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HOW ARE FUEL PRICES LINKED TO FIJI'S MACROECONOMY?

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ABSTRACT

Understanding how well the fuel market (or its prices) are linked to a country's macroeconomy has both fiscal and monetary policy coordination implications. This note attempts to provide an understanding of how shocks from the fuel market impact the macroeconomy and vice versa. Our results are novel: we show that Fiji's macroeconomy only absorbs a maximum of 31% of shocks from the system, implying that most movements in the macroeconomy are due to fundamentals and not the fuel market. The key policy message is that pricing behavior and any price controls associated with the fuel market will not have negative macroeconomic connotations.

Keywords: Fuel prices; Macroeconomy; Fiscal-monetary policy coordination.

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I. INTRODUCTION

Policy research that produces outcomes which have implications for both monetary and fiscal policy coordination ensures macroeconomic stability. In this policy note, we develop the idea that the fuel market and the macroeconomy are connected. In our proposal, (a) the fuel market consists of the key fuel market variables namely the prices of crude oil, diesel, premix, motor spirit and kerosene; and (b) the macroeconomy consists of industrial production, inflation and nominal exchange rate. The expected association between the fuel market and the macroeconomy is important in the case of Fiji because the fuel market is regulated by the Fijian Competition and Consumer Commission (FCCC). The question, as a result is, how much does the fuel market influence the macroeconomy and how precisely is this effect transmitted? Similarly, there is the possibility that both the fuel market and the macroeconomy (or at least some components of it) are endogenous—that is, they have bidirectional effect. Put differently, the possibility exists that both the fuel market and the macroeconomy influence each other. If they do, the key question is 'by how much'?

Given the above policy background, our hypothesis is that price-controlled fuel market, because FCCC's objective of controlling prices is to cushion the prices on both producer and consumer welfare, does not negatively influence the macroeconomy. The implication is that if this hypothesis is true that it provides empirical support to FCCC's role in contributing to Fiji's macroeconomic stability, such as a stable exchange rate, manageable inflation rate (or short-term interest rate), at the minimum.

We propose a 8-variable vector autoregressive model to estimate the role of shocks in this system. Our key finding is that macroeconomy absorbs only around 31% of shocks from this system. The bulk of the movements to macroeconomic variables owe to their own shocks or fundamentals which have little to do with the fuel market.

II. DATA, METHODOLOGY AND RESULTS

A. Data

We have seven time-series data on hand. They are categorized into two sets. The first set belongs to the fuel market, where we have five fuel price related data, namely crude oil, diesel, premix, motor spirit, and kerosene. The second set has proxies for Fiji's macroeconomy, namely consumer price inflation (computed as the monthly annualized growth rate in the consumer price index), nominal exchange rate (vis-à-vis the Fiji dollar), and industrial production (which is seasonally adjusted using the familiar Census X13 procedure). All price data are sources from the FCCC while the proxies for the macroeconomy are obtained from the Reserve Bank of Fiji. The data are monthly and cover the sample January 2011 to March 2022. A plot of the two data categories is displayed in Figure 1. Most variables, except for the nominal exchange rate, seem to be characterized by structural changes. This is confirmed by the Narayan and Popp (2010) structural break test. The Narayan and Popp test suggests that levels of all variables except inflation are non-stationary. The implication is that in the VAR model we take variables in their first difference form.

B. Methodology and Results

The empirical model is borrowed from Diebold and Yilmaz (DY, 2012)—a generalized spillover model that is based on a *8*-variable Vector AutoRegressive (VAR) model. Our preference for the DY-VAR model has roots in the model's ability to inform decisions regarding our hypothesis test. With this model, for instance, we can interpret the role of shocks, such as:

(i) the total spillover effect, where total is nothing but the ecosystem of all eight variables;
(ii) directional spillovers, with which we deduce how shocks from each of the eight variables impact the system's other variables;
(iii) net spillovers, with which we are able to gauge whether a variable shock is a net contributor of shocks to others or a net taker of shocks from others in the system; and
(iv) own shock spillovers, with which we deduce how much a variable's own shock help explain its future.

