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Effectiveness of Monetary and Fiscal Policies on Output and Exchange Rates in India

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Abstract: Applying an extended IS-LM model, this study finds that fiscal expansion reduced output and caused real appreciation and that monetary expansion increased output and caused real depreciation. Therefore, except for the negative impact of fiscal expansion on output, the Mundell-Fleming model applies to India.

Keywords: fiscal expansion, monetary expansion, exchange rates, Mundell-Fleming model

JEL Codes: E52, E62, F41

Introduction

India's government has engaged in fiscal policy, monetary policy and other macroeconomic measures to stimulate or stabilize its economy. During the global financial crisis, the Indian government used expansionary fiscal policy by raising government borrowing as a percent of GDP from 4.505% in 2007 to 8.982% in 2008 and 9.534% in 2009. As the economy continued to improve, the borrowing-to-GDP ratio declined to 6.542% in 2018.Its average general government debt-to-GDP ratio was 73.523% during 2008-2009 compared with 74.027% in 2007 and gradually declined to 68.913%. These statistics suggest that the Indian government has attempted to maintain fiscal discipline.

During the global financial crisis, the Reserve Bank of India lowered the policy rate from 6.07% in 2007-2008 to 3.29% in 2009-2010. The lending rate dropped from 13.0208% in 2007 to 8.3334% in 2010. M3 money supply rose 20.15% and 18.03% in 2008 and 2009, respectively, to provide more liquidity to the banking and financial systems.The Reserve Bank of Indiahas pursued a managed floating exchange rate system based on market demand and supply since March 1993 and may intervene in the exchange rate market in order to ensure orderly conditions and stabilize the rupee exchange rate.

A review of the literature shows that few of previous studies have examined the effects of monetary policy and fiscal policy on output and the exchange rate in India based on an extended Mundell-Fleming model.

This paper attempts to test if the Mundell-Fleming model may apply to India. According to the Mundell-Fleming Model (Mundell, 1963, 2001; Fleming, 1962; Romer, 1996; Obstfeld, 2001; Mankiw, 2019), under a floating exchange rate system, expansionary fiscal policy is ineffective in raising output and tends to cause real appreciation whereas expansionary monetary policy is effective in raising output and tends to cause real depreciation. This paper differs from previous studies partly becausethe realeffective exchange rate is included in the money demand function. Hence, the LM* curve may not be vertical, and expansionary fiscal policy may affect output.

Literature Survey

Several recent studies have examinedfiscal policy, monetary policy, exchange rates, and other related variables for India and other related countries.

Buiter and Patel (2010) reviewed India's fiscal rules mandated by the 2003 Fiscal Responsibility and Budget Management Act (FRBMA) requiring that the central government deficit should be less than 3% of GDP by 2008-2009 and that the budget should be in balance or surplus by 2008-2009. By 2008-09, its actual fiscal deficit was 6% of GDP, and budget balance was not achieved. The rising government deficit was attributable to government subsidies, funding of money-losing public enterprises, rising pensions and salaries of government employees, a rural income support program, and a massive farm loan waiver program, etc.

In studying India's fiscal policy during 2015-2019, Bhanumurthy, Bose, and Chakravartti (2018) estimated that the Pay Commission award led to slight higher economic growth but resulted in fiscal deficits, current account deficits, higher inflation, and more government debt. Increasing government capital spending and reducing government transfer payments would lead to higher economic growth and a reasonable fiscal deficit of 5.3% of GDP and a government debt ratio of 60% in 2019-2020.

Based on a new Keynesian model for India, Patra and Kapur (2012) found that aggregate demand responded to a change in interest rates with at least a 3-quarter lag and that inflation took 7 quarters to react. Inflation was persistent and inertial once it set in. Exchange rate pass-through to domestic inflation was relatively low. The dominant focus of monetary policy was inflation, along with a firm commitment to stabilize output.

