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Are More Government Debt and Real Depreciation Expansionary in Australia?

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Abstract: Applying an extended IS-MP-AS model (Romer 2000, 2006), this paper finds that the government debt-to-GDP ratio had a negative impact on real GDP during 1989-2007 and a positive impact on real GDP during 2008-2018. In addition, real GDP has a positive relation with the real stock price and a negative relation with real appreciation of the Australian dollar, the U.S. real interest rate, the real oil price and the expected inflation rate. Although fiscal expansion had a positive effect on real GDP, rapid rise in the government debt-to-GDP ratio in recent years may make the positive relation unsustainable.

Keywords: Fiscal Policy, Monetary Policy Reaction Function, Exchange Rates,

JEL codes: E52, E62, F41

Introduction

During time of crises, Australia's government has continued to employ fiscal and monetary expansion to stimulate its economy. For example, during and after the recent global financial crisis, the government debt-to-GDP ratio rose from a low of 9.7% in 2007 to a high of 42.3% in 2018 (IMF, 2019). More debt-financed government spending shifts up aggregate demand and raises real GDP in the short run, though the crowding-out effect may cancel part or all of the increase in real GDP in the long run. In order to stimulate consumption and investment spending, the Reserve Bank of Australia (RBA) engaged in monetary easing by reducing the policy rate or the cash rate from a high of 7.25% to a low of 1.5% since August 3, 2016. Other interest rates also dropped in varying degrees in response to the decline in the cash rate. The government bond yield declined from 5.9945% in 2007 to 2.6842% in 2018. The 6-month bank acceptance bill rate dropped from 8.04% in March 2008 to a recent low of 1.91% in March 2019. The lending rate for small businesses declined from a high of 10.19% in April 2008 to 5.19% in March 2019.

This paper applies an extended IS-MP-AS model (Romer, 2000) to study the impact of fiscal expansion and exchange rate movements on output

and has several different aspects. First, the real stock price is included in the IS function due to its impacts on consumption and investment spending. Second, the world real interest rate and the real effective exchange rate are incorporated in the monetary policy reaction function (Taylor, 1993) as decisions made by the Reserve Bank of Australia are expected to be influenced by the world real interest rate and movements in the real exchange rate. Third, comparative static analysis is employed to determine the sign and the magnitude of a change in an exogenous variable on equilibrium real GDP.

Literature Survey

Employing the SVAR model, Moreno (1992) examined macroeconomic shocks and business cycles in Australia and showed several major findings. Demand shocks raised aggregate output temporarily and prices permanently. Supply shocks played the more important role in the longer run. Technology shocks dominated supply shocks, raised aggregate output, and reduced prices. Shocks to crude oil prices and the supply of labor played smaller roles.

De Brouwer and O'Regan (1997) examined issues in applying monetary policy rules in Australia. A monetary rule is more useful if an inflation target is incorporated explicitly. A feedback rule with the output gap significantly reduces inflation volatility. Incorporation of the current and future information on inflation and output would improve the efficiency of the rule. De Brouwer and Gilbert (2005) analyzed the monetary policy reaction function in Australia and made several comments. The Reserve Bank of Australia (RBA) has not sticked to a single simple rule after the post-floating period because it has experienced through three different monetary policy operating regimes. The RBA has raised the real cash rate in response to a higher inflation rate. The monetary policy reaction function based on inflation and output may be over-simplified because the RBA also responded to changes in the U.S. monetary policy and depreciation of the trade-weighted exchange rate if the inflation rate is greater than 2.5%. The simple monetary policy reaction function implied a neutral interest rate between 5% and 5.5%.

Huh (1999) studied Australia's economy using five variables – IS, money demand, money supply, the world interest rate, and aggregate supply. His results are consistent with the predictions of the Mundell-Fleming model. Expansionary monetary policy results in a permanent depreciation and a temporary increase in output. An increase in IS or money demand leads to appreciation whereas a higher world interest rate results in depreciation.

