Impact of government spending on inflation in Asian emerging economies: evidence from India, Vietnam, and Indonesia

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Abstract

High economic growth accompanied by high inflation is a common phenomenon among many emerging economies. Inflation is one of the major problems that may hurt the favourable growth prospect of emerging economies in Asia. This paper investigates the long-run and short-run impact of government spending on inflation in three Asian emerging economies including India, Indonesia and Vietnam by applying the cointegration and Vector Error Correction Model to time series data for the period 1970-2010. The results from both bivariate and trivariate models suggest that government spending does have a statistically significant and positive effect on inflation in the long-run in all three countries. This implies that the differences in institutions and governance system of these countries hardly affect the long-run impact of government spending on inflation. In the short-run, there is a cointegrating relationship between government spending and inflation, which is either a direct or an indirect link through interactions with GDP per capita or nominal exchange rate. For India, government spending appears to have positive short-run impact on inflation, which is consistent with the Keynesian view. In the case of Indonesia, this short-run impact of government spending on inflation is negative, suggesting a crowding out effect of government spending on private investment in the spirit of Neo-classical school. Meanwhile, for Vietnam, the short-run impact runs from inflation to government spending. The implication is that governments in Asian emerging economies should be prudent when considering big increases in public spending if they want to minimize the inherent risk of price inflation hurting economic growth.

JEL classification: E31; E63; E65; O57

Keywords: inflation; government spending; Asian emerging economies; cointegration; vector error correction model; India; Vietnam; Indonesia

Introduction

ADB (2011) pointed out that Asian economies by 2050 may grow according to two scenarios: the Asian Century and the Middle Income Trap. As presented in Figure 1, under the Asian Century scenario, the region's economies will likely account for 52% of global output in 2050 and per capital income reach the current Europe's levels in purchasing power parity terms. The Middle

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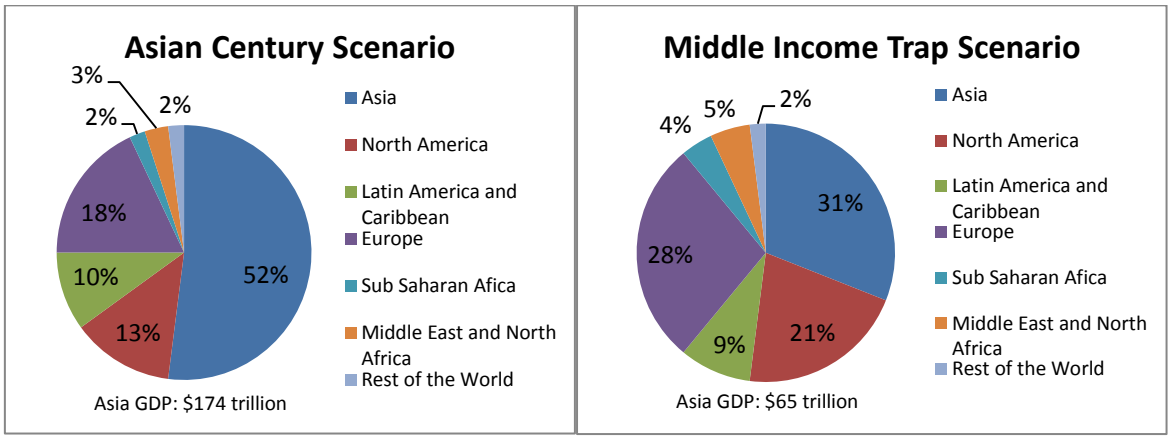
Income Trap scenario is a sharp contrast to the optimistic Asian Century one with the region's share in global output reaching only 31%. One of the potential major constraints that can keep Asian from realizing the Asian Century scenario is high and unstable inflation.

