

Does the Mundell-Fleming Model Apply to Indonesia?

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Abstract: Based on an extended Mundell-Fleming Model, this study finds that fiscal expansion reduces output and causes the Indonesian rupiah to appreciate whereas monetary expansion raises output and causes the Indonesian rupiah to depreciate. Hence, except for the effect of fiscal expansion on output, the predictions of the Mundell-Fleming model apply to Indonesia.

1. Introduction

Under the assumptions of perfect capital mobility and a vertical LM^* curve, the Mundell-Fleming model predicts that under a floating exchange rate, expansionary fiscal policy does not raise output but causes real appreciation whereas expansionary monetary policy raises output and causes real depreciation and that under a fixed exchange rate, expansionary fiscal policy raises output whereas expansionary monetary policy has no effect on output (Mankiw, 2019). Whether these predictions may apply to individual countries remains unanswered because the assumption of perfect capital mobility and a vertical LM^* curve may not hold in some of the countries and because some countries may choose a managed floating exchange rate, which is neither a floating nor a fixed exchange rate. It is challenging to test these predictions because many countries have gone through several phases of exchange rate systems, namely, a pegged exchange rate, a managed floating exchange rate, and/or an independently floating exchange rate. Indonesia has adopted different exchange rate regimes over time. It operated under a fixed exchange rate during 1971-1978 and switched to a managed exchange rate during 1978-1997. Since 1997, it has chosen an independently floating exchange rate.

This paper examines whether the Mundell-Fleming model may apply to Indonesia and has several different aspects. First, the real stock price as a proxy for the value of financial assets is included in the aggregate expenditure and money demand functions. Second, the real exchange rate is incorporated in the money

demand function to test if a non-vertical LM* curve may change some of the predictions of the Mundell-Fleming model. Third, comparative static analysis is applied to discuss potential impacts of fiscal expansion and monetary expansion on equilibrium output and real exchange rate.

2. Literature Survey

Several recent articles have examined the Mundell-Fleming model, effectiveness of fiscal and monetary policy, and the exchange rate for Indonesia and related countries.

Using five variables – IS, money demand, the money supply, the world interest rate, and aggregate supply, Huh (1999) applied the Mundell-Fleming model to examine Australia's economy. The results are consistent with the predictions of the Mundell-Fleming model. Monetary expansion 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 an extended Mundell-Fleming model, Hsing (2006) studied the real exchange rate in South Korea during 1980.Q1- 2004.Q4. He showed that monetary expansionary leads to real depreciation of the Korean won whereas fiscal expansionary does not affect the real exchange rate. Furthermore, a higher real stock price and expected real exchange rate lead to real appreciation whereas a higher real world interest rate and country risk result in real depreciation. The mixed results are mainly because the exchange rate system in South Korea changed from a pegged system to a floating system during this time period.

Based on a sample of 44 countries including several Asian countries, Ilzetzi, 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.

In studying exchange rates for emerging countries including Indonesia, Edwards (2011) provided several insightful comments. Exchange rate crises are quite harmful. Countries adopting a floating exchange rate grow faster than countries adopting a pegged exchange rate in the long run. Countries adopting the dollar do not perform better than non-dollarized countries. Countries with a floating exchange rate can adapt to external shocks better than countries with a fixed or rigid exchange rate. Countries with a fixed exchange rate and perfect capital mobility cannot pursue independent monetary policy. Stabilization programs based on the exchange rate often lead to severe overvaluation of a

currency. Exchange rate misalignment would be quite harmful, and intervention by the central bank is justified even under a floating exchange rate.

Simorangkir and Adamanti (2010) indicated that the combination of fiscal expansion and monetary expansion is more effective and has a larger multiplier effect in stimulating Indonesia's economy during the 2008-2009 global financial crisis. The effects are reflected in more consumption, investment, exports, imports and government spending. Fiscal and monetary expansion also raise production mainly due to lower taxes and lower import tariffs.

Based on a sample of 61 countries including many Asian developing countries 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. Based on a sample of 179 developing and developed countries including Indonesia 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.

Silalahi and Chawwa (2011) revealed that Indonesia's output was positively associated with the lagged real M1 and real government spending and negatively affected by the lagged real currency depreciation and the lagged inflation rate. They emphasized that cooperation and coordination among the central bank and other government agencies and timely responses to a financial crisis are important. In addition, nonconventional monetary policy such as a decrease in the requirement reserve and provision of standing deposit facility and lending facility will be helpful. Expansionary fiscal policy should be targeted, timely and temporary.