Brischetto and Voss (1999) investigated the effects of monetary policy in Australia based on an extended model employed by Kim and Roubini (1999). They showed that monetary policy had a graduate and delayed impact on the general price level and a small transitory impact on aggregate output and that monetary policy reduced fluctuations in aggregate output and the general price level.

Perotti (2005) studied the effects of fiscal policy on output and several other macroeconomic variables for five OECD countries including Australia. The fiscal multiplier tended to be small. Only the government spending multiplier in the U.S. during the pre-1980 period was greater than one. There was lack of evidence that tax cuts were more effective than government spending increase or that the tax multiplier was greater than the government spending multiplier. The effects of fiscal expansion including more government spending or a tax cut became significantly weaker and were negative in most cases during the post-1980 period. There was evidence of a positive impact of government spending on long-term interest rates during the post-1980 period.

Based on a sample of 44 countries including Australia, Ilzetzki, Mendoza, and Végh (2010) revealed that the effect of fiscal expansion depends on the exchange rate regime, government debt, trade openness, and the development stage. The fiscal multiplier is zero under a floating exchange rate but relatively large under a predetermined exchange rate. The fiscal multiplier is negative in countries with a high level of debt. The fiscal multiplier is greater in closed economies than in open economies. The effect of fiscal expansion is greater in industrialized countries than in developing countries.

Furceri and Sousa (2011) analyzed the effects of government spending on private spending using a sample consisting of 145 countries including Australia during 1960-2007. They found that government spending crowded out consumption and investment spending and that the effects did not change much during the phase of a business cycle but differed significantly among geographical regions.

Using a sample of 61 countries including Australia and using the panel data technique including the fixed effect and the random effect, Karras (2011) found that the estimated long-run fiscal multiplier ranges from 1.21 to 1.53 in the full sample, from 1.44 to 2.43 for countries with fixed exchange rates, and from 0.98 to 1.39 for countries with floating exchange rates. Hence, fiscal multipliers are more effective under fixed exchange rates than under floating exchange rates. On the basis of a sample of 179 developing and developed countries including Australia during 1970-2011, Karras (2014) also showed that the domestic multiplier is much higher in the least open economies than in the most open economies and that the spillover effect is

much greater in the most open economies than in the least open economies. These results suggest that there would be a tradeoff of the domestic multiplier and the spillover effect in the least open and most open economies.

The Model

Suppose that aggregate expenditures are determined by real GDP, government taxes, government spending, the real interest rate, the real stock price and the real effective exchange rate, that the real interest rate is affected by the inflation gap, the output gap, the world real interest rate and the real effective exchange rate, and that the inflation rate is determined by the expected inflation rate, the output gap, the real oil price, and the real effective exchange rate. Extending Romer (2000), we can express the IS, MP and AS functions as:

$$Y = F(Y, T, G, R, S, \varepsilon) \tag{1}$$

$$R = M(\pi - \pi^*, Y - Y^*, R^*, \varepsilon) \tag{2}$$

$$\pi = H(\pi^e, Y - Y^*, E, \varepsilon) \tag{3}$$

where

Y = real GDP,

T = government taxes,

G = government spending,

R = the real interest rate,

S = the real stock price,

ε = the real effective exchange rate (An increase means real appreciation.)

π = the inflation rate,

π^* = the inflation target.

Y^* = potential real GDP,

R^* = the world real interest rate,

π^e = the expected inflation rate, and

E = real crude oil price.