The effects of inflation on economic growth are documented extensively in the literature, both theoretically and empirically. In a well-known empirical work, Fisher et al (2002) studies hyper-inflation and high inflation for a large cross section of 94 countries in the period 1960-1995 and concludes that high inflation (ones with annual rate of over 100%) has a negative effect on output growth. [2]

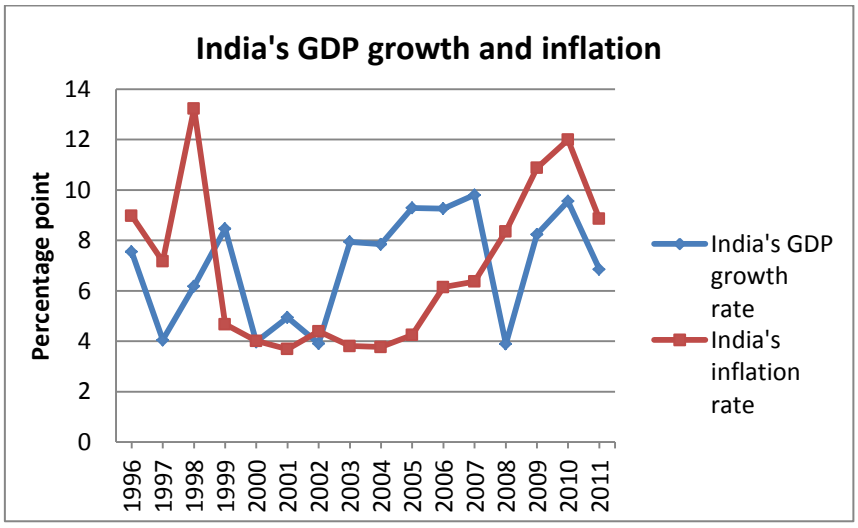
Figure 1. Two scenarios for Asian economies by 2050



Source: Centennial Group International projections, 2011. Figures use market exchange rate.

Chart 1. GDP growth rate and inflation in India, Vietnam, and Indonesia

Chart 1a. GDP growth rate and inflation in India



[2] While some studies point out a threshold level of inflation, Singh and Kalirajan (2003) present evidence that inflation at all levels has a negative effect on growth in India.

Chart 1b. GDP growth rate and inflation in Vietnam

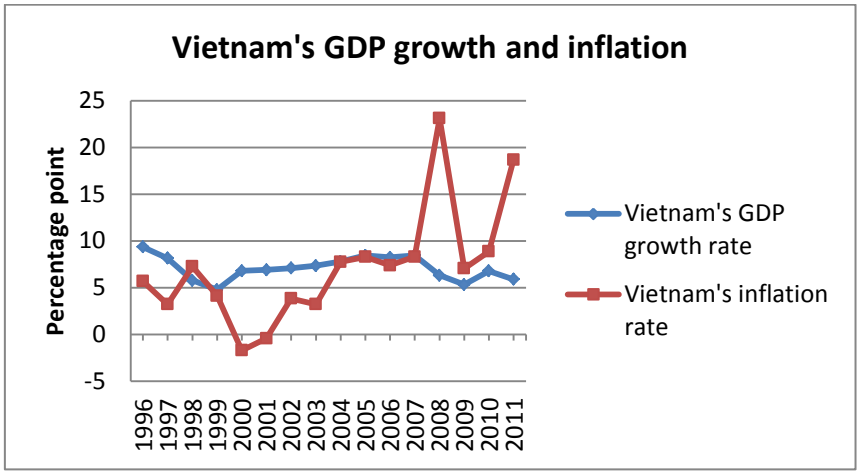
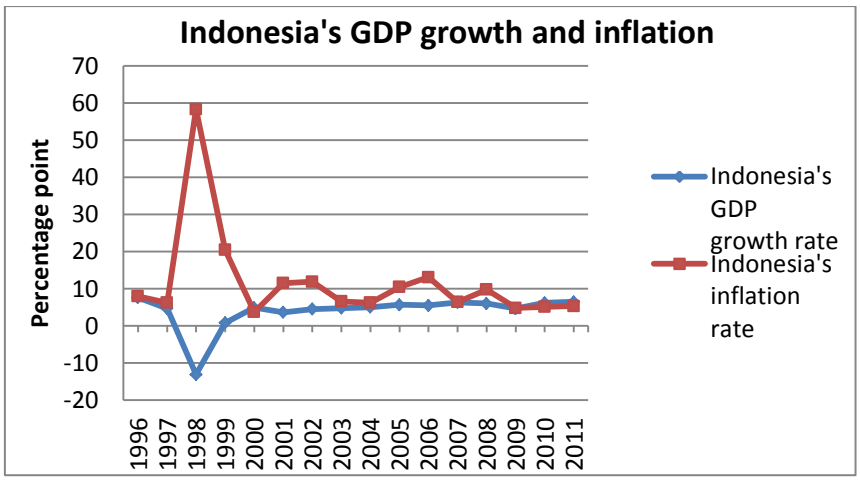


