The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy

Thesis submitted by

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Statement of Original Authorship

The work presented in this thesis has not been previously submitted to meet the requirements for the Degree of Doctor of Philosophy at James Cook University or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Michael Koczyrkewycz

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Contribution of Others to this Thesis

Nature of Assistance	Role / Contribution	Names, Titles, and Affiliations of Co-Contributors
Supervision	Primary Supervisor	Associate Professor Taha Chaiechi, James Cook University (JCU)
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Abstract

Background: Although the role of financial development and fiscal policy in a circular economy is widely established, their integration into a Kaleckian post-Keynesian macroeconomic framework remains limited. Through the incorporation of commonly used measures (i.e., broad money and domestic credit) and contemporary measures (i.e., liquid liabilities, credit to government and state-owned enterprises, and stock market turnover) of financial development alongside a fiscal policy indicator (i.e., government expenditure), this study seeks to understand the implications surrounding the augmentation of the Kaleckian post-Keynesian macroeconomic framework. As the role of financial markets and government policies within a circular economy is gaining more attention, analysis within such an augmented framework will provide decision-makers with a better understanding of how the explanatory variables influence key macroeconomic indicators over periods of time. Such incorporations are original and are a contribution to current knowledge. The implications of such incorporations are explored through system-dynamic analysis, uncovering whether such inclusions are warranted. In another contribution, this study examines the resilience of the selected key macroeconomic indicators (i.e., investment, productivity growth, and savings) against external and unforeseen shocks within the augmented Kaleckian post-Keynesian macroeconomic framework.

The research aims, gaps, and questions: The study aims to: 1) incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks within an augmented Kaleckian post-Keynesian macroeconomic framework. Therefore, the aims of this study provide a unique analysis. The study's aims were uncovered through the following research gaps within the literature.

Research Gap 1:	Limited research on the incorporation of contemporary measures of financial development within the macroeconomic frameworks
Research Gap 2:	Lack of research regarding the incorporation of the role of the public sector (e.g., fiscal policy) within the macroeconomic frameworks
Research Gap 3:	Lack of research regarding the exploration of factors underpinning resilience and economic stability.
This study contains three research questions, following the three research gaps under analysis.	
Research Question 1:	How can multisector dynamic macroeconomic models be improved upon to provide plausible counterfactual outcomes that describe an economy's reaction to external factors affecting it?
Research Question 2:	How do financial markets and government expenditure fluctuations influence the sources of economic growth in a multisector economy?

Research Question 3:	How stable and resilient are the seemingly well-functioning economies, and can they withstand external shocks?

Methodology: This study adopts a quantitative approach to examine the existing research gaps and questions. This study employs time-series analysis to explore statistical characteristics, make inferences, and establish relationships using various methods and econometric techniques. In this study, unit-root testing finds that the time series data exhibited both *I(0)* and *I(1)* behaviours, suggesting that vector error-correction modelling (VECM) and autoregressive distributed lag (ARDL) modelling methodologies are appropriate. In analysing the resilience of investment, productivity growth, and savings towards exogenous shocks, the use of impulse response functions (IRF) and variance decompositions (VD) is incorporated within this study.

Results: In exploring the impacts of financial development and fiscal policy upon selected key macroeconomic indicators, this study divides the results into two chapters from which three research papers were emulated. The results chapters explore research gaps and questions 1 and 2. The emulated papers satisfied both aims of this study and the exploration of research gaps and questions 1, 2, and 3.

Results Chapter 5 and emulated paper: Explored within an Australian context, this study utilises a Kaleckian post-Keynesian macroeconomic framework to analyse key macroeconomic indicators, including investment, savings, income distribution, productivity growth, and net exports. The augmented models incorporate the financial development measurements of stock market turnover, credit to government and state-owned enterprises, and monetisation. The chapter utilises annual historical data from 1980-2015, adopting VECM methodology to test for long and short-run (i.e., periods) causality and their implications towards the economic theory for five augmented models. Besides income distribution, all models held a significant error-correction term (ECT), suggesting that the inclusion of financial development and fiscal policy indicators was warranted for four of the five models in explaining long-run causal relationships. This is a significant result. The most utilised commonly used indicator was monetisation (i.e., broad money). Government expenditure (i.e., fiscal policy) was a more powerful explanatory indicator when compared with the financial development indicators. Chapter 5 satisfied research gaps and questions 1 and 2. In a further contribution, a peer-reviewed conference paper[1] satisfied research gaps and questions 1, 2, and 3, whereby IRFs and VDs examined investments' resilience against external disturbances. In answering research question 3, IRFs showed that investors reacted to changes in profit share, productivity, and financial markets cyclically and positively. Appearing to absorb the shocks through short-run stability (i.e., 5-6 years), the investment benefited from an improvement in these variables. The VD technique showed that changes in the private sector's productive capacity and profitability were most capable of explaining investment level variations.

[1] **eBook ISBN,** 978-981-16-5260-8, **DOI:** 10.1007/978-981-16-5260-8. Details can be found here.

Results Chapter 6 and emulated papers: Explored the impacts of financial development and fiscal policy upon key macroeconomic indicators for the United States, Japan, and South Korea. The augmented models incorporated the financial development measurements of monetisation, domestic credit, stock market turnover, credit to government and state-owned enterprises, and liquid liabilities. The chapter utilised annual historical data from 1980-2019, adopting ARDL methodology to test for long and short-run causality and their implications towards the economic theory. All 15 models exhibited a significant ECT, suggesting that the inclusion of financial development and fiscal policy indicators was warranted, being a significant result. Liquid liabilities were the most utilised contemporary measure of financial development, followed by stock market turnover and credit to government and state-owned enterprises. In contrast, domestic credit was the most utilised commonly used measure of financial development, followed by monetisation. Compared with the incorporated financial development indicators, government expenditure (i.e., fiscal policy) was found to be a more powerful explanatory indicator. Chapter 6 satisfied research gaps and questions 1 and 2.

In addressing research gap and question 3, a thorough empirical analysis was conducted in a paper[2]. This analysis sheds light on the resilience of productivity growth in the United States, Japan, and South Korea when exposed to exogenous shocks. Results obtained from the IRFs indicated that in the United States, productivity growth showed a higher level of resilience to a shock in stock market turnover, both in the short and long run. However, it exhibited the least resilience to a shock in investment. In the long run, Japan's data showed that productivity growth was most resilient to a shock in investment while also showing similar resilience to a shock in government spending in the short run. South Korea's data showed the most resilience in a short-run shock in domestic credit while also showing similar resilience to a shock in government spending in the long run. Variance decompositions were also employed in this study, investigating the influence of variables towards the growth of productivity and their ability to explain variability in the short and long run. The United States data showed that productivity growth exhibited susceptibility to changes in capacity utilisation while displaying weaker sensitivity to stock market turnover, government expenditure, and investment in the long run. Japan's data showed that productivity growth exhibited moderate sensitivity to change in the orders of monetisation, investment, and government spending in the long run. The data showed that productivity growth exhibited weaker sensitivity to changes in capacity utilisation. South Korea's data showed that productivity growth displayed susceptibility to investment and capacity utilisation changes; however, it experienced a weak acceleration in sensitivity towards changes in domestic credit and government spending over time.

In answering research gap and question 3, the incorporated IRFs contained within the paper[3] under review showed that savings in South Korea contained the strongest absolute

[2] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

[3] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

impulse responses in the short run, all economies exhibited mixed results in the medium term, and savings in Japan held the weakest absolute impulse reactions in the long run. Overall, however, savings in Japan became somewhat steady after eight years, savings in South Korea became somewhat steady after 14-15 years, and savings in the United States after 17-18 years. Furthermore, the VDs showed that savings were not sensitive to changes in capacity utilisation in the long run, whereby an orthogonal shock in capacity utilisation only weakly influenced the stability of savings via United States data. Savings exhibited moderate to strong sensitivity in the short run towards changes in profit share and government expenditure; however, showed weaker sensitivity in the long run. Interestingly, savings did not react strongly to changes in domestic credit. Japan's data showed that savings grew in sensitivity towards changes in credit to government and state-owned enterprises over time. South Korea's data showed that, for the most part, savings in the short run were not sensitive to changes in all independent variables; however, grew in sensitivity over time.

Conclusions: Through research gaps and questions 1 and 2, it was found that 19 of the 20 augmented models showed a significant ECT, indicating that the inclusion of such indicators for future research is warranted. Comparing the indicators revealed that government expenditure was the more powerful mechanism. In each emulated paper, exploring research gaps and questions 1, 2, and 3, impulse responses showed each key macroeconomic indicator exhibited unique resilience capabilities towards a one-time exogenous shock over time, while variance decompositions showed that each key macroeconomic indicator held different sensitivities to change over time.

Through theoretical and empirical contributions, this study incorporated multidimensional and system-dynamic analysis, contributing to the current framework by incorporating financial development and fiscal policy indicators. The findings contained within this study provide policymakers with a wide array of information. This information can assist in understanding the dynamics of long and short-run relationships running from government expenditure towards the selected key macroeconomic indicators. This study also examined the resilience of investment, productivity growth, and savings towards a shock in government expenditure via impulse response analysis, providing policymakers with an understanding of: 1) the reactionary delays; 2) positive and/or negative cyclical manner behaviours; 3) time to stability; and 4) the strength of a positive one-time shock over time (i.e., resilience). Likewise, for professional practitioners who operate in the financial sector (i.e., investors, regulators, bankers, and insurers), the information contained within this study can assist decision-makers in creating appropriate investment strategies based on the strength of causal relationships of the selected financial development indicators towards key macroeconomic indicators, alongside which financial development indicator held the most suitable representation.

While the results contained within this study contribute to the literature, recommendations for future research are warranted in several forms, including: 1) the inclusion of a more comprehensive selection of financial development indicators; 2) the extension of datasets to include the effects of COVID-19; 3) the incorporation of more specific measurements of fiscal policy; and 4) the expansion of time series methodology (i.e., non-

linear ARDL) to allow for additional analysis of the short and long-run asymmetric impacts of both negative and positive changes in the independent variables over time, offering a more comprehensive overview of the connections under examination.

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List of Tables and Diagrams

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Abbreviations and Acronyms Used

ADF	Augmented Dickey-Fuller
ADI	Authorised Deposit-Taking Institution
AFC	Asian Financial Crisis
AIC	Akaike Information Criterion
APEC	Asia-Pacific Economic Co-operation
APRA	Australian Prudential Regulation Authority
ARDL	Autoregressive Distributed Lag
ASX	Australian Stock Exchange
BCFP	Bureau of Consumer Financial Protection
BEMAS	International Conference on Business, Economics, Management and Sustainability
BOK	Bank of Korea
CBO	Congressional Budget Office
CFTC	Commodity Futures Trading Commission
CGSO	Credit to Government and State-Owned Enterprises
CO2e	Carbon Dioxide Equivalent
COVID-19	Coronavirus Disease 2019
CUSUM	Accumulative Sum Chart
CUSUMSQ	Accumulative Sum Chart Squared
DC	Domestic Credit
DF	Dickey-Fuller
EC	Error-Correction
ECT	Error-Correction Term
ESG	Environmental, Social and Governance
FD	Financial Development
FDIC	Federal Deposit Insurance Corporation
FIRREA	Financial Institutions Reform, Recovery and Enforcement Act
FOMC	Federal Open Market Committee
FP	Fiscal Policy
FSC	Financial Services Commission
FSS	Financial Supervisory Service
FSU	Financial Supervisory Union
GDP	Gross Domestic Product
GE	Government Expenditure
GFC	Global Financial Crisis
GFDD	Global Financial Development Database
HQ	Hannan-Quinn Criterion
I(0)	Non-Stationary
I(1)	Stationary
IMF	International Monetary Fund
INV	Investment
IR	Interest Rate

IRF	Impulse Response Function
JPX	Japan Exchange Group
KOSPI	Korea Composite Stock Price Index
KRX	Korea Exchange
LL	Liquid Liabilities
MOFJ	Ministry of Finance Japan
MR	Monetisation Ratio
NABO	Korean National Assembly Budget Office
NCUA	National Credit Union Administration
NGDP	Nominal Gross Domestic Product
NX	Net Exports
OCC	Office of the Comptroller of the Currency
OECD	Organisation for Economic Co-Operation and Development
OLS	Ordinary Least Squared
OSE	Osaka Securities Exchange
P	Profit Share
PG	Productivity Growth
PP	Phillips-Perron
Q	Quarter
R&D	Research and Development
RBA	Reserve Bank of Australia
ROK	Republic of Korea
S	Savings
SBT	Science-Based Target
SEC	Securities and Exchange Commission
SME	Small and Medium-Sized Enterprises
SMTR	Stock Market Turnover Ratio
SOE	State-Owned Enterprise
SVAR	Structural Vector Autoregression
TFP	Total Factor Productivity
TSE	Tokyo Stock Exchange Group
U	Unemployment
UT	Capacity Utilisation
VAR	Vector Autoregression
VD	Variance Decomposition
VEC	Vector Error-Correction
VECM	Vector Error-Correction Model

Keywords*:* Kaleckian post-Keynesian macroeconomic framework; financial development; fiscal policy; financial markets; time series; VECM; ARDL; resilience; investment; savings; productivity growth; income distribution; net exports.

Glossary of Terms Used

ARDL: a statistical model used in econometrics to study the relationship between a dependent variable and one or more independent variables over time. ARDL models are a type of cointegration analysis that can be used to study both short and long-run relationships between variables, making them useful for analysing dynamic relationships in macroeconomic and financial data.

Augmentation: the process of improving or enhancing something, often by adding new features, capabilities, or components.

Capital: the resources, both financial and physical, that are used to produce goods and services. In economics, capital includes machinery, equipment, buildings, and other tangible assets, and financial capital such as stocks, bonds, and bank deposits. Capital is an important factor of production and is essential for economic growth, allowing firms to increase their capacity to produce goods and services, increasing productivity and competitiveness.

Causality: the relationship between an event (the cause) and a second event (the effect), whereby the second event results from the first. In other words, causality refers to the notion that a cause-and-effect relationship exists between two events.

The Circular Flow of an Economy: the continuous flow of goods, services, and resources between households and firms in a market economy.

Contemporary Measures: current methods and tools used to assess or quantify a particular phenomenon. The term is often used in economics, where contemporary measures are used to track economic indicators and assess economic conditions.

Economic Development: the process of improving a country's citizens' economic well-being and quality of life through increased production of goods, services, and employment opportunities, leading to higher living standards.

Economic Growth: the increase in a country's production of goods and services over a period of time is typically measured by the growth rate of its gross domestic product (GDP). It is an essential indicator of the health and development of an economy and is usually accompanied by increased levels of income, employment, and standard of living for a country's citizens.

Economic Resilience: the ability of an economy to withstand and recover from adverse events such as economic shocks, recessions, financial crises, or natural disasters. Economic resilience can be measured in terms of the speed and strength of an economy's response to shocks and its ability to maintain its key functions, such as providing goods, services, employment opportunities, and financial stability.

Financial Development: the growth and expansion of a country's financial sector, including the growth of financial institutions, financial markets, and financial instruments. It involves the creation of new financial products and services, the integration of new technologies into the financial system, and increasing citizens' participation in financial markets.

Financial Markets: venues where buyers and sellers participate in the trading of financial securities such as stocks, bonds, currencies, and commodities.

Financial Sector: the part of the economy that deals with creating, distributing, and managing money and financial assets. It includes institutions such as banks, insurance companies, investment firms, and stock exchanges. The financial sector plays a crucial role in the functioning of modern economies by facilitating the flow of funds from savers to borrowers and enabling businesses to access the capital they need to grow and invest.

Fiscal Policy: the use of government spending and taxation to influence the economy. Fiscal policy includes changes in government spending levels, tax rates, and government borrowing. Fiscal policy can stabilise the economy during economic downturns by increasing government spending, cutting taxes, or cooling down an overheating economy by reducing spending.

Income Distribution: how the total income generated in an economy is distributed among its members. Income can be distributed among individuals, households, and different socioeconomic groups.

Investment: the purchase of goods not consumed today but used in the future to create wealth. In finance, investment refers to purchasing financial products, such as stocks, bonds, or real estate, expecting to earn income or capital appreciation. Investment can also refer to using resources, such as capital, labour, or technology, to develop or improve a project or business with the expectation of generating future returns.

Kaleckian Macroeconomic Model: this focuses on the role of investment in driving economic growth. It was developed by the economist Michał Kalecki and is based on the idea that the level of investment in the economy is determined by the level of effective demand or the total demand for goods and services. The model assumes that investment is a function of the profit expectations of firms and the level of aggregate demand in the economy. If aggregate demand is strong and firms make high profits, they will increase their investment, leading to higher economic growth. The Kaleckian macroeconomic model emphasises the importance of aggregate demand and the role of the government in stimulating demand through fiscal and monetary policy.

Kaleckian Post-Keynesian Model of Growth and Distribution: an integrated model of behavioural functions of the real sector, such as private investment, domestic savings, income distribution, productivity growth, net exports, and employment.

Keynesian Macroeconomic Theory: this is named after British economist John Maynard Keynes. The theory emphasises the role of government intervention in stabilising the economy during economic downturns and high unemployment. Keynesian economics argues that the government should increase spending and lower taxes during recessions to stimulate demand and boost economic growth. The government should, however, reduce spending and raise taxes during periods of inflation to curb inflationary pressures. The theory also holds that the government should manage the economy proactively, intervening to stabilise output, prices, and unemployment. Keynesian economics was widely influential in the mid-20th century and continues to inform government economic policies in many countries today.

Macroeconomic Framework: a theoretical or conceptual structure used to analyse and understand the behaviour of an economy as a whole, rather than the behaviour of individual consumers or firms. The framework typically includes models and theories of aggregate demand and supply, inflation, unemployment, and growth. It helps policymakers and economists understand how changes in one aspect of the economy, such as interest rates or government spending, affect other aspects of the economy.

Market Developments: changes and trends in a particular market or group of markets over time. Market developments can include changes in supply and demand, prices, competition, and regulatory or technological changes, significantly impacting businesses, consumers, and the overall economy.

Market Efficiency: a market in which security prices quickly respond to new information by accurately incorporating this information into prices and reaching a new equilibrium.

Marxian Reserve Army Effect: higher unemployment diminishes workers' bargaining power and stimulates higher profits.

Monetary Policy: the actions a central bank takes to control the money supply and interest rates in an economy to achieve its macroeconomic objectives, such as low inflation, stable currency value, and sustainable economic growth.

Neo-Classical Growth Theory: a branch of macroeconomics that studies long-term economic growth and development determinants. It is based on Classical economics and builds on the ideas of Adam Smith and David Ricardo. The focus of neo-Classical growth theory is the role of technological progress and capital accumulation in driving economic growth.

Net Exports: the difference between a country's total exports and imports.

Policymaker: a person or a group of people who decide how to allocate resources, design and implement laws, and make decisions that shape the direction and priorities of a society.

Post-Keynesian Growth Theory: a heterodox economic perspective that critiques and builds upon the Keynesian tradition in macroeconomics. Unlike neo-Classical growth theory, which emphasises the role of technological progress and capital accumulation in driving economic growth, post-Keynesian growth theory emphasises the role of aggregate demand, distribution, and institutions in shaping economic growth and development. In post-Keynesian growth theory, the key determinants of growth are seen as investment spending, innovation, and the distribution of income and wealth. The theory also highlights the importance of institutional arrangements and the state in shaping the economic environment and promoting sustainable growth.

Productivity Growth: the increase in goods and services produced per input unit, such as labour or capital, in a specific period. It measures how efficiently an economy, a firm, or an industry uses its resources to produce output. The productivity growth rate measures the annual rate of change in productivity and is an essential indicator of an economy's potential for long-term economic growth and prosperity.

Professional Practitioners: individuals who have acquired specialised skills and knowledge in a particular field through formal education, training, and experience. They use their expertise to provide services, solve problems, and make decisions in their areas of specialisation.

Profit Share: a portion of a company's profit distributed among its employees or shareholders. Profit sharing is a form of incentive compensation that rewards individuals for contributing to the company's financial success. In some companies, employees receive a direct payment based on a percentage of the company's profits, while in others, profits are used to purchase company stock for employees. Profit sharing can be an essential tool for motivating and retaining employees, aligning the interests of employees with the interests of the company and its shareholders.

Random Walk: a stochastic or random process in which the movements of stock prices are unpredictable and independent.

Real Sector: the part of the economy that produces goods and services, as opposed to the financial sector, which deals with the creation, distribution, and management of money and financial assets. The real sector includes the agriculture, manufacturing, construction, mining, and service industries.

Savings: the portion of income not spent on consumption. In other words, it is the amount of money individuals or households have left after paying expenses. Savings can take many forms, including bank deposits, stocks, bonds, mutual funds, and real estate. By saving money, individuals and households can accumulate wealth over time, which can be used for future consumption or investment. Savings also play an essential role in the economy as a whole.

Stock Market: a platform where publicly traded companies' stocks (i.e., shares or equities) are bought and sold. The stock market provides a way for companies to raise capital by issuing shares and for investors to buy and sell these shares to earn a profit.

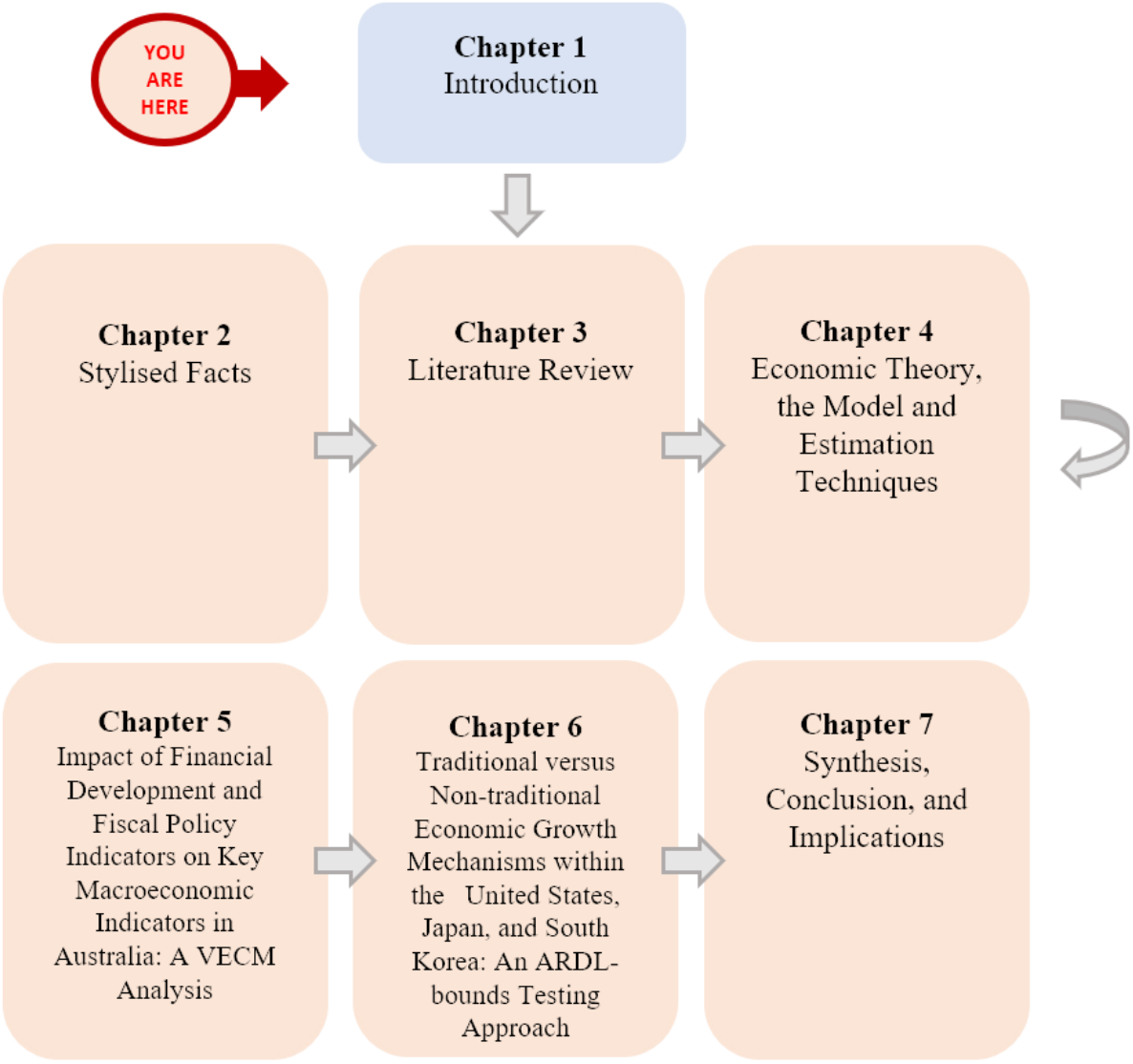
Structural Break: a phenomenon that occurs when a time series encounters an abrupt change at a point in time.

Technical Analysis: a prominent technique used to forecast stock prices and suggest trading rules based on trends and regular cycles.

VAR Model: a statistical model used in econometrics and finance to study the relationship between multiple time series variables. It is a type of multivariate time series model that attempts to capture the dynamic interrelationships between multiple variables and their past values.

VECM: a type of multivariate time-series model used in econometrics and finance to study the relationship between multiple variables over time. It is an extension of the VAR (vector autoregression) model that incorporates the idea of cointegration between variables. Cointegration means the variables are related, so their differences converge over time, forming a long-run equilibrium relationship.

Thesis Structure



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Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2018). *The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy*. Paper presented at the 2018 Australian Conference of Economists (ACE), The Economic Society of Australia (ESA), Canberra, 10-13 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2020). *Impacts of Financial Development and Fiscal Policy Upon Investment within Australia*. Paper presented at the 33rd PhD Conference in Business and Economics, Monash University, Melbourne, 23-24 November.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea*. Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better – Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), James Cook University, Cairns, 1-3 July.

Chapter 1: Introduction

Abstract

This chapter explores the overview of this study by providing an introduction and background towards the impacts of financial markets and governments in influencing economic growth in the first instance. Secondly, after carefully considering the literature, this chapter introduces three clear research gaps and three associated research questions. Simply put, this study sets out to augment the Kaleckian post-Keynesian macroeconomic framework by incorporating financial development (*fd*) and fiscal policy (*fp*) indicators. To achieve this, the study utilises time-series analysis to assess the necessity of these inclusions. It examines the significance of the error-correction terms (ECT) and investigates individual unidirectional long and/or short-run relationships towards the selected key macroeconomic indicators. Under such analysis, the study also explores the resilience of three well-established economic growth instruments: investment, productivity growth, and savings against unexpected exogenous shocks. Thirdly, this chapter explores research methodology, country and data selection, the employment of statistical properties, inferences, and relationships through a series of processes and econometric techniques. Fourthly, the significance of the research is examined, detailing this study's empirical and theoretical contributions and considering the potential impact on policymakers and professional practitioners. Lastly, the chapter concludes by outlining the key components of the study.

1.0 Introduction

What makes some nations poor and others rich? Since the days of Adam Smith, economists have debated this question (see Mankiw et al., 1995; Engel, 2010; Schumacher, 2015). While the description of direct and indirect influences upon economic growth has expanded over time through advances in literature, research, and economic modelling, the primary explanation for such an important indicator is quite simple: economic growth is the process by which a nation's wealth increases over time, through the production of economic goods and services (Williamson, 2018). While the debate continues about which academic theories and measurements best describe economic growth, there is no debate that some nations have grown rapidly while others have not. As such, the study of economic growth is fundamental towards promoting the well-being of a nation's citizens. In exploring such a fundamental concept, Acemoglu (2012) provides various reasons why economic growth is an important field to study, including: 1) many unknowns still require discovery, inviting great intellectual activity; 2) economic development is highly multi-faceted; 3) the theory combines both macro and micro elements; and 4) the field has mainly become empirical, inviting researchers to answer new empirical questions.

The circular flow of an economy constitutes a fundamental framework for understanding the interplay of income and expenditure within an economic system. In the context of a five-sector economy, crucial participants include businesses (i.e., firms) and households, alongside the financial, government, and overseas sectors. The overseas sector encompasses imports, exports, direct investments, and portfolio investments, facilitating the flow of funds from the foreign sector into the domestic economy. This integration with the

global economy signifies the characteristics of an open economy. Households play a role in the market by purchasing goods and services from the business sector while also supplying the factors of production. In return, the business sector compensates households through various forms of payment. The government sector includes all local, state, and federal government bodies, central banks, and other financial services bodies. Acting as a regulator, governments hold powerful mediums to influence the economy, such as taxation and expenditure (i.e., fiscal policy). The public sector can also consist of state-owned enterprises, such as utilities, financial sectors, and, in some circumstances, banks. The financial sector includes bank and non-bank intermediaries, encouraging borrowing and investment activities.

In analysing the role of financial markets, the Ellen Macarthur Foundation (2020) delivers a comprehensive report on the role of the circular economy in reducing global greenhouse gas emissions. The report proposes moving past today's 'take-make-waste' linear model, towards a circular economy that offers a production suite in which products are designed to be recycled, repaired, and repurposed to a point where natural systems are regenerated. In such a circular economy, there is an effort to move away from producing goods and services from finite resources, instead encouraging renewable energy sources to minimise waste, ultimately helping global pollution reductions by changing the way industry produces. The report suggests this can be achieved through three principles: 1) redesigning out waste and pollution handling strategies; 2) keeping produced materials in use; and 3) the regeneration of natural systems.

In June 2020, more than 50 global business leaders endorsed such a circular economy in response to such exposures to attract stronger economic growth. The Ellen Macarthur Foundation (2020) report highlights that the global financial sector has started to capture this opportunity through debt and equity instruments. The report suggests that climate change, alongside environmental, social, and governance (ESG) issues, have become boardroom topics for global financial firms, with ESG investment increasing from $US23 trillion in 2016 to more than $US40 trillion in 2020 (Foubert, 2020). Since the Ellen Macarthur Foundation (2020) report, global policymakers have enabled regulations to assist, such as creating green bond standards and climate benchmarks. Global governments are beginning to recognise the potential of such frameworks, encouraging market competitiveness to build stronger supply chains to deliver on environmental objectives. One way to encourage such behaviour is targeted government expenditure programs.

Regardless of the type of circular flow under consideration, there is little doubt regarding the influence of financial markets and governments towards international economics. While ESG investment took a modern form in the 1960s, the growing interest in financial market ESG investment sparks curiosity in analysing the relationship between financial developments and key macroeconomic indicators within a prescribed macroeconomic framework. There is also further curiosity towards analysing the influence of government expenditure on key macroeconomic indicators, as the role of government is vital within such a circular economy. This study adopts a Kaleckian post-Keynesian macroeconomic framework to explore and describe the aforementioned indicators. This framework provides a theoretical

lens for analysing the dynamics of the economy. Within this framework, several key macroeconomic indicators are considered crucial. These indicators include investment, savings, income distribution, productivity growth, employment, and net exports. By examining these indicators within the Kaleckian post-Keynesian macroeconomic framework, this study can gain insight into the functioning and performance of an economy.

While the importance of financial development (*fd*) and fiscal policy (*fp*) influences towards economic growth is well-established within the literature, work by Chaiechi (2012) has highlighted the underrepresentation of these incorporations within the Kaleckian post-Keynesian macroeconomic framework. This observation presents an opportunity to delve into this mostly unexplored field. There is also scope to explore the resilience of three well-established economic growth instruments: investment, productivity growth, and savings against unexpected exogenous shocks. As such, this study aims to: 1) incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of savings, investment, and productivity growth against external and unforeseen shocks within such a prescribed framework. Therefore, this study aims to offer a distinctive analysis by utilising time series data to examine the cases of Australia, the United States, Japan, and South Korea.

1.1 Background

In this section, the implications regarding the augmentation of the Kaleckian post-Keynesian macroeconomic framework, through the incorporation of *fd* and *fp* indicators, are explored through a literature review. In addition, the resilience of three well-established economic growth instruments: investment, productivity growth, and savings, are also explored. The following analyses the functions defining the financial market and fiscal developments in the first instance. Levine (2005) identifies five key functional activities defining financial market advancement. These functions include information analysis for investments, corporate governance oversight, facilitating trade and risk management, mobilising savings, and enabling the exchange of goods, services, and financial instruments. As demonstrated by Levine's research, empirical evidence supports the notion that financial system development is closely linked to economic growth.

While the role of *fd* is well established, its incorporation within a Kaleckian post-Keynesian macroeconomic framework is somewhat limited. Some research has incorporated *fd* into the prescribed framework, utilising and extending the works of Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004). The full description of the Kaleckian post-Keynesian framework is provided in Chapter 4. In extending these works, Chaiechi et al. (2006) incorporate an *fd* indicator within an investment model utilising South Korea data from 1990-2014, utilising vector autoregression (VAR) methodology. The authors found a stable long-run relationship running towards investment, concluding that *fd* does have a role in influencing economic growth. Utilising three *fd* indicators via a structural (VAR) methodology for the economies of South Korea, the United Kingdom, and Hong Kong during the periods 1990-2010, Chaiechi (2012) found that *fd* improves macroeconomic performance in South Korea,

stimulates savings, investment, and productivity growth in Hong Kong, but reveals vulnerability to future shocks in the United Kingdom due to a weak and unstable financial system. In suggesting future research, Chaiechi (2012) recommends incorporating the public sector to capture the effectiveness of tax and spending policies in influencing key macroeconomic indicators. Nguyen et al. (2020) conducted a study investigating the response of macroeconomic indicators to shocks in the development of second-tier stock markets. Employing structural vector error-correction (VEC) methodology, the authors found that the development of small and medium-sized enterprise (SME) stock markets, indicative of financial development and/or innovation, had a positive yet moderate impact on short-run economic stimulation. The study emphasised that economic growth in Hong Kong, Singapore, and Thailand during 2009-2016 was propelled by developments of SME stock markets and innovation, influencing factors such as investment, employment, productivity growth, and savings.

The role of *fp* within the Kaleckian post-Keynesian macroeconomic framework has been explored previously within the literature, whereby Kaleckian economists argue that expansionary *fp* positively influences the economy (Ko, 2018). According to You and Dutt (1996), fiscal policies leading to increases in government debt can stimulate economic growth, albeit at the cost of exacerbating income inequality through the interest income earned by capitalists. Following this study, Asada (2012) argued that fiscal policies produce positive outcomes, whereby income changes hold stronger causality when compared with government debt changes in promoting economic growth. In other words, expansionary fiscal policies can promote economic growth and stability faster, whereas fiscal austerity policies that aim to reduce government debt can destabilise economies.

In a separate study, Taylor et al. (2012) analysed the interrelationships between economic growth, government debt, and budget deficits. Using econometric estimations of United States data from 1961-2011, a stronger positive influence towards economic growth was evident with a higher government deficit. According to Taylor et al. (2012), the impact of productive government expenditure on economic growth depends on the ratio of government expenditure to income, as interpreted within the Kaleckian macroeconomic framework. Government expenditure can be defined as spending aimed at fostering economic growth, improving productivity, and enhancing society's overall well-being. Expenditure can be directed to various areas, including infrastructure investment, education and research, healthcare, technology and innovation, and social safety nets (Irmen & Kuehnel, 2009).

They argue that unproductive government expenditure always impacts economic growth. In Ko's (2018) analysis, which focused on growth and distribution within Kaleckian macroeconomic models, the budget deficit ratio (i.e., representing *fp*) was used as an indicator to explore long and short-run causality. The empirical findings suggest that an increase in budget deficits positively affected economic growth, contingent upon a corresponding rise in the long-run equilibrium growth rate. In the short term, increased budget deficits positively affected the capacity utilisation rate. The results also imply that raising the tax rate for capital income can stimulate the economy in the short run.

While the main aim of the study is the augmentation of the Kaleckian post-Keynesian macroeconomic framework, through the incorporation of commonly used and contemporary measures of *fd* indicators and a single *fp* indicator, there is scope to test the resilience of three powerful economic growth instruments: investment, productivity growth, and savings against unexpected exogenous shocks. Chaiechi and Nguyen (2021) argued that Classical economics may not be suitable for analysing economic resilience effectively due to the strong focus on equilibrium conditions. Instead, they advocate for utilising a post-Keynesian macroeconomic framework, which offers a more appropriate approach. Post-Keynesian economists commonly employ well-established methodologies and frameworks to examine out-of-equilibrium phenomena within modern economic theories. Caldera-Sanchez et al. (2016) explored economic resilience, analysing severe recessions and financial crises post-1990. Their research encompassed various economies, including OECD and non-OECD countries, during the period 1970-2014. The study found that governments with effective governance experienced less severe recessions and higher economic growth. The authors emphasised the significance of implementing policies to mitigate the risks and consequences of crises, strengthening economic resilience.

This study sets out to analyse the gaps within the current literature, being: 1) the incorporation of both *fd* and *fp* into an augmented Kaleckian post-Keynesian macroeconomic framework; 2) the employment of commonly used and contemporary *fd* indicators; and 3) an exploration of the resilience of investment, productivity growth, and savings mechanisms against unexpected exogenous shocks within such an augmented framework. Incorporating both indicators within such an augmented framework, alongside exploring the resilience of three powerful growth mechanisms of the selected economies, will be a first. Within the Kaleckian post-Keynesian macroeconomic framework, the analysis will focus on key macroeconomic indicators such as investment, savings, income distribution, productivity growth, and net exports. These indicators will be examined within the selected economies of Australia, the United States, Japan, and South Korea. By studying these indicators, insights can be gained into the dynamics and performance of these economies from a Kaleckian post-Keynesian perspective.

The aims of this study are important for two reasons: 1) the role of financial markets and government policies within a circular economy is gaining more attention, and as such, analysis within such an augmented framework will provide decision-makers with a better understanding of how the explanatory variables influence key macroeconomic indicators over periods of time; and 2) understanding the resilience of three powerful key macroeconomic indicators, namely investment, productivity growth, and savings, will provide decision-makers with information on which of the explanatory variables holds the strongest influence during unexpected exogenous shocks and changes.

1.2 Research Gaps

While there has been some contribution towards incorporating *fd* into such a macroeconomic framework (Chaiechi et al., 2006; Chaiechi, 2012; Nguyen et al., 2020), there is scope to add to the literature in more ways than one. This study aims to: 1) incorporate and

analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks within such a prescribed framework. Therefore, the aims of this study provide a unique analysis. This section will funnel such aims into three clear and precise research gaps.

Research Gap 1:	Limited research on the incorporation of contemporary measures of financial development within the macroeconomic frameworks
Research Gap 2:	Lack of research regarding the incorporation of the role of the public sector (e.g., fiscal policy) within the macroeconomic frameworks
Research Gap 3:	Lack of research regarding the exploration of factors underpinning resilience and economic stability.

1.2.1 Research Gap 1: Limited Research on the Incorporation of Contemporary Measures of Financial Development within the Macroeconomic Frameworks

While previous research has incorporated *fd* indicators within a Kaleckian post-Keynesian macroeconomic framework, such analysis has only incorporated and tested commonly used measures (i.e., domestic credit, stock market capitalisation, and monetisation) within selected key macroeconomic models. In reviewing the literature, Chaiechi et al. (2006) utilised an investment model through vector autoregression (VAR) methodology, Chaiechi (2012) utilised structural (VAR) methodology for the key macroeconomic indicators of investment, savings, income distribution, productivity growth, net exports, and employment, while Nguyen et al. (2020) utilised structural vector error-correction (VEC) methodology for the models of investment, savings, productivity growth, and employment. While Chaiechi et al. (2006) analysed long and short-run causality running from the explanatory variables towards investment, the later studies analysed the response of the dependent variables towards orthogonal shocks in a structural setting through impulse response functions. This presents an opportunity to expand upon the literature by: 1) incorporating commonly used and contemporary measures of *fd*, ultimately selecting the most appropriate indicators through model selection processes; and 2) incorporating other time series methodologies, such as vector error-correction modelling (VECM) and autoregressive distributed lag (ARDL) modelling, to provide a more complete picture of the studied relationships.

In defining the post-Keynesian macroeconomic framework within this study, the key macroeconomic indicators of investment, savings, income distribution, productivity growth, and net exports will be placed as a dependent variable, making five models, with each respective dependent indicator explained by its explanatory variables. In defining *fd*, this study incorporates the use of two commonly used measures, domestic credit (DC) and monetisation ratio (MR) or M2, and three contemporary measures, stock market turnover ratio (SMTR), credit to government and state-owned enterprises (CGSO), and liquid liabilities (LL), or M3. A different *fd* indicator is placed as an additional explanatory variable through rotational

processes in each of the five models. Of the five *fd* indicators tested within each model, one will be selected for deeper analysis, based on economic theory, the significance of the coefficients, the goodness of fit, and the stability of the model. The selected indicator will be considered the most suitable representation of *fd* for each model. Therefore, this study sets out to analyse the unidirectional causal relationships running from the explanatory variables to the key macroeconomic indicators, utilising time-series-analysis, and investigate whether incorporating such *fd* indicators is warranted within the framework.

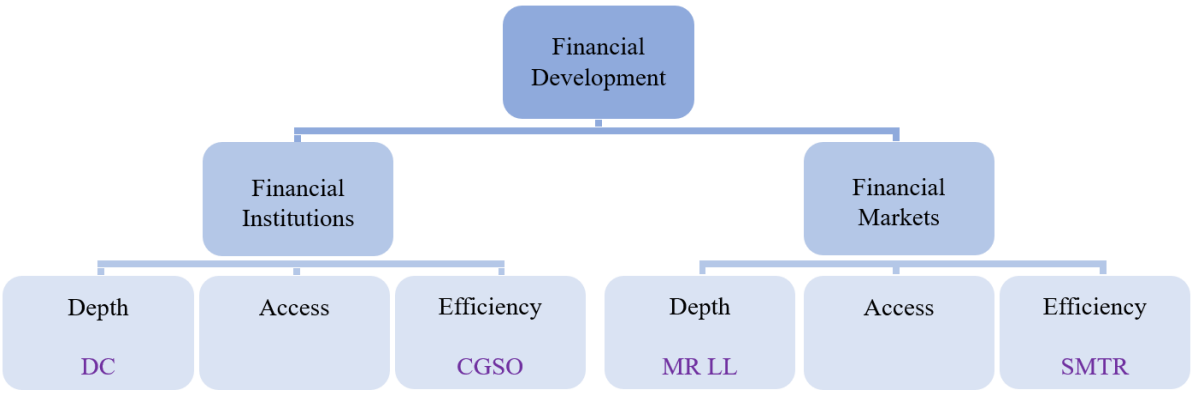


Figure 1.1. Financial Development, based on Čihák et al. (2012).

The selection of contemporary measures contained within this study was incorporated by analysing the introduction of new broad-based indexes of *fd*, as presented by Svirydzenda (2016), which is an extension of the works of Čihák et al. (2012). Financial development measurements are divided into financial institutions and financial markets. Financial institutions include mutual and pension funds, insurance companies, and banks, while financial markets include the bond and stock market. Contained within each are three descriptions: depth, access, and efficiency. At the time of the latest available data in 2019, the database encompassed attributes from 214 economies, examining 109 unique indicators individually. However, it is important to note that only a limited subset of indicators was analysed throughout this research project. Figure 1.1 illustrates the categorisation of the financial indicators. Domestic credit (DC) is classified as a depth indicator for financial institutions, while credit to government and state-owned enterprises (CGSO) is an efficiency indicator. Within financial markets, the monetisation ratio (MR) and liquid liabilities (LL) are depth indicators, while stock market turnover (SMTR) is an efficiency indicator. A deeper analysis of the relationships between the selected *fd* indicators towards each key macroeconomic indicator can be found in the results chapters in this study. As the role of financial markets within a circular economy is gaining more attention, incorporating both commonly used and contemporary measures of *fd* will be a first to see which holds the strongest causal effects.

1.2.2 Research Gap 2: Lack of Research Regarding the Incorporation of the Role of the Public Sector (e.g., Fiscal Policy) within the Macroeconomic Frameworks

While *fd* has been incorporated previously into the framework, through utilising commonly used measures, Chaiechi (2012) recommended including the public sector within such a framework to capture the influence of government activity upon the key macroeconomic indicators. A literature review shows that the incorporation of *fp* has not been analysed within such a framework (i.e., within the lineage of Bhaduri and Marglin (1990) and Stockhammer

and Onaran (2004) Kaleckian post-Keynesian macroeconomic frameworks). In this study, government expenditure represents *fp*, a powerful mechanism to stimulate economic growth positively. In combination with research gap 1, a government expenditure indicator will be incorporated into each tested model. Simply put, each model will rotate one *fd* indicator at a time, in combination with one constant *fp* indicator, to conduct a model selection process.

The combination of research gaps 1 and 2, being the incorporation of both indicators into such a framework, sets out to analyse the unidirectional causal relationships running from the explanatory variables to the selected macroeconomic indicators and to see whether such inclusions are warranted. As the role of financial markets and government policies within a circular economy is gaining more attention, analysis within such a framework will provide decision-makers with a better understanding of how the explanatory variables influence key macroeconomic indicators over periods of time. Such a study is currently not present within the literature, providing a unique analysis.

1.2.3 Research Gap 3: Lack of Research Regarding the Exploration of Factors Underpinning Resilience and Economic Stability

While the first two research gaps focus on augmenting Kaleckian post-Keynesian macroeconomic frameworks, there is scope to test the resilience of three powerful economic growth instruments: investment, productivity growth, and savings, against unexpected exogenous shocks. While testing for resilience against exogenous shocks via time-series analysis is not uncommon within the literature, testing the selected augmented framework will provide a unique analysis. This study will close the gap towards understanding the channels through which investment, productivity growth, and savings mechanisms react to external shocks, alongside their ability to absorb and recover over time. Such an understanding provides decision-makers with information on which explanatory factors exhibit the strongest influence, providing an opportunity to incorporate coping strategies in the presence of external disturbances.

1.3 Research Questions

This study contains three research questions, following the three research gaps under analysis.

Research Question 1:	How can multisector dynamic macroeconomic models be improved upon to provide plausible counterfactual outcomes that describe an economy's reaction to external factors affecting it?
Research Question 2:	How do financial markets and government expenditure fluctuations influence the sources of economic growth in a multisector economy?
Research Question 3:	How stable and resilient are the seemingly well-functioning economies, and can they withstand external shocks?

1.3.1 Research Question 1: How can Multisector Dynamic Macroeconomic Models be Improved Upon to Provide Plausible Counterfactual Outcomes that Describe an Economy's Reaction to External Factors Affecting it?

Research question 1 sets the foundation of this study, analysing how the selected multisector dynamic macroeconomic models can be improved upon by incorporating measures of *fd* and *fp* instruments, within the Kaleckian post-Keynesian macroeconomic framework. Five *fd* indicators and one *fp* indicator will be incorporated within the models of investment, savings, income distribution, productivity growth, and net exports, with a selection process through empirical testing determining which indicators are reported. The reported models hence incorporate the best fitting *fd* indicator alongside the incorporation of a *fp* indicator.

1.3.2 Research Question 2: How do Financial Markets and Government Expenditure Fluctuations Influence the Sources of Economic Growth in a Multisector Economy?

Research question 2 sets out to analyse the causal relationships running from the explanatory variables towards the selected macroeconomic indicators, focusing on the relationship between *fd* and *fp* towards such indicators. This research question sets out to analyse whether such inclusions are warranted through time-series-analysis, describing the significance of the error-correction terms (ECT) alongside any singular unidirectional long and/or short-run relationships towards the key macroeconomic indicators. Alongside this, there is also interest in examining the relationships of the original explanatory variables towards the macroeconomic indicators and to see whether the economic theory holds.

1.3.3 Research Question 3: How Stable and Resilient are the Seemingly Well-Functioning Economies, and Can They Withstand External Shocks?

Research question 3 sets out to analyse the resilience of three powerful growth mechanisms: investment, productivity growth, and savings. Shocks can manifest in different shapes, sizes, and definitions, spreading across borders with little hesitation or discrimination. Derived from the interactions between the real economy and the financial sector, shocks at certain levels can potentially cause large-scale crises (Claessens & Kose, 2013). As such, research question 3 sets out to understand the channels through which investment, productivity growth, and savings mechanisms react to external shocks, alongside their ability to absorb and recover. This provides decision-makers with information on which explanatory factors exhibit the strongest influence, enabling the incorporation of coping strategies in the presence of external disturbances.

1.4 Bringing it All Together

Having previously highlighted the research gaps and questions of interest, this section outlines how these elements are addressed within this study. Chapter 5 analyses the impacts of *fd* and *fp* upon the selected key macroeconomic indicators for the case of Australia. Such analysis satisfies research gaps 1 and 2, as outlined in research questions 1 and 2. The chosen macroeconomic indicators for analysis are investment, savings, income distribution, productivity growth, and net exports. These indicators play a crucial role in understanding and evaluating the performance and dynamics of the economy under study. Utilising vector error-correction modelling (VECM) methodology, Chapter 5 analyses the causal relationships through the ECTs, alongside the long and short-run dynamics. Emulated from Chapter 5, a published conference paper analyses the investment model for the case of Australia, alongside

IRFs and VDs to examine investment's resilience against external disturbances and changes, satisfying all research gaps and associated research questions.

In Chapter 6, the impacts of *fd* and *fp* upon the selected key macroeconomic indicators are analysed for the cases of the United States, Japan, and South Korea, satisfying research gaps 1 and 2 and research questions 1 and 2. The selected macroeconomic indicators include investment, savings, income distribution, productivity growth, and net exports. Utilising autoregressive distributed lag (ARDL) modelling methodology, Chapter 6 analyses causal relationships through the ECTs, alongside long and short-run dynamics. Emulated from Chapter 6, two papers are produced. The first paper analyses the productivity growth model for the cases of the United States, Japan, and South Korea, alongside IRFs and VDs, to examine productivity growth's resilience against external disturbances and changes, satisfying all research gaps and associated research questions. The second paper analyses the savings model for the cases of the United States, Japan, and South Korea, incorporating similar testing methodologies.

1.5 Research Methodology and Data

1.5.1 Research Methodology

Quantitative methodology is utilised to address the research gaps and questions contained within this study. Time-series analysis is utilised to explore the statistical properties, inferences, and relationships among the variables of interest. Various econometric techniques and methods are applied to analyse the data and derive meaningful insights from the quantitative analysis. In this study, unit-root testing finds that the time series data exhibited both *I(0)* and *I(1)* (i.e., stationary and non-stationary) behaviours, suggesting that VECM and ARDL modelling methodologies are appropriate. In capturing the long and short-run relationships running from the explanatory variables towards the selected key macroeconomic indicators for Chapter 5 and the published conference paper, VECM analysis utilised the following processes: testing for stationarity, lag selection, Johansen testing for cointegration, long-run dynamics, short-run dynamics derived from the long-run model alongside an ECT, and Granger causality. In capturing similar relationships, alongside analysing investment's resilience towards unexpected exogenous shocks and changes, IRFs and VDs are incorporated within the conference paper, which was not analysed in Chapter 5.

In capturing the long and short-run relationships running from the explanatory variables towards the selected key macroeconomic indicators for Chapter 6 and both papers, ARDL modelling utilised the following processes: testing for stationarity, lag selection, F-statistic testing for cointegration, long-run dynamics, short-run dynamics derived from the long-run model, alongside an ECT. As per the previous analysis, model selection processes were implemented. In capturing similar relationships, alongside analysing the resilience of productivity growth and savings towards unexpected exogenous shocks and changes, the use of IRFs and VDs is incorporated within the papers, which was not analysed in Chapter 6.

1.5.2 Scope of the Study

The economies examined in this study are affiliated with the Asia-Pacific Economic Cooperation (APEC), focusing on a diverse group of countries within the Asia-Pacific region.

APEC is a platform comprising 21 member countries working towards fostering balanced, sustainable, innovative, secure, and inclusive growth in the region. APEC's primary objective is to promote regional economic integration and accelerate progress towards greater prosperity for the people of the Asia-Pacific (APEC, 2021a). More specifically, APEC intends to achieve prosperity through the following activities: 1) the promotion of regional economic integration and trade; 2) ease of trade and business; 3) improved customs procedures; 4) structural reforms; 5) regional connection; 6) supply chain connectivity; 7) environmental goods lists; 8) increasing energy efficiencies and renewables; 9) green towns; 10) nurturing small businesses; and 11) enhancing social equity in the region (APEC, 2021b).

The importance of the group lies in several aspects, including: 1) some APEC countries house the world's largest and most dynamic economies; 2) APEC countries account for a substantial portion of global trade and foreign direct investment; 3) membership in APEC provides stronger market access; 4) a number of APEC countries are leaders in technological innovation and advancements; 5) APEC provides a platform for member economies to engage in capacity-building activities; and 6) APEC plays a role in shaping discussions on global economic governance (APEC, 2021b). Figure 1.2 illustrates each of the member-based economies, with those economies in green represented within this study, namely Australia, Japan, South Korea, and the United States. The selected economies have undergone unique developmental changes and stages due to their economic and political diversities (see Chapter 2), providing an interest in exploring these influential economies and their responsiveness to global crises.

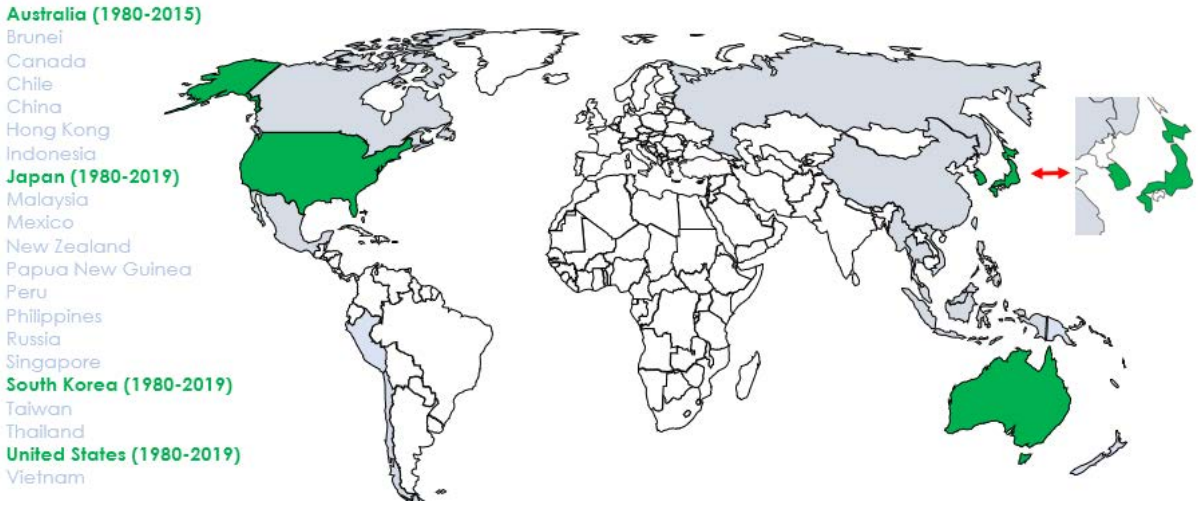


Figure 1.2. Asia-Pacific Economic Cooperation (APEC) Member Economies. Source: APEC.

As this study analyses periods from 1980-2019, the following data are obtained from trusted sources (see APEC, 2019; APEC, 2021c). Each economy joined APEC as a founding member in 1989. APEC, at a glance, as of 2019, represented 38% of the world's population (2.9 billion people), 47% of international trade ($US22 trillion), and 60% of the world's GDP ($US48 trillion). In order of GDP, the United States was ranked as the largest economy in the world with $US21.4 trillion, Japan was ranked as the third largest economy with $US5.1 trillion, South Korea was ranked as the 12th largest economy with $US1.7 trillion, and Australia

was ranked as the 14th largest economy with $US1.4 trillion. Other key statistics for the selected economies, as of 2019, include a combined population of 531 million, a combined GDP of $US29.6 trillion, and combined exports of $US4.4 trillion. Additionally, as of 2019, each economy ranked in the top 15 largest economies globally, significantly influencing international exports.

1.5.3 Data

The relevant annualised datasets used in this study were acquired from reliable sources (Table 1.1). For Australia, data from 1980-2015 yielded 36 annualised observations. For the United States, Japan, and South Korea, data from 1980-2019 yielded 40 annualised observations. Most datasets were sourced from institutions such as the World Bank and the Penn World Table, while specific variables such as investment, capacity utilisation, profit share, and productivity growth required manual computations. The *fd* indicators, acquired from the Global Financial Development Database (GFDD) via the World Bank, were presented annually. It is pertinent to acknowledge that although the comprehensive database encompassed characteristics from 214 economies and analysed 109 distinct indicators in 2019, only a select subset of variables was considered throughout this study.

Table 1.1. Data Sources. 1980-2015/2019

Variables	Calculation	Data Sources
Investment	Investment/NGDP Ratio (INV)	World Development Indicators: World Bank
Savings	Domestic Savings/NGDP Ratio (S)	World Development Indicators: World Bank
Capacity Utilisation	NGDP/Stock of Capital Ratio (UT)	World Development Indicators: World Bank, IMF Fiscal Affairs Department
Profit Share	(1-Wb)u (P)	World Development Indicators: World Bank, Penn World Table, Statista, Australian Bureau of Statistics, Australian Tax Office
Interest Rate	Lending Interest Rate: GDP Deflator Adjusted (IR)	World Development Indicators: World Bank
Productivity Growth	Stock of Capital/Labour Ratio (PG)	IMF Fiscal Affairs Department, World Development Indicators: World Bank, Penn World Table
Unemployment Rate	Harmonised Unemployment Rate: Total: All Persons, Percent, Annual, Not Seasonally Adjusted (U)	Federal Reserve Economic Data
Net Exports	Imports - Exports/NGDP Ratio (NX)	World Development Indicators: World Bank
Financial Development Indicator	Total Value of Shares Traded/Average Market Capitalisation Ratio (SMTR) Credit by Domestic Money Banks to a Government and State-Owned Enterprises/NGDP Ratio (CGSO) Liquid Liabilities/NGDP Ratio (LL) Broad Money/NGDP Ratio (MR) Domestic Credit/NGDP Ratio (DC)	Global Financial Development Database: World Bank
Fiscal Policy Indicator	Government Expenditure/NGDP Ratio (GE)	World Development Indicators: World Bank
Nominal GDP	Nominal Gross Domestic Product (NGDP)	World Development Indicators: World Bank

1.6 Significance of the Research

The results of this study provide a unique contribution to the empirical literature through the augmentation of the Kaleckian post-Keynesian macroeconomic framework, alongside utilising such augmentations to test the resilience of three important key macroeconomic indicators. The findings contained within this study benefit a broad audience, including professional practitioners, policymakers, and investors. The forthcoming sections

outline these contributions from an empirical and theoretical perspective, discussing real-world implications.

1.6.1 Empirical Contributions

While the importance of *fd* and *fp* towards economic growth is well established within the circular economy, Chaiechi (2012) provided evidence that such incorporations within the Kaleckian post-Keynesian macroeconomic framework have been mostly absent within the literature. As such, this study provides empirical contributions through the following analysis.

Through the application of VECM methodology, research Chapter 5 analyses the causal dynamics of the key macroeconomic indicators for the case of Australia, utilising augmented models. Such augmentation is achieved through enhancing existing empirical models by incorporating both commonly used and contemporary measures of *fd* as variable indicators alongside an *fp* indicator. In a further contribution (i.e., research paper), this study introduces IRFs to test for the absorbability and recoverability (i.e., resilience) of investment in the face of external shocks, alongside VDs, which will determine the strength of influence of the explanatory variables towards investment in explaining variability over time. Such empirical contributions are a first.

Chapter 6 analyses similar causal dynamics in this study; however, for the case studies of the United States, Japan, and South Korea, utilising ARDL modelling methodology. A similar resilience analysis explains variability over time. In a further contribution (i.e., research papers), this study introduces IRFs and VDs to test for the resilience and absorbability of productivity growth and savings towards exogenous shocks and changes. Chapter 6 provides similar empirical contributions but does so with differing economies and time series data.

1.6.2 Theoretical Contribution

Classical economic models are primarily concerned with equilibrium conditions through ‘laissez-faire’ outcomes, arguing that free markets are efficient and self-regulating, whereby government intervention is not required in managing the economy. Keynesian economists argue, however, that an economy can benefit from the role of *fp* in expanding economic growth, as the economy can be below full capacity for an extended period if no intervention occurs. Other differences in the economic school of thought between Classical and Keynesian economics, in a general sense, include long-run aggregate supply, unemployment, the Phillips curve, prices and wages, rationality and confidence, and policy recommendations, to name a few.

As a major shortcoming, Classical economic models do not contend with multidimensional economic modelling and system dynamics. Multidimensional economic modelling contains two assumptions: 1) all dimensions run under different time speeds; and 2) any economic phenomena always experience imbalanced dynamics. As such, multidimensional economic modelling does not require an equilibrium state under the assumption of Ceteris Paribus (Estrada, 2009). On the other hand, system dynamics utilises a computer simulation methodology, analysing dynamic feedback to design policies to improve system performance. This is done by identifying and linking relevant pieces of a system’s

structure and simulating the behaviour generated by such a structure (Radzicki, 2010). There are several schools of thought with which system dynamics fit well, including behavioural economics, ecological economics, institutional economics, and post-Keynesian economics. While traditional post-Keynesian economists rejected Classical economic models, earlier economists rejected alternative modelling techniques, as they were seen as inadequate in concept representation. In a more modern era, however, post-Keynesian economists have embraced such techniques in analysing economic schools of thought (Radzicki, 2010).

This study sets out to incorporate both multidimensional and system-dynamic analysis. This study contributes to such frameworks by incorporating *fd* and *fp* indicators. While this makes for a strong theoretical contribution, there is further scope to test the resilience of three important key macroeconomic indicators: investment, productivity growth, and savings via the newly augmented models. Such research provides for a richer analysis of the newly augmented framework. Therefore, such inclusions and analysis help improve the model specification and the original theoretical frameworks.

1.6.3 Implications for Policymakers and Professional Practitioners

The findings contained within this study provide policymakers with a rich array of information. The findings can assist policymakers in understanding the dynamics of long and short-run relationships of the explanatory variables towards key macroeconomic indicators. As the *fp* indicator has been incorporated within all augmented models for the selected economies, decision-makers can see the negative/positive relationships fiscal policies may have on key macroeconomic indicators, alongside the strength of those relationships. For example, fiscal policies may produce positive causal effects towards a key indicator in the long run; however, they may have a negative in the short run and/or vice versa. Also, such causal effects may hold stronger effects in the long run while exhibiting weaker effects in the short run and/or vice versa. Such results can inform decision-makers on how long government *fp* programs should be implemented, alongside the strength of the causal effects towards key macroeconomic indicators they wish to influence. Also, the results showing the resilience of investment, productivity growth, and savings provide decision-makers with information on which explanatory variable holds the strongest influence after an unexpected exogenous shock. This information may assist in creating policy measures to combat exogenous shocks.

Similarly, for professional practitioners, this study can assist firms, businesses, board members, decision-makers, and investors create appropriate investment strategies within the circular economy. The role of financial markets in reducing global greenhouse gas emissions via a circular economy, through the premise of moving past today's 'take-make-waste' linear model, is growing stronger in influence. Such an economy offers a production suite whereby products are designed to be recycled, repaired, and repurposed to a point where natural systems are regenerated. These are now boardroom topics for financial firms, customers, and government regulators. More recently, with over 50 financial institutions publicly committing to setting emissions reduction targets, through the Science Based Targets (SBT) program, the influence of all *fd* indicators, whether they be commonly used or contemporary measures, will be important measurements for decision-makers in allocating their portfolios to those

investments that not only have a positive impact on the environment but also yield high rates of return.

1.7 Thesis Outline

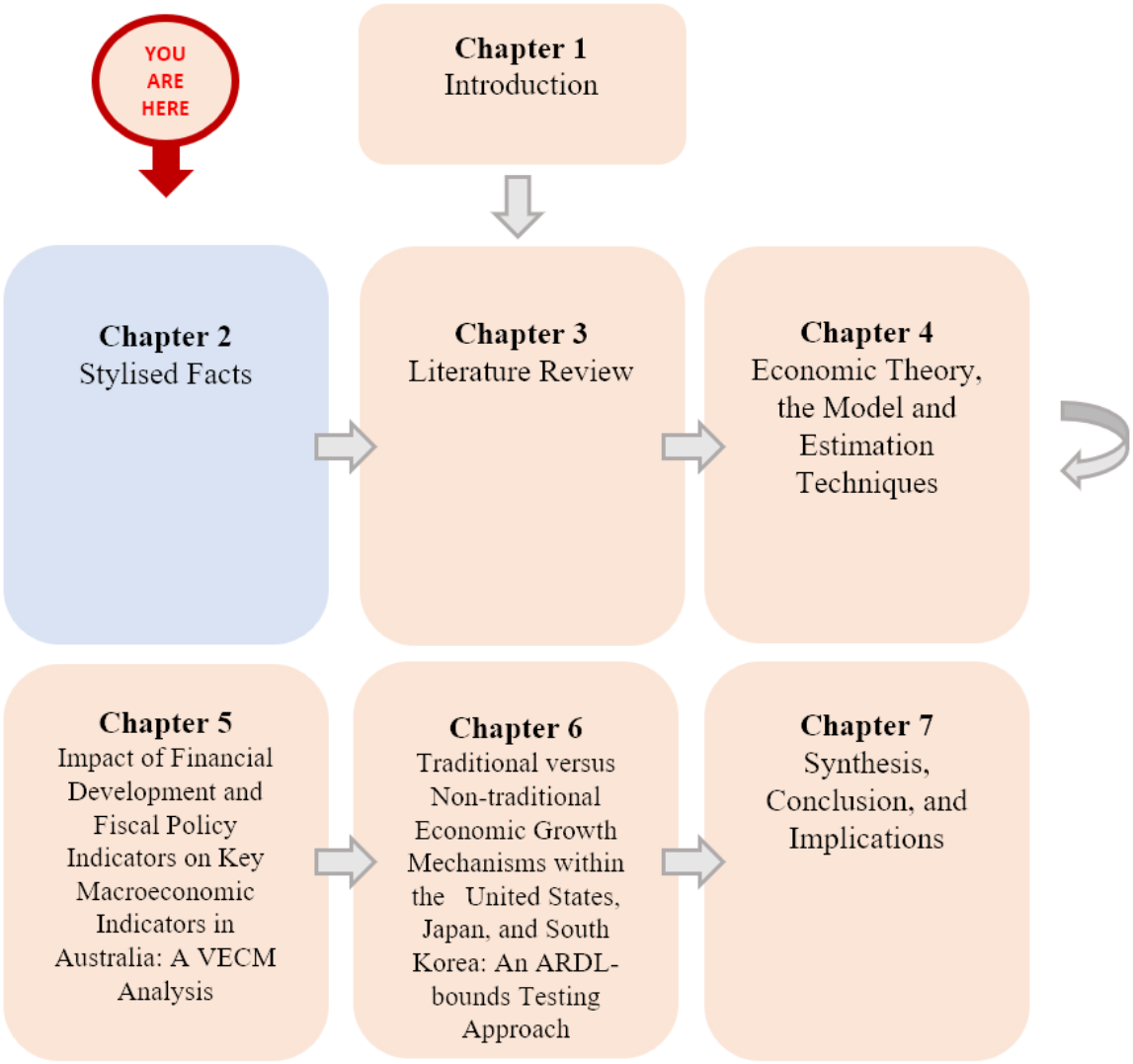
This study comprises seven chapters and three emulated papers. A conference paper is emulated from Chapter 5, while two papers are emulated from Chapter 6. The chapters and papers are outlined below (Table 1.2).