Solving Y, R and π simultaneously, we can find equilibrium real GDP:

$$\overline{Y} = \overline{Y}(G - T, \varepsilon, R^*, S, E, \pi^e) \tag{4}$$

Assume that the target inflation rate and potential real GDP are constant in the short run. We can find the Jacobian for the three endogenous variables, namely, Y, R and π:

$$|J| = [(1 - F_Y) - F_R H_Y M_\pi - F_R M_Y] > 0 \tag{5}$$

The partial derivatives of equilibrium real GDP respect to the government deficit, the real effective exchange rate, and the real stock price can be expressed as:

$$\partial \bar{Y} / \partial (G - T) = (F_G - F_T) / |J| > or < 0 \tag{6}$$

$$\partial \bar{Y} / \partial \varepsilon = (F_\varepsilon + F_R H_\varepsilon M_\pi + F_R M_\varepsilon) / |J| > or < 0 \tag{7}$$

$$\partial \bar{Y} / \partial S = F_S / |J| > 0 \tag{8}$$

The net effect of real appreciation on equilibrium real GDP depends on the positive impact of real appreciation on the real interest rate and the inflation rate and the negative effect of real appreciation on net exports. Real appreciation causes the real interest rate and the inflation rate to decline and causes net exports to decline.

Due to lack of data for budget deficits, government debt is used to represent fiscal policy. An analysis of the data indicates that the relation between equilibrium real GDP and the government debt-to-GDP ratio is nonlinear, showing a negative relation during most part of 1989-2007 and a positive relation during 2008-2018. Hence, a binary variable (B) is created and has a value of 0 during 1989-2007 and 1 during 2008-2018. Adding an intercept binary variable and an interactive binary variable to equation (8) and using the government debt-to-GDP ratio (D) to replace the government deficit, we have:

$$\bar{Y} = \bar{Y}(D, D*B, B, \varepsilon, R^*, S, E, \pi^e) \tag{9}$$

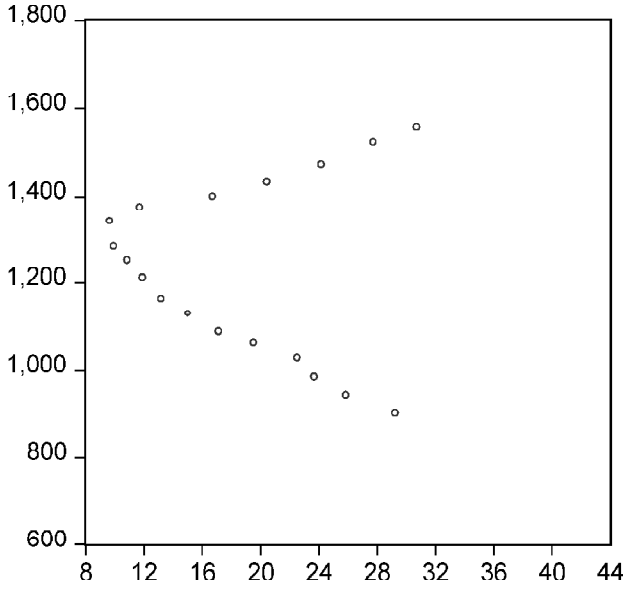

Figure 1: Scatter Diagram between Real GDP (RGDP) and the Debt-to-GDP Ratio (DEBTY) in Australia

Empirical Results

The data were collected from the Reserve Bank of Australia and the International Financial Statistics, which is published by the International Monetary Fund. Real GDP is measured in billions. Fiscal policy is represented by the government debt-to-GDP ratio. The real effective exchange rate is a trade-weighted index. An increase means real appreciation, and vice versa. The world real interest rate is represented by the U.S. real government bond yield. The nominal stock price index is divided by the consumer price index to derive the real stock price. The real oil price is equal to the nominal oil price measured in the Australian dollar divided by the consumer price index. The expected inflation rate is the average inflation rate of the past three years. Real GDP, the real stock price and the real oil price are expressed on a log scale. Other variables are measured in level due to possible negative values before or after log transformation. The sample consists of annual data ranging from 1989 to 2018. The quarterly data for government debt are not available.

The ADF test on the residual is applied to detect if there would be any cointegration among these time series variables. The value of the test statistic is estimated to be -6.6238 compared with the critical value of -4.2293 at the 1% level. Hence, these variables are cointegrated and have a stable long-term relation.