Examining monetary transmission mechanism for India, Kapur and Behera (2012) showed that an increase of 0.25 percentage points in the effective policy rate led to a maximum increase of 0.40 percentage points in non-agricultural growth with a 2-qaurter lag and a change in 25 percentage points in inflation in the non-food manufacturing products with a 5-quarter

lag. These effects were comparable to those in major emerging and advanced countries. Hence, the interest rate channel was effective.

Investigating the interest rate channel of monetary transmission mechanism for India based on the SVAR model, Mohanty (2012) revealed that an increase in the policy rate had a negative impact on output growth with a 2-quarter lag and a moderate effect on inflation with a 3-quarter lag. The overall effect lasted over 8-10 quarters. Except for M3 money, there was a significant unidirectional causality from the policy rate to inflation, output and liquidity.

Mishra, Montiel, and Sengupta (2016) investigated monetary transmission in India during 2001.M4 – 2014.M2 based on the SVAR model. They found that monetary tightening led to an increase in the bank lending rate. However, the pass-through from the policy rate to the bank lending rate was incomplete. The impact of monetary policy on the real effective exchange rate was weak and insignificant at the 10% level. There was no evidence that monetary policy affected the output gap or the inflation rate.

In analyzing the effectiveness of different monetary transmission channels for India, Bhoi, Mitra, Singh, and Sivaramakrishnan (2017) showed that in response to a shock to a higher policy rate, GDP growth declined most after 2 to 3 quarters, and change in inflation happened after 3 to 4 quarters. The interest rate channel was the dominant one among four different channels.

Patra, Khundrakpam, and Gangadaran (2017) estimated the optimal monetary policy rule for India during 2000-2014. The weights for the inflation gap and the output gap were greater than the 0.5 weight in the conventional Taylor rule. Flexible inflation targeting adopted by India happened to maximize India's welfare. The best suited policy rate was estimated to be between 6.25% and 6.70% that prevailed during 2015-2016.

Combining the new Keynesian model and Ramsey's growth model and employing the Kalman filter process, Behera, Pattanaik, and Kavediya (2017) estimated the natural real interest rate for India to be 0.6%-3.1% in the fourth quarter of 2014-2015. Core estimates narrowed to a range of 1.6%-1.8%. These figures suggest that the gap of the real interest rate was negative and monetary policy of the Reserve Bank of India was accommodative instead of anti-inflationary.

Examining the interaction between fiscal and monetary policies in India during 2000.Q2-2010.Q1, Raj, Khundrakpam, and Das (2011) showed that fiscal policy continued to significantly affect monetary policy. In response to shocks to output and inflation, fiscal and monetary policies moved in the opposite directions in most cases. Monetary policy was counter cyclical whereas fiscal policy was pro-cyclical. The impact of fiscal expansion was

positive but brief and was significantly negative in the medium and long term.

Applying the PVAR model and using a sample of the five BRICS countries, Jawadi, Mallick, and Sousa (2016) found that monetary policy and fiscal policy accommodated to each other and that increased government spending resulted in significant Keynesian impacts whereas contractionary monetary policy led to declining economic activities in the real sector and less liquidity in the financial market.

Based on a sample of 11 advanced countries and 22 emerging countries including India during 1994.Q1-2015.Q4, Jasova, Moessner, and Takáts (2016) reported that exchange rate pass-through (ERPT) in emerging countries declined after the global financial crisis and remained relatively stable and low in advanced countries. Declining ERPT in emerging countries was attributable to declining inflation. In estimating ERPT, nonlinear relationships need to be considered.

Dua and Sen (2017) analyzed the determinants of real exchange rates in India during 1993.Q2-2010.Q4. They revealed that selected macroeconomic variables and the real exchange rate had a long-term relationship and Granger caused the real exchange rate and that real exchange rates were influenced by net capital inflows, volatility of net capital inflows, government spending, the money supply, and the current account balance.