Table 1.2. Thesis Outline

Chapter 1 Introduction	Presents an introduction to the study.
Chapter 2 Stylised Facts	Presents stylised facts about Australia, the United States, Japan, and South Korea.
Chapter 3 Literature Review	Presents a review of the literature through the following: history of economic growth, modern growth theories, financial market developments, and identifying the research gaps.
Chapter 4 Economic Theory, the Model, and Estimation Techniques	Presents the appropriate methods to analyse long and short-run causal relationships towards the key macroeconomic indicators in the form of VECM and ARDL modelling.
Chapter 5 Impact of Financial Development Indicators and Fiscal Policy Indicators on Key Macroeconomic Indicators in Australia: A VECM Analysis	This chapter explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented macroeconomic framework upon five key indicators; and 2) the employment of commonly used and contemporary *fd* indicators. This chapter adopts a VECM approach in testing for long and short-run causality and its implications towards the economic theory. Chapter 5 satisfies research gaps and questions 1 and 2. Emulated from Chapter 5, a published conference paper explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented macroeconomic framework upon investment; and 2) the employment of a contemporary *fd* indicator. This paper adopts a VECM approach to test for long and short-run causality and their implications towards the economic theory. This study also explores investment resilience against exogenous shocks using impulse response functions and variance decompositions. The paper satisfies research gaps and questions 1, 2, and 3.
Chapter 6 Traditional versus Non-traditional Economic Growth Mechanisms within the United States, Japan, and South Korea: An ARDL-bounds Testing Approach	This chapter explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented macroeconomic framework upon five key indicators; and 2) the employment of commonly used and contemporary *fd* indicators. This chapter adopts an ARDL modelling approach in testing for long and short-run causality and their implications towards the economic theory. Chapter 6 satisfies research gaps and questions 1 and 2. Emulated from Chapter 6, one published journal article and one submitted paper explore: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented macroeconomic framework upon productivity growth and savings; and 2) the employment of commonly used and contemporary *fd* indicators. Both papers adopt an ARDL modelling approach to test for long and short-run causality and their implications for the economic theory. The papers also explore the resilience of productivity growth and savings against exogenous shocks using impulse response functions and variance decompositions. Both papers satisfy research gaps and questions 1, 2, and 3.

Chapter 7 Synthesis, Conclusion, and Implications	Concludes the study by addressing the research studies and questions identified. This section also analyses research contributions, implications, and recommendations for further research.

Thesis Structure



Some sections of the material in this chapter were adapted for publication in the following referenced conferences, journal articles, and conference paper:

Journal and Conference Publications

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors. In: Chaiechi T., Wood J. (eds) *Community Empowerment, Sustainable Cities and Transformative Economies*. Springer, Singapore.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*

Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2018). *The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy*. Paper presented at the 2018 Australian Conference of Economists (ACE), The Economic Society of Australia (ESA), Canberra, 10-13 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2020). *Impacts of Financial Development and Fiscal Policy Upon Investment within Australia*. Paper presented at the 33rd PhD Conference in Business and Economics, Monash University, Melbourne, 23-24 November.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea*. Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better – Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), James Cook University, Cairns, 1-3 July.

Chapter 2: Stylised Facts

Abstract

Chapter 2 investigates the stylised facts of the selected economies of Australia, the United States, Japan, and South Korea from 1980-2022. A review of the stylised facts is commonly used in economics to understand the drivers' influencing variables in constructing economic models. In gaining a holistic viewpoint, this chapter first explores a general overview of each selected economy. Following this, the stylised facts focus on financial market overviews, monetary and fiscal policies, and a broad range of macroeconomic indicators that influence the real sector. Each selected economy holds noticeable differences in how regulatory bodies and government entities operate towards promoting economic growth, more so after exogenous shocks. Each country has implemented different fiscal and monetary policies to promote a stable, competitive, and growing economy to improve its citizens' living standards. Despite the Global Financial Crisis (GFC) and the COVID-19 pandemic having adverse effects on the selected economies, different schools of thought and policy implementations were utilised for those economies. As such, the presented stylised facts offer insights and comparisons into each selected economy, providing a solid foundation for analysing the research output contained within this study.

2.0 Introduction

A review of the stylised facts is commonly used in economics to understand the drivers influencing variables in constructing economic models. The stylised facts start with analysing a general overview of each selected economy. Following this, the stylised facts focus on financial market overviews, monetary and fiscal policies, and a broad range of macroeconomic indicators that influence the real sector. Financial market overviews concentrate on the banking sector and its historical lineage, while the regulatory section highlights the acts, departments, and international agreements that oversee their financial markets. Also, the strength and structure of domestic stock markets provide deeper insight. At the same time, a historical illustration of monetary and fiscal policy decisions presents an understanding of past, current, and future policy decisions influencing each economy. Real sector developments conclude with the analysis of each selected economy, providing insight towards the overall health of the explored indicators. The selected stylised facts were chosen to enable a comprehensive and unbiased comparison of the selected economies under review.

2.1 Economy Selection

The economies included in this study are part of the Asia-Pacific Economic Cooperation (APEC). APEC is a platform comprised of 21 member countries to foster enhanced prosperity for the people in the region (APEC, 2021a). More specifically, APEC intends to achieve such prosperity through the following activities: 1) the promotion of regional economic integration and trade; 2) ease of trade and business; 3) improved customs procedures; 4) structural reforms; 5) regional connection; 6) supply chain connectivity; 7) environmental goods lists; 8) increasing energy efficiencies and renewables; 9) green towns; 10) nurturing small businesses; and 11) enhancing social equity in the region (APEC, 2021b).

Figure 2.1 illustrates each member, whereby the selected economies in this study are Australia, Japan, South Korea, and the United States. The selected economies have undergone unique developmental changes and stages due to their economic and political diversities, providing an interest in exploring these influential economies and their responsiveness to global crises. Furthermore, each economy was also selected for its strong financial markets, openness to international trade, well-established democratic governments, and reliable available data for analysis. As this study analyses the period 1980-2019 through data selection processes, the following data is obtained from the following sources (see APEC, 2019; APEC, 2021c): APEC at a glance, as of 2019, represented 38% of the world's population (2.9 billion people), 47% of international trade ($US22 trillion), and 60% of the world's GDP ($48US trillion). In order of GDP, the United States was ranked as the largest economy in the world with $US21.4 trillion, Japan was ranked as the third largest economy with $US5.1 trillion, South Korea was ranked as the 12th largest economy with $US1.7 trillion, and Australia was ranked as the 14th largest economy with $US1.4 trillion. Other key statistics for the selected economies, as of 2019, include a population of 531 million, a shared GDP of $US29.6 trillion, and shared exports of $US4.4 trillion. Additionally, as of 2019, each economy ranked in the top 15 largest economies globally, significantly influencing international exports.

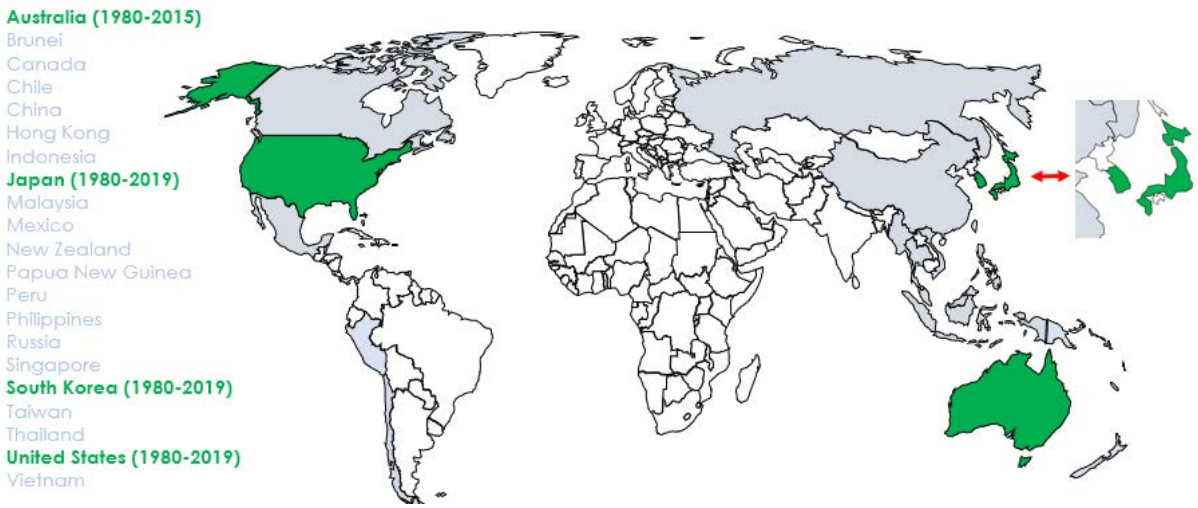


Figure 2.1. World Map. Asia-Pacific Economic Cooperation (APEC) Member Economies. Source: APEC.

2.2 Australia

2.2.1 Financial Market Overview

Australia houses 48 domestically owned banks and building societies, classified as authorised deposit-taking institutions (ADIs), four restricted ADIs, 81 credit unions, 14 Australian-friendly societies, and eight foreign-owned subsidiary banks as of late 2022 (APRA, 2022a). Dominating the market share are Australia's four largest banks: the Commonwealth Bank of Australia, the ANZ Banking Group, the Westpac Banking Corporation, and the National Australia Bank, with combined assets of $AUD4.11 trillion as of the first half of 2022 (Statista, 2022a). Historically, the big four have grown in market share due mainly to competition and deregulation strategies.

During the 1950s and 1960s, with influence from the United States and the United Kingdom, Australia embraced competitive strategies to compete internationally (Li, 2014). Deregulation strategies followed, including interest-rate control removals in the 1970s and the implementation of the tender system for selling debt to the public in the early 1980s (Battellino, 2007). The Neoliberal school of thought then dominated Australian Government policy. Abolishing interest-rate controls, credit guidelines, and easing entry guidelines for foreign banks were among the strongest reforms, leading to increased financial competition for products, prices, and services (Li, 2014). Due to previous deregulation strategies, government decision-makers voiced concerns regarding higher-risk portfolios, leading to the creation of the Wallis Inquiry in 1997.

Further along, the Australian Prudential Regulation Authority (APRA) was formed in July 1998 to enforce prudential standards and practices, ensuring that financial promises were met within a stable, efficient, and competitive financial system (APRA, n.d.). APRA acknowledges that strengthening economic resilience was a key learning from the GFC event, whereby APRA implemented specific reforms to strengthen liquidity/capital frameworks and requirements. As a result, capital buffers were introduced for ADIs in 2013, meeting Basel III requirements. Consequently, capital adequacy within Australia's banking system was robust at the end of 2019 (APRA, 2022b). Again, in 2020, APRA coordinated the banking industry's response to a new global crisis, the COVID-19 pandemic. APRA focused on three main areas to strengthen the banking sector: 1) improving operational resilience by ensuring ADIs were able to maintain their payment and banking services; 2) improving liquidity risks by ensuring banks and other ADIs were adequately managing their balance sheets; and 3) monitoring credit risk and capital profiles through stress testing (APRA, 2022b).

As per its functionality, the Australian financial market is characterised by the stock and bond market. The Australian Stock Exchange (ASX) was founded in 1987 by amalgamating six independent state-based stock exchanges (ASX, 2010). According to Statista (2022b), as of July 2022, Australia was home to the world's 16th largest stock exchange, which boasted a market capitalisation of $US1.7 trillion. Australia's primary market gauge, the All-Ordinaries Index (XAO), tracks the performance of the 500 largest companies listed on the ASX, encompassing approximately 87% of Australia's equity market as of September 2022. Notably, the XAO has experienced an impressive increase in value, rising by 984% since August 1984, as Market Index (2022) reported. The bond market runs in a traditional sense, with both government and corporate securities available. Securities offer different payment schedules, lengths, and interest rates, with more than $AUD1.87 trillion in Australian Government, State Government, and non-government bonds as of September 2022 (RBA, 2022a).

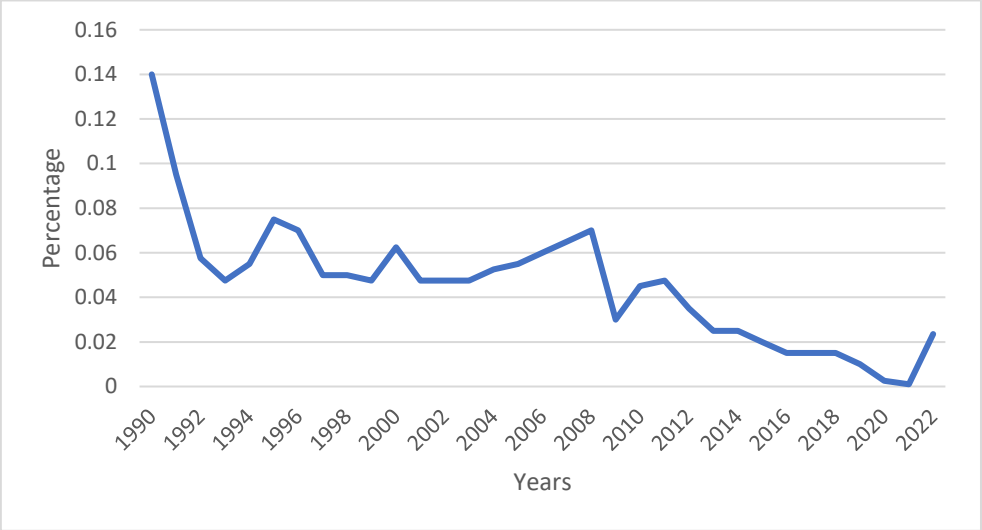
2.2.2 Monetary Policy

The Reserve Bank of Australia (RBA) governs monetary policy, deriving its functions from the *Reserve Bank Act 1959* (RBA, n.d.). The RBA reports on exchange markets, housing markets, wage developments, and economic outlooks four times yearly through a *Statement of Monetary Policy*. The RBA manages $AUD95.5 billion worth of currency in circulation,

amounting to over 1.9 billion in individual currency notes as of the middle of 2021 (RBA, 2021). During the GFC, the RBA cut interest rates by 100 basis points and worked closely with the Australian Government, guaranteeing bank deposits, alongside the wholesale funding of Australian banks for a cost. This action was the first in Australia's history to ease business and consumer concerns about the financial sector and the economy as a whole.

Prior to the COVID-19 pandemic, the moderate easing of economic growth in China, increases in commodity prices, and upward pressure on global inflation were all factors influencing the Australian economy and, hence, the cash rate set by the RBA. Figure 2.2 illustrates the historical cash rate, showing a downward trend from 1990-2021, particularly from 2007-2021. Post-2022, the war in Ukraine, COVID-19 supply chain constraints, and considerable increases in global government spending dramatically increased inflation globally, resulting in rises in global interest rates. Central banks targeted inflation during this period to reduce negative impacts before it became too embedded in wage and price-setting behaviours (RBA, 2022b). Australia did not escape the impact, with interest rates increasing from 0.1% in April 2022 to 2.35% in September 2022 (RBA, 2022b).

Figure 2.2. RBA Cash Rate 1990-2022



Source: RBA Cash Rate (RBA, 2022b). Months of September 1990-2022.

2.2.3 Fiscal Policy

Fiscal policy is analysed, structured, and determined by the Australian Government, with the assistance of the Treasury. Treasury holds four main priorities: 1) promoting fiscal sustainability; 2) increasing productivity; 3) increasing workplace participation; and 4) securing the benefits of global economic integration (The Treasury, 2016). The Treasury also assists with Federal Budgets, fiscal outlooks, and engagement with the G20. During the GFC, the Australian Government introduced fiscal policies to reduce the impacts of the downturn, including: 1) a first phase implementation of a $AUD10.4 billion stimulus package aimed at pensioners and low-income families, housing construction, and new training places; and 2) a second phase implementation of a $AUD42 billion stimulus package, aimed at nation building and a national jobs plan (The Treasury, 2016). During the COVID-19 pandemic, the Australian Government implemented a wide range of economic measures to support the community,

including: 1) the creation of a job-keeper payment to employers ($AUD101 billion); 2) supporting the creation of 180,000 apprentices and traineeships; 3) income support for individuals ($AUD16.8 billion); and 4) supporting pensioners ($AUD12 billion), alongside other important measures (Budget 2020-21, 2021).

The government releases yearly Budget papers, whereby the *Budget 2022-2023* focused on: 1) delivering higher job participation to push the unemployment rate below 4%; 2) investing in stronger defence; 3) continuing record funding towards health, education, women's safety, and other essential services; 4) delivering cost of living relief; and 5) investing in public infrastructure such as roads, rail, dams, and renewable energy technology (Budget 2022-23, 2022). At a glance, the Budget sets out to build a stronger economy by repairing the Budget itself, reducing the deficit to 1.6% of GDP by 2025-2026, falling to 0.7% by the end of the medium term (Budget 2022-23, 2022). The Budget also ensured that the Australian economy held strong resilience, being well positioned to meet the challenges of further shocks by efficient absorption through broad-based growth in consumption, exports, and investment, alongside a strong labour market through rising incomes and associated tax cuts (Budget 2022-23, 2022).

2.2.4 The Real Sector

Figure 2.3 illustrates the selected yearly macroeconomic indicators of GDP growth, unemployment, inflation, and the current account balance from 1980-2021. This section does not include wage share as an indicator, as the results chapters explore wage-led and profit-led regimes in the Stockhammer and Onaran (2004) tradition via time-series analysis. The authors characterise a wage-led regime as a scenario in which wage changes play a central role in driving economic activity, while a profit-led regime resolves around the notion that profits are the primary driver of economic activity.

From 1991 to 2020, Australia achieved more than 25 consecutive years of economic growth, making it the only developed nation to accomplish such a feat (Statista, 2022c). Gross Domestic Product (GDP) is commonly utilised as a growth indicator for various reasons: 1) it functions as an indicator of economic output; 2) it facilitates the comparison of economic performance among different economies; 3) investors can employ the data to assess the economic environment; 4) it is frequently associated with employment; and 5) the data can be utilised for forecasting future economic trends. While GDP data does have some disadvantages (i.e., it cannot demonstrate persistent income equality; see Cingano, 2014), it is one of several measurements this chapter employs to demonstrate real sector development.

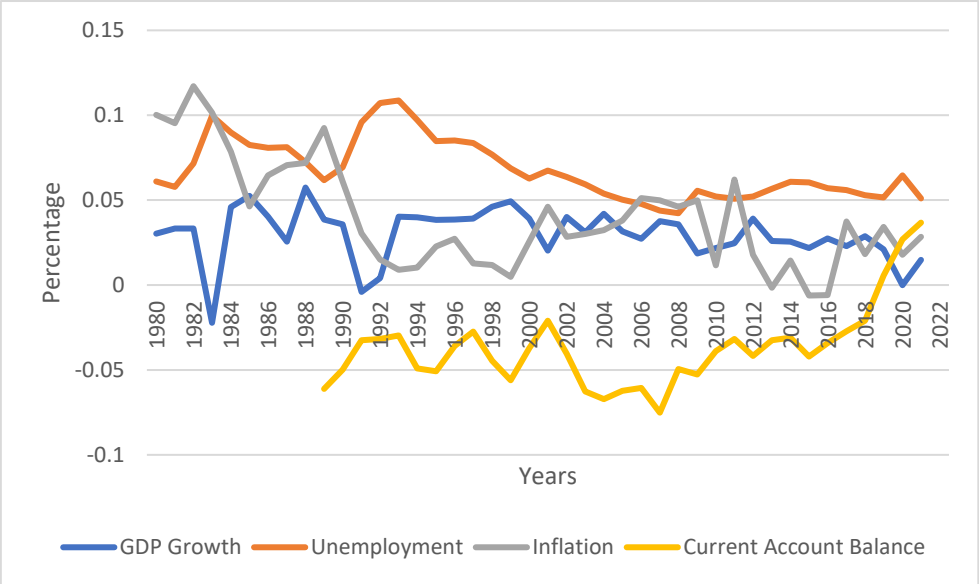
The GDP growth indicator displays a slight downward trend during this period, with 1995-2008 showing somewhat stable GDP growth but declining after that. The combined effects of the COVID-19 pandemic led to two consecutive quarters of negative GDP growth in early 2020, placing Australia into a technical recession, with annual GDP growth calculated to be -2.18% (Statista, 2022c). As of Q1 2022, GDP grew 0.9%, the third straight quarter of growth, influenced by the reopening of domestic and international borders, stronger demand

for mineral ores and other mineral fuels, and increased consumer demand (Trading Economics, 2022a).

The unemployment rate indicator shows a downward-sloping trend from 1995 to 2008, with a noticeable upward trend from 2008 to 2015. Rising past 7% at the start of the COVID-19 pandemic, the unemployment rate steadily decreased over time, calculated to be 3.5% as of August 2022 (Trading Economics, 2022b). This is likely due to a sustained period of dramatically lower migration to Australia due to government pandemic responses. In response, the Australian Government implemented a permanent migration program in 2022 to offer 160,000 places with targeted compositions (i.e., skill, family, and special eligibility). Such increases in migration are set to boost Australia's economic recovery and social cohesion outcomes (Department of Home Affairs, 2022).

Based on consumer prices, the inflation indicator line shows a long-run downward trend, with a notable dip from 2011-2016, followed by a slight increase and stability from 2017-2020. Although not captured in Figure 2.3, the Australian economy experienced sharp increases in inflation in 2022, with a pre-COVID-19 economy showing an annualised CPI figure of 2.2% in March 2022, compared to 6.1% in June 2022, the highest inflation rate since Q2 2001. Such movements are a combination of cost-of-living increases (i.e., food, fuels, and dwellings) (Trading Economics, 2022c). Before 2019, Australia had maintained a long-run deficit; however, rises in commodity prices abroad have turned the deficit into a surplus post-2019 (Trading Economics, 2022d). Government debt imposes significant costs on taxpayers. Hussey and Wallace (2021) emphasise five negative impacts: 1) taxpayers must pay off debt; 2) interest payments impose further ongoing costs on taxpayers; 3) funding through issuing debt removes political constraints and encourages wasteful spending; 4) debt puts upward pressure on interest rates, which can result in the crowding out of private investment; and 5) growing debt levels can reduce economic activity, leading to higher unemployment and lower wages.

Figure 2.3. Real Sector Indicators: Australia 1980-2021



Source: Australia Data: 1980-2021. (World Bank, 2022).

Productivity, gross national savings, and investment are other important real-sector indicators. Index points indicate productivity measurements, by which periods 2010-2011 are the base calculation of 100. Productivity is the real value of output a labour unit produces over time. The index point has experienced an upward trend over the long run, moving from 58.20 in Q3 1978 to 102.3 in Q2 2022 (Trading Economics, 2022e). Gross national savings, as a percentage of GDP, is a measurement that deduces final consumption expenditure from gross national disposable income. Gross national savings were recorded as 25.82% of GDP in 2021, increasing dramatically after the initial impacts of the COVID-19 pandemic in early 2020 (Trading Economics, 2022f). While gross savings grew into the 2020 decade, they are below the savings rates of the 1960s and 1970s. Private investment refers to a quarter-on-quarter change in private capital expenditure. From Q1 2019 to Q3 2020, Australia experienced some negative growth. Post-2020 declines have been mostly due to falls in building and infrastructure investments, while equipment, plant, and machinery positively influenced investment growth during the noted periods. Since 1992, private investment has mostly held positive growth, only contracting in global economic downturns (FX Empire, 2022). Investment in Australia accounted for 23.6% of NGDP in June 2022, an increase from 22.3% in the previous quarter (Ceicdata, 2022a).

2.3 United States

2.3.1 Financial Market Overview

The United States houses a substantially larger financial market than Australia, shaped and moulded by differences in historical events and economic policy strategies. The differences are most noticeable when comparing the number of banks, credit unions, brokers, and hedge funds in operation. The United States houses 5,141 commercial banks, with total assets of $US22.7 trillion as of September 2022 (Fred Economic Data, 2022a). Dominating market share are the four largest domestic and international banks: JP Morgan Chase & Co, the Industrial & Commercial Bank of China (ICBC), the Bank of America, and Wells Fargo & Co, with a combined market capitalisation of $US1.69 trillion as of September 2022 (Rel Banks, 2022). Credit unions held more than $US2.1 trillion in total assets as of Q2 2022 (Fred Economic Data, 2022b).

The United States embodies various regulatory departments supervising banks and security markets. Regulators include the Federal Reserve, the Office of the Comptroller of the Currency (OCC), the Securities and Exchange Commission (SEC), the Federal Deposit Insurance Corporation (FDIC), the National Credit Union Administration (NCUA), the Commodity Futures Trading Commission (CFTC), and the Bureau of Consumer Financial Protection (BCFP). Each regulator has a specific mission statement, area of focus, and code of conduct. Regulators can offer liquidity assistance and debt guarantees and enforce accounting standards. Regulators hold systemic powers to unilaterally close markets, suspend trading for limited periods, and shut down firms that provide a severe financial threat (Board of Governors of the Federal Reserve System, 2013).

Changing national strategies and priorities have shaped the United States through periods of regulation and deregulation. Formal regulations began with the establishment of the

Central Bank in 1914, creating stronger money supply controls and regulating member banks (Board of Governors of the Federal Reserve System, 2013). Further regulations included the establishment of the *Securities Act* of 1933, requiring registration of security sales; the establishment of the Securities and Exchange Commission (SEC) in 1934 to regulate secondary trading; and the establishment of the *Commodity Exchange Act* of 1936, which set rules for exchanges of commodities. In 1978, the Supreme Court allowed banks to cross borders with lending opportunities, leading to the implementation of the 1982 *Garn-St. Germain Act*, removing all interest rate ceilings on deposits (Sherman, 2009).

President Bush signed the *Financial Institutions Reform, Recovery, and Enforcement Act* (FIRREA) in 1989, resolving 1,043 institutions with assets valued at more than $US874 billion (FDIC, 1989). Further along, Alan Greenspan allowed banks to invest up to 25% of their revenues in investment banking operations in 1996, making *Glass-Stegall* irrelevant with the passing of the *Gramm-Leach-Bliley Act* (Federal Trade Commission, 1999). The deregulation of the derivatives market occurred with the passing of the *Commodity Futures Modernization Act* of 2000, with little debate or review from the United States Senate (Sherman, 2009). Expansion soon followed, moving from a nominal value of $US106 trillion in 2001 to $US531 trillion in 2008. The mortgage market's use of securitisation to pool and package mortgage assets into securities began with the lifting of banking restrictions. Strong sub-prime lending activities soon followed, whereby some customers did not understand the complicated financial arrangements they entered (Sherman, 2009). Ultra-low interest rates contributed to the housing bubble, where some regions increased by more than 100% in value above their historic trend levels, contributing heavily towards the GFC (CEPR, 2005).

The impact of the GFC was met with a swift response. The first response housed the implementation of the *Emergency Economic Stabilization Act* of 2008, authorising the Treasury to spend up to $US700 billion to purchase troubled assets (Congress, 2008). The second response gave entities emergency liquidity and implemented the Federal Deposit Insurance Corporation (FDIC), which oversaw the takeover of IndyMac (Sherman, 2009). The Obama Administration passed the *Dodd-Frank Act* of 2010 to address and decrease various risks in the US financial system, monitor the stability of major firms, and assist with receivership activities (SEC, 2010). The *Act* sets out to make Wall Street more accountable, separating proprietary trading from business banking and ending bailouts (The White House, n.d).

In response to the COVID-19 pandemic, the Board of Governors of the Federal Reserve System implemented supervisory and regulatory actions. Supervisory actions included, and were not limited to, capital assessments (i.e., bank stress tests), shared national credit reviews, analysis of risk management principles in association with the Federal Financial Institutions Examination Council (FFIEC), the promotion of examiner guidance to promote consistency and flexibility, resolution plans, and other support platform programs (The Federal Reserve, 2019). Regulatory actions included, and were not limited to, increasing the effectiveness of business lending, changes to supplementary leverage ratios for depository institutions, the establishment of capital investments in depository and financial institutions (i.e., community

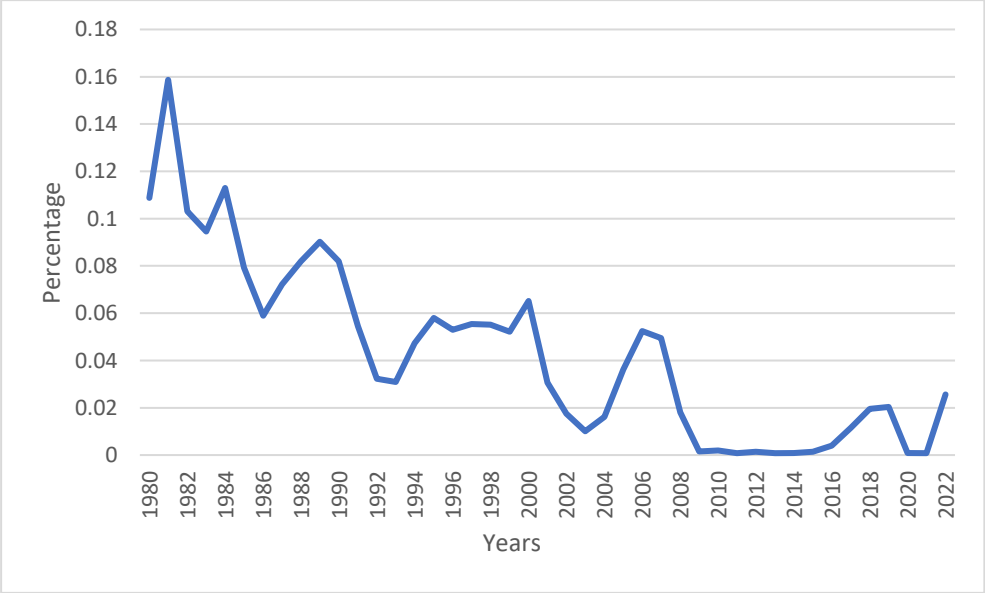
development), improvements to liquidity coverage ratios to support banking organisations in money markets and paycheque protection programs, and other support platform programs (The Federal Reserve, 2019).

Within the United States, there are two primary stock exchanges. The New York Stock Exchange (NYSE) is the largest in the world, with a reported market capitalisation of $US24.68 trillion as of July 2022 (Statista, 2022d). Similarly, the NASDAQ is the world's second-largest stock exchange, with a market capitalisation of $US19.50 trillion as of July 2022 (Statista, 2022d). The US stock market relies on two key indicators, namely the S&P 500 Index and the Dow Jones Industrial Average, to assess its overall performance. The S&P 500 index has maintained a long-running upward trend over time, moving from an index of 120 in September 1983 to 3,719 as of September 2022 (MSN Money, 2022a). The Dow Jones Industrial Average has experienced similar trends, with index lows of 896 in September 1983, moving to 29,680 as of September 2022 (MSN Money, 2022b). The bond market runs traditionally, with governmental and corporate securities available, defined by municipal, treasury, mortgage-related corporate debt, federal agency securities, and asset-backed bonds. At the end of Q3 2021, market capitalisation stood at $US46 trillion (Sifma, 2021).

2.3.2 Monetary Policy

The Federal Reserve is responsible for formulating monetary policy, with its functions and powers outlined in the *Federal Reserve Act* (Board of Governors of the Federal Reserve System, 2015). Furthermore, the Federal Open Market Committee (FOMC) is dedicated to fulfilling its mandated objective, which fosters maximum employment, stable prices, and long-run interest rate moderation (Federal Reserve, 2016). The effective federal funds rate during 1980-2022 is shown in Figure 2.4.

Figure 2.4. Federal Funds Effective Rate 1980-2022



Source: Federal Funds Effective Rate (Fred Economic Data, 2022c).
Months of September 1980-2022.

During the GFC, the Federal Reserve reduced the effective fund's rate from 4.94% in September 2007 to 0.15% in September 2009 (Fred Economic Data, 2022c). In response to the GFC, the Federal Reserve implemented three groups of tools to support the liquidity of financial institutions: 1) improved bilateral currency swap agreements; 2) improved provisions of providing liquidity directly to investors and borrowers in key credit markets; and 3) the expansion of traditional tools to open market conditions to improve the functioning of credit markets (Federal Reserve, 2009).

Before the COVID-19 pandemic, interest rates moved from 0.40% in September 2016 to 2.04% in September 2019 (Fred Economic Data, 2022c). During the first weeks of the COVID-19 pandemic, the Federal Reserve implemented responses in four broad categories: 1) conventional monetary policy measures; 2) improvement of liquidity and funding support to money markets; 3) improvement of credit flows to businesses, households, and all levels of government; and 4) the recalibration of supervisory and regulatory practices to encourage banks to increase the flow of credit (Clarida et al., 2021). Post-2022, the war in Ukraine, COVID-19 supply chain constraints, and considerable increases in global government spending have dramatically increased inflation globally, with international interest rates increasing. Inflation (CPI) rose from 1.4% annually in 2020 to 8.3% in September 2022 (US Inflation Calculator, 2022). In response, the Federal Reserve increased the effective funds rate from 0.08% in September 2021 to 3.08% in September 2022 (Federal Reserve Bank of New York, 2022).

2.2.3 Fiscal Policy

The Congressional Budget Office (CBO) supports the Congressional Budget process through Budget analysis (CBO, n.d.). Following the GFC, the United States Congress passed the *Economic Stimulus Act* of 2008, amounting to $US152 billion in tax rebates for individuals that year (CBO, n.d.). In further response to the GFC, the *American Recovery and Reinvestment Act* of 2009 was signed, granting the government the ability to establish a federal stimulus package to increase rebates on taxes for individuals and businesses (IRS, 2009). Government spending increased by $US184 billion in 2009 and $US399 billion in 2010 (GPO, 2009). Congress took bipartisan action in 2010 to improve economic growth; however, the adopted policies produced little economic recovery. Reacting to this outcome, President Obama implemented the *Bipartisan Budget Act* of 2013, ultimately contributing 350,000 extra jobs to the economy nationwide (Office of Management and Budget, 2016).

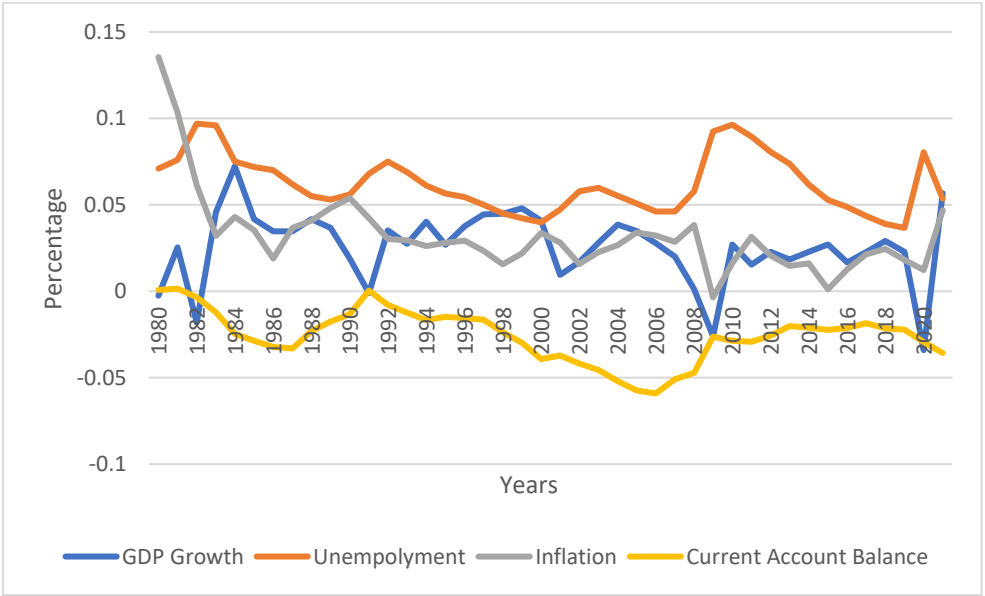
Further along, during the COVID-19 pandemic, President Trump signed a $US868 billion relief and government funding bill on December 28, 2021, implemented within the *Consolidated Appropriations Act* of 2021, to enhance unemployment benefits, direct stimulus payments to individuals, and resources for vaccines and testing (IMF, 2022). President Trump also issued executive orders to address the expansion of coronavirus reliefs by: 1) introducing a $US44 billion package to extend unemployment benefits; 2) continuing student loan reliefs; 3) halting the collection of social security taxes; and 4) assisting homeowners and renters to avoid foreclosure and evictions. In March 2021, President Biden signed the American Rescue Plan, implementing a fresh round of coronavirus relief, being $US1.84 trillion, focusing on: 1) improving public health sector responses; 2) extending unemployment benefits; 3) increasing

stimulus payments to individuals; 4) improving aid to government agencies; and 5) increasing funding to schools (IMF, 2022). In summary, the United States Government spent $US6.8 trillion in the financial year of 2021, resulting in a deficit. While the Federal Budget is divided into 20 categories, known as Budget functions, spending by the United States Government in the top 10 categories was as follows: income security (24%); social security (17%); health (12%); national defence (11%); Medicare (10%); net interest (5%); education and training (4%); general government (4%); Veterans' benefits and services (3%); and other (5%) (Treasury, 2022).

2.3.4 The Real Sector

Figure 2.5 illustrates the selected yearly macroeconomic indicators from 1980-2021. The GDP growth percentage indicator displays mostly stable behaviour over the period. However, it displays notable growth periods from 1982-1984, 2009-2010, and 2020-2021. While growth remained relatively strong in 2021, GDP experienced negative growth in Q1 and Q2 2022, recording -1.6% and -0.6%, respectively, indicating the economy was in a technical recession (World Bank, 2022). The movement from -1.6% to -0.6% reflected increases in exports and higher consumer spending (Bea, 2022). Typical patterns post-GFC are evident in the unemployment indicator, with a significant rise during 2007-2010, followed by a pronounced decline after that. After 2020, there was a swift increase in unemployment due to the impacts of the pandemic, reaching 14.7% in April 2020 (Fred Economic Data, 2022d). Because of a strong and ongoing labour market, unemployment fell to 3.5% in September 2022 (Trading Economics, 2022g).

Figure 2.5. Real Sector Indicators: United States 1980-2021



Source: United States Data: 1980-2021. (World Bank, 2022).

The inflation (CPI) indicator shows a long-run downward trend, with a notable dip between 1980-1983 and 2008-2009, followed by mostly stable conditions before the onset of the COVID-19 pandemic. Inflation rose from 1.4% in January 2021 to 8.3% in September 2022, driven by supply-chain constraints (cost-push inflation) and government spending (demand-pull inflation) (Investing, 2022). Cost-push inflation often refers to shortages of

supply, while demand-pull refers to the stimulation of aggregate demand (i.e., increasing government spending, the reduction of interest rates, and the reduction of taxation). The current account balance indicator indicates two main reduction periods, during 1980-1986 and 1991-2006, rising subsequently. The current account balance deficit was recorded as -$US180 billion as of January 2021 (Trading Economics, 2022h). As seen in Figure 2.5, the United States' current account balance has been in primarily negative territory since 1981.

Other important real-sector indicators include non-farm labour productivity, gross national savings, and investment. Index points represent productivity measurements, with 2009 serving as the base calculation of 100. Non-farm labour productivity is defined as the output of goods and services per hour worked, calculated by dividing an index of real output by an index of hours worked by all persons, including employees, unpaid family workers, and proprietors. The index point has seen an upward trend over the long run, moving from 27.60 in Q1 1950 to 109.86 in Q2 2021 (Trading Economics, 2022i). Gross national savings to GDP were recorded as 18.04% in 2020, declining from 22.9% in 1980 (Trading Economics, 2022j). The most substantial decrease in national savings occurred during the GFC, moving from 17.40% in 2007 to 13.85% in 2008, the lowest on record. Gross private domestic investment reached a record high of $US4,113 billion as of January 2021, increasing steadily since 2010, with only 2016 and 2020 seeing slight negative contraction (Trading Economics, 2022k). United States investment accounted for 22.0% of NGDP in June 2022, a decrease from 22.6% in the previous quarter (Ceicdata, 2022b).

2.4 Japan

2.4.1 Financial Market Overview

Japan's banking sector is larger than the Australian sector but smaller than the United States sector. It comprises three mega-banks, four money centre banks, 16 trust banks, and 30 international commercial banks. As of 2020, the Japanese banking industry held more than $US21 trillion in assets (Statista, 2022e). City and regional banks characterise the Japanese commercial landscape. City banks are national institutions that provide comprehensive banking services to large corporate customers and are active internationally, while regional banks provide region-based retail services and commercial lending (Megumi & Li, 2016). *Act No.59* in 1981 was introduced to govern a broad range of areas, including capital adequacy, licensing, governance, mergers, and acquisitions (FSA, 1981). The FSA regulates this *Act*, imposing sanctions on banks where required. An amendment to the *Act* was made in 2013, reducing legislation on holding ratios and tightening large exposures (FSA, n.d.).

Further amendments in 2016 saw advances in management practices, with the relaxation of intra-group transactions and a simplification in the requirements for foreign banks to obtain transaction licences (FSA, n.d.). Banking has been a strong contributor to economic growth in Japan; however, strong governmental policies were necessary during the early 1990s. From 1991-1997, the Ministry of Finance Japan (MOFJ) aimed to protect ailing banks and introduce regulatory forbearance. The policies included the injection of ¥680 billion to assist *Jusen*, a subsidiary of the banks created in the 1970s. Such injections were criticised domestically, discouraging the MOFJ from pursuing further policy implementations to assist

economic stability. In 1996, an amendment was made to the *Deposit Insurance Law*, temporarily suspending the limits on deposit protection and increasing insurance premiums of total deposits outstanding within Japan (Milhaupt, 1999).

Stagnant economic conditions and falling asset prices marked the period of the Asian Financial Crisis (AFC). The government injected ¥30 trillion into the Deposit Insurance Corporation of Japan (DICJ), bolstering bank balance sheets and strengthening the deposit insurance system, introducing an additional ¥7.5 trillion in bailouts (DICJ, n.d.). The Financial Services Agency (FSA) was established in 2000, launching widespread reclassifications of loans while increasing regulatory pressures. The FSA focused on balance-sheet health and accounting practices, improving portfolio positions by 2003. The initiative of promoting quantitative easing in 2006 saw the Banks Shareholding Purchase Corporation (BSPC) purchase ¥1.6 trillion in stocks from Japanese domestic banks. During the GFC, Japan's financial regulators placed a strong focus on implementing recovery policies in five key areas: 1) Basel III implementation; 2) stress testing; 3) improving over-the-counter derivatives regulation; 4) recovery and resolution planning; and 5) strengthening banking policies for SME lending (Harada et al., 2014). Harada et al. (2011) argued that Japan's micro-prudential regulation regime was significantly improved following the 1990 crisis, reducing the overall exposure of domestic financial institutions during the GFC.

During the COVID-19 pandemic, the Central Bank intervened in the financial system in three significant ways. Firstly, it launched a Special Program, injecting ¥120 trillion through purchasing CP and corporate bonds, which supplemented the Special Funds-Supply Operations activity of injecting ¥100 trillion. Through these measures, the Central Bank provided special consideration to financial institutions that provided loans in response to the pandemic. Secondly, the Central Bank supplied ample yen and foreign currency funds, especially US dollars, ensuring the smooth functioning of economic activities. Lastly, the Central Bank actively purchased ETFs and J-REITs to shield households and firms from volatility in the financial markets (Kuroda, 2020). Regulatory adjustments included a 12-month postponement in the full implementation of Basel III frameworks, advising financial institutions to deploy their liquidity and capital buffers during the pandemic's early impacts. To complement this, the Central Bank and the FSA eased leverage ratio requirements (Kuroda, 2020).

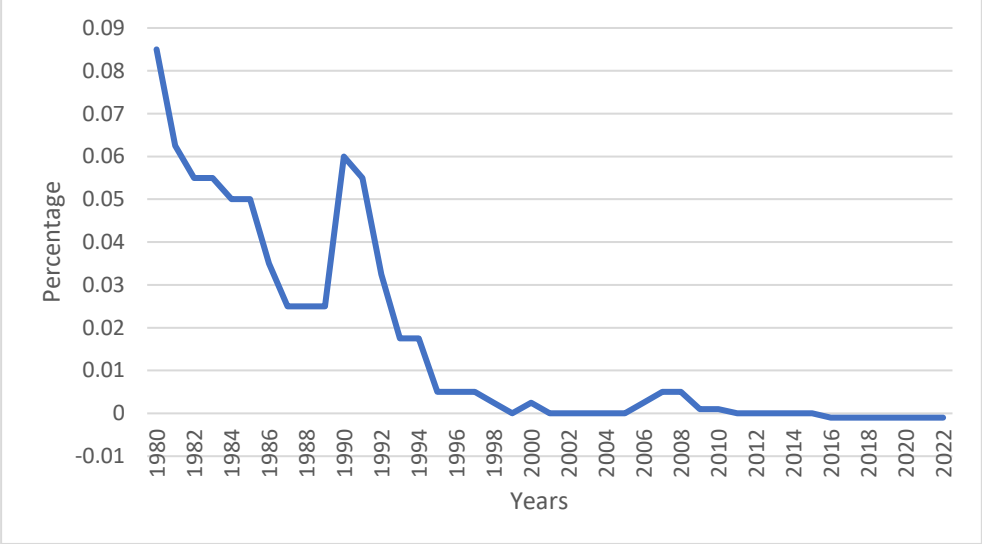
The Japan Exchange Group (JPX) is the fifth largest exchange in the world, with a market capitalisation of $US5.29 trillion as of August 2022 (Statistia, 2022f). Established in 2013, the group was formed by merging the Tokyo Stock Exchange Group (TSE) and the Osaka Securities Exchange (OSE). Previously, the TSE implemented a tiered regime with different tick sizes corresponding to price bands from December 1985, with future movement towards smaller increments and tick size reductions for some price bands in January 2010 through the JPX (Kondo, 2015). Tick size is defined as the minimum price movement of a trading instruction, with the price movements of different trading instruments varying with tick size. Arrowhead was launched as a cash-equity trading system in January 2010, combining low latency, high reliability, and scalability of the highest global standard (JPX, 2022).

As of September 2022, the JPX houses 3,839 listed companies (JPX, 2022). The Nikkei 225 is Japan's financial market's top indicator, consisting of 225 blue-chip companies. Like other major indices, the Nikkei 225 experienced a sharp yet moderate drop during the GFC period, with flatline growth from 2009-2013. The period from 2013-2019 experienced a strong upward trend, moving from 10,800 in early 2013 to 23,600 before the onset of the COVID-19 pandemic (Trading Economics, 2022l). While the pandemic presented an exogenous shock towards the financial market, the Nikkei 225 experienced little downturn, rebounding strongly in March 2020. In February 2021, however, the Nikkei 225 experienced a steady downward trend (Trading Economics, 2022l). The bond market runs in a traditional sense, with the combined size of all defined bonds (i.e., sovereign, government, agency, provincial, and corporate) reported to be more than ¥2 trillion in value in late 2022, as defined by the S&P Japan Bond Index (S&P Dow Jones Indices, 2022).

2.4.2 Monetary Policy

The Bank of Japan (BOJ) is responsible for monetary policy, deriving its functions and powers from the *Bank of Japan Act* 1997 (BOJ, 1997). Managing bank notes, implementing policy, providing settlement services, operating the Treasury, and reporting on the economy are all functions of the BOJ (BOJ, 2013). Like the United States, the BOJ sets a stability target of 2% for yearly inflation. The BOJ interest rate is shown in Figure 2.6, covering the period 1980-2022. An asset bubble influenced low rates from 1995-2000, reducing from 1.75% to 0.5%. During 2001-2006, the rate held steady at 0.1%. In response to the GFC, the BOJ reduced interest rates, with stability occurring between 2009-2022.

Figure 2.6. BOJ Interest Rate 1980-2022



Source: Interest Rates (BOJ, 2022a). Months of September 1980-2022.

In early 2016, the BOJ reduced rates to historic lows of -0.1%, encouraging banks to place their money into more productive uses, such as lending to households and businesses (BOJ, 2016). Interest rate changes, through quantitative and qualitative monetary easing with yield curve controls, were discussed within the September 2016 BOJ Statement, while the December 2016 BOJ statement noted Japan's economy as displaying moderate recovery trends, with increases in business investments, corporate profits, private consumption, and

employment (BOJ, 2016). The BOJ assisted the financial system through the COVID-19 pandemic by: 1) implementing the Special Program; 2) providing ample yen and foreign currency funds; and 3) delaying stricter Basel III frameworks. The BOJ analysed the outlook for economic activity and prices in July 2022, concluding that the year-on-year rate of change in the CPI would most likely increase into 2023 (BOJ, 2022b).

2.4.3 Fiscal Policy

The MOFJ conducts a broad range of duties, containing multiple bureaus that focus on budgets, taxes, customs and tariffs, financials, and international policy (MOFJ, n.d.). The State Treasury was initially founded in the 6th century in ancient Japan, only modernising through a new constitution imposed by US occupation forces in 1947 (Hartcher, 1999). During the GFC, the Japanese economy contracted by -6.3% (i.e., GDP) despite housing a robust financial sector. Such a slowdown was the strongest received among all OECD economies, with a slow recovery recorded after that, despite the implementation of multiple large stimulus packages (Katada, 2013). Katada (2013) traces the response of the Japanese Government throughout the GFC. The Author argued that the government failed to manage the crisis through various constraints in the critical months of October 2008 through to the end of 2009. One notable constraint was the experience policymakers had gained through the 1990s and 2000s financial crises. The author also argued that this type of 'crisis fatigue' constrained the supply of Japan's fiscal measures to respond quickly, causing Japanese society to be unresponsive to such late measures.

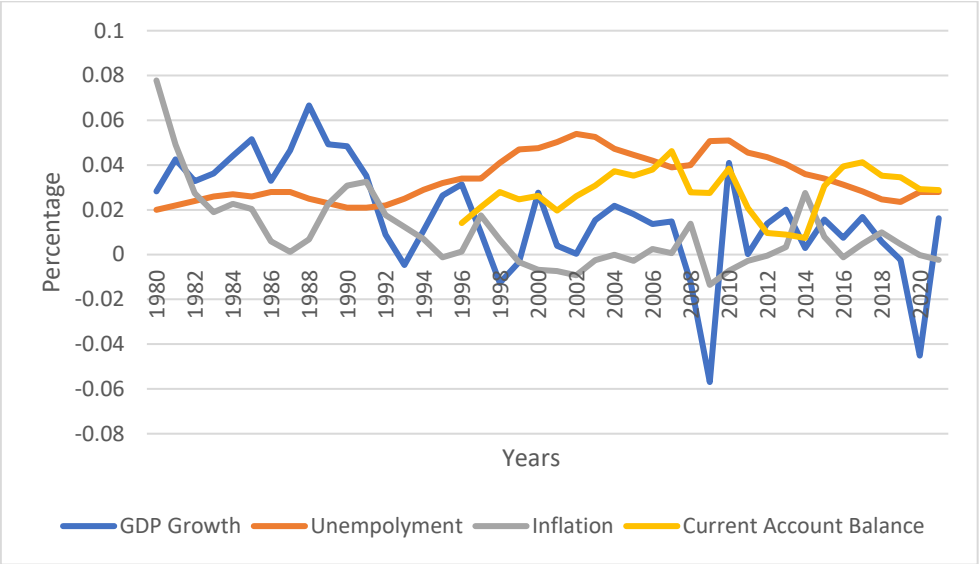
In response to the COVID-19 pandemic, three emergency response packages were announced, with the third delivering a ¥117 trillion package, or 22% of GDP, aimed towards positively stimulating the economy in April 2020. Most of the package was aimed towards employment and business support, alongside assistance for the healthcare sector, public investment, and a consumption promotion campaign (KPMG, 2020a). In May 2020, the government announced an additional ¥117 trillion package to establish rent-free support benefits for SMEs and provide subordinated loans for large companies (KPMG, 2020a). Highlights from the FY2022 Budget included releasing a measure for a 'new form of capitalism' through various growth and distribution means, including creating a science and technology nation, enhancing economic security through promoting R&D towards quantum cryptography, promoting investment in human resources and other wide spending policies such as non-social and social security expenditure, totalling ¥107 trillion (MOFJ, 2022).

2.4.4 The Real Sector

Figure 2.7 illustrates the selected yearly macroeconomic indicators from 1980-2021. Annual GDP growth displays both negative and positive swings. Economic downturns that plagued Japan are evident throughout the indicator, especially with the AFC during 1997-1998, the GFC during 2007-2009, and the COVID-19 pandemic of 2020. Post-2021 has seen slight negative and positive growth, with early 2022 showing slight positive growth (Trading Economics, 2022m). Typical post-GFC behaviours are displayed throughout the unemployment indicator, with a slight negative trend from 2009-2019, before rising sharply due to the COVID-19 pandemic. Post-2021, the unemployment rate declined, falling to 2.5% in August 2022 (Trading Economics, 2022n). The inflation indicator shows a downward trend

since 1980, rising sharply in early 2022. The annual inflation rate rose to 3% in August 2022, reaching almost the highest level since September 2014 due to higher food and raw material costs and a weakening yen (Trading Economics, 2022o). The current account balance has been mostly positive since 1995, with more positive balances than negative since October 2021, running until August 2022 (Trading Economics, 2022p).

Figure 2.7. Real Sector Indicators: Japan 1980-2021



Source: Japan Data: 1980-2021. (World Bank, 2022).

Productivity, gross national savings, and investment are other important real-sector indicators. From 1992, productivity in Japan held a positive and strong trend before the GFC, presenting non-trend growth (i.e., stability) from 2009-2022. More recently, the productivity index decreased to 98.20 in July 2022 from 98.90 in June 2022 (Trading Economics, 2022q). Gross national savings were recorded as 25.17% of GDP in 2020, having reduced significantly since the 1970s (Trading Economics, 2022r). Investment experienced four quarters of positive growth in 2022, reversing four negative quarters of growth in the middle of 2020 into early 2021 (Trading Economics, 2022s). Investment accounted for 26.9% of NGDP in March 2022, rising from the previous quarterly result of 25.3% (Ceicdata, 2022c).

2.5 South Korea

2.5.1 Financial Market Overview

South Korea houses a smaller financial market than the United States and Japan due to its relatively new arrival as a sovereign nation. As of 2022, South Korea houses six national banks, six regional banks, three digital banks, five government-affiliated banks, and 35 foreign bank branches (Statista, 2022g). The largest banks, in order, in 2022 were the KB Financial Group with $US12.17 billion in market capitalisation, the Kakao Bank with $US5.91 billion, and the Industrial Bank of Korea with $US5.16 billion (Companies Market Cap, 2022a). The modern formation of South Korea has been shaped by war and conflict. Declaring independence from the North in 1950, the Republic of Korea (ROK) established a separate government in 1948 (Lew, 2000). Postwar South Korea displayed troubling political unrest, assassinations of corrupt figureheads, and numerous national protests. Financial markets have

been, and continue to be, influenced by these modern changes, including the unpredictable activities of North Korea (Lew, 2000).

Expanding on the agencies that regulate the banking and security markets is an important step in understanding the structure and procedures that govern risk within South Korea. In 1998, the Financial Services Commission (FSC) was established to oversee the financial industry after the AFC. Primary responsibilities include conducting examinations of financial institutions and enforcing and managing activities. Established in 1999, the Financial Supervisory Service (FSS) was granted full integrated supervisory authority under the *Act of the Establishment of Financial Supervisory Organisations* in 1997 (FSS, n.d.). Primary responsibilities include supervising financial institutions and evaluating and implementing prompt corrective actions as directed or charged by the FSC (FSS, n.d.).

South Korea's first true economic test occurred during the 1997-1998 AFC. Kihwan (2006) draws on four factors that stalled the economy during this period: 1) the act of liberalising short-run capital flows ahead of long-run capital flows; 2) the speculative attacks on the currency due to the adoption of a managed floating system over that of a pure floating exchange; 3) a lack of confidence of foreign investors alongside an underdeveloped long-run capital market; and 4) a liquidity shortage. The International Monetary Fund (IMF) and other international financial institutions set to end the liquidity trap by introducing a $US58.40-billion package. When difficulty in repaying became apparent, payment options and package conditions were restructured. This allowed the government to focus on increasing flexibility in exchange rates, tightening fiscal and monetary policies, closing unviable institutions, and increasing foreign participation in domestic markets. Such restructuring improved liquidity movements dramatically. As time passed, further reforms were introduced to reduce the likelihood of liquidity traps, resulting in a rebounding economy in 2002 (Kihwan, 2006).

Like other developed nations, South Korea's financial markets were exposed to the GFC. In response, the government executed fiscal packages alongside monetary easing. The stimulus package was estimated to be KRW59.8 trillion during 2008-2010, accounting for 5.1% of GDP in 2010 (Hur & Kim, 2012). Tax exemptions, reductions, and government spending expansions defined the package. Hur and Kim (2012) show the efficiency of expansionary fiscal policies during this period as very effective, assisting the financial market and allowing the economy to rebound from recession. In addition, the South Korean Government proposed and implemented new legislation and financial reforms in response to the GFC, including: 1) increased protection for financial customers; 2) the reinforcement of corporate governance in financial institutions; 3) Basel III implementation; 4) the introduction of a new bank levy scheme; and 5) the improvement of financial information sharing (Ko, 2016).

In response to the COVID-19 pandemic, the Ministry of SMEs and Start-ups introduced a plan package worth €1.2 billion, being a supplementary measure to the Budget, implementing assistance through: 1) an emergency fund to support SMEs and self-employed individuals directly; 2) government guarantees; 3) insurance on loans; and 4) support to open online businesses. In addition, the financial sector, being state investment and private banks, provided

direct financial support to SMEs worth over €2.1 billion (KPMG, 2020b). The BOK initiated the following through the pandemic: 1) the creation of a bilateral swap line with the US Federal Reserve; 2) increasing the cap on foreign exchanges; 3) suspending the 0.1% tax on short-term non-deposit foreign exchange liabilities placed on institutions; and 4) reducing the minimum foreign exchange liquidity cover ratio. In combination with this, the government introduced a stabilisation plan aimed towards assisting the financial markets through a KRW100 trillion fund by: 1) expanding lending of both state-owned and privately-owned banks to all businesses regardless of size; 2) stabilising the bond market through the purchase of corporate and financial bonds; 3) financing bond insurance; 4) assisting the money market financing via stock finance loans and refinancing support; and 5) implementing an equity market stabilisation fund (IMF, 2022).

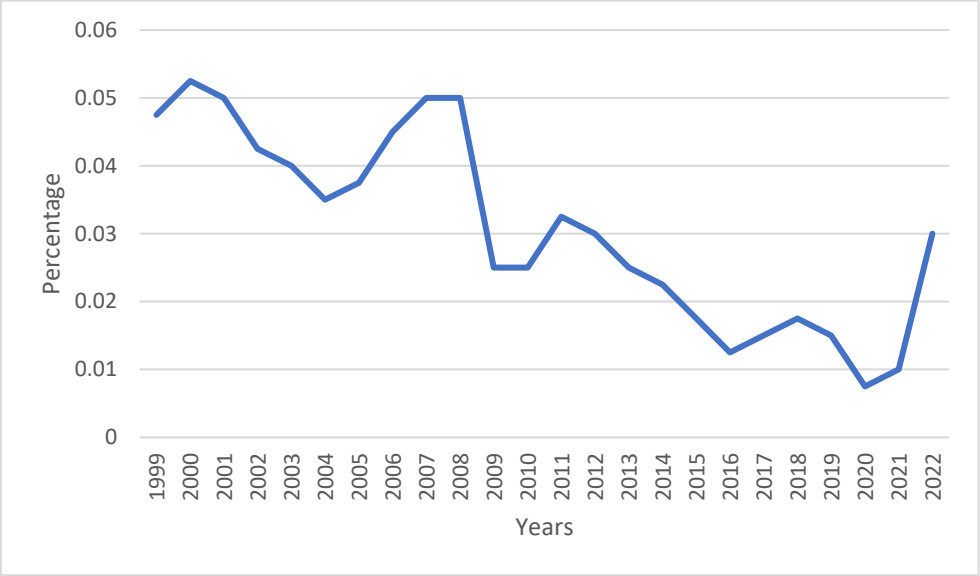
The Korea Exchange (KRX) is South Korea's sole exchange operator, with a market capitalisation of $US2.6 trillion and housing a total of 2,448 listed companies as of June 2021 (KRX, 2022). Founded in 1983, the KRX houses the Korea Composite Stock Price Index (KOSPI). The KOSPI held a base value index of 100 in 1983, moving to 2,200 in September 2022, reducing by -26% in FY2022. Like the S&P500, the KOSPI follows the exchange's health (KRX, 2022). As of October 2022, the most prominent companies by market capitalisation in order were Samsung ($US260 billion), LG Energy Solution ($US79.33 billion), SK Hynix ($US45.67 billion), and Samsung Biologics ($US40.96 billion) (Companies Market Cap, 2022b).

2.5.2 Monetary Policy

The BOK is responsible for monetary policy and derives its functions and powers from the *Bank of Korea Act* of 1950 (BOK, 2011). Pursuing price stability, with a vision of becoming a globally respected central bank, is the primary purpose of the BOK (BOK, 2016). Like the United States and Japan, the BOK sets a stability target of 2% for yearly inflation. This goal is reviewed four times yearly through a published Monetary Policy Report (BOK, n.d.). The BOK reduced interest rates from 2000 to 2004 before they started rising again through 2008. In response to the GFC, the BOK decreased interest rates, finding stability in 2009 before they started rising again in 2011.

The BOK lowered the base rate on six occasions between October 2008 and February 2009, moving from 5.25% to 2.00%, the lowest rate since the 2% policy target was announced in 1999 (BIS, 2011). In addition, the BOK injected liquidity of KRW15.5 trillion, or 28.5% of reserve funds, into the open market to ensure that the circulation of funds was not hampered, particularly in the bond and money markets (BIS, 2011). As shown previously, the BOK initiated several initiatives during the COVID-19 pandemic. Regardless of such actions, South Korea exhibited a sharp increase in the interest rate due to inflationary pressures.

Figure 2.8. Bank of Korea Interest Rate 1999-2022



Source: South Korea Interest Rate (World Bank, 2022). Months of September 1999-2022.

2.5.3 Fiscal Policy

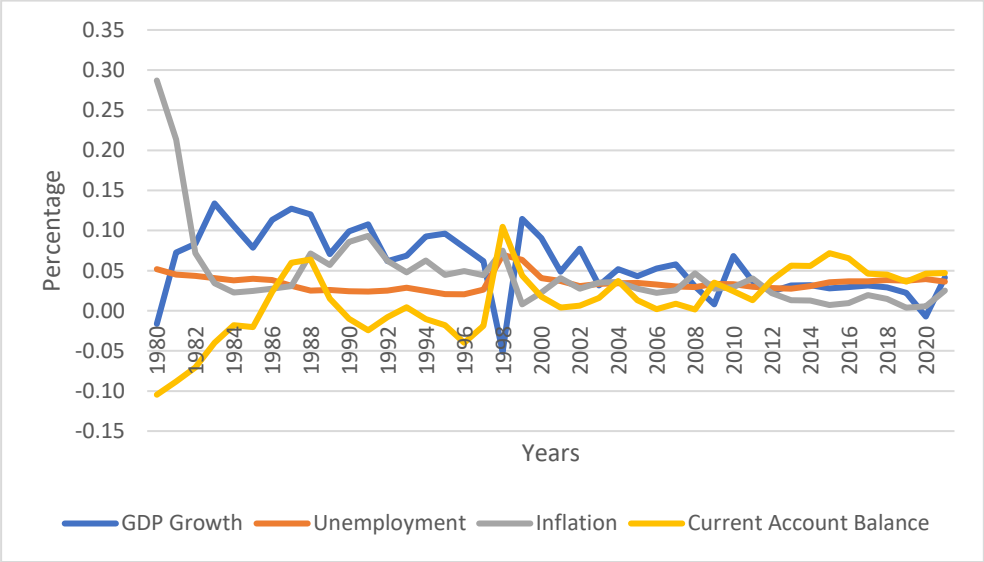
Policy implementation is directed by the Korean National Assembly Budget Office (NABO), established in 2003 under the *National Assembly Act Article (22) and the National Assembly Budget Act* (NABO, n.d.). During the GFC, the NABO implemented four major fiscal stimulus packages. The first supplementary Budget in 2008 amounted to KRW4.60 trillion, focusing on spending towards infrastructure, stabilisation of utility bills, investment, and support for primary producers. The second measure was a tax cut of KRW29.60 trillion. The third was a revised 2008 Budget of KRW10.70 trillion, focusing on supporting SMEs, increasing social projects, and supporting low-income earners. The fourth measure focused on a supplementary Budget of KRW29.60 trillion in 2009, focusing on job creation and retention, further support for SMEs, and investment towards research and development (R&D) (Hur & Kim, 2012).

In response to the COVID-19 pandemic, the National Assembly passed the first supplementary Budget in 2020, implementing a spending program worth KRW10.9 trillion focused on disease prevention and treatment, loans, and guarantees for those affected businesses, alongside support for households and local economies. The second supplementary Budget in 2020 focused on implementing another spending program worth KRW14.3 trillion to provide relief payments to households, while the third supplementary Budget in 2020 implemented another spending program worth KRW23.7 trillion towards providing financial support for companies, reducing unemployment, increasing disease control, and fostering digital and green industries (IMF, 2022). Ongoing, three further supplementary Budgets were announced, totalling KRW55.7 trillion, focusing on supporting the continuation of previous spending policies. In the 2021 Budget, projected government revenue was reduced by 1.2% of GDP due to COVID-19 influences, totalling KRW482.6 trillion, with Budget expenditure being KRW558 trillion, 0.6% higher than the projected 2020 Budget plan (IMF, 2022).

