The Dynamics of Australian Commodity Prices

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Abstract

The study uses Johansen's (1988, 1991) cointegration technique and vector error correction model to understand the dynamic interactions between Australian commodity prices and other fundamental macroeconomic variables. The author has been formulated the econometric models by using seasonally adjusted monthly time series from January 2000 to December 2015. The study shows that the real interest rate (rr), real exchange rate (rer) and the industrial production (ip) have an adverse effect on Australian real commodity price (rci). Moreover, the model of this study shows that all the variables are helping to restore the divergence from the long-run equilibrium in commodity prices of Australia.

Keywords: Commodity prices, Macroeconomic variables, Cointegration, Vector error correction

1. INTRODUCTION

Commodity price swings affect world's commodity exporting nations and these fluctuations are major concerns of the policy makers without any doubt. Australia is not an exception of those nations. Australia noted its 25th year of uninterrupted economic growth in 2015-16. After considering the uncertain economic and political condition in this present world, this Australian achievement is definitely significant. This is the only commodity exporting nation after Netherlands which has the longest record of economic growth, at 26 years (OCE, 2016).

Increasing commodity export prices had been a positive contributor for the Australian economic growth at the beginning of twenty first century. During that timeframe Australian terms of trade have reached their highest level since the Korean War boom. The difference between the growth of export and import prices was believed to be the reason of that favourable condition. But there is an argument over whether these gains are purely cyclical or show a structural shift to an eternally higher level of national income. Some researchers point out towards the historical experiences of Australia which suggests that this country is well placed to weather any downturn in commodity prices. They argue that commodity production and exports are not as important to the overall Australian economy as commonly assumed (Kirchner, 2009).

The above view is not supported by many academics and policy circles of commodity exporting nations as fluctuations in commodity prices responsible for countries' external and internal balances as well as their particular fiscal and monetary policies (Byrne, Fazio, & Fiess, 2013). Moreover, Australia has experienced both the upward and downward swings in its commodity prices in last two decades. Commodity price rises to its highest peak in real terms during the Global Financial Crisis of 2008-2009 and this kind of former historical highs reached in the 1970s. The commodity price index then had a steady falling trend since 2011 till recent time. The surge in commodity prices is partially, if not primarily, attributed to the drop in interest rates and the exchange rates and vice versa (Q. Farooq Akram, 2009; Krichene, 2008).

These are the reasons of focusing on the Australian commodity prices dynamics. The main focus on this article is given on assessing the influence of various fundamental macroeconomic variables on Australian commodity prices to observe their long-run as well as short-run influences.

2. LITERATURE REVIEW AND RESEARCH OBJECTIVES

Like many other countries in the world, Australian economy is also highly dependent on commodity market. High commodity reliance impacts almost every policy standpoint in an open economy, like Australia. Therefore, determinants of commodity prices are an important task.

The revolutionary model of Ridler and Yandle (1972) presents a simple method of taking into account of a number of exchange rate changes as they may affect the value of world exports of a primary commodity and the export earnings of a single country from the commodity. The model of Dornbusch (1985) shows similar features like Ridler and Yandle (1972) that the elasticity of commodity prices to real exchange rate would be less than one in absolute value. Beenstock (1988) mentions about few other factors that affect the world commodity prices as part of a general model of North-South interdependence. Pindyck and Rotemberg (1990) show that the prices of a broad set of commodities may move together because of changes in macroeconomic variables. The reason is that it can affect demands and /or supplies of those commodities and these changes can affect prices in two ways. The theoretical model of Frankel and Rose (2010) presents the model of the determination of prices for storable commodities that provides full expression to such macroeconomic aspects as economic activity and real interest rates. The theory of Frankel and Rose (2010) is similar to the prominent theory of exchange rate overshooting of Rudiger Dornbusch (1976), with the price of commodities substituted for the price of foreign exchange and with convenience yield substituted for the foreign interest rate.

Determinants of Australian commodity prices are also analyzed by many researchers. Bleaney (1996) uses ninety-two years of Australian data to analyze how real exchange rates of primary commodity exporters responded to variations in the relative prices of their exports. The study of Simpson and Evans (2004) also identifies Australia as a price taker and shows that volatility in commodity prices is reflected in volatility in exchange rates. The study of Hatzinikolaou and Polasek (2005) supports the view that the floating Australian dollar is a 'commodity currency'. The study of Bhattacharyya and Williamson (2011) shows that Australia has indeed reacted differently to unstable commodity prices than have other commodity exporters. The study of Bashar and Kabir (2013) shows two-way Granger causality between exchange rate and commodity prices, but one-way Granger causality from Global Financial Crisis to commodity prices. The distributional consequences of commodity price shocks are assessed in the research of Bhattacharyya and Williamson (2016).