The Model

Suppose that aggregate expenditures are a function of real income,government tax revenues, government spending, the real interest rate, the financial stock price, and the realeffective exchange rate and that real money demand is determined by the nominal interest rate, real GDP, the financial stock price, and the real effective exchange rate. Extending Romer (1996) and Mankiw (2019), we can express the IS and LM functions as:

$$Y = f(Y, T, G, R - \pi^*, F, E) \tag{1}$$

$$M / P = g(R, Y, F, E) \tag{2}$$

where

Y = real GDP in India,

T = government tax revenue,

G = government spending,

R = the nominal interest rate,

π^* = the expected inflation rate,

F = the financial stock price,

E = the realeffective exchange rate (An increase means real appreciation.),

M = nominal money supply, and
P = the price level.

Solving for the two endogenous variables, Y and E, we can find equilibrium real GDP andreal effective exchange rate as:

$$\bar{Y} = \bar{Y}(G - T,\ M/P, R - \pi^*, F) \tag{3}$$

$$\bar{E} = \bar{E}(G - T, M/P, R - \pi^*, F) \tag{4}$$

Assume that $g_E < 0$ and that $f_G > f_T$. The Jacobian for the two endogenous variables is given by:

$$|J| = [-g_E\,(1 - f_Y) - f_E g_Y] > 0 \tag{5}$$

The impacts of fiscal expansion on equilibrium Y and E can be shown as:

$$\partial\bar{Y}/\partial G - \partial\bar{Y}/\partial T = -(f_G - f_T)g_E/|J| > 0. \tag{6}$$

$$\partial\bar{Y}/\partial G - \partial\bar{Y}/\partial T = -(f_G - f_T)g_Y/|J| > 0. \tag{7}$$

Equations (6) and (7) suggest that more government deficit tends to raise output and lead to real appreciation. The prediction in equation (6) is different from the Mundell-Fleming model because of the inclusion of the realeffective exchange rate in the money demand function. In the Mundell-Fleming model, because the realeffective exchange rate is not included, $g_E = 0$, and the partial derivative of equilibrium real GDP with respect to the government deficit is zero, suggesting that fiscal expansion does not raise real GDP.

The partial derivatives of equilibrium Y and ε with respect to monetary expansion can be expressed as:

$$\partial\bar{Y}/\partial M = -P^{-1} f_E/|J| > 0. \tag{8}$$

$$\partial\bar{E}/\partial M = -P^{-1}(1 - f_Y)/|J| < 0. \tag{9}$$

Equations (8) and (9) indicate that more money supply tends to raise output and cause real depreciation. When the money supply increases, the LM^* curve shifts to the right, equilibrium real GDP rises, and equilibrium real effective exchange rate declines.

Empirical Results

The data were collected from IMF's *International Financial Statistics*, the Reserve Bank of India the Federal Reserve Bank of St. Louis, and the OECD. Real GDP is measured in million rupees. Government debt as a percent of

GDP is chosen to represent fiscal policy as it is an accumulation of government deficits. The real effective exchange rate is a trade weighted index. An increase means real appreciation. Real money supply is represented by M3 money adjusted for the consumer price index where M3 is an index with a base year in 2015. M1 money may be relatively narrow as it does not include saving accounts, small time deposits, money market accounts, and money market deposit accounts. The lending rate minus the expected inflation rate is selected to represent the real interest rate. Other types of interest rates do not have adequate observations. The financial stock price is an index with the base year in 2015. The expected inflation rate is estimated as the average of lagged inflation rates in the past four years. Real GDP, the debt-to-GDP ratio, real M3, and the stock index are transformed to a log scale. The lending rate and the expected inflation rate are not transformed to a log scale due to negative values before or after the transformation.The sample consistsof annual data ranging from 1994 to 2018. The data for the real effective exchange rate before 1994 are unavailable.