2.5.4 The Real Sector

Figure 2.9 illustrates the selected yearly macroeconomic indicators ranging from 1980-2021. Annual GDP growth displays negative and positive swings, dipping strongly during the AFC. Fiscal and monetary policies during 2000-2007 did little towards assisting growth, with the GFC contributing negatively to the economy, with similar effects occurring due to the COVID-19 pandemic, showing -0.008% growth in 2020, followed by a rebound of 4% growth in 2021 (World Bank, 2022). However, the unemployment indicator was relatively stable throughout the reporting periods, with a noticeable increase during the AFC. As of August 2022, the unemployment rate was 2.5% (Trading Economics, 2022t). The inflation indicator shows a downward trend since 1980 and became somewhat stable; however, it started rising sharply in early 2021. While not as high as the peak inflationary pressures between 1970-1980, inflation (CPI) rose to 6.3% in July 2022, falling to 5.6% in September 2022 (Trading Economics, 2022u).

Figure 2.9. Real Sector Indicators: South Korea 1980-2021



Source: South Korea Data: 1980-2021. (World Bank, 2022).

Productivity, gross national savings, and investment are other important real sector indicators. Since 2000, the productivity index rose to 126.70 in Q1 2022, following a strong upward trend (Trading Economics, 2022v). Gross household savings were recorded at 35.40% of GDP in Q4 2021, reducing from 37.20% in January 2021 due to the COVID-19 pandemic. Since the 1990s, household savings have remained relatively stable (Trading Economics, 2022w). South Korean investment accounted for 32.5% of NGDP in June 2022, rising from 29.6% in the previous quarter (Ceicdata, 2022d).

2.6 Conclusion

The stylised facts of each country were investigated within a historical framework. Differences in historical frameworks have shaped and defined each country, with each adopting countermeasures to positively influence economic growth in the presence of exogenous shocks (i.e., the GFC and COVID-19). The stylised facts included overviews of the financial markets, monetary policies, fiscal policies, and finally, the macroeconomic indicators of the real sector. Vast differences were apparent throughout, especially with implementing regulatory systems and governmental policies to reduce the impacts of exogenous shocks.

The stylised facts of Australia began with a financial market overview, describing the evolving schools of thought towards driving economic growth from the 1950s onwards. Australia's financial market is housed in the ASX, the 16th largest stock exchange in the world. The stylised facts then focused on monetary policies, fiscal policies, and the macroeconomic indicators of the real sector. The Reserve Bank, which governs monetary policy, instigated targeted responses to the GFC and COVID-19 pandemic through various regulatory measures. Fiscal policy is analysed, structured, and determined by the Australian Government, with the assistance of the Treasury. The government implemented several spending packages and programs to positively influence economic growth throughout the GFC and COVID-19 pandemic. The impacts of real-sector indicators provided the following main takeaways: 1) Australia enjoyed more than 25 years of positive economic growth; and 2) the GFC and the COVID-19 pandemic had a notable impact on GDP growth, unemployment, inflation, and the current account balance.

The stylised facts of the United States began with a financial market overview, being significantly larger than the other countries under analysis. The United States has a long history of changing national strategies and priorities, starting with establishing the Central Bank in 1914 and installing various regulatory bodies from the 1930s to the late 2000s to enhance the financial sector. The stylised facts then focused on monetary policies, fiscal policies, and the macroeconomic indicators of the real sector. The Federal Reserve instigated targeted responses to the GFC and COVID-19 pandemic through various regulatory measures. Fiscal policy is orchestrated through the Congressional Budget Office, implementing several spending packages and programs to positively influence the economy through various exogenous shocks. The impacts of real-sector indicators provided the following main takeaways: 1) GDP growth has been severely hampered by exogenous shocks since 1980; however, it shows recovery after that; 2) inflation has been relatively stable since the early 1980s; however, inflation levels (CPI) are at 40-year highs as of 2022; and 3) the current account balance has been in mostly negative territory since the 1980s.

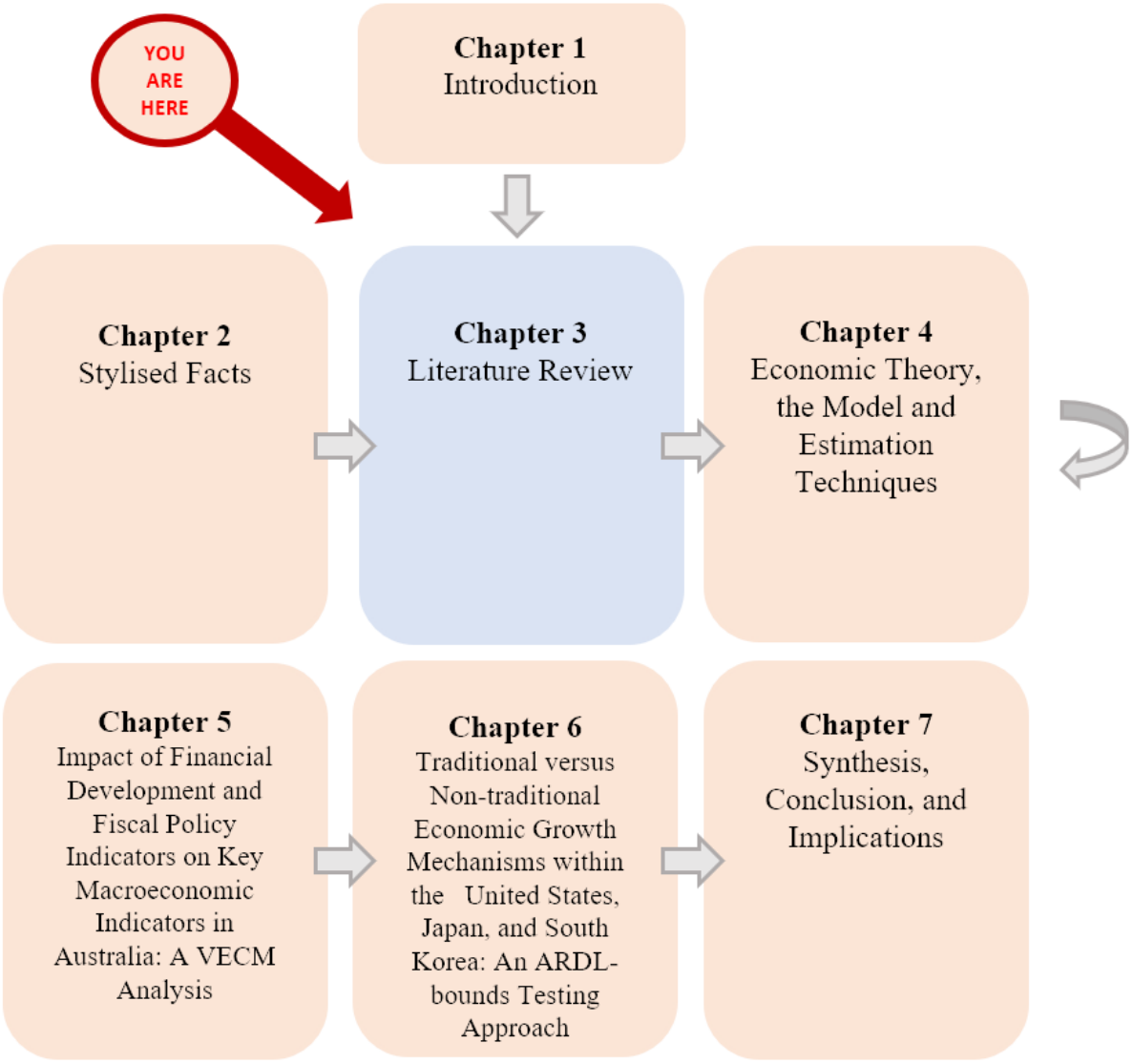
The stylised facts of Japan began with a financial market overview, displaying lighter forms of regulatory influence when compared with Australia and the United States, housing a political culture that is historically hesitant to react quickly to serious economic events. Regardless, various regulatory acts and legislation were most notably introduced in 1981, 2013, and 2016 to ensure the stability of the financial market, with the Japan Exchange Group being the fifth largest exchange in the world as of 2022. The stylised facts then focused on monetary policies, fiscal policies, and the macroeconomic indicators of the real sector. The Bank of Japan instigated targeted responses to the GFC and COVID-19 pandemic through various regulatory measures. The Ministry implemented various supplementary budgets during the GFC and COVID-19 pandemic to positively influence economic growth; however, the literature argues that ongoing 'crisis fatigue' constrained the supply of Japan's fiscal measures to respond quickly, causing Japanese society to be unresponsive to such measures. The impacts of real sector indicators provided the following main takeaways: 1) GDP growth held strong positive and negative swings over the period; 2) unemployment has stayed relatively stable since 1980; 3) inflation has shown strong negative and positive movements alongside periods of stability;

and 4) the account balance has stayed in mostly positive territory, besides the periods impacted by both the GFC and the COVID-19 pandemic.

The stylised facts of South Korea began with a financial market overview, with the three largest banks holding a total of $US23.24 billion in market capitalisation as of 2022. South Korea houses two main regulatory bodies: the Financial Supervisory Service and the Financial Services Commission, supervising financial institutions, leading evaluations, and implementing prompt corrective actions where required. The Korea Exchange is South Korea's sole exchange operator, with a market capitalisation of $US2.6 trillion as of June 2021. The stylised facts then focused on monetary policies, fiscal policies, and the macroeconomic indicators of the real sector. The Bank of Korea instigated targeted responses to the GFC and the COVID-19 pandemic through various regulatory measures. Fiscal policy is directed through the Korean National Assembly Budget Office, implementing various supplementary Budgets to contain the impacts of the GFC and the COVID-19 pandemic. The impacts of real sector indicators provided the following main takeaways: 1) GDP growth has shown very strong swings since 1980; 2) the unemployment rate has remained extremely resilient to the effects of exogenous shocks from 2000 onwards; 3) inflation has remained somewhat low from its high in the early 1980s, with minimal impacts from the GFC; and 4) the current account balance has been in mostly positive territory from 1988 onwards.

In conclusion, each selected country has displayed noticeable differences in how their regulatory bodies and governments operate towards promoting economic growth after exogenous shocks. Each country has implemented different fiscal and monetary policies to promote a stable, competitive, and growing economy that improves its citizens' standard of living. Despite the GFC and COVID-19 pandemic having similar negative effects on global economies, different schools of thought and policy implementations that best suited those economies were utilised. Due to this, real-sector indicators display vastly different behaviours, indicating that a one-size-fits-all approach in promoting economic growth across economies would not be plausible.

Thesis Structure



Some sections of the material in this chapter were adapted for publication in the following referenced conferences, journal articles, and conference paper:

Journal and Conference Publications

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors. In: Chaiechi T., Wood J. (eds) *Community Empowerment, Sustainable Cities and Transformative Economies*. Springer, Singapore.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*

Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2018). *The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy*. Paper presented at the 2018 Australian Conference of Economists (ACE), The Economic Society of Australia (ESA), Canberra, 10-13 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2020). *Impacts of Financial Development and Fiscal Policy Upon Investment within Australia*. Paper presented at the 33rd PhD Conference in Business and Economics, Monash University, Melbourne, 23-24 November.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea*. Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better – Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), James Cook University, Cairns, 1-3 July.

Chapter 3: Literature Review

Abstract

Chapter 3 comprehensively examines the relationship between financial and fiscal policy developments and their impact on economic growth from different theoretical perspectives. The primary objectives of this chapter are to critically review and analyse the existing literature, identify gaps in previous research, and uncover potential opportunities for theoretical and empirical contributions to the field of economics. A systematic and structured approach is adopted to achieve these objectives, utilising a funnel approach encompassing various schools of thought on economic growth. Emphasis is particularly placed on post-Keynesian and Kaleckian post-Keynesian macroeconomic frameworks, which provide valuable insights into the role of financial development and fiscal policies in shaping economic growth dynamics. Through this review, the identified gaps in the literature are carefully examined and explained, providing a foundation for future research and analysis.

3.0 Introduction

This chapter comprehensively examines how financial development and fiscal policy developments influence various sources of economic growth, aiming to analyse the literature critically, outline gaps in previous research, and uncover any opportunities to contribute to the field of economics by empirical and theoretical means. Employing a funnel approach to explore economic growth theory, this review aims to analyse the diverse schools of thought. The review begins with a historical overview of economic growth, encompassing the Classical schools and post-World-War-II developments, including Keynesian growth theory, Harrod-Domar growth theory, Lewis's growth theory, neo-Classical growth theory, post-Keynesian growth theory, and finally, Kaleckian post-Keynesian growth theory. Subsequently, the review delves into the history of financial markets, providing a comprehensive definition of the financial sector, analysing the developments in financial markets, and examining their linkage with economic growth. Lastly, the review focuses on financial and fiscal policy developments within the Kaleckian post-Keynesian macroeconomic framework. Through this analysis, three gaps are identified in the existing literature, presenting opportunities to make theoretical and empirical contributions to the field of economics.

3.1 The History of Economic Growth

This section provides a concise overview of the historical evolution of economic growth theory and the corresponding models prescribed to understand and explain it. In analysing the journey of economic growth theory, the following section provides a brief overview of a wide variety of growth theories proposed by different schools of thought, such as Classical growth theory, Keynesian growth theory, Harrod-Domar growth theory, Lewis's theory of economic growth, neo-Classical growth theory, post-Keynesian growth theories, and finally, the prescribed Kaleckian post-Keynesian growth model.

3.1.1 Classical Views on Growth Theory

Classical views in economics revolve around influential economic thinkers of the Industrial Age, including Adam Smith, Thomas Malthus, David Ricardo, John Stuart Mill, and Karl Marx. These scholars proposed various theories and ideas that laid the foundation for modern economic thought and continue to shape our understanding of economic growth today.

Smith (1776), generally referred to as the modern grandfather of economics, emphasised the importance of capital accumulation, defining growth as endogenous. His analysis of the division of labour suggests that changes in technical processes could radically improve economic growth. Natural increases in per capita output would result, championed by continuous improvements in innovation and research from firms and individuals. Smith focused on the increase and the level of specialisation of labour productivity, concluding that growth resulted from such divisions. However, he was aware of the limitations contained within this analysis, conceding that an insufficient supply of workers and the erosion of accumulation may hamper economic growth. Smith also concluded that growth depended on the actions of independent agents, their resourcefulness of thought, and their revolving ability to save and invest towards a favourable outcome.

Thomas Malthus (1798) provided more caution than Smith (1776) in the field of economic growth through his influential work in population studies. Malthus (1798) claimed that the relationship between food supply and the general population would result in an imbalance and possible starvation as the population steadily increased faster than the availability of the food supply. Thomas Carlyle (1853) famously paraded this sentiment as an illustration of 'the dismal science'. David Ricardo (1817) built upon Smith's literature, establishing a theory of diminishing returns through the scarcity of natural resources. Ricardo's literature centred on two main bodies of work. The first centred on the advantage of constant technical change, suggesting that advancements in this field could positively influence static economic states, influencing labour productivity and profit rates. The second centred on the diminishing returns of land, suggesting that a fall in profits may occur when there is a reduction in capital accumulation, promoting the 'natural course' of events.

Further along, Jean-Baptiste Say (1803) proposed the economic principle that the production of goods inherently generates its own demand. Put simply, the notion is that supply creates its own demand, with the production of goods and services automatically generating income, consequently fostering a demand for other goods and services. Advocates argue that this principle ensures market self-adjustment, efficient resource allocation, and a sustainable link between supply and demand. However, critics contend that Say's Law oversimplifies economic dynamics, potentially overlooking demand shortfalls, preferences for saving over consumption, and the risks of financial instability. Real-world intricacies, such as sticky prices and wages, challenge the concept that supply consistently and effortlessly creates its own demand, particularly in economic downturns (Sowell, 2016).

Following Say (1803), John Stuart Mill (1848) discussed various topics, including comparative advantage, the requisites of production, labour, capital, and laws of increasing labour/production. Concerning economic growth, Mill argued that science and education promoted such growth by comparing what society values and economics measure. Mill argued that sacrificing growth to reduce negative environmental impacts was of utmost importance. Following Mill, Karl Marx (1859) argued that only in the 18th century could men define a greater understanding of this concept through the works of Smith and Ricardo. Marx openly criticised the ahistorical nature of their work, concluding that before Ricardo, most economists

could not grasp that their own science had emerged. Marx highlighted that Ricardo was the first to develop different analysis methods, labelling it as 'Ricardo's greatest service to the science'. Regardless, Marx (1863) insisted that weaknesses engulfed Ricardo's work, delicately describing criticisms of the descriptions and concepts of value, money, and capital. Marx (1859) wrote three volumes on the theory of economic growth, highlighting historical progressions through commodity production. The labour theory of value was an important basis for Marx, suggesting that the capitalist pockets profit from the difference in the product sold and the costs associated with production.

Schumpeter (1911, 1939, 1942) is best known for analysing capitalist economics, business cycles, entrepreneurship theory, and creative destruction. Regarding business cycles, Schumpeter (1911) argued that a capitalist economy experiences short and long waves of growth, whereby the emergence of new industries and technical progress influences long waves. For technological leaps to occur, stable economic conditions, credit access, and free open markets must exist. In the way of entrepreneurship, Schumpeter (1942) argued that capitalism, through individuals, disrupts social and economic systems through innovation, ultimately destabilising business cycles. In expressing innovation, Schumpeter's economic development theory implements leaps in technical advancement (Parjiono, 2009). Lukasz (2014) points out that Schumpeter's theory contradicts the Classics, arguing that capital accumulation was not the main driving force of economic growth, but rather entrepreneurial and innovation drivers. Creative destruction was another contribution made by Schumpeter (1942), arguing that economic progress can be abrupt and unpleasant. Such progress can disrupt long-held practices by evolving technology, products, and production methods. Being paradoxical, the term has been used as a shorter description of how free markets deliver economic growth. Schumpeter (1942) devoted only six pages to this theory, becoming an important reference for how economies evolve. Economists can apply this theory when describing fundamental changes to economies, industries, and companies (Parjiono, 2009).

While Schumpeter's influence towards industrialised countries is well defined (see Laumas, 1962; Becker et al., 2012; Hanusch, 2017), such influence has gained little attention in developing countries (Juma, 2014). Juma (2014) considers this to be an intellectual oversight on the part of government decision-makers, whereby the critics of Schumpeter implemented more linear and static views of economic change in the way of utilising both central planning and equilibrium models to grow the economy, as opposed to more centralised themes of entrepreneurship and innovation through endogenous transformation. In a more recent review of Schumpeterian growth theory, Aghion (2016) argued that such a theory can generate specific predictions regarding the relationship between innovation-led growth and firm dynamics, wage inequality, and competition. This argument is based upon extending an augmented Schumpeterian model, as proposed by Aghion et al. (1997) and Aghion et al. (2001), allowing for a step-by-step innovation model. Such a model assumes that firms lagging to be technical leaders must innovate to be industry-leading, resulting in the possibility of some sectors being 'neck-and-neck' in striving for such innovations. Aghion (2016) also argued that the theory could contribute towards accommodating growth within development economics through

appropriate growth policies, and by analysing how the development of institutions shapes the relationships between the distribution of size, reallocations, and economic growth.

The contributions of Classical economists led to the establishment of one of the main theories of growth economics: Classical growth theory. Such a theory established the definitions of technological progress, production, accumulation of capital, the division of labour, and the growth of populations (Engel, 2010). Engel (2010) argued that one of the most centred contributions of Classical economics is the importance it places on trade-enhancing development (i.e., Smith's arguments of 'gains from trade' from specialisation benefits, alongside Ricardo's comparative advantage theory). Harris (2007) argued that while Classical economists primarily focused their analysis on the conditions of industrial capitalism in Britain, economists at the time were able to establish an understanding of the broad forces influencing economic growth (i.e., productive investment and accumulation), which were argued to be strong drivers through profits.

3.1.2 John Maynard Keynes Growth Theory

During the Great Depression, economic theory could not explain what caused the Great Crash. In reaction, John Maynard Keynes introduced the 1936 work, *The General Theory of Employment, Interest and Money*. While other contributions should be noted (see Keynes 1909, 1920, 1922, 1923, 1930), this review holds interest towards exploring the 1936 works. *The General Theory* explored questioning economic orthodoxy rather than providing application practicality (Sangkuhl, 2015). *The General Theory* contains four books exploring definitions and ideas, the propensity to consume, and the inducement to invest. *The General Theory* provides three principal tenets of how an economy works: 1) many economic decisions influence aggregate demand; 2) supply and demand changes slowly influence prices and wages; and 3) aggregate demand changes hold strong short-run effects upon employment and real output compared with price. The central argument, differing from the Classical works, was that employment levels were determined by aggregate demand levels, as opposed to the price of labour.

Keynes (1936) suggested that influencing aggregate demand would kickstart a struggling economy. However, he later contested the idea that free markets would never display self-balancing mechanisms leading to full employment outcomes. Keynes considered the role of government as important, advocating spending to stimulate the economy. Such stimulation, he argued, could stabilise employment during economic depressions or downturns. Keynes asserted that, in the short run, governments had a fundamental responsibility to interfere with market developments. As Keynes put it, 'in the long run, we are all dead' (Keynes, 1923). Keynes (1936) advocated the idea of co-using monetary policy to cool or warm an economy according to the requirements of the time. He also believed that increases in net exports, government spending, investment, and consumption could positively influence economies experiencing high unemployment. The impact of Keynes extends beyond the 1936 works, influencing the creation of different schools of thought, such as neo-Keynesian economics, new-Keynesian economics, and Kaleckian post-Keynesian economics. While each differs in

meaningful ways, this review focuses on post-Keynesian and Kaleckian post-Keynesian traditions (see sections 3.1.7 and 3.1.8).

Regardless, individuals and other schools of thought have scrutinised Keynes' work. While numerous, the following explores some of the more well-known contributors. The primary opponent of Keynes in the field of macroeconomics in the 1930s was Friedrich Hayek. While Hayek did not criticise *The General Theory* directly, rather other Keynes works: *A Treatise on Money* 1930, Bass (2011) maintains that criticisms exist within the works of Hayek (see Hayek, 1937, 1939, 1941, 1974, 1988). Bass (2011) highlights the main criticisms made by Hayek towards *The General Theory* within such works, including: 1) capital theory is not contained within the works, as it does not explain how companies operate complex production structures; 2) market processes are of the main focus (i.e., the monetary surface, while neglecting real underlying processes); 3) while macroeconomic in nature, economists must study the actors involved to understand relative prices and investment structures as opposed to concepts (i.e., wage levels and aggregate investment); and 4) short-term focus can lead to scientific irresponsibility, as economists have the opportunity to analyse and understand medium to long-run effects of economic policy.

Milton Friedman was another well-known critic, a monetarist economist who explored the impacts of the money supply as opposed to the impacts of aggregate demand, as proposed by Keynes (1936). Friedman holds the following main criticisms of *The General Theory*: 1) there is an incorporation of a liquidity trap that undermines full employment in the long run (Friedman, 1970, 1972); and 2) an inability to recognise a wealth effect (Friedman, 1968). Friedman also criticised the monetary argument contained within *The General Theory*, the concepts of the investment multiplier, capital and its marginal efficiency, and the interest rate. Through the analysis of such concepts in the short run, Keynes (1936) argued that monetary expansion will reduce the rate of interest and thus increase aggregate demand. Friedman (1970, 1972) opposes such a viewpoint, arguing that while such increases in the money supply would boost aggregate demand, interest rates may rise or fall depending on liquidity constraints, Fisher effects, and income (Nelson, 2020). While the noted criticism of Keynes has focused on the works of Hayek and Friedman, there is a recognition that a large and wide variety of analysis is contained within the literature, which cannot be analysed entirely within this review (see Pilling, 1986; Fletcher, 1987; Blinder, 1988; Hazlitt, 1995; Penden, 2004; Bunting, 2015).

3.1.3 Harrod-Domar Growth Theory

When World War II concluded, a lack of international conformity surrounded decision-makers on how best to influence economic growth (Parjiono, 2009). In reaction, Harrod (1939, 1948) and Domar (1946, 1957) constructed an endogenous growth model heavily influenced by the writings of Keynes (1936). The model applies technology through a fixed coefficient within a production function, whereby returns to scale are constant through a capital/labour ratio. The framework suggests that the gross national product (GNP) growth rate is jointly determined by the ratio of capital/output and national savings (Tadaro & Smith, 2003). Government decision-makers, more so in the 1950s, implemented such a growth theory into their agendas. Many economists were aware that the growth theory addressed the issue of

economic instability as opposed to long-run economic growth. Regardless, Harrod later adopted the notion of a natural growth rate, arguing that such growth was a determinant of the implementation of technical processes (Boianovsky, 2018).

While the growth theory suggests that long-run investment does not influence economic growth, whereby productivity and labour forces are exogenously determined, the growth theory does not account for developing well-organised international systems, to which external forces can nullify development strategies (Tadaro & Smith, 2003). While developing nations have used this theory extensively towards implementing growth and strategic policies in the short run, often through overseas investment, the influence of high-rate technological processes, productivity, and money gains are not captured within the model (Parjiono, 2009). From another point of view, Hochstien (2020) argued that the literature mainly focuses on two criticisms: the non-inclusion of labour market influence and the assumption of a fixed capital-output ratio. Regardless, the previous works of Hochstien (2006) show that the growth models can be incorporated within the production possibility curve via the IS/LM framework.

3.1.4 Lewis's Theory of Economic Growth

Lewis's theory of economic growth surrounds the sentiment of structural transformation, building mechanisms by which underdeveloped nations can alter their economic policies (Lewis, 1954). Transformations include moving away from traditional means of income (i.e., agriculture) to more modern influences such as industrialisation. The level of wages in the urban industrial sector is considered constant, whereby the speed of economic growth can be described by capital obtainment and the level of investment in the modern sector. As such, investment is influenced by the availability of profits (Lewis, 1954). Lewis's theory of economic growth, however, has received notable criticism. Schultz (1964) asks whether the marginal productivity of labour is zero or negatable, as Lewis (1954) proposed. Schultz (1964) analysed the epidemics that caused many deaths in rural India from 1918 to 1919, the country Lewis based his analysis on, arguing that acreage sown crop increases should have occurred due to a declining population, but they did not. Sen (1967) and Fields (1975) find similar results, showing that Lewis's argument that the marginal productivity of labour is zero did not hold up within the agricultural sector.

In another criticism, Harris and Todaro (1970) argued that the flow of rural migrants to cities may be in excess due to increased income equality between rural and urban areas. Tadaro and Smith (2003) place criticisms towards the assumptions made by Lewis (1954), questioning whether the amount of employment creation and transfer of labour in such a sector is equal to the rate of capital accumulation. Tadaro and Smith (2003) also criticise the assumption that the labour market can provide constant real wages to a point where rural supply surpluses are exhausted. This suggests that before the 1980s, most developing economies exhibited wage-determining factors within urban labour markets.

3.1.5 Neo-Classical Growth Theory

Neo-Classical economics focuses on price determination, output, and income distribution within markets through the forces of demand and supply (Colander, 2009). Neo-Classical growth theory assumes that individuals make rational decisions, maximise utility, and

act on perfect information. As such, neo-Classical growth theory is mainly concerned with the efficient use of resources in the long run, and integrates Classical economic theory (i.e., the cost of production and places demand as an important driver in the value of a product). There are critics of such a growth theory, including Keynes (1936), who argued that the time required to restore equilibrium is too long, and Tversky (1979), who claims that people repeatedly make judgement errors to the point of prediction.

While there have been several key theorists in neo-Classical growth theory (see Carl Menger, William Jevons, Leon Walras, Alfred Marshall, Francis Edgeworth, and John Clark), this section holds interest in exploring more modern contributions. Modern neo-Classical growth theory combines three driving influences in explaining economic growth: technology, labour, and capital. While Swan (1956) developed the growth model 10 months before Solow (1956), the combination of both works is commonly referred to as the 'Solow-Swan' growth model (Dimand & Spencer, 2008). In a further contribution, Solow (1957) incorporated technological progress into the original model, which placed population increases as an indicator of the growth rate. The contributions of Swan (1956) and Solow (1956, 1957) saw growth economics become a significant area of research (i.e., economic theory and macroeconomics) (Boianovsky & Hoover, 2009). In simple terms, the Solow-Swan growth model aims to capture economic growth in the long run, accounting for the factors of population growth, capital accumulation, and productivity growth facilitated by technological advancements. It supersedes the Harrod-Domar model and is characterised as a neo-Classical production function with an aggregate approach, enabling it to align with microeconomic principles through general equilibrium theory (Acemoglu, 2009). In finance, neo-Classical growth theory is rooted in two fundamental tenets: efficient markets and asset pricing. The efficient market hypothesis (EMH) posits that market prices accurately reflect all relevant information. Conversely, as exemplified by the arbitrage pricing theory (APT), asset pricing employs a linear framework to establish the link between expected returns and various macroeconomic variables that can anticipate the magnitude of returns (Crotty, 2005).

Ramiah et al. (2015) summarise the key takeaways of neo-Classical finance as: 1) fundamental value should be aligned with market value; 2) financial markets respond to new information quickly; 3) prices follow a random walk, therefore producing new information for decision-makers; and 4) consistently high earnings cannot be achieved without higher risk. In the way of fiscal policy, Swan (1956) and Solow (1956, 1957) refrained from including government spending, as they viewed long-run economic growth as determined by technological progress and population growth (Acemoglu, 2009). Arrow and Kurz (1969) developed an augmented neo-Classical model to include the benefits of government finances and public capital services, implying a non-monotonical relationship between government size and economic growth. As such, if government spending and/or taxes reach below a threshold, which is not defined within the augmented model, expansionary fiscal policy positively influences economic growth, while increases in taxation hold the opposite effect. Due to the non-relationship between long-run economic growth and policy decision-making, endogenous growth theories became more popular in the 1980s (Carboni & Medda, 2011).

3.1.6 Post-Keynesian Growth Theory

The post-Keynesian growth theory extends and evolves from the work of Keynes (1936). While neo-Classical growth theory assumes that underemployed resources are a relatively short-run event, post-Keynesian growth theory argues that such underemployment is a short and long-run event to a point where technical progress allows for flexible production possibilities. As such, the production capability of resources is deemed important, as opposed to the quantity of resources (Lovie, 2006). Lovie (2006) makes further distinctions post-Keynesians place over neo-Classical schools of thought, including: 1) consumers prefer the satisfaction of needs over that of utility maximisation; 2) firms compete in an oligopolistic market, with no unit cost increases when capacity utilisation is at normal levels; 3) production problems are explored over that of problems of exchange; and 4) money supply is endogenous. More importantly, post-Keynesian economists do not favour market outcomes. Instead, government intervention is seen to determine more positive economic outcomes. Lavoie (2004) makes further distinctions in defining post-Keynesian growth theory, including the arguments that: 1) markets are inefficient and imperfect; 2) market corrections are not automatic; 3) resources can be underutilised; 4) firms rarely operate at full potential; 5) the economy depends on effective demand in both the short and long run; and 6) entrepreneurs' expectations of future demand levels, ultimately through their investments, influence effective demand levels.

The heterodox school of thought (i.e., post-Keynesian growth theory) draws upon the works of several noted economists (see John Kenneth Galbraith, Nicolas Kaldor, Michał Kalecki, Wassily Leontief, Joan Robinson, Nicholas Georgescu-Roegen, Piero Sraffa, and Thorstein Veblen), with the sciences of sociology, psychology, political science, and history also contributing to post-Keynesian economics (Lavoie, 2004). In channelling specific focus, two of the most influential contributors to post-Keynesian economics, being Joan Robinson and Nicholas Kaldor, are explored in this section. Joan Robinson (1956, 1963) wrote extensively surrounding a simple propagated growth model, illustrating a pure working capitalist economy. Assumptions within the model included a closed laissez-faire economy, labour and capital factors of production, neutral technical progressions, workers save nothing, entrepreneurs consume nothing, and price levels show no change. Robinson (1963) concludes that evolutionary economics cannot be fully understood in the short and long run without analysing Keynesian definitions of effective demand alongside social and distributional conflict. Robinson's work on market equilibrium was groundbreaking, arguing that the neo-Classical position was unattainable, as the economy was already in equilibrium (Skott, 2004-2009). While considered groundbreaking by some, Robinson's work was frequently perceived as challenging to comprehend. Skott (2004-2009) contended that economists should not overlook the valuable mathematical analysis tools available for employment. Skott (2004-2009) states that a comprehensive theory can be constructed by integrating methodological and analytical approaches. While Robinson (1964) places equilibrium as a valuable tool in isolating causal forces, Cohen (1993) shows that Robinson's critique focuses only on the outcomes of such deterministic equilibrium models, considered useless as they are not considered the end of the actual process. Cohen (1993) argued that actual causal forces must be included within an open historical model, allowing for the exploration of economic process effects.

Nicholas Kaldor was another strong contributor towards post-Keynesian economics, more so in economic growth, monetary theory, and the balance of payments. In the 1956 paper *Alternative Theories of Distribution*, Kaldor compares neo-Classical, Classical, and post-Keynesian theories. Inspired by Keynes (1930), the works of Kaldor (1956) were seen as a replacement for the Solow-Swan growth model, considered a precursor of newer models of growth (Wulwick, 2009). Kaldor (1956) places two classes in the model, each holding different propensities to save, whereby the appropriate income distribution allows for equilibrium. As such, the growth rate and income distribution are cointegrated. Critics of Kaldor's work disagreed with the logical consistency with which workers earn income from capital, saving a percentage of their total income at a higher rate, as illustrated in Kaldor's savings model (Harcourt & Sardoni, 1992). Kaldor (1966) later retorted by arguing that he thought of savings as pertaining to the total source of income, not the individual savers themselves. Kaldor sets out to explain that savings from retained earnings may not be transparent to individuals holding stock in selected corporations, which is tied into explaining how corporate stock valuations are linked to the value of book assets owned by corporations. Furthermore, Lazonick (2014) notes the disparity between corporate profits and widespread economic prosperity in the United States, particularly five years after the GFC. Lazonick criticises the prevalence of stock-based pay for executives during this period, stating that it motivated large-scale stock repurchases to drive up stock prices in the short term. The author suggested that such practices prioritise executives' prosperity over the broader economic well-being.

The landscape of economics changed with the introduction of stagflation in the early 1970s. As Keynes (1936) provided limited solutions for such economic positions, governments and economists started looking elsewhere for inspiration. Monetarist-styled theories became popular in developed economies, suggesting that the money supply could positively affect short and long-run output. In time, economists embraced such notions, adding to the sentiment of long-run money neutrality within the post-Keynesian school of thought. The theory argues that money supply changes influence nominal variables within an economy, including prices and wages, ultimately having no real effect on real variables (Thirlwall, 1997). According to Thirlwall (1997), the modern post-Keynesian macroeconomic school of thought encompasses six core propositions. These propositions include: 1) the product market plays a significant role in determining both employment and unemployment; 2) involuntary unemployment is primarily driven by effective demand; 3) the relationship between investment and savings is of utmost importance; 4) the influence of a barter economy is considered distinct; 5) cost-push forces have the potential to generate inflation within an economy even before achieving full employment; and 6) 'animal spirits' of investors exert a significant influence on capitalist economies, ultimately shaping investment decisions.

Further along, Piketty (2013) emphasises wealth and income inequality, the impact of inherited wealth, and the role of taxation in addressing inequality, aligning with concerns often addressed by post-Keynesian economists. Piketty investigated the historical patterns of wealth and income inequality, focusing on the 21st century. Piketty analysed data spanning centuries, highlighting the tendency for wealth to concentrate when the rate of return on capital exceeds economic growth. He underscores the role of inherited wealth in perpetuating inequality and

challenges traditional economic theories predicting a decline in such disparities. Piketty proposed policy solutions, including progressive taxation and a global wealth tax, to address rising inequality. Overall, Piketty's work reshaped the discourse on economic inequality, emphasising the importance of historical context and advocating for policy measures to mitigate wealth concentration in the contemporary era.

3.1.7 Kaleckian Post-Keynesian Growth Model

Post-Keynesian macroeconomics is associated with three main schools of thought: Paul Davidson's fundamentalist Keynesianism (see Davidson, 1990; Davidson, 2002), Hyman Minsky's financial instability hypothesis (see Minsky, 1977), and Michał Kalecki's two-class model (see Kalecki, 1954). Davidson focused on uncertainty, money, and finance issues, emphasising the importance of radical uncertainty in economic decision making. He also explored the role of financial markets and the significance of money in understanding economic phenomena. Minsky is best known for his financial instability hypothesis, which explains the inherent instability of financial markets and the economy over time. He argued that stability in financial markets could lead to overconfidence, excessive risk taking, and, ultimately, financial crises. The importance of financial regulation and the role of government in promoting stability were critical, according to Minsky. Kalecki, on the other hand, is known for his work on the theory of distribution and the business cycle. He viewed capitalism as inherently prone to cycles of booms and recessions. As this section seeks to explore the Kaleckian post-Keynesian growth model, this literature review narrows its focus to the lack of research towards real-sector development.

Michał Kalecki, a Polish economist, researched the principle of effective demand during a period that coincided with Keynes' investigations. Kalecki is seen as a contributor to heterodox economics and as one of its founders (Rochon, 2020). According to Arestis (1996), Kalecki's contribution to post-Keynesian economics is significant and fundamental. Similarly, Sawyer (1985) contends that numerous post-Keynesian economists are indebted to Kalecki even more than Keynes himself. While Kalecki wrote several major works from 1932 to 1976 (see the Collected Works of Michał Kalecki, Volumes I-VII), this review focuses on Kalecki (1954), being the *Theory of Economic Dynamics: An Essay on Cyclical and Long-run Changes in Capitalist Economy.*

Kalecki (1954) extensively researched the distinction between workers and capitalists, suggesting that investment was fundamental to the business cycle. In his work, Kalecki (1954) explored economic growth theory using models incorporating profit and income distribution. Within the profit model, it is posited that the overall profits correspond to the expenditure of the capitalist, assuming workers do not save and the economy operates in a closed system. The model also assumes that, in aggregate terms, profits are ultimately determined by a capitalist's total expenditure. Kalecki (1954) always places investment as key in determining the movements of the business cycle. In line with this, Kalecki (1954) states that profits will positively influence financial investments. The model adheres to the principle that increased risk is linked to economic booms, which are influenced by increasing investment, decreasing unemployment, and economic growth. Kalecki's (1954) work significantly contributed to

economics by developing the income distribution model. This model explains the business cycle by considering industries competing within an imperfect market. It acknowledges that the price of goods is contingent upon firms' ability to increase prices without experiencing a decline in the quantity demanded. Kalecki (1954) argued that the total national income share directly relates to the increase in prices, particularly when it harms wages. During a recession, for example, firms may collaborate to cope with reductions in profits, arguing that prices could increase as the degree of monopolies increases. Kalecki's income model makes one crucial distinction: changes influence the business cycle in investment volumes. The assumptions made by this model have potent consequences, being that increases in investment can positively influence economic growth.

In reviewing critics of Kalecki's contributions, Dutt (2011) summarises the following main takeaways: 1) while Kaleckian economists adopted the use of equilibrium analysis, Kalecki had doubts about its usefulness (i.e., tools of analysis via neo-Classical economics); 2) while Kalecki's work did not centre on equilibrium positions, it does allow for long-run unemployment, against neo-Classical growth theory; 3) although Kalecki argued for the existence of excess capacity in the long run, critics contend that this outcome is incongruent with long-run equilibrium; and 4) Kalecki differs with the post-Keynesian interpretation of investment (i.e., investment is dependent upon capacity utilisation), whereby Trigg (1994) argued that Kalecki rejected such dependency, through changes in output as opposed to the level of output/capacity utilisation.

In comparing post-Keynesian growth theories and their views on financial development, Chaiechi (2014) argued that Keynes (1936) and Kalecki (1954) centred their focus towards income distribution. Regardless, there are notable differences between the two theories. Keynes (1936) based his analysis on investment theory through marginal capital efficiency, while Kalecki (1954) placed investment decisions through current profits, change rates, production capacity adaptations, and technical progressions. Also, both schools of thought pay little attention to the financial side, often neglecting the financial sector within economic modelling and its impacts on equilibrium conditions. As such, little attention has been given to: 1) how financial development influences economic growth; 2) what proxies are appropriate for explaining financial sector development; and 3) whether structure is an important element when examining economic growth processes.

3.2 Financial Markets

The following explores the history of financial markets, defining the financial sector and market developments. As the previous section focused on economic growth developments within a historical setting, the following links economic growth with financial markets. Defining the financial sector and market developments will be an important addition to this review, naturally connecting with the history of financial markets.

3.2.1 Defining the Financial Sector and Market Developments

Linking market developments and financial sector roles in promoting economic growth is well defined by Čihák et al. (2012). Čihák et al. (2012) argued that markets' inherent costs are associated with processing and accruing information regarding potential investments

through the transaction of services and goods utilising financial instruments. Market imperfections curtail economic growth and impede living standards by detrimentally affecting society's allocation of savings towards individuals with superior projects and ideas (Chaiechi, 2012). Regardless, such imperfections encourage the creation of intermediaries, markets, and financial contracts. The success of financial systems in reducing such costs can positively impact economic growth. As such, the development of the financial sector occurs when such forces mitigate imperfect information, transactional costings, and limited enforcement. In defining how such a sector develops, Sherriff (2019) argued that such progressions occur through: 1) the improvement of efficiencies and competitiveness; 2) expansion in the diversity of institutions; 3) increases in the money supply; 4) capital allocation from private sector institutions to private sector enterprises; 5) regulation and stability; and 6) more access to the financial market by the general population.

Levine (2005) delineates the fundamental functions of the financial system, categorising them into five key areas: 1) generating and analysing information related to potential investments and capital allocation; 2) enforcing corporate governance principles to oversee firms and individuals following capital allocation; 3) facilitating the trading, diversification, and management of risk; 4) mobilising and pooling savings; and 5) facilitating the exchange of goods, services, and financial instruments. Notably, Levine (2005) observes a strong association between financial development and economic growth, highlighting that advancements in the financial system significantly contribute to fostering growth. Therefore, economies with robust financial systems tend to experience sustained growth over time, outperforming those with weaker financial systems. Čihák et al. (2012) demonstrate how economic growth is influenced by finance, whereby such a system can positively direct economic growth by influencing the direction of society's savings. When such systems identify and fund firms with the best prospects, better-positioned capital allocation fosters economic growth, expanding economic opportunities through credit allocation.

3.2.2 The History of Financial Markets

This section reviews the contributions of various authors and their analysis of financial markets. The review begins with Fisher (1906, 1907, 1930), who illustrates multiple functions housed within credit markets in economic activity, highlighting the importance of understanding risk. Authors (see Keynes, 1936; Marschak, 1938; Kaldor, 1939) construct the theory of selections within portfolios, whereby risk and uncertainty contribute to evaluations. Williams (1938) investigated the notion of the casino view, arguing that intrinsic values reflect the price of financial assets. Following this, Markowitz (1952) focuses on a modern portfolio theory through optimal selection, arguing that diversification held a role in reducing investor risk.

Patrick (1966) focuses on supply leading and demand following activity analysis, examining the relationship between economic growth and finance. Supply-leading theories suggest that economic growth is positively influenced by financial intermediation through saving movements from small investors to large, while demand-following activities theorise that growth creates demand for services in the financial sector, increasing the demand for

external sources of funds. Goldsmith (1969) later argued that intermediation (i.e., financial) influence on growth may be due to productivity and investment capacity increases. Goldsmith (1969) was the first to construct a single financial development measurement, placed simply as all financial assets' values over GNP. Utilising such a ratio, Goldsmith (1969) analysed 35 socialist, developing, and developed economies, finding a positive relationship between financial development and GNP. Ross (1976) offered an alternative to arbitrage pricing theory, moving away from the traditional frameworks of risk vs return and focusing on pricing by arbitrage. Another important contributor to the literature is Eugene Fama (see Fama 1965, 1970, 1976, 1988), often referred to as the father of the efficient market theory (Spulbar & Minea, 2020). Fama's main arguments include: 1) the random walk model holds strong support through empirical testing; 2) the assumption that prices reflect the information available is too generalised with no empirical implications; and 3) efficient markets may overreact to events through the overreaction of information.

Moving on from earlier developments, McKinnon (1973) and Shaw (1973) create a macroeconomic model, placing investment within a developing economy as self-financing through a strong national savings rate. In describing such a model, Eschenbach (2004) argued that the main focus of such a school of thought centres on repression in a financial sense, being a combination of a high and accelerating inflation rate, alongside a nominal interest rate ceiling, being potentially harmful towards long-run growth through the reduction of investment activity via the limiting of funds. According to Chaiechi (2014), both McKinnon (1973) and Shaw (1973) advocated for interest rate liberalisation and the removal of other policy measures associated with financial repression. Financial liberalisation policies in the 1980s were further developed, whereby financial system liberalisation was evident within several economies (Chaiechi, 2014). Neo-Structuralist schools of thought became popular during this period, criticising financial deregulation from a macroeconomic viewpoint. Playing an important role in promoting economic growth, Eschenbach (2004) argued that unorganised money markets can strongly influence financial liberalisation.

Chaiechi (2014) later suggests problems lie within such models, arguing that cost-push-based inflation increases interest rates, leading to a potential reduction in effective demand alongside increases in savings rates, reducing effective demand. Extending the neo-Structuralist approach, such an argument extends to households holding assets in various forms (i.e., time/currency deposits, direct loans, income, physical assets, and other factors). As per the neo-Structuralist theory, various factors can influence the rise in deposit rates, depending on the origin of savings. Consequently, interest rate hikes are expected to shift fund markets towards time deposits, decreasing credit availability. Theoretically, these shifts can curtail investment and output.

3.2.3 Linking Financial Market Development to Economic Growth

In an interconnected global economy, financial market developments significantly influence economic growth, as Nguyen (2021) noted. Financial market development refers to the process of enhancing and improving the functionality, efficiency, and scope of financial markets within an economy. It involves the evolution and growth of financial markets in terms

of depth, breadth, and sophistication. Financial market development is a crucial aspect of overall economic development, as it plays a central role in facilitating the flow of funds between savers and borrowers, allocating capital efficiently, and promoting economic growth (BIS, 2020). Schumpeter (1911) was among the early analysts who examined the impact of credit markets on economic growth, and his analysis suggested that savings facilitated through banks contributed to capital accumulation. Current perspectives on the link between financial development and economic growth draw inspiration from the influential studies conducted by King and Levine (1993a, 1993b). Their research, covering a period from 1970-1989, encompasses 77 countries, employs distinct proxies for financial development, and utilises econometric techniques that differ from earlier studies. By employing a regression methodology in a cross-country framework, the study demonstrates a compelling correlation between heightened levels of financial development and significant associations with economic growth, efficiency, and capital accumulation.

Extensive research has examined the relationship between financial development and economic growth, leading to diverse findings. For instance, De Gregorio and Guidotti (1995) discovered a positive relationship across a sample of 100+ countries from 1960-1985, whereas a negative relationship was observed in 12 Latin American countries from 1950-1985. Using GDP and GDP growth ratios, Bloch and Tang (2003) employed time series methodologies to investigate the relationship between financial development and economic growth among 75 economies. The results indicated an ongoing relationship between the two measures, with the financial indicator private credit to GDP ratio demonstrating a significant coefficient. In a more recent study, Afonso and Blanco-Arana (2018) analysed 30 OECD countries from 1990-2016 and found positive and statistically significant relationships between economic growth and three tested financial development indicators: domestic credit, the market capitalisation of listed domestic companies, and stocks traded. These findings align with previous works by Goldsmith (1969), King and Levine (1993), Beck et al. (2000), Christopoulos and Tsionas (2004), and Beck et al. (2007).

Valickova et al. (2013) conducted a meta-regression analysis, examining 67 studies encompassing 1,334 estimates to investigate the impact of finance on economic growth. Their study yielded several key findings, which can be summarised as follows: 1) differences in research methodology introduced heterogeneity within the results as a whole; 2) of the 1,334 estimates, 638 were positive and statistically significant, 446 were insignificant yet positive, 128 were negative and statistically significant, and 122 were reported as negative and insignificant; 3) the measurement of financial development is an important factor in determining the strength of causality; 4) ignoring endogeneity issues tends to exaggerate the finance-growth relationship (i.e., underutilising econometric methods that take care of endogeneity, for example, vector error-correction modelling (VECM)); and 5) longer data samples report stronger finance-growth relationships. In complementing the conclusions of Valickova et al. (2013), Nguyen (2021) further argued that the abundance of mixed results is due to the differences in the samples of economies, periods of research, and types of quantitative analysis techniques implemented.

3.3 Kaleckian Post-Keynesian Analysis of Financial Development

This section explores the progression of the Kaleckian post-Keynesian macroeconomic framework. While Chapter 4 provides a more in-depth analysis of the Kaleckian macroeconomic model, this section provides a more generalised literature overview. In his original Theory, Kalecki (1954) suggests the economy is closed, with no public sector. Three classes are involved: capitalists, workers, and small proprietors. All savings are derived through capitalists out of profits, whereby workers and small proprietors consume all incomes, and national income is distributed between wages and profits. Two sectors are evident: those producing investment goods and those consuming goods. Consumption of goods is equal to the total consumption by the investment goods sector, whereby the investment is characterised as inventory accumulation. The investment sector is influenced by the demand for goods, resulting in income from both wages and profits, while savings are redirected back into investment.

The Kaleckian post-Keynesian macroeconomic framework is built upon the concept of effective demand, whereby the balance between revenue and profit determines total spending. This framework highlights the interplay between aggregate demand and income distribution, emphasising the role of profits in influencing economic growth and stability. Kalecki (1954) considers the capitalist economy as 'dynamically unstable', whereby the consumption function is not of consideration, as investments determine the level of economic growth. Kalecki (1954) argued that investment is slightly interest-elastic, whereby the rate of interest may not influence long-run decisions. Additionally, Kalecki (1968) posits that the economy's long-run growth is significantly impacted by effective demand, specifically through investment. Kalecki perceives the long run as a culmination of multiple short-run equilibriums.

The theoretical framework employed in this study draws on a lineage of contributors who have developed a single equation approach for macroeconomic indicators (see Steindl, 1952; Kalecki, 1954; Robinson, 1962; Pasinetti, 1974; Rowthorn, 1981; Dutt, 1984; Taylor, 1985; Blecker, 1989; Bhaduri & Marglin, 1990; Bowles & Boyer, 1995; Stockhammer, 1999; Stockhammer & Onaran, 2004; Stockhammer, 2005). The framework under analysis builds upon the works of Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), encompassing functions related to investment, savings, the goods market, and the producers' equilibrium curve defined by international trade. Bhaduri and Marglin (1990) were motivated to demonstrate that Keynesian theory had more profound political implications. Counter to the orthodox view that higher labour costs discourage various forms of production, Bhaduri and Marglin (1990) argued that higher wages drive demand. Bhaduri and Marglin (1990) depart from treating real wages as endogenous to investigate the relationship between unemployment and wages, showing that exogenous influences within the real wage rate may be possible via exchange rate adjustments. Bhaduri and Marglin (1990) divide their work into two fields of enquiry: the closed and open economy. In addition, Bhaduri and Marglin (1990) argued that a demand-driven labour market can positively influence the goods market in conjunction with technical change and an army effect in reserve.

Subsequently, Bowles and Boyer (1995) employed a single equation approach, utilising time-series analysis to examine macroeconomic indicators of investment, savings, income distribution, and net exports for the economies of France, Germany, Italy, the United States, and the United Kingdom. Extending the theoretical model within an open economy setting, Stockhammer (1999) utilises income distribution to argue: 1) structural factors determine the income distribution in the short run; 2) causality runs from accumulation to income distribution; and 3) investment does not determine income distribution but is instead set autonomously. Stockhammer and Onaran (2004) extend these works by incorporating productivity growth and employment models into the framework, utilising structured vector autoregression (VAR) methodology for the economies of the United Kingdom, the United States, and France. In such a framework, the goods market is augmented by technological change and a labour market driven by demand. Interest rates are assumed to be exogenous for the investment function, determined by the holdings of wealth organisations, banks, and the central bank, in line with Kaldor (1961), Moore (1988), and Lavoie (1984, 1992, 1996). Also, income distribution was seen as a determinant of the bargaining position of labour and capital, dependent upon macroeconomic activity and the unemployment rate.

In later works, Stockhammer (2005) analyses the effect of profits upon investment and employment, being a further extension of Bhaduri and Marglin (1990), for the economies of the United States, the United Kingdom, and France, utilising similar models contained within the works of Stockhammer and Onaran (2004). While the more recent works of Stockhammer (see Nishi & Stockhammer, 2019; Nishi & Stockhammer, 2020) explore Kaleckian post-Keynesian models that are centred towards natural output levels of cyclical dynamics and hysteresis, financial development is not contained within the analyses. Therefore, the theoretical model utilised within this study begins with the extension of the modern Kaleckian post-Keynesian macroeconomic framework, inspired by Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), providing a single model approach for each of the macroeconomic indicators: accumulation (i.e., investment), savings, income distribution, productivity growth, and net exports.

It is worth noting that there are existing studies in the literature that analyse finance or financial development within a Kaleckian post-Keynesian macroeconomic framework; however, these do not utilise the macroeconomic framework as proposed by Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004) (see Eckhard & Till, 2007; Hein, 2010; Bortz, 2014; Hein, 2014; Cavalcante, 2018; Chakrabarti et al., 2019; Hein & Martschin, 2020). While previous research has formulated key macroeconomic indicators via equational forms, some research has incorporated financial development indicators into the Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004) inspired Kaleckian post-Keynesian macroeconomic framework itself. Chaiechi et al. (2006) incorporated a financial development indicator within an investment model for the economy of South Korea during the period 1990-2014, utilising vector autoregression (VAR) methodology. The investment model was a function of the rate of profit, interest rates, and financial development, defined as a monetisation ratio or broad money/GDP. The error-correction term (ECT) result showed a joint long-run relationship between the explanatory variables and investment. The inclusion of

financial development within such a Kaleckian post-Keynesian macroeconomic framework was warranted, concluding that financial development does have a role in influencing economic growth.

In a later study, Chaiechi (2012) employed three financial development indicators within a structural (VAR) methodology for the economies of South Korea, the United Kingdom, and Hong Kong from 1990-2010. The study incorporated a broader selection of commonly used financial development indicators, including a domestic credit ratio to GDP, a stock market capitalisation ratio to GDP, and a monetisation ratio to GDP. The results of the study show that financial development: 1) improves the macroeconomic performance of South Korea data; 2) is strongly responsible for the stimulation of investment, productivity growth, and savings through Hong Kong data; and 3) the United Kingdom data are vulnerable to future shocks, due to the lack of strength and stability within the financial system. In suggesting future research, Chaiechi (2012) recommended incorporating the fiscal sector to capture the effectiveness of government tax and spending policies. As the study utilised structural (VAR) methodology, individual models were not tested to establish: 1) whether a long and/or short-run relationship towards the macroeconomic indicators exists; and 2) whether such inclusions are warranted. In a more recent study, Nguyen et al. (2020) utilise structural vector error-correction (VEC) methodology, whereby SME stock market developments, an indicator of financial development, and an innovation indicator were incorporated within the macroeconomic framework during periods 2009:M7-2016:M12 utilising Thailand, Singapore, and Hong Kong data. The advancement of SME stock markets and innovation fostered economic growth by influencing private investment, savings, productivity growth, and employment. However, the structural vector error-correction (VEC) methodology does not investigate the aforementioned aspects.

3.4 Public Sector and the Role of Fiscal Policy: A Keynesian and Kaleckian Post-Keynesian Approach

Before Keynes (1936), a commonly held belief was that government expenditure and taxation had little influence on aggregate spending. Instead, it was believed that these factors could only redirect resources to the public sector from private sector transfers (Blinder & Solow, 1972). Contrary to these arguments, Keynes (1936) incorporated government and fiscal policy into a macroeconomic framework, distinguishing between the current consumption of government and capital budgets through investment. Current budgets were argued to be in equilibrium with financial expenditures, to which Keynes (1936) opposed a government policy of public works and taxation to influence short-run consumption, instead arguing for fiscal stabilisers (i.e., expenditure of capital to counter business cycle movements). Through the example of the Great Depression, where interest rates were close to zero, Keynes (1936) argued that monetary policy held little influence in increasing economic growth, instead arguing that increases in government spending and the lowering of taxes would boost aggregate demand, in turn boosting demand from suppliers and workers through increased income. Keynes (1936) advocated for higher budget deficits during high unemployment periods, opposing the idea that such deficits should be avoided (Nelson, 2006). While Kahn (1931) introduced the multiplier effect, it is considered a key instrument in Keynesian countercyclical fiscal policy theory,

whereby a fiscal stimulus can lead to additional business activity, output, and higher spending beyond the amount initially injected.

Critics of Keynesian economics have argued that the contraction of liquidity and large-scale international trade protectionism prolonged the Great Depression, which negatively influenced investor confidence (Makin & Narayan, 2011). Perry and Vernengo (2014) analysed the evidence for this hypothesis, utilising conventional measures of fiscal multipliers, arguing that incorrectly denying the importance of fiscal policy and wrongly emphasising the effects of monetary policy promotes the anti-New Deal agenda. In analysing government spending before and through World War II for periods 1929-1945 in the United States, Perry and Vernengo (2014) found that fiscal expansion effectively promoted economic growth. Another criticism of the Keynesian approach is that fiscal stimulus can produce a crowding-out effect towards private investment, as public debt instruments divert funds away from more productive private investment options. However, an open economy approach can counteract this through the twin deficit hypothesis, whereby a strong link exists between the current account balance and the government's budget balance. Fiscal stimulus, through increased government spending, reduces national savings in relation to investment, resulting in increases in foreign borrowing (Makin & Narayan, 2011). As such, the Mundell-Fleming approach (see Mundell, 1963; Fleming, 1962), an extension of the IS-LM model via a small open economy, places pressure upon domestic interest rates, moving nominal exchange rates upwards, as foreign capital purchase bonds are required to fund the budget deficit. This further supports the twin deficits argument (Jung, 2011).

Regardless, government fiscal stimulus packages can provide strong positive influences for households and businesses, countering the effects of any reduction in confidence that Keynes considered 'animal spirits' (Makin & Narayan, 2011). Makin and Narayan (2011) also counter this argument, suggesting that a contradiction may exist, whereby business confidence may be negatively affected by the uncertainty fiscal deficits produce. Such uncertainty can negatively influence investment, price recovery, and the potential for economic growth. Makin and Narayan (2011) also argue that fiscally induced programs can raise output by more than the spending itself in some circumstances, whereby several studies premised on Keynesian behavioural relationships have produced mixed results, mostly showing some positive effect in the short run, while long-run results produced negative influences when taxes rise to repair the budget. You and Dutt (1996) argued that government debt increases, through fiscal policies, promotes economic growth while worsening income distribution through capitalists' interest income. Taylor et al. (2012) analysed the relationship between economic growth, government debt, and budget deficits, utilising United States data from 1961-2011, showing that higher primary deficits influenced economic development. Taylor et al. (2012) argued that government expenditure could negatively or positively impact economic growth, depending on the expenditure to income ratio. Following this study, Asada (2012) argued that fiscal policies produce more positive outcomes when changes in income are seen as more influential than changes in government debt in promoting economic growth. Lavoie and Godley (2000) showed that a positive influence on corporate profits exists with increases in government debt.

While mainstream economists emphasise monetary policy over fiscal policy as an effective stabilisation instrument, Kaleckian post-Keynesian economists hold the opposite view, arguing that expansionary fiscal policy positively influences the economy (Ko, 2018). Kalecki argued that full employment was achievable through the assistance of fiscal policy in driving aggregate demand and maintaining such employment (Halevi & Kriesler, 2016). While some neo-Kaleckian and Minskyan-Kaleckian economists explore the impacts of fiscal policy within their prescribed models (see Tcherneva, 2012; Hannsgen, 2012; Palley, 2013; Hein, 2018), this review holds interest towards the Kaleckian post-Keynesian macroeconomic framework.

While most post-Keynesian models neglect the inclusion of fiscal policy (Lavoie, 2014), there are some exceptions, with several authors incorporating government spending into Kaleckian growth and distribution models (see Mott & Slattery, 1994; You and Dutt, 1996; Bonzani, 2012; Dutt, 2013; Palley, 2013; Tavani & Zamparelli, 2015; Obst et al., 2016; Ko, 2018). In some noted examples, Bonzani (2012) introduces three income classes to investigate the influence of exogenous finance on economic growth and income distribution, considering the effects of fiscal policy. On the other hand, Ko (2018) concentrates on the effects of fiscal policy, specifically budget deficits and increases in income tax rates, on economic growth and income distribution. It is important to note that neither study relies on time series data to support the inclusion of fiscal policy within the macroeconomic framework. Instead, they analyse these inclusions through theoretical frameworks.

Some research does incorporate time series data to support the inclusion of fiscal policy within the macroeconomic framework, such as Obst et al. (2016), which augmented a post-Kaleckian model through the inclusion of a government sector (i.e., taxes and public spending on consumption, capital, and labour) for 15 EU economies during periods 1960-2013, utilising a single equation approach. The impact of income distribution and government spending on private aggregate demand (i.e., net exports, investment, and consumption) produced the following results: 1) fiscal multiplier effects held stronger impacts towards economic growth when government policies are simultaneously implemented; 2) public investment, a disaggregate of public spending, was found to hold significant and positive influence towards private investment in a majority of the 15 EU economies; 3) wage-led economic regimes were present with the inclusion of taxes on capital and labour; and 4) the combination of egalitarian labour markets, coupled with tax and government expenditure policies, was found to be important for economic growth. Regardless, the literature shows economists generally place more interest in exploring fiscal inclusion implications on specific Kaleckian post-Keynesian models than the entire macroeconomic framework itself. Also, the literature shows that no fiscal policy inclusions have been implemented within the lineage of Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004) Kaleckian post-Keynesian macroeconomic frameworks.

3.5 Identifying the Gaps in the Literature

In reviewing the Kaleckian post-Keynesian literature, three gaps have been identified. While the role of financial development and fiscal policy in influencing economic growth has

been well-documented in the literature, there is an opportunity to further expand upon the Kaleckian post-Keynesian macroeconomic framework. While contributions have been made towards financial development incorporations within the Kaleckian post-Keynesian macroeconomic framework (see Chaiechi et al., 2006; Chaiechi, 2012; Nguyen et al., 2020) inspired by Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), there is scope to add to the literature in more ways than one. The next step is to articulate the gaps within the literature clearly and to explore and define the aims and scope of this study. The following expands upon the explanation for each identified gap within this review.

3.5.1 Research Gap 1: Limited Research on the Incorporation of Contemporary Measures of Financial Development within the Macroeconomic Frameworks

Despite the recognised importance of financial sector dynamics in influencing economic growth, the literature in this area has been relatively scarce, particularly in integrating up-to-date financial development indicators within the established macroeconomic framework of Kaleckian post-Keynesian economics. Therefore, the theoretical framework utilised within this study contains a lineage of contributors in establishing a single equation approach for the macroeconomic indicators (see section 3.3). Building upon the works of Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), researchers have made some contributions to the integration of financial development indicators into Kaleckian post-Keynesian macroeconomic frameworks (also section 3.3). In these contributions, the incorporation of financial development indicators is limited to commonly used measures such as domestic credit, stock market capitalisation, monetisation, and ratios related to SME stock market development. This presents an opportunity to expand upon the literature by incorporating both commonly used and contemporary measures of financial development within the prescribed Kaleckian post-Keynesian macroeconomic framework, ultimately selecting the most appropriate indicator through model selection processes. There is an opportunity to explore a wide variety of contemporary measures of financial development through a list of new broad-based indexes as presented by Svirydzenda (2016), an extension of the works of Čihák et al. (2012), dividing financial development into financial institutions and financial markets. Financial institutions encompass mutual and pension funds, insurance companies, and banks, while financial markets comprise the bond and stock markets. Three key dimensions can be described within each category: depth, access, and efficiency.

Through the incorporation of both commonly used and contemporary measures of financial development within the prescribed Kaleckian post-Keynesian macroeconomic framework, there is an opportunity to utilise time-series analysis to explore the unidirectional causal relationships running from the explanatory variables to the key macroeconomic indicators (i.e., investment, savings, income distribution, productivity growth, and net exports). This study analyses whether incorporating such financial development indicators is warranted within the prescribed framework. Incorporating commonly used and contemporary measures of financial development within the prescribed framework to see which holds the strongest causal effects will be a first.

3.5.2 Research Gap 2: Lack of Research Regarding the Incorporation of the Role of the Public Sector (e.g., Fiscal Policy) within the Macroeconomic Frameworks

Despite the recognised significance of fiscal policy as a tool for shaping economic outcomes, the literature within the Kaleckian post-Keynesian macroeconomic framework has been relatively limited. There are some exceptions, with several authors incorporating such inclusion into Kaleckian growth and distribution models (section 3.4). A literature review shows that fiscal incorporations have not been adopted following the Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004) lineage, presenting an opportunity to do so. In a further contribution, there is an opportunity to incorporate financial development and fiscal policy indicators within such a Kaleckian post-Keynesian macroeconomic framework. The combination of research gaps 1 and 2 aims to analyse the unidirectional causal relationships running from the explanatory variables to the selected macroeconomic indicators to see whether the inclusion of both indicators is warranted. As the role of financial markets and government policies within a circular economy is gaining more attention, analysis within such a framework will provide decision-makers and investors with a better understanding of how the explanatory variables influence key macroeconomic indicators over periods of time. Such a study is currently not present within the literature, providing a basis for unique analysis.