Chart 1c. GDP growth rate and inflation in Indonesia



Source: World Development Indicators, The World Bank.

While there is a certain consensus among the profession that high inflation has negative impacts on growth, the causes of inflation are still being debated. The three main approaches to explaining causes and dynamics of inflation include one from monetary side, fiscal side and public finance. Within the monetary approach, Friedman (1963) famously argues that inflation is always and everywhere a monetary phenomenon. Empirically, Fisher et al. (2002) shows that inflation is strongly correlated with money growth rate both in the long-run and the short-run.

From a fiscal perspective, the relationship between fiscal deficit and inflation are also well documented in both recent theoretical and empirical studies. Sargent and Wallace (1981) discuss theoretically the monetary dominance and fiscal dominance regimes, where fiscal deficit can affect inflation indirectly through money creation. Catao and Terrones (2005) provide empirical evidence to support the positive correlation between fiscal deficit and inflation. According to the Fiscal Theory of The Price Level (FTPL), fiscal authority alone can dominantly affect inflation, regardless of monetary policy.

Based on a pubic finance perspective to explain inflation, Click (1998) and Koreshkova (2006) show that revenues from money creation is a significant source of total government revenue in a large number of developing countries.[3] With governments in developing countries increase their revenue from seigniorage, increased money supply may lead to higher inflation. Campillo and Miron (1996) find that variation in inflation rates across countries can be partly explained by optimal tax rationale.

This paper seeks to explain inflation phenomenon in Asian emerging economies adopting the two of the three approaches above, meaning fiscal policy and public finance. More specifically, it looks at government spending and examines to what extent this government variable can account for inflation in these countries. Since the level of financial market development and independence of central banks in Asian emerging economies is still relatively low, the two approaches focusing on fiscal policy and public finance can be justified and preferred to the monetary approach.

From the fiscal policy perspective, another point of interest is that government spending can be one of the contributing factors to rising inflation. Theoretically, Varvargigos (2010) presents a model in which inflation and its variance have a significant and negative correlation with output growth and the result is, importantly, driven by the volatility in government spending. He assumes that the growth rate of money supply is endogenously determined as a non-linear function of government spending and that policy volatility corresponds to volatility in public spending. The transmission mechanism of volatility of public spending is that policy volatility first affects negatively both inflation and its variance, which then affect output growth. Basu (2001) presents evidence for the view that public investment and public revenue from seigniorage are positively correlated. This means that the more government spends on public investment, the higher the amount of government revenue from raising monetary base or inflation. Moreover, fiscal deficit and government spending seem to be highly correlated, as supported by the evidence from Roubini and Sachs (1989). Therefore, given the statistically significant correlation of fiscal deficit and government spending, there are good reasons to conjecture that changes in government spending, just as fiscal deficit does, can have a sizeable impact on inflation.

