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Understanding Price Leadership in Fiji's Energy Market

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In this note, we explore price leadership in Fiji's energy market. Using key energy prices, such as oil, diesel, premix, kerosene and motor spirits, we propose a price leader model. The price discovery model and its theory were proposed by Westerlund, Reese, and Narayan (2017). Using an application of this model to Fiji's energy price data, we unravel evidence that premix is the market leader with a 54.8% market share followed by the oil price (33.9%). From these results, we draw implications for price regulations and identify the future direction for energy policy.

I. Introduction

The objective of this note is to explore and establish the price leadership profile of Fiji's energy market. Our hypothesis is that amongst the key energy price movers, there will be a dominant product. The motivation behind identifying the dominant (or the leader) product is that once identified, from a price control viewpoint, it can be the first target for policy makers, which in the case of Fiji is the Fijian Competition and Consumer Commission (FCCC). Targeting the price leader will produce a more effective policy of price control. This is not the only advantage. Amongst a list of price movers, if a ranking of price movers is identified the ranking itself can be utilized to decide on the magnitude of price control.

To test our proposed hypothesis, we utilize an econometric model of price discovery developed by Westerlund, Reese, and Narayan (2017; WRN hereafter) and adapt it for Fiji's case study. The WRN approach is appealing for multiple reasons. Leaving aside its econometric advantages, as documented eloquently in WRN, the WRN method does not restrict the number of price variables that can be simultaneously modeled. For example, in our setup we have: (a) five price variables, namely oil price, diesel, premix, kerosene and motor spirit; and (b) a very small sample size of 135 monthly observations. With other approaches such as vector autoregessive models, for instance, this type of small sample (135 observations) can be a problem from an estimation precision viewpoint—a concern obviated with the WRN approach. Equally importantly, modelling a large number of prices can be problematic and often a way around this problem is to pre-select only the key variables, like in our case this could simply mean choosing only the three main variables of interest. If we do this, we effectively engage in a pre-selection bias which does not help policy design and indeed policy making. The WRN keeps us safe from such selection bias issues.

Our empirical work produces the following findings. We find that the leader product in Fiji's energy market is premix, which dominates 54.8% of the market price movements, where the market comprises oil, diesel, premix, kerosene, and motor spirit. Oil price contributes 33.9% of price evolution followed by motor spirit (5.3%). The least contributions are seen from diesel (4.4%) and kerosene (1.6%). The key policy implication emanating from this result is that regulating premix should be the priority or trying to understand the reasons why premix is the dominant fuel in the market. A related policy discussion, we believe, should focus on how to reduce Fiji's dependence on premix, away from non-renewable to renewable energy sources.

II. Methodology

The WRN model is a common factor model, which can be written as follows:

$$EnergyPrice_{i,t} = \pi_i CommonFactor_t + \cup_{i,t} \quad (1)$$

where $EnergyPrice_{i,t}$ is the price relating to oil, diesel, premix, kerosene, and motor spirit represented by the subscript i, $i = 1, \ldots, 5$, in period $t = 2011M01, \ldots, 2022M03$. The dataset is monthly starting in January 2011 and ending in March 2022. There are a total of 135 monthly observations.

The common factor, $CommonFactor_t$ is simply the aggregate energy price in Fiji dollars. WRN propose using such an approach to deal with the common factor. The point of having the common factor is that it is a variable that is common to all energy prices and an aggregate measure of the prices is a simple way of obtaining a common

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Table 1. Unit root test

Price series	Dickey-Fuller	Test stat.	p-value
Oil price	DF	-1.60835	>0.10
Diesel	DF	-1.57402	>0.10
Premix	DF	-1.58433	>0.10
Kerosene	DF	-1.64046	>0.10
Motor spirit	DF	-1.59717	>0.10
Idiosyncratic component	IPS	-1.60	0.055

This table reports the time-series unit root test results (Dickey-Fuller) and the Im, Pesaran and Shin (IPS) panel unit root test for the idiosyncratic component.

factor. Indeed, this is not the only common factor. One can, if one wants to, use other proxies for common factor. We stop with the aggregate measure because the literature shows that such a common factor works perfectly. Each price's relation to the common factor is represented by π_i. Finally, $\cup_{i,t}$ is an idiosyncratic error term.