This current study assesses the long run as well as short run dynamic interactions between Australian commodity prices with fundamental macroeconomic variables to get better understanding of the swings in commodity prices. These understandings can help the policymakers to develop efficient measures to control the shocks of these variables to control the commodity prices of such a commodity dependent economy for its sustainable economic growth.

3. MODEL SPECIFICATION AND METHODOLOGY

This study uses the equations of a competitive market model for understanding the dynamics of various macroeconomic variables which are affecting Australian commodity prices. The study uses Johansen's (1988, 1991) cointegration technique to understand the long-run relationship between commodity prices and Australian macroeconomic variables. This research assumes a vector of g

variables (here, g = 5) and four of which are $I(1)$ to assess the dynamic interactions among the variables:

$$Y_t = [rci, rr, rer, ip, spr] \quad (1)$$

where, rci denotes real commodity price, rr represents real interest rate, rer shows the trade weighted real exchange rate of Australia, ip denotes industrial production index over time and spr shows S&P/ASX 200 resources index in real form. To construct the model, four variables have been used in logs (rci, rer, ip and spr) and real interest rate (rr) after following Bloch (2012), Rossi (2012), Frankel and Rose (2010), Akram (2009), Akram (2004), Cashin (2004) and the references therein. The author has been formulated the econometric models for seasonally adjusted monthly time series from January 2000 to December 2015. As the study has found significant long run relationship among the variables, the vector error correction model (VECM) is used to judge the short-run dynamic relationship among the variables. Four out of five variables of our model show the same break date in the series. The commodity price index (rci), real interest rate (rr), real exchange rate (rer) and Australian real resources stock price index (spr) shows the break date as 01/10/2008. For that reason, the model of this study has considered a dummy variable at the break date to analyse the interactions more accurately.

4. ECONOMETRIC RESULTS

This study considers four macroeconomic variables, (rr, rer, ip and spr) to see their influence on Australian real commodity price (rci). The trace and eigenvalue statistics yield the same results of one cointegrating vector. Moreover, the eigenvalue statistics drop sharply for both the tests from 0.23 to 0.13. So, it can be said that the statistical model of this study represents the commodity price model fairly.

After normalising the value of rci, the following cointegrating Equation (2) with the standard error in parentheses can be found:

$$rci = -\underset{(2.096)}{9.291\, rr} - \underset{(0.351)}{0.019\, rer} - \underset{(0.640)}{3.303\, ip} + \underset{(0.102)}{0.773 spr} + \underset{(0.097)}{0.191\, dummy} \quad (2)$$

The Equation (2) shows the expected sign of all the variables according to the literature. However, real interest rate (rr), industrial production (ip), real resources stock prices (spr) and the dummy are significant in the current commodity price model. The result shows that the real interest rate (rr), real exchange rate (rer) and the industrial production (ip) of Australia have an adverse effect on the real commodity price (rci). But, the effect of real exchange rate on real commodity prices in the long-run is not significant. On the other hand, the real resources stock price (spr) is showing a significant favourable effect on the real commodity price (rci) in the long-run which is also supported by existing literature. The effect of structural break is also significant in the model. Overall, the Equation (2) represents the long-run relationship between commodity price index and other macroeconomic variables of Australia.

The variables of the commodity price model of this study are cointegrated in the long-run, so there exists an error correction mechanism which brings together the long-run relationship with its short-run dynamic adjustments. The error correction mechanism (ECM) combines the long-run equilibrium with short-run dynamics to reach the equilibrium situation. Since the study is dealing with a multivariate VAR system, the multivariate counterpart of ECM is known as the vector error correction model (VECM). This VECM can be expressed according to the following matrix form:

