Original Paper

Does the Mundell-Fleming Model Apply to Australia's Economy?

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Abstract

Applying an extended Mundell-Fleming Model to Australia, this paper finds that expansionary fiscal policy does not affect output whereas expansionary monetary policy raises output. In addition, a higher real stock price, a lower real oil price or a lower expected inflation rate would increase output. Hence, the predictions of the Mundell-Fleming model works for Australia's economy.

Keywords

Mundell-Fleming model, fiscal policy, monetary policy, exchange rates, interest rates

1. Introduction

The Mundell-Fleming model has been studied extensively. Under a floating exchange rate system, it predicts that expansionary fiscal policy does not raise output but causes real appreciation and that expansionary monetary policy raises output and causes real depreciation. Under a fixed exchange rate system, expansionary fiscal policy raises output whereas expansionary monetary policy has no effect on output. Because Australia is classified as an independently floating exchange rate regime and has relatively free capital mobility, it would be an ideal country to examine the impacts of expansionary fiscal policy and monetary policy on output.

This paper focuses on whether the Mundell-Fleming model may apply to Australia's output and has several different aspects. First, the Mundell-Fleming model as presented by Mankiw (2019) is extended to include the real stock price as a proxy for the value of financial assets, which tends to affect consumption spending and the demand for money. Second, a theoretical model is developed to discuss potential impacts of expansionary fiscal and monetary policy on equilibrium output. Third, an advanced econometric methodology is employed in empirical work so that potential residual problems can be corrected.

2. Literature Survey

Siklos (1988) employed the Mundell-Fleming model to investigate whether there would be a positive relation between government deficits, interest rates, and trade deficits in Canada. The conventional view in the Mundell-Fleming model is that more government deficits lead to higher interest rates, currency appreciation, less exports, and more trade deficits. Based on the quarterly or annual data, he found that there is no positive relation between interest rates and trade deficits.

Applying the IS-LM-Phillips curve model, Gali (1992) used money supply, money demand, IS and supply shocks to explain changes in output, prices, interest rates and money in the U.S. The results matched well with the predictions of the IS-LM model. Supply shocks contributed to a large proportion of output fluctuations in the short run.

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.

Huh (1999) applied the Mundell-Fleming model to study 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.

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.

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, 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.

Blanchard, Ostry, Ghosh, and Chamon (2016, 2017) applied an extended Mundell-Fleming model to

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study the impacts of capital inflows on 19 emerging markets including six Asian countries. They showed that bond inflows are contractionary due to currency appreciation whereas non-bond inflows also causes currency appreciation but reduce borrowing cost and are expansionary. Different policy tools need to be used in combination in response to different types of inflows.

Jeong, Kang, and Kim (2017) investigated the effect of fiscal expansion on output, the exchange rate and the trade balance based on an extended Mundell-Fleming model. According to their findings, the fiscal multipliers are much greater than 1. Expansionary fiscal policy has become more effective in Korea and Japan than China. China's multiplier is larger than Japan's multiplier. Higher fiscal multipliers are affected by monetary policy, the exchange rate policy and institutional factors. Under a flexible exchange rate, fiscal expansion tends to cause real depreciation and improve the trade balance.

3. The Model

Suppose that aggregate expenditures are determined by real income, government tax revenues, government spending, the real interest rate, the real exchange rate, and the real stock price, that the demand for money is affected by the nominal interest rate, real income, and the real stock price, and that the inflation rate is a function of the expected inflation rate, the output gap, the real oil price and the real exchange rate. Extending Mankiw (2019), we can express the IS*, LM* and the augmented short-run aggregate supply functions as:

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

$$M = L(R + \pi^e, Y, S) \tag{2}$$

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

where

Y = real GDP or income,

T = government tax revenue,

G = government spending,

R = the real interest rate,

ε = the real exchange rate (Units of the Australian dollar per U.S. dollar times relative prices in the U.S. and Australia. Hence, an increase means real depreciation of the Australian dollar).

S = the real stock price,

M = real money supply,

L = real money demand,

π^e = the expected inflation rate,

Y^* = potential real GDP, and

E = the real oil price.