3.5.3 Research Gap 3: Lack of Research Regarding the Exploration of Factors Underpinning Resilience and Economic Stability

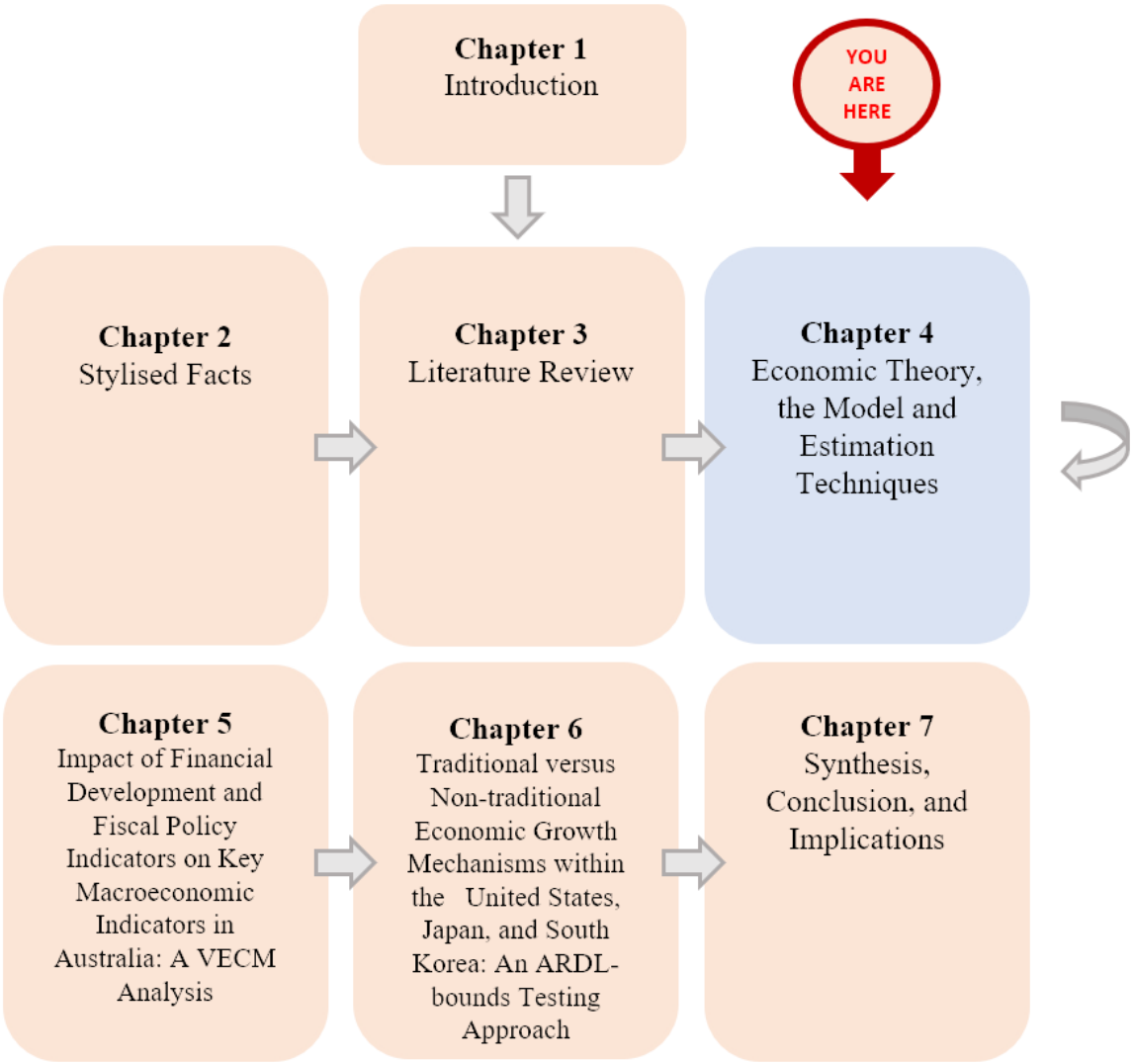
While research gaps 1 and 2 focus on augmenting Kaleckian post-Keynesian macroeconomic frameworks, there is also an opportunity to investigate the resilience of three key economic growth drivers, namely investment, productivity growth, and savings, in the face of unexpected exogenous shocks. While testing for resilience against exogenous shocks, via time-series-analysis, is not uncommon within the literature, applying it to the selected augmented framework in this study will provide unique insights. Therefore, this study aims to fill the gap in understanding how investment, productivity growth, and savings mechanisms within the augmented Kaleckian post-Keynesian macroeconomic framework react to external shocks and their ability to absorb and recover over time. By identifying the explanatory factors that exhibit the strongest influence, decision-makers and investors can incorporate coping strategies in the presence of external disturbances.

3.6 Conclusion

A review of the literature concluded with the identification of three research gaps. The first gap pertained to the limited research on the incorporation of contemporary measures of financial development within the prescribed Kaleckian post-Keynesian macroeconomic framework. The second gap provided evidence that fiscal incorporations have not been adopted within such a Kaleckian post-Keynesian macroeconomic framework. The third gap pertained to the lack of research exploring the factors that underpin the resilience and economic stability of the proposed augmented Kaleckian post-Keynesian macroeconomic framework. By addressing the identified gaps 1 and 2, there is an opportunity to develop the Kaleckian post-Keynesian multisector dynamic macroeconomic models further by integrating measures and indicators of both financial development and fiscal policy. As understanding the resilience and stability of the resulting framework in the face of economic shocks and uncertainties is crucial, addressing gap 3 identifies the factors contributing to the augmented framework's robustness and stability, including potential interactions between financial development measures, fiscal policy measures, and other relevant macroeconomic factors. Therefore, this review uncovered

that there is an opportunity to provide a basis for unique analysis through the aims of this study, being to: 1) incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks within such a prescribed framework. In exploring these aims, the following chapters expand upon model and estimation techniques, alongside analysing the results through Chapters 5 and 6.

Thesis Structure



Some sections of the material in this chapter were adapted for publication in the following referenced conferences, journal articles, and conference paper:

Journal and Conference Publications

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors. In: Chaiechi T., Wood J. (eds) *Community Empowerment, Sustainable Cities and Transformative Economies*. Springer, Singapore.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2018). *The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy*. Paper presented at the 2018 Australian Conference of Economists (ACE), The Economic Society of Australia (ESA), Canberra, 10-13 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2020). *Impacts of Financial Development and Fiscal Policy Upon Investment within Australia*. Paper presented at the 33rd PhD Conference in Business and Economics, Monash University, Melbourne, 23-24 November.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea*. Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better – Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), James Cook University, Cairns, 1-3 July.

Chapter 4: Economic Theory, the Model, and Estimation Techniques

Abstract

This chapter addresses the sequence and justifications of the methodology within this study. This thesis sets to expand upon Kaleckian post-Keynesian theoretical frameworks through the inclusion of financial development and fiscal policy indicators. Utilising unit-root testing, the series data for Australia, the United States, Japan, and South Korea exhibited stationary *I(0)* and/or non-stationary *I(1)* behaviours. Chapter 5 explores Australia's data, exhibiting *I(1)* series for the periods 1980-2015, while Chapter 6 explores the data of the United States, Japan, and South Korea, exhibiting both *I(0)* and *I(1)* series for the periods 1980-2019. In justifying the methodology of this thesis, this chapter highlights the appropriate methods for analysing the long and short-run causal relationships between the independent variables and the selected key macroeconomic indicators, in the form of autoregressive distributed lag (ARDL) modelling and vector error-correction modelling (VECM) techniques. Three separate emulated papers utilised the results found in Chapters 5 and 6. While the papers incorporate either ARDL or VECM techniques, they also utilise impulse response functions (IRF) and variance decompositions (VD) to examine the resilience of selected key macroeconomic indicators and their speeds of adjustment following an external shock.

4.0 Introduction

This chapter expands upon the economic theory, the Kaleckian post-Keynesian theoretical model, and the methodological techniques utilised within this study. Expanding upon the literature review, Kaleckian post-Keynesian macroeconomic theory is explored, highlighting the main attributes of: 1) the basic model, its profits, interest, and implications; 2) historical viewpoints; 3) the Bhaduri and Marglin (1990) model extension; 4) defining the model through closed and open economy definitions; and 5) the proposed augmented model. While the Kaleckian post-Keynesian theoretical model incorporates various components, it specifically encompasses key elements such as investment, savings, net exports, income distribution, employment, productivity growth, and market equilibrium. These elements collectively shape the dynamics and functioning of the model. The literature has largely overlooked the incorporation of financial development and fiscal policy within the Kaleckian post-Keynesian macroeconomic framework, as Chaiechi (2012) demonstrated. This study explores augmented econometric models that include these indicators to address this gap. Utilising unit-root testing, the series data for Australia, the United States, Japan, and South Korea exhibited stationary *I(0)* and/or non-stationary *I(1)* behaviours. Estimation techniques and multi-equation time-series models will be of focus, with appropriate methods in ARDL and VECM processes. Utilising the results of Chapters 5 and 6, three separate emulated papers incorporated not only ARDL and/or VECM processes, but also IRF and VD techniques, examining the resilience of the selected key macroeconomic indicators and their speeds of adjustment following an external shock.

4.1 Kaleckian Macroeconomic Theory

In exploring alternatives to conventional neo-Classical theories, the Kaleckian approach is appealing for several reasons. Firstly, the framework allows for a single model approach in exploring the underlying factors influencing important macroeconomic indicators,

such as investment, savings, income distribution, productivity growth, employment, and net exports. Such a framework allows for augmentation, using time-series analysis, to explore such implications. Furthermore, the Kaleckian framework allows for distributional focus, placing strong emphasis on income distribution and its impact on economic variables. That is, it recognises that the income distribution between profit and wages can significantly affect consumption, investment, and overall economic performance. The Kaleckian framework also incorporates the concept of effective demand, arguing that fluctuations in aggregate demand play a crucial role in determining economic activity. Additionally, it introduces the idea of profit-led growth, suggesting that changes in the profit share of income can drive economic contraction or expansion. Finally, the framework can be used to analyse the implications of different policy measures related to income distribution, fiscal, and monetary policy.

In a broader sense, several post-Keynesian models complement Kaleckian post-Keynesian frameworks. The Cambridge Keynesian tradition, exemplified by economists like Joan Robinson and Nicholas Kaldor, aligns with Kaleckian models in its emphasis on effective demand, income distribution, and the role of historical and institutional factors, as shown previously. Sraffian post-Keynesian models (see Lavoie, 2013) provide insights into determining prices and income distribution, harmonising with Kaleckian approaches. Minskyan post-Keynesian models, influenced by Hyman Minsky (see Minsky, 1977, 1992), extend the analysis to financial instability and the financial sector dynamics, offering a more comprehensive view of the interplay between financial factors, income distribution, and effective demand. Regulationist models, associated with economists like Michel Aglietta (1990) and Robert Boyer (1992), contribute by exploring capitalist economies' institutional and structural dimensions, aligning with Kaleckian frameworks' focus on power relations and distributional dynamics. While other widely used macroeconomic frameworks exist (i.e., computational general equilibrium modelling, dynamic stochastic general equilibrium modelling, and PK-stock-flow consistent modelling), there is interest towards exploring Kaleckian post-Keynesian frameworks, whereby the expansion of other macroeconomic frameworks will not be explored further.

Kalecki's (1899-1970) works are considered important and influential within the discipline of economics. Some see Kalecki's contributions to macroeconomic theory as having complementary and non-complementary attributes to those presented by Keynes. Mostly self-educated, Kalecki was not bound by the much-accepted *General Theory*, instead being influenced primarily by Marxism (King, 1996). As Kalecki's work is considered a suitable alternative to the mainstream macroeconomic theory, it is appropriate to illustrate his central role in post-Keynesian economics. Kalecki's contributions include pricing theory and its extensions, distribution theory, wage and price inflation, collective bargaining, the theory of credit and money, investment theory, and economic policy.

Pricing theory is relatable to Kalecki (1954), recognising that not all markets are perfectly collective, whereby a distinction between cost and demand can be made. Kalecki (1954) emphasises the degree of monopoly, by which full capacity is achieved when the average variable cost is constant. In the context of pricing in an economy, a firm's price is

determined by various factors, including the average price of all firms operating within the economy, the extent of market monopoly, and the average variable costs involved in production. These elements collectively influence the pricing dynamics within the firm. Asimakopulos (1975) extends such a pricing model by assuming that only labour costs change, such that both mark-ups and the average outcome per unit of labour influence the price set by firms, whereby the strength of a monopoly is bound by the profit rate of investment, alongside fixed cost rates via the increase in unit pricing. The main argument of Asimakopulos (1975) is this: the relationship between pricing and investment influences investment itself. Further extensions to the model include Cowling and Waterson (1976) and Cowling (1982), arguing that firms seek independent profit maximisation, with rival output changes considered. Therefore, in line with Kalecki's assumption, short-run fluctuations in the price of manufactured goods are primarily attributed to cost factors rather than changes in demand, irrespective of any additional extensions assumed within the model.

The distribution theory of income combines wages and profits in determining income distribution. Income levels are influenced by both the volume and share of profits, whereby unchanged profits and the level of income determine the power of a monopoly. King (1996) suggests that Kaldor (1956) added to post-Keynesian distribution theory more directly, submitting an analysis that full employment is achievable through a steady-state theoretical framework, contrary to Kalecki. Kalecki (1954), on the other hand, suggests that while central to growth, full employment stability is not entirely dependent upon the distribution theory.

Wage and price inflation were a class conflict for Kalecki (1954), implying a strong 'conflict of interest' between capitalists and workers, whereby unions would bargain for higher wages when commodity prices increase. Kalecki (1954) suggests that unions will accept a level of profit margin, comparing such a margin to the profit margin of industry. If the gap is large or unacceptable, unions will chase higher wages (Sawyer, 1985). Post-Keynesian wage determination analysis is defined through profit margins, corresponding to a targeted real wage, as opposed to the actual real wage (King, 1996). Kalecki (1954) argued that wage inflation is the strongest determinator of price inflation, contributed by its relativity towards productivity alongside the prices of raw materials and imports. The profit share of income/wages is expressed through labour and corporations' wage and price-setting processes. Ultimately, inflation is governed and interlinked by three factors: 1) collective bargaining; 2) the determination of real wages; and 3) the implementation of price/wage levels by credit systems and authorities of monetary policy (King, 1996).

Collective bargaining is a tool labour uses to seek and collect a real target wage, strengthened by drive and aspirations to improve economic and political power. Such bargaining leads to determining wages, whereby the degree of monopoly influences the pricing policy of firms that employ labour. Wage increases are passed to the consumer through markup processes, preserving real profit levels (King, 1996). Kalecki (1966) posits that the labour market does not solely determine real wages but instead influences wages within the broader economic context. In other words, while the labour market impacts wages, it is not the sole determinant of real wage levels.

Theories of money and credit are considered endogenous by post-Keynesian economists. They posit that the money supply is endogenous or internally determined in a market-oriented production economy. This perspective sharply contrasts with Monetarists like Milton Friedman, who contend that the money supply in an economy is externally determined. The central bank, possessing the authority to modify this base, can effectively regulate the money supply in the economy (Nayan et al., 2013). In the contemporary economy, bank deposits constitute the majority of money primarily generated through commercial banks issuing loans. Monetary policy, implemented by the central bank through adjustments in interest rates, serves as the ultimate constraint on money creation. In extraordinary circumstances, such as when interest rates are at their lower bound, quantitative easing (QE) may be employed. QE entails the purchase of assets to inject money into the economy, influencing spending and asset prices (McLeay et al., 2014).

Kalecki (1944, 1954) classifies three types of financial assets: 1) long-term loans; 2) short-term bills; and 3) money. Money is said to have a zero rate of interest in both the short and long run. Money fulfils the essential 'needs for trade', as banks and other financial institutions play a pivotal role in supporting firms by providing lending services. The demand curve for lending exhibits a downward slope in accordance with the demand for money. This implies that the quantity of lending borrowers seek is inversely related to the prevailing short-term interest rates. As interest rates decrease, the demand for lending increases, and vice versa, indicating the interplay between lending demand and short-term interest rates. The supply curve produces an upward-sloping trend as more funds are provided via investment. Short-term interest rates are said to be influenced by long-term movements. However, Kalecki (1954) argued that such change is minimal over continuous business cycles.

Kalecki's (1954) investment theory is well established, whereby the levels of profits relative to capital directly influence the level of investment. Profits can affect investment in two ways: 1) being a source of funds that undertake investment; and 2) the firm's expectations about the likelihood of those investments materialising (King, 1996). Retained profits strongly influence decision-making processes, whereby larger profits, in combination with depreciation allowances, often dictate the direction of future investments towards expenditure programs (King, 1996). Kalecki (1954) suggests that increased risk reduces a firm's ability to reach full investment as risk rises in line with investment. Kalecki (1954) also argued that the level of capital stock utilisation influences investment outcomes. Therefore, Kalecki (1954) recommends reductions in capital expenditure for those firms underutilising capacity. Likewise, when demand increases, pressure should be placed on using existing capital stock, encouraging investment expansion (King, 1996). In time, Kalecki (1954) argued that investment is slightly interest-elastic, suggesting that while long-run investment decisions can be based upon rates of interest, there are some circumstances by which this may not hold. For example, any changes could be incorporated into profit rate movements. Determinants of investment are subject to time lags, promoting the 'acceleration principle' whereby the rate of output change positively influences investment.

Kalecki's analysis of economic policies may be considered a suitable alternative to mainstream macroeconomic theory. Kalecki (1943) argued that governments can positively influence economies, but not to their full potential, as severe obstacles exist. Kalecki (1944) argued that there are four main influencers towards achieving full employment: 1) government spending towards public investment; 2) subsidies to consumption; 3) income distribution to lower-income classes; and 4) the stimulation of private investment. Kalecki (1943) discusses obstacles and constraints to which industry leaders typically reject the full employment theory. Industry leaders can disagree with government influence and tend to favour the invisible hand. Capitalists see government influence as potentially threatening investment and profitability health by crowding out wealth creation and production efficiencies through less efficient government bureaus. Kalecki (1944) argued that the constant battle between business and political cycles is heightened through elections and contracted when near full employment is reached.

4.2 The Kaleckian Macroeconomic Model

The following focuses primarily on the macroeconomic model itself by expanding on: 1) the model dynamics through profits, interest, and the implications; 2) the historical settings of the theoretical model; and 3) the model extensions incorporated by Bhaduri and Marglin (1990). This will ultimately funnel direction towards expanding upon the empirical econometric model, utilising suitable estimation techniques.

4.2.1 The Basic Model, Profits, Interest, and Implications

Kalecki's starting economic model is that of a closed economy with no public sector. Three classes are involved: 1) capitalists; 2) workers; and 3) small proprietors (Kalecki, 1954). All savings are derived through capitalists out of profits, whereby workers and small proprietors consume all incomes, and national income is distributed between wages and profits. Two sectors are evident: those producing investment goods and those consuming goods. Consumption of goods is equal to the total consumption by the investment goods sector, whereby the investment is characterised as inventory accumulation. The investment goods sector is influenced by the demand for goods, resulting in income from wages and profits, while savings are redirected back into investment. Although the public sector is not included, new public investment may have the same effects as private investment if private investors are unwilling to expand. The basic model is based upon effective demand, whereby total spending depends on a revenue of profit of equal footing. Kalecki (1944) considers the capitalist economy to be 'dynamically unstable', and the consumption function is not of consideration, as investments determine the level of economic growth. As stated previously, Kalecki (1944) argued that investment is slightly interest-elastic, whereby the short-term rate of interest may not influence long-run decisions. As such, Kalecki (1944) suggests that interest rate changes should not significantly affect investment, whereby any such changes could be incorporated into profit rate movements. Kalecki (1968) presents an alternative perspective, contending that long-run economic growth is primarily driven by effective demand, mainly through investment. In Kalecki's framework, the long run is the culmination of various short-run equilibriums, emphasising the significance of sustained investment and its impact on long-run growth.

4.2.2 A Historical Viewpoint: The Theoretical Model

The theoretical model utilised within this study began with Steindl (1952) and Kalecki (1954), with additions and extensions constructed through the works of Robinson (1962), Rowthorn (1981), and Dutt (1984). Newer expansions differ from Robinson (1962), placing long-run full capacity utilisation and income distribution as endogenous influences within the macroeconomic model, as opposed to placing a degree of freedom via capacity utilisation, as seen through other extended Kaleckian models. Such an extension requires regimes that allow for increased economic growth through increased wages via the exogenous theory of income distribution (Stockhammer, 1999). Other important centrepieces of earlier post-Keynesian growth models include Kaldor (1956, 1957, 1961) and Pasinetti (1974). Such extensions focus on profit and accumulation rates alongside propensities to consume out of profits. Such extensions follow the Cambridge equation, being the alternative approach to the Classical quantity of money theory, as $R = G(r^e)/S_\Pi$), whereby $R = \Pi/K$ = profit rate, $G = I/K$ = rate of accumulation, r^e = rate of profit, and S_Π = the propensity to consume, whereby K = capital and I = investment.

Stockhammer (1999) extends the theoretical model, emphasising that structural factors determine income distribution in the short run. Furthermore, causality runs from accumulation to income distribution, while investment is autonomously determined and does not directly shape the income distribution. Reflecting on the works of Kalecki (1954) and Steindl (1952), the authors Rowthorn (1981), Dutt (1984, 1987), Taylor (1985), Amadeo (1986), and Kurz (1994, 1995) consider capacity utilisation as endogenous, determined ultimately by investment. The authors place mark-up-pricing within oligopolistic markets as an influencer in income distribution, whereby mark-ups determine a firm's ability to claim profits while considering labour and competitor leakage.

4.2.2.1 The Bhaduri and Marglin Extension

The theoretical model utilised within this study extends the works of Bhaduri and Marglin (1990), who were motivated to demonstrate that Keynesian theory had more profound political implications. Counter to the orthodox view, whereby higher labour costs discourage varying forms of production, Bhaduri and Marglin (1990) argued that higher wages drive demand. The authors depart from treating real wages as endogenous when investigating the relationship between unemployment and wages, arguing that exogenous influences within the real wage rate may be possible via exchange rate adjustments. In another study, Card and Krueger (1994) investigated the employment effects of a minimum wage increase in the fast-food industry, revealing minimal negative impact on employment, contrary to prevailing economic theories. This research sparked a significant debate on minimum wage policies and prompted a reassessment of traditional assumptions regarding the relationship between wage increases and employment levels. The following sets to explore the Bhaduri and Marglin extension, whereby the authors divide their work into two fields of enquiry: the closed and open economy.

4.2.2.2 The Closed Economy

A closed economy refers to the non-inclusion of foreign trade and government activity. The main drivers of aggregate demand are private expenditure towards investment and

consumption. The consumptionist view, in this instance, requires high real wages to maintain constant private consumption (Marx, 1887). Keynes (1936) emphasises stimulating private and public investment, positively influencing output and demand. Further along, Bhaduri and Marglin (1990) show that such expansion methods emerge naturally if real wage exogenous variations are considered. Another assumption is that property income is consumed by capitalists in the way of profits, and workers own no property outright. The algebraic argument can be formulated whereby wages and profits are saved through the constant fraction of (1>s>1). As such, any redirection of income to profit, via increases in real wages, decreases savings via $S = sR = s(R/Y)(Y/Y^*)Y^*$, whereby R = profit, Y = income, and Y^* = full capacity potential. Setting $Y^* = 1$, savings become normalised at $S = shz$, whereby $h = R/Y$ = profit share, and z = Y/Y^* = degree of capacity utilisation, whereby 0<h<1.

The complexities of labour processes contribute to the overall production costs and are ignored entirely. Average labour productivity can experience rises in output via higher capacity utilisation while exhibiting no change in staffing levels. To combat this implication, Bhaduri and Marglin (1990) place staff as 'operatives', whose numbers vary directly with output levels. As a result, the money wage rate is considered constant, given the marginal and average production costs. Given that a firm sets a profit margin on such constants, a price equation can be shown as $p = (1 + m)bw$, whereby p = price level, m = profit margin, b = labour, and w = money wage. Therefore, profit margin and profit share hold a positive relationship, whereby $h = m/(1 + m)$, whereby $dh/dm > 0$, leading to a real wage increase, which decreases savings, validating the under-consumptionist thesis within the model. Depending on the influence of profit share/margin on the investment, aggregate demand (i.e., $C+I$) can rise or fall. Although a higher real wage rate can increase consumption, it can also negatively influence investment, dependent upon the profit margin. The level of investment is, therefore, a function of profit share, whereby $I = I(h)$, and $Y^* = 1$, to which the equality between investment and savings is determined by $shz = I(h)$. The IS-curve slope is $dz/dh = (I_h - sz/sh)$, and $I_h = (dI/dh) > 0$, whereby h = profit share, and z = capacity utilisation. Depending on whether sz is greater than I_h, the slope of the IS-curve can be positive or negative.

Bhaduri and Marglin (1990) make two observations up until this point by analysing the inverse relationship between real wages and output levels, as proposed by neo-Classical economists and Keynes, obtained through a case of profit-led economic expansion. Output is said to expand at lower real wage levels, driving higher aggregate demand due to stronger investment responses, directly opposing neo-Classical and Keynesian cases. Secondly, the investment demand function, $I = I(h)$, whereby $Y^* = 1$, maybe implausible as the profit rate is assumed to influence investment directly. The average rate of profit (r) is a function of the profit share/margin and capacity utilisation, whereby $(r) = R/K = (R/Y)(Y/Y^*)(Y^*/K)hza$, whereby K = capital stock, and $(Y^*/K)hza$ = the ratio of the output of full capacity.

As Bhaduri and Marglin (1990) argue, the investment function does not exceed the rate of profit itself. Such a function is, therefore, considered insensitive towards the existing degree of capacity utilisation. In one such example, investors may not consider increases in capacity if a surplus already exists. Such a function cannot be captured by introducing the terms of

capacity utilisation and the profit rate. Profit-led expansion can be ultimately ruled out through the investment function via restrictions placed upon investment response towards the profit rate, h, and z. Capacity utilisation and profit share/margin inclusions may overcome any shortcomings, being independent and separate within the investment function, whereby $I = I(h, z)$, whereby $Y^* = 1$, so that $I_h > 0$ and $I_z > 0$. Investment can be refined as profitability in current average terms (m & h) alongside the degree of capacity utilisation. Investors may view such functions as the future state of demand. Bhaduri and Marglin (1990) also capture the dual effects of real wage variation, whereby z and h are incorporated within the savings rate via the IS-curve so that $S = shz$, or $shz = I(h, z)$, defining the slope as $dz/dh = (I_h - sz)/(sh - I_z)$.

Bhaduri and Marglin (1990) further compare the standard Keynesian approach, whereby investment changes in capacity utilisation are less responsive to the margin of saving, producing stability for income adjustment via $sh\text{-}I_z > 0$. Wage-led expansion defines the stagnationist regime, whereby a higher profit share leads to higher aggregate demand and capacity utilisation. Therefore, the rate of profit positively influences accumulation. Alongside this, profit and investment strongly influence aggregate demand, whereby a positive response in private investment compensates for a reduction in consumption. Extending the stagnationist regime, capitalists may still experience higher total profits if they recoup more on the sales volume than any profit margin loss. Bhaduri and Marglin (1990) place the normalised value of total profit as $(R/Y^*) = (R/Y)(Y/Y) = hz$. Profit follows that a real wage rate decrease leads to a profit share increase, whereby $d(hz)/(hd) < 0$. Simply argued, a relationship between labour and capital is forged within the stagnationist regime via $zI_z > hI_z$, implying that investors respond strongly towards a variation in capacity utilisation. Short-term implications suggest that profit squeeze can lead to a reduction in economic interest from the capitalist class. In contrast, long-run implications focus on strengthening capacity utilisation and economic growth, expansion through consumption increases, and lowering profit share/margins. Wage-led growth can lead to poor expansion rates, causing a 'crisis of under accumulation', whereby productive capacity cannot maintain sustained labour force growth, better known as structural unemployment.

4.2.2.3 The Open Economy

Following the description of a closed economy, Bhaduri and Marglin (1990) later focus on the functions of an open economy while discussing the problematic features of a closed economy. Firstly, the closed economy theory assumes that lower real wages influence consumption; however, it stimulates investment over a short period by raising the profit share/margin. Deemed problematic, investment is most likely influenced by a shift in profit share/margin rather than consumption, leading to different adjustment speeds. For example, if imports and exports extend faster speeds of adjustment over that of investment, a misleading short-run IS-curve may be evident. Therefore, assuming the variation in the profit share is exogenous within an open economy is plausible (Kalecki, 1939). In theory, downside exchange rate fluctuations would reduce the profit margin through the increased cost of imported goods.

Exchange rate fluctuations highlight whether an economy is a price-taker or price-maker, dependent upon the size of the economy and the function and influence of international

price discipline. Bhaduri and Marglin (1990) extend their modelling, showcasing global price competitiveness, devaluation, raw material importations, profit share, export/import expenditure, income effects, and the effect of devaluation upon capacity utilisation. This section explores only the effect of devaluations, allowing for extended explanations of profit share and the income distribution effects. The balance between expenditure and income within such an economy can be shown as $shz + M = I(h, z) + E$, whereby M = initial trade balance ($E_0 = M_0$) and E = export and import expenditure. The effect of capacity utilisation devaluation, through differencing, can be obtained through $dz = [D^{-1}(I_h - sz)dh] + [D^{-1}gz(n_e + n_m - 1)(d\theta/\theta)]$, whereby g = trade income, n_e = exports, n_m = imports, whereby $D = (g + sh\text{-}I_z)$, $m = vp_f - Xm$, and p_f = imported raw materials based on the average international price level per selected period. The second bracketed section of the equation illustrates the influence of devaluation in capacity utilisation through profit share changes. The income distribution effect can be seen through the devaluation of operations through profit share changes, influencing domestic prices and money wages. In one such example, lower wages and higher profit margins could raise capacity utilisation through aggregate demand stimulation.

4.3 The Kaleckian Post-Keynesian Theoretical Model

The Kaleckian post-Keynesian theoretical framework lays the foundations for an augmented econometric framework. The following illustrates the theoretical foundations of the framework within this study, describing the assumptions and definitions through a mathematical form in the way of accumulation, savings, exports/imports, income distribution, employment, productivity growth, the goods market equilibrium, and capacity utilisation. Stronger definitions of the variables will provide meaningful interpretations throughout the results chapters of this thesis. The model is created from a generalised form of neo-Kaleckian models (see Rowthorn, 1981; Dutt, 1984; Taylor, 1985; Blecker, 1989). The framework under analysis extends the work of Bhaduri and Marglin (1990), a function of investment, savings, the goods market, and the producers' equilibrium curve, defined by international trade. Constraints regarding the degrees of freedom will follow Stockhammer (2000). The goods market will follow Bhaduri and Marglin (1990), whereby the producers' equilibrium will be determined by the pricing behaviour of firms, alongside the Marxian contribution of a reserve army effect.

Employment definitions are extracted from Okun's Law, which defines the relationship between GDP growth and unemployment. Stockhammer and Onaran (2004) state that the goods market is augmented by technological change and a labour market driven by demand. Interest rates are assumed to be exogenous for the investment function, determined by the holdings of wealth organisations, banks, and the central bank, in line with Kaldor (1961), Moore (1988), and Lavoie (1984, 1992, 1996). As described by previous Kaleckian growth models, the framework under analysis will house the function of accumulation (i.e., investment), which is positively influenced by capacity utilisation and profit share. In addition, Bhaduri and Marglin (1990) argued that a demand-driven labour market can positively influence the goods market with technical change and an army effect in reserve. Therefore, the framework within this study is a function of profit share (π), capacity utilisation (z), and technical capital productivity (k), so the profit rate (r) is shown as follows:

$$r = \frac{R}{K} = \frac{R}{Y}\frac{Y}{\bar{Y}}\frac{\bar{Y}}{K} = \pi\, z\, k, \tag{4.1}$$

whereby:

Accumulation:	$I/K = g^1(\pi, z)$,	(4.2)
Cambridge Private Savings:	$s_p/K = s\,\pi\, z$,	(4.3)
Exports:	$X/Y = x(\pi)$,	(4.4)
Imports:	$M/Y = m(\pi, z, I/K)$,	(4.5)
Income Distribution:	$\pi = p(z, E/N, gx)$,	(4.6)
Employment:	$\Delta E/N = e(I/K, \Delta z, \pi, u, gx)$,	(4.7)
Productivity Growth:	$gx = x(g^1, z, \tau)$,	(4.8)
Goods Market Equilibrium:	$g^1 = g^{st} \equiv s\,\pi\, z - (X/Y - M/Y)z$,	(4.9)
Capacity Utilisation (Implied by the goods market equilibrium):	$z = z(\pi, I/K, (X/Y - M/Y))$,	(4.10)

whereby,

I/K: Investment/Capital stock,
π: Profit share,
z: Capacity utilisation proxied by output/Capital ratio,
s_p/K: Private savings/Capital stock,
s: Marginal propensity to save,
X/Y: Exports/Output,
M/Y: Imports/Output,
E/N: Employment rate,
gx: Productivity growth,
g^{st}: Total savings growth rate.

4.3.1 Investment

The investment decisions of firms are given via the accumulation equation (4.2), whereby profitability, proxied by capacity utilisation and profit share, is a positive function (Bhaduri & Marglin, 1990). Kalecki (1954) makes strong contributions to the theory of investment, arguing that investment is slightly interest-elastic. Kalecki (1954) further argued that while the rate of interest influences long-run investment decisions, there are some circumstances whereby this may not be the case, as changes could be incorporated within profit rate movements. Kalecki (1968) presented counter-arguments, suggesting that investors' decisions were jointly affected by the rate of interest and expected profits. As such, investment is positively influenced by net profit, calculated as gross profit minus interest payments. Hence, profits play a dual role in influencing investment. Firstly, profits serve as a source of funds that facilitate investment activities. Secondly, firms' expectations about the future, influenced by

profit levels, determine the likelihood of investment projects being realised (King, 1996). Additionally, Kalecki (1954) argued that the level of investment depends on the profitability of capital, specifically the ratio of profits to capital stock.

4.3.2 Cambridge Private Savings

According to the Cambridge private savings equation (4.3), private savings are positively influenced by the marginal propensity to save out of profits. This propensity is estimated using a capital/output ratio, determined by capacity utilisation and profit share. Kalecki (1954) argued that in a closed economy, all savings are derived through capitalists out of profits, whereby workers and small proprietors consume all incomes. Therefore, it will be assumed that there are no savings out of wages.

4.3.3 Net Exports

Net exports incorporate equations (4.4) and (4.5); being exports minus imports. Profit share is considered a positive function of exports and a negative function of imports. In defining exports, profit share indicates international competitiveness (Bowles & Boyer, 1995). As such, a negative function holds between capacity utilisation and net exports, whereby the demand for imports has a positive relationship with the demand for domestic goods (Stockhammer & Onaran, 2004).

4.3.4 Income Distribution

Income distribution, known as profit share via equation (4.6), is the macroeconomic framework's supply side. Capacity utilisation and productivity growth are positive functions of profit share, while employment is a negative (Stockhammer & Onaran, 2004). Bhaduri and Marglin (1990) make two main assumptions regarding income distribution: 1) employment movements parallel capacity utilisation; and 2) firms set prices through mark-ups over unit labour costs. Following Stockhammer and Onaran (2004), income distribution is a determinant of the bargaining position of labour and capital, which is dependent upon macroeconomic activity and the employment rate.

4.3.5 Employment

Any change in employment, equation (4.7), is positively influenced by investment in the long and short run, while capacity utilisation has a short-run influence (Bhaduri & Marglin, 1990). As employment is a variation of Okun’s Law, exports and profit share are positively related. Bhaduri and Marglin (1990) argue against the under-consumptionist school of thought and propose that high employment and capacity utilisation levels can be achieved by reducing wages. They suggest that lower wages stimulate investment and increase profitability, leading to higher economic activity. Despite this, higher real wages can be achieved through increased employment and capacity utilisation under specific conditions, whereby decreases in real wages stimulate capacity utilisation and demand, increasing aggregate employment and wages. In complementing such assumptions, the adopted framework will incorporate a reserve army of labour, as described by Marx (1887). Therefore, unemployment is a function of productivity growth, investment, private sector profitability, and past unemployment rates.

4.3.6 Productivity Growth

Productivity growth, equation (4.8), describes labour productivity growth as a determinant of capacity utilisation and accumulation. Technological progress is important, directly influencing increases within the capital/labour ratio through implementing new machinery, in line with Kaldor (1966). Kaldor (1966) provides insights into the role of productivity in economic dynamics. Kaldor (1966) argued that there is a continuous increase in capital production per worker and a steady rate of profit on capital in developed economies. Kaldor also suggested that the ratio between profits and wages remains constant, and real wage increases are proportionate to labour productivity growth. Furthermore, Kaldor (1966) posits that capital-output ratios are stable in the long run while recognising that productivity growth rates vary across sectors and economies.

4.3.7 Market Equilibrium

The goods market equilibrium, equation (4.9), represents capital stock growth, equal to total savings growth. Market equilibrium denotes private domestic savings, whereby $-(X/Y - M/Y)z$ represents foreign savings, being a capital stock ratio. Capacity utilisation, z, is implied via the equilibrium of the goods market. The impact of net foreign demand upon accumulation, distribution, and capacity utilisation rate is subtracted from the equation (Chaiechi, 2014). Bhaduri and Marglin (1990) argued that such increases positively influence capacity utilisation in accumulation; however, a negative influence is also evident through increases in profit share.

4.4 The Econometric Model

Building on Bhaduri and Marglin (1990), Stockhammer and Onaran (2004), and Chaiechi (2014), this study employs a Kaleckian post-Keynesian open economy framework. It incorporates key equations for accumulation (i.e., investment), savings, income distribution, productivity growth, net exports, and market equilibrium, comprehensively analysing their interactions and implications. Due to data restrictions, the VECM process would not allow for time-series analysis as there was insufficient data to run the model in Eviews. Regardless, the original model is illustrated as (4.16). This study will augment the original models to include financial development indicators, $\boldsymbol{fd}$, and an indicator of fiscal policy, $\boldsymbol{fp}$. Therefore, the augmented framework can be shown as follows:

Investment: $$inv_t = a_0 + a_1 ut_t + a_2 \pi_t + a_3 ir_t + a_4 pg_t + a_5 \boldsymbol{fd}_t + a_6 \boldsymbol{fp}_t + \varepsilon_t, \quad (4.11)$$

Savings: $$s_t = \beta_0 + \beta_1 ut_t + \beta_2 \pi_t + \beta_3 \boldsymbol{fd}_t + \beta_4 \boldsymbol{fp}_t + \varepsilon_t, \quad (4.12)$$

Income Distribution: $$\pi_t = \gamma_0 + \gamma_1 ut_t + \gamma_2 u_t + \gamma_3 pg_t + \gamma_4 \boldsymbol{fd}_t + \gamma_5 \boldsymbol{fp}_t + \varepsilon_t, \quad (4.13)$$

Productivity Growth: $$pg_t = \tau_0 + \tau_1 inv_t + \tau_2 ut_t + \tau_3 \boldsymbol{fd}_t + \tau_4 \boldsymbol{fp}_t + \varepsilon_t, \quad (4.14)$$

Net Exports: $$nx_t = \delta_0 - \delta_1 ut_t + \delta_2 \pi_t + \delta_3 \boldsymbol{fd}_t + \delta_4 \boldsymbol{fp}_t + \varepsilon_t, \quad (4.15)$$

Employment: $$u_t = n - e_1 inv_t - e_2 \Delta ut_t - e_3 \pi_t + e_4 u_{t-1} + e_5 pg_t + \varepsilon_t, \quad (4.16)$$

Market Equilibrium: $$inv_t = s_t = s_t - ne, \quad (4.17)$$

whereby,

inv_t: Normalised investment,
s_t: Normalised domestic savings,

ut_t: Capacity utilisation proxied by output/Capital ratio,
π_t: Profit share,
ir_t: Interest rate,
nx_t: Net exports,
u_t: Unemployment rate,
pg_t: Productivity growth,
fd_t: Financial development indicator,
fp_t: Fiscal policy indicator,
ε_t: Random disturbance term with certain properties,
a_i: i = 0, 1, 2, 3, 4, 5, and 6 are unknown parameters to be estimated,
β_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
γ_i: i = 0, 1, 2, 3, 4, and 5 are unknown parameters to be estimated,
τ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
δ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
t: Time index.

4.5 Estimation Techniques

This section addresses the sequence and justifications of the methodology utilised within this study. Following the results of Chapters 5 and 6, the time series contained within this study exhibited stationary *I(0)* and non-stationary *I(1)* behaviours, with Australian data exhibiting *I(1)* behaviours for the periods 1980-2015, while the United States, Japan, and South Korea data exhibited *I(0)* and/or *I(1)* behaviours for periods 1980-2019. The following estimation techniques highlight the appropriate methods for analysing long and short-run causal relationships towards the key macroeconomic indicators. Firstly, the following sections expand upon preliminary testing and multi-equation time series techniques, adequately illustrating the methods utilised within this study. The preliminary testing section focuses on deterministic and stochastic trends alongside unit-root testing, being the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) methods. Following this, multi-equation time-series techniques are expanded upon, including vector autoregression (VAR) models, auto regressive distributed lag (ARDL) models, and vector error-correction (VECM) models. Such methods are accompanied by other testing sequences, including: 1) lag structure; 2) residual testing; 3) cointegration testing; and 4) Granger causality. As result Chapters 5 and 6 emulate three research papers that incorporate impulse response function (IRF) and variance decomposition (VD) techniques, examining the resilience of selected key macroeconomic indicators and their speeds of adjustment after an external shock, this chapter expands upon such methods. Enders (2014) explains and expands upon the following estimation techniques.

4.5.1 Preliminary Testing

The following expands upon preliminary testing methods by explaining deterministic and stochastic trends alongside unit-root testing. If a stationary property of a series does not hold, non-stationary behaviour exists. Conditions for non-stationary behaviours include: 1) no long-run means; 2) autocorrelations do not decay; and 3) variances are dependent on time. Therefore, permanent or nondecaying components of specific series may exist through non-

stationary time series that exhibit trends (Enders, 2014). The difference between deterministic and stochastic trends will initially focus on time-series-analysis, followed by unit-root testing.

4.5.2 Deterministic and Stochastic Trends

Non-stationary series can display deterministic trends, stochastic trends, and/or both. A deterministic trend, as a non-random time function, can be shown as follows:

$$y_t = a_0 + \beta t + \varepsilon_t, \tag{4.18}$$

whereby ε_t is an '*iid*' random variable. Equation (4.18) has a constant, a_0, alongside a constant value of time, βt, whereby random disturbances are independently and identically distributed. On the other hand, a stochastic trend is a random trend that varies over time, defined as a random walk with or without drift. The process of random walk can be shown as follows:

$$y_t = y_{t-1} + \varepsilon_t. \tag{4.19}$$

After repeated substitutions, equation (4.19) can be expressed as:

$$y_t = y_0 + \sum_{i=1}^{t} \varepsilon_i, \tag{4.20}$$

whereby the mean of the random walk is constant, and all effects on the y_t sequence are nondecaying. The conditional mean of y_{t+s} for any $s > 0$ is:

$$y_{t+s} = y_t + \sum_{i=1}^{s} \varepsilon_{t+i}, \tag{4.21}$$

so that

$$E(y_{t+s} \mid y_t) = E(y_t). \tag{4.22}$$

If the value of s is positive, equivalence is found through the conditional means for all values of y_{t+s}. The values of y_{t+s} can be estimated by the constant value of an unbiased y_t. Therefore, a ε_t shock is said to have a permanent effect on y_t. The random walk process is said to be non-stationary, as the variance is not constant, that is, $\text{var}(y_t) \neq \text{var}(y_{t-s})$. Since the mean is constant, the covariance of γ_{t-s} can be estimated as $(t - s)\,\sigma^2$. Dividing γ_{t-s} by the standard deviation of y_t and then multiplying the standard deviation of y_{t-s}, the correlation coefficient ρ_s is obtained as:

$$\rho_s = (t - s)/\sqrt{(t - s)t}. \tag{4.23}$$

A random walk with drift, on the other hand, builds upon y_t by including a constant term a_0, given by:

$$y_t = y_{t-1} + a_0 + \varepsilon_t, \tag{4.24}$$

whereby ε_t is '*iid*', and the term a_0 is considered the drift, whereby if $a_0 > 0$, y_t will increase over time. Conversely, random walk with drift can be both deterministic and partially stochastic. If one were to give the condition y_0, the general solution for y_t is given by:

$$y_t = y_0 + a_0 t + \sum_{i=1}^{t} \varepsilon_i. \tag{4.25}$$

Therefore, two non-stationary components determine the behaviour of y_t: a deterministic linear and stochastic trend, $\sum \varepsilon_i$. The mean of y_t is affected permanently by a shock.

4.5.3 Unit-Roots Nonstationarity

Spurious regression can occur when violating the stationary assumption, by which more than two variables are not causally related to each other but may be wrongly inferred as if they are (Granger & Newbold, 1974). This can be due to the presence of an unknown factor or mere coincidence (Maddala & Kim, 1998). Unit-root testing can provide insight, beginning with the following regression equation:

$$y_t = a_0 + a_1 z_t + \varepsilon_t. \tag{4.26}$$

The assumptions of Classical regression require y_t and z_t sequences to be stationary, whereby e_t holds a mean of zero and finite variance. Spurious regressions display high t-statistics, low Durbin-Watson (1952) statistics, and a high R^2, which exhibit significant t-statistics but hold little economic meaning. Regression output may produce significant results, as the ordinary least squares (OLS) are inconsistent, and statistical inferences are unreliable. Granger and Newbold (1974) explain such consequences through the generation of y_t and z_t, as random independent walks, via:

$$y_t = y_{t-1} + \varepsilon_{yt}, \tag{4.27}$$

and

$$z_t = z_{t-1} + \varepsilon_{zt}, \tag{4.28}$$

whereby ε_{yt} and ε_{zt} are white-noise processes of y_t and z_t, respectively, independent from each other. Deviation from the model is deemed permanent if the error sequences hold a stochastic trend, as period *t* errors never decay. Such deviations lead to infinitely large variances as *t* increases, resulting in high autocorrelation. In terms of (4.26), four cases are to be considered when working with non-stationary variables.

Case One

Both y_t and z_t are stationary, and Classical regression is appropriate to use.

Case Two

The sequences of y_t and z_t contain different integration orders, thus making Classical regressions meaningless.

Case Three

The presence of a stochastic trend in the residual sequence and the similarity in the order of integration among the non-stationary sequences lead to spurious regression, posing challenges in drawing meaningful conclusions from the analysis. In differencing equation (4.26), we obtain:

$$\Delta y_t = a_1 \Delta z_t + e_t. \tag{4.29}$$

Since y_t, z_t and e_t contain unit roots, each stationary through the first differentiation. However, this may not be appropriate if stochastic and deterministic trends appear.

Case Four

The non-stationary sequences exhibit same-order integration alongside sequence stationarity, causing both to be cointegrated. A cointegrated system occurs if ε_{yt} and ε_{zt} are perfectly correlated. Differencing or detrending a stationary series and/or detrending a unit-root process is inappropriate. The method of detecting unit roots or deterministic trends through sample correlograms can be imprecise, as the near-unit process may have a similarly shaped ACF compared with processes containing trends. As such, a first-order process can be shown as follows:

$$y_t = a_1 y_{t-1} + \varepsilon_t, \tag{4.30}$$

whereby ε_t is white noise. In testing $a_1 = 1$, the OLS estimate of a_1 will be biased, and variance will be time dependent. Therefore, the usual *t*-test is invalid for testing $a_1 = 1$ in equation (4.30). Dickey and Fuller (1979, 1981) developed an alternative means of testing non-stationary versus stationary series.

4.5.3.1 Dickey-Fuller Tests

Dickey and Fuller (1979, 1981) devised a process to test for unit root presence through three regression equations:

$$\Delta y_t = \gamma y_{t-1} + \varepsilon_t, \tag{4.31}$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + \varepsilon_t, \tag{4.32}$$

and

$$\Delta y_t = a_0 + \gamma y_{t-1} + a_2 t + \varepsilon_t. \tag{4.33}$$

Equation (4.31) is considered a model with a pure walk if $\gamma = 0$, (4.32) incorporates a drift term with an intercept, and (4.33) incorporates a drift element with a linear time trend. A unit root exists in the y_t sequence if $\gamma = 0$. Utilising OLS methods, the test estimates one or more of the equations to find the value of γ and the standard error. Rejection or acceptance of the null hypothesis, being $\gamma = 0$, is obtained by comparing the t-statistics (i.e., critical values). Dickey and Fuller (1981) provide three additional *F*-statistics ($\emptyset_1$, $\emptyset_2$ $\emptyset_3$), testing the coefficients jointly. The null hypothesis of $\gamma = a_0 = 0$ can be tested utilising the $\emptyset_1$ statistic. With the regression incorporating trend, the joint hypothesis $a_0 = \gamma = a_2 = 0$ can be tested utilising the statistic of $\emptyset_2$, while the $\emptyset_3$ statistic can test $\gamma = a_2 = 0$ as a joint null hypothesis. The *F*-statistics are constructed as follows:

$$\emptyset_i = \frac{[SSR\ (\text{restricted}) - SSR\ (\text{unrestrcited})]/r}{SSR\ (\text{unrestricted})/(T-k)}, \tag{4.34}$$

whereby SSR (restricted) – SSR (unrestricted) are the squared residual sums from the models in restricted and unrestricted forms, restrictions and their numbers are *r*, *T* is the number of the observations, and *k* is the estimated number of parameters. The degrees of freedom within the model in unrestricted form equals $T - k$ (Yang, 2000).

4.5.3.2 Augmented Dickey-Fuller Unit-root Tests

The primary assumption of the Dickey-Fuller testing process is that ε_t is white noise; however, if ε_t is autocorrelated, a different version of the test is warranted, allowing for higher-

order lags. The ADF test adjusts the DF test to take care of any error-term serial correlation by incorporating lagged differences of the DF model of regression (Gujarati, 2004). Considering the *p-th* order autoregression model:

$$y_t = a_0 + \sum_{i=1}^{p} a_i\, y_{t-i} + \varepsilon_i, \tag{4.35}$$

whereby equation (4.35) can be written as:

$$\Delta y_t = a_0 + \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i\, \Delta y_{t-i+1} + \varepsilon_t, \tag{4.36}$$

whereby

$$\gamma = -(1 - \sum_{i=1}^{p} a_i),$$

and

$$\beta_i = -\sum_{y=i}^{p} a_{y.}$$

Equation (4.36) represents the ADF, allowing for a time trend through generalisation. The function of γ is the sum of β_i, being the auto-regressive coefficients of the residual. Therefore, if $\gamma = 0$, the sum of $\beta_i = 1$. This meets the condition that a unit root must be present if the sum of the auto-regressive coefficients equals 1. The ADF is the testing of the null hypothesis, $\gamma = 0$ (i.e., non-stationary), against the alternative $\gamma < 0$ (i.e., stationary).

4.5.3.3 Phillips-Perron Unit-Root Test

While the DF test involves fitting a regression model using OLS, serial correlation may be present. To overcome this, the ADF test uses regression with lags in the first difference to account for such correlations. Regardless, both testing methods hold low power in certain circumstances, including stationary processes with near-unit roots and processes that hold stationary trend behaviours. In response, Phillips and Perron (1988) developed the Phillips-Perron (PP) methodology, testing the null hypothesis of whether a time series is integrated of order 1. Simply put, the method utilises a nonparametric statistical process to eliminate serial correlation within the error terms without differenced error terms (Gujarati, 2004). The PP testing method is shown as follows:

$$\Delta y_t = \mu^* + \delta^* t + \Psi y_{t-1} + \mu_t, \tag{4.37}$$

whereby μ_t is *I(0)*, whereby heteroskedastic and autocorrelation may be present, following an ARMA *(ρ, q)*. Unit root presence is shown through the null hypothesis of $\Psi = 0$. Utilising the errors in μ_t, the test can correct for serial correlation and heteroscedasticity with no requirement to specify the lag length.

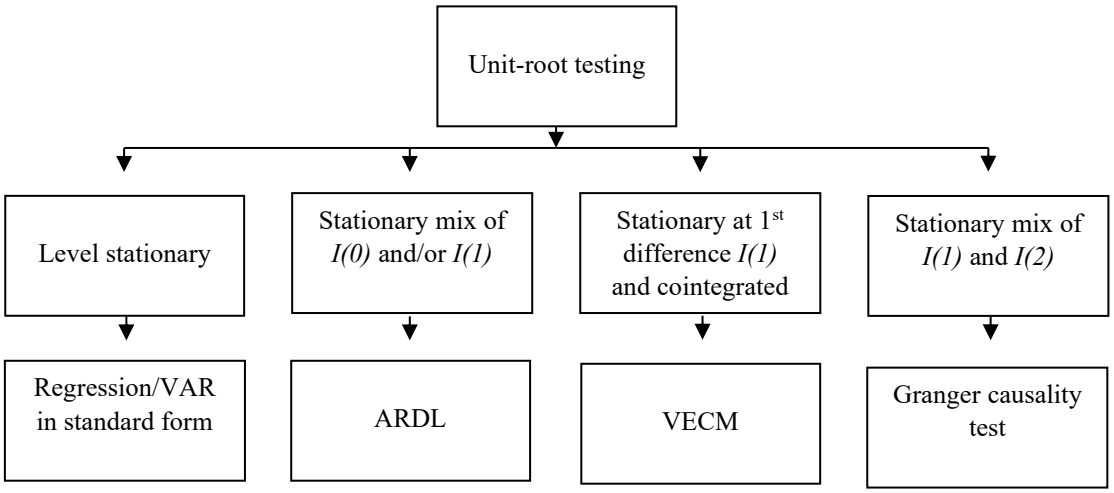
4.6 Multi-Equation Time-Series Models

Intervention and transfer function analysis allow the dependent variable to be influenced by an independent variable through time path processes (EViews 9, 2016). If it is known that there is no feedback, the regression approach can be useful; however, many economic systems do exhibit feedback. The following multi-equation time series methods will be explained via Enders (2014). Depending upon the results of unit root and cointegration testing, research will follow either VAR, VECM, or ARDL methods of analysis, as shown in Diagram 4.1. If the variables within the time series data exhibit stationary behaviours at level,

VAR will be utilised, and no questions of cointegration will arise. When all time series variables exhibit first-order stationary behaviours and are cointegrated, the VECM methodology is appropriate to utilise.

When time-series-variables exhibit a mixture of *I(0)* and/or *I(1)* behaviours, ARDL methodology is appropriate. Each method utilises specific processes and tests to ensure model suitability, including lag selection, cointegration testing, Granger causality, and residual testing. As the results chapters and emulated papers analysed stationary and non-stationary series, alongside testing the resilience of the selected key macroeconomic indicators against exogenous shocks and changes, the following explores VAR, VECM, and ARDL methodologies alongside the complementary testing methods of IRFs and VDs.

Diagram 4.1. Time-Series Analysis Methods



4.6.1 Vector Autoregression

Vector autoregression (VAR) is a powerful tool when there is little confidence about whether a variable is exogenous. When a lack of confidence exists, each variable can be treated symmetrically, extending transfer function analysis (Panda & Nanda, 2017). Interrelated time series can be forecasted using VAR, analysing random disturbances and their dynamic impacts on the variables (EViews 9, 2016). In extending such a function, Enders (2014) shows that in a two-variable case, the time path y_t is directly affected by the current and past realisations of z_t sequences, and the z_t sequences are directly affected by similar realisations of the y_t sequence. Such a VAR in first-order terms can be written as:

$$y_t = b_{10} - b_{12}z_t + \gamma_{11}y_{t-1} + \gamma_{12}z_{t-1} + \varepsilon_{yt}, \quad (4.38)$$

$$z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \varepsilon_{zt}, \quad (4.39)$$

whereby y_t and z_t are stationary and ε_{yt} and ε_{zt} are standard deviations with white-noise disturbances, to which both are uncorrelated disturbances. Equations (4.38) and (4.39) illustrate a first-order VAR. The terms y_t and z_t exhibit feedback, as both are permitted to affect each other. This can be illustrated by showing that $-b_{12}$ influences a unit change of z_t on y_t through contemporaneous effects, whereby γ_{12} is the impact of a unit change in z_{t-1} on y_t. As y_t has

a contemporaneous effect on z_t and vice versa, neither equation is presented in reduced forms. Utilising matrix algebra, we obtain the following:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix},$$

or

$$Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \varepsilon_t,$$

whereby

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}, x_t = \begin{bmatrix} y_t \\ z_t \end{bmatrix}, \Gamma_0 = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix},$$

$$\Gamma_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}.$$

Pre-multiplication by B^{-1} allows the VAR model to be obtained in the standard form:

$$x_t = A_0 + A_1 x_{t-1} + e_t, \tag{4.40}$$

whereby

$$A_0 = B^{-1}\Gamma_0,$$
$$A_1 = B^{-1}\Gamma_1,$$
$$e_t = B^{-1}e_t.$$

Equation (4.40) can be rewritten when a_{i0} is defined as an element *I* of the vector A_0, a_{ij} as the element in row *i* and column *j* of the matrix A_1, and e_{it} as the element *I* of the vector e_t. This new notation creates:

$$y_t = a_{10} + a_{11}y_{t-1} + a_{12}z_{t-1} + \varepsilon_{1t}, \tag{4.41}$$

$$z_t = a_{20} + a_{21}y_{t-1} + a_{22}z_{t-1} + \varepsilon_{2t}. \tag{4.42}$$

In distinguishing the systems represented by equations (4.38) and (4.39) versus (4.41) and (4.42), the first is described as a structural VAR (SVAR), while the second is in standard form. Since ε_{yt} and ε_{zt} of the SVAR equation contain processes that are white-noise in nature, both ε_{1t} and ε_{2t} exhibit zero means, are uncorrelated individually, and exhibit constant variances (EViews 9, 2016). In such an example, via an autoregressive model in first-order form, $y_t = a_0 + a_1 y_{t-1} + \varepsilon_t$ relies on the stability condition that unity in absolute value is higher than a_1. Such stabilities require that the roots of $(1 - a_{11}L)(1 - a_{22}L) - (a_{12}a_{21}L^2)$ lay outside the circle of the unit.

4.6.1.1 LM Test for Autocorrelation

The multivariate Lagrange multiplier (LM) test reports the statistics for serial correlation in residual form up to a specified order. Autocorrelations refer to the relations between observations at different lags, whereby correlograms plot autocorrelation functions (EViews 9, 2016). The LM test statistic can be described as a χ^2 (chi-square) test, being asymptotically distributed, with $df = m$ describing the degrees of freedom, where *m* is the number of serial correlations examined under the null hypothesis, as: $H_0 : \rho_1 = \rho_2 = ... = \rho_m = 0$.

In the multivariate case, $df = k^2m$ is an important step within the residual testing process. Johansen (1995) calculates the corresponding test statistic as follows:

$$LM_s = (T - d - 0.5) ln \frac{|\widehat{\sum}|}{|\widehat{\sum_s}|}, \tag{4.43}$$

whereby

T = number of observations in the VAR,
d = number of coefficients estimated in the augmented VAR,
$\widehat{\sum}$ = the maximum likelihood estimates of $\sum$, the variance/covariance matrix of the disturbances of the VAR,
$\widehat{\sum_s}$= the maximum likelihood estimates of $\sum$ from the following augmented VAR.

4.6.1.2 Tests for Normality

Normality tests are primarily used to determine whether a time series exhibits a normal distribution. While Bayesian statistics utilise likelihood computations with the given parameters to compare the likelihood that data came from other distributions, descriptive statistics define the goodness of fit within a normal model towards the time series (Gujarati, 2004). However, within the sphere of multivariate VAR normality testing, the factorisation of the k residuals is to be considered when they are orthogonal to each other. Normality testing compares up to the fourth moment of the residuals to those found within a normal distribution (EViews 9, 2016). Let P be a (k x k) factorisation matrix so that:

$$v_t = Pu_t \sim N(0, I_k), \tag{4.44}$$

whereby u_t is the demeaned residuals. Defining the third and fourth-moment vectors, $m_3 = \sum_t v_t^3/T$ and $m_4 = \sum_t v_t^4/T$, giving:

$$\sqrt{T}\begin{bmatrix} m_3 \\ m_4 - 3 \end{bmatrix} \rightarrow N(0, \begin{bmatrix} 6\mathrm{I}_k & 0 \\ 0 & 24\mathrm{I}_k \end{bmatrix}), \tag{4.45}$$

through normal distribution. With each component independent in nature, a χ^2 statistic can be formed by summing moments in third and fourth forms (Jarque & Bera, 1987). There are several factorisation matrix choices available for use, including: 1) Cholesky (1910), being a residual correlation matrix that incorporates a square root in an inverse form (Doornik & Hansen, 1994); 2) a residual covariance matrix that is also in an inverse square root form; and 3) factorisation via an identified SVAR (EViews 9, 2016).

4.6.1.3 White Test for Heteroskedasticity

Heteroskedasticity defies the assumption that errors are uncorrelated, invalidating the statistical significance of test results. White (1980) introduces a method to correct for heteroskedasticity to obtain consistent estimates of covariances. This approach addresses the issue of unknown conditional heteroskedasticity, ensuring a more reliable estimation of coefficients and covariance matrix in statistical analysis. Such a specification can be estimated as follows:

$$\Omega = \frac{T}{T-k} \sum_{t=1}^{T} \hat{\epsilon}_t^2 X_t \frac{X_t'}{T}, \tag{4.46}$$

whereby $\hat{\epsilon}$ represents the residuals, T is the number of observations, and the number of regressions is $T/(T-k)$, whereby k represents the optional degrees-of-freedom correction.

4.6.2 Auto Regressive Distributed Lag (ARDL) Models

Diagram 4.1 presents the application of the ARDL method by Pesaran and Shin (1995), Pesaran et al. (1996), and Pesaran et al. (2001) to test for cointegration in series exhibiting *I(0)* and/or *I(1)* properties. Unlike the Johansen and Juselius (1990) method, the ARDL approach identifies cointegrating vector(s) by treating each variable as a single equation of a long-run relationship. Once cointegration is identified, the cointegrating vector is re-parametrised into an error-correction model, as explained by Nkoro and Uko (2016). Pesaran and Shin (1995) provide a model showing the variables' short and long-run dynamics. The ARDL (p, q_1, $q_2 \dots q_k$) framework is defined by Pesaran et al. (1996) and Pesaran et al. (2001), and is shown by Narayan and Narayan (2006) as:

$$\Omega(L,p)y_t = a_0 + \sum_{i=1}^{k} \beta_i(L,q_i)x_{it} + \delta' w_t + u_t, \tag{4.47}$$

whereby

$$\Omega(L,p) = 1 - \Omega_1\delta_1 L^1 - \Omega_2\delta_2 L^2 \dots - \Omega_p L^p, \tag{4.48}$$

and

$$\beta_i(L,q_i) = \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + \dots + \beta_{iqi}L^{qi}, \tag{4.49}$$

whereby y_t is the dependent variable, a_0 is the constant, $i = 1, 2, 3, \dots k$, and $u_t \sim iid\ (0, \delta^2)$. In equation (4.47), L is the lag operator so that $L_0 y_t = X_t$, and $L^1 y_t = y_{t-1}$, whereby w_t is an s x 1 vector of the deterministic variables with fixed lags. As such, $p = 0, 1, 2, \dots m$, $q = 0, 1, 2, \dots m$, and $i = 0, 1, 2, \dots k$ is a total of $(m+1)^{k+1}$, whereby different ARDL models with a sample period hold $t = m+1, m+2, \dots n$. In extending (4.47), the long-run equation can be shown as follows:

$$y_t = a_0 + \sum_{k=i}^{k} \beta_i x_i + \delta' w_t + v_t, \Omega = \frac{a_0}{\Omega(1,p)}, \tag{4.50}$$

whereby the long-run coefficient to a unit change in x_{it} and the response of y_t can be written as:

$$\beta_i = \frac{\hat{\beta}_i(1,\hat{q}_i)}{\Omega(1,\hat{p}_i)} = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + \dots + \hat{\beta}_{i\hat{q}}}{1 - \hat{\Omega}_1 - \hat{\Omega}_2 \dots - \hat{\Omega}_{\hat{p}}},\ i = 1, 2, \dots k, \tag{4.51}$$

whereby $\hat{p}_i$ and $\hat{q}_i$, $i = 1, 2, \dots k$ are the estimated values of p and $q_i = 1, 2, \dots k$. As such, long-run coefficients with deterministic variables with fixed lags can be written as:

$$\delta' = \frac{\hat{\delta}(\hat{p}, \widehat{q_1}, \widehat{q_2}, \dots, \widehat{q_k})}{1 - \hat{\Omega}_1 - \hat{\Omega}_2 \dots - \hat{\Omega}_{\hat{p}}}, \tag{4.52}$$

whereby $\hat{\delta}(\hat{p}, \widehat{q_1}, \widehat{q_2}, \dots, \widehat{q_k})$ represents the OLS of δ as shown in (4.30), being the selected ARDL. As such, the error-correction can be created via (4.30) through the implementation of lagged levels and first differences, such that:

$$\Delta y_t = \Delta a_0 + \sum_{j=i}^{\hat{p}-1} \Omega_j^* \Delta y_{t-j} + \sum_{i=i}^{k} \beta_{i0} \Delta x_{it} - \sum_{i=1}^{k} \sum_{j=1}^{\widehat{q_t}-1} \beta_{ij}^* \Delta x_{i,t-j} + \delta' \Delta w_t - \Omega(1,\hat{p}) ECM_{t-1} + u_t, \tag{4.53}$$

whereby the error-correction model (ECM) is written as:

$$ECM_t = y_t - \hat{a} - \sum_{i=1}^{k} \widehat{\beta}_\iota x_{it} - \delta' w_t,$$

whereby Δ is the first difference of Ω_j^*, β_{ij}^*, and δ' are short-run coefficients to the models' convergence to equilibrium, while the speed of adjustment is measured as $\Omega(1, \hat{p})$.

4.6.2.1 Bounds F-test for Cointegration

In analysing whether a long-run relationship runs from the independent variables towards the dependent variable, the ARDL method requires using the F-test. No cointegration (i.e., the null hypothesis) is tested against null rejection (i.e., the existence of cointegration). As the F-test does not contain a standard distribution, it is dependent on: 1) if the series exhibits *I(0)* and/or *I(1)* behaviours; 2) the regression number; 3) if the ARDL model incorporates a trend and/or an intercept; and 4) the size of the sample under analysis (Narayan, 2005). Two main sets of critical values are utilised within the literature, proposed by Pesaran and Pesaran (1997) and Pesaran et al. (2001), each providing critical values for all regressors that exhibit *I(0)* and/or *I(1)* behaviours, or contain cointegrated behaviours mutually. The critical bound values are generated in sample size combinations of 500, 1,000, 20,000, and 40,000 observations (Pesaran et al., 2001; Narayan, 2005). Narayan (2004) and Narayan (2005) argued that previous methods cannot be used for smaller sample sizes, as such methods are based on larger sample sizes. For example, Narayan (2005) compares 31 observations against 1,000, arguing that the upper bound critical value for 1,000 observations is 3.49, 18.3% lower than the critical value based on 31 observations. Narayan (2005) provides critical values for sample sizes between 30 and 80, whereby utilising the GAUSS code within the works of Pesaran and Pesaran (1997) and Pesaran et al. (2001) is appropriate.