Recent economic events have once again redirected the attention of the public and academia to the important role of fiscal policy in determining inflation and stabilising the economy. Since the beginning of Global Financial Crisis in 2008, with nominal interest rates being close to zero, fiscal stimulus in the form of government spending has become a more popular tool used by governments to stabilize and stimulate economies. With additional aggregate demand generated by the public sector, inflation can quickly enter the picture once the economies have picked up. For Asian emerging markets whose inflation dynamics can differ from that in developed ones, the consequences may be even more significant unless rising inflation is well-managed. The stimulus package by Chinese government in 2009 is an example for the case of rising inflation after a big spike in public spending.

Therefore, the hypothesis that needs to be tested empirically is that there seems to be some cases, at least in the short-run, in favour of government spending (with inflationary financing) for capital formation and economic growth. Yet, a policy of continuous inflation may do more harm than good specifically in the face of ineffective and infant nature of fiscal and monetary policies that are

[3]Varvarigos (2010)

adopted in developing countries. An important question naturally arises is whether government spending really influences inflation. This can be empirically supported by a statistically significant government spending-inflation nexus. A large number of studies on government spending and inflation relationship have focused on industrialized countries. There are several studies for emerging market economies but with the focus either on one particular country or on the effects of government expenditure on the whole macro-economy.[4] Furthermore, empirical studies have provided mixed results on the relationship between government spending and inflation.

This paper aims to fill in the gap in the literature by addressing the question of how government spending may impact the price level in Asian emerging economies. More specifically, it investigates the government spending- inflation relationship in the long-run and the short-run using evidence from three Asian emerging economies including India, Vietnam, and Indonesia. The reason for the choice of this sample of three countries is that will allow us to further examine whether there is any influence of governance on the government spending-inflation nexus. These three economies not only represent emerging economies in Asia but also function under three different system of institutions and governance. Specifically, in terms of growth, governance and fiscal deficit, India is the largest democratic country with multi-party system and enjoyed an average annual Gross Domestic Product (GDP) growth rate of 7.8% between 2000 and 2011. It had a high level of fiscal deficit (6% of GDP in 2012) and imports 80% of its oil needs. Meanwhile, Indonesia is a democratic republic with multi-party system and has a system of governance that is characterized as both centrally governed and increasingly decentralized to local governments in its spatially spread out islands. Its average annual GDP growth rate between 2000 and 2011 was 5.8% and had low fiscal deficit (1.6% of GDP in 2012). Finally, Vietnam is a socialist republic with a single-party system led by the Communist Party of Vietnam. Its average annual GDP growth rate was 7.8% during 2001- 2011 period and its fiscal deficit was 4.5% in 2012.

Using a bivariate and trivariate cointegration models and Vector Error Correction Model (VECM), the paper examines both the long-run and short-run impact that changes in government spending may exert on inflation. The results show that in the long-run the impact of government spending on inflation is significant for all three countries. Also, there is short-run dynamics between the two variables, which ensures that whenever inflation deviates from its long-run equilibrium level, this adjustment mechanism will drive inflation back to the long-run level. To address the problem of potential endogeneity of the government spending variable, other variables are included in the VECM. These control variables include GDP per capita and nominal exchange rate.

The remaining of the paper is organised as follows. The next section provides a summary of the main channels through which price inflation can be determined. Section 3 presents the literature review. The data and methodology are presented in section 4. The empirical results are given in section 5. Finally, section 6 concludes.

2. Key determinants of inflation and channels through which government spending may affect inflation

In this section, theoretical foundation to support the selection of the main variables to be included in the model is reviewed. In conducting empirical test of the relationship between government spending and inflation, it is important to identify the key determinants of inflation as well as the main channels through which the former may affect the latter. According to economic theories, aggregate demand - aggregate supply framework (AS-AD) can be used to specify one of those

[4] See Kraipornsak (2010) for example

channels. The first channel through which government spending may affect inflation is aggregate demand. According to Keynesian school, aggregate demand rises through increase in consumption and investment in both public and private sectors. Given the inelasticity of aggregate supply in the short-run, an increase in aggregate demand leads to higher prices. In terms of aggregate supply, if government borrows more by issuing bond to finance its public spending, interest rates will rise, lowering private consumption and investment and, therefore, output. This crowding-out effect may fully or partly offset any expansionary effect that public spending may have on the economy. If the crowding-out effect is large, it can even make the government spending multiplier become negative, that is, an increase in government spending causes a reduction in GDP. In addition to accumulating debt, another way for the government to finance its spending is money creation. As the central bank grows its monetary base, aggregate money supply increases, leading to higher credit supply, and then higher inflation, which in turn results in higher demand for money and a new equilibrium reached.