Suppose that potential real GDP is constant in the short run. Solving for Y, ε and π simultaneously, we derive equilibrium real GDP as:

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

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The Jacobian for the three endogenous variables can be written as:

$$|J| = -F_\varepsilon L_Y < 0 \tag{5}$$

The effect of government budget deficit on equilibrium real GDP can be expressed as:

$$\partial \overline{Y} / \partial (G - T) = 0 / |J| = 0 \tag{6}$$

The impact of real money supply on equilibrium real GDP is given by

$$\partial \overline{Y} / \partial M = -F_\varepsilon / |J| > 0 \tag{7}$$

An increase in the real stock price is expected to increase or reduce equilibrium real GDP depending upon whether the financial stock is treated as wealth or a substitute for real money balances (Hsing, 2007):

$$\partial \overline{\varepsilon} / \partial S = F_\varepsilon L_S / |J| > 0 \text{ or } < 0 \tag{8}$$

These analyses suggest that expansionary monetary policy is expected to increase equilibrium real GDP, that expansionary fiscal policy is expected not to affect equilibrium real GDP, and that the impact of a higher real stock price is unclear.

4. 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. The government deficit is expressed as a percent of GDP. Real M2 money is measured in billions. The nominal stock price index is divided by the consumer price index to derive the real stock price. The nominal oil price in the Australian dollar is divided by the consumer price index to derive the real oil price. The expected inflation rate is the average inflation rate of the past four quarters. Real GDP, real M2, 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 ranges from 2004.Q3 to 2018.Q3. Earlier data for the government deficit are not available.

The DF-GLS 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 -2.1142 compared with the critical value of -1.9468. 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. Approximately 98.6% of the variation in real GDP can be explained by the six right-hand side variables. The positive coefficient of the deficit-to-GDP ratio is insignificant at the 10% level. The coefficients of other variables are significant at the 1% level. Real GDP has a positive relation with real M2 money and the real stock price and a negative relation with the real interest rate, the real oil price and the expected inflation rate. The findings that expansionary fiscal policy does not affect real GDP whereas expansionary monetary policy has a positive impact on real GDP suggest that the predictions of the Mundell-Fleming model are correct. The positive significant coefficient of the real stock price implies that the substitution effect dominates the wealth effect in the money demand function.

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Specifically, a 1% increase in real M2 money would raise real GDP by 0.3456%. If the real interest rate rises 1 percentage point, the log of real GDP would decline by 0.0154. If the real stock price increases 1%, real GDP would increase by 0.0610%. A 1% rise in the real oil price is expected to reduce real GDP by 0.0110%. When the expected inflation raises 1 percentage point, the log of real GDP declines by 0.0185.

Table 1. Estimated Log(Real GDP) in Australia

Variable	Coefficient	z-Statistic	Probability
Constant	10.22172	53.99625	0.0000
Deficit-to GDP ratio	0.000164	0.326971	0.7437
Log(Real M2)	0.345588	20.79787	0.0000
Real interest rate	-0.015406	-5.802669	0.0000
Log(Real stock price)	0.060974	3.990887	0.0001
Log(Real oil price)	-0.010958	-2.822559	0.0048
Expected inflation rate	-0.018504	-5.871760	0.0000
R-squared	0.985993		
Adjusted R-squared	0.984312		
Akaike information criteria	-6.072660		
Schwarz criteria	-5.714230		
Sample period	2004.Q3-2018.Q3		
Observation	57		

5. Summary and Conclusions

This paper has examined whether the predictions of the impacts of expansionary fiscal and monetary policies on Australia's output in the Mundell-Fleming model are correct. The results are consistent with the predictions. Expansionary fiscal policy does not increase real GDP whereas expansionary monetary policy raises real GDP. In addition, a higher real stock price, a lower real oil price or a lower expected inflation would raise real GDP.

There are policy implications. Because expansionary fiscal policy does not have a positive impact on real GDP, fiscal prudence may need to be exercised. Monetary policy plays a more significant role. A healthy stock market is conducive to economic growth as higher stock prices tend to result in the wealth and other effects, increasing consumption and business spending. The current higher real oil price tends to shift short-run aggregate supply to the left and reduce real GDP.

Note that the real exchange rate is not included in the LM^* function (Mankiw, 2019), suggesting that the demand for money is not affected by the real exchange rate. There may be potential substitution effect between real money demand and the real exchange rate. As the Australian dollar depreciates

versus the U.S. dollar or other major currencies, people may substitute the U.S. dollar or other major currencies for the Australian dollar in order to reduce the cost of exchange for the U.S. dollar or engage in currency trading to make a profit in the future.

Potential future research may apply the IS-MP-AS model (Romer, 2000, 2006) to examine the impacts of expansionary fiscal and monetary policies on real GDP. The advantage of this model is the incorporation of the monetary policy reaction function and inflation targeting to replace the LM[*] function. Empirical results would determine which model would work better for Australia.

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