4.6.3 Vector Error-Correction Models

The VEC model is a simple VAR under restriction designed to be used with non-stationary time series containing cointegrated adjustments (EViews 9, 2016). As shown in Diagram 4.1, the VECM can be performed when all time series contain a unit root. Cointegrating relations are built into the VECM specification, allowing for adjustment dynamics in the short run, but restricting long-run endogenous variable behaviours. The error-correction term (ECT) is the cointegrating term, with the long-run equilibrium corrected in each period gradually through a series of partial adjustments in the short run (EViews 9, 2016). For example, consider a two-variable system exhibiting no lagged difference terms and one cointegrating equation. The VECM can be written as:

$$\Delta y_{1t} = a_{1t}(y_{2t-1} - \beta y_{1t-1}) + \varepsilon_{1t}, \tag{4.54}$$

$$\Delta y_{2t} = a_{2t}(y_{2t-1} - \beta y_{1t-1}) + \varepsilon_{2t}. \tag{4.55}$$

The right-hand side of the equation is the ECT. The long-run equilibrium may be zero; however, if y_1 and y_2 deviate, the ECT will be non-zero. In such a case, each variable partially adjusts in each period to restore equilibrium. The speed of adjustment is represented by a_i through the *i-th* endogenous variable (EViews 9, 2016). Both ε_{1t} and ε_{2t} are considered in terms of white noise that may be correlated and are considered stochastic shocks. The long run is represented as $y_{2t} = \beta y_{1t}$. Therefore, the relationship between the cointegrated variables and

the EC models can be seen. By assumption, Δy_{1t} exhibits stationarity, whereby the left-hand side of (4.54) is *I(0)* along with the right-hand side of the equation. The ECT representation requires two variables to be cointegrated of order *CI(1,1)*. Generally, the Johansen cointegration test should be run first to find the number of cointegrating relations and provide VECM specifications. From here, the ECT is constructed from the estimated cointegrating relationships through the estimation of a VAR in first differences, which includes the ECT (EViews 9, 2016).

4.6.3.1 Johansen Cointegration Testing

Within univariate models, differencing can remove stochastic trends, whereby univariate Box-Jenkin techniques can estimate stationary series. Engle and Granger (1987) show that multiple series that exhibit non-stationary behaviours may be stationary in a linear combination form. For example, a constructed cointegrated equation can interpret the long-run equilibrium relationship if the non-stationary series are cointegrated. The Johansen (1991, 1995) cointegration testing framework is appropriate within this context, whereby all variables are of the same order of integration, utilising an estimated VAR object. As the Engle and Granger (1987) test is based on DF and/or ADF testing for unit roots of single cointegrating relationships, the Johansen method allows for more than one cointegrating relationship, whereby the model can be estimated by the maximum likelihood method (Johansen 1995). This method, therefore, is appropriate when running VECM analysis. Enders (2014) illustrates the steps involved in implementing the Johansen procedure:

Step One

The first step involves plotting the data to see whether any linear trend exists; in most instances, the variables show the same order of integration. Estimating a VAR utilising undifferenced data is the first step, using the same number of lag lengths as a traditional VAR. For example, if the researcher was testing lags two through to four, the following VAR (4) estimations can be made:

$$\text{VAR(4)}: x_t = A_0 + A_1 x_{t-1} + A_2 x_{t-2} + A_3 x_{t-3} + A_4 x_{t-4} + \mathrm{e}_{1t}, \tag{4.56}$$

$$\text{VAR(1)}: x_t = A_0 + A_1 x_{t-1} + \mathrm{e}_{2t}, \tag{4.57}$$

whereby

x_t = the (n X 1) vector of variables,
A_0 = (n X 1) matrix of intercept terms,
A_i = (n X n) matrix of intercept terms,
e_{1t} and e_{2t} = (n X 1) vector of error terms.

In this example, one could estimate (4.56) via four lags and refer to the variance and covariance matrix of the noted residuals as $\sum_4$. Also, one could estimate (4.57) utilising one lag for each of the variables in each equation, represented by $\sum_1$. Although non-stationary variables are being utilised, incorporating the likelihood ratio to test for lag lengths as per Sims (1980) is appropriate, whereby:

$$(T - c)(\log|\sum_1| - \log|\sum_4|), \quad (4.58)$$

whereby

T = number of observations,
c = number of parameters in the unrestricted system,
$\log|\sum_i|$ = natural logarithm of the determinant of $\sum_i$.

Step Two

Step two is to estimate the model and determine the rank. However, the OLS will not be appropriate, as imposing a cross-equation restriction on the π matrix is necessary. The model can be tested by placing the elements of A_0 set to equal zero, regardless of whether a drift or a constant term within the cointegrating vector exists.

Step Three

Step three is to analyse the speed of adjustment coefficients and the normalised vector/s that contain cointegration, whereby utilising the likelihood ratio test with different restitutions and corresponding degrees of freedom is appropriate.

Step Four

Step four is to test for causality, whereby the ECM can identify a potentially structured model, estimating the most appropriate model.

4.6.3.2 Impulse Response Function

Impulse response functions are an important testing method, as shocks produce long-lasting impacts on many economic variables and can trace out the effects of a one-time shock towards one innovation of values in current or future forms of the variables under analysis, which are endogenous. Such a shock towards the i-*th* variable is transmitted to all other variables through a VAR in dynamic terms (EViews 9, 2016). The equation (4.40) can be written as a vector moving average (VMA) for a stationary VAR(1), shown as follows:

$$x_t = \mu + \sum_{i=0}^{\infty} A_1^i \, e_{t-i}, \quad (4.59)$$

whereby

$x_t = (y_t \; z_t)'$,
$\mu = [\,\bar{y} \;\; \bar{z}\,]'$,
$\bar{y} = [a_{10}(1-a_{22}) + a_{12}a_{20}]/\Delta$,
$\bar{z} = [a_{20}(1-a_{11}) + a_{21}a_{10}]/\Delta$,
$\Delta = (1-a_{11})(1-a_{22}) - a_{12}a_{21}$.

The variables in (4.59) are expressed as past and current values of the two shocks via the error terms (i.e., e_{1t} and e_{2t}). The methodology of VMA is an important feature of Sims' (1980) work, allowing for the time paths to be traced out to analyse the various shocks on the variables incorporated within the VAR system. Enders (2014) illustrates this process using a two-variable VAR within a matrix form using (4.48):

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} e_{1t-i} \\ e_{2t-i} \end{bmatrix}, \tag{4.60}$$

whereby y_t and z_t are expressed in terms of e_{1t} and e_{2t} sequences. If we were to expand e_{1t} and e_{2t} from (4.40) to (4.42), we would obtain:

$$e_{1t} = (\varepsilon_{yt} - b_{12}\varepsilon_{zt}) / (1 - b_{12}b_{21}), \tag{4.61}$$

$$e_{2t} = (\varepsilon_{zt} - b_{21}\varepsilon_{yt}) / (1 - b_{12}b_{21}), \tag{4.62}$$

whereby vector errors can be written as:

$$\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = \frac{1}{1 - b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}, \tag{4.63}$$

so that (4.60) and (4.63) combine to form:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \frac{1}{1 - b_{12}b_{21}} \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^i \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{yt-i} \\ \varepsilon_{zt-i} \end{bmatrix}, \tag{4.64}$$

whereby the moving average can be written as:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \phi_{11}^{(i)} & \phi_{12}^{(i)} \\ \phi_{21}^{(i)} & \phi_{22}^{(i)} \end{bmatrix} \begin{bmatrix} \varepsilon_{yt-i} \\ \varepsilon_{zt-i} \end{bmatrix},$$

or

$$x_t = \mu + \sum_{i=0}^{\infty} \phi_i \, \varepsilon_{t-i}. \tag{4.65}$$

The effects of e_{yt} and e_{zt} shocks upon the time series of y_t and z_t sequences can be generated via the coefficients of ϕ_i. The accumulated effects of unit impulses can be obtained via the following:

$$\sum_{i=0}^{n} \phi_{12}^{(i)}, \tag{4.66}$$

whereby after *n* periods, the effect of e_{zt} on the value of y_{t+n} is $\phi_{12}(n)$. Allowing for *n* to approach infinity yields stationary sequences via y_t and z_t through the long-run multiplier. Therefore, this makes the case for all *k* and *j* that:

$$\sum_{i=0}^{\infty} \phi_{jk}^2 \, (i) \text{ is infinite}, \tag{4.67}$$

whereby the four sets of coefficients $\phi_{11}^{(i)}$, $\phi_{12}^{(i)}$, $\phi_{21}^{(i)}$, and $\phi_{22}^{(i)}$ are known as the impulse response functions. In visually analysing the behaviour of y_t and z_t after various shocks, plotting such functions is advisable. It is possible to extract the time paths of the effects of pure shocks (EViews 9, 2016). However, since the estimated VAR is under-identified, additional restrictions are required for the VAR system to identify impulse responses. It is possible to use the Cholesky decomposition to identify restrictions (Cholesky, 1910).

4.6.3.3 Cholesky Decomposition

The Cholesky decomposition imposes an identification restriction, whereby z_t does not show any contemporaneous effects running from y_t. Enders (2014) shows that such a

restriction can be represented by setting b_{12} equal to zero, whereby such a system can be decomposed as:

$$e_{1t} = \varepsilon_{yt} - b_{12}\varepsilon_{zt}, \tag{4.68}$$

$$e_{2t} = \varepsilon_{zt}. \tag{4.69}$$

Utilising (4.69), errors from the e_{2t} are attributed to ε_{zt} shocks. A shock towards ε_{zt} directly affects e_{1t} and e_{2t}; however, a shock towards ε_{yt} shock does not affect e_{2t}, therefore z_t is said to be 'casually prior' to y_t. Deciding which decompositions or alternative decompositions are appropriate depends on methodological and theoretical reasoning. Usually, there is no prior knowledge of the datasets; however, imposing a structure upon a VAR system is against Sims' (1980) argument against 'incredible' identifying restrictions. Decomposition requires some structure upon the system in the form of identification necessities, setting limited assumptions to be incorporated to identify such a model.

4.6.3.4 Granger Test for Causality

The Granger (1969) method tests whether one variable can affect another over time. Such testing analyses the power of past values upon the current value of a variable, alongside analysing whether adding another variable can improve the explanation of the original variable itself. One variable is Granger caused by another if that secondary variable assists with prediction. Importantly, correlated series may not imply causation, and the statement that one variable Granger causes another may not imply that one variable is the direct result of another over time (EViews 9, 2016). Typical Granger causality tests run in a bivariate regression form as:

$$y_t = a_0 + a_1 y_{t-1} + \cdots + a_i y_{t-i} + b_1 x_{t-1} + \cdots + b_i x_{t-i} + \mathrm{e}_t, \tag{4.70}$$

$$x_t = a_0 + a_1 x_{t-1} + \cdots + a_i x_{t-i} + b_1 y_{t-1} + \cdots + b_i y_{t-i} + u_t, \tag{4.71}$$

whereby all possible pairs of x_t and y_t are shown in (4.70) and (4.71). Therefore, the F-statistics and Wald Statistics for such a joint hypothesis are:

$$b_1 = b_2 = \ldots = b_j = 0. \tag{4.72}$$

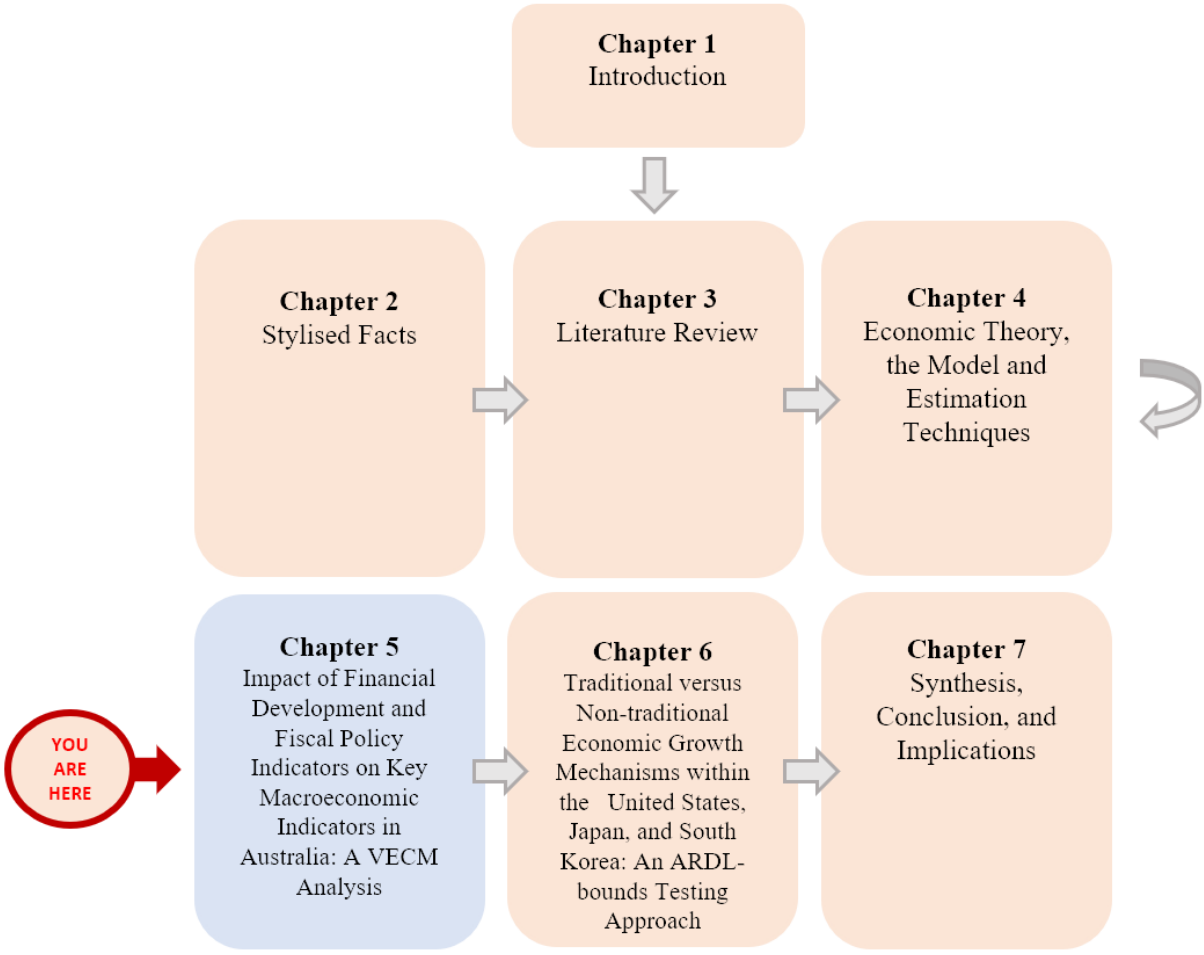
Using the VECM method, a block exogeneity test focuses more on unidirectional Granger causality. Such a test determines whether the lags of one variable Granger cause other variables within the tested system. According to Engle and Granger (1987), short-run dynamics may infer causality between a set of variables in the chain of error-correction if cointegration exists. Using a three-variable case with y_t, x_t, and w_t, we can test whether the lags of y_t Granger cause x_t or w_t. The block exogeneity tests all lags so that y_t in the x_t, and w_t are equal to zero (Enders, 2014). The chi-squared (Wald) statistic is utilised to test the joint significance of the other lagged endogenous variables.

4.7 Conclusion

This chapter has expanded upon the economic theory, the augmented model, and estimated techniques for this study. The macroeconomic theory was defined through: 1) the basic model, its profits, interest, and implications; 2) historical viewpoints; 3) the Bhaduri and Marglin (1990) model extension; 4) the model through both closed and open economy

definitions; and 5) the proposed augmented model. The Kaleckian post-Keynesian theoretical model itself was defined through the definitions of investment, private savings, net exports, income distribution, employment, productivity growth, and market equilibrium. As the literature has largely neglected the incorporation of financial development and fiscal policy within the Kaleckian post-Keynesian macroeconomic model, as evidenced by Chaiechi (2012), the main aims of the study are to: 1) incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks within such a prescribed framework. The sections then focused on specific estimation techniques and multi-equation time-series models, providing insight into the methods of use for the results chapters of this study. As unit-root testing showed *I(1)* and *I(0)* behaviours for the time series in the empirical chapters, this study adopted vector error-correction and autoregressive distributed lag model approaches to cointegration within the error-correction framework. While this chapter provided specific explanations of the methods used throughout, Chapters 5 and 6 ultimately show the appropriate processes in order.

Thesis Structure



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Conference

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Conference Paper

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Chapter 5: Impact of Financial Development and Fiscal Policy Indicators on Key Macroeconomic Indicators in Australia: A VECM Analysis

Abstract

In exploring the impacts of financial development (*fd*) and fiscal policy (*fp*) upon key macroeconomic indicators within an Australian context, this chapter utilises an augmented Kaleckian post-Keynesian macroeconomic framework, whereby investment, savings, income distribution, productivity growth, and net exports are perceived as key macroeconomic indicators. Chaiechi (2012) highlights the neglect of *fd* and *fp* within the existing literature, emphasising their importance in economic frameworks. This study serves as a foundation for addressing the gap and enhancing understanding of the interactions between *fd*, *fp*, and macroeconomic outcomes.

A commonly used indicator of monetisation is contained within this study, while contemporary indicators include stock market turnover and credit to government and state-owned enterprises. The *fp* indicator within this study is described as government expenditure. This chapter incorporates relevant indicators to enhance modelling approaches. It considers the role of *fd* and *fp* in the analysis, providing a more comprehensive understanding of their impact. In capturing the aims of this thesis, this chapter explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented Kaleckian post-Keynesian macroeconomic framework; and 2) the employment of commonly utilised and contemporary measures of *fd*. The aims of this chapter are aligned with research gaps and questions 1 and 2, as shown in Chapter 1. This chapter utilises historical data of annualised periods 1980-2015, adopting vector error-correction modelling (VECM) techniques to test for long and short-run causality and their implications towards the economic theory.

All models, besides income distribution, held a significant error-correction term (ECT), suggesting that the inclusion of *fd* and *fp* indicators within the models of investment, savings, productivity growth, and net exports is warranted in explaining long-run causal relationships. Of note, the results of the investment models were presented at a conference[4] proceeding, whereby an emulated paper[5] not only utilised VECM methodology to test for causality but also impulse response functions (IRF) and variance decompositions (VD) to examine investment's resilience against external disturbances, which are not examined within this chapter. Such results are aligned with research gaps and questions 1, 2, and 3, as shown in Chapter 1. In this study, the money supply indicator provided the most influential results towards the dependent variables, while government expenditure was the most influential overall through strong causal effects. Given the evidence demonstrating the significant impact of government expenditure, serious consideration should be given to permanently incorporating it into the Kaleckian post-Keynesian macroeconomic framework.

[4] The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2021. Conference details are here.

[5] **eBook ISBN,** 978-981-16-5260-8, **DOI:** 10.1007/978-981-16-5260-8. Details can be found here.

5.0 Introduction

Following the works of Kalecki, this chapter expands upon the augmentations of Bhaduri and Marglin (1990), Stockhammer and Onaran (2004), and Chaiechi (2012) through the inclusion of financial development indicators and a fiscal policy indicator. The literature has largely overlooked incorporating such elements within the Kaleckian post-Keynesian macroeconomic framework, as Chaiechi (2012) demonstrated. This provides a precise scope and aims upon which this thesis is based, being to: 1) incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks within such a prescribed framework. Therefore, the focus of this chapter is aligned with research gaps and questions 1 and 2, as per Chapter 1. Of note, the results of the investment model were used in an emulated paper.

This chapter tests whether long and/or short-run relationships exist between the dependent variables within the selected models of investment, savings, income distribution, productivity growth, and net exports and their independent counterparts for Australia during annualised periods 1980-2015. The long and short-run relationships among the variables will be analysed within an error-correction (EC) framework, utilising cointegration analysis via Johansen's (1995) method. The Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) (see Dickey-Fuller, 1979, 1981; Phillips-Perron, 1988) methods are utilised to test for integration, whereby the ADF test is parametric, while the PP is non-parametric. For a unit-root time series, it is appropriate to apply Johansen's approach, as the test simultaneously utilises cointegration and EC within a vector autoregression (VAR) framework.

The following sections describe the econometric model, data, and methodology to define the selected models. Following this, unit-root testing, lag selection, cointegration testing, and estimation of the VECMs are performed. The models are analysed through long and short-run dynamics (i.e., causality) alongside residual testing via theoretical and variable definitions. Results and discussion follow, describing those relationships in line and not in line with the economic theory and analysing the consequences of each.

5.1 The Econometric Model, Data, and Methodology

This section analyses the econometric model, data, and methodologies. Utilising annualised periods 1980-2015 for Australia data, this section explores the VECM framework, testing for multiple unidirectional cointegration vectors via the Johansen method for the selected models of investment, savings, income distribution, productivity growth, and net exports.

5.1.1 The Econometric Model

As discussed in Chapter 1, the primary aim of this thesis is to examine the impacts upon key macroeconomic indicators within a Kaleckian post-Keynesian macroeconomic framework through the inclusion of *fd* indicators and an *fp* indicator, alongside testing for the resilience of investment, productivity growth, and savings in a seemingly well-functioning economy. While

not explored in this chapter, the resilience of investment in the context of Australia data has been referenced. The framework houses the model-dependent investment, savings, income distribution, productivity growth, net exports, and employment variables. The independent variables directly influence the dependent variables in a unidirectional fashion. Due to data constraints, this study does not explore the employment model. While Chapter 4 examined the explanation of the variables, this chapter explores the economic relationships of the following:

Investment: $$inv_t = a_0 + a_1 ut_t + a_2 \pi_t + a_3 ir_t + a_4 pg_t + a_5 fd_t + a_6 fp_t + \varepsilon_t, \quad (5.1)$$

Savings: $$s_t = \beta_0 + \beta_1 ut_t + \beta_2 \pi_t + \beta_3 fd_t + \beta_4 fp_t + \varepsilon_t, \quad (5.2)$$

Income Distribution: $$\pi_t = \gamma_0 + \gamma_1 ut_t + \gamma_2 u_t + \gamma_3 pg_t + \gamma_4 fd_t + \gamma_5 fp_t + \varepsilon_t, \quad (5.3)$$

Productivity Growth: $$pg_t = \tau_0 + \tau_1 inv_t + \tau_2 ut_t + \tau_3 fd_t + \tau_4 fp_t + \varepsilon_t, \quad (5.4)$$

Net Exports: $$nx_t = \delta_0 - \delta_1 ut_t + \delta_2 \pi_t + \delta_3 fd_t + \delta_4 fp_t + \varepsilon_t, \quad (5.5)$$

whereby

inv_t: Normalised investment,
s_t: Normalised savings,
ut_t: Capacity utilisation proxied by output/Capital ratio,
π_t: Profit share,
ir_t: Interest rate,
nx_t: Net exports,
u_t: Unemployment rate,
pg_t: Productivity growth,
fd_t: Financial development indicator,
fp_t: Fiscal policy indicator,
ε_t: Random disturbance term with certain properties,
a_i: i = 0, 1, 2, 3, 4, 5, and 6 are unknown parameters to be estimated,
β_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
γ_i: i = 0, 1, 2, 3, 4, and 5 are unknown parameters to be estimated,
τ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
δ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
t: Time index.

5.1.2 Data, Characteristics, and Methodology

Australia presents an interesting analysis, with differences in population size, GDP, financial markets, government structure, and policies compared to other developed nations and those within the APEC. The data pertaining to Australia were collected from reliable sources (Table 5.1), covering the period 1980-2015. Descriptive statistics can be found in Appendix 1. While many datasets were readily available and pre-calculated using sources shown in Table 5.1, certain variables necessitated manual calculations. These variables included profit share, investment, capacity utilisation, and productivity growth. The *fd* indicators used in this study were sourced from the Global Financial Development Database (GFDD), accessible through the World Bank. As of 2015, the database included information for 183 economies, covering 105 unique indicators. However, only a limited set of indicators was selected for the duration of this study. In analysing a broad range of indicators and the aims of this study, comparing

commonly utilised and contemporary measures of financial development, as described in section (5.2), was of particular interest. The data analysis for this study was conducted using an Excel spreadsheet and EViews 9 software, which is widely recognised as one of the leading tools for econometrics and time-series-analysis. While the calculations and their ratios are shown in Table 5.1, their economic implications are described throughout the chapter. EViews 9 contains detailed user guides, providing step-by-step processes for researchers, which were utilised within this study.

Table 5.1. Data Sources. 1980-2015

Variables	Calculation	Data Sources
Investment	Investment/NGDP Ratio (INV)	World Development Indicators: World Bank
Savings	Domestic Savings/NGDP Ratio (S)	World Development Indicators: World Bank
Capacity Utilisation	NGDP/Stock of Capital Ratio (UT)	World Development Indicators: World Bank IMF Fiscal Affairs Department
Profit Share	(1-Wb)u (P)	Australian Bureau of Statistics, Australian Tax Office, Penn World Table
Interest Rate	Lending Interest Rate: GDP Deflator Adjusted (IR)	World Development Indicators: World Bank
Productivity Growth	Stock of Capital/Labour Ratio (PG)	IMF Fiscal Affairs Department, World Development Indicators: World Bank
Unemployment Rate	Harmonised Unemployment Rate, Total: All Persons Percent, Annual, Not Seasonally Adjusted (U)	Federal Reserve Economic Data
Net Exports	Imports - Exports/NGDP Ratio (NX)	World Development Indicators: World Bank
Financial Development Indicator	Total Value of Shares Traded/Average Market Capitalisation Ratio (SMTR.) Credit by Domestic Money Banks to a Government & State-Owned Enterprises/NGDP Ratio (CGSO) Broad Money/NGDP Ratio (MR)	World Development Indicators: World Bank
Fiscal Policy Indicator	Government Expenditure/NGDP Ratio (GE)	World Development Indicators: World Bank
Nominal GDP	Nominal Gross National Product (NGDP)	World Development Indicators: World Bank

In terms of methodology, this chapter adopts VECM techniques capable of modelling *I(1)* time series (i.e., non-stationary) that exhibit cointegration. In restricting the behaviour of the long-run endogenous series, cointegrating relationships are taken into consideration. An error-correction term (ECT) describes the direction and strength to which the long-run equilibrium deviates through gradual correction adjustments in the short run (EViews 9, 2016). The following illustrates a two-variable system, whereby the error-correction term can be described as:

$$\Delta y_{1t} = a_1(y_{2t-1} - \beta y_{1t-1}) + \varepsilon_{1t}, \tag{5.6}$$

$$\Delta y_{2t} = a_2(y_{2t-1} - \beta y_{1t-1}) + \varepsilon_{2t}. \tag{5.7}$$

The ECTs are represented by the right-hand side of equations (5.6) and (5.7). The ECT will be non-zero if the variables y_{1t} and y_{2t} exhibit long-run deviation, however, will be zero if no deviation occurs. If each variable partially adjusts to restore equilibrium relations, the long-run equilibrium is zero. The coefficient measures the speed of adjustment of the *i-th* endogenous variable towards equilibrium a_i, whereby stochastic shocks are measured by the white-noise processes of both ε_{1t} and ε_{2t}. The relationship between the ECT and cointegrated variables is represented by the long-run equation of $y_{2t} = \beta y_{1t}$, shown by (5.7). By assumption, Δy_{1t} is stationary, whereby the left and right-hand sides of (5.6) are *I(0)* (i.e., stationary). However, the ECT representation requires that both variables are cointegrated of order *I(1)*

(Enders, 2014). When all time series are *I(1)*, utilising the Johansen (1995) method for cointegration testing is appropriate for the case of more than two non-stationary variables.

5.2 Selected Models

This section selects the most appropriate models, satisfying aim 1 of this study. In exploring aim 1, this chapter incorporates a single *fd* indicator and a single *fp* indicator in testing each model. In expanding research gap 1 of this study, this chapter compares commonly utilised and contemporary measures of *fd*. Two commonly utilised *fd* indicators within the literature are monetisation ratio (MR) and domestic credit (DC), while contemporary measures of *fd* in this study include a stock market turnover ratio (SMTR), credit to government and state-owned enterprises (CGSO), and liquid liabilities (LL). Fiscal policy will be represented by the commonly utilised indicator of government expenditure (GE). For example, through exploring aim 1 of this study, alongside research questions 1 and 2, the investment model (5.1) is utilised to incorporate one *fd* and one *fp* indicator at a time (Table 5.2). Based on criteria such as the economic theory, coefficient significance, goodness of fit, and the stability of the model, a specific model for investment is selected from Table 5.2. This careful selection process ensures that the chosen model aligns with theoretical expectations, exhibits statistically significant coefficients, provides a good fit to the data, and demonstrates stability in its estimates.

Table 5.2. Tested Models for Investment

Models
INV = *f*(UT, P, IR, PG, MR, GE)
INV = *f*(UT, P, IR, PG, DC, GE)
INV = *f*(UT, P, IR, PG, SMTR, GE)
INV = *f*(UT, P, IR, PG, CGSO, GE)
INV = *f*(UT, P, IR, PG, LL, GE)

INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, MR = Monetisation Ratio, DC = Domestic Credit, SMTR = Stock Market Turnover Ratio, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, GE = Government Expenditure.

Table 5.3. Selected Models

Dependent Variable	Model No.	Models
Investment	(1)	INV = *f*(UT, P, IR, PG, SMTR, GE)
Savings	(2)	S = *f*(UT, P, CGSO, GE)
Income Distribution	(3)	P = *f*(UT, U, PG, MR, GE)
Productivity Growth	(4)	PG = *f*(INV, UT, MR, GE)
Net Exports	(5)	NX = *f*(UT, P, MR, GE)

INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, S = Savings, CGSO = Credit to Government and State-Owned Enterprises, U = Unemployment Rate, MR = Monetisation Ratio, NX = Net Exports, GE = Government Expenditure.

Following this line of analysis, Table 5.3 shows the selected models for investment (INV), savings (S), income distribution (P), productivity growth (PG), and net exports (NX), with the selected independent variables that meet the selection process criteria. The selected models incorporate the *fd* indicators of SMTR, CGSO, and MR while utilising GE as a representative of the *fp* indicator.

5.3 Testing for Stationarity

Before lag selection and Johansen cointegration testing, an analysis of the descriptive statistics and unit-root testing was conducted. Appendix 2 shows the results of the unit-root testing process. The null hypothesis is rejected at the 10% statistical significance level for all p-value results in this study. For each variable, the order of integration is tested via the ADF and PP methods. For time series exhibiting a trend, the result is reported under trend, or intercept + trend, while those exhibiting no trend are reported under intercept, or intercept only. The ADF and PP tests have their advantages and disadvantages. The ADF test is simple and robust to unknown serial correlation, while the PP test addresses the issue of serial correlation in the data. Each test has its strengths, and the choice depends on the specific requirements of the analysis (Chaiechi, 2012). As seen in Appendix 2, the ADF results show that all time series are *I(1)*; that is, when all level time series are differenced, stationary behaviour at the 1% or 5% statistical significance level is evident.

5.4 Lag Selection

The selected models in Table 5.3 have undergone a lag selection process. For the sake of being thorough, the data allows for the testing of up to three lags via EViews 9. The software program considers the potential consequences of including additional lags, such as misspecification errors, serial correlation, and multicollinearity, which can lead to a loss of degrees of freedom. In Appendix 3, the selected lag lengths for models (1)-(5) are illustrated, and it is determined that a lag selection of three is appropriate based on the AIC criteria.

5.5 Johansen Testing

Johansen's method is appropriate for testing for multiple cointegrating long-run relationships. Appendix 4 shows cointegration testing for models (1)-(5) in Table 5.3, utilising the MHM (MacKinnon-Haug-Michelis, 1999) method. In comparing λ_{trace} and $\lambda_{\max}$, Kasa (1992) and Serletis and King (1997) argued that the λ_{trace} statistic considers all the smallest eigenvalues and is considered more powerful. However, Lutkepohl et al. (2001) argued that the λ_{trace} test suffers from size distortion issues when applied to smaller time series. As such, the $\lambda_{\max}$ result may be more accurate. As seen in Appendix 4, most models show two cointegrating vectors, utilising the third option of a linear time series with an intercept and no trend. Model (5) in Table 5.3, being net exports, is the only model showing at least one cointegrating vector. As all models show at least one cointegrating vector, this chapter will utilise vector error-correction methodology.

5.6 Results: Investment

As this chapter sets to analyse the selected models (1)-(5) in Table 5.3, each will be examined and subdivided in order. The investment model (1) in Table 5.3 will receive a more detailed explanation and attention towards the empirical specifications than the other models. This section will then focus on the theoretical model and variable definitions, the long and short-run dynamics via VECM analysis, Granger causality, and residual testing. The following

results were also incorporated via a conference[6] proceeding, alongside an emulated paper[7]. The conference paper utilised VECM processes, IRFs, and VDs to examine investment's resilience against external disturbances, which are not examined within this chapter. Of note, the results in this chapter satisfy the investigation of research gaps and questions 1 and 2, while the conference paper satisfies research gaps and questions 1, 2, and 3, as shown in Chapter 1.

5.6.1 The Theoretical Model and Variable Definitions

Following Appendix 4, the investment model contains two cointegrating vectors. Model (5.1), the original investment model, is defined as *INV=f(UT*, *P*, *IR*, *PG)*, whereby the investment is a function of capacity utilisation, profit share, interest rates, and productivity growth. In post-Keynesian models, particularly within the Kaleckian framework, the primary emphasis tends to be on factors like income distribution, effective demand, and the role of profits. While these models acknowledge the importance of investment, the specific focus on investment financing may not be as pronounced as other economic theories. That said, the relevance of discussing investment financing can vary based on the specific objectives and scope of the model being used. If the aim is to make arguments about government intervention policies, understanding how investments are financed becomes crucial, as it directly ties into the funding sources and the impact on the overall economy.

Moreover, it is essential to acknowledge the role of money creation within the macroeconomic economy, with a rich history of theoretical contributions. Li and Wang (2020) conduct an extensive literature review on the credit creation theory, elucidating how banks engage in the creation or destruction of money. Their exploration encompasses various frameworks, such as stock-flow consistent models, monetary circuit theory, and disaggregated credit quantity theory. The authors highlight the prevalence of the financial intermediation theory of banking in conventional models, drawing a contrast with the credit creation theory. This alternative theory posits that banks generate money through lending, challenging the notion of a simple transfer of real resources.

The proposed augmented empirical model is built upon the works of Bhaduri and Marglin (1990), Stockhammer and Onaran (2004), and Chaiechi (2012), using an open Kaleckian post-Keynesian economic model, augmented by the reserve army effect and a demand-driven labour market. Model (1) in Table 5.3 shows interest in the selected model of *INV=f(UT*, *P*, *IR*, *PG*, *SMTR*, *GE)*, containing a contemporary measure of *fd* (i.e., SMTR). The following section will define each variable through theory and calculations for the investment model only. Kalecki and Keynes were pioneers in recognising the significance of investment in determining aggregate demand and output within theoretical frameworks. Both argued that the economy's ability to achieve development depended on private investors' capability to invest. Investment plays a central role in stimulating aggregate demand, as emphasised by Keynes in his influential work in 1936. A decrease in investment levels adversely affects

[6] The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2021. Conference details are here.

[7] **eBook ISBN,** 978-981-16-5260-8, **DOI:** 10.1007/978-981-16-5260-8. Details can be found here.

employment and business continuity, underscoring the criticality of investment for fostering a robust economy. In economic analysis, investment is often measured as a ratio of nominal GDP, denoted as INV/NGDP.

Capacity utilisation measures the utility of resources, whereby if an organisation utilises less than 100% of its production capacity, increases in production can be achieved with zero increases in expenses (Dutt, 1995). Capacity utilisation is calculated as $u = Y/K$, whereby Y is NGDP, and K is the stock of capital, as per Bhaduri and Marglin (1990), Dutt (1992), and Chaiechi (2012). Bhaduri and Marglin (1990) argued that the combination of the profit rate and capacity utilisation imposes a stagnationist regime, causing an expansionary effect on wage share. Capacity utilisation, therefore, is said to be positively related to investment. Profit share houses three main occurrences: 1) the direct effect upon investment itself; 2) the positive international demand effect; and 3) the negative effect on domestic consumption (Bhaduri & Marglin, 1990). Profit share is calculated as the rate of profit (p_t) as $pr = (1-Wb)u$, whereby W is the real wage rate, b is the full ratio of labour to NGDP, and u is the rate of profit (Bhaduri & Marglin, 1990). Profit share is seen to be positively correlated with investment. Depending on such magnitudes, profit share increases can result in an increase in investment, known as wage-led, or a decrease in investment, known as profit-led. Wealth organisations, liquidity holdings, and other holders are said to determine interest rates (Stockhammer & Onaran, 2004). In this study, the lending rate of interest is calculated through the adjustment of the GDP deflator. The lending rate is the bank rate that usually meets the short and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing (World Bank, 2022). The literature offers a wide variety of analyses between investment and interest rates, whereby a negative relationship is the core basis of the economic theory.

Productivity growth is vital for economic growth and sustainable development. It represents the increase in output achieved with the same inputs over time. Higher productivity enables more efficient resource utilisation and drives economic expansion, improving the living standards of citizens. Without productivity growth, achieving economic growth becomes challenging, and sustainable development becomes harder to attain. Following the assumptions of Kaldor (1966), productivity growth: 1) contains technological progression, directly influencing increases within the capital/labour ratio through the implementation of new machinery; 2) produces a steady rate of profit on capital if the productivity of each worker increases over time; 3) provides no change in the ratio via profit and wages, if rises in real wages are proportionate to an equal rise in labour productivity; and 4) provides capital-output ratios that offer stability through long-run labour productivity, as each experiences differences in the rate of growth in different sectors and economies. A K/L ratio defines productivity growth, whereby K is capital and L is labour. Productivity growth, therefore, is positively correlated with investment.

The stock market turnover ratio (SMTR) measures efficiency in financial markets, calculated by dividing the total value of shares traded during a given period by the average

market capitalisation. According to Svirydzenda (2016), a high turnover ratio indicates higher liquidity pressures driven by investors' demand to trade shares. Market capitalisation is a financial metric calculated by dividing a company's outstanding shares by the current market price of one share. It represents the total value of a company's equity in the stock market. Stock market development is a comprehensive concept that includes factors such as volatility, size, and the impact on the real sector (El-Wassal, 2005). The stock market promotes economic development through the real sector, positively influencing manufacturing. As such, the stock market is argued to hold a positively correlated relationship with investment. Stock market turnover in this study is defined as a contemporary measure of *fd*, in the sense of being of lesser use than more commonly used measures within the literature.

The literature provides mixed results on whether GE positively or negatively influences investment. Taylor et al. (2012) argued that depending on the expenditure-to-income ratio of the central government, such expenditure can positively or negatively influence economic growth. When fiscal policy expands, it can influence investment positively. Conversely, there is also the possibility of a crowding-out effect, where fiscal expansion leads to negative consequences for economic growth. The relationship between fiscal policy and investment outcomes can be complex, with mixed findings in the literature (Akinlo & Oyeleke, 2018). In some examples, such as Laopodis (2001), a crowding-in effect was found for some economies, while a crowding-out effect was found for others.

5.6.2 Long-Term Dynamics: A VECM Analysis

As per the previous section, the λ_{max} result showed that two cointegrating vectors exist. For ease of illustration, however, only $ECT1_{t-1}$ will be expanded upon as the investment is the dependent variable. Also, only *ECT1* will be analysed in Table 5.4, recognising that *ECT2* places capacity utilisation (UT) as the dependent variable, which is not of interest within this study. Moreover, UT is not incorporated within $ECT1_{t-1}$, as a restriction has been placed upon this variable due to two cointegrating vectors. In interpreting $ECT1_{t-1}$ via model (1), the coefficients of P, IR, PG, and SMTR show a negative *fd* sign, with only P and IR being statistically significant at the 5% level. Standard errors are reported in ( ), and *t*-statistics are reported in [ ]. The signs of the coefficients are reversed in the long run in model (1), as ECT = 0.

In investigating the impacts of profit share (P), a positive impact upon investment is known as wage-led, while a negative impact is known as profit-led. As such, P is deemed to show profit-led behaviours in the long run, as the coefficient is negative and statistically significant. Interest rates (IR) are negative and statistically significant, whereby a 1% increase in interest rates will decrease investment by 1.77% in the long run. This is a significant result, showing interest rates' strong negative influence on investment. Government expenditure (GE) exhibits strong statistical unidirectional significance with investment in the long run, whereby a 1% increase in GE increases investment by 6.90%, suggesting a crowding-in effect. The coefficients of PG and SMTR do not hold statistical unidirectional causality towards investment in the long run.

$$ECT1_{t-1} = -(1.00INV_{t-1} + \underset{(0.42)}{\underset{[2.26]}{0.95P_{t-1}}} + \underset{(0.40)}{\underset{[4.34]}{1.77IR_{t-1}}} + \underset{(0.39)}{\underset{[1.31]}{0.52PG_{t-1}}} + \underset{(0.05)}{\underset{[0.38]}{0.02SMTR_{t-1}}} - \underset{(0.37)}{\underset{[-18.58]}{6.90GE_{t-1}}} + 0.84). \quad \text{(Eq 1)}$$

5.6.3 Short-Run Dynamics Derived from the Long-Run Model: A VECM Analysis

This section analyses the short-run dynamics. The *ECT1* coefficient in Table 5.4 shows that 68% of departures from long-run equilibrium are corrected in each period, being annual, after some disturbance in the system. That is, joint unidirectional causality runs from the independent variables towards investment in the long run. Capacity utilisation (UT), in absolute values of both first and second-order lags, is positively related to investment but exhibits non-significance at the 10% statistical level. Positively lagged individual short-run relations in absolute terms with significance only includes P, while SMTR and GE exhibit negative and significant unidirectional individual short-run causality. The results of IR show that neither lagged coefficient holds significant causality towards investment in the short run. Residual testing for serial correlation, heteroskedasticity, and normality shows that the VECM is correctly specified. The null hypothesis of no serial correlation cannot be rejected in analysing the LM test result. Similar results are found for heteroskedasticity and normality testing, suggesting that the null hypothesis of each test cannot be rejected. Therefore, the VECM is correctly specified.

Table 5.4. Error-Correction Model. Dependent Variable: Investment

Variable	Coefficient	t-Statistic	*Prob.*
ECT1	**-0.68**	**-3.98**	**0.00**
ECT2	**0.28**	**3.47**	**0.00**
D(INV(-1))	-0.06	-0.49	0.63
D(INV(-2))	-0.44	-4.98	0.00
D(UT(-1))	0.09	0.52	0.61
D(UT(-2))	0.06	0.39	0.70
D(P(-1))	0.42	4.09	0.00
D(P(-2))	0.38	4.19	0.00
D(IR(-1))	0.11	1.76	0.10
D(IR(-2))	0.07	1.35	0.19
D(PG(-1))	-0.21	-1.77	0.10
D(PG(-2))	0.08	1.00	0.33
D(SMTR(-1))	-0.03	-2.79	0.01
D(SMTR(-2))	-0.02	-1.85	0.08
D(GE(-1))	-0.35	-3.22	0.01
D(GE(-2))	-0.51	-4.52	0.00
C	-0.002	-1.45	0.17
R-squared.	0.93		
Adjusted R-squared.	0.87		
S.E. of regression.	0.005		
Sum squared resid.	0.000		
Log likelihood.	143.53		
F-statistic/Prob.	13.82/0.00		
Residual Testing			
LM test.	0.59		
Normality.	0.56		
ARCH test.	0.64		

ECT1/2 = Error-Correction Model (long-run coefficient signs), D(INV) = (Differenced) Investment, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(IR) = (Differenced) Interest Rate, D(PG) = (Differenced) Productivity Growth, D(SMTR) = (Differenced) Stock Market Turnover Ratio, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, Normality is the Jarque-Bera statistic test for normality, and the ARCH test is the F-statistic of White heteroskedasticity testing.

5.6.4 Short-Run Causality: Granger Causality/Block Exogeneity Wald Test

Short-run causality between investment and the explanatory variables can be determined by testing both individual and joint significance of the lagged coefficients. In testing joint significance, the Wald test measures whether parameters associated with a group of explanatory variables are zero (Polit, 1996). In other words, the Wald test will show if short-run joint Granger causality exists between investment and the explanatory variables. As shown in Table 5.5, UT holds a chi-square p-value of more than 0.05, meaning there is no short-run joint (i.e., coefficient) unidirectional Granger causality between UT and investment. In interpreting P, the null hypothesis can be rejected, suggesting that there is short-run joint unidirectional Granger causality towards investment. In analysing the remaining results, short-run joint unidirectional Granger causality is running from PG, SMTR, and GE towards investment. The p-value result of 0, under all, suggests that all coefficients jointly Granger cause investment in the short run in a unidirectional manner, complementary to the ECT result in Table 5.4.

Table 5.5. VECM Granger Causality/Block Exogeneity Wald Test: Investment

Dependent Variable: D(INV)			
Excluded	Chi-sq	d.f.	*Prob.*
D(UT)	0.55	2	0.76
D(P)	25.71	2	0.00
D(IR)	3.49	2	0.17
D(PG)	12.47	2	0.00
D(SMTR)	7.78	2	0.02
D(GE)	25.01	2	0.00
All	124.76	12	0.00

D(INV) = (Differenced) Investment, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(IR) = (Differenced) Interest Rate, D(PG) = (Differenced) Productivity Growth, D(SMTR) = (Differenced) Stock Market Turnover Ratio, D(GE) = (Differenced) Government Expenditure. All = Joint Wald Test.

5.6.5 Results and Discussion

Analysing the investment model comes in two forms: 1) whether the economic theory holds; and 2) the sign and strength of the incorporated *fd* and *fp* indicators. While UT was not incorporated within the ECM, short-run individual and joint coefficient results show no statistical significance in a unidirectional fashion towards investment, against the economic theory. This suggests that any change to implement efficiencies within industry holds no significant consequences towards investment within the Australian economy. In investigating the impact of P, a positive impact upon investment is known as wage-led, while a negative impact is known as profit-led. Profit share shows profit-led behaviour in the long run and wage-led behaviour in the short run.

The causal effect of IR is in line with the economic theory, whereby a 1% increase in IR decreases investment by 1.77% in the long run. The analysis of PG provides interesting results, whereby the long-run result of non-significance is against the economic theory, while a joint influence upon investment is evident via Granger causality testing, both against and in line with the economic theory in the short run (i.e., short-run coefficient sign). Such a result suggests that PG only Granger causes investment in the short run through joint coefficient significance (i.e., block exogeneity Wald testing). The negative, weak causal effect of SMTR

towards investment holds significance in the short run only, suggesting that Australia's stock market may be inefficient. Regardless, any possible inefficiencies are deemed to be very weak. In analysing the causal effects of GE towards investment, strong and significant causal unidirectional relationships exist in the long and short run, showing both crowding-in and crowding-out behaviours.

5.7 Results: Savings

The remainder of the chapter analyses the selected models (2)-(5) in Table 5.3. This section explores the savings model (2) in Table 5.3 by expanding upon empirical specifications, theoretical models, and variable definitions. Further, the focus will be directed towards long and short-run dynamics via VECM analysis, Granger causality, and residual testing.

5.7.1 The Theoretical Model and Variable Definitions

Following Appendix 4, the savings model contains two cointegrating vectors. Model (5.2), the original savings model, is defined as $S=f(UT, P)$, whereby savings is a positive function of capacity utilisation (UT) and profit share (P). The selected model (2) in Table 5.3 is shown as $S=f(UT, P, CGSO, GE)$, incorporating a contemporary measure of *fd* (CGSO) and a commonly used measure of *fp* (GE). The following section aims to define each variable through definitions and theory. While Chapter 4 explained the theory of savings within the Kaleckian post-Keynesian theoretical model, this section defines savings and the associated independent variables more thoroughly.

The marginal propensity to save out of profits is the function of Cambridge's private savings. Following Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), savings are a direct function of both capacity utilisation and income distribution. The function assumes that an *S* amount of profit is saved, whereby capitalists have a higher propensity to save when compared to workers. Various schools of thought differed on this matter, whereby: 1) Classical economists argued that savings are a necessary condition for investment creation (Bhaduri & Marglin, 1990); 2) Kalecki (1976) asserts that all savings are derived through capitalists' profits, whereby workers and small proprietors consume all incomes; and 3) post-Keynesian growth theorists argued that the distribution of income influences savings, as workers and capitalists show different savings propensities (Stockhammer & Onaran, 2004). Bhaduri and Marglin (1990) further argued that if a nation's gross savings rate is high, the economy has a strong potential to invest in capital. Kalecki (1937), like Keynes (1936), argued that while ex-post savings and investment are equal, the investment directly determines savings. Kalecki (1937) argued that: 1) changes in the level of economic activity, not changes in interest rates, bring about equality; and 2) generally speaking, capitalist economies experience unutilised capacity. As such, savings are calculated as domestic savings normalised by NGDP.

Credit to government and state-owned enterprises (CGSO) is calculated as the ratio between credit by domestic money banks to government and state-owned enterprises to NGDP and is defined as an efficiency indicator. A state-owned enterprise (SOE) is defined as an organisation that is a legal entity of a government tasked with partaking in commercial activities (Yu, 2014). While there is considerable literature regarding the role of government and SOEs and their influences on economies such as China, Brazil, and Vietnam, there is

limited literature exploring the influence of this indicator upon savings, particularly within a developed nation such as Australia. Yu (2014) analysed the causality from state-owned banks towards private savings during 1991-2015, utilising a fixed panel model of 91 countries, incorporating the variables of GDP growth rate, privatisation, political regimes, and inflation rates. The study found that a reduction in government ownership of banking systems tends to reduce savings, whereby reductions in intervention towards banking platforms increase the demand for household credit.

Kaleckian economists argue that expansionary *fp* can positively influence the economy (see Chaiechi, 2012; Chaiechi, 2014; Ko, 2019). Keynes (1936) wrote extensively about the circular flow model of an economy, whereby an increase in current spending positively influences future spending. Keynes (1936) argued for lowering interest rates to increase such current spending to reduce current savings rates. If current savings are not reduced enough, government spending could assist. Keynes (1936) favoured increasing government spending and lowering taxes to stimulate demand in such an economy. Keynes (1936) also argued that increases in savings rates reduce the amount of money people spend and invest, resulting in higher unemployment and lower economic growth.

5.7.2 Long-Term Dynamics: A VECM Analysis

This section follows Johansen's technique, whereby normalised long-run cointegrating relationships can be expressed through the ECT. As the λ_{max} result showed that two cointegrating vectors exist within the time series, as per Appendix 4, incorporating two ECTs into the VECM is warranted. As this chapter aims to explore *S=f(UT*, *P*, *CGSO*, *GE)*, $ECT1_{t-1}$ is of interest. In interpreting $ECT1_{t-1}$, the coefficients of P and CGSO are negative in sign, with neither being statistically significant at the 5% level. At the same time, GE exhibits strong positive unidirectional significance towards savings in the long run. When GE increases by 1%, savings increase by 10.57% in the long run.

$$ECT1_{t-1} = -(1.00S_{t-1} + \underset{\substack{(1.04)\\[0.99]}}{1.03P_{t-1}} + \underset{\substack{(1.33)\\[0.29]}}{0.38CGSO_{t-1}} \underset{\substack{(1.30)\\[-8.11]}}{-10.57GE_{t-1}} + 1.83) \qquad \text{(Eq 2)}$$

5.7.3 Short-Run Dynamics Derived from the Long-Run Model: A VECM Analysis

Establishing the estimated VECM to investigate short-run disequilibrium is now appropriate. The *ECT1* in Table 5.6 shows the speed at which the model returns to equilibrium following an exogenous shock. In interpreting the *ECT1*, 59% of departures from long-run equilibrium are corrected in each period at the 5% statistical significance level. Therefore, joint long-run unidirectional causality running from the lagged explanatory variables of P, CGSO, and GE to savings exists. Following this, the short-run lagged dynamics can be interpreted. Capacity utilisation (UT) in absolute values of both first and second-order lags are positively related to savings. That is, when UT increases by 1%, savings increase by 0.72% at lag 1 and 0.52% at lag 2. Of note, only lag 1 is statistically significant at the 5% level. In line with the long-run result, profit share shows no statistical significance at either lag. The *fd* indicator, CGSO, shows statistical significance at lag 2, only at the 10% level, whereby a 1% increase in CGSO increases savings by 0.59%. Government spending holds negative statistical

significance at the 5% level for both lagged coefficients. Residual testing for serial correlation, heteroskedasticity, and normality shows that the VECM is correctly specified.

Table 5.6. Error-Correction Model. Dependent Variable: Savings

Variable	Coefficient	t-Statistic	*Prob.*
ECT1	**-0.59**	**-2.45**	**0.02**
ECT2	**-0.31**	**-2.15**	**0.04**
D(S(-1))	-0.45	-1.89	0.07
D(S(-2))	0.00	0.01	0.99
D(UT(-1))	0.72	2.57	0.02
D(UT(-2))	0.52	1.74	0.10
D(P(-1))	-0.09	-0.27	0.79
D(P(-2))	-0.09	-0.39	0.70
D(CGSO(-1))	0.23	0.81	0.43
D(CGSO(-2))	0.59	2.13	0.05
D(GE(-1))	-0.70	-2.74	0.01
D(GE(-2))	-0.58	-2.42	0.03
C	-0.00	-1.33	0.20
R-squared.	0.76		
Adjusted R-squared.	0.61		
S.E. of regression.	0.01		
Sum squared resid.	0.002		
Log likelihood.	116.91		
F-statistic/Prob.	5.23/0.00		
Residual Testing			
LM test.	0.84		
Normality.	0.14		
ARCH test.	0.80		

ECT1/2 = Error-Correction Model (long-run coefficient signs), D(S) = (Differenced) Savings, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(CGSO) = (Differenced) Credit to Government and State-Owned Enterprises, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality is the Jarque-Bera statistic test for normality, and the ARCH test is the F-statistic of White heteroskedasticity testing.

5.7.4 Short-Run Causality: Granger Causality/Block Exogeneity Wald Test

As shown in Table 5.7, UT holds a chi-square p-value less than 0.05, showing short-run joint unidirectional causality towards savings. The null hypothesis cannot be rejected in interpreting P, suggesting no joint short-run unidirectional Granger causality towards savings. In analysing the remaining results, short-run unidirectional Granger causality exists between CGSO and GE towards savings. The p-value result of 0, under all, suggests that all coefficients jointly Granger cause savings in the short run in a unidirectional manner, complementing the ECT result.

Table 5.7. VECM Granger Causality/Block Exogeneity Wald Test: Savings

Dependent Variable: D(S)			
Excluded	Chi-sq	d.f.	*Prob.*
D(UT)	10.54	2	0.01
D(P)	0.15	2	0.93
D(CGSO)	6.43	2	0.04
D(GE)	9.11	2	0.01
All	33.92	8	0.00

D(S) = (Differenced) Savings, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(CGSO) = (Differenced) Credit to Government and State-Owned Enterprises, D(GE) = (Differenced) Government Expenditure. All = Joint Wald Test.

5.7.5 Results and Discussion

Analysing the savings model comes in two forms: 1) whether the economic theory holds for the model; and 2) the sign and strength of the incorporated *fd* and *fp* indicators within

the augmented framework. Capacity utilisation (UT) holds a strong positive unidirectional relationship with savings in the short run. In theory, collective manufacturing organisations within Australia, with less than 100% utilisation, can increase production without incurring increases in overhead costs, resulting in instant savings in the short run. In analysing the causal effects of P upon savings, both long and short-run results show non-significance, counter to the economic theory (Tables 5.6 and 5.7). The non-significance of P indicates that the model cannot identify whether savings are influenced by wage or profit-led mechanisms. The long-run result for CGSO shows non-significance; however, it displays strong significance at lag 2 individually and jointly via Granger causality testing. This result suggests that the savings rate within Australia is positively influenced in the short run. Regarding GE, both long and short-run results offer differing yet statistically significant results. The long-run results suggest that an increase in GE increases savings. That is, households in Australia increase savings due to future uncertainty in the long run when GE increases, therefore consuming less, representing a diminishing circular flow of income. In the short run, however, an increase in GE reduces household savings, thus inducing increases in consumption. Therefore, policymakers should be aware that GE positively influences household consumption in the short run; however, long-run GE policies cause households to maintain strong savings habits.

5.8 Results: Income Distribution

The following section analyses the selected model (3) in Table 5.3, following the previous sections' order: the long and short-run dynamics via VECM analysis, Granger causality, and residual testing. To begin with, the expansion of the variables contained within the income distribution model requires explanation.

5.8.1 The Theoretical Model and Variable Definitions

Following Appendix 4, the income distribution model contains two cointegrating vectors. The original income distribution model is *P=f(UT*, *U*, *PG)*, whereby profit share is a function of capacity utilisation (UT), unemployment (U), and productivity growth (PG). Through the economic theory, UT and PG are said to have a positive relationship with profit share, while U is said to have a negative relationship. Model (3) in Table 5.3 is augmented as *P=f(UT*, *U*, *PG*, *MR*, *GE)*, containing a commonly used measure of *fd* (MR) alongside GE. The following section will define each previously undefined variable by theory and application.

Following Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), income distribution is partly determined by the bargaining power of workers and capitalists, influenced by macroeconomic activity and the unemployment rate. Stockhammer and Onaran (2004) argued that Marx formulated the former approach, later incorporated within labour market bargaining theories (i.e., wage efficiencies and NAIRU), whereby Keynesian economics focuses on the latter. Kaldor (1960) places short-run output levels and long-run income distributions as being determined by effective demand. In expanding the income distribution model, Stockhammer and Onaran (2004) incorporate the growth of productivity labour, whereby such growth influences profit share. Chapter 4 further explains the theory of income distribution within the Kaleckian post-Keynesian theoretical model.

Introduced by McKinnon (1973) and Shaw (1973), the monetisation ratio (MR) is regarded as a commonly used measure of financial depth, measured as the money supply within an economy (i.e., broad money or M2). Broad money refers to cash, cheque deposits, and other assets that are easily convertible to money. The ratio measures the size of the financial sector, the correlation between the real GDP per capita, and its rate of change (King & Levine, 1993). As such, the ratio is calculated as M2/NGDP. Theoretically, an increase in MR further influences the expansion of the financial sector, influencing the economy (Chaiechi, 2012).

Historically, the nexus between *fd* and income equality draws from a non-linear relationship, explained via the Kuznets curve (Kuznets, 1955). Kuznets (1955) argued that economic development, in its early stages, increases income disparities due to expansions in urbanisation. This relationship stabilises as time passes, declining in the advanced stages of public redistribution policies. Challenging this theory, Greenwood and Jovanovic (1990) argued for a U-shaped nexus through trade enhancement, whereby greater profits arise. In the early stages of economic development, greater profits generally lead to greater costs. Due to such costs, poorer demographics may be unable to afford to use advanced services due to inequality. Moving towards the intermediate stage, an economy experiences *fd*, causing savings to rise. Underprivileged populations who cannot save cause further income disparity within the population. Moving towards an advanced stage, inequality reduces as investors see their incomes grow due to easier access to financial intermediation (Meniago & Asongu, 2018). These ideas were challenged by Banerjee and Newman (1993), whereby entrepreneurship opportunities take centre stage. High contract enforcement and costs can push out populations with low incomes from partaking in investments due to lowered access to credit, regardless of the profit potential of projects.

Further review of the literature shows mixed results. Beck et al. (2007) showed that greater *fd* reduces income equality, while Kim and Lin (2011) show that *fd* improves income distribution. On the other hand, Jauch and Watzka (2016) show that increases in *fd* increased income inequality. The authors analysed a comprehensive dataset of developed and developing economies from 1960-2008, utilising private credit/NGDP as a measure of *fd*. The authors tested the theory that better-developed financial markets lead to decreasing levels of income equality, utilising a broader and more comprehensive dataset compared to the previously mentioned studies. The results show that increases in *fd* lead to increased income inequalities. The *fd* indicators can positively or negatively influence income distribution.

Government expenditure can positively or negatively affect income distribution. In examining the relationship between public spending and income distribution among OECD economies, Afonso et al. (2010) found that strong redistributive public spending and public educational spending correlate with income distribution. Such correlation is met with two principal policy implications. Firstly, efficiency improvements could provide the same results as increases in government spending. Secondly, advances in educational achievement and institutional frameworks are deemed relevant towards income distribution. In a more theoretical framework, Mello and Tiongson (2006) analysed whether more unequal societies spend more on income distribution than their more egalitarian peers, utilising a sample of 56

underdeveloped and developed economies. While theoretical arguments are inconclusive, the authors found that the 'imperfect markets' hypothesis is supported, whereby more unequal economies spend less on redistribution. In fact, the study supported the newer 'incomplete markets' viewpoint, whereby inequality is perpetuated over time. This was more evident with poorer economies, as there was limited access to capital markets to insure themselves against adverse economic shocks or make long-run investments to improve future earnings potential.

5.8.2 Long-Run Dynamics: A VECM Analysis

In interpreting $ECT1_{t-1}$ via model (3), the coefficients of U, PG, and GE are negative in sign, with only MR showing a positive coefficient sign, whereby all coefficients are statistically significant at the 5% level. In analysing the impact of U on profit share, a 1% increase in U decreases profit share by 1.99%. Productivity growth exhibits a negative unidirectional relationship towards profit share, whereby a 1% increase in PG decreases profit share by 0.62%. While weak in influence, MR holds a significant positive causal influence towards profit share in the long run. Compared with the investment and savings models, government expenditure has a moderate level of influence towards profit share.

$$ECT1_{t-1} = -(1.00P_{t-1} + \underset{(0.09)\ [21.00]}{1.99U_{t-1}} + \underset{(0.05)\ [12.38]}{0.62PG_{t-1}} - \underset{(0.00)\ [-2.63]}{0.03MR_{t-1}} + \underset{(0.05)\ [6.56]}{0.38GE_{t-1}} - 0.77) \qquad \text{(Eq 3)}$$

5.8.3 Short-Run Dynamics Derived from the Long-Run Model: A VECM Analysis

The error-correction term, *ECT1* (Table 5.8), shows a negative yet non-significant result, suggesting that no unidirectional relationship between the joint independent coefficients towards profit share exists in the long run, despite all individual long-run coefficients being significant. Despite the Johansen cointegration result, no valid conclusion can be drawn on the long-run equilibrium relationship and the speed of adjustment after deviation. Analysing Appendix 2 via unit-root testing, the ADF and PP methods show all time series to be *I(1)*, with no counter results. As such, the following short-run results should be taken under consideration that the ECT is non-significant, meaning there is no joint long-run unidirectional relationship.

In absolute values of both first and second-order lags, UT is negatively related to profit share; however, only lag 2 exhibits statistical significance. While the absolute values of both first and second-order lag coefficients for U are negative, non-significance suggests no influence in the short run. That is, no individual causality runs from unemployment to profit share in the short run, regardless of lag length. While negative, PG shows significance at lag 2 only at the 10% statistical level, whereby a 1% increase in PG decreases profit share by 0.50%. In contradiction to the long-run positive result, MR holds no short-run significance towards profit share. In line with the long-run result, GE holds a negative and significant relationship towards profit share. Residual testing for serial correlation, heteroskedasticity, and normality shows that the VECM is correctly specified.

Table 5.8. Error-Correction Model. Dependent Variable: Income Distribution

Variable	Coefficient	t-Statistic	*Prob.*
ECT1	**-0.01**	**-0.02**	**0.99**
ECT2	0.85	3.50	0.00
D(P(-1))	-0.46	-1.15	0.26
D(P(-2))	0.08	0.25	0.81

D(UT(-1))	0.60	1.18	0.26
D(UT(-2))	-2.13	-3.49	0.00
D(U(-1))	0.28	0.64	0.53
D(U(-2))	-0.80	-1.21	0.24
D(PG(-1))	-0.31	-0.99	0.33
D(PG(-2))	-0.50	-1.95	0.07
D(MR(-1))	-0.21	-1.46	0.16
D(MR(-2))	0.11	1.05	0.31
D(GE(-1))	-1.19	-2.57	0.02
D(GE(-2))	-1.47	-3.47	0.00
C	0.01	2.59	0.02
R-squared.	0.69		
Adjusted R-squared.	0.44		
S.E. of regression.	0.01		
Sum squared resid.	0.003		
Log likelihood.	105.09		
F-statistic/Prob.	2.75/0.02		
Residual Testing			
LM test.	0.40		
Normality.	0.90		
ARCH test.	0.89		

ECT1/2 = Error-Correction Model (long-run coefficient signs), D(P) = (Differenced) Profit Share, D(UT) = (Differenced) Capacity Utilisation, D(U) = (Differenced) Unemployment Rate, D(PG) = (Differenced) Productivity Growth, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality is the Jarque-Bera statistic test for normality, and the ARCH test is the F-statistic of White heteroskedasticity testing.

5.8.4 Short-Run Causality

As shown in Table 5.9, short-run joint unidirectional causality between UT and profit share exists. The null hypothesis cannot be rejected in interpreting U, suggesting no joint short-run unidirectional Granger causality towards profit share. In analysing the remaining results, short-run joint unidirectional Granger causality only exists between GE and profit share. The result under all suggests that all coefficients jointly Granger cause income distribution in the short run in a unidirectional manner, non-complementary to the ECT result.

Table *5.9. VECM Granger Causality/Block Exogeneity Wald Test: Income Distribution*

Dependent Variable: D(P)			
Excluded	Chi-sq	d.f.	*Prob.*
D(UT)	12.37	2	0.00
D(U)	2.07	2	0.36
D(PG)	4.04	2	0.13
D(MR)	3.55	2	0.17
D(GE)	12.03	2	0.00
All	20.49	10	0.02

D(P) = (Differenced) Profit Share, D(UT) = (Differenced) Capacity Utilisation, D(U) = (Differenced) Unemployment Rate, D(PG) = (Differenced) Productivity Growth, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure.