Another possible channel that inflation can be influenced is exchange rate pass-through. Domestic prices can be influenced by the magnitude of a country's trading structure and volume with the rest of the world. Aggregate price levels are affected by the prices of all items in the consumption basket of that country. If a country relies heavily on imports for its domestic consumption and investment, its domestic prices will also be dependent upon prices in foreign countries. The fluctuation of exchange rate, the relative prices of domestic currency and foreign ones, can significantly affect prices of imports sold in domestic market. This pass-through effect of exchange rate fluctuation, from exchange rate to import prices to domestic prices of tradable goods, can play a big part in determining inflation in export-oriented economies such as India, Indonesia and Vietnam. Therefore, nominal exchange rate will need to be included in the model to account for the possible pass-through effect.

Output growth can affect both government spending and inflation. As output or income per capita increases, private consumption may rise depending upon the marginal propensity to consume of consumers. Public consumption may also rise as government expands to meet the higher demand for public services by the private sector. As a result, prices may increase to high level.

With the main channels for government spending to impact inflation identified, appropriate variables are selected to include in the empirical model. These are rate of annual output growth, nominal exchange rate, and government spending including consumption and investment.

3. Literature review

This section provides a selective review of theoretical and empirical literature relevant to the nexus between government spending and inflation. There have been a number of studies of the possible effects of government spending on other macro variables in the -economy. Studying output growth, Aiyagari et al. (1992) show that government purchases have expansionary effects in a neoclassical growth model through an increase in real interest rate and investment.

In the literature, there are two existing theories that support the correlation between fiscal policy and inflation. Within the conventional theoretical framework, Sargent and Wallace (1981) pointed out the "unpleasant monetarist arithmetic". They suggest that because of the inter-temporal

government budget constraint, central bank's commitment to price stability will force fiscal authority to act accordingly and keep inflation under control.

We have the inter-temporal government budget constraint:

$$s^f + s^m = b \qquad (1)$$

In (1), s^f denotes taxes minus government spending, s^m: the seigniorage from government-supplied fiat currency (nominal increase in money stock), and *b:* principal and interest on past real government debt. Equation (1) says that the present value of government revenue should equal to the present value of all the government-issued bonds in current and future periods. In other words, a government has to finance its spending either by revenue from taxes or by issuing bonds.

Sargent and Wallace (1981) suggest that a tough monetary authority that is committed to price stability can control inflation with fiscal authority acting accordingly. The only way that fiscal policy can affect inflation is indirectly through loose monetary policy, in which central bank increases money supply.

Different from the above conventional view, the Fiscal Theory of The Price Level (FTPL) states that inter-temporal budget constraint can be satisfied without fiscal authority having to adjust their policy if prices are endogenous. FTPL advocates argue that this is possible in practice since government bonds are nominal. As a result, fiscal policy does have a role in affecting the price level.[5]

The inter-temporal government budget constraint now becomes:

$$P(s^f + s^m) = B \qquad (2)$$

Where: B is the outstanding nominal debt of the government and P is the price level.

According to the conventional view, the government's tax and expenditure policy is constrained by this equation. FTPL advocates, however, argue that governments' policy is not necessarily bound by the above equation. When there are changes in government's policies, the market forces move the price level, P, to restore equality. More specifically, in the FTPL model, P is endogenous. If the fiscal authority increases public spending, which means a lower s^f , the monetary authority does not necessarily have to accommodate that increase by boosting revenue from money creation. When public spending increases without an accommodating monetary policy, decreased public saving can be offset by the jump in P, which can ensure that the equation can still be satisfied.

