***WHOLESALE PRICE PASS-THROUGH TO RETAIL ELECTRICITY PRICES IN LIBERALIZED ENERGY MARKETS: A STUDY OF VICTORIA, AUSTRALIA***

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## Overview

Wholesale electricity markets were introduced in the state of Victoria, Australia, in the late 1990s following a similar approach to that initially adopted in Britain. Retail electricity markets were introduced a little over a decade later. The extent to which wholesale price movements are reflected in retail prices has been an enduring focus for economists and policy makers in electricity markets and a range of retail markets (see, for example, gasoline (Chesnes, 2016) and milk (Loy, Weiss, & Glauben, 2016)). In electricity retail markets, the way that wholesale electricity prices are reflected in retail electricity prices has been examined in the United Kingdom (Ofgem, 2011), the Netherlands (Mulder & Willems, 2019), Norway (Mirza & Bergland, 2012) and Texas (Brown, Tsai, Woo, Zarnikau, & Zhu, 2020; Hartley, Medlock, & Jankovska, 2019). These studies suggest that wholesale price pass-through to retail prices occurs incompletely and asymmetrically in the long-run, the extent of the pass-through and asymmetry being dependent on numerous factors.

Using wholesale futures contract prices, and retail price time series data, we develop a dynamic symmetric and asymmetric econometric model to understand the relationship between wholesale and retail prices. Specifically we explore how wholesale price changes are reflected in retail price changes. As far as we are aware, this is the first study to test empirically whether wholesale price movements are reflected in retail electricity prices in Victoria.

## Methods

We estimate the Wholesale Electricity Costs (WECs) paid by retailers on the assumption that retailers are fully hedged using quarterly base futures, and that new customers will remain with the retailer for 12 months. We estimate the future price of supplying new customers for the next 12 months based on the 12-month volume trade weighted price of quarterly base futures.

## To obtain a measure of retail electricity prices, we use a large sample of household electricity bills in Victoria to price every retail tariff available each month from January 2019 to March 2021. The pricing of household bills takes into account all relevant discounts, concession and solar revenue. To isolate the “wholesale” component of retail offers we deduct network charges and metering charges. Across our sample we establish time series data using the 10th, 50th and 90th percentile offer, consistent with the methodology of Mountain and Burns (2020).

We also include a dummy variable to account for the Victorian Default Offer (VDO), a significant regulatory change commencing in July 2019.

We estimate a symmetric and asymmetric Auto-regressive Distributed Lag (ARDL) model to explain movements in retail prices based on movements in WECs and the VDO.

We use the Akaike information criterion test to determine the appropriate number of lags and apply standard model diagnostic checking to confirm the robustness of the models and residuals for reliable hypothesis testing. We also apply a non-nested model selection test to assess for asymmetry. Standard t-test are then applied to the relevant estimated coefficients to test H1: wholesale prices pass-through to retail prices over time; H2: wholesale prices pass-through to retail prices completely; H3: pass-through is symmetric; H4: Pass-through varies across retailers and offers; H5: the VDO impacted prices.

## Results

## Preliminary results suggest that wholesale prices do pass-through to retail prices symmetrically and in a timely manner. However, the relationship between changes in wholesale and retail prices differs widely across different segments of the retail market. In particular, incumbent firms exhibit lower pass-through than new entrant counterparts across all percentile offers. Holding all other factors constant, the VDO reduced the most expensive tariffs in the market. On the other hand, the VDO saw retailers withdraw their cheapest offers and median offers were not materially influenced.

## Conclusions

## The measurement of the relationship between wholesale and retail prices is greatly affected by the selection of each, and there are several plausible ways to define and measure prices in the wholesale and retail markets. Consumer loyalty, inertia and switching rates may help explain differences in pass-through amongst different retail market segments. These findings have implications for the analysis and regulation of electricity markets in Australia and elsewhere.

## References

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