5.8.5 Results and Discussion

As previously discussed, the ECT result shows non-significance, indicating no long-run unidirectional relationship of the joint independent coefficients towards income distribution, despite individual long-run coefficients all being significant. While unit-root testing showed all time series to be *I(1)*, alongside the Johansen cointegration result, the non-significance of the ECT should be taken seriously when analysing long and short-run individual coefficient dynamics. While UT was not incorporated within the ECT, short-run results show negative significance towards income distribution, which contradicts the economic theory. This result suggests that industry cannot implement efficiencies immediately without a short-run

negative cost towards income distribution. The long-run unemployment result aligns with the economic theory, whereby an increase in U decreases income distribution. With this result, government policymakers should be aware that the unemployment rate highly influences income distribution in the long run.

With similar results, PG shows negative unidirectional causality towards income distribution in both the long and short run, contrary to the economic theory. This suggests that income distribution is negatively influenced in the long and short run as PG increases. Financial development, represented by MR, shows unidirectional causality towards income distribution in the long run. Government expenditure is significant in both terms, with a stronger short-run influence on income distribution. This suggests that policymakers should be aware that through targeted activities, GE will produce strong negative results towards income distribution in the short run while producing moderate negative results in the long run.

5.9 Results: Productivity Growth

According to Paul Krugman (1997), 'Productivity is not everything, but it is almost everything in the long run. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker'. This section analyses model (4) (Table 5.3), following the order of the previous sections, the long- and short-run dynamics via VECM analysis, Granger causality, and residual testing. To begin with, the expansion of the variables contained within the productivity growth model requires explanation.

5.9.1 The Theoretical Model and Variable Definitions

Following Appendix 4, the productivity growth model contains two cointegrating vectors. The original productivity growth model is *PG=f(INV*, *UT)*, whereby productivity growth is dependent upon investment and capacity utilisation. Following Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), both explanatory variables positively influence productivity growth. Model (4) (Table 5.3) shows interest in the selected model of *PG=f(INV*, *UT*, *MR*, *GE)*. The following section defines each previously undefined variable by theory and application.

Productivity growth is a measure of economic performance. In assessing such growth, Hercowitz et al. (1999) demonstrate that per capita income can only be sustained by increases in total factor productivity (TFP). In comparing the differences in TFP among developed and underdeveloped economies, any associated gaps correlate to large differences in such a measure (Hall & Jones, 1999). Such differences can be due to either the use and/or the efficiencies of adopted technologies. Adejumo and Adejumo (2019) provide an in-depth review of the empirical literature, cross analysing TFP analysis with more than a dozen authors with differing econometrical methodologies, country datasets, and analysis objectives. The results are mixed, with some studies showing an insignificant relationship between productivity growth and economic growth, while other studies showed the opposite. Opposing results appear to be influenced by differing economies, mostly towards the differences in factors of production. As stated, Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004) deem the relationship between productivity growth and INV/UT as positive. Investment directly

influences capital and labour force growth positively, while UT holds the same relationship with productivity growth through the utility of resources.

As mentioned previously, the MR measures the money supply within an economy. While literature analysing the relationship between money supply and economic growth is abundant, literature analysing the relationship between broad money and productivity growth is limited, with most of the literature focusing on developing nations. Unsal (2018) found a negative relationship between broad money and productivity growth from 1980-2014 for Turkey, utilising a VECM analysis. Demmou et al. (2019) incorporated a panel empirical analysis of 32 countries and 30 industries from 1990-2014 in a more comprehensive study. The impact of *fd* on labour productivity varied across different sectors, influenced by financial structures, reliance on external financing, and the intensity of intangible assets. The authors highlighted that these factors contributed to the non-uniform effects of *fd* on labour productivity in different sectors. In a more targeted analysis, Ma and Zhang (2020) analysed the effect of *fd* upon TFP growth in 30 Chinese provinces during 2000-2016, showing that productivity growth was non-linear, instead exhibiting U-shaped behaviours. However, the analysis concluded that *fd* volatility strongly and negatively affected TFP growth. Therefore, the literature indicates that MR can positively or negatively affect productivity growth over time.

Government expenditure can hold positive and/or negative relationships towards productivity growth. Hansson and Henrekson (1994) show the general differences, whereby the arguments for GE holding a positive effect upon productivity include: 1) rectifying market failures; 2) government costs of production equal market values through final output valuations; 3) Verdoorns' law: Kaldor (1966) claims a high rate of utilisation holds positive effects upon long-run productivity growth; and 4) cost of social inequality: Myrdal (1960) highlights the potential benefits of increased government involvement in promoting economic growth and reducing inequalities. Arguments against government involvement in the economy include the possibility of crowding-out (i.e., production growth and investment). In a study examining 14 OECD countries from 1965-1987, Hansson and Henrekson (1994) found that government expenditure did not significantly impact productivity growth. Another study by Chu et al. (2020) analysed 37 high-income and 22 low-to-middle-income economies and their compositions of government spending from the period 1993-2012. The authors challenge the existing literature by finding that developing economies that reallocate government expenditure from non-productive outputs to more productive outputs experience higher levels of productivity growth. Their study highlights that 39% of government expenditure in countries that exhibit high incomes is allocated towards non-productive components.

5.9.2 Long-Term Dynamics: A VECM Analysis

In interpreting $ECT1_{t-1}$ via model (4) (Table 5.3), the coefficients of UT and GE show positive signs, with only MR showing a negative coefficient sign, whereby MR and GE are statistically significant at the 5% level. In the long run, the results suggest MR holds a negative, moderate, unidirectional causal relationship towards productivity growth, with GE exhibiting a very strong positive causality. With such a result, government policymakers should be aware

of the very strong positive influence government spending has on uplifting productivity growth within Australia in the long run.

$$ECT1_{t-1} = -(1.00PG_{t-1} - 1.14UT_{t-1} + 0.64MR_{t-1} - 14.02GE_{t-1} + 3.50) \quad \text{(Eq 4)}$$
$$\begin{matrix} & (0.95) & (0.28) & (1.28) & \\ & [-1.18] & [2.24] & [-10.94] & \end{matrix}$$

5.9.3 Short-Run Dynamics Derived from the Long-Run Model: A VECM Analysis

In analysing the *ECT1* result (Table 5.10), 76% of departures from long-run equilibrium are corrected in each period. Therefore, long-run joint causality runs from the explanatory variables towards productivity growth. While various coefficients hold positive and negative signs, no short-run results show statistical significance at the 10% level. Unlike previous models, Table 5.10 shows an adjusted R-squared result of 31%, suggesting that the additional input variables of MR and GE may not have improved the model. The model, however, was the best-performing of the five alternative *fd* indicators. Residual testing for serial correlation, heteroskedasticity, and normality shows that the VECM is correctly specified.

Table 5.10. Error-Correction Model. Dependent Variable: Productivity Growth

Variable	Coefficient	t-Statistic	*Prob.*
ECT1	**-0.76**	**-2.61**	**0.02**
ECT2	**0.93**	**2.54**	**0.02**
D(PG(-1))	0.13	0.46	0.65
D(PG(-2))	0.08	0.36	0.72
D(INV(-1))	-0.24	-0.62	0.54
D(INV(-2))	-0.46	-1.37	0.19
D(UT(-1))	-0.06	-0.11	0.91
D(UT(-2))	0.02	0.03	0.98
D(MR(-1))	0.18	1.04	0.31
D(MR(-2))	-0.01	-0.04	0.97
D(GE(-1))	-0.20	-0.48	0.64
D(GE(-2))	0.32	0.67	0.51
C	-0.01	-0.87	0.39
R-squared.	0.57		
Adjusted R-squared.	0.31		
S.E. of regression.	0.02		
Sum squared resid.	0.006		
Log likelihood.	93.73		
F-statistic/Prob.	2.22/0.05		
Residual Testing			
LM test.	0.47		
Normality.	0.83		
ARCH test.	0.92		

ECT1/2 = Error-Correction Model (long-run coefficient signs), D(PG) = (Differenced) Productivity Growth, D(INV) = (Differenced) Investment, D(UT) = (Differenced) Capacity Utilisation, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality is the Jarque-Bera statistic test for normality, and the ARCH test is the F-statistic of White heteroskedasticity testing.

5.9.4 Short-Run Causality

Unlike the previous Granger block causality results, Table 5.11 shows no unidirectional joint coefficient relationship exists between the explanatory variables towards productivity growth in the short run. This aligns with the results in Table 5.10 on an individual coefficient basis but contradicts the ECT result.

Table 5.11. VECM Granger Causality/Block Exogeneity Wald Test: Productivity Growth

Dependent Variable: D(PG)			
Excluded	Chi-sq	d.f.	*Prob.*
D(INV)	2.04	2	0.36

D(UT)	0.01	2	0.99
D(MR)	1.10	2	0.58
D(GE)	0.89	2	0.64
All	4.96	8	0.76

D(PG) = (Differenced) Productivity Growth, D(INV) = (Differenced) Investment, D(UT) = (Differenced) Capacity Utilisation, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure.

5.9.5 Results and Discussion

While the ECT is significant, no short-run individual or joint Granger causality results show statistical significance in a unidirectional manner towards productivity growth, against the economic theory. The short-run negative non-significance of the INV coefficient suggests that INV changes do not influence productivity growth, contrary to economic theory. This is also the case for UT, implying that any change to implement efficiencies within industry holds no significant consequences towards productivity growth within the Australian economy, both in the long and short run. Monetisation had a negative yet significant influence on productivity growth in the long run only, suggesting that changes in money supply expansion hold no short-run effects. Government expenditure only positively influences productivity growth in the long run. This result suggests that policymakers should be aware that through targeted activities, GE will produce a strong influence on productivity growth in the long run only, with no immediate impacts in the short run.

5.10 Net Exports

This section analyses the selected model (5) (Table 5.3), following the order of the previous sections, the long and short-run dynamics via VECM analysis, Granger causality, and residual testing. To begin with, the expansion of the variables contained within the net exports model requires explanation.

5.10.1 The Theoretical Model and Variable Definitions

Unlike previous models, net exports exhibit only one cointegrating vector. As shown via model (5.5), the original net exports model is $NX=f(UT, P)$, whereby net exports are a function of capacity utilisation and profit share. Model (5) (Table 5.3) shows interest in the selected model of $NX=f(UT, P, MR, GE)$, containing a traditional measure of *fd*, MR. The following section defines each previously undefined variable through theory and calculations for net exports only.

Following Bhaduri and Marglin (1990) and Stockhammer and Onaran (2004), net exports are a negative function of UT, while P holds a positive function. The production of exports is considered a positive function of P, while imports are considered a negative function. Such a relationship is seen as a positive function towards economic activity, determined by UT and the accumulation rate. On the other hand, UT holds a negative relationship towards net exports, being influenced by import demand and, thus, is positively influenced by domestic demand itself (Chaiechi, 2014). International competitiveness is represented by P to a point where P depends upon UT, reflecting upon unemployment and demand conditions that dictate labour bargaining power (Chaiechi, 2014).

As mentioned previously, the MR measures the money supply within an economy. Money supply impacts net exports in the long and short run via exchange rates. Factors that can change nominal and real domestic exchange rates include inflation, interest rates, current account deficits, public debt, the terms of trade, and economic performance. A falling domestic exchange rate has several upsides, including cheaper exports, increases in exports, and rises in aggregate demand. On the other hand, if domestic exchange rates rise, exports become more expensive. The money supply is said to immediately affect domestic exchange rates and interest rates. Such effects can cause overshooting, which describes exchange volatility, as prices do not adjust as quickly in financial markets. If a Central Bank increases the money supply within an economy, nominal interest rates will decrease, and the quantity of demand for money will increase. Lower interest rates will decrease foreign investments in assets, such as government bonds, ultimately reducing the demand for currency. This decrease will place downward pressure on domestic exchange rates. At this stage, domestic consumption and investment become more attractive, and savings become less, causing expansionary aggregate demand. As domestic exchange rates fall, the economy's goods will become more attractive to overseas buyers and foreign goods less attractive to domestic buyers. As such, an expansionary money supply boosts consumption and domestic net exports, whereby MR holds a positive relationship with domestic net exports.

Government expenditure injects money into the circular economy, influencing aggregate demand and prices of goods. Government expenditure impacts on net exports hold differing influences when compared to MR. Government spending increases aggregate demand, increasing GDP and short-run inflation. As government bond supply increases to finance GE, bond price levels decrease. The impact of this can be seen in the market for loanable funds, whereby the reduction of the supply of savings causes the cost of real interest rates to increase, causing a crowding-out effect upon private investment. When interest rates increase, domestic and foreign investors keep and demand more currency within the domestic market through net capital outflow reductions. The market for foreign currency exchange also shifts, whereby a shift in the supply curve increases the real exchange rate, causing currency appreciation. Such appreciation harms the economy's competitiveness, as exports reduce while imports increase. As such, GE holds a negative relationship with net exports.

5.10.2 Long-Term Dynamics: A VECM Analysis

In interpreting $ECT1_{t-1}$ via model (5), all coefficients show statistical significance at the 5% level, whereby UT and GE display negative coefficient signs, while P and MR show positive. In the long run, the results suggest that UT, P, and MR hold a weak to moderate unidirectional causal relationship towards net exports, while GE exhibits a stronger causal relationship. As such, policymakers should be aware of the strong negative influence government spending has on reducing export growth within Australia in the long run.

$$ECT1_{t-1} = -(1.00NX_{t-1} + \underset{(0.08)\ [4.55]}{0.36UT_{t-1}} - \underset{(0.09)\ [-2.32]}{0.22P_{t-1}} - \underset{(0.01)\ [-9.27]}{0.10MR_{t-1}} + \underset{(0.05)\ [13.54]}{0.72GE_{t-1}} - 0.13) \qquad \text{(Eq 5)}$$

5.10.3 Short-Run Dynamics Derived from the Long-Run Model: A VECM Analysis

The *ECT1* in Table 5.12 reveals that 73% of departures from long-run equilibrium are corrected in each period at the 1% statistical significance level after some disturbance in the system. In absolute values of first and second-order lags, UT is positively related to net exports but exhibits non-significance. Profit share demonstrates negative significance towards exports at lag 2 at the 10% statistical level, MR shows negative non-significance, and GE only indicates positive statistical significance at the 10% level at lag 2. Residual testing for serial correlation, heteroskedasticity, and normality confirms that the VECM is correctly specified.

Table *5.12. Error-Correction Model. Dependent Variable: Net Exports*

Variable	Coefficient	t-Statistic	*Prob.*
ECT1	**-0.73**	**-3.57**	**0.00**
D(NX(-1))	0.10	0.50	0.62
D(NX(-2))	-0.18	-0.98	0.34
D(UT(-1))	0.47	1.67	0.11
D(UT(-2))	0.41	1.39	0.18
D(P(-1))	-0.28	-1.54	0.14
D(P(-2))	-0.35	-1.97	0.06
D(MR(-1))	-0.02	-0.17	0.87
D(MR(-2))	-0.11	-1.40	0.18
D(GE(-1))	0.24	1.28	0.21
D(GE(-2))	0.36	1.77	0.09
C	0.00	0.03	0.97
R-squared.	0.59		
Adjusted R-squared.	0.38		
S.E. of regression.	0.01		
Sum squared resid.	0.00		
Log likelihood.	114.73		
F-statistic/Prob.	2.78/0.02		
Residual Testing			
LM test.	0.80		
Normality.	0.65		
ARCH test.	0.83		

ECT1/2 = Error-Correction Model (long-run coefficient signs), D(NX) = (Differenced) Net Exports, D(P) = (Differenced) Profit Share, D(UT) = (Differenced) Capacity Utilisation, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality is the Jarque-Bera statistic test for normality, and the ARCH test is the F-statistic of White heteroskedasticity testing.

5.10.4 Short-Run Causality

As depicted in Table 5.13, UT and P exhibit short-run joint unidirectional Granger causality towards net exports at the 10% statistical significance level. In interpreting MR and GE, the null hypothesis cannot be rejected, suggesting no joint short-run unidirectional causality towards net exports. Under all, all coefficients jointly Granger cause net exports in the short run in a unidirectional manner at the 10% statistical significance level, complementing the ECT result.

Table 5.13. VECM Granger Causality/Block Exogeneity Wald Test: Net Exports

Dependent Variable: D(NX)			
Excluded	Chi-sq	d.f.	*Prob.*
D(UT)	5.32	2	0.07
D(P)	4.87	2	0.09
D(MR)	1.97	2	0.37
D(GE)	3.83	2	0.15
All	15.13	8	0.06

D(NX) = (Differenced) Net Exports, D(P) = (Differenced) Profit Share, D(UT) = (Differenced) Capacity Utilisation, D(MR) = (Differenced) Monetisation Ratio, D(GE) = (Differenced) Government Expenditure.

5.10.5 Results and Discussion

Unlike previous models, only net exports exhibited one cointegrating vector, meaning all the explanatory variables were included within the ECT. The ECT reveals a strong joint causal relationship between the explanatory variables and net exports in the long run. Capacity utilisation presented conflicting results, showing long-run negative causality towards net exports while revealing positive joint short-run causal effects via the Granger causality Wald test; however, it had non-significant individual coefficients via the short-run ECM. Long-run profit share produced results in line with the economic theory. In line with the economic theory, money supply demonstrated a weak yet significant positive causal relationship with net exports in the long run; however, it showed non-significance in the short run. Government spending held a negative and highly significant relationship towards net exports in the long run while exhibiting individual positive causality towards net exports in the short run. This indicates that policymakers should be aware that through targeted activities, GE will produce a strong negative influence towards net exports in the long run, with moderate positive impacts at lag 2.

5.11 Chapter Conclusion

This chapter has focused on examining the effects of financial development and fiscal policy on key macroeconomic indicators within the context of a Kaleckian post-Keynesian macroeconomic framework for the Australian economy from 1980-2015. The chapter started by selecting suitable models to analyse the impacts of financial development and fiscal policy, aligning with the first aim of this thesis. This chapter aligns with research gaps and questions 1 and 2, as outlined in Chapter 1. As unit-root testing revealed that the time series exhibited *I(1)* behaviours, VECM methodology was incorporated to conclude long and short-run relationships. On the completion of model selection, the chapter focused on cointegration testing, long and short-run relationship analysis utilising model stability tests, alongside Granger causality testing, discussing whether the economic theory was upheld. The results of the investment model were incorporated within this chapter. However, they are also shown via a published conference proceeding, which included resilience testing, which was not examined in this chapter. While most relationships between the explanatory and dependent variables aligned with the economic theory, some long and short-run results did not. Each of those variables (i.e., coefficients) against the economic theory was analysed, describing the strength of those relationships and previous literature that found similar results. As shown in Table 5.14, all models held a negative and significant ECT, besides profit share (P), suggesting that including financial development and fiscal policy indicators within the models of investment, savings, productivity growth, and net exports was warranted in explaining long-run causal relationships.

Table 5.14. Error-Correction Terms (ECT) for all Models: Australia

Models	ECT
INV = *f*(UT, P, IR, PG, SMTR, GE)	-0.68***
S = *f*(UT, P, CGSO, GE)	-0.59**
P = *f*(UT, U, PG, MR, GE)	-0.01
PG = *f*(INV, UT, MR, GE)	-0.76**
NX = *f*(UT, P, MR, GE)	-0.73***

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (Long-run Coefficient Signs). Red Colour = No Significant Causality. Green Colour = Significant Causality. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, S = Savings, U = Unemployment, NX = Net Exports, SMTR = Stock Market Turnover Ratio, CGSO = Credit to Government and State-Owned Enterprises, MR = Monetisation Ratio, GE = Government Expenditure.

In examining the strength of both financial development and fiscal policy indicators, Table 5.15 illustrates long and short-run (LR/SR) causality. Interpretation of Table 5.15 is as follows: in examining the long-run coefficient result of SMTR via the investment model (INV), the long-run (LR) box is red in colour with a negative sign, showing that while there is a negative relationship (i.e., coefficient sign) between SMTR and investment, that relationship is non-significant. In examining the short-run coefficient result of SMTR via the investment model, the short-run (SR) box is green in colour with a negative sign, showing that there is a negative relationship between SMTR and investment that is statistically significant. Looking at the short-run coefficient range, the strength of the lagged coefficients is between -0.03% and 0.02%, at the 5% (**) and 10% (*) statistical significance level. The results show that SMTR only has a weak causal effect towards investment in the short run. Monetisation was the most commonly incorporated used indicator within this chapter. At the same time, credit to government and state-owned enterprises and stock market turnover were also incorporated as contemporary measures of financial development. While money supply (MR) held a weak yet positive significant long-run relationship with income distribution (P) and net exports (NX), strong negative causal effects were found with productivity growth (PG) in the long run. Of note, money supply held non-significance with all the dependent variables in the short run. In examining the remaining results, credit to government and state-owned enterprises (CGSO) held a strong positive short-run causal effect upon savings.

Table 5.15. Financial Development and Fiscal Policy Indicators – Long and Short-Run Causality: Australia

Financial Development	**Model**	**LR**	**Coefficient**	**SR**	**Coefficient Range**
SMTR	INV	-	0.02	-	0.03 to 0.02 (**/*)
CGSO	S	-	0.38	+	0.59(*)
MR	P	+	0.03(**)	- +	-0.21 to +0.11
	PG	-	0.64(**)	- +	-0.01 to +0.18
	NX	+	0.10(***)	-	0.11 to 0.02
Fiscal Policy	**Model**	**LR**	**Coefficient**	**SR**	**Coefficient Range**
GE	INV	+	6.90(***)	-	0.51 to 0.35 (***)
	S	+	10.57(***)	-	0.70 to 0.58 (***/**)
	P	-	0.38(***)	-	1.47 to 1.19 (***/**)
	PG	+	14.02(***)	- +	-0.20 to +0.32
	NX	-	0.72(***)	+	0.24 to 0.36(*)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. Red Colour = No Significant Causality, Green Colour = Significant Causality. (+) = Positive Causality, (-) = Negative Causality, LR = Long Run, SR = Short Run. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, S = Savings, U = Unemployment, NX = Net Exports, SMTR = Stock Market Turnover Ratio, CGSO = Credit to Government and State-Owned Enterprises, MR = Monetisation Ratio, GE = Government Expenditure.

Government expenditure (GE) was incorporated as the fiscal policy indicator within all selected models, whereby a mix of statistically significant positive and negative influences upon the dependent variables was found. Compared with the incorporated financial development indicators, government expenditure was a significantly more powerful explanatory indicator, exhibiting strong causal effects upon investment, savings, income

distribution, and net exports in the long and short run while showing strong causal effects towards long-run productivity growth only.

The following analyses the long- and short-term causal effects of financial development and fiscal policy on Australia's key macroeconomic indicators. While the indicators that positively influenced the key macroeconomic indicators bring ease of analysis in explaining such causal effects, those financial development and fiscal policy indicators that hold a negative relationship towards the key macroeconomic indicators present complexity for investors and policymakers to understand such relationships adequately. The following sets out to critically analyse why such negative relationships may arise.

Stock market turnover held a negative yet significant causal relationship with investment in the short run. Stock markets promote economic growth through their role in securing new sources of private capital. Stock markets seek efficient capital allocation to allow for diverse usage within the economy, providing investors with competitive returns. An efficient stock market generates information to investors about a firm's performance, reflecting real sector fundamentals (Osamwonyi & Kasimu, 2013). Regarding investment, the weak negative causal effects of stock market turnover may suggest that capital allocation is slightly inefficient, partly due to investors not having all the information required to respond accordingly to stock market movements. While such inefficiencies promote weak negative causality towards investment, there is an opportunity for policymakers and regulatory bodies to implement strategies to improve the efficiency of the stock market within Australia. Such policy implementation may include market and bank-based economic stability regimes, fostering capital formation. Osamwonyi and Kasimu (2013) argue that this could be achieved by: 1) promoting more transparent legal and institutional frameworks that encourage human resource investment to influence auxiliary supports within the stock exchange positively; and 2) the creation of platforms that incorporate best practices in growing investment through increased confidence in the financial system.

Australian data showed a negative long-run causal relationship between productivity growth and money supply. From 1980-2015, productivity growth within Australia slowed, following other developed economies, while the volume of money increased substantially over the same period. Such a relationship may be considered inversed, whereby the growth of productivity and the increase in the volume of money may have occurred due to exogenous influences. In analysing the slowdown in productivity, the Productivity Commission (2020) provides the following historical insights: 1) the slow diffusion of technology, meaning that a large gap between the least and most productive firms was present; 2) industry composition was affected through a reduction in the size of tradable sectors; 3) lower rates of knowledge-based capital accumulation has been evident over time; 4) changes in technology processes through reduced yield benefits have been evident over time; and 5) the GFC increased debt, resulting in a liquidity trap, as interest rates reduced while secular stagnation occurred.

Regardless, this result suggests that increases in the volume of money are being utilised in other parts of the economy, away from creating end products. Analysing GDP by sector in

Australia, services made up 62.7% in 2017, followed by construction at 7.4%, mining at 5.8%, manufacturing at 5.5%, and agriculture at 2.8% (Office of the Chief Economist, 2017). The high concentration of services within Australia suggests that the services sector provides more economic activity than the production of end products. Also, the calculation of productivity growth in this study is the ratio of the stock of capital/labour force over time, meaning that this measurement may not adequately capture the output of the services sector within Australia. Regardless, policymakers should be aware that increases in the volume of money may negatively impact productivity regimes that produce end products.

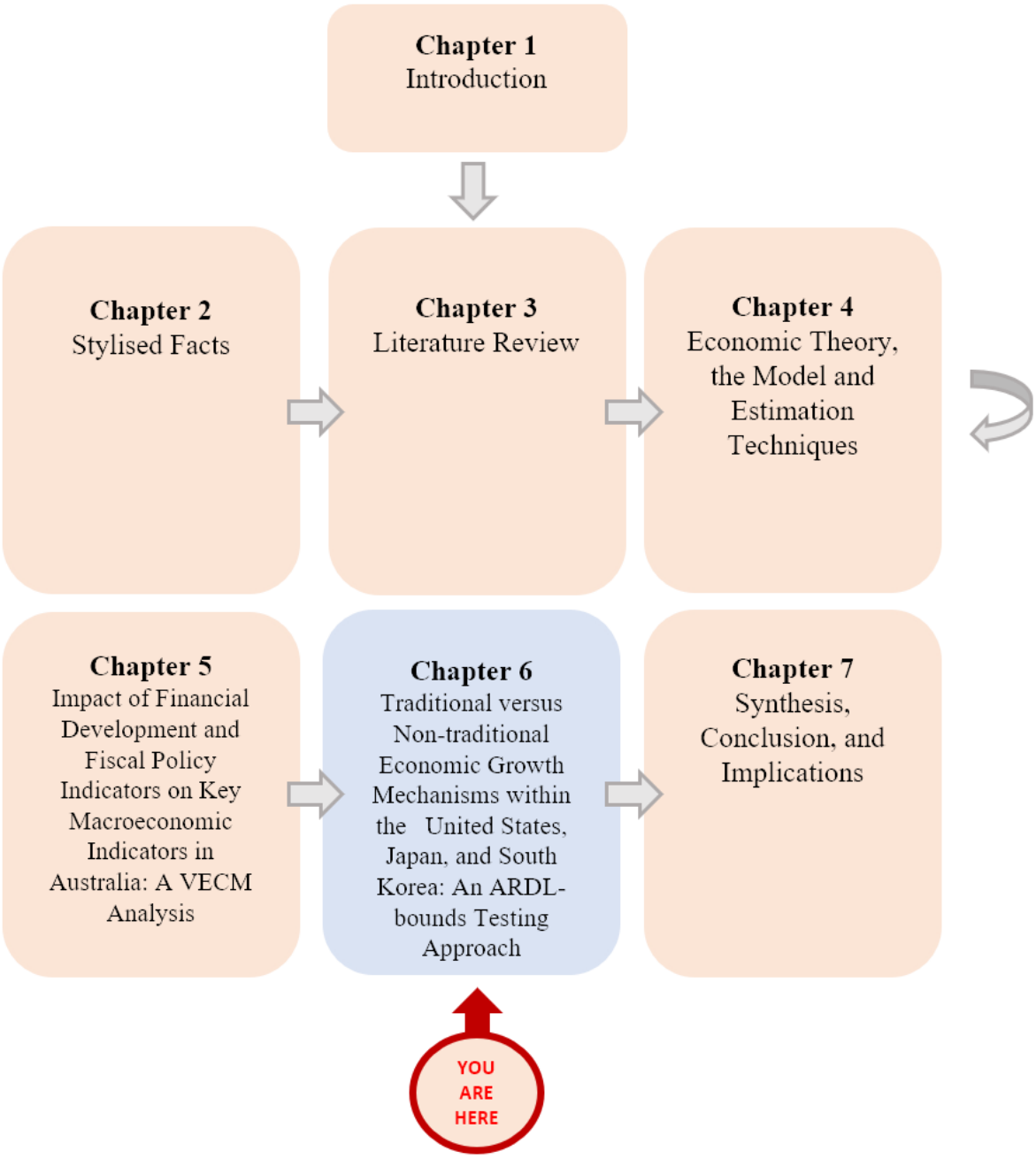
This study incorporated fiscal policy within five individual models, resulting in positive and negative statistically significant results. In examining the relationship between investment and government expenditure, positive and negative causal effects have been found in this study. As previously discussed, government expenditure can hold either a crowding-in effect, whereby increases in government expenditure increase private-sector investment, or a crowding-out effect, where such increases in government expenditure lead to decreases in private-sector investment. If an economy is below full capacity, increases in government expenditure can positively influence economic growth through the multiplier effect, encouraging firms to invest more. In the case of crowding-out effects, private sector savers tend to purchase government bonds, reducing savings to fund other types of investment. Also, financed expansionary government spending often increases interest rates, negatively impacting private-sector investment (Ko, 2019). In terms of savings, Keynes (1936) recognised that households might increase savings due to future uncertainty, therefore consuming less, representing a diminishing circular flow of income. The long-run results suggest that an increase in government expenditure increases savings. That is, households in Australia increase savings due to future uncertainty in the long run when government expenditure increases, therefore consuming less, representing a diminishing circular flow of income. In the short run, however, an increase in government expenditure reduces household savings, thus inducing increases in consumption.

Negative causal effects have been found in this study when examining the relationship between income distribution and government expenditure. This may be due to: 1) most government expenditure is captured by the middle class (Branko & Milanovic, 1994); 2) government expenditure towards education and health may be disproportionately allocated towards middle-class urban centres (Davoodi et al., 2003); and 3) a decline in public housing and educational expenditures points to a negative impact towards income distribution (Martinez-Vazquez et al., 2012). The causal effects of government expenditure towards net exports within this study were negative in the long run. In examining such negative causal effects on net exports, government expenditure injects money into the circular economy, causing an increase in aggregate demand and the prices of goods. Bond price levels decrease as government bond supply increases to finance government expenditure. When interest rates increase over time, domestic and foreign investors keep and demand more currency within the domestic market through net capital outflow reductions. The market for foreign currency exchange also shifts, whereby a shift in the supply curve increases the real exchange rate. Such appreciation harms the competitiveness of the economy, as exports will reduce, and imports

will increase. Government expenditure only holds a negative relationship with net exports in the long run.

In conclusion, this chapter has presented a rich assortment of selected models within a Kaleckian post-Keynesian macroeconomic framework. The money supply indicator provided the most influential results towards the dependent variables, while government expenditure was the most influential overall through strong causal effects. Besides income distribution, all models exhibited joint long-run cointegration with a significant ECT, showing that the incorporation of the financial development and fiscal policy indicators is warranted. As it was shown that government expenditure is the more powerful mechanism, its permanent incorporation into the Kaleckian post-Keynesian macroeconomic framework should be taken seriously.

Thesis Structure



Some sections of the material in this chapter were adapted for publication in the following referenced conferences and journal articles:

Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better – Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), Cairns, 1-3 July.

Journals

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2): 163-184.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

Chapter 6: Traditional versus Non-traditional Economic Growth Mechanisms within the United States, Japan, and South Korea: An ARDL-Bounds Testing Approach

Abstract

In exploring the impacts of financial development (*fd*) and fiscal policy (*fp*) upon the key macroeconomic indicators of the selected economies of the United States, Japan, and South Korea, this chapter utilises an augmented Kaleckian post-Keynesian macroeconomic framework. In this framework, investment, savings, income distribution, productivity growth, and net exports are perceived as key macroeconomic indicators. Following Chapter 5, in capturing the aims of this thesis, this chapter explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented Kaleckian post-Keynesian macroeconomic framework; and 2) the employment of commonly utilised and contemporary measures of *fd*. The aims of this chapter are aligned with research gaps and questions 1 and 2, as shown in Chapter 1. In this chapter, commonly used indicators include monetisation and domestic credit, while contemporary measures include stock market turnover, liquid liabilities, and credit to government and state-owned enterprises. As per Chapter 5, the *fp* indicator is described as government expenditure.

In its annualised form, this chapter utilises historical data from 1980-2019. It incorporates autoregressive distributed lag (ARDL) modelling techniques to test for long and short-run causality and their implications for the economic theory. While Chapter 5 analysed five models for Australia data, this chapter analysed 15 models. Of note, the results of the productivity growth models are also shown by a published paper[8] and were also presented[9]. Likewise, the results of the savings models are also shown by a paper[10] under review and were also presented[11]. While both papers focus on the long and short-run causal effects upon productivity growth and savings within the selected economies, there was also interest in testing their resilience against exogenous shocks and changes. While this chapter analyses the results of the causal relationships between the key macroeconomic indicators and *fd* and *fp*, both published papers hold a point of difference, being the inclusion of impulse response functions (IRF) and variance decompositions (VD) to test the strength of resilience against exogenous shocks and changes, analysing their speeds of adjustment and recovery. Such results are aligned with research gaps and questions 1, 2, and 3, as shown in Chapter 1.

All models exhibit a statistically significant error-correction term (ECT). Complications arose with the net exports model utilising Japan data, showing that unstable

[8] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

[9] The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2021. Conference details are here.

[10] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

[11] The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2022. Conference details are here.

parameters exist, indicating that the regression coefficients are changing suddenly, which is undesirable. The remaining models successfully passed diagnostic testing. Therefore, the results of 14 out of the 15 models can be taken seriously. Contemporary measures of *fd* exhibited a stronger influence on the dependent variables, whereby liquid liabilities were the most influential. Regarding more traditional measures of *fd*, domestic credit exhibited a stronger influence over monetisation. Government expenditure was found to exhibit the strongest influence of all incorporated indicators within the framework, showing moderate to very strong influence towards the dependent variables. Regardless, the ECT results show that the inclusion of both *fd* and *fp* indicators is mostly warranted within this study, suggesting that the permanent inclusion into the Kaleckian post-Keynesian macroeconomic framework should be taken seriously.

6.0 Introduction

Following Chapter 5, this chapter explores the impact of two powerful growth instruments, *fd* and *fp*, within an augmented Kaleckian post-Keynesian macroeconomic framework. As previously discussed, Chaiechi (2012) has provided evidence that such incorporations within the framework have been largely absent from the literature. In capturing the aims of this thesis, this chapter explores: 1) the estimation and analysis of the impacts of *fd* and *fp* within an augmented Kaleckian post-Keynesian macroeconomic framework; and 2) the employment of commonly utilised and contemporary measures of *fd*. The aims of this chapter are aligned with research gaps and questions 1 and 2, as shown in Chapter 1. In this chapter, commonly used indicators include monetisation and domestic credit, while contemporary measures include stock market turnover, liquid liabilities, and credit to government and state-owned enterprises. As per Chapter 5, the fiscal policy indicator is described as government expenditure.

As Chapter 5 contained all *I(1)* time series, VECM methodology and processes were employed for the economy of Australia. As the data utilised within this chapter includes both *I(0)* and *I(1)* time series during annualised periods 1980-2019 for the selected economies of the United States, Japan, and South Korea, ARDL modelling methodology is appropriate using Pesarn-Shin-Smith (2001) processes. Therefore, the long and short-run relationships among the variables can be analysed within an error-correction (EC) framework, utilising cointegration analysis via the Narayan (2004) finite sample critical bounds test (i.e., F-statistic).

While Chapter 5 incorporated five augmented models for analysis, this chapter analyses 15 augmented models, including two emulated journal articles for the productivity[12] and savings[13] models. While this chapter analyses the results of the causal relationships between the key macroeconomic indicators and *fd* and *fp*, both papers hold a point of difference, being the inclusion of IRFs and VDs to test the strength of resilience against exogenous shocks and

[12] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

[13] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

changes, analysing their speeds of adjustment and subsequent recovery. The results of such further analysis are not incorporated within this chapter. Therefore, this chapter explains the econometric model, the data, and the methods, followed by an analysis of the selected models. The analysis will establish the theoretical model and variable definitions, lag length selection, F-statistics, error-correction models (ECM), and associated results. Results and discussion will follow, describing those relationships that are both for and against the economic theory, analysing the consequences of each where necessary. It is important to note that the variable definitions are intricately tied to Chapter 5.

6.1 The Econometric Model, Data, and Methodology

This section analyses the econometric model, data, and methodologies. While the original models have not changed, the incorporated data and methodologies have. While Chapter 5 analysed Australia data during 1980-2015 via VECM methodology, this chapter analyses the selected economies of the United States, Japan, and South Korea during annualised periods 1980-2019. The following expands upon the ARDL framework, requiring the use of the F-statistics in testing for a single unidirectional cointegrating vector, instead of the Johansen method, which tests for multiples. The ARDL framework is more robust, whereby the dependent and independent variables are not limited to sharing the same number of lagged coefficients, allowing for multiples to find the best-fitting model.

6.1.1 The Econometric Model

In this chapter, research gaps and questions 1 and 2 are analysed. In line with Chapter 5, this chapter aims to explain the relationships between the selected *fd* and *fp* indicators towards each of the key macroeconomic indicators, whereby:

Investment: $$inv_t = a_0 + a_1 ut_t + a_2 \pi_t + a_3 ir_t + a_4 pg_t + a_5 fd_t + a_6 fp_t + \varepsilon_t, \quad (6.1)$$

Savings: $$s_t = \beta_0 + \beta_1 ut_t + \beta_2 \pi_t + \beta_3 fd_t + \beta_4 fp_t + \varepsilon_t, \quad (6.2)$$

Income Distribution: $$\pi_t = \gamma_0 + \gamma_1 ut_t + \gamma_2 u_t + \gamma_3 pg_t + \gamma_4 fd_t + \gamma_5 fp_t + \varepsilon_t, \quad (6.3)$$

Productivity Growth: $$pg_t = \tau_0 + \tau_1 inv_t + \tau_2 ut_t + \tau_3 fd_t + \tau_4 fp_t + \varepsilon_t, \quad (6.4)$$

Net Exports: $$nx_t = \delta_0 - \delta_1 ut_t + \delta_2 \pi_t + \delta_3 fd_t + \delta_4 fp_t + \varepsilon_t, \quad (6.5)$$

whereby,

inv_t: Normalised investment,
s_t: Normalised domestic savings,
ut_t: Capacity utilisation proxied by output/Capital ratio,
π_t: Profit share,
ir_t: Interest rate,
nx_t: Net exports,
u_t: Unemployment rate,
pg_t: Productivity growth,
fd_t: Financial development indicator,
fp_t: Fiscal policy indicators,
ε_t: Random disturbance term with certain properties,
a_i: i = 0, 1, 2, 3, 4, 5, and 6 are unknown parameters to be estimated,

β_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
γ_i: i = 0, 1, 2, 3, 4, and 5 are unknown parameters to be estimated,
τ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
δ_i: i = 0, 1, 2, 3, and 4 are unknown parameters to be estimated,
t: Time index.

6.1.2 Data, Characteristics, and Methodology

The selected economies included in the study are members of the APEC and were chosen based on their strong financial markets, openness to international trade, well-established democratic governments, and availability of reliable data for analysis, particularly in relation to *fd* measurements. Annualised datasets from 1980-2019 were obtained from trusted sources (Table 6.1). Each time series consisted of 40 observations. Descriptive statistics for the variables are provided in Appendices 5-7. While most datasets were pre-calculated using sources shown in Table 6.1, some variables required manual calculations as per Chapter 5.

The *fd* indicators used in the study were obtained in annualised form from the GFDD provided by the World Bank. Although the GFDD database covered characteristics from 214 economies and included 109 distinct indicators, as of 2019, only a limited selection of indicators spanning the entire study period was available. Given the broad range of indicators and the specific objectives of the thesis, it was important to compare commonly used and contemporary measures. All datasets were collected and consolidated into a single Excel spreadsheet for analysis using EViews 11 software, a prominent tool for econometrics and time-series-analysis. The software offers detailed user guides providing step-by-step instructions for researchers, from importing Excel spreadsheets to analysing outputs from ARDL models. The calculations and ratios used in the study are presented in Table 6.1, and their economic implications are discussed throughout the chapter.

In terms of methodology, this chapter adopts ARDL modelling to establish long and short-run unidirectional causality, as introduced by Pesaran et al. (1996), Pesaran and Pesaran (1997), and Pesaran and Shin (1995, 1999). While more traditional cointegration methods require all variables to be *I(1)*, as per Engle and Granger (1987) and Johansen and Juselius (1990), ARDL methodology contains important advantages, including: 1) the non-requirement for unit-root pretesting, regardless of whether the underlying variables are purely *I(0)*, *I(1)*, or a mixture of both; 2) the process can distinguish between dependent and independent variables, deriving the ECM through a simple linear transformation; 3) allowing for various lag lengths within a single model; and 4) the process can be applied to smaller sample sizes. As each time series contains 40 observations, the critical values proposed by Narayan (2004) are suitable for observations between 30 and 80. The ARDL process utilises standard least squares regression, whereby the following must be met: 1) the dependent variable must be *I(1)*; and 2) no *I(2)* variables exist.

This study followed a three-stage process, as suggested by Narayan and Smyth (2005), Narayan and Narayan (2006), and Pan and Mishra (2018). This process involved: 1) testing for

a long-run relationship using the F-test within a single model; 2) estimating the parameters of the long-run relationship; and 3) estimating the ECM to analyse short-run dynamics. The F-test has a non-standard distribution, dependent on: 1) whether the model contains *I(0)* or *I(1)* variables; 2) the number of regressors; and 3) whether the model contains a trend and/or intercept. The critical bound F-test tests the null hypothesis of no cointegration against the alternative. If the value of the F-statistics falls outside the critical bounds, a conclusion of cointegration can be made (Narayan & Smyth, 2005). For rejection of the null to occur, cointegration exists, and the F-statistic must be above the upper bound. If cointegration exists, step 2 is introduced through a lag selection, after which OLS technique methods estimate the selected model. While ARDL methodology is shown in Chapter 4, specific empirical specifications will only be shown in section 6.3.

Table 6.1. Data Sources. 1980-2019

Variables	Calculation	Data Sources
Investment	Investment/NGDP Ratio (INV)	World Development Indicators: World Bank
Savings	Domestic Savings/NGDP Ratio (S)	World Development Indicators: World Bank
Capacity Utilisation	NGDP/Stock of Capital Ratio (UT)	World Development Indicators: World Bank
Profit Share	(1-Wb)u (P)	World Development Indicators: World Bank, Penn World Table, Statista
Interest Rate	Lending Interest Rate: GDP Deflator Adjusted (IR)	World Development Indicators: World Bank
Productivity Growth	Stock of Capital/Labour Ratio (PG)	IMF Fiscal Affairs Department, World Development Indicators: World Bank, Penn World Table
Unemployment Rate	Harmonised Unemployment Rate, Total: All Persons, Percent, Annual, Not Seasonally Adjusted (U)	Federal Reserve Economic Data
Net Exports	Imports - Exports/NGDP Ratio (NX)	World Development Indicators: World Bank
Financial Development Indicator	Total Value of Shares Traded/Average Market Capitalisation Ratio (SMTR) Credit by Domestic Money Banks to a Government and State-Owned Enterprises/NGDP Ratio (CGSO) Liquid Liabilities/NGDP Ratio (LL) Broad Money/NGDP Ratio (MR) Domestic Credit/NGDP Ratio (DC)	Global Financial Development Database: World Bank
Fiscal Policy Indicator	Government Expenditure/NGDP Ratio (GE)	World Development Indicators: World Bank
Nominal GDP	Nominal Gross Domestic Product (NGDP)	World Development Indicators: World Bank

6.2 Selected Models

The model selection process follows Chapter 5, satisfying aim 1 of this study. In exploring aim 1, this chapter aims to incorporate a single *fd* indicator and a single *fp* indicator in testing each model. In expanding research gap 1 of this study, this chapter compares commonly utilised and contemporary measures of *fd*. As seen in Table 6.3, the model *INV=f(UT, P, IR, PG, SMTR, GE)* was selected based on selection processes. Table 6.3 shows all selected augmented models in this chapter.

Table *6.2. Tested Models for Investment*

Models
INV = *f*(UT, P, IR, PG, MR, GE)
INV = *f*(UT, P, IR, PG, DC, GE)
INV = *f*(UT, P, IR, PG, SMTR, GE)
INV = *f*(UT, P, IR, PG, CGSO, GE)
INV = *f*(UT, P, IR, PG, LL, GE)

INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, MR = Monetisation Ratio, DC = Domestic Credit, SMTR = Stock Market Turnover Ratio,

CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, GE = Government Expenditure.

Table 6.3. Selected Models. USA, Japan, and South Korea

Investment	**Model No.**	**Models**
United States	(1)	INV = *f*(UT, P, IR, PG, SMTR, GE)
Japan	(2)	INV = *f*(UT, P, IR, PG, MR, GE)
South Korea	(3)	INV = *f*(UT, P, IR, PG, CGSO, GE)
Savings	**Model No.**	**Models**
United States	(4)	S = *f*(UT, P, DC, GE)
Japan	(5)	S = *f*(UT, P, CGSO, GE)
South Korea	(6)	S = *f*(UT, P, LL, GE)
Income Distribution	**Model No.**	**Models**
United States	(7)	P = *f*(UT, U, PG, LL, GE)
Japan	(8)	P = *f*(UT, U, PG, LL, GE)
South Korea	(9)	P = *f*(UT, U, PG, DC, GE)
Productivity Growth	**Model No.**	**Models**
United States	(10)	PG = *f*(INV, UT, SMTR, GE)
Japan	(11)	PG = *f*(INV, UT, MR, GE)
South Korea	(12)	PG = *f*(INV, UT, DC, GE)
Net Exports	**Model No.**	**Models**
United States	(13)	NX = *f*(UT, P, SMTR, GE)
Japan	(14)	NX = *f*(UT, P, LL, GE)
South Korea	(15)	NX = *f*(UT, P, LL, GE)

INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, DC = Domestic Credit, LL = Liquid Liabilities, GE = Government Expenditure.

6.3 Results: Investment Model

This chapter analyses the selected models, i.e., (6.1)-(6.5) in section 6.1.1, whereby each model will be analysed sequentially, starting with the augmented investment model. While this section analyses the theoretical model and variable definitions, expanding upon and explaining the empirical specifications is also necessary. This will be followed by testing for stationarity, lag length, bounds F-testing, and long and short-run ARDL-ECM dynamics analysis. It is important to note that the following variable definitions are intricately tied to Chapter 5.

6.3.1 Empirical Specifications

The augmented investment models for the United States, Japan, and South Korea are analysed within this section, shown in Table 6.3 as models (1), (2), and (3). In analysing the empirical specification process, the investment model for the United States data will be of use, being *INV=f*(*UT*, *P*, *IR*, *PG*, *SMTR*, *GE*). As empirical specifications in this study are lengthy, this chapter sets out to analyse this process for the investment model only. The estimation of the ECM requires ARDL processes to cointegration, as per Pesaran et al. (2001), whereby investment and its determinants can be defined as, where *j* = (1, 2, 3, 4, 5, 6, 7):

$$\Delta INV_t = a_0 + \sum_{i=1}^{n} a_{ji}\,\Delta INV_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta UT_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta P_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta IR_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta PG_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta SMTR_{t-i} + \sum_{i=0}^{n} a_{ji}\,\Delta GE_{t-i} + a_8\,INV_{t-1} + a_9\,UT_{t-1} + a_{10}\,P_{t-1} + a_{11}\,IR_{t-1} + a_{12}\,PG_{t-1} + a_{13}\,SMTR_{t-1} + a_{14}\,GE_{t-1} + \varepsilon_t. \quad (6.6)$$

Pearson's bound F-test is incorporated into the model (6.6) to test whether a long-run relationship exists. Following Narayan and Smyth (2005) and Narayan and Narayan (2006), unrestricted error-correction regressions are estimated, taking each variable in turn as the

dependent. When such a relationship exists, the F-test indicates which variable should be normalised and reported (i.e., one cointegrating relationship exists).

The null hypothesis of no cointegration contained within the variables for model (6.6) is $H_0 : a_8 = a_9 = \dots a_{14} = 0$, against the alternative $H_1: a_8 \neq a_9 \neq \dots a_{14} \neq 0$. If the F-statistics fall outside the critical bounds, a decision can be made about whether cointegration exists, whereby one set refers to an *I(1)* time series, and the other set refers to an *I(0)* time series. If the F-statistic falls outside the critical upper bound, evidence of a long-run relationship exists, whereby the null of no cointegration is rejected. If the F-statistic falls within the lower and upper bounds, the test produces an inconclusive result. If the F-statistic falls below the critical bound, a long-run relationship does not exist (i.e., the non-existence of cointegration). If cointegration is found (i.e., a long-run relationship), the following ARDL*(m, n, p, q, r, s, l)* model can be estimated:

$$INV_t = a_0 + \sum_{i=1}^{m} a_1\, INV_{t-i} + \sum_{i=0}^{n} a_2\, UT_{t-i} + \sum_{i=0}^{p} a_3\, P_{t-i} + \sum_{i=0}^{q} a_4\, IR_{t-i} + \sum_{i=0}^{r} a_5\, PG_{t-i} + \sum_{i=0}^{s} a_6\, SMTR_{t-i} + \sum_{i=0}^{l} a_7\, GE_{t-i} + \varepsilon_t. \quad (6.7)$$

The lags and their orders within the ARDL-ECM can be selected by various methods, such as the Akaike Information Criterion (AIC). Once lag selection has occurred, the model is estimated by the OLS method. In the presence of cointegration, short-run dynamics can be derived by constructing the investment model through the following ECM:

$$\Delta INV_t = a_0 + \sum_{i=1}^{n} a_1\, \Delta INV_{t-i} + \sum_{i=0}^{n} a_2\, \Delta UT_{t-i} + \sum_{i=0}^{n} a_3\, \Delta P_{t-i} + \sum_{i=0}^{n} a_4\, \Delta IR_{t-i} + \sum_{i=0}^{n} a_5\, \Delta PG_{t-i} + \sum_{i=0}^{n} a_6\, \Delta SMTR_{t-i} + \sum_{i=0}^{n} a_7\, \Delta GE_{t-i} + \theta ECM_{t-1} + \varepsilon_t, \quad (6.8)$$

whereby the ECM can be defined as:

$$ECM_t = INV_t - a_0 - \sum_{i=1}^{m} a_1\, INV_{t-i} - \sum_{i=0}^{n} a_2\, UT_{t-i} - \sum_{i=0}^{p} a_3\, P_{t-i} - \sum_{i=0}^{q} a_4\, IR_{t-i} - \sum_{i=0}^{r} a_5\, PG_{t-i} - \sum_{i=0}^{s} a_6\, SMTR_{t-i} - \sum_{i=0}^{l} a_7\, GE_{t-i}. \quad (6.9)$$

All coefficients within equation (6.8) are the short-run dynamics of the model, showing the convergence to the equilibrium through the speed of adjustment via the ECM. The ARDL processes of (6.6)-(6.9) are followed not only for the investment models of (1), (2), and (3) within Table 6.3 but also for the models of savings (4, 5, and 6), income distribution (7, 8, and 9), productivity growth (10, 11, and 12), and net exports (13, 14, and 15).

6.3.2 The Theoretical Model and Variable Definitions

This section explores the investment models (1), (2), and (3) within Table 6.3. In analysing model (6.1), the original investment model is defined as *INV=f(UT, P, IR, PG),* whereby the investment is a function of the explanatory variables. Table 6.3 shows the variable combinations of SMTR, MR, CGSO, and GE are incorporated into models (1), (2), and (3). The selected models contain a commonly used *fd* indicator, MR, and two contemporary measures of *fd*, SMTR and CGSO. While Chapter 5 described the theory and calculations for the explanatory variables of investment (i.e., UT, P, IR, PG, SMTR, GE), the following section

explores the relationship of MR and CGSO towards investment contained within the augmented models for Japan and South Korea.

Monetisation is a commonly used measure of financial depth, described as the money supply within an economy, as per McKinnon (1973) and Shaw (1973). An increase in money supply can reduce real interest rates, promoting more investment and consumption within an economy. In theory, the MR holds a positive relationship towards investment. A state-owned enterprise (SOE) is defined as an organisation that is a legal entity of a government tasked with partaking in commercial activities (Yu, 2014). The government can partly or wholly own the entity and is defined as an efficiency indicator. Currently, no literature explores the influence of CGSO towards investment within South Korea. However, some case studies examine the transparency of SOEs within South Korea. Lee (2014) explores government support for SOEs, exploring money amounts and management performance. Although detailed, the case study does not refer to the influence of CGSO towards investment. As of late 2022, nine large government-owned companies operated within South Korea in broadcasting, air travel and ports, railways, electric power, land and housing, oil/gas, and banking. Regardless, this indicator may have either a positive or negative relationship towards investment.

6.3.3 Testing for Stationarity

Before cointegration testing, analysis of descriptive statistics and unit-root testing is incorporated. Descriptive statistics for all time series are found in Appendices 5-7, while Appendices 8-10 show unit-root testing, whereby the rejection of the null occurs at the 10% statistical significance level. For each variable, the order of integration is tested via the ADF and PP methods. For time series exhibiting a trend, the result is reported under trend, or intercept + trend, while those time series exhibiting no trend are reported under intercept, or intercept only. Although one of the advantages of the ARDL method is the non-requirement for unit-root pretesting, regardless of whether the underlying regressors are purely *I(0)*, *I(1),* or a mixture of both, none of the variables can be *I(2)*. Appendices 8-10 show that the unit-root testing results show a mixture of *I(0)* and *I(1)* time series.

Pre-testing can be problematic, as the power of unit-root testing is typically low, whereby a switch in the distribution function of the test statistics can occur as one or more unit-roots approach unity (Pesaran & Pesaran, 1997). Arltova and Fedorova (2016) utilise various forms of unit-root testing for time series in analysing the appropriate unit-root testing method based on the length between 25-500. As the time series within this study contains 40 observations, the following is taken into consideration: for time series containing t=25 usable observations, the PP and ADF are most appropriate in such an order, while time series containing t=50 show that the ADF and PP are most appropriate in such an order, while the ADF is most suitable as time series increase to t=100, and t=500. Regardless of the low power of both tests, the ADF and PP methods show no *I(2)* time series, satisfying ARDL processes.

6.3.4 Lag Length Selection

The selected investment models (1), (2), and (3) in Table 6.3 require the process of lag selection. As per Chapter 5, the data allows for testing up to three lags. Table 6.4 shows the selected lag lengths for all models, showing that a lag selection of three is appropriate for the

time series, utilising model selection criteria. The Hendry (1993) 'General-to-Specific Approach', via parsimonious specification, will ultimately decide which lag lengths are appropriate for the ARDL-ECMs.

Table 6.4. Lag Lengths Investment Model: Lags 3

United States						
INV = *f*(UT, P, IR, PG, SMTR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	624.78	NA	0	-33.39	-33.09	-33.29
1	871.96	387.47	0	-44.11	-41.66*	-43.25
2	947.15	89.40*	0	-45.52	-40.95	-43.91
3	1028.15	65.68	2.51e-29*	-47.25*	-40.55	-44.88*
Japan						
INV = *f*(UT, P, IR, PG, MR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	657.36	NA	0	-35.15	-34.85	-35.05
1	817.1	250.4	0	-41.14	-38.70*	-40.28
2	879.91	74.69521*	0	-41.89	-37.32	-40.28
3	948.71	55.78	1.84e-27*	-42.95*	-36.25	-40.59*
South Korea						
INV = *f*(UT, P, IR, PG, CGSO, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	543.93	NA	0	-29.02	-28.72	-28.92
1	712.16	263.71	0	-35.47	-33.03*	-34.61
2	762.8	60.22	0	-35.56	-30.99	-33.95
3	848.68	69.62*	4.10e-25*	-37.55*	-30.85	-35.18*

* Indicates lag order selected by the criterion. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure. Criteria: (LR) = Likelihood Ratio, (FPE) = Final Prediction Error, (AIC) = Akaike Information Criterion, (SC) = Schwarz Information Criterion, (HQ) = Hannan-Quinn Criterion.

6.3.5 F-Statistic

In the next step of the ARDL process, the long-run relationships among the variables in models (1), (2), and (3) are tested using the Narayan (2004) finite sample critical bounds test. Following the approach of Narayan and Smyth (2005) and Narayan and Narayan (2006), each variable in the models is treated as the dependent variable in a parsimonious ARDL model during the bounds testing procedure. The F-test is then used to determine which variable should be normalised and reported, indicating the presence of a long-run relationship. Following Nkoro and Uko (2016), alternated lags of the variables are presented, models re-estimated and then compared, ensuring Gaussian error terms exist (i.e., the standard errors are free from heteroskedasticity, autocorrelation, and do not suffer from non-normality). The estimates from the best-performed become the long-run coefficients. The calculated F-statistics are shown in Table 6.5, with models (1) and (2) showing F-statistics of 10.87 and 9.21, above the *I(1)* critical bounds (CB) of 5.12 at the 1% statistical significance level. In contrast, model (3) shows an F-statistic of 4.29, above the *I(1)* critical bounds of 3.86 at the 5% statistical significance level. Therefore, a cointegrating relationship among the variables in each model exists.

Table 6.5. F-Statistic of Cointegration Relationship: Investment

Country	**No.**	**Models**	**ARDL Models**	**F-Statistic**	**CB 1%**	**CB 5%**	**Result**
United States	(1)	INV = *f*(UT, P, IR, PG, SMTR, GE)	(3, 1, 3, 3, 3, 3, 2)	10.87***	I(0): 3.50 I(1): 5.12		Cointegration
Japan	(2)	INV = *f*(UT, P, IR, PG, MR, GE)	(1, 3, 2, 3, 0, 1, 3)	9.21***	I(0): 3.50 I(1): 5.12		Cointegration
South Korea	(3)	INV = *f*(UT, P, IR, PG, CGSO, GE)	(2, 3, 3, 1, 1, 1, 1)	4.29**		I(0): 2.61 I(1): 3.86	Cointegration

Null Hypothesis: No Cointegration. 1 = Model One, 2 = Model Two, 3 = Model Three. K = 6. Based on Narayan (2004), F-statistic, where *** Significant at 1%, ** Significant at 5%. CB 1% = Critical Bounds at 1%, CB 5% = Critical Bounds at 5%. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure.

6.3.6 Long-Run Dynamics: ARDL Analysis

The empirical results of the long-run coefficients of models (1), (2), and (3) are presented in Table 6.6. Ongoing, statistically significant results are implied to be significant while interpreting the results. Interpretation of the long-run dynamics through the coefficients is as follows: United States data shows positive long-run unidirectional causality running from PG and SMTR towards investment at the 5% and 1% statistical significance level, while UT, P, IR, and GE show non-significant causality towards investment. That is, PG and SMTR hold causality towards investment in the long run in a unidirectional fashion. In explaining the results in Table 6.6, utilising the United States data, a 1% increase in PG increases investment by 0.51% in the long run. Japan data shows mostly negative significant long-run unidirectional causality running from all explanatory variables, besides UT, towards investment. South Korea data shows mostly negative significant long-run unidirectional causality running from the explanatory variables towards investment, with UT showing positive causality, while P and CGSO show non-significance.

Overall, the long-run results show that the coefficients of UT, IR, and SMTR are of expected significant coefficient sign, while P and MR show negative and significant causality towards investment. Through the United States and South Korea data, productivity growth offers mixed results, showing positive and negative significant unidirectional causality towards investment. An important causal relationship (i.e., economic significance) runs from IR to investment, being negative and significant for Japan and South Korea data. Analysing the results of the *fd* indicators, SMTR and MR show significant yet weak unidirectional causality towards investment. In contrast, CGSO shows no significant long-run unidirectional causality towards investment. Japan and South Korea data show that GE holds negative significant unidirectional causality towards investment, being a long-run crowding-out effect.

Table 6.6. Long-Run Models. Dependent Variable: Investment

Variable	**1 - United States**	t-Stat.	**2 - Japan**	t-Stat.	**3 - South Korea**	t-Stat.
UT	-0.005	-0.02	0.92***	4.11	0.48**	2.25
P	-0.39	-0.93	-0.34***	-9.66	-0.08	-0.72
IR	-0.11	-0.54	-0.68**	-2.63	-1.19**	-2.42
PG	0.51**	2.69	0.09	0.62	-1.59***	-2.98
SMTR	0.02***	3.43				
MR			-0.04**	-2.63		
CGSO					-0.74	-1.56
GE	-0.38	-1.20	-0.60***	-4.70	-0.69*	-2.07
C	0.47***	3.72	0.19**	2.34	0.47**	2.84

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure.

6.3.7 Short-Run Dynamics Derived from the Long-Run Model: A ARDL Analysis

The empirical results of the models (1), (2), and (3) are presented in Table 6.7. As stated previously, each model is subject to the Hendry (1993) 'General-to-Specific Approach' in obtaining parsimonious specification. All models show a negative and significant ECT, suggesting a long-run equilibrium relationship between the explanatory variables and investment exists. That is, the variables share a common underlying stochastic trend along which they move together on a non-stationary path. In examining the ECT result for the United States data, being model (1), 42% of departures from the long-run equilibrium are corrected in

each period after a shock to the system (i.e., speeds of adjustment). The United States data shows the most inclusive parsimonious model, with most short-run coefficients showing significant results. In terms of coefficient analysis, where lagged and non-lagged coefficients are evident, the interpretation of short-run dynamics will account for coefficients jointly. Therefore, the interpretation of the short-run dynamics (i.e., none, first, and secondary) is as follows: United States data shows moderate to strong positive causality running from UT, P, PG, and GE towards investment, while IR holds negative causality. While the result of IR shows that the economic theory holds (i.e., there is a negative relationship between IR and investment), such a relationship only holds in the short run. Similar to the long-run result, SMTR holds weak causality towards investment. When compared to SMTR, GE holds stronger causality.

Of all models, Japan data shows an ECT result closest to 1, or 100%, whereby 78% of departures from the long-run equilibrium are corrected in each period. Interpretation of the short-run dynamics is as follows: Japan data shows strong positive causality running from UT, P, and GE towards investment, while IR and MR exhibit negative causality. Of note, the coefficients of PG are not included within the selected parsimonious model, meaning that the coefficients hold no statistical significance towards investment. The significant MR coefficient shows a weak unidirectional influence towards investment in the short run, in line with the long-run result. Following the United States data, GE holds stronger causality towards investment compared to MR. South Korea data shows that 47% of departures from the long-run equilibrium are corrected in each period. Interpretation of the short-run dynamics is as follows: UT and PG show strong negative causality towards investment against the economic theory. In contrast, P and IR show strong causality in line with the economic theory. The result of CGSO shows the strongest *fd* influence towards investment when comparing models (1)-(3), meaning that a 1% increase in funding towards state-owned enterprises causes a 1.07% decrease towards investment in the short run. Unlike the previous models of the United States and Japan, GE holds no short-run causality towards investment.

To check reliability, this study incorporated diagnostic testing (i.e., Lagrange Multiplier (LM) for serial correlation, normality of residual terms, ARCH effects, Ramsey's RESET testing, alongside CUSUM and CUSUMSQ analysis). The ARDL-ECMs pass all diagnostic tests. Inspection of the CUSUM and CUSUMSQ graphs (Appendix 11) indicates stability. Such stability indicates that no systematic change was detected in the ARDL-ECMs coefficients at a 5% statistical significance level over the period, meaning no structural break was detected.

Table 6.7. Error-Correction Models. Dependent Variable: Investment

Variable	**1 - United States**	t-Stat.	**2 - Japan**	t-Stat.	**3 - South Korea**	t-Stat.
ECT	**-0.42*** **	**-11.74**	**-0.78*** **	**-10.20**	**-0.47*** **	**-6.91**
D(INV(-1))	0.44***	5.59			0.72***	5.44
D(INV(-2))	0.57***	8.55				
D(UT)	0.63***	10.65	-0.04	-0.24	-0.73***	-3.81
D(UT(-1))			-0.12	-0.61	-1.24***	-4.89
D(UT(-2))			0.55***	3.51	-0.29**	-2.42
D(P)	0.14**	2.45	0.01	0.18	0.03	0.68
D(P(-1))	0.36***	5.56	0.34***	6.26	0.12**	2.28
D(P(-2))	-0.14**	-2.91			0.20***	4.07

D(IR)	-0.08**	-2.66	-0.67***	-7.92	-0.24*	-2.01
D(IR(-1))	-0.06**	-2.21	-0.10	-1.20		
D(IR(-2))	-0.10***	-3.50	0.15*	1.89		
D(PG)	0.34***	11.58			-0.31***	-4.33
D(PG(-1))	0.02	1.32				
D(PG(-2))	0.05***	3.97				
D(SMTR)	0.01***	8.35				
D(SMTR(-1))	0.00***	3.72				
D(SMTR(-2))	-0.01***	-5.32				
D(CGSO)					-1.07***	-4.88
D(MR)			-0.06***	-6.15		
D(GE)	-0.04	-0.74	-0.02	-0.20	0.08	0.67
D(GE(-1))	0.28***	5.67	0.69***	7.37		
D(GE(-2))			0.67***	7.93		

Goodness of Fit and Diagnostic Tests for the Investment Model			
	1 - United States	**2 - Japan**	**3 - South Korea**
Adj R-squared.	0.96	0.86	0.66
S.E. of regression.	0.00	0.00	0.01
LM test.	0.12	0.67	0.40
Normality.	0.22	0.93	0.89
ARCH test.	0.79	0.25	0.76
RESET.	0.54	0.32	0.55
CUSUM.		No Structural Break	
CUSUMSQ.		No Structural Break	

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (long-run coefficient signs). D(INV) = (Differenced) Investment, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(IR) = (Differenced) Interest Rate, D(PG) = (Differenced) Productivity Growth, D(SMTR) = (Differenced) Stock Market Turnover Ratio, D(MR) = (Differenced) Monetisation Ratio, D(CGSO) = (Differenced) Credit to Government and State-Owned Enterprises, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, Normality is the Jarque-Bera statistic test for normality, ARCH test is the F-statistic of White heteroskedasticity testing, RESET is the Ramsey regression specification error test, CUSUM is the cumulative sum control chart test, CUSUMSQ is the cumulative sum squared test.