Woodford (1996) notes that if policy is non-Ricardian, which means government policy does not satisfy the inter-temporal budget constraint for all values of P, fiscal shocks then behave as shocks to the price level, regardless of monetary policy. With non-Ricardian assumption, government spending may not crowd out but crowd in private consumption. This means that the output multiplier is greater than one. The output growth in turn may affect the price levels of the economy.

Built on the theoretical foundation of fiscal impact on inflation, most empirical literature has so far focused on fiscal deficit as the main determinant of inflation. Eltis (1983) provides empirical

[5]Leeper (1991), Sims (1994), Christiano and Fitzegrald (2000) and Woodford (2001)

evidence from the United Kingdom in 1970s that budget deficits led to inflationary pressures. Buiter(1987) suggests that public capital expenditure cuts can increase deficit, which in turn raise the pressure for inflation tax. Aizenman and Hausmann (2000) use a panel data for a sample of Latin American countries during the 1970-1994 period to suggest a high correlation between budgetary revisions and inflation.

Roubini and Sachs (1989) document a significant and positive correlation between budget deficits and government spending. Given this positive correlation and the already large literature of budget deficit's impact on inflation, it is worth looking at government spending, instead of fiscal deficit, as a determinant of inflation in Asian emerging economies, which is the focus of this paper.

There have been a number of studies that adopt government spending as the key determinant of inflation. Theoretically, Ruge-Murcia (1999) develops a dynamic, rational expectations model of inflation where the money supply is an endogenous variable influenced by the government spending financed by newly created money and by the effect of past rates of inflation on the real value of taxes. In an empirical application to Brazil using monthly data for the period 1980-1989, estimates indicate that there are steady-state inflation and money growth rates associated with each of the two possible government spending regimes. For the low spending regime, in equilibrium rates of inflation and money growth are 8.22% and 7.29% per month respectively, and government spending accounts for 22.73% as a share of GDP. The high spending regime would have an expenditure level of 33.43% of GDP, a monthly rate of inflation of 19.12%, and a monthly money growth rate of 19.25%. Clearly, high government spending regime is associated with a much higher monthly rate of inflation.

In another theoretical study, Varvarigos (2010) presents a growth model where inflation rate (including its means and variance) is assumed to be influenced by fluctuations in public spending.

Other studies that found a negative correlation between government spending and inflation include Cukierman (1992) and Becker and Mulligan (2003). The reason, as they pointed out, is that in countries with inefficient tax systems, governments are generally smaller and rely on inefficient taxes such as inflation tax to raise revenue.

Kandil (2006) investigates the asymmetry in effects of monetary shocks and government spending shocks using quarterly data for a sample of 17 industrial economies. His results indicate that the cumulative effects of both contractionary and expansionary government spending shocks are deflationary on prices with price deflation effect exceeding price inflation one. This means that government spending shocks and price inflation are negatively correlated in most countries in the sample.

Most of the empirical studies on the effects of government spending on inflation has so far utilized co-integration and Granger-causality method for time series data. Using this methodology, Ezirim et. al (2008) studied the relationship between growth rate of public spending and inflation rate for the United States of America in the period 1970-2002. They found that the two variables are positively correlated. There is also a bi-causational relationship between public expenditure growth and inflation in the United States of America. Inflation significantly influences public expenditure decisions in the United States of America. Public expenditure growth was seen to aggravate

inflationary pressures in the country, while reduction in public expenditure tends to reduce inflation.

Han and Mulligan (2008) empirically investigate the case of US and the United Kingdom. They found that inflation is strongly and positively related to government size and the relation is driven mainly by the strong positive relation between inflation and defence spending.

Some other studies include Serfraz and Anwar (2009) and Agha and Khan (2006), both of which provide evidence for fiscal deficit effect on inflation in Pakistan using time series data, and Ayo et al (2012) for Nigeria.