The EGARCH process is employed in empirical work to correct for autoregressive conditional heteroscedasticity. The estimated coefficients in the conditional variance equation are significant at the 1% level, suggesting that the EGARCH process is appropriate. In the estimated regression for real GDP in Table 1, thefour exogenous variables can explain approximately 98.63% of the variation in real GDP. All the estimated coefficients are significant at the 1% or 2.5% level. Real GDP has a positive relationship with real M3 money and the stock price and a negative relationship with the debt-to-GDP ratio and the real interest rate. Hence, fiscal expansion reduces real GDP whereas monetary expansion is effective in raising real GDP. A possible reason for the negative effect of fiscal expansion on real GDP is that the negative crowding-out effect on private spending may dominate the positive effect of fiscal expansion on aggregate demand. Specifically, if the debt-to-GDP ratio rises 1%, real GDP would decline by 0.4230%. A 1% increase in real M3 money would raise real GDP by 0.7591%. A higher stock price raises real GDP mainly due to increases in consumption and investment expenditures through the wealth effect, the balance sheet channel and Tobin's q theory (Mishkin, 1995).

In the estimated regression for the real effective exchange rate, approximately 49.63% of the change in the dependent variable can be explained by the right-hand side variables with significant coefficients. Except for the coefficient of the real interest rate, other coefficients are significant at the 1% level. The real effective exchange rate is positively affected by the debt-to-GDP ratio and the stock price and negatively influenced by real M3 money. These results indicate that fiscal expansion

results in real appreciation whereas monetary expansion leads to real depreciation. A higher real interest rate tends to attract international capital inflows, increase the demand for the rupee, and cause real appreciation. On the other hand, a higher real interest rate tends to reduce consumption and investment spending, shift IS* to the left, reduce equilibrium real GDP, and lead to real depreciation. Thus, the net effect is unclear. A higher stock value tends to attract foreign investors to purchase India's stocks, increase the demand for the rupee, and cause real appreciation.

Table 1: Estimated Regressions for Real GDP and the RealEffective Exchange Rate (REER)

	Log(real GDP)	*Log(REER)*
Constant	10.0417	3.2613
	(18449116.0000)	(12.8476)
Log(government debt as a percent of GDP)	-0.4230	0.2940
	(-54.0467)	(4.6506)
Log(real M3)	0.7591	-0.1019
	(204.7668)	(-4.6562)
Real interest rate	-0.0076	-0.0009
	(-3.4708)	(-0.3455)
Log (stock price)	0.0178	0.1105
	(2.3940)	(5.3672)
R-squared	0.9863	0.4963
Adjusted R-squared	0.9836	0.3956
Akaike information criterion	-3.8716	-3.4205
Schwarz criterion	-3.4815	-3.0304
Sample period	1994-2018	1994-2018
Number of observations	25	25

Notes: REER: the realeffective exchange rate.
Figures in the parentheses are z-statistics.

If the government borrowing-to-GDP ratio is selected to replace the government debt-to-GDP ratio as fiscal policy, in the regression for real GDP, the signs and significance of the coefficients are similar. R-squared is estimated to be 97.63%. Fiscal expansion reduces real GDP whereas monetary expansion raises real GDP. In the regression for the real effective exchange rate, the positive coefficient of the real interest rate is significant at the 1% level. R-squared is estimated to be 25.83%, suggesting that the explanatory power is smaller than that when the debt-to-GDP ratio is used to represent fiscal policy.

Summary and Conclusions

This paper has examined the effectiveness of fiscal and monetary policies under the framework of the Mundell-Fleming model. For India, fiscal expansionreduces output and causes real appreciation, and monetary

expansion raises output and causes real depreciation. Except for the impact of fiscal expansion on output, the findings are generally consistent with the Mundell-Fleming model. In addition, a lower real interest rate or a higher stock price would raise output; and a higherstock price would result in real appreciation. A higher real interest rate may or may not cause real appreciation depending upon which measurement of fiscal policy is employed in empirical work.