6.3.8 Results and Discussion

The parsimonious specification of each of the selected models (1), (2), and (3) offers different insights as to the sign and influence of each of the coefficient estimates. Analysing each model comes in two forms: 1) whether the economic theory holds for the variables of the original models; and 2) the sign and influence of the incorporated *fd* and *fp* indicators. The following analyses the coefficients as their sums (i.e., none, first, and secondary). The investment model (1) for United States data shows that UT, P, and IR hold no long-run significance towards investment against the economic theory. Short-run relationships towards investment, however, are strong and significant, showing coefficient signs in line with the economic theory. Profit share is positive and significant in the short run, suggesting that the United States data exhibits wage-led mechanisms. The relationship between IR and investment only holds true to the economic theory in the short run, exhibiting weak influence. Of note, SMTR holds a weak yet significant unidirectional relationship towards investment in both the long and short run, while GE holds a short-run positive relationship.

The investment model (2) for Japan data shows that only UT holds a positive long-run relationship towards investment, with all other coefficients showing a negative relationship. Short-run positive relationships towards investment are evident for the coefficients of UT, P, and GE. In analysing P, Japan data holds profit-led mechanisms in the long run while holding wage-led mechanisms in the short run. Comparing P and investment graphically, investment gradually declined from 1980-2019, while P increased over the same period, with some elements of the time series moving in tandem in the short run. Productivity growth holds no significance with investment in either the long or short run, suggesting that changes in

productivity do not significantly influence investment, against the economic theory. The relationship between IR and investment holds true in economic theory in the long and short run, exhibiting strong influence. Monetisation holds a significant yet weak negative unidirectional relationship towards investment in the long and short run. This result suggests that increasing the money supply decreases investment, if only slightly.

The investment model (3) for South Korea data shows that most long-run coefficients, besides UT, hold negative unidirectional causality towards investment. Of note, PG holds negative causality in both the long and short run. Comparing PG and investment graphically, investment gradually declined during the 1980-2019 period, while the decline of PG over the same period was stronger. Productivity growth declined rapidly in South Korea from 1980 to 1987 before accelerating from 1988 to 1998. In analysing PG efficiency within South Korea, Jeong (2019) defines the processes of PG during the period 1970-2016. Efficiency dynamics showed that a biased allocation of land and labour towards agriculture over that of industry existed, alongside a biased allocation of capital towards industry. Over the period, efficiencies towards agriculture declined; however, they later improved, influenced by diverse sources of real income during the transformation period. Utilising a single-sector growth model, Jeong (2017) showed that long-run growth depended on the sustainability of human capital and PG, as opposed to rapid growth and capital accumulation (i.e., investment). Such dependence drew the attention of South Korea's development economists and policymakers, ultimately influencing how the investment was allocated, focusing on developing human capital and further productivity advancement schemes such as R&D. Regarding the relationship between IR and investment, IR holds true to the economic theory in the long and short run, exhibiting strong influence.

While CGSO holds no long-run unidirectional relationship towards investment, CGSO exhibits a strong and significant negative short-run relationship. As explored within Chapter 5, CGSO is deemed an efficiency indicator. As there is a negative unidirectional relationship between CGSO and investment, any efficiency gains within industry negatively impact investment in the short run. This result allows government policymakers to explore alternative measures of efficiency improvements, which could hold a more favourable result towards investment impacts. Of interest, GE only holds a negative causal relationship towards investment in the long run, suggesting that increases in GE hold no short-run influence.

6.4 Results: Savings

This section follows the previous section by: 1) explaining the theoretical model and new variable definitions; 2) analysing stationarity, lag length, and F-statistic testing results; and 3) analysing long-run results and ARDL-ECMs. Of note, the following results are also incorporated within a paper[14] currently under review, utilising not only the ARDL

[14] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

methodology, but also IRFs and VDs to examine savings' resilience against external disturbances, which are not examined within this chapter.

6.4.1 The Theoretical Model and Variable Definitions

This section analyses the savings models (4), (5), and (6) within Table 6.3. The original savings model (6.2) is defined as $S=f(UT, P)$, whereby savings are a positive function of UT and P. Table 6.3 shows that the variable combinations of DC, CGSO, LL, and GE are incorporated into models (4), (5), and (6). The selected models contain one commonly used *fd* indicator, DC, and two contemporary measures, CGSO and LL. While Chapter 5 described the theory and calculations of the explanatory variables towards savings (i.e., UT, P, CGSO, GE), the following explores the relationship of DC and LL towards savings contained within the augmented models for the United States and South Korea data.

Domestic credit (DC), introduced by McKinnon (1973) and Shaw (1973), is a commonly used measure of *fd*, analysing the 'backflow of financial resources to corporate sectors' (Liebscher et al., 2006). Although savings within the Kaleckian post-Keynesian theoretical model are positively derived from P and UT, DC provides capitalists and entrepreneurs with the funds necessary for investment, which determines savings. The relationship between *fd* and savings offers mixed results. Several studies have shown a positive relationship (see King & Levine, 1993; Sahoo & Dash, 2013), while others show a negative (see Loayza et al., 2000; Park & Shin, 2009). In a qualitative and quantitative analysis, Aiyagari (1994) predicts a monotonical relationship whereby households save only for self-insurance, while financial sector development reduces the reliance on savings. Furthermore, it is argued that *fd* leads to easing credit restrictions through deregulation, thereby reducing savings incentives (Bandiera et al., 2000).

Liquid liabilities (LL), also known as broad money or M3, encompass various components that reflect money's liquidity and store-of-value functions. It includes M0 (i.e., central bank holdings of currency and deposits), M1 (i.e., savings/time deposits and transferable foreign currency), and M2 (i.e., repurchase agreements in the form of securities) (Daniels, 2010). Additionally, LL comprises travellers' cheques, foreign currency time deposits, commercial papers, and shares of mutual funds or market funds held by residents. By aggregating these components, LL provides a comprehensive measure of the total money supply within an economy. As such, LL is placed as an indicator of depth within *fd* (Svirydzenda, 2016). As savings can be defined as holdings of broad money across multiple definitions, the ability of savers to save is linked to the degree of monetisation within the economy. Depending upon the role of monetary policy within each economy, the relationship between LL and savings can be either negative or positive. Utilising the IS-LM model as an example, a shift in the LM curve occurs if a central bank introduces expansionary monetary policy. Such an increase lowers interest rates, increasing aggregate demand and reducing savings. The opposite can also be true, whereby the tightening of monetary policy can increase savings.

6.4.2 Lag Length Selection

The data allows the testing of three lags (Table 6.8). The results show that three lags are appropriate for United States and South Korea data, while two are appropriate for Japan data, utilising model selection criteria.

Table 6.8. Lag Lengths Savings Model: Lags 3

United States						
S = *f*(UT, P, DC, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	447.80	NA	0.00	-23.94	-23.72	-23.86
1	633.05	310.41	0.00	-32.60	-31.29*	-32.13*
2	661.19	39.55*	0.00	-32.77	-30.37	-31.92
3	692.56	35.60	3.89e-21*	-33.11*	-29.63	-31.88
Japan						
S = *f*(UT, P, CGSO, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	308.50	NA	0.00	-16.45	-16.28	-16.39
1	411.94	178.93	0.00	-21.18	-20.31	-20.87
2	441.21	44.28*	3.76e-15*	-21.90*	-20.33*	-21.35*
3	451.49	13.34	0.00	-21.59	-19.33	-20.79
South Korea						
S = *f*(UT, P, LL, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	335.67	NA	0.00	-17.87	-17.66	-17.80
1	483.59	247.86	0.00	-24.52	-23.21*	-24.06
2	522.64	54.88*	7.94e-18*	-25.24	-22.88	-24.43*
3	546.98	27.63	0.00	-25.27*	-21.76	-24.01

* Indicates lag order selected by the criterion. S = Savings, UT = Capacity Utilisation, P = Profit Share, DC = Domestic Credit, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, GE = Government Expenditure. Criteria: (LR) = Likelihood Ratio, (FPE) = Final Prediction Error, (AIC) = Akaike Information Criterion, (SC) = Schwarz Information Criterion, (HQ) = Hannan-Quinn Criterion.

6.4.3 F-Statistic

The calculated F-statistics for models (4), (5), and (6) are illustrated in Table 6.9. Model (4) shows a critical bounds result above *I(1)* at the 1% statistical significance level, model (5) shows a critical bounds result above *I(1)* at the 5% statistical significance level, and model (6) shows a critical bounds result above *I(1)* at the 10% statistical significance level. As such, the null hypothesis of no cointegration cannot be accepted.

Table 6.9. F-Statistic of Cointegration Relationship: Savings

Country	**No.**	**Models**	**ARDL Models**	**F-Stat**	**CB 1%**	**CB 5%**	**CB 10%**	**Result**
United States	(4)	S = *f*(UT, P, DC, GE)	(2, 2, 0, 2, 3)	6.20***	I(0): 3.96 I(1): 5.45			Cointegration
Japan	(5)	S = *f*(UT, P, CGSO, GE)	(2, 1, 1, 1, 1)	4.81**		I(0): 2.89 I(1): 4.00		Cointegration
South Korea	(6)	S = *f*(UT, P, LL, GE)	(2, 3, 3, 3, 3)	3.88*			I(0): 2.42 I(1): 3.39	Cointegration

Null Hypothesis: No Cointegration. 4 = Model Four, 5 = Model Five, 6 = Model Six. K = 4. Based on Narayan (2004), F-statistic, where *** Significant at 1%, ** Significant at 5%, * Significant at 10%. CB 1% = Critical Bounds at 1%, CB 5% = Critical Bounds at 5%, CB 10% = Critical Bounds at 10%. S = Savings, UT = Capacity Utilisation, P = Profit Share, DC = Domestic Credit, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, GE = Government Expenditure.

6.4.4 Long-Run Dynamics: ARDL Analysis

The empirical results of the long-run coefficients of models (4), (5), and (6) are presented in Table 6.10. Interpretation of the long-run dynamics is as follows: the United States data shows that UT and GE hold negative individual unidirectional causality towards savings. Of note, P and DC show non-significance, which is unexpected, alongside the unidirectional negative relationship between UT and savings. Japan data shows UT holds positive individual unidirectional causality towards savings, while P, CGSO, and GE hold negative causality. South Korea data shows unidirectional positive causality from UT and LL towards savings and non-causality from P and GE towards savings. Analysing the *fd* and *fp* indicators, only CGSO

and LL hold unidirectional significance towards long-run savings. In contrast, GE holds a significant and negative unidirectional relationship towards savings utilising the United States and Japan data.

Table 6.10. Long-Run Models. Dependent Variable: Savings

Variable	4 - United States	t-Stat.	5 - Japan	t-Stat.	6 - South Korea	t-Stat.
UT	-0.34***	-4.25	2.39***	2.80	0.65***	4.17
P	0.15	1.06	-0.52***	-3.36	-0.05	-0.74
DC	0.00	-0.11				
CGSO			-0.15**	-2.26		
LL					0.18*	1.91
GE	-0.65***	-6.94	-2.09***	-4.64	-0.27	-0.80
C	0.39***	9.14	-0.04	-0.14	0.03	0.30

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. UT = Capacity Utilisation, P = Profit Share, DC = Domestic Credit, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, GE = Government Expenditure.

6.4.5 Short-Run Dynamics Derived from the Long-Run Model: A ARDL Analysis

The empirical results of the models (4), (5), and (6) are presented in Table 6.11. All models show a negative and significant ECT, suggesting a long-run equilibrium relationship between the explanatory variables and savings exists. Interpretation of the short-run dynamics is as follows: the United States data shows that UT holds a positive unidirectional relationship towards savings, DC and GE show negative unidirectional relations, while P shows no unidirectional significance. Despite holding significance, the DC coefficient shows a weak influence towards savings, while GE shows stronger causality. Japan's short-run data exhibit the least parsimonious model, showing the following results: an ECT result of 21%, CGSO and GE exhibit moderate negative relationships towards savings, UT shows a very strong positive relationship towards savings, while P shows non-significance, counter to the long-run result. The most inclusive parsimonious model is shown by South Korea data. Positive unidirectional causality is running towards savings through the coefficients of UT, LL, and GE, with P exhibiting a negative relationship. Government expenditure, however, exhibits a positive significant causal effect towards savings in the short run. The models pass all diagnostic tests. No systematic changes were detected, suggesting stability through CUSUM and CUSUMSQ analysis (Appendix 12).

Table 6.11. Error-Correction Models. Dependent Variable: Savings

Variable	4 - United States	t-Stat.	5 - Japan	t-Stat.	6 - South Korea	t-Stat.
ECT	**-0.65*** **	**-6.73**	**-0.21*** **	**-5.85**	**-0.65*** **	**-5.46**
D(S(-1))	0.18*	1.95	-0.05	0.61	0.34**	2.66
D(S(-2))						
D(UT)	0.21**	2.79	1.58***	7.23	0.36**	2.68
D(UT(-1))	0.20**	2.23			-0.22	-1.26
D(UT(-2))					-0.24	-1.59
D(P)			-0.10	-1.60	-0.11*	-2.00
D(P(-1))					-0.06	-0.96
D(P(-2))					-0.06	-1.47
D(DC)	0.00	0.60				
D(DC(-1))	-0.02**	-2.18				
D(DC(-2))						
D(CGSO)			-0.18*	-1.76		
D(LL)					0.39***	3.19
D(LL(-1))					-0.11	-0.76
D(LL(-2))					-0.17	-1.46
D(GE)	-0.60***	-7.52	-0.19**	-1.94	0.05	0.36
D(GE(-1))	0.16	1.49			0.42**	2.76
D(GE(-2))	-0.29***	-3.78			0.17	1.06
Goodness of Fit and Diagnostic Tests for the Savings Model						
	4 - United States		**5 - Japan**		**6 - South Korea**	

Adj R-squared.	0.83	0.71	0.51
S.E. of regression.	0.00	0.00	0.01
LM test.	0.16	0.15	0.09
Normality.	0.33	0.64	0.73
ARCH test.	0.69	0.56	0.23
RESET.	0.81	0.42	0.14
CUSUM.		No Structural Break	
CUSUMSQ.		No Structural Break	

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (long-run coefficient signs). D(S) = (Differenced) Savings, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(DC) = (Differenced) Domestic Credit, D(CGSO) = (Differenced) Credit to Government and State-Owned Enterprises, D(LL) = (Differenced) Liquid Liabilities, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality is the Jarque-Bera statistic test for normality, ARCH test is the F-statistic of White heteroskedasticity testing, RESET is the Ramsey regression specification error test, CUSUM test is the cumulative sum control chart test, CUSUMSQ test is the cumulative sum squared test.

6.4.6 Results and Discussion

The parsimonious specification of each of the selected models (4), (5), and (6) offers different insights as to the sign and strength of each of the coefficients. The savings model (4) for United States data shows that, for the most part, the relationships are in tandem with the economic theory. Against the economic theory, long-run UT exhibits a negative and significant relationship towards savings while showing a significant and positive relationship in the short run. As such, short-run dynamics suggest that efficiency gains and household savings move in tandem. Such a relationship, however, does not exist in the long run, suggesting that the opposite occurs. The non-significance of P indicates that the model cannot identify whether savings are influenced by wage or profit-led mechanisms. Domestic credit holds a significant weak negative causal relationship towards savings in the short run only, suggesting that household savings are used in the short run when the private sector obtains credit. This result is supported by Levine (2005), who argues that excessive growth can lead to increases in DC, resulting in short-run credit booms that offer inefficiencies. Government expenditure holds a negative relationship towards savings in both the long and short run, confirming that current spending induces future spending behaviours.

Japan data shows that efficiency improvements (i.e., UT) in both the long and short run positively influence savings. In contrast, a negative relationship between P and savings suggests that profit-led mechanisms only guide the economy in the long run. Credit by domestic money banks to government and state-owned enterprises shows moderate negative long and short-run causality towards savings. Such a relationship is explained by Duggan (2017), showing that inefficiencies, corruption, and poor transparency have hindered development in state-owned enterprises (SOEs) within Japan. Evidence also shows that wasteful spending was associated with promoting household savings through SMEs, housing, and domestic infrastructure schemes, which were linked with political motives and activities (Yoshino et al., 2018). Government expenditure holds long and short-run negative causality towards savings, suggesting that increases in current spending induce future spending behaviours.

South Korea data is mostly in line with the economic theory, whereby P is negative and significant in the short run only, suggesting that weak short-run profit-led mechanisms exist. Liquid liabilities show moderate significance in both the long and short run. This suggests that broad money (i.e., M3) is an efficient way of introducing a credit boom in both time frames, as opposed to an inefficient credit boom of DC in the short run, as per the United States data.

Regarding GE, policymakers should be aware of the strong positive short-run causality towards savings, suggesting that such spending holds no causal effects in the long run.

6.5 Results: Income Distribution

This section follows the previous sections by: 1) explaining the theoretical model and new variable definitions; 2) analysing stationarity, lag length, and F-statistic testing results; and 3) analysing long-run results and ARDL-ECMs.

6.5.1 The Theoretical Model and Variable Definitions

This section analyses the income distribution models (7), (8), and (9) within Table 6.3, whereby the original profit share model (6.3) is defined as *P=f(UT, U, PG)*. Table 6.3 shows that the variable combinations of DC, LL, and GE are incorporated into models (7), (8), and (9). The selected models house one commonly used *fd* indicator, DC, and one contemporary measure of *fd*, LL. While Chapter 5 described the theory and calculations of the explanatory variables towards profit share (i.e., UT, U, PG, MR, GE), the following explores the relationship of DC and LL towards profit share contained within the augmented models for the United States, Japan, and South Korea data.

While Chapter 4 explained the theory of income distribution within the Kaleckian post-Keynesian theoretical model, Chapter 5 defined the relationship between *fd* and income distribution, linking income equality to the Kuznets' curve, alongside the mixed findings within the literature. As shown previously, DC is considered 'the backflow of financial resources to corporate sectors' (Liebscher et al., 2006). Analysing a unique dataset of business loan applications to a single large European Bank, Delis et al. (2020) suggest that efficient credit provision to small businesses positively impacts individual upward mobility and income. More specifically, the income of those businesses accepted for credit was 6% higher than those of denied businesses one to three years after the loan application decision, increasing to over 11% five years later. As shown in Chapter 5, the definitions of MR and its relationship to profit share will also be held with LL.

6.5.2 Lag Length Selection

The data allows the testing of three lags (Table 6.12). The results show that two lags are appropriate for the United States data, while three are appropriate for Japan and South Korea data, utilising model selection criteria.

Table 6.12. Lag Lengths Income Distribution: Lags 3

United States						
P = *f*(UT, U, PG, LL, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	600.96	NA	0.00	-32.16	-31.90	-32.07
1	821.50	357.64	0.00	-42.14	-40.30*	-41.49
2	880.12	76.04*	7.19e-27*	-43.35*	-39.96	-42.16*
3	912.00	31.02	0.00	-43.13	-38.17	-41.39
Japan						
P = *f*(UT, U, PG, LL, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	556.30	NA	0.00	-29.75	-29.48	-29.65
1	712.92	253.96*	0.00	-36.27	-34.43*	-35.62*
2	749.78	47.82	0.00	-36.31	-32.92	-35.12
3	800.17	49.03	6.00e-24*	-37.09*	-32.13	-35.34
South Korea						
P = *f*(UT, U, PG, DC, GE)						

Lag	LogL	LR	FPE	AIC	SC	HQ
0	405.05	NA	0.00	-21.57	-21.31	-21.48
1	565.23	259.74*	2.16e-20*	-28.28	-26.45*	-27.63*
2	598.05	42.57	0.00	-28.11	-24.71	-26.91
3	645.55	46.22	0.00	-28.73*	-23.77	-26.98

* Indicates lag order selected by the criterion. P = Profit Share, UT = Capacity Utilisation, U = Unemployment Rate, PG = Productivity Growth, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

6.5.3 F-Statistic

The calculated F-statistics for models (7), (8), and (9) are illustrated in Table 6.13. Model (7) shows a critical bounds result above *I(1)* at the 1% statistical significance level, while models (8) and (9) show critical bound results above *I(1)* at the 5% statistical significance level. As such, the null hypothesis of no cointegration cannot be accepted.

Table 6.13. F-Statistic of Cointegration Relationship: Income Distribution

Country	No.	Models	ARDL Models	F-Statistic	CB 1%	CB 5%	Result
United States	(7)	P = *f*(UT, U, PG, LL, GE)	(2, 2, 2, 2, 2, 2)	6.46***	I(0): 3.65 I(1): 5.25		Cointegration
Japan	(8)	P = *f*(UT, U, PG, LL, GE)	(2, 0, 3, 1, 3, 3)	4.59**		I(0): 2.73 I(1): 3.92	Cointegration
South Korea	(9)	P = *f*(UT, U, PG, DC, GE)	(1, 3, 2, 0, 3, 3)	4.08**		I(0): 2.73 I(1): 3.92	Cointegration

Null Hypothesis: No Cointegration. 7 = Model Seven, 8 = Model Eight, 9 = Model Nine. K = 5. Based on Narayan (2004), F-statistic, where *** Significant at 1%, ** Significant at 5%. CB 1% = Critical bounds at 1%, CB 5% = Critical Bounds at 5%. P = Profit Share, UT = Capacity Utilisation, U = Unemployment Rate, PG = Productivity Growth, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

6.5.4 Long-Run Dynamics: A ARDL Analysis

The empirical results of the long-run coefficients of models (7), (8), and (9) are presented in Table 6.14. Interpretation of the long-run dynamics is as follows: the United States data shows individual positive long-run unidirectional significance running from UT, PG, and GE towards profit share, while LL holds negative unidirectional significance. The unemployment rate shows a negative unidirectional relationship towards profit share; however, it is non-significant. Japan data shows positive long-run unidirectional significance running from UT and LL towards profit share, while holding negative unidirectional significance with PG. The unemployment rate and GE show a negative relationship towards profit share; however, they hold non-significance. South Korea data shows positive long-run unidirectional significance running from U towards profit share, which is unexpected, while holding negative significance with GE.

Table 6.14. Long-Run Models. Dependent Variable: Income Distribution

Variable	7 - United States	t-Stat.	8 - Japan	t-Stat.	9 - South Korea	t-Stat.
UT	0.78***	10.25	6.29*	1.98	-0.44	-0.84
U	-0.38	-0.83	-1.54	-0.45	4.25***	3.35
PG	1.26**	2.20	-2.75**	-2.16	-0.21	-0.73
LL	-0.18**	-2.52	0.11**	2.11		
DC					0.08	0.80
GE	1.38***	5.12	-0.45	-0.38	-1.44*	-1.97
C	0.04	0.72	-1.98*	-1.81	0.48	1.60

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. UT = Capacity Utilisation, U = Unemployment Rate, PG = Productivity Growth, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

6.5.5 Short-Run Dynamics Derived from the Long-Run Model: A ARDL Analysis

The empirical results of the models (7), (8), and (9) are presented in Table 6.15. All models show a negative and significant ECT, suggesting a long-run equilibrium relationship between the explanatory variables and profit share. Interpretation of the short-run dynamics is as follows: the United States data shows the positive unidirectional significance of the

combined coefficients UT, PG, and LL towards profit share, while U exhibits negative significance, showing that the *fd* coefficient sign aligns with the economic theory. Government expenditure, however, holds a non-significant unidirectional relationship towards profit share in the short run.

Japan data shows positive unidirectional significance of the combined short-run coefficients U and GE towards profit share, while showing a negative and significant relationship with LL. The coefficients UT and PG hold non-significance towards profit share. The influence of U towards profit share is unexpected, whereby the relationship is positive overall; however, fluctuations between negative and positive signs through the non-lagged and lagged coefficients with differing significances are exhibited, suggesting that U follows the economic theory in the immediate period only. Regarding GE, there is a positive relationship towards profit share, counter to the long-run result.

South Korea data shows a positive overall unidirectional significance of the short-run coefficients UT, DC, and GE towards profit share, while showing significant positive and negative short-run signs for U. Counter to Japan data results, U in the immediate period exhibits a positive causality effect towards profit share, while showing a negative effect at lag 1. The results show that PG coefficients are not included within the parsimonious model, meaning that non-significance exists. The estimated models pass all diagnostic tests for model adequacy. No systematic changes were detected, suggesting stability through CUSUM and CUSUMSQ analysis (Appendix 13).

Table 6.15. Error-Correction Models. Dependent Variable: Income Distribution

Variable	**7 - United States**	t-Stat.	**8 - Japan**	t-Stat.	**9 - South Korea**	t-Stat.
ECT	**-0.37*** **	**-7.67**	**-0.20*** **	**-6.50**	**-0.60*** **	**-6.13**
D(P(-1))	0.24**	2.09	-0.26**	-2.30		
D(UT)	0.91***	4.80			1.23***	4.33
D(UT(-1))	0.15	0.84			-1.11***	-3.16
D(UT(-2))					0.67**	2.78
D(U)	0.25	1.51	-0.70*	-2.09	1.36**	2.30
D(U(-1))	-0.44***	-3.31	0.30	0.71	-1.35**	-2.23
D(U(-2))			1.23***	2.93		
D(PG)	0.20**	2.50	-0.08	-0.52		
D(PG(-1))	-0.15***	-5.02				
D(LL)	-0.09*	-1.77	-0.18***	-4.86		
D(LL(-1))	0.11**	2.48	0.03	0.74		
D(LL(-2))			-0.16***	-4.51		
D(DC)					0.17**	2.30
D(DC(-1))					-0.18**	-2.16
D(DC(-2))					0.30***	4.34
D(GE)			-0.29	-1.51	0.08	0.27
D(GE(-1))	0.16	1.16	0.02	0.09	1.28***	3.72
D(GE(-2))	0.02	0.16	0.41*	2.04	0.64*	1.75
Goodness of Fit and Diagnostic Tests for the Income Distribution Model						
	7 - United States		**8 - Japan**		**9 - South Korea**	
Adj R-squared.	0.79		0.80		0.81	
S.E. of regression.	0.00		0.01		0.02	
LM test.	0.12		0.22		0.35	
Normality.	0.61		0.46		0.46	
ARCH test.	0.77		0.27		0.87	
RESET.	0.12		0.78		0.30	
CUSUM.			No Structural Break			
CUSUMSQ.			No Structural Break			

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (long-run coefficient signs). D(P) = (Differenced) Profit Share, D(UT) = (Differenced) Capacity Utilisation, D(U) = (Differenced) Unemployment Rate, D(PG) = (Differenced) Productivity Growth, D(LL) = (Differenced) Liquid Liabilities, D(DC) = (Differenced) Domestic Credit, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, Normality is the Jarque-Bera statistic test for normality, ARCH test is the F-statistic of White heteroskedasticity testing, RESET is the Ramsey regression specification error test, CUSUM is the cumulative sum control chart test, CUSUMSQ is the cumulative sum squared test.

6.5.6 Results and Discussion

The parsimonious specification of each of the selected models (7), (8), and (9) offers different insights about the sign and strength of each of the coefficients. The profit share model (7) for United States data shows that UT, U, and PG hold significance and correct signs in the long and short run. Of note, the significant negative unidirectional relationship between U and profit share only holds for the short run, suggesting that U within the United States data does not influence profit share in the long run. Liquid liabilities hold negative causality towards profit share in the long run; however, they exhibit both positive and negative causality in the short run. Therefore, increases in M3 increase profit share at lag 1 only. Also, GE is only positively related to profit share in the long run.

Japan data shows mixed results, with the most prevalent being the coefficient signs of PG and U being against the economic theory. Productivity growth is shown to hold a very strong, significant negative unidirectional relationship towards profit share in the long run, against the economic theory. In analysing the future of PG in Japan, McKinsey Global Institute (2015) provides an interesting insight. The study argues that Japan has experienced two painful 'lost decades' due to stalling productivity growth below 2%, alongside a declining population since 2011. Such combinations have led to declining household purchasing power, thereby tightening social security and healthcare resources.

When comparing the United States and Japan data, McKinsey Global Institute (2015) shows that the United States was substantially more productive in terms of labour productivity in 2015, more so in the fields of health and social work (25% more productive), advanced manufacturing (33%), financial intermediation (35%), retail trade (34%), business services (45%), agriculture (66%), real estate (40%), and transport (39%). Similar results are evident when comparing capital productivity. Unemployment also exhibits unexpected results through Japan data, exhibiting a mix of positive and negative unidirectional relationships towards profit share in the short run. Overall, positive and significant coefficients may be due to a rising ageing population in Japan. At the end of 2019, more than 20% of the Japanese population was over 65 years of age, the highest in the world (United Nations, 2019). By 2030, this figure will rise to one in every three people, while one in five will be over 75 years of age (United Nations, 2019). These results inform government policymakers that changes in U hold negative and immediate causality towards profit share; however, positive and significant effects occur at lag 2. Liquid liabilities hold significant positive and negative relationships towards profit share in the long and short run, suggesting that M3 holds various influences over time. Government expenditure, however, holds a positive relationship towards profit share only in the short run.

South Korea shows unexpected results in both the long and short run, more so with the large and significant unidirectional coefficient result of U in the long run. Although U holds

both a negative and positive relationship towards profit share in the short run, the result of the long-run coefficient is very significant and meaningful. The result shows that a 1% increase in U increases profit share by 4.25%, or fourfold. Comparing U and profit share graphically, the data in this study show that U is stable below 7% annually from 1980-2019. In contrast, profit share increases from 10% to 22% annually during the same period. The year 1997 saw GDP growth rise to 6.17%, while the Asian Financial Crisis (AFC) saw this figure fall to -5.13% in 1998. In 1999, GDP rose 11.3%, seeing a substantial jump in profit share, followed by a lagged increase in U from 2.6% to 6.3% during the same period. This is an example of GDP and U rising together, counter to Okun's law. A similar event occurred with the GFC in 2007 but was smaller in magnitude. During annualised periods 1980-2019, GDP growth was erratic, with no signs of stability. With erratic movements in GDP and hence profit share within South Korea data, coupled with lagged unemployment rates, the positive and significant result of U towards profit share should be taken seriously by policymakers, being that there is an erratic and continuous change in profit share during the periods. Domestic credit in the short run is also of interest, showing an overall (i.e., coefficient) positive unidirectional relationship towards profit share. In contrast, GE shows very strong significance in both terms, exhibiting negative influence in the long run and positive in the short run.

6.6 Results: Productivity Growth

This section follows the previous sections by: 1) explaining the theoretical model and new variable definitions; 2) analysing stationarity, lag length, and F-statistic testing results; and 3) analysing long-run results and ARDL-ECMs. The following results were also incorporated within a reviewed paper[15]. The paper utilised not only ARDL methodology, but also IRFs and VDs to examine productivity growth's resilience against external disturbances, which are not examined within this chapter.

6.6.1 The Theoretical Model and Variable Definitions

This section analyses the productivity growth models (10), (11), and (12) within Table 6.3. The original productivity growth model (6.4) is defined as *PG=f(INV*, *UT*, *PG)*. Table 6.3 shows that the variable combinations of SMTR, MR, DC, and GE are incorporated into models (10), (11), and (12). The selected models contain two commonly used *fd* indicators, MR and DC, and one contemporary measure, SMTR. While Chapter 5 describes the theory and calculations of the explanatory variables towards productivity growth (i.e., INV, UT, MR, GE), the following explores the relationship between SMTR and DC towards productivity growth. According to Svirydzenda (2016), a high turnover ratio is often associated with increased liquidity pressures resulting from investors' demand to buy and sell shares. This suggests that a higher turnover ratio reflects a more active and liquid stock market, where shares are frequently bought and sold by investors. Therefore, the stock market promotes economic development through the real sector, positively influencing manufacturing.

[15] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021) Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

Analysing the relationship between SMTR and productivity growth can provide insights into two aspects. First, it helps assess the efficiency of the financial market in facilitating the buying and selling of shares, and a higher SMTR indicates greater ease of transactions and liquidity in the stock market. Second, examining the relationship between SMTR and productivity growth reveals the relative strength of this association. Regarding the impact of *fd* on productivity growth, Demmou et al. (2019) conducted an empirical analysis using panel data from 32 countries and 30 industries from 1990-2014. Their study revealed non-uniform effects across sectors, which were influenced by country-specific institutional settings, financial structure, external dependence on financing, and the intensity of intangible assets. This suggests that the relationship between *fd* and productivity growth can vary depending on these factors.

6.6.2 Lag Length Selection

As described previously, the data allows the testing of three lags (Table 6.16). The results show that three lags are appropriate for all economies, utilising model selection criteria.

Table 6.16. Lag Lengths Productivity Growth: Lags 3

United States						
PG = *f*(INV, UT, SMTR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	372.29	NA	0.00	-19.85	-19.64	-19.78
1	564.63	322.30	0.00	-28.90	-27.59*	-28.43*
2	591.98	38.43*	1.87e-19*	-29.03	-26.63	-28.18
3	619.65	31.41	0.00	-29.17*	-25.69	-27.94
Japan						
PG = *f*(INV, UT, MR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	442.32	NA	0.00	-23.64	-23.42	-23.56
1	561.37	199.49*	2.34e-19*	-28.72	-27.41*	-28.26*
2	583.76	31.47	0.00	-28.58	-26.19	-27.74
3	613.73	34.02	0.00	-28.85*	-25.37	-27.62
South Korea						
PG = *f*(INV, UT, DC, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	297.87	NA	0.00	-15.83	-15.61	-15.75
1	446.43	248.94	0.00	-22.51	-21.20*	-22.04*
2	473.90	38.60*	1.11e-16*	-22.64	-20.25	-21.80
3	501.46	31.29	0.00	-22.78*	-19.30	-21.55

* Indicates lag order selected by the criterion. PG = Productivity Growth, INV = Investment, UT = Capacity Utilisation, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, DC = Domestic Credit, GE = Government Expenditure. AIC = Akaike Information Criterion, SC = Schwarz Information Criterion, HQ = Hannan and Quinn Information Criterion.

6.6.3 F-Statistic

The calculated F-statistics for models (10), (11), and (12) are illustrated in Table 6.17. All models show a critical bounds result above *I(1)* at the 1% statistical significance level, showing cointegration.

Table 6.17. F-Statistic of Cointegration Relationship: Productivity Growth

Country	No.	Models	ARDL Models	F-Statistic	CB 1%	Result
United States	(10)	PG = *f*(INV, UT, SMTR, GE)	(3, 3, 3, 3, 3)	5.70***	I(0): 3.96 I(1): 5.45	Cointegration
Japan	(11)	PG = *f*(INV, UT, MR, GE)	(1, 2, 1, 0, 2)	8.88***	I(0): 3.96 I(1): 5.45	Cointegration
South Korea	(12)	PG = *f*(INV, UT, DC, GE)	(3, 2, 2, 2, 2)	12.36***	I(0): 3.96 I(1): 5.45	Cointegration

Null Hypothesis: No Cointegration. 10 = Model Ten, 11 = Model Eleven, 12 = Model Twelve. K = 4. F-statistic based on Narayan (2004), where *** Significant at 1%. CB 1% = Critical Bounds at 1%. PG = Productivity Growth, INV = Investment, UT = Capacity Utilisation, SMTR = Stock Market Turnover Ratio, MR = Monetisation Ratio, DC = Domestic Credit, GE = Government Expenditure.

6.6.4 Long-Run Dynamics: ARDL Analysis

The empirical results of the long-run coefficients of models (10), (11), and (12) are presented in Table 6.18. Interpretation of the long-run dynamics is as follows: the United States data shows positive unidirectional causality running from INV, UT, and GE towards productivity growth, with SMTR the only coefficient showing a negative relationship, albeit mildly. Japan data shows that all coefficients, besides GE, exhibit positive unidirectional causality towards productivity growth, while GE holds negative. Investment and DC do not hold a significant unidirectional relationship towards productivity growth for South Korea data.

Table 6.18. Long-Run Models. Dependent Variable: Productivity Growth

Variable	10 - United States	t-Stat.	11 - Japan	t-Stat.	12 - South Korea	t-Stat.
INV	0.99***	4.24	0.46***	4.50	-0.25	-0.98
UT	0.18**	2.21	1.16***	6.31	0.93*	2.05
SMTR	-0.02**	-2.79				
DC					0.09	1.37
MR			0.02*	2.38		
GE	0.41**	2.31	-0.01	-0.12	-1.10***	-2.94
C	-0.32***	-2.93	-0.54***	-11.14	-0.16	-0.95

** Significant at 1%, ** Significant at 5%, * Significant at 10%. INV = Investment, UT = Capacity Utilisation, SMTR = Stock Market Turnover Ratio, DC = Domestic Credit, MR = Monetisation Ratio, GE = Government Expenditure.

6.6.5 Short-Run Dynamics Derived from the Long-Run Model: A ARDL Analysis

The empirical results of the models (10), (11), and (12) are presented in Table 6.19. All models show a negative and significant ECT, suggesting a long-run equilibrium relationship between the explanatory variables and productivity growth exists. Interpretation of the short-run dynamics is as follows: the United States data shows that INV holds a negative relationship towards productivity growth (i.e., combined coefficients), such that a mixture of positive and negative coefficients exists in the short run. The coefficients of UT and GE also hold negative causality towards productivity growth, while SMTR holds weak positive and negative causality. The least inclusive short-run parsimonious model is shown via Japan data, whereby INV and GE are the only significant coefficients, showing negative causality towards productivity growth. The non-inclusion of the remaining coefficients suggests non-significance. In analysing South Korea data, the short-run coefficients differ from the long-run results, whereby a majority shows negative causality towards productivity growth, besides that of INV. The models passed all diagnostic tests. No systematic changes were detected, suggesting stability through CUSUM and CUSUMSQ analysis (Appendix 14).

Table 6.19. Error-Correction Models. Dependent Variable: Productivity Growth

Variable	10 - United States	t-Stat.	11 - Japan	t-Stat.	12 - South Korea	t-Stat.
ECT	**-0.93*** **	**-6.66**	**-0.94*** **	**-7.95**	**-0.75*** **	**-6.37**
D(PG(-1))	0.14	1.21			-0.41***	-5.35
D(PG(-2))	0.02	0.64			-0.23***	-3.82
D(INV)	1.75***	6.16	0.05	0.34	-0.47	-1.69
D(INV(-1))	-0.81**	-2.60	-0.59***	-3.80	0.54*	1.97
D(INV(-2))	-1.09***	-3.19				
D(UT)	-1.68***	-8.82	0.17	0.55	-1.70***	-7.78
D(UT(-1))	-0.20	-0.54			-0.63*	-1.80
D(UT(-2))	-0.16	-0.66				
D(SMTR)	-0.01**	-2.17				
D(SMTR(-1))	0.00	-0.17				
D(SMTR(-2))	0.01***	3.44				
D(DC)					-0.16**	-2.44
D(DC(-1))					0.08	1.29
D(GE)	0.12	0.62	-0.31**	-2.30	-0.22	-0.80
D(GE(-1))	-0.67***	-3.30	-0.33**	-2.68	0.03	0.12
D(GE(-2))	-0.20	-1.04				

Goodness of Fit and Diagnostic Tests for the Productivity Growth Model			
	10 - United States	**11 - Japan**	**12 - South Korea**
Adj R-squared.	0.91	0.71	0.84
S.E. of regression.	0.00	0.01	0.02
LM test.	0.06	0.13	0.08
Normality.	0.40	0.78	0.54
ARCH test.	0.08	0.40	0.05
RESET.	0.36	0.72	0.11
CUSUM.		No structural Break	
CUSUMSQ.		No structural Break	

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (long-run coefficient signs). D(PG) = Differenced Productivity Growth, D(INV) = Differenced Investment, D(UT) = Differenced Capacity Utilisation, D(SMTR) = Differenced Stock Market Turnover Ratio, D(DC) = Differenced Domestic Credit, D(GE) = Differenced Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, normality test is the Jarque-Bera statistic test for normality, the ARCH test is the F-statistic of White heteroskedasticity testing, the RESET test is the Ramsey regression specification error test, CUSUM test is the cumulative sum control chart test, CUSUMSQ test is the cumulative sum squared test.

6.6.6 Results and Discussion

The parsimonious specification of each of the selected models (10), (11), and (12) offers different insights as to the sign and strength of each of the coefficients. The productivity growth model (10) for United States data shows mixed results for INV in both the long and short run, with some of the lagged short-run coefficients showing signs against the economic theory. In exploring 450 US manufacturing industries, Carey (1996) demonstrates that inventory investment and total factor production (TFP) growth exhibit a negative relationship, arguing that industries with higher productivity growth hold lower average inventory investments due to sales growth. Capacity utilisation shows strong negative causality in the short run while exhibiting moderate positive causality in the long run, suggesting that industry cannot improve short-run efficiencies without a negative cost. Stock market turnover shows weak causality in both the long and short run, in both positive and negative coefficient form, suggesting that either: 1) the financial market shows strong efficiencies in the way of allowing for the buying and selling of shares without difficulty; 2) the indicator is a weak measurement of financial development impacts; or 3) productivity growth is weakly influenced by financial development itself. Regarding GE, policymakers should be aware of different causal influences in both terms.

The coefficients of Japan data are expected in the long run, while INV holds negative causality towards productivity growth in the short run. We cannot interpret the parsimonious model's short-run dynamics in this study. While investors should be aware that MR holds weak positive causality towards productivity growth in the long run, policymakers should know that targeted government spending will negatively influence productivity growth in the short run. Long and short-run causalities show differences in analysing South Korea data, whereby the UT coefficient is expected in the long run while holding negative causality in the short run, suggesting that productivity efficiencies cannot be achieved without reducing productivity growth. Despite being regarded as an advanced economy, South Korea data shows that TFP growth rates have fallen from 2007-2018, an important contributor to productivity growth (The Conference Board, 2019). Domestic credit shows a negative moderate causal influence towards productivity growth in the short run only. Graphically, DC to the private sector shows a strong and rapid increase from 1980-2019, while TFP fell over the same period. In exploring banks' credit and productivity growth, Hassan et al. (2017) analyses the efficiency of bank credit allocation across European countries, utilising firm-level data on loan application results and

productivity. The authors argue that capital misallocation by banks can be a key driver in the ongoing slow growth of productivity. As such, this may be the case for South Korea. Policymakers should be aware of strong long-run negative causality in the way of GE.

6.7 Results: Net Exports

This section follows the previous sections by: 1) explaining the theoretical model and new variable definitions; 2) analysing stationarity, lag length, and F-statistic testing results; and 3) analysing long-run results and ARDL-ECMs.

6.7.1 The Theoretical Model and Variable Definitions

This section analyses the net exports models (12), (13), and (14) within Table 6.3. The original net exports model (6.5) is *NX=f(UT, P)*. Table 6.3 shows that the *fd* variable combinations of SMTR, LL, and GE are incorporated into models (13), (14), and (15). The selected models contain two contemporary measures of *fd*. While Chapter 5 describes the theory and calculations of the explanatory variables towards net exports (i.e., UT, P, MR, GE), the following explores the relationship of LL and SMTR towards net exports. While MR measures broad money as M2, LL is defined as M3. The definitions of MR and its relationship towards exports also hold with LL.

Regarding the relationship between SMTR and net exports, any ongoing and sustained trade deficit negatively impacts financial markets through investor sentiment. Investors will notice a decline in domestic spending if the deficit worsens, negatively influencing stock prices. As a result, investors seek opportunities from foreign markets due to such a domestic downturn, weakening domestic stock prices and the financial market itself. The opposite could also be true, whereby deficits could be influenced by economic expansion and infrastructure growth. This, in turn, could lower the need for imports in the long run, as the domestic market can produce more goods from its manufacturing sector. On the other hand, a growing stock market can indicate economic growth, leading to the possibility of imports increasing to meet aggregate demand. Therefore, the behaviour of the stock market could hold a negative or positive relationship towards exports.

6.7.2 Lag Length Selection

The data allows for testing three lags (Table 6.20). The results show that three lags are appropriate for the United States and Japan data, while two lags are appropriate for South Korea data, utilising model selection criteria.

Table 6.20. Lag Lengths Net Exports Models: Lags 3

United States						
NX = *f*(UT, P, SMTR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	377.83	NA	0.00	-20.15	-19.94	-20.08
1	602.02	375.65	0.00	-30.92	-29.61*	-30.46
2	624.53	31.64	0.00	-30.79	-28.39	-29.94
3	667.48	48.75*	1.51e-20*	-31.75*	-28.27	-30.52*
Japan						
NX = *f*(UT, P, LL, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	397.51	NA	0.00	-21.22	-21.00	-21.14
1	527.64	218.06	0.00	-26.90	-25.59*	-26.43*
2	548.61	29.47	0.00	-26.68	-24.29	-25.84
3	586.49	42.99*	1.20e-18*	-27.37*	-23.89	-26.15

South Korea						
NX = *f*(UT, P, LL, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	320.73	NA	0.00	-17.07	-16.85	-16.99
1	461.62	236.09	0.00	-23.33	-22.02*	-22.87
2	501.82	56.49*	2.45e-17*	-24.15*	-21.76	-23.30*
3	520.06	20.70	0.00	-23.79	-20.30	-22.56

* Indicates lag order selected by the criterion. NX = Net Exports, UT = Capacity Utilisation, P = Profit Share, SMTR = Stock Market Turnover Ratio, LL = Liquid Liabilities, GE = Government Expenditure. AIC = Akaike Information Criterion, SC = Schwarz Information Criterion, HQ = Hannan and Quinn Information Criterion.

6.7.3 F-Statistic

The calculated F-statistics for models (13), (14), and (15) are illustrated in Table 6.21. Models (13) and (14) show a critical bounds result above *I(1)* at the 10% statistical significance level, while model (15) shows a critical bounds result above *I(1)* at the 5% statistical significance level.

Table 6.21. F-Statistic of Cointegration Relationship: Net Exports

Country	No.	Models	ARDL Models	F-Statistic	CB 5%	CB 10%	Result
United States	(13)	NX = *f*(UT, P, SMTR, GE)	(3, 3, 3, 3, 2)	3.43*		I(0): 2.42 I(1): 3.39	Cointegration
Japan	(14)	NX = *f*(UT, P, LL, GE)	(2, 0, 0, 0, 0)	3.80*		I(0): 2.42 I(1): 3.39	Cointegration
South Korea	(15)	NX = *f*(UT, P, LL, GE)	(2, 2, 2, 2, 2)	4.49**	I(0): 2.89 I(1): 4.00		Cointegration

Null Hypothesis: No Cointegration. 13 = Model Thirteen, 14 = Model Fourteen, 15 = Model Fifteen. K = 4. Based on Narayan (2004), F-statistic, where *** Significant at 1%, ** Significant at 5%, * Significant at 10%. CB 1% = Critical Bounds at 1%, CB 5% = Critical Bounds at 5%, CB 10% = Critical Bounds at 10%. NX = Net Exports, UT = Capacity Utilisation, P = Profit Share, SMTR = Stock Market Turnover Ratio, LL = Liquid Liabilities, GE = Government Expenditure.

6.7.4 Long-Run Dynamics: ARDL Analysis

The empirical results of the long-run coefficients of models (13), (14), and (15) are presented in Table 6.22. Interpretation of the long-run dynamics is as follows: the United States data shows no individual positive or negative long-run unidirectional significance towards net exports. Japan data shows individual negative long-run unidirectional significance running from P and GE towards net exports. South Korea data shows all coefficients, besides GE, exhibit a positive and significant unidirectional relationship towards net exports.

Table 6.22. Long-Run Models. Dependent Variable: Net Exports

Variable	13 - United States	t-Stat.	14 - Japan	t-Stat.	15 - South Korea	t-Stat.
UT	-8.15	-0.41	-0.07	-0.28	0.70***	3.86
P	9.23	0.38	-0.14*	-1.77	0.21**	2.68
SMTR	0.01	-0.16				
LL			-0.01	0.30	0.16**	2.67
GE	-2.46	0.02	-0.66**	-1.94	0.16	0.56
C	-1.11	-0.41	0.14	1.21	-0.47***	-4.09

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. UT = Capacity Utilisation, P = Profit Share, SMTR = Stock Market Turnover Ratio, LL = Liquid Liabilities, GE = Government Expenditure.

6.7.5 Short-Run Dynamics Derived from the Long-Run Model: A ARDL Analysis

The empirical results of the models (13), (14), and (15) in Table 6.3 are presented in Table 6.23. All models show a negative and significant ECT, suggesting a long-run equilibrium relationship between the explanatory variables and net exports exists. Interpretation of the short-run dynamics is as follows: the United States data shows the joint positive unidirectional significance of the short-run coefficients of P and SMTR towards net exports. In contrast, UT and GE show negative significance. Japan data shows the least number of coefficients through representation, as model selection processes chose ARDL (2, 0, 0, 0, 0). South Korea data shows that the ECT is slightly above -1, or 100%, which is unexpected. Narayan and Smyth

(2005) explain that if the ECT is between -1 and -2, or 100% and 200%, fluctuations around the long-run value occur in a dampening manner, as opposed to a monotonical convergence towards the equilibrium path directly. The models passed all diagnostic tests. Inspection of the CUSUM and CUSUMSQ graphs (Appendix 15) indicates that the United States and South Korea data are stable. However, Japan data shows unstable parameters via CUSUMSQ, indicating that the regression coefficients are changing suddenly for a short period, which is undesirable.

Table 6.23. Error-Correction Models. Dependent Variable: Net Exports

Variable	13 - United States	t-Stat.	14 - Japan	t-Stat.	15 - South Korea	t-Stat.
ECT	**-0.03*** **	**-5.23**	**-0.86*** **	**-5.15**	**-1.01*** **	**-5.73**
D(NX(-1))	0.08	0.55	0.26*	1.74	0.66***	4.14
D(NX(-2))	0.58***	4.14				
D(UT)	-0.62***	-6.56			0.58**	2.13
D(UT(-1))	-0.15	-1.23			-0.65**	-2.54
D(UT(-2))	0.37***	3.72				
D(P)	0.51***	4.78			-0.12	-1.14
D(P(-1))	-0.16	-1.33			-0.02	-0.29
D(P(-2))	-0.41***	-3.47				
D(SMTR)	-0.004*	-2.08				
D(SMTR(-1))	0.003	1.39				
D(SMTR(-3))	0.006***	2.31				
D(LL)					1.19***	4.79
D(LL(-1))					-0.64***	-3.26
D(LL(-2))						
D(GE)	0.02	0.17			0.20	0.78
D(GE(-1))	-0.32***	-3.63			0.62**	2.22
Goodness of Fit and Diagnostic Tests for the Net Exports Model						
	13 - United States		**14 - Japan**		**15 - South Korea**	
Adj R-squared.	0.82		0.42		0.52	
S.E. of regression.	0.00		0.02		0.02	
LM test.	0.24		0.27		0.91	
Normality.	0.25		0.03		0.17	
ARCH test.	0.49		0.46		0.76	
RESET.	0.17		0.53		0.23	
CUSUM.	No Structural Break		No Structural Break		No Structural Break	
CUSUMSQ.	No Structural Break		Structural Break		No Structural Break	

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. ECT = Error-Correction Model (long-run coefficient signs). D(NX) = (Differenced) Net Exports, D(UT) = (Differenced) Capacity Utilisation, D(P) = (Differenced) Profit Share, D(SMTR) = (Differenced) Stock Market Turnover Ratio, D(LL) = (Differenced) Liquid Liabilities, D(GE) = (Differenced) Government Expenditure. LM test is the F-statistic of the Breusch-Godfrey test for serial correlation, Normality is the Jarque-Bera statistic test for normality, ARCH test is the F-statistic of White heteroskedasticity testing, RESET is the Ramsey regression specification error test, CUSUM is the cumulative sum control chart test, CUSUMSQ is the cumulative sum squared test.

6.7.6 Results and Discussion

The parsimonious specification of each of the selected models (13), (14), and (15) offers different insights as to the sign and strength of each of the coefficients. The net exports model (13) for United States data shows that UT and P hold no significance towards net exports in the long run; however, they show positive and negative coefficient significance in the short run. As discussed in Chapter 5, UT is negatively related to net exports, as demand for imports is positively related to domestic demand. The immediate impact of an increase in UT holding a negative influence over net exports is in line with the economic theory. Profit share can hold both a positive and negative causal effect towards net exports, whereby the production of exports is considered a positive function of P. In contrast, imports are considered a negative function. The short-run result shows significant unidirectional positive and negative relationships towards net exports, with the positive function in line with the economic theory. As per previous models, SMTR holds significant yet weak unidirectional causality.

Government expenditure, however, holds moderate negative causality towards net exports in the short run. The interpretation of the long and short-run coefficients may be in dispute for Japan data, as CUSUMSQ shows unstable parameters, indicating that the regression coefficients are changing suddenly for a short period, which is undesirable. The CUSUMSQ results show a structural break before and after the GFC. While some of the long-run individual coefficients are significant, model selection processes chose ARDL (2, 0, 0, 0, 0), meaning that regardless of the lag selection process of ARDL model selection, no independent variables were statistically significant in the short-run. While the ECT result is significant, the lack of independent variables oversimplifies the relationships within the data, with the adjusted R-squared result showing 42%. This result suggests that the independent variables in the model are not collectively providing a strong explanation for the variability in the dependent variable (i.e., net exports). Utilising Monte Carlo techniques, Caporale and Pittis (2004) show that CUSUMSQ is robust in the presence of non-predetermined regressors in environments that display cointegration and stationarity. The authors argue that CUSUMSQ is very powerful in detecting a change in the conditional model parameters if the regression error variance is included within the set of shifting parameters (i.e., residual error variance stability).

The net exports model (15) for South Korea data shows the strongest long-run coefficient influence, with GE being the only coefficient to show non-significance. Capacity utilisation shows conflicting positive and negative results in the short run, whereby the sum of the lagged coefficients is negative and in line with the economic theory. Liquid liabilities also show conflicting yet strong significant short-run results, whereby the sum of the lagged coefficients is positive, in line with the long-run result. Unlike previous results in this section, GE holds a positive short-run relationship towards net exports. The ECT for South Korea data is -1.01, or 101%, meaning that fluctuations around the long-run value occur in a dampening manner. A literature review provides a non-consensus in relation to such a result. It could be argued that an ECT result between -1 and -2 contains oscillatory convergence/adjustment processes, thus introducing instability. On the other hand, a significant number of well-cited authors have reported ECT results between -1 and -2 (i.e., Narayan & Smyth, 2005), however, there is no consensus on whether this is acceptable to report. Therefore, the ECT result should be considered with care for South Korea data.

6.8 Conclusion

This chapter has explored the impact of two important growth instruments, financial development and fiscal policy, upon key macroeconomic indicators within a Kaleckian post-Keynesian context for the economies of the United States, Japan, and South Korea, during 1980-2019. In capturing the aims of this thesis, this chapter explored: 1) the estimation and analysis of the impacts of financial development and fiscal policy within such a macroeconomic framework; and 2) the employment of commonly utilised and contemporary measures of financial development. Therefore, the focus of this chapter aligned with research gaps and questions 1 and 2, as shown in Chapter 1. As unit-root testing revealed the time series contained both *I(0)* and *I(1)* behaviours, ARDL methodology was incorporated to conclude long and short-run relationships (i.e., cointegrating relationships). Upon completion of model selection, the chapter focused on cointegration testing and long and short-run relationship

analysis utilising model stability tests. The study then analysed whether the economic theory held through policy implications, alongside whether the inclusion of financial development and fiscal policy was warranted. While the results of the savings and productivity growth models were incorporated within this chapter, such results were also incorporated within two papers.

Each model produced differing results, not only for the original explanatory variables but also for the financial development and fiscal policy indicators. While most relationships between the explanatory and dependent variables aligned with the economic theory, some long and short-run results did not. Each of the variables (i.e., coefficients) against the economic theory was analysed, describing the strength of those relationships and exploring previous literature, which found similar results. As shown in Table 6.24, all models held a negative and significant ECT, suggesting that the inclusion of financial development and fiscal policy indicators is warranted. The ECT for net exports via South Korea data showed a result of -1.01, suggesting that fluctuations around the long-run value occur in a dampening manner, as opposed to a monotonical convergence towards the equilibrium path directly. Regardless, all other ECTs were between the 0-100% range, which is desirable. While most estimated models passed diagnostic testing, the CUSUMSQ results for net exports via Japan data indicate that unstable parameters exist (i.e., residual error variance stability), indicating that the regression coefficients are changing suddenly in some periods, which is undesirable.

Table 6.24. Error-Correction Terms (ECT) for all Models: United States, Japan, and South Korea

Country	Models	ECT
United States	INV = *f*(UT, P, IR, PG, SMTR, GE)	-0.42***
United States	S = *f*(UT, P, DC, GE)	-0.65***
United States	P = f(UT, U, PG, LL, GE)	-0.37***
United States	PG = *f*(INV, UT, SMTR, GE)	-0.93***
United States	NX = *f*(UT, P, SMTR, GE)	-0.03***
Japan	INV = *f*(UT, P, IR, PG, MR, GE)	-0.78***
Japan	S = *f*(UT, P, CGSO, GE)	-0.21***
Japan	P = *f*(UT, U, PG, LL, GE)	-0.20***
Japan	PG = *f*(INV, UT, MR, GE)	-0.94***
Japan	NX = *f*(UT, P, LL, GE)	-0.86***
South Korea	INV = *f*(UT, P, IR, PG, CGSO, GE)	-0.47***
South Korea	S = *f*(UT, P, LL, GE)	-0.65***
South Korea	P = *f*(UT, U, PG, DC, GE)	-0.60***
South Korea	PG = *f*(INV, UT, DC, GE)	-0.75***
South Korea	NX = *f*(UT, P, LL, GE)	-1.01***

*** Significant at 1%. ECT = Error-Correction Model (long-run coefficient signs). Green Colour = Significant Causality. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, S = Savings, U = Unemployment, NX = Net Exports, SMTR = Stock Market Turnover Ratio, DC = Domestic Credit, LL = Liquid Liabilities, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure.

In examining the strength of financial development and fiscal policy indicators, Table 6.25 illustrates long-run (LR) and short-run (SR) causality. Interpretation of Table 6.25 is as follows: in examining the long-run coefficient result of stock market turnover (SMTR) via the investment (INV) model for the United States data, the LR box is green in colour with a positive sign, showing a positive (+) coefficient of 0.02(***). Therefore, SMTR holds positive long-run causality towards the investment for the United States data, whereby a 1% increase in SMTR increases INV by 0.02%. Looking at the short-run coefficient range, SMTR holds causality

towards INV between -0.01% and +0.01% (***) over different lagged periods. Therefore, the results show that SMTR holds weak causal influences towards INV in both the long and short run. Liquid liabilities were the most incorporated contemporary measure of financial development, while DC was the most commonly used measurement. In comparing the relative causal strengths of the financial development indicators, LL showed the strongest coefficient response in both the long and short run. Government expenditure (GE) was incorporated as the fiscal policy indicator within all selected models, whereby a mix of significant positive and negative influences upon the dependent variables was found. Government expenditure was a significantly more powerful explanatory indicator compared with the incorporated financial development indicators.

Table 6.25. Financial Development and Fiscal Policy Indicators – Long and Short-Run Causality: United States, Japan, and South Korea

Financial Development	Country	Model	LR	Coefficient	SR	Coefficient Range
SMTR	United States	INV	+	0.02***	- | +	-0.01 to +0.01 (***)
	United States	PG	-	0.02***	- | +	-0.01 to +0.01 (**/***)
	United States	NX	+	0.01	- | +	-.0004 to +0.006(*/***)
CGSO	Japan	S	-	0.15**	-	0.18*
	South Korea	INV	-	0.74	-	1.07***
LL	South Korea	S	+	0.18*	+	0.39***
	United States	P	-	0.18**	- | +	-0.09 to +0.11 (*/**)
	Japan	P	+	0.11**	-	0.18 to 0.16 (***)
	Japan	NX	-	0.01		
	South Korea	NX	+	0.16**	- | +	-0.64 to +1.19 (***)
MR	Japan	INV	-	0.04**	-	0.06***
	Japan	PG	+	0.02*		
DC	United States	S		0.00	-	0.02**
	South Korea	PG	+	0.09	-	0.16**
	South Korea	P	+	0.08	- | +	-0.18 to +0.30 (**/***)
Fiscal Policy	**Country**	**Model**	**LR**	**Coefficient**	**SR**	**Coefficient Range**
GE	United States	INV	-	0.38	+	0.28 ***
		S	-	0.65***	-	0.60 to 0.29 (***)
		P	+	1.38***	+	0.02 to 0.16
		PG	+	0.41**	-	0.67***
		NX	-	2.46	-	0.32***
	Japan	INV	-	0.60***	+	0.67 to 0.69 (***)
		S	-	2.09***	-	0.19**
		P	-	0.45	+	0.41*
		PG	-	0.01	-	0.33 to 0.31 (**)
		NX	-	0.66**		
	South Korea	INV	-	0.69*	+	0.08
		S	-	0.27	+	0.42**
		P	-	1.44*	+	0.64 to 1.28 (*/***)
		PG	-	1.10***	- | +	-0.22 to +0.03
		NX	+	0.16	+	0.62**

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. Red Colour = Non-Significant Causality, Green Colour = Significant Causality, LR = Long Run, SR = Short Run. (+) = Positive Causality, (-) = Negative Causality. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, S = Savings, U = Unemployment, NX = Net Exports, SMTR = Stock Market Turnover Ratio, DC = Domestic Credit, LL = Liquid Liabilities, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure.

The following sections analyse the long and short-run causal effects of financial development and fiscal policy on the selected economies' key macroeconomic indicators. While the indicators that positively influenced the key macroeconomic indicators bring ease of analysis in explaining such causal effects, those financial development and fiscal policy indicators that hold a negative relationship towards the key macroeconomic indicators present complexity for investors and policymakers to understand such relationships adequately. Therefore, the following sections critically analyse why such negative relationships may arise.

6.8.1 Stock Market Turnover

In analysing SMTR, Table 6.25 shows that the United States exhibits: 1) a positive causal relationship towards INV in the long run while showing both a positive and negative causal relationship in the short run; 2) a negative causal relationship in the long run towards PG, while showing both positive and negative causal effects in the short run; and 3) a short-run positive causal effect towards NE. Osamwonyi and Kasimu (2013) argued that stock markets promote economic growth by securing new private capital sources. Stock markets seek efficient capital allocation to allow for diverse usage within the economy, providing investors with competitive returns. Additionally, an efficient stock market generates efficient information for investors about a firm's performance, reflecting real sector fundamentals. Regardless, SMTR held a significant yet weak influence towards INV.

Regarding productivity allocation inefficiencies, financial distortion can lead to resource mismatch, showing a negative relationship between PG and the stock market. This may be due to investors holding incomplete information about market developments, which reduces resource allocation efficiency. In theory, efficient resource allocation is based on investors having good access to private information and making better-informed decisions regarding production projects (Grossman & Stiglitz, 1980). Moreover, the role of financial development in promoting PG is strongly associated with technical progress (Romer, 1986). As the United States data shows, the stock market holds negative long-run causality towards PG, and efficiency improvements and technical progress are not positively influencing economic growth. This may be related to resource mismatches caused by lagging financial development. Regardless, the weak causality of SMTR towards INV, PG, and NX, in both positive and negative coefficient form, may suggest that either: 1) the financial market shows strong efficiency in the way of allowing for the buying and selling of shares without difficulty and hence does not strongly influence such key macroeconomic indicators; 2) weak financial distortion may be influencing efficiency improvements and technical progress; or 3) the indicator is a weak measure of the impacts of financial development, suggesting that other measurements may be more appropriate for analysing time series relationships.

6.8.2 Credit to Government and State-Owned Enterprises

In analysing CGSO, Table 6.25 shows that: 1) Japan data showed CGSO holds negative long and short-run causality towards savings; and 2) South Korea data showed CGSO holds short-run negative causality towards investment. Regarding Japan, state-owned enterprises (SOEs) consist of *Tokushu Hojin* and *Tokushu Geisha*. *Tokushu Hojin* comprises statutory corporations, making up five large bodies in Japan. In contrast, *Tokushu Geisha* comprises organisations that are wholly or mostly owned by the government, making up nine large bodies

(Colignon & Usui, 2003). *Tokushu Geisha* comprises railways, racing, post, airports, communications, development finance, pensions, and expressway services. Privatisation has slowly engulfed Japanese SOEs in the past couple of decades, starting with the Japanese National Railways in 1987 and Japan Post in 2007, increasing productivity and quality of service (Kim & Huang, 2019). Kim and Huang (2019) argued that such privatisation has encouraged structural reforms and deregulation alongside the implementation of advanced technologies in service diversification. Such activities provided freedoms and incentives for advances in R&D, especially in high-speed rail. Accordingly, Kim and Huang (2019) point out that the number of tourists increased from 5 million in 2002 to 30 million post-2018, illustrating the strong demand for such efficient services.

Regardless of the social welfare improvements in this example, through encouraging innovative services and creating sustainable development in Japan (Kim & Huang, 2019), CGSO holds a negative relationship towards savings. This would suggest that increased credit to SOEs within Japan reduces household savings in both periods. In examining why Japan encouraged the privatisation of railways and the Japan Post, Duggan (2017) argued that inefficiencies, corruption, and poor transparency hindered development in those industries under SOE's direction. The need for more efficiency was important, as a quarter of Japan's financial wealth in the early 2000s was associated with Japan Post, holding 25% of all savings within Japan, making it the largest deposit holder in the world with JPY175 trillion in 2008 (Duggan, 2017). As such, Japan Post is important in promoting economic development by collecting and employing savings to invest in SMEs, housing, and domestic infrastructure (Kim & Huang, 2019). Regardless, there is evidence that such investments led to wasteful spending, often tied to political activities and motives (Yoshino et al., 2018). Furthermore, since 2001, more than 75% of such deposits have been invested in government bonds, thus eliminating the potential of creating new investments (Kim & Huang, 2019). Two main reasons could cause the negative relationship between CGSO and savings in Japan: 1) inefficiencies have played a role within SOEs, negatively influencing savings within the economy; and 2) investing a large portion of domestic savings into low-yielding government bonds has negatively impacted savings, for example, Japanese government bonds have offered negative rates during periods 2016-2021 (Trading Economics, 2023).