The DY-VAR model can be understood with a K-variable VAR(p) model: $y_t = \sum_{i=1}^{p} \Psi_i y_{t-1} + \mu$, $\mu_t \sim (0, \Sigma)$ is a vector of iid disturbances and where Y_t is a moving average (MA), which captures the dynamics of the system, such that $\sum_{i=0}^{\infty} B_i \mu_{t-i}$, where the $K\ x\ K$ coefficient matrices $B_i = \Psi_1 B_{i-1} + \Psi_2 B_{i-2} + \cdots + \Psi_p B_{i-p}$. The method draws on the Variance Decompositions (VDs), as proposed in the work of Koop, Pesaran and Potter (1996) and Pesaran and Shin (1998). This makes it easy to extract the Forecast Error Variance (FEV) of each variable. With the VDs we obtain the percentage of the h-step-ahead error variance in forecasting Y_i that is due to shocks in Y_i, where i and j are different markets, given that $\forall_j \neq i$ for each i.[1] To see how own variance shares—that is the FEV of Y_i that is due to Y_i, denote the h-step-ahead FEVDs by to obtain:

$$\lambda_{ij}(h) = \frac{SD_{jj}^{-1} \sum_{l=0}^{h-1} \left(\mu_i' B_l \Sigma \mu_j\right)^2}{\sum_{l=0}^{h-1} \left(\mu_i' B_l \sum B_l' \mu_j\right)} \qquad (1)$$

Where Σ is the variance matrix for the error vector μ, SD_{jj} represents the standard deviation of the j^{th} equation's error term and μ_i is the selection vector with one as the i^{th} element and zeros otherwise. The spillover index is given by: $\hat{\lambda}_{ij}(h) = \lambda_{ij}(h) / \sum_{j=1}^{V} \lambda_{ij}(h)$ and the total spillover index (TSI) at h-step-ahead becomes:

$$TSI(h) = \frac{\sum_{\substack{i,j=1 \\ i \neq j}}^{V} \hat{\lambda}_{ij}(h)}{V} \times 100, \text{ where } V = \sum_{i,j=1}^{V} \hat{\lambda}_{ij}(h) \qquad (2)$$

The directional spillovers to market i from all other markets, j, $(DS_{i \to j})$, is:

$$DS_{i \to j}(h) = \frac{\sum_{\substack{i,j=1 \\ i \neq j}}^{V} \hat{\lambda}_{ij}(h)}{V} \times 100 \qquad (3)$$

[1] Interested readers are referred to Diebold and Yilmaz (2012) for original details and for applications see Antonakakis (2012), Antonakakis *et al*. (2018a, b).

$$DS_{j\rightarrow i}(h) = \frac{\sum_{\substack{i,j=1 \\ i\neq j}}^{V} \hat{\lambda}_{ji}(h)}{V} \times 100 \quad (4)$$

And, the directional spillovers from market i to all markets, j, $(DS_{j\rightarrow i})$, is:
Our VAR model is setup as follows: it has one lag, a forecasting horizon of three months, and a rolling window of 50 months.

The results are displayed in Table 1. The row title "TO" represents shocks from the variable in that column to all other variables in the system. The net shock transmitter effect is captured in the last row which simply represents the amount of shock received (FROM column) less the amount of shocks dispersed (TO row). A negative sign means that that variable is a net absorber (or receiver) of shocks while a positive sign means it is the main or net transmitter of shocks. We start with the total connectedness effect, which is displayed in the bottom right corner table value of 53 implies that on average 53% of a shock in the system of variables we have spills over to all others. Thus, 47% of shocks end up explaining the variable itself—these are effectively self-shocks. In other words, shocks of inflation affect inflation. These connectedness statistics confirm that we have a system of variables representing a highly connected ecosystem.

The biggest transmitters of shocks are motor spirit (80%), followed by diesel (73.6%), and premix (70.2%). The macroeconomy by comparison is the least transmitter of shocks at less than 22%. On the whole, between 23-31% of the emanating shocks are felt by the macroeconomy.