According to price discovery theory, the $CommonFactor_t$, which is also the fundamental price be a unit root process and be common across prices, while the noise component ($\cup_{i,t}$) should be stationary and idiosyncratic. This implies that $\pi_1 = \ldots = \pi_5 = 1$. The idea behind Equation (1) is to discover the price leader product in the market—that is, which price product contributes most to the aggregate movement of market prices.

To extract the share (or contribution) of each product price to the aggregate (market) price, we employ Hasbrouck's (1995) information share (which we refer to as *Price Leader*), which has been extended by WRN to a panel version (to accommodate the panel of 5 products in our example) in the spirit of Narayan, Sharma, and Thuraisamy (2014) as follows:

$$Price\ Leader_i = \frac{\pi_i^2 \sigma^2_{Commonfactor} \sigma^{-2}_{\cup,i}}{\sum_{n=1}^{5} \pi_n^2 \sigma^2_{CommonFactor} \sigma^{-2}_{\cup,n}} \qquad (2)$$

where $\sigma^2_{\cup,i}$ is the variance of $\cup_{i,t}$ and $\sigma^2_{CommonFactor}$ is the variance of $Commonfactor_t = CommonFactor_t - CommonFactor_{t-1}$, the shock to the fundamental price. This equation states that (a) the lower the amount of noise ($\sigma^2_{\cup}$) in the energy price of i, the higher that energy price contributes to the aggregate (market) price, and (b) as the covariance between the energy price of i and the aggregate price (π_i) increases, that price's contribution to the aggregate price rises.

III. Data and results

All the data are obtained from the Fijian Consumer and Competition Commission. The data are monthly, from January 2011 to March 2022.

The persistence of the price variables is also confirmed by the panel unit root tests through simple regression of a first-order autoregressive model. We also performed the Narayan and Popp (2010, 2013) structural break unit root test and discover similar results. The results show that the idiosyncratic component (from Equation (1)) turns out to be stationary. These unit root tests are consistent with the theoretical expectations of Equation (1) (WRN, 2017).

In Table 2, we report results from Equation (2). This table contains the market share contributed to by each product. We also report statistics that evaluate the null hypothesis that the share of each price to the market price is statistically zero. We see that the null hypothesis is comfortably rejected suggesting that each product type contributes significantly to the evolution of the market price. Premix is the market leader, contributing as much as 54.8% of all price movements. This is followed by oil price, which accounts for 33.9% of price movements. The least contributors to market price are motor spirit (5%), diesel (4.4%), and kerosene (1.6%). In controlling prices, given that the objective of FCCC, the price regulator, is to maintain price stability and enhance consumer and producer welfare, pricing-related policy should pay greater attention to the market leader—that is, premix price.

IV. Concluding remarks

In this note, we explore price leadership in Fiji's energy market. Using key energy prices, such as oil, diesel, premix, kerosene and motor spirits, we propose a price leader model. The price discovery model and its theory were proposed by Westerlund, Reese, and Narayan (2017). Using an application of this model to Fiji's energy price data, we unravel evidence that premix is the market leader with a 54.8% market share followed by the oil price (33.9%). From these results, we draw implications for FCCC.

In controlling prices, given that the objective of FCCC, the price regulator, is to maintain price stability and enhance consumer and producer welfare, pricing-related policy should pay greater attention to the market leader—that is, premix price. It could also mean that if price cannot be regulated in the current market due to volatile international price movements in crude oil prices and other factors beyond the control of FCCC, alternatives such as renewable energy should be considered and adopted. This will also support the global and national objective of addressing the issue of climate change mitigation and adapting to the new imperatives, such as the transition to net-zero, demanded as part of addressing the climate change challenge.

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Table 2. Market price leader results

Series	Price Leader share (%)	phi	S.E.	t-stat	pval
Oil price	33.8686	3.61	0.02	234.22	0
Diesel	4.3971	-0.86	0.01	-82.77	0
Premix	54.7508	3.56	0.01	286.37	0
Kerosene	1.6446	-0.35	0.01	-50.64	0
Motor spirit	5.3389	-0.97	0.01	-91.93	0

This table has results on the market leader. Statistics related to the percentage contribution of each product (or price) type to the evolution of market price (column 2), market coefficient as depicted by phi (column 3), the standard error (S.E) for the test of the null hypothesis that phi is zero, its associated t-statistic (denoted t-stat, column 4), and its p-value, noted pval in column 5.

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