Tang, Liu and Cheung (2013) investigated fiscal multipliers for 5 ASEAN countries based on different models. For Indonesia, the impact of a government tax shock on GDP ranges from 0.37 to 0.41 whereas the impact of a government spending shock on GDP ranges from -0.01 to -0.42. These results suggest that a tax cut is more effective than more government spending for Indonesia.

Applying the IS-LM analysis, Yunanto and Medyawati(2014) studied the effects of fiscal and monetary expansion on output in Indonesia. They found that the fiscal policy multiplier is estimated to be 1.077 whereas the monetary policy multiplier was found to be 1.795. Hence, expansionary monetary policy is more effective than expansionary fiscal policy.

Kuncahyo (2016) examined the twin deficit hypothesis for Indonesia. The results show that more budget deficits caused interest rates to rise and the Indonesian rupiah to appreciate, hurt exports and net exports, and led to more current account deficits.

Blanchard, Ostry, Ghosh, and Chamon (2016, 2017) applied an extended Mundell-Fleming model to study the impacts of capital inflows on 19 emerging markets including Indonesia. 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.

Nursini (2017) showed that the effectiveness of fiscal expansion depends on the type of financing and spending. Fiscal expansion is effective if it is spent on infrastructures and human resources and financed by tax revenue and is ineffective if it is financed by foreign loans. Routine government expenditure is ineffective if it is financed by tax revenue or foreign loans. Economic growth is positively affected by more trade openness.

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 aggregate expenditures are determined by real income, government tax revenues, government spending, the real interest rate, the real stock price, and the real exchange rate and that real money demand is affected by the nominal interest rate, real income, the real stock price and the real exchange rate. Extending Mundell (1963, 2001), Felming (1962), Romer (1996), Mankiw (2019) and others, we can express the IS and LM functions as:

$$Y = F(Y, T, G, R, S, \epsilon) \quad (1)$$

$$M/P = L(R + \pi^e, Y, S, \epsilon) \quad (2)$$

Y = real GDP or income,

T = government tax revenue,

G = government spending,

R = the real interest rate,

S = the real stock price,

ε = the real exchange rate (units of the Indonesian rupiah per U.S. dollar. An increase means real depreciation of the rupiah.)

M = the money supply,

P = the price level,

L = real money demand function, and

π^e = the expected inflation rate.

Solving for Y and ε simultaneously, we have equilibrium real GDP and ε as:

$$\bar{Y} = \bar{Y}(G - T, M / P, R, S, \pi^e) \quad (3)$$

$$\bar{\varepsilon} = \bar{\varepsilon}(G - T, M / P, R, S, \pi^e) \quad (4)$$

To maintain a stable equilibrium given a change in an exogenous variable, the partial derivative of real money demand with respect to the real exchange rate needs to be positive or $L_\varepsilon > 0$. $L_\varepsilon > 0$.

The determinant of the Jacobian matrix for the two endogenous variables can be written as:

$$|J| = [-L_\varepsilon (1 - F_Y) - F_\varepsilon L_Y] < 0. \quad (5)$$

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

$$\partial \bar{Y} / \partial (G - T) = -(F_G - F_T) L_\varepsilon / |J| > 0. \quad (6)$$

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

$$\partial \bar{Y} / \partial M = -P^{-1} F_\varepsilon / |J| > 0. \quad (7)$$

An increase in the government deficit tends to cause the Indonesian rupiah to appreciate:

$$\partial \bar{\varepsilon} / \partial (G - T) = (F_G - F_T) L_Y / |J| < 0 \quad (8)$$

An increase in the money supply is expected to cause the Indonesian rupiah to depreciate:

$$\partial \bar{\varepsilon} / \partial M = -P^{-1} (1 - F_Y) / |J| > 0 \quad (9)$$

These analyses suggest that expansionary fiscal policy may raise equilibrium real GDP if $L_\varepsilon > 0$ and cause real appreciation of the Indonesian rupiah and that expansionary monetary policy is expected to increase equilibrium real GDP and cause real depreciation of the Indonesian rupiah.