$$\begin{bmatrix}\Delta rci_t\\ \Delta rr_t\\ \Delta rer_t\\ \Delta \text{rip}_t\\ \Delta spr_t\end{bmatrix} = \begin{bmatrix}-0.025\\ -0.010\\ -0.029\\ -0.003\\ -0.072\end{bmatrix}[1.000 \quad -9.291 \quad -0.019 \quad -3.303 \quad +0.773]\begin{bmatrix}rci_{t-1}\\ rr_{t-1}\\ rer_{t-1}\\ ip_{t-1}\\ spr_{t-1}\end{bmatrix} + \begin{bmatrix}+0.514 & +0.765 & +0.092 & -1.144 & -0.013\\ -0.024 & -0.019 & +0.031 & -0.085 & -0.042\\ -0.269 & -0.384 & +0.043 & +2.079 & -0.008\\ -0.000 & -0.022 & +0.002 & +0.891 & +0.002\\ -0.202 & -0.486 & +0.111 & -1.737 & -0.214\end{bmatrix}\begin{bmatrix}\Delta rci_{t-1}\\ \Delta rr_{t-1}\\ \Delta rer_{t-1}\\ \Delta \text{ip}_{t-1}\\ \Delta spr_{t-1}\end{bmatrix}$$

$$+ \begin{bmatrix}-0.046 & +0.210 & +0.083 & -0.345 & -0.021\\ +0.059 & +0.115 & +0.098 & +0.083 & -0.030\\ +0.088 & +0.043 & -0.130 & -1.584 & +0.006\\ -0.011 & +0.029 & -0.022 & -0.106 & -0.001\\ +0.209 & +0.433 & +0.532 & -1.250 & -0.117\end{bmatrix}\begin{bmatrix}\Delta rci_{t-2}\\ \Delta rr_{t-2}\\ \Delta rer_{t-2}\\ \Delta \text{ip}_{t-2}\\ \Delta spr_{t-2}\end{bmatrix} + \begin{bmatrix}+0.103 & +0.516 & +0.200 & +1.651 & +0.042\\ +0.036 & -0.130 & -0.066 & +0.322 & -0.001\\ -0.030 & +0.216 & +0.025 & -0.967 & -0.020\\ -0.003 & -0.069 & +0.003 & -0.323 & -0.004\\ -0.012 & +0.064 & -0.360 & +1.549 & +0.017\end{bmatrix}\begin{bmatrix}\Delta rci_{t-3}\\ \Delta rr_{t-3}\\ \Delta rer_{t-3}\\ \Delta \text{ip}_{t-3}\\ \Delta spr_{t-3}\end{bmatrix}$$

$$+ \begin{bmatrix}+0.033 & +0.315 & -0.008 & -0.954 & +0.061\\ -0.031 & -0.068 & -0.003 & +0.008 & +0.001\\ -0.073 & +0.220 & -0.209 & +1.109 & -0.032\\ -0.002 & +0.018 & -0.009 & +0.202 & -0.004\\ -0.221 & -0.075 & -0.083 & -1.403 & -0.092\end{bmatrix}\begin{bmatrix}\Delta rci_{t-4}\\ \Delta rr_{t-4}\\ \Delta rer_{t-4}\\ \Delta \text{ip}_{t-4}\\ \Delta spr_{t-4}\end{bmatrix} + \begin{bmatrix}u1_t\\ u2_t\\ u3_t\\ u4_t\\ u5_t\end{bmatrix} \quad (3)$$

It is clear from the previous matrix that the vector error correction has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term, which is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. All the error correction terms of the model of this study is negative and statistically significant. Thus, the model shows that all the variables are helping to restore the divergence from the long-run equilibrium in commodity price model of Australia.

5. CONCLUSION

The result of this current study shows the expected sign of all the variables according to the literature. However, real interest rate (rr), industrial production (ip) and real resources stock prices (spr) are significant in this commodity price model. The result shows that the real interest rate (rr), real exchange rate (rer) and the industrial production (ip) of Australia have an adverse effect on the real commodity price (rci). These findings are consistent with the outcome for Australia by Bleaney (1996). But, the effect of real exchange rate on real commodity prices in the long-run is not significant in our study. On the other hand, the real resources stock price (spr) is showing a significant favourable effect on the real commodity price (rci) in the long-run. This result is consistent with the study of Sarkar, Ratti and Westerholm (2015) which also considered Australian case.

As the variables of this model are cointegrated in the long-run, there exists an error correction mechanism which is presented in this study. This vector error correction mechanism combines the long-run equilibrium with short run dynamics to reach the equilibrium situation. The signs of the error correction terms of the model has expected negative (-) sign with statistical significance. Thus, the model shows that all the variables are helping to restore the divergence from the long-run equilibrium in commodity price model of Australia.

The commodity price model of this study does not show significant long run relationship between commodity price and real exchange rate of Australia. As Akram (2009) explains in his empirical analysis to control some macroeconomic variables like interest rates and economic activity to find out the true connection between commodity price and real exchange rate. This feature can be explored further in future study.

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