Among one of the latest study, Magazzino (2011) examines the nexus between government expenditure and inflation for Mediterranean countries using this approach and suggests that evidence of whether government spending causes prices dynamics is not yet clear.

In short, the existing empirical evidence of the impact of government spending on inflation has been mixed. The first contribution of this paper is to examine the relationship between government spending and inflation for selected emerging market economies including India, Indonesia and Vietnam. The second contribution is that it utilizes the methodology of error correction model as in the existing literature but accounts for the potential endogeneity of government spending. Studies have documented different determinants of government spending. The fact that government spending possibly being determined by these factors such as growth, tax system's imperfection can result in the bias of estimation results in the VEC model. Controlling for these possible determinants of government spending in the model may help address the bias in the estimate unbiased coefficients.

4. Data and methodology

Method of co-integration and Granger causality testing has been employed in various studies using time series data. The model can either be bivariate or trivariate, that is two or three endogenous variables in the system, respectively. One of the recent studies adopting this approach is Loizides and Vamvoukas (2005). They utilize a trivariate error correction model to study the relationship between government size measured as the ratio of total government expenditure percentage over GDP and the rate of output growth. The three variables include GDP growth rate, growth rate of the share of government expenditure in GDP, and either unemployment rates or inflation rates.

In the current paper, both bivariate and trivariate VECM are adopted to evaluate the causal link between government spending and inflation. The bivariate VECM include the two endogenous variables, which are growth rate of annual consumer price index (CPI) and growth rate of government spending as percentage of GDP. In the trivariate system, apart from the two above variables, either nominal exchange rate or GDP per capita is added as another endogenous variable in the system. The inclusion of another endogenous variable may help in controlling for possible omitted variable bias and also in testing for the robustness of the estimated results in the bivariate system.

In empirical testing, annual time series data are used. The sample includes three countries including India, Indonesia and Vietnam. The two variables in the VECM include consumer price index and

government spending as percentage of nominal GDP. The data are taken from International Financial Statistics and the World Development Indicator of the World Bank.

The time series data first need to be assessed for the property by unit root tests. If the variables are stationary, the standard econometric analysis can be done. However, if the variables are non-stationary, estimating their relationship using OLS can produce spurious regression and the results are biased and inconsistent. The two variables government spending as percentage of GDP and CPI growth rate will be examined for their stationarity using Augmented Dickey-Fuller and Philip-Perron unit root tests.

In the unit-root test, we test the following hypotheses:

Ho: The data have a unit root.

H1: The data does not have a unit root and are stationary.

If the test statistics is greater than the critical values at 5% level of significance, the null hypothesis can be rejected and the conclusion is that the data do not have a unit root and are stationary. Otherwise, the data are non-stationary. Then, if the variables are non-stationary but of the same order, they may be co-integrated, which means they share the same long-run equilibrium.

If the variables are non-stationary of the same level, co-integration tests will be done to evaluate the possibility of a long-run relationship between the two. To assess the co-integration of the non-stationary variables, the Johansen Co-integration test is conducted. If the two variables are co-integrated, their relationship can be estimated consistently using OLS. In this test, the following hypotheses are tested:

Test 1

Ho: No co-integration relation between LG and DLP

H1: At most 1 co-integration relation between LG and DLP

Test 2

Ho: At most 1 co-integration relation between LG and DLP

H1: 2 co-integration relations between LG and DLP

Where: LG denotes logarithm of government spending as percentage of GDP, and DLP inflation.

In order to evaluate short-run dynamics between the variables, a Vector Error Correction model (VECM) model is utilized. The error correction terms in the model represents the speed of adjustment in the short-run- the speed at which the variable that deviates from the long-run equilibrium level is corrected back to that level. The coefficients on the error correction terms are expected to be statistically significant and have a negative sign.