Table 1 reports the estimated regression. The GARCH model is employed in empirical work to correct for autoregressive conditional heteroscedasticity. The right-hand side variables can explain approximately 98.83% of the variation in real GDP. All the coefficients are significant at the 1% level. The government debt-to-GDP ratio has a negative impact on real GDP during 1989-2007 and a positive impact on real GDP during 2008-2018. Real GDP is positively affected by the real stock price and negatively affected by real appreciation of the Australian dollar, the U.S. real interest rate, the real oil price, and the expected inflation rate.

Specifically, if the debt-to-GDP ratio rises 1%, real GDP will decline 0.3479% during 1989-2007 but rise 0.0923% during 2008-2018. It suggests that debt-financed government spending helped Australia's economy during and after the global financial crisis. If the Australian dollar appreciate 1%, real GDP will decline 0.1101%, suggesting that the negative impact of real appreciation on net exports is greater than the positive impact on inflation and other sectors. A 1% increase in the real stock price will result in a 0.1229% increase in real GDP. When the real oil price rises 1%, real GDP will decline 0.0486%.

Table 1: Estimated Log (Real GDP) in Australia

Variable	*Coefficient*	*z-Statistic*	*Probability*
C	8.228466	18566.06	0.0000
Log(Debty)	-0.347902	-336.8014	0.0000
Log(Debty)*B2008	0.440168	49.47285	0.0000
B2008	-0.922496	-31.84643	0.0000
Log(REER)	-0.110053	-6.118589	0.0000
World real interest rate	-0.011174	-4.787519	0.0000
Log(Real stock price)	0.122943	7.933524	0.0000
Log(Real oil price)	-0.048627	-14.28448	0.0000
Expected inflation rate	-0.042082	-21.70427	0.0000
R-squared	0.988290		
Adjusted R-squared	0.983828		
Akaike info criterion	-3.790029		
Schwarz criterion	-3.276256		
Sample period	1989-2018		
MAPE	1.7000%		

Notes: Debty is the government debt-to-GDP ratio. REER is the real effective exchange rate.

Several different versions have been considered. If the expected inflation rate is estimated as a weighted average inflation rate of the past four years, its coefficient is estimated to be -0.0506 and significant at the 1% level. Other results are similar except that the coefficient of the real oil price becomes insignificant at the 10% level. When the U.S. real government bond yield is replaced with the U.S. real lending rate, its estimated coefficient of -.0180 is significant at the 1% level. Other results are similar. If the real effective exchange rate is replaced with the real exchange rate defined as the units of the Australian dollar per U.S. dollar times relative prices in the U.S. and Australia, its estimated coefficient of 0.0781 is significant at the 1% level and suggests that real depreciation raises real GDP. Other results are similar.

Summary and Conclusions

This paper has examined the impacts of fiscal expansion and exchange rate movements on output in Australia based on an extended IS-MP-AS model. Major results show that the debt-to-GDP ratio had a negative effect on real GDP during 1989-2007 and a positive effect during 2008-2018. Furthermore, a lower real interest rate in the U.S., real depreciation, a higher real stock price, a lower real oil price and a lower expected inflation rate would raise real GDP.

There are several policy implications. Although a higher debt-to-GDP ratio helped raise real GDP during 2008-2018, this positive relation may not be sustainable if the debt-to-GDP ratio continues to rise rapidly. Hence, fiscal discipline may need to be exercised. Real appreciation of the Australian dollar generates positive benefits such as a lower import price or inflation,

but its negative impact on exports overwhelms its positive impact. Changes in the recent exchange rate measured as units of the Australian dollar per U.S. dollar from 0.9658 to 1.3384 seem to move to the right direction. The incorporation of the U.S. interest rate in the monetary policy reaction function seems to be appropriate as its coefficient in Table 1 is highly significant and suggests that Australia's monetary policy is correlated with the U.S. monetary policy.

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