We see that fundamental shocks, not the fuel market, are responsible for explaining the macroeconomy. For example, 69.3%, 71.1% and 77.4% of shocks to inflation, nominal exchange rate and industrial production explain themselves. And while we see that inflation (-18.5%) and nominal exchange rate (-13.6%) are the main receivers of shocks, the effect is less than one fifth of what explains those variables, pointing towards fundamentals rather than the fuel market itself. This finding implies that the price control endeavors of FCCC do not have negative effects on macroeconomic certainty.

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Table 1.
Average Spillover of Shocks

This table reports the average connected of the fuel market (motor spirit (MS), oil price (OP), kerosene (KERO), diesel, and premix) and the macroeconomy (inflation (INF), nominal exchange rate (NER), and industrial production (IP)). The last column entitled FROM represents shocks from other variables in the system to the corresponding variable noted in column 1 of that row.

	INF	NER	IP	MS	OP	KERO	DIESEL	PREMIX	FROM
INF	69.32	1.51	5.04	6.1	5.52	2.34	5.58	4.59	**30.68**
NER	1.12	71.07	5.93	2.46	6.86	3.88	1.85	6.84	**28.93**
IP	3.49	1.52	77.44	3.76	3.28	4.59	3.63	2.29	**22.56**
MP	1.81	1.05	1.54	29	7.09	13.44	22.23	23.83	**71**
OP	2.02	5.31	5.05	1.53	78.67	3.45	1.81	2.16	**21.33**
KERO	0.99	2.18	2.08	16.37	7.63	39.27	19.39	12.09	**60.73**
DIESEL	1.4	1.42	1.75	23.98	4.9	15.73	32.44	18.37	**67.56**
PREMIX	1.4	2.35	1.31	25.49	7.38	11.14	19.11	31.81	**68.19**
TO	**12.22**	**15.34**	**22.7**	**79.69**	**42.66**	**54.57**	**73.61**	**70.17**	**370.97**
Inc.Own	81.54	86.41	100.14	108.69	121.33	93.84	106.05	101.99	cTCI/TCI
NET	-18.46	-13.59	0.14	8.69	21.33	-6.16	6.05	1.99	53.00/46.37