There are several policy implications. Monetary expansion would be a better choice than fiscal expansion as the former leads to real depreciation and more output whereas the latter results in real appreciation and less output. Real appreciation hurts exports. A higher real interest rate hurts output and may cause real appreciation. Hence, if the macroeconomic goal is to stimulate exports and output, a lower real interest rate would be a better strategy. A healthy stock market is important as a higher stock value would lead to a higher output and real appreciation. Real appreciation tends to increase international capital inflows but hurt exports.

References

Behera, H. K., Pattanaik, S., & Kavediya, R. (2017). Natural interest rate: Assessing the stance of India's monetary policy under uncertainty. Journal of Policy Modeling, 39(3), 482-498.

Bhanumurthy, N. R., Bose, S., & Chakravartti, P. (2018). Targeting Debt and Deficits in India: A Structural Macroeconometric Approach. Journal of Quantitative Economics, 16(1), 87-119.

Bhoi, B. K., Mitra, A. K., Singh, J. B., & Sivaramakrishnan, G. (2017). Effectiveness of alternative channels of monetary policy transmission: some evidence for India. Macroeconomics and Finance in Emerging Market Economies, 10(1), 19-38.

Buiter, Willem H. and Patel, Urjit R., (2010). Fiscal rules in India: Are they effective? National Bureau of Economic Research working paper No. 15934.

Dholakia, R. H. (2018). Sacrifice ratio and cost of inflation for the Indian economy. In Issues in Indian Public Policies (pp. 1-18). Springer, Singapore.

Dua, P., & Sen, P. (2017). Capital flows and exchange rates: the Indian experience. In Perspectives on economic development and policy in India (pp. 193-216). Springer, Singapore.

Jasova, M., Moessner, R., & Takáts, E. (2016). Exchange rate pass-through: what has changed since the crisis?

Fleming, J. M. (1962). Domestic financial policies under fixed and under floating exchange rates. International Monetary Fund Staff Papers 9: 369–379.

Jawadi, F., Mallick, S. K., & Sousa, R. M. (2016). Fiscal and monetary policies in the BRICS: A panel VAR approach. Economic Modelling, 58, 535-542.

Kapur, M., & Behera, H. K. (2012). Monetary transmission mechanism in India: A quarterly model. Reserve Bank of India Working Paper, (09).

Mankiw, N. G. (2019). Macroeconomics, 10th edition, Worth Publishers, NY: New York.

Mishkin, F. S. (1995). Symposium on the monetary transmission mechanism. Journal of Economic perspectives, 9(4), 3-10.

Mishra, P., Montiel, P., & Sengupta, R. (2016). Monetary transmission in developing countries: Evidence from India. In Monetary Policy in India (pp. 59-110). Springer, New Delhi.

Mohanty, D. (2012). Evidence of interest rate channel of monetary policy transmission in India. In Second International Research Conference at the Reserve Bank of India, February (pp. 1-2).

Mundell, R. A. (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. Canadian Journal of Economics and Political Science 29: 475–485.

Mundell, R. A. (2001). On the history of the Mundell–Fleming model. Keynote speech. International Monetary Fund Staff Papers Special, 47.

Obstfeld, M. (2001). International macroeconomics: Beyond the Mundell-Fleming model. International Monetary Fund Staff Papers 47: 1–39.

Patra, M. D., & Kapur, M. (2012). A monetary policy model for India. Macroeconomics and Finance in Emerging Market Economies, 5(1), 18-41.

Patra, M. D., Khundrakpam, J. K., & Gangadaran, S. (2017). The quest for optimal monetary policy rules in India. Journal of Policy Modeling, 39(2), 349-370.

Raj, J., Khundrakpam, J. K., & Das, D. (2011). An empirical analysis of monetary and fiscal policy interaction in India (No. id: 4504).

Romer, D. (1996). Advanced Macroeconomics, McGraw-Hill/Irwin. Massachusetts: Boston.