4. Empirical Results

The data were taken from the International Financial Statistics and the world Economic Outlook published by the International Monetary Fund. Real GDP and M2 are measured in billion rupiahs. The real exchange rate is equal to the nominal exchange rate defined as units of the Indonesian rupiah per U.S. dollar times relative prices in the U.S. and Indonesia. Fiscal policy is represented by government net borrowing as a percent of GDP. The real interest rate is represented by the lending rate minus the expected inflation rate. The government bond yield may be considered, but complete data are not available. The real stock price is represented by the equity index adjusted for the consumer price index. The expected inflation rate is estimated as a weighted average inflation rate of the past four years. Real GDP, real M2, the real stock price are measured in log scale. Other variables are measured in level due to negative values before or after log transformation. Due to incomplete quarterly data for fiscal policy, annual data during 1996–2018 are employed in empirical work.

The ADF test on regression residuals is used to determine whether these time series variables are cointegrated. When the dependent variable is real GDP, the test statistic is greater than the critical value in absolute value at the 5% level. When the dependent variable is the real exchange rate, a similar conclusion is reached. Hence, these variables have a stable long-term relationship.

The GARCH process is employed in empirical work to correct for autoregressive conditional heteroskedasticity. Table 1 presents empirical results for real GDP. Approximately 98.84% of the change in real GDP can be explained by the five right-hand side variables. All the coefficients are significant at the 1% level. Real GDP has a negative relation with government net borrowing as a percent of GDP, the real interest rate, and the expected inflation rate and a positive relation with real M2 and the real stock price. If real M2 rises 1%, real GDP will increase by 0.7535%. A 1% increase in the real stock price will lead to a 0.0796% rise in real GDP.

The results for the real exchange rate is also presented. The explanatory variables can explain approximately 79.39% of the variation in the real exchange rate. All the coefficients are significant at the 1% level. More government net borrowing as a percent of GDP and a higher real stock price cause the Indonesian rupiah to appreciate whereas more real M2, a higher real interest rate, and a higher expected inflation rate lead to depreciation of the Indonesian rupiah.

Hence, except for the negative impact of fiscal expansion on real GDP, the findings that fiscal expansion causes the rupiah to appreciate and that monetary expansion causes real GDP to rise and the rupiah to depreciate are consistent with the predictions of the Mundell-Fleming model.

Table 1
Estimated Regressions for Log(Real GDP) and Log (Real Exchange Rate) in
Indonesia

	<i>Log(Real GDP)</i>	<i>Log(Real Exchange Rate)</i>
C	-0.8178 (0.0000)	-0.3131 (0.0000)
Government net borrowing as a percent of GDP	-0.0168 (0.0000)	-0.0152 (0.0004)
Log(Real M2)	0.7535 (0.0000)	0.5106 (0.0000)
Real Interest rate	-0.0109 (0.0000)	0.0186 (0.0000)
Log(Real stock price)	0.0796 (0.0000)	-0.3828 (0.0000)
Expected inflation rate	-0.0137 (0.0000)	0.0202 (0.0000)
R-squared	0.9884	0.7939
Adjusted R-squared	0.9850	0.7333
Akaike info criterion	-3.7098	-1.8460
Schwarz criterion	-3.3148	-1.4511
Sample period	1996-2018	1996-2018

Notes: Figures in the parentheses are P-values.

5. Summary and Conclusions

This paper has examined whether the predictions of the Mundell-Fleming model would apply to Indonesia. An extended Mundell-Fleming model incorporating the real exchange rate and the real stock price is employed.

The results show that fiscal expansion reduces real GDP and causes the Indonesian rupiah to appreciate whereas monetary expansion raises real GDP and causes the Indonesian rupiah to depreciate. Therefore, except for the negative effect of fiscal expansion on real GDP, empirical results are consistent with the predictions of the Mundell-Fleming model. In addition, a lower real interest rate, a higher real stock price and a lower expected inflation rate would raise real GDP. A higher real interest rate or a higher inflation rate would cause real depreciation

of the Indonesian rupiah whereas a higher real stock price would cause real appreciation.

There are several policy implications. The Indonesian government may need to exercise fiscal prudence as fiscal expansion does not raise output and also causes the Indonesian rupiah to appreciate, which may hurt exports and net exports. Raising the real interest rate is expected to cause output to decline and the Indonesian rupiah to depreciate, suggesting that using the interest rate to prevent the Indonesian rupiah from depreciating may not work. In comparison, monetary expansion is a better choice than fiscal expansion in terms of their impacts on output and exports.

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