Figure 1.
A Plot of the Data Series

Panel A: A plot of the fuel price data, January 2011 to March 2022

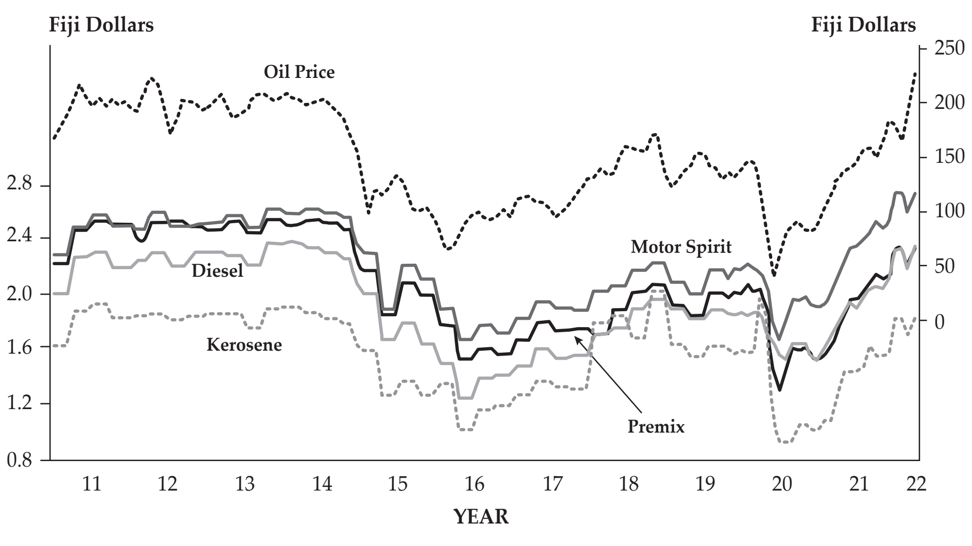
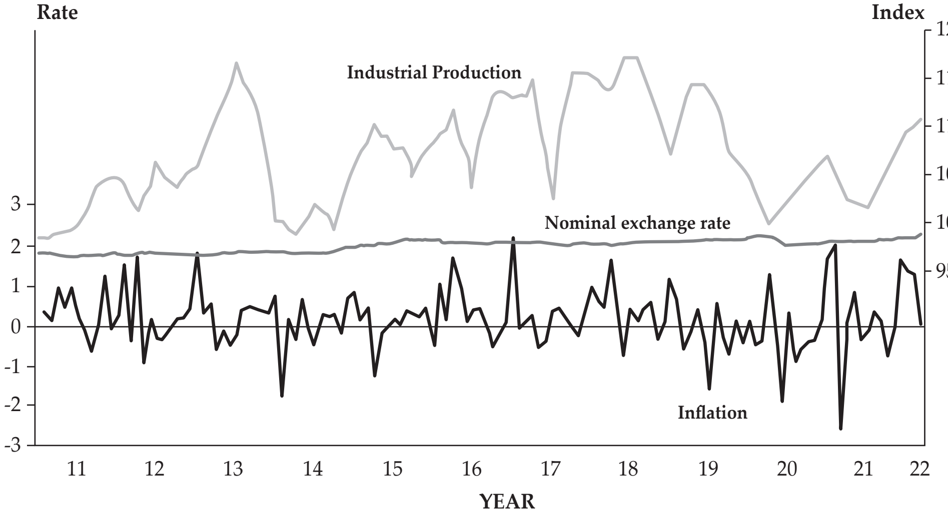


Figure 1.
A Plot of the Data Series (Continued)

Panel B: A Plot of the Macroeconomy Variables, January 2011 to March 2022



III. CONCLUDING REMARKS

This note hypothesizes that FCCC controlled fuel prices, as a market for fuel on the one hand, and the macroeconomy, represented by inflation, nominal exchange rate and industrial production, on the other hand, should be connected when exposed to shocks. The note, in order to test this hypothesis, proposes a 8-variable VAR model comprising of both fuel market and macroeconomy variables and proposes this as the ecosystem to understand how well shocks from this system affect both the fuel and macroeconomy.

Our key finding is that macroeconomy absorbs only around 31% of shocks from this system. The bulk of the movements to macroeconomic variables owe to their own shocks or fundamentals which have little to do with the fuel market.

This finding has implications for FCCC in at least two ways. The first point is that price controls have not negatively impacted Fiji's inflation, nominal exchange rate or the industrial production. This means that the current price control approach is efficient. The second point is that because there is a possible association between FCCC's price control efforts on fuels and the macroeconomy, greater micro-macro policy coordination will ensure that in future price setting endeavors the effects on the macroeconomy are optimized. The form of this coordination should be discussed is one recommendation of this note.

REFERENCES

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & Perez de Garcia, F. (2018). Oil Volatility, Oil and Gas Firms and Portfolio Diversification. *Energy Economics*.

Antonakakis, N., Chatziantoniou, I., Floros, C., & Gabauer, D. (2018). The Dynamic Connectedness of UK Regional Property Returns. *Urban Studies*, 0042098017739569.

Diebold, F. X., & Yilmaz, K. (2012). Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers. *International Journal of Forecasting*, 28, 57–66.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996) Impulse Response Analysis in Non-linear Multivariate Models, *Journal of Econometrics*, 74, 119–147.

Narayan, P. K., & Popp, S. (2010). A New Unit Root Test with Two Structural Breaks in Level and Slope at Unknown Time. *Journal of Applied Statistics*, 37, 1425–1438.

Pesaran, M. H., & Shin, Y. (1998) Generalized Impulse Response Analysis in Linear Multivariate Models. *Economics Letters*, 58, 17–29.

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