While a literature review shows limited analysis of such a relationship within South Korea, some case studies exploring the transparency of SOEs within South Korea exist. In one such example, Lee (2014) explored government support for SOEs, especially with money amounts and management performance. Although detailed, the case study does not refer to the influence of CGSO towards investment. As of 2019, five types of SOEs were subject to performance evaluations by the Ministry of Economy and Finance (2019): 1) full market governance SOEs, defined as large-scale organisations with the main business of managing social infrastructure facilities, made up of five large organisations; 2) semi-market governance SOEs, defined as organisations engaged in the promotion of small to medium industries, made up of nine large organisations; 3) fund management based SOEs, managing fund management-type quasi-government organisations, made up of six organisations; 4) commission service-

based SOEs, institutions designated as commissioned-serviced type quasi-governmental organisations, made up of six organisations; and 5) small scale SOEs fund management quasi-government institutions, made up by six organisations.

The depth of SEOs within South Korea has been substantial. However, during 1998-2003, large-scale privatisation of SOEs occurred, leading to significant development in the market economy. Regardless, SOEs within South Korea still play a significant role in public administration by serving as proxy organisations to carry out government policy (Park et al., 2019). For example, as of 2019, the Budget for public institutions accounted for 15.8% of total government expenditure (National Assembly Budget Office, 2019). Park et al. (2019) argued that South Korean SOEs require significant efficiency improvements. Such improvements are not highlighted in this section. However, as there is a negative unidirectional relationship between CGSO and INV within South Korea data, one main conclusion can be drawn based on the literature: regardless of the inefficiency or efficiency of SOEs to provide goods and services at given prices, the amount of government spending within South Korea is significant enough to keep SOEs operating, to a point where such spending actively detracts investment opportunities from investors. For example, if a Korean SOE makes a financial loss, government spending to support that SOE will still occur. This does not attract private investors to enter the market, as prices do not incur revenue. This is due to a crowding-out effect, whereby government spending decreases investment (Park et al., 2019).

6.8.3 Liquid Liabilities

In analysing LL, Table 6.25 shows that: 1) the United States data showed a negative causal relationship towards P in the long run and a mix of positive and negative in the short run; and 2) Japan data showed a positive causal relationship towards P in the long run, but a negative in the short run. Also known as income inequality, P is a measure of how unevenly income is distributed throughout the population within an economy. Therefore, the less equal the distribution, the higher income inequality is. In explaining the possible causes of such relationships, Amaral (2017) explains the different types of income that may be impacted, alongside the main channels by which money supply increases may affect inequality. Amaral (2017) defines income sources as labour income (i.e., salaries and wages), business income, financial/capital income, and transfer income (i.e., unemployment payments to individuals).

In such a circumstance, the relationship between the volume of money and income distribution can be influenced by five channels, as per Amaral (2017). The first is that inflation increases erode household purchasing power, acting as a regressive consumption tax. The second channel focuses on inflation increases, lowering the value of assets/liabilities. Inequality depends on asset maturity and distribution across households, as Doepke and Schneider (2006) analysed, finding that middle-aged groups experience the most net wealth increases due to the most debt placed into mortgages. However, older and more affluent households may endure more inequality over time, as most of their savings are placed into short-term denominated debt assets. The third channel is interest rate exposure, whereby Auclert (2016) finds that a fall in real interest rates creates winners and losers across different households. Net savers, for example, that place wealth in short-term assets such as CDs or T-

bills will be disadvantaged, while net borrowers of long-term assets, such as mortgages, will hold an advantage due to future interest savings.

The fourth channel is centred around earnings heterogeneity, influencing labour earnings differently. In analysing income distribution at different earnings levels, Heathcote et al. (2009) show that top-income earning households and individuals are affected mainly by changes in hourly wages, while bottom-earning households and individuals were primarily influenced by the number of hours worked and the unemployment rate. In complementing this study, Carpenter and Rodgers (2004) found that increases in the volume of money disproportionately increased unemployment for lower-skilled workers via United States data, negatively impacting racial minorities and other demographic groups that overrepresent the lower-end income distribution measurements.

The fifth channel is income composition, suggesting that households obtain income from different sources, each responding differently to changes in the money supply. At the lower end of income distribution measurements, households rely more on transfer income, such as unemployment payments. Middle-income households rely on labour income, while the upper tail of income distribution relies on capital and business income. As such, changes in the volume of money will produce different influences. For example, falling interest rates may stimulate economic growth, increase wages, and decrease unemployment. Such influences will decrease inequality at the lower end of the distribution. In a counterargument, such a decrease in interest rates will reduce the interest income of those individuals and households at the upper end of the distribution, therefore increasing inequality. Therefore, in analysing the results of the United States and Japan data, one or a combination of more than one of the mentioned channels of influence may result in a negative relationship between the volume of money and income distribution for each economy. Policymakers should be aware that multiple channels affect the negative/positive relationship between money supply and income distribution.

6.8.4 Monetisation

In analysing MR, Table 6.25 shows a negative long and short-run significant causal relationship towards INV via Japan data. In description, M3 is a broader measure than M2 in analysing the depth of financial development within an economy, which is the degree of monetisation in the economy. In theory, when the volume of money is increased within the economy, interest rates are typically lowered, generating stronger investment and thus stimulating aggregate demand. However, the result of MR towards INV suggests that an increase in the volume of money decreases INV, if only mildly. Interest rates in Japan have been below 3% since 2000, entering negative territory in 2014 (Trading Economics, 2023), while INV has decreased steadily over time, explaining such a negative relationship. Therefore, policymakers in Japan should be aware that increases in money supply will have a negative causal effect on INV while such a long-run downward INV trend exists.

6.8.5 Domestic Credit

In analysing DC, Table 6.25 shows that: 1) the United States data shows that DC holds no long-run causality towards S, however, it exhibits negative short-run causal effects; and 2) South Korea data shows that DC exhibits negative short-run causal effects towards PG. In

defining the effects of expanding DC, the corporate sector can borrow and spend money to increase investment and capital to meet demand. The positive relationship between economic growth and DC is generally well-established (Thierry et al., 2006). In a counterargument, Pagano and Giovanni (2012) show that DC does not always positively impact economic growth, while Levine (2005) also shows a negative relationship. Levine (2005) argued that excessive growth that leads to increases in DC could result in an inefficient credit boom in the short run. In analysing the results of the United States data and the savings model, an increase in DC is not met with an increase in S. Therefore, investors in the United States should be aware that increases in DC lead to a reduction in savings, whereby a larger proportion of disposable income within households is spent on the current consumption of services and goods, with less reserved for future use. While only significant in the short run, investors should be aware that the causal effects are non-existent in the long run. That is, increases in DC only slightly reduce the short-run savings rate within the United States.

The results of examining South Korea data show negative causality running from DC to PG in the short run. In other words, when DC increases, productivity decreases in South Korea. Such causality only appears to be present in the current period and not in previous short-run periods or the long run. As such, increased DC within South Korea decreases productivity in the immediate short run. This suggests that credit is being allocated away from productive means and into other areas this study cannot identify. The services industry in South Korea contributed 57% of the GDP in 2021, while 32.8% came from the industry sector. South Korea's services sector employs 70% of the workforce (Statista, 2021). Therefore, increases in DC may be directed towards meeting demand in the services sector over demand for produced end products.

6.8.6 Government Expenditure

This study has incorporated fiscal policy, measured as government expenditure, into the augmented Kaleckian post-Keynesian macroeconomic framework. This indicator was incorporated into 15 individual models within this chapter, resulting in both positive and negative significant results. All causal effects are moderate to strong, ranging from -2.09 % to +1.38% in the long run and from -0.60% to +1.28% in the short run. While some research tests for specific expenditure types and measurements, such as housing and education, this study utilises government expenditure as a whole measurement. The results of the causality running from GE towards the selected key macroeconomic indicators cannot determine which specific type of government spending influences such indicators. While Chapter 5 explained the relationship between government expenditure and investment, savings, profit share, and net exports, the following expands upon the relationship with productivity growth only.

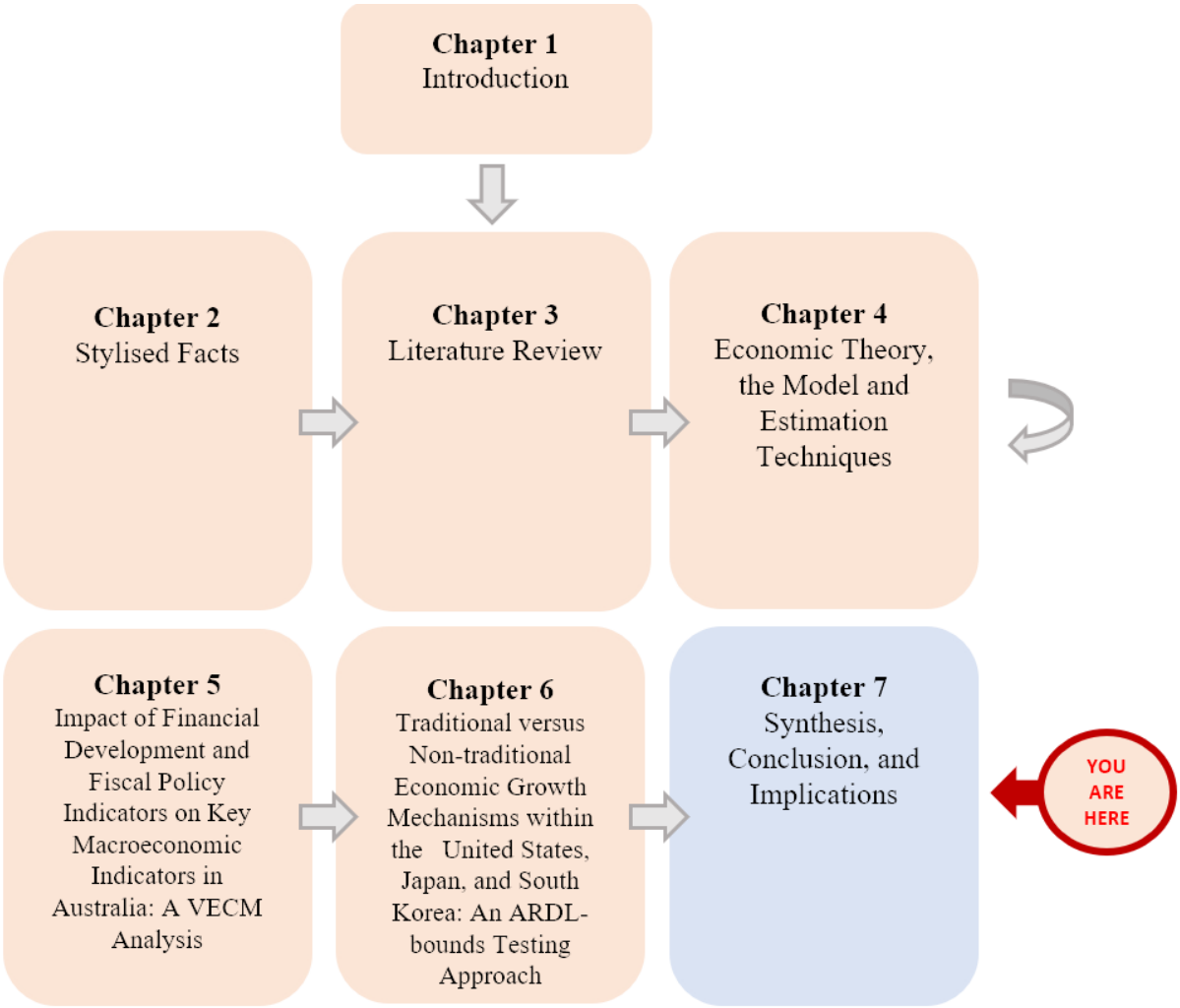
In examining the relationship between productivity growth and government expenditure, positive and negative causal effects have been found in this study. In understanding the causal effects, Hansson and Henrekson (1994) show the general differences, whereby the arguments for government expenditure holding a positive effect upon productivity include: 1) rectifying market failures; 2) ensuring government costs of production equal market values through final output valuations; and 3) Verdoorns' law: Kaldor (1966) claims a high

rate of utilisation holds positive effects upon long-run productivity growth. Arguments towards negative effects include: 1) the crowding-out of production and private investment; and 2) institutional sclerosis and rent-seeking. Regardless, policymakers in all selected economies should be aware that increases in government expenditure produce different long and short-run influences towards each key macroeconomic indicator, indicating that policy creation should be carefully constructed to suit agendas.

6.8.7 Final Conclusion

This chapter has explored the first aim of this thesis, which is to incorporate and analyse whether the inclusion of financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted. This was done by employing both commonly utilised and contemporary measures of financial development. Therefore, the focus of this chapter was aligned with research gaps and questions 1 and 2, as shown in Chapter 1. This chapter has presented a rich assortment of selected models within a Kaleckian post-Keynesian macroeconomic framework. All models in this chapter exhibited a significant error-correction term (ECT), showing that incorporating all indicators is warranted. Complications arose with the net exports model utilising Japan data, showing that unstable parameters exist. This indicates that the regression coefficients are changing suddenly, which is undesirable. All other models passed diagnostic testing. Therefore, the results of 14 out of the 15 models can be taken seriously. Contemporary measures of financial development provided the most influential results towards the dependent variables, being more likely to be augmented into the original models, with the most influential indicator being liquid liabilities. Regarding more traditional measures of financial development, domestic credit proved to be more influential than monetisation. Government expenditure was found to have the strongest influence within the augmented framework, exhibiting moderate to very strong influence on the dependent variables. As it was shown that government expenditure is the more powerful mechanism within this study, permanent incorporation into the Kaleckian post-Keynesian macroeconomic framework should be taken seriously.

Thesis Structure



Some sections of the material in this chapter were adapted for publication in the following referenced conferences, journal articles, and conference paper:

Journal and Conference Publications

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors. In: Chaiechi T., Wood J. (eds) *Community Empowerment, Sustainable Cities and Transformative Economies*. Springer, Singapore.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*

Conferences

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2018). *The Impact of Financial Market Developments on Growth and the Effectiveness of Fiscal Policy*. Paper presented at the 2018 Australian Conference of Economists (ACE), The Economic Society of Australia (ESA), Canberra, 10-13 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2020). *Impacts of Financial Development and Fiscal Policy Upon Investment within Australia*. Paper presented at the 33rd PhD Conference in Business and Economics, Monash University, Melbourne, 23-24 November.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *How Resilient is the Investment Climate in Australia? Unpacking the Driving Factors.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). *Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea.* Paper presented at the International Conference on Business, Economics, Management, and Sustainability (BEMAS), James Cook University, Cairns, 2-3 July.

Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2022). *Building Back Better–Financial Resilience in the United States, Japan, and South Korea: An ARDL Approach*. Paper presented at the 2022 Re-imagining Economic Resilience and Urban Futures in Post-COVID Era (BEMAS), James Cook University, Cairns, 1-3 July.

Chapter 7: Synthesis, Conclusion, and Implications

Chapter Overview

Chapter 7 provides a comprehensive summary of the study's key findings, starting with an overview of the results, and then proceeds to analyse the theoretical and empirical contributions of the study. Moreover, the chapter explores the practical implications of the findings for policymakers and practitioners, highlighting how these results can guide future decision-making. Additionally, the study's limitations are discussed, and recommendations for future research are made. These recommendations provide valuable insights into areas that require further exploration to advance knowledge in this field.

7.1 An Overview of the Chapter's Summaries

Chapter 1 presented an overview of this study, highlighting the potential impact of the financial sector and government policy on economic growth. The chapter concluded by outlining the study's primary objectives, which included identifying three significant research gaps and corresponding research questions. Chapter 2 investigated the stylised facts of the selected economies of Australia, the United States, Japan, and South Korea, mostly from 1980-2022, focusing on financial market overviews, monetary and fiscal policies, and a broad range of macroeconomic indicators that influence the real sector. Chapter 3 aimed to understand how financial and fiscal policy developments influence various sources of economic growth. It adopted a funnel approach towards exploring economic growth theory through various schools of thought, with a particular focus on financial and fiscal policy developments within post-Keynesian and Kaleckian post-Keynesian macroeconomic frameworks, leading to the discovery and explanation of the identified gaps within the literature. Chapter 4 outlined and justified the methodology used in the study. Chapter 5 examined the effects of financial development and fiscal policy on important macroeconomic indicators in Australia, being investment, savings, income distribution, productivity growth, and net exports. Moving on to Chapter 6, the study expanded its analysis to explore data from the United States, Japan, and South Korea. The impacts of financial development and fiscal policy on key macroeconomic indicators were investigated using a similar augmented Kaleckian post-Keynesian macroeconomic framework. This chapter provided insights into how financial development and fiscal policy influenced these indicators in different countries.

7.1.1 Chapter 1: Introduction

Chapter 1 introduced an overview of this study, exploring the impacts of financial markets and governments in influencing economic growth. It concluded by identifying three clear research gaps and associated research questions. The chapter identified the aims of the study after a well-rounded literature review: 1) to incorporate and analyse whether the inclusion of both financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted; and 2) to uncover the resilience of investment, productivity growth, and savings against external and unforeseen shocks and changes within such a prescribed framework. In exploring the aims of this study, three research gaps were identified: 1) limited research on the incorporation of contemporary measures of financial development within the macroeconomic frameworks; 2) lack of research regarding the incorporation of the role of the public sector (e.g., fiscal policy) within the macroeconomic

frameworks; and 3) lack of research regarding the exploration of factors underpinning resilience and economic stability.

The chapter then investigated three research questions: 1) how can multisector dynamic macroeconomic models be improved upon to provide plausible counterfactual outcomes that describe an economy's reaction to external factors affecting it?; 2) how do financial markets and government expenditure fluctuations influence the sources of economic growth in a multisector economy?; and 3) how stable and resilient are the seemingly well-functioning economies, and can they withstand external shocks? The chapter then described the research methodologies associated with this study. Finally, the chapter analysed: 1) the significance of the research through empirical and theoretical contributions; and 2) the implications for both professional practitioners and policymakers.

7.1.2 Chapter 2: Stylised Facts

In Chapter 2, a review of the stylised facts was conducted to identify the key drivers that influence the variables used in constructing economic models. The chapter provided an overview of each selected economy (i.e., Australia, the United States, Japan, and South Korea) by examining financial market overviews, monetary and fiscal policies, and a wide range of macroeconomic indicators. The financial market overview section focused on the banking sector's historical development, while the regulatory section highlighted the relevant acts, departments, and international agreements that oversee the financial markets. The strength and structure of domestic stock markets provided a deeper understanding of each selected economy. At the same time, monetary and fiscal developments illustrated past, current, and future policy decisions influencing each economy. Real sector developments were presented for each selected economy, providing insight into the overall health of such indicators. The selected stylised facts were chosen to provide a whole and unbiased comparison of the selected economies under review.

7.1.3 Chapter 3: Literature Review

Chapter 3 aimed to understand the impact of financial and fiscal policies on economic growth. The chapter began by analysing the history of growth theory, starting from Classical schools to post-Keynesian models, including Kaleckian post-Keynesian theory. Additionally, the chapter explored the role of financial markets in promoting economic growth by reviewing their historical development. The review identified three research gaps within the Kaleckian post-Keynesian macroeconomic framework. These research gaps include the limited incorporation of financial development measures, the lack of research on the role of the public sector, and the lack of research on factors that underpin resilience and economic stability within the framework. Therefore, a review of the literature identified the first aim of this study to be the incorporation and analysis of whether the inclusion of financial development and fiscal policy indicators within the prescribed Kaleckian post-Keynesian macroeconomic framework is warranted. By identifying research gap 3, the study's second aim was to uncover the ability of growth drivers (i.e., investment, productivity growth, and savings) to absorb and recover from external shocks.

7.1.4 Chapter 4: Economic Theory, the Model, and Estimation Techniques

As the research gaps in this study focus on expanding upon Kaleckian post-Keynesian theoretical frameworks and incorporating financial development and fiscal policy indicators, this chapter discussed the methodology used in the study. The chapter explained the sequence and justifications for the methodology, including the economic theory, the augmented model, and the estimation techniques. Five key components defined the macroeconomic theory within this study: 1) the basic model and its implications for profits and interest; 2) historical viewpoints on macroeconomic theory; 3) the Bhaduri and Marglin (1990) model extension; 4) the model through both closed and open economy definitions; and 5) the proposed augmented macroeconomic framework. Utilising unit-root testing, the series data for Australia, the United States, Japan, and South Korea exhibited both stationary and non-stationary behaviours, directing the focus of this study towards vector error-correction modelling (VECM) and autoregressive distributed lag (ARDL) modelling methodology approaches to cointegration within the error-correction (EC) framework. Contained within the results Chapters 5 and 6 are three emulated research papers, a published conference paper alongside one published journal article, and one paper currently under review. While each contained either VECM or ARDL processes, all incorporated impulse response functions (IRF) and variance decompositions (VD), examining the resilience of the selected key macroeconomic indicators and their speeds of adjustment after an unexpected external shock alongside sensitivities to change. Methodology processes were also explored within this chapter.

7.1.5 Chapter 5: Impact of Financial Development and Fiscal Policy Indicators on Key Macroeconomic Indicators in Australia: A VECM Analysis

This chapter utilised a Kaleckian post-Keynesian macroeconomic framework to explore the impacts of financial development and fiscal policy on key macroeconomic indicators in Australia. The selected macroeconomic indicators included investment, savings, income distribution, productivity growth, and net exports, which were incorporated to capture their role in modelling approaches. To achieve the aims of the thesis, this chapter explored two key areas: 1) the estimation and analysis of the impacts of financial development and fiscal policy within the chosen macroeconomic framework; and 2) the use of commonly utilised and contemporary measures of financial development. These aims were aligned with the research gaps and questions identified in the study, specifically research gaps and questions 1 and 2.

This chapter utilised annual historical data from 1980-2015 and adopted VECM methodology to test for long and short-run (i.e., periods) causality, and their implications for the economic theory. The focus of this chapter was purely empirical. The results of the investment model emulated a peer-reviewed conference paper16 proceeding via Springer17. The paper utilised the VECM methodology to test for causality, and IRFs and VDs to examine investments' resilience against external disturbances, which were not examined in this chapter. The results of the emulated paper were aligned with research gaps and questions 1, 2, and 3.

Besides income distribution, all models showed a significant error-correction term (ECT), indicating that incorporating financial development and fiscal policy indicators for investment, savings, productivity growth, and net exports was appropriate in explaining long-run causal relationships using Australian data. This finding is noteworthy as it supports the

validity of the models used in the study. Although most of the relationships between the explanatory and dependent variables were consistent with the economic theory, some long and short-run results were not. The coefficients against the economic theory were examined to determine the strength of these relationships and the literature was also reviewed, which yielded similar findings.

The most commonly used indicator was monetisation, while credit to government and state-owned enterprises and stock market turnover were also incorporated as contemporary indicators. Although the long-run relationship between money supply, income distribution, and net exports was weak, it was still significant. On the other hand, a strong causal effect was observed between money supply and long-run productivity growth. Additionally, credit to government and state-owned enterprises had a strong short-run effect on savings, while stock market turnover showed a very weak short-run effect on investment. These results were compared with existing literature, and the coefficients were analysed to assess the strength of the relationships between explanatory and dependent variables, some of which were not aligned with the economic theory. Compared with the incorporated financial development indicators, government expenditure was the more powerful explanatory indicator, exhibiting strong causal effects on investment, savings, income distribution, and net exports in both periods while showing strong causal effects towards long-run productivity growth. Therefore, through model selection processes, this chapter incorporated both commonly used and contemporary measures of financial development, with the best-performing model selected for analysis. Such model selection satisfies research question 1 of this study. Also, the role of the public sector was incorporated with each selected model, thus satisfying research question 2.

To address the research gap and question 3, a peer-reviewed conference paper processing[16] was emulated from this chapter. While the ECT and associated long and short-run causal relationships are the same in the chapter and paper, IRFs and VDs examined investments' resilience against external disturbances. In answering research question 3, IRFs suggested that financial markets, productivity, and changes in profit show positive outcomes through investor activity in financial markets. Through such improvement, the variables absorb shocks through short-term stability after five-six years. Furthermore, the VD technique showed that investment level variations in Australia were mostly explained by profitability and the private sector's productive capacity.

This empirical chapter and the emulated paper addressed this study's research gaps and questions. Specifically, they investigated whether the inclusion of financial development and fiscal policy indicators within the Kaleckian post-Keynesian macroeconomic framework is justified and examined the resilience of investment to external shocks within this framework. The findings support the inclusion of these indicators in the model, as they have significant long-run relationships with key macroeconomic indicators in the Australian context.

[16] **eBook ISBN,** 978-981-16-5260-8, **DOI:** 10.1007/978-981-16-5260-8. Details can be found here.

Furthermore, the study demonstrated that investment has a high degree of resilience against external shocks, indicating the robustness of the prescribed framework.

7.1.6 Chapter 6: Traditional versus Non-traditional Economic Growth Mechanisms within the United States, Japan, and South Korea: An ARDL-Bounds Testing Approach

This chapter utilised a Kaleckian post-Keynesian macroeconomic framework to explore the impacts of financial development and fiscal policy on the key macroeconomic indicators in the United States, Japan, and South Korea to explore research gaps and questions 1 and 2. It employed annual historical data from 1980-2019 and adopted the ARDL methodology to test for long and short-run causality and their implications for the economic theory. Two papers were emulated from this chapter, with the first peer-reviewed paper[17] also being presented[18]. The emulated paper[17] incorporated IRFs and VDs to examine productivity growths' resilience against external disturbances, which were not examined within this chapter. The second paper[20], currently under review, was also emulated from this chapter. The results of the emulated paper[20] were also presented[21]. The savings paper incorporated IRFs and VDs to examine savings' resilience against external disturbances, again not examined within this chapter. The outcomes of the emulated papers aligned with research gaps and questions 1, 2, and 3. All models showed a significant error-correction term (ECT), indicating that the incorporation of financial development and fiscal policy indicators into the framework is appropriate in explaining long-run causal relationships. This finding is noteworthy as it supports the validity of the models used in the study. The coefficients against the economic theory were examined to determine the strength of these relationships, and the literature was also reviewed, which yielded similar findings.

Liquid liabilities were the most utilised contemporary measure of financial development, followed by stock market turnover, and credit to government and state-owned enterprises. In contrast, domestic credit was the most utilised commonly used measure of financial development, followed by monetisation. The results of this chapter were compared with existing literature, and the coefficients were analysed to assess the strength of the relationships between explanatory and dependent variables, some of which were not aligned with the economic theory. Compared with the incorporated financial development indicators, government expenditure was the more powerful explanatory indicator, exhibiting moderate to strong causal effects on the key macroeconomic indicators either in the long or short run. Therefore, through model selection processes, this chapter incorporated both commonly used and contemporary measures of financial development, with the best-performing model selected

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17 Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

18 The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2021. Conference details are here.

19 **eBook ISBN,** 978-981-16-5260-8, **DOI:** 10.1007/978-981-16-5260-8. Details can be found here.

20 Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

21 The International Conference on Business, Economics, Management and Sustainability (BEMAS) on July 2nd, 2022. Conference details are here.

for analysis. Such model selection satisfies research question 1 of this study. Also, the role of the public sector was incorporated with each selected model, thus satisfying research question 2.

To address the research gap and question 3, paper[22] and paper[23] explored the resilience of productivity growth and savings. The impulse response functions revealed how productivity growth responded to shocks in different short and long-run variables. Analysing the United States data, the findings showed that productivity growth was most resilient towards a shock in stock market turnover in both the short and long run. However, it exhibited the least resilience to a shock in investment. In the long run, Japan's data showed that productivity growth was most resilient to a shock in investment while also showing similar resilience to a shock in government spending in the short run. South Korea's data showed the most resilience in a short-run shock in domestic credit, while also showing similar resilience to a shock in government spending in the long run. Variance decomposition analysis was utilised to show the influence of the variables on productivity growth, explaining their variability over different periods of time. The United States data showed that productivity growth exhibited susceptibility to changes in capacity utilisation while displaying weaker sensitivity to stock market turnover, government expenditure, and investment in the long run. Japan's data showed that productivity growth exhibited moderate sensitivity to change in the orders of monetisation, investment, and government spending in the long run. The data showed that productivity growth exhibited weaker sensitivity to changes in capacity utilisation. South Korea's data showed that productivity growth displayed susceptibility to investment and capacity utilisation changes; however, it experienced a weak acceleration in sensitivity towards changes in domestic credit and government spending over time.

The incorporated IRFs within the savings paper showed that South Korea data contained the strongest absolute impulse responses in the short run, all economies exhibited mixed results in the medium term, and Japan data held the weakest absolute impulse reactions in the long run. Overall, however, savings via Japan data become somewhat steady after eight years, South Korea data become somewhat steady after 14-15 years, and the United States data after 17-18 years. Furthermore, the VDs showed that savings were not sensitive to changes in capacity utilisation in the long run, whereby an orthogonal shock in capacity utilisation only weakly influenced the stability of savings via the United States data. Savings exhibited moderate to strong sensitivity towards changes in profit share and government expenditure in the short run but showed weaker sensitivity in the long run. Interestingly, savings did not react strongly to changes in domestic credit. Japan's data showed that savings grew in sensitivity towards changes in credit to government and state-owned enterprises over time. South Korea's

[22] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (2021). Productivity Growth Recovery Mechanisms: An ARDL Approach Lessons from the United States, Japan, and South Korea. *Bulletin of Applied Economics*, *8*(2), 163-184. Details can be found here.

[23] Koczyrkewycz, M., Chaiechi, T., & Beg, R. (Under Review). Financial Resilience of Households and National Savings: An ARDL Approach. *Journal of Evolutionary Economics*.

data showed that, for the most part, savings in the short run were not sensitive to changes in all independent variables but grew in sensitivity over time.

This empirical chapter and emulated papers addressed this study's research gaps and questions. Specifically, they investigated whether the inclusion of financial development and fiscal policy indicators within the Kaleckian post-Keynesian macroeconomic framework is justified and examined the resilience of productivity growth and savings to external shocks within this framework. The findings support the inclusion of these indicators in the model, as they have significant long-run relationships with key macroeconomic indicators in the context of the United States, Japan, and South Korea data. Furthermore, the study demonstrated that productivity growth and savings have a high degree of resilience against external shocks, indicating the robustness of the prescribed framework.

7.2 Contributions and Implications

The research conducted in chapters 5 and 6, and the emulated papers, has contributed to theoretical and empirical knowledge in macroeconomics. These findings have significant implications for policymakers and professional practitioners who are formulating and implementing financial and fiscal policies. In the following sections, we discuss these contributions and their implications.

7.2.1 Theoretical and Empirical Contributions

This study attempted to expand upon the current Kaleckian post-Keynesian macroeconomic frameworks by incorporating financial development and fiscal policy indicators through augmentation, utilising multidimensional and system-dynamic analysis. To fill gaps in previous research, this study aimed to provide a more comprehensive understanding of the relationship between these indicators and the selected key macroeconomic indicators. In presenting a unique empirical contribution towards enhancing existing empirical models, this study analysed the causal dynamics of the selected key macroeconomic indicators for the cases of Australia, the United States, Japan, and South Korea, utilising augmented models through the incorporation of VECM and ARDL modelling methodology. This study aimed to enhance the current empirical models and contribute meaningfully to the existing literature.

In addition, this study tested the resilience of three key macroeconomic indicators (i.e., investment, productivity growth, and savings) in response to unexpected exogenous shocks. Impulse response functions tested each key macroeconomic indicator's absorbability and recoverability (i.e., resilience), while variance decompositions determined the strength of influence of their explanatory variables. This provided a unique opportunity to examine the newly augmented framework to understand how the selected indicators react to external events (i.e., the ability to absorb and recover over time). The additional theoretical contribution of this study lies in the use of comprehensive and rigorous analysis to uncover the relationship between financial development and fiscal policy towards the key macroeconomic indicators that are usually absent from the existing literature to provide further insight into the functionality of the selected economies through resilience analysis.

7.2.2 Implications for Policymakers

Policymakers are constantly seeking ways to improve the macroeconomic performance of their countries, and one tool at their disposal is government expenditure. However, achieving this objective is not always straightforward. While government expenditure can have important implications for policymakers, such as creating jobs for government employees, several considerations must be explored throughout the implementation process, such as fiscal priorities, budget constraints, inflationary pressures, distributional effects, and debt burden. As government expenditure directly affects the allocation of resources within an economy, such implications must be approached with care and consideration for long-run impacts on the economy and society. The findings of this study provide valuable information to policymakers in understanding the potential impact of policy changes on macroeconomic goals. For instance, the results of this study show that the causal effects of a 1% increase in government expenditure can vary (i.e., none, positive, or negative) depending on the specific country and macroeconomic indicator being analysed. Therefore, policymakers must carefully consider the potential impacts of government expenditure on various macroeconomic indicators and ensure that the expenditure aligns with long-run economic and social goals. The results of this study can be used as a guide for policymakers in their decision-making processes, aiding in more efficient use of public resources, better economic performance, and ultimately improved economic well-being for citizens.

Our findings also indicated that the causal relationship between government expenditure and the selected key macroeconomic indicators was not always straightforward. In some cases, government expenditure held a negative short-run causal relationship towards the selected indicators, while exhibiting a positive long-run causal effect, or vice versa. Therefore, policymakers should carefully consider the trade-off between short-run negative impacts and potential long-run positive effects or vice versa. Policymakers must evaluate whether an increase in government expenditure will likely lead to the desired outcomes, considering the specific context and characteristics of the economy.

This study also examined the resilience of investment, productivity growth, and savings towards an unexpected shock in government expenditure via impulse response analysis, providing policymakers with an understanding of: 1) possible reactionary delays; 2) the cyclical behaviour in response (i.e., positive or negative); 3) time to stability; and 4) the strength of a positive one-time shock over time (i.e., resilience). This information can help policymakers anticipate and respond to unexpected exogenous shocks, for example, by adjusting fiscal policies or other measures. Additionally, variance decompositions were explored in this study, which can provide policymakers with an understanding of the sensitivity of the selected key macroeconomic indicators to changes over time. Therefore, our findings can help policymakers determine whether their policy measures effectively mitigate the impact of shocks on the economy, which can inform decisions about future policy directions.

7.2.3 Implications for Professional Practitioners

The results of this study are relevant to professional practitioners in the financial sector, including investors, regulators, bankers, and insurers, as they can gain insights into the impacts of changes in financial development and government expenditure on key macroeconomic

indicators over time. By analysing policymakers' responses to such changes, practitioners can formulate a strategy based on the potential causal repercussions of government expenditure. Understanding which financial development indicator/s hold the strongest causal effects is also crucial for practitioners to formulate an investment strategy, as each indicator represents a specific aspect of the financial market and may have varying impacts on macroeconomic outcomes.

The results contained within this study could be of interest to practitioners, assisting in: 1) identifying market opportunities; 2) introducing stronger regulatory environments; 3) advancing skill development; 4) fostering technological advancements; and 5) establishing stronger risk management systems and processes through the development of more accurate risk models, leading to better-informed investment decisions. Furthermore, analysing the resilience and sensitivity of the macroeconomic indicators to unexpected external shocks could help practitioners to better prepare for potential risks and uncertainties in the market. This could include developing contingency plans and risk management strategies to minimise the impact of external shocks on investments and financial stability.

7.3 Limitations of Research

This study has some limitations that should be acknowledged. Post-Keynesian macroeconomic models have faced criticism for their lack of mathematical rigour, making it challenging to test and compare predictions with other macroeconomic models. Regardless, it is noteworthy to acknowledge that other post-Keynesian macroeconomic modelling approaches exist (i.e., Dynamic Stochastic General Equilibrium Models, Stock-Flow Consistent Models, and Computational General Equilibrium Models). However, we have taken care to handle the modelling steps carefully to increase the level of rigour and make our models more systematic. The scope of this study focused on four economies, limiting the information available to policymakers and practitioners regarding other influential economic players. Additionally, although we explored five measures of financial development, more indicators available in the Global Financial Development Database (GFDD) could be considered. Finally, this study did not explore the causal effects of taxation, which is an essential tool in fiscal policy. Overall, while this study has its limitations, we believe that the findings presented contribute to a better understanding of the relationships between financial development, fiscal policy, and key macroeconomic indicators.

7.4 Recommendations for Future Research

Future research should carefully evaluate the relevance and appropriateness of selected variables based on the research question and external factors such as COVID-19 and government policies. To improve the analysis of financial development indicators, it is recommended to use a larger sample size and include more measurements. When analysing the influence of fiscal policy, incorporating broader measures of government expenditure, government taxation, and larger sample sizes is recommended to account for potential biases and confounding factors. Incorporating additional variables requires careful consideration of potential limitations and biases. Researchers should also consider utilising other time series methodology, such as non-linear ARDL (NARDL) modelling, to provide a more complete picture of the studied relationships.

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Appendix 1

Descriptive Statistics. Australia: 1980-2015

Statistics	INV	S	UT	P	IR	PG	U	NX	SMTR	CGSO	MR	GE
Mean	0.25	0.25	0.42	0.52	0.05	0.04	0.07	-0.01	0.52	0.05	0.68	0.25
Median	0.26	0.25	0.43	0.53	0.05	0.04	0.07	-0.01	0.52	0.05	0.65	0.25
Maximum	0.28	0.28	0.51	0.58	0.10	0.14	0.11	0.01	1.12	0.11	1.13	0.27
Minimum	0.22	0.22	0.32	0.43	0.00	-0.01	0.04	-0.03	0.10	0.00	0.38	0.21
Std. Dev.	0.02	0.02	0.06	0.04	0.03	0.03	0.02	0.01	0.26	0.03	0.23	0.01
Skewness	-0.39	-0.03	-0.11	-0.26	0.00	0.92	0.52	0.07	0.22	0.00	0.40	-0.77
Kurtosis	2.17	2.45	1.46	1.79	2.04	3.91	2.34	2.01	2.30	1.79	1.96	2.87
J-B.	1.92	0.45	3.62	2.60	1.39	6.34	2.32	1.50	1.02	2.21	2.55	3.56
Prob.	0.38	0.80	0.16	0.27	0.50	0.04	0.31	0.47	0.60	0.33	0.28	0.17
Ob.	36	36	36	36	36	36	36	36	36	36	36	36

INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, SMTR = Stock Market Turnover Ratio, CGSO = Credit to Government and State-Owned Enterprises, MR = Monetisation Ratio, GE = Government Expenditure.

Appendix 2

Stationarity Results. Australia: 1980-2015

Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	Intercept	Trend	Intercept	Trend	Intercept	Trend	Intercept	Trend
INV		-3.21 (0.10)		-5.77*** (0.02)		-3.21 (0.10)		-5.78*** (0.00)
S	-2.51 (0.12)		-6.67*** (0.00)		-2.56 (0.11)		-8.83*** (0.00)	
UT		-0.47 (0.98)		-4.45*** (0.02)		-0.81 (0.95)		-4.47*** (0.00)
P		-2.30 (0.42)		-6.46*** (0.00)		-2.35 (0.39)		-6.70*** (0.02)
IR	-1.94 (0.31)		-4.79*** (0.00)		-2.39 (0.10)		-8.09*** (0.00)	
PG		-2.63 (0.26)		-7.19*** (0.00)		-2.41 (0.36)		-8.28*** (0.00)
U		-2.45 (0.35)		-4.15** (0.02)		-2.45 (0.35)		-4.15** (0.02)
NX	-2.05 (0.27)		-4.24*** (0.00)		-3.68*** (0.00)		-3.82*** (0.00)	
SMTR		-2.28 (0.43)		-8.94*** (0.02)		-2.03 (0.56)		-9.19*** (0.00)
CGSO		-0.82 (0.95)		-5.44*** (0.00)		-0.91 (0.94)		-5.45*** (0.00)
MR		-2.27 (0.44)		-3.82*** (0.00)		-2.27 (0.44)		-7.45*** (0.00)
GE		-2.76 (0.22)		-3.82*** (0.00)		-2.76 (0.22)		-3.82*** (0.00)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%, MacKinnon (1996) one-sided p-values. INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, SMTR = Stock Market Turnover Ratio, CGSO = Credit to Government and State-Owned Enterprises, MR = Monetisation Ratio, GE = Government Expenditure.

Appendix 3

Lag Lengths. Australia:1980-2015: Lags 3

INV = *f*(UT, P, IR, PG, SMTR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	551.07	NA	1.13E-23	-32.97	-32.66	-32.87
1	682.97	199.85	7.95E-26	-38.00	-35.45*	-37.14
2	731.80	53.27	1.24E-25	-37.99	-33.23	-36.39
3	852.27	80.30*	6.81e-27*	-42.31*	-35.34	-39.96*
S = *f*(UT, P, CGSO, GE)						

Lag	LogL	LR	FPE	AIC	SC	HQ
0	449.12	NA	1.41E-18	-26.91	-26.69	-26.84
1	561.14	183.30	7.35E-21	-32.19	-30.82964*	-31.73
2	587.57	35.24	7.54E-21	-32.27	-29.78	-31.44
3	625.80	39.39*	4.62e-21*	-33.07*	-29.45	-31.85*
P = *f*(UT, U, PG, MR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	482.95	NA	1.13E-20	-28.91	-28.63	-28.81
1	641.42	249.71	7.00E-24	-36.33	-34.42*	-35.69
2	692.95	62.46*	3.44E-24	-37.27	-33.73	-36.08
3	746.89	45.77	2.32e-24*	-38.35*	-33.19	-36.61*
PG = *f*(INV, UT, MR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	361.12	NA	2.91E-16	-21.58	-21.36	-21.51
1	513.29	249.00	1.34E-19	-29.29	-27.92*	-28.83
2	539.40	34.81	1.40E-19	-29.36	-26.86	-28.52
3	585.75	47.75*	5.24e-20*	-30.65*	-27.02	-29.43*
NX = *f*(UT, P, MR, GE)						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	391.94	NA	4.50E-17	-23.45	-23.22	-23.37
1	515.60	202.35	1.16E-19	-29.43	-28.07*	-28.97
2	546.17	40.75	9.27E-20	-29.77	-27.27	-28.93
3	597.87	53.27*	2.51e-20*	-31.38*	-27.76	-30.16*

INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, GE = Government Expenditure, S = Savings, CGSO = Credit to Government and State-Owned Enterprises, U = Unemployment Rate, MR = Monetisation Ratio, NX= Net Exports. Criteria: (LR) = Likelihood Ratio, (FPE) = Final Prediction Error, (AIC) = Akaike Information Criterion, (SC) = Schwarz Information Criterion, (HQ) = Hannan-Quinn Criterion.

Appendix 4

Johansen Testing. Australia:1980-2015

INV = *f*(UT, P, IR, PG, SMTR, GE)					
Data Trend	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
MHM:0.01	No Trend	No Trend	No Trend	Trend	Trend
Trace	4	4	5	5	4
Max	2	3	2	3	3
S = *f*(UT, P, CGSO, GE)					
Data Trend	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
MHM:0.01	No Trend	No Trend	No Trend	Trend	Trend
Trace	1	2	2	1	2
Max	1	2	2	2	2
P = *f*(UT, U, PG, MR, GE)					
Data Trend	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
MHM:0.01	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	4	3	3	3
Max	1	2	2	3	2
PG = *f*(INV, UT, MR, GE)					
Data Trend	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
MHM:0.01	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	2	2	2
Max	1	2	2	2	2
NX = *f*(UT, P, MR GE)					
Data Trend	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
MHM:0.01	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	2	2	2
Max	1	1	1	2	2

Critical values based on MacKinnon-Haug-Michelis (1999). Critical values: MHM: 1%. INV = Investment, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, SMTR = Stock Market Turnover Ratio, GE = Government Expenditure, S = Savings, CGSO = Credit to Government and State-Owned Enterprises, U = Unemployment Rate, MR = Monetisation Ratio, NX= Net Exports.

Appendix 5

Descriptive Statistics United States: 1980-2019

Statistics	INV	S	UT	P	IR	PG	U	NX	SMTR	LL	DC	GE
Mean	0.21	0.19	0.45	0.58	0.04	0.03	0.06	-0.03	1.30	0.68	1.52	0.22
Median	0.21	0.19	0.47	0.59	0.05	0.02	0.06	-0.03	1.25	0.68	1.62	0.21
Maximum	0.24	0.24	0.55	0.66	0.09	0.11	0.10	0.00	2.93	0.74	2.12	0.26
Minimum	0.18	0.15	0.31	0.47	0.01	-0.06	0.04	-0.06	0.31	0.59	0.89	0.18
Std. Dev.	0.01	0.02	0.06	0.05	0.02	0.03	0.02	0.02	0.68	0.04	0.38	0.02
Skewness	-0.20	0.00	-0.58	-0.39	0.01	0.44	0.77	-0.10	0.47	-0.40	-0.18	0.39
Kurtosis	1.96	2.16	2.24	2.39	1.65	7.20	2.76	2.02	2.28	2.06	1.55	3.45
J-B.	2.06	1.18	3.19	1.65	3.03	30.72	4.09	1.67	2.35	2.53	3.71	1.33
Prob.	0.36	0.55	0.20	0.44	0.22	0.00	0.13	0.43	0.31	0.28	0.16	0.51
Ob.	40	40	40	40	40	40	40	40	40	40	40	40

INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, SMTR = Stock Market Turnover Ratio, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

Appendix 6

Descriptive Statistics Japan: 1980-2019

Statistics	INV	S	UT	P	IR	PG	U	NX	LL	CGSO	MR	GE
Mean	0.27	0.29	0.33	0.11	0.03	0.02	0.03	0.01	1.94	0.57	1.73	0.16
Median	0.27	0.29	0.33	0.11	0.03	0.02	0.03	0.01	1.96	0.59	1.69	0.16
Maximum	0.35	0.36	0.36	0.18	0.06	0.13	0.05	0.06	2.32	0.74	2.21	0.20
Minimum	0.23	0.21	0.31	0.02	-0.01	-0.03	0.02	-0.05	1.37	0.24	1.27	0.14
Std. Dev.	0.03	0.05	0.12	0.05	0.02	0.03	0.01	0.02	0.25	0.11	0.23	0.01
Skewness	0.71	-0.13	0.72	-0.21	-0.73	1.32	0.13	0.15	-0.60	-1.31	0.12	0.50
Kurtosis	2.89	1.65	3.12	1.96	3.65	6.18	1.82	4.98	2.62	4.74	2.59	2.66
J-B.	3.33	3.12	3.52	2.07	4.27	28.45	2.44	6.66	2.64	16.53	0.39	1.84
Prob.	0.19	0.21	0.17	0.35	0.12	0.00	0.30	0.04	0.27	0.00	0.82	0.40
Ob.	40	40	40	40	40	40	40	40	40	40	40	40

INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, LL = Liquid Liabilities, CGSO = Credit to Government and State-Owned Enterprises, MR = Monetisation Ratio, GE = Government Expenditure.

Appendix 7

Descriptive Statistics South Korea: 1980-2019

Statistics	INV	S	UT	P	IR	PG	U	NX	CGSO	LL	DC	GE
Mean	0.33	0.35	0.45	0.25	0.04	0.10	0.04	0.01	0.06	0.51	0.87	0.17
Median	0.32	0.36	0.43	0.24	0.04	0.08	0.03	0.02	0.04	0.54	0.69	0.15
Maximum	0.40	0.41	0.56	0.40	0.11	0.50	0.07	0.11	0.11	0.80	1.54	0.25
Minimum	0.29	0.25	0.37	0.04	-0.05	-0.06	0.02	-0.09	0.01	0.29	0.40	0.12
Std. Dev.	0.03	0.03	0.05	0.09	0.03	0.09	0.01	0.04	0.03	0.18	0.48	0.04
Skewness	0.79	-1.21	0.53	-0.22	-0.21	1.98	1.05	-0.37	0.06	0.12	0.26	0.78
Kurtosis	2.22	4.79	2.01	2.34	4.75	9.39	5.04	3.97	1.28	1.35	1.30	2.49
J-B.	5.14	15.10	3.52	1.05	5.39	94.12	14.24	2.49	4.94	4.65	5.11	4.53
Prob.	0.08	0.00	0.17	0.59	0.07	0.00	0.00	0.29	0.08	0.10	0.08	0.10
Ob.	40	40	40	40	40	40	40	40	40	40	40	40

INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

Appendix 8

Stationarity Results United States: 1980-2019

Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	Intercept	Trend	Intercept	Trend	Intercept	Trend	Intercept	Trend
INV		-3.82** (0.02)		-4.17** (0.01)		-2.26 (0.44)		-3.47* (0.05)
S		-3.37* (0.07)		-4.45*** (0.00)		-2.57 (0.29)		-5.33*** (0.00)
UT		-2.08 (0.53)		-4.24*** (0.00)		-1.35 (0.85)		-4.15** (0.01)
P		-2.77 (0.21)		-4.26*** (0.00)		-3.10 (0.12)		-5.41*** (0.00)
IR		-3.50* (0.05)		-5.94*** (0.00)		-3.48* (0.05)		-6.54*** (0.00)
PG	-2.15 (0.22)		-4.15*** (0.00)		-6.40*** (0.00)		-13.17*** (0.00)	
U	-3.49** (0.01)		-5.42*** (0.00)		-2.19 (0.21)		-4.03*** (0.00)	
NX		-1.69 (0.73)		-4.75*** (0.00)		-2.04 (0.56)		-4.75*** (0.00)
SMTR		-2.41 (0.36)		-5.46*** (0.00)		-2.64 (0.26)		-5.46*** (0.00)
LL		-2.32 (0.41)		-4.18*** (0.00)		-1.84 (0.66)		-3.96** (0.01)
DC		-1.84 (0.66)		-6.29*** (0.00)		-1.84 (0.66)		-6.29*** (0.00)
GE		-2.60 (0.27)		-3.85*** (0.00)		-1.90 (0.62)		-3.93** (0.02)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%, MacKinnon (1996) one-sided p-values. INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, SMTR = Stock Market Turnover Ratio, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

Appendix 9

Stationarity Results Japan: 1980-2019

Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	Intercept	Trend	Intercept	Trend	Interce pt	Trend	Intercept	Trend
INV		-2.97 (0.15)		-4.39*** (0.00)		-3.48* (0.06)		-5.03*** (0.00)
S	0.06 (0.95)		-5.61*** (0.00)		0.08 (0.49)		-5.62*** (0.00)	
UT	-1.43 (0.55)		-4.58*** (0.00)		-1.85 (0.35)		-4.66*** (0.00)	
P		-2.78 (0.21)		-6.16*** (0.00)		-2.78 (0.21)		-6.18*** (0.00)
IR		-4.49*** (0.00)		-7.61*** (0.00)		-4.53*** (0.00)		-10.37*** (0.00)
PG		-2.04 (0.56)		-4.87*** (0.00)		-4.15** (0.02)		-8.46*** (0.00)
U		-2.11 (0.53)		-5.54*** (0.00)		-2.23 (0.46)		-5.54*** (0.00)
NX		-2.84 (0.19)		-3.82** (0.03)		-4.13** (0.01)		-9.20*** (0.00)
LL		-2.58 (0.29)		-3.98** (0.02)		-1.88 (0.64)		-3.81** (0.03)
MR		-2.21 (0.47)		-5.69*** (0.00)		-2.21 (0.47)		-5.67*** (0.00)
CGSO	-2.69* (0.09)		-6.59*** (0.00)		-2.74* (0.08)		-7.21*** (0.00)	
GE	-2.71* (0.08)		-8.52*** (0.00)		-2.65* (0.09)		-8.54*** (0.00)	-2.71* (0.08)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%, MacKinnon (1996) one-sided p-values. INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, LL = Liquid Liabilities, MR = Monetisation Ratio, CGSO = Credit to Government and State-Owned Enterprises, GE = Government Expenditure.

Appendix 10

Stationarity Results South Korea: 1980-2019

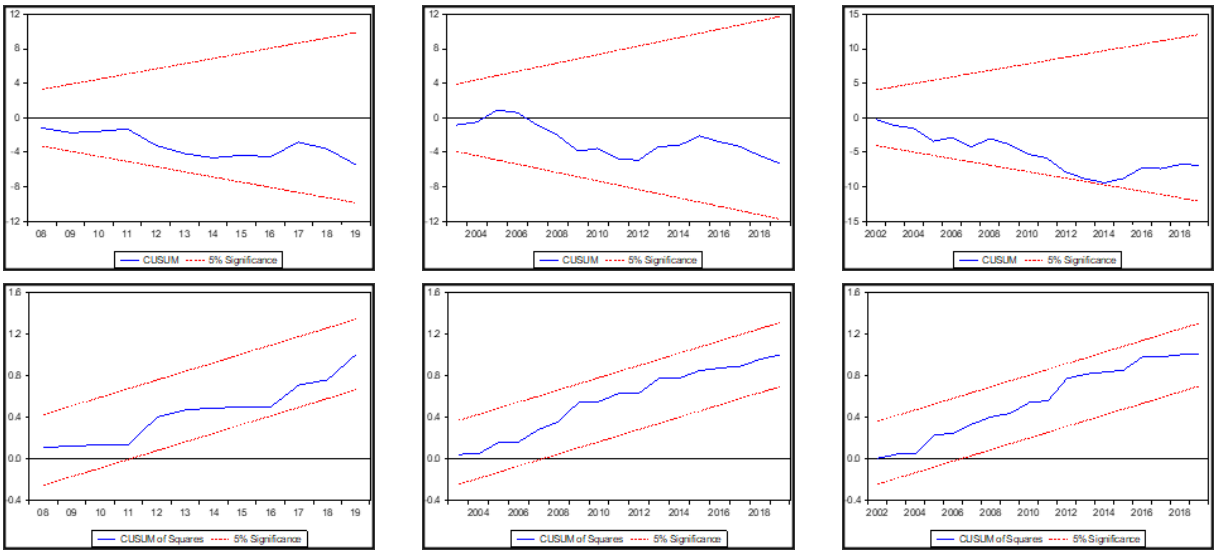
Variable	ADF				PP			
	Level		First Difference		Level		First Difference	
	Intercept	Trend	Intercept	Trend	Intercept	Trend	Intercept	Trend
INV	-2.35		-5.25***		-2.00		-4.77***	
	(0.16)		(0.00)		(0.29)		(0.30)	
S	0.95		-2.63*		-3.05**		-4.48***	
	(0.95)		(0.09)		(0.04)		(0.00)	
UT		-2.25		-5.31***		-2.32		-5.31***
		(0.45)		(0.00)		(0.41)		(0.00)
P		-2.77		-7.45***		-2.72		-7.69***
		(0.22)		(0.00)		(0.24)		(0.30)
IR	-3.82**		-5.99***		-3.88**		-6.00***	
	(0.03)		(0.00)		(0.03)		(0.00)	
PG		-3.06		-4.31***		-6.49***		-9.10***
		(0.13)		(0.00)		(0.00)		(0.00)
U	-3.99***		-5.47***		-3.11**		-8.89***	
	(0.00)		(0.00)		(0.03)		(0.00)	
NX		-4.06**		-5.33***		-3.38*		-7.02***
		(0.01)		(0.00)		(0.07)		(0.00)
CGSO		-2.00		-6.80***		-2.00		-6.82***
		(0.58)		(0.00)		(0.58)		(0.00)
LL		-2.30		-4.62***		-2.24		-3.45*
		(0.43)		(0.00)		(0.46)		(0.05)
DC		-2.29		-4.54***		-1.98		-4.41***
		(0.43)		(0.00)		(0.59)		(0.00)
GE		-2.65		-7.12***		-2.65		-7.18***
		(0.26)		(0.00)		(0.26)		(0.00)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%, MacKinnon (1996) one-sided p-values. INV = Investment, S = Savings, UT = Capacity Utilisation, P = Profit Share, IR = Interest Rate, PG = Productivity Growth, U = Unemployment Rate, NX = Net Exports, CGSO = Credit to Government and State-Owned Enterprises, LL = Liquid Liabilities, DC = Domestic Credit, GE = Government Expenditure.

Appendix 11

CUSUM and CUSUMSQ Dependent Variable: Investment. 1980-2019

1-USA (a) 2-Japan (b) 3-South Korea (c)

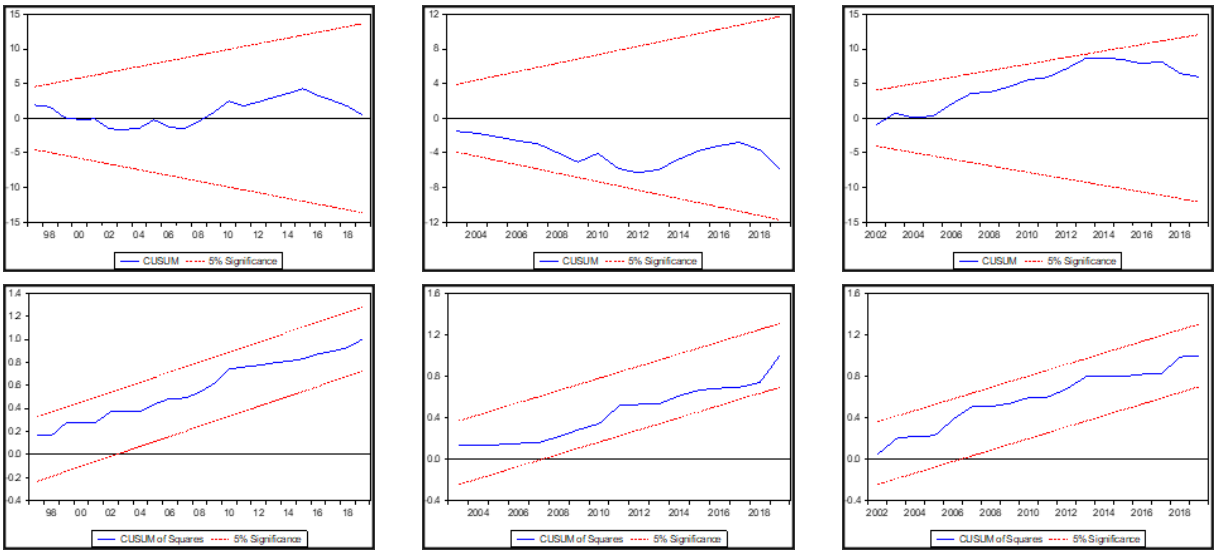


Inspection of the CUSUM and CUSUMSQ graphs indicates that there is stability. Such stability indicates that no systematic change is detected in the coefficients of the ARDL models at a 5% significance level over the period, meaning there is no structural break detected.

Appendix 12

CUSUM and CUSUMSQ Dependent Variable: Savings. 1980-2019

4-USA (d) | 5-Japan (e) | 6-South Korea (f)

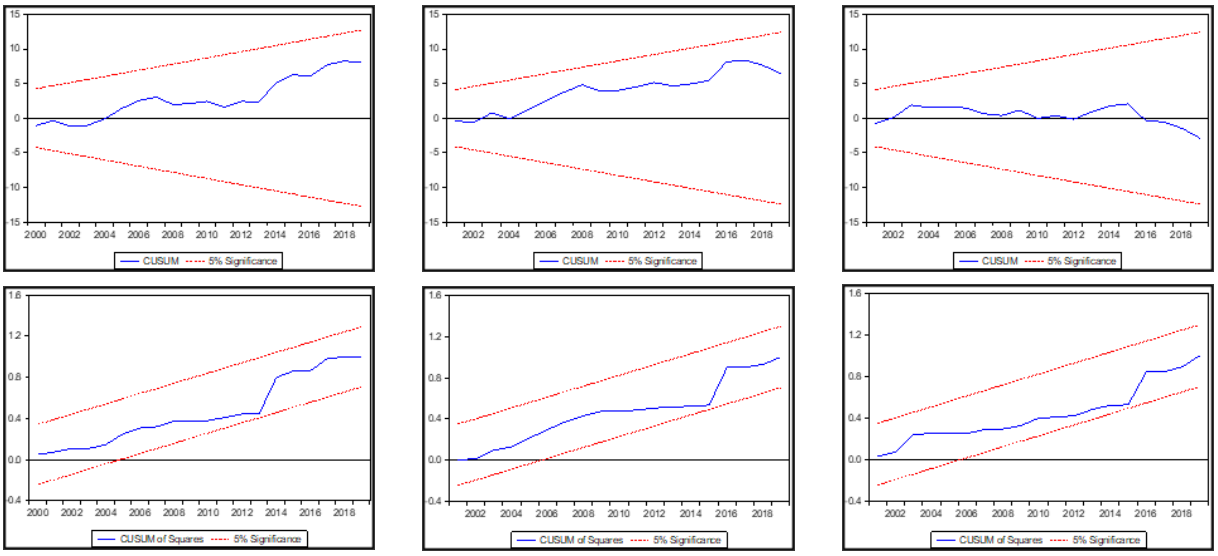


Inspection of the CUSUM and CUSUMSQ graphs indicates that there is stability. Such stability indicates that no systematic change is detected in the coefficients of the ARDL models at a 5% significance level over the period, meaning there is no structural break detected.

Appendix 13

CUSUM and CUSUMSQ Dependent Variable: Income Distribution. 1980-2019

7-USA (g) | 8-Japan (h) | 9-South Korea (i)

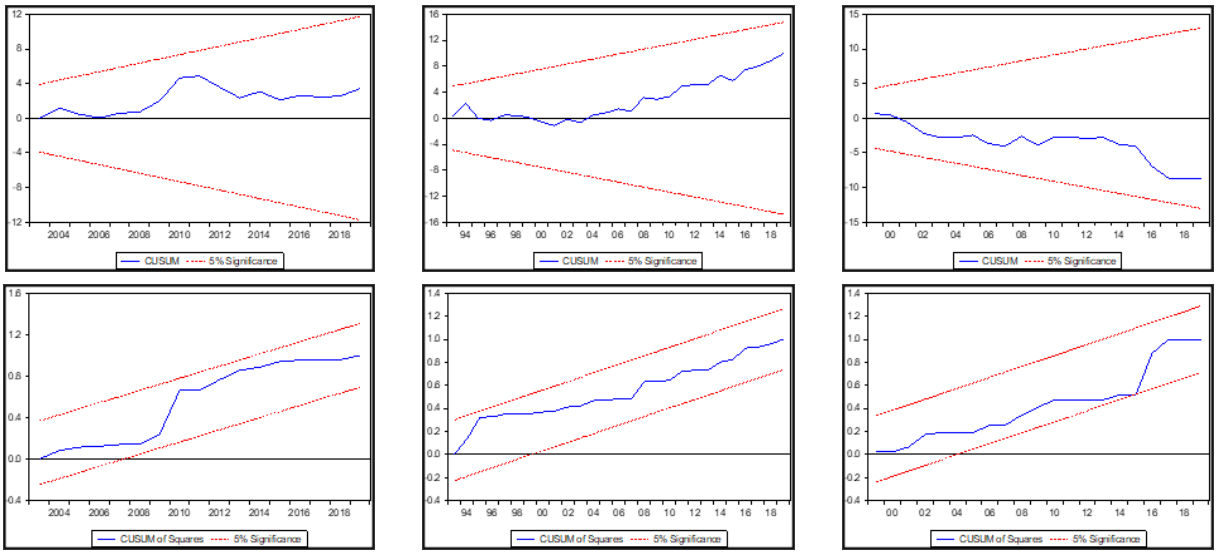


Inspection of the CUSUM and CUSUMSQ graphs indicates that there is stability. Such stability indicates that no systematic change is detected in the coefficients of the ARDL models at a 5% significance level over the period, meaning there is no structural break detected.

Appendix 14

CUSUM and CUSUMSQ Dependent Variable: Productivity Growth. 1980-2019

10-USA (j) 11-Japan (k) 12-South Korea (l)

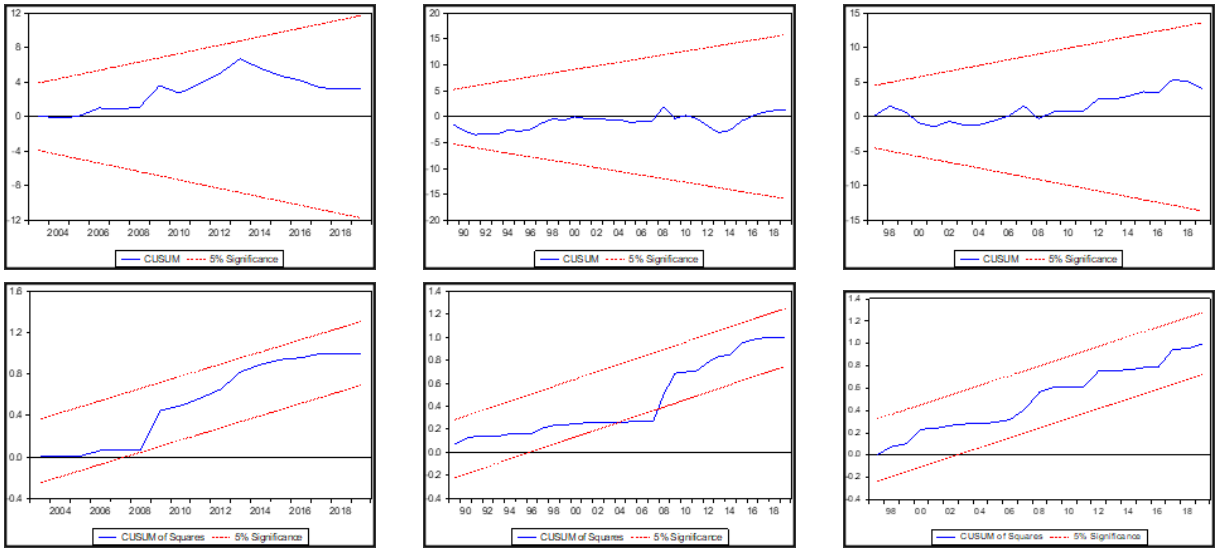


Inspection of the CUSUM and CUSUMSQ graphs indicates that there is stability. Such stability indicates that no systematic change is detected in the coefficients of the ARDL models at a 5% significance level over the period, meaning there is no structural break detected.

Appendix 15

CUSUM and CUSUMSQ Dependent Variable: Net Exports. 1980–2019

13-USA (m) 14-Japan (n) 15-South Korea (o)



Inspection of the CUSUM and CUSUMSQ graphs indicates stability for the USA and South Korea. Such stability indicates no systematic change is detected in the coefficients of the ARDL-ECM at a 5% significance level over the period, meaning there is no structural break detected for the USA and South Korea. CUSUMSQ for Japan shows a result outside of the bounds, meaning the Japan model is unstable in certain periods, whereby the regression coefficients are changing suddenly.