The bivariate Vector Error Correction Model is estimated as follows:

$$\Delta p_t = \sum_{i=1}^{j} a_{1i}\Delta p_{t-i} + \sum_{i=1}^{j} b_{1i}\Delta g_{t-i} + c_{1i}(p_t - \beta g_t)_{t-1} + \varepsilon_t$$

$$\Delta g_t = \sum_{i=1}^{j} a_{2i}\Delta p_{t-i} + \sum_{i=1}^{j} b_{2i}\Delta g_{t-i} + c_{2i}(g_t - \beta p_t)_{t-1} + \delta_t$$

The tri-variate VECM is estimated as follows:

$$\Delta p_t = \sum_{i=1}^{j} a_{1i}\Delta p_{t-i} + \sum_{i=1}^{j} b_{1i}\Delta g_{t-i} + \sum_{i=1}^{j} c_{1i}\Delta xr_{t-i} + d_{1i}(p_t - \alpha_1 g_t - \gamma_1 xr_t - \alpha_0)_{t-1} + \varepsilon_t$$

$$\Delta g_t = \sum_{i=1}^{j} a_{2i}\Delta p_{t-i} + \sum_{i=1}^{j} b_{2i}\Delta g_{t-i} + \sum_{i=1}^{j} c_{2i}\Delta xr_{t-i} + d_{2i}(g_t - \beta_1 p_t - \varphi_1 xr_t - \beta_0)_{t-1} + \delta_t$$

$$\Delta xr_t = \sum_{i=1}^{j} a_{3i}\Delta p_{t-i} + \sum_{i=1}^{j} b_{3i}\Delta g_{t-i} + \sum_{i=1}^{j} c_{3i}\Delta xr_{t-i} + d_{3i}(xr_t - \lambda_1 p_t - \eta_1 g_t - \theta_0)_{t-1} + \omega_t$$

Where:

p_t: log of annual inflation rate at time t

g_t: log of annual government spending as percentage of GDP at time t

xr_t: log of nominal exchange rate at time t

$\varepsilon_t, \delta_t, \omega_t$: Disturbance terms at time t

Δ: First difference

$a_{ni}, b_{ni}, c_{ni}, d_{ni}$: coefficients to be estimated (n = 1, 2,3)

$0 \leq i \leq \infty$; t= $(0,\infty)$

5. Empirical results

Augmented Dickey-Fuller (ADF) tests for India and Indonesia show that the consumer price index (CPI) and government spending series both are non-stationary in level and become stationary after first difference. For Vietnam, as initial ADF test indicates the CPI is integrated of order two, the inflation rate (first difference of the CPI) is used as variable of interest and only its ADF test results are reported. To recheck the time series property of the data, Philip Perron (PP) unit root tests are also conducted. The PP tests give similar results to the ADF tests, which confirm the non-stationary properties of the data being investigated. All test results are shown in table 1 and 2.

Since both series have a unit root and are integrated of order 1, we perform a Johansen co-integration test to see if there is a co-integrating relationship between inflation and government spending. Test results are summarised in table 2. Three criteria including trace test, eigen-value test

and likelihood ratio test are used. The tests are done either with or without a trend included in the cointegrating equation. In the India's trace test that does not include a trend, the null hypothesis of no co-integration is rejected since the test statistics is 27.265, greater than the 5% critical value of 19.96. The alternative hypothesis of one co-integration relationship is accepted. Further, the hypothesis of two co-integrating relationship cannot be accepted. The eigen-value test gives the similar conclusion with test statistics greater than the critical value at 5% level of significance. Finally, the likelihood ratio test also confirms the existence of one co-integrating relationship between government spending and price level. Similarly, test results also suggest the existence of one cointegrating relationship between the two variables for Vietnam and Indonesia.

Table 1. Unit root tests

Table 1a. Unit root test (India)

	Augmented Dickey Fuller Test			Philip Perron Test		
Variables	Level	Difference	Order of integration	Level	Difference	Order of integration
LP	-2.02765	-5.35704	I(1)	-2.01182	-4.62877	I(1)
LG	-1.93637	-5.46769	I(1)	-1.99223	-4.98134	I(1)

Table 1b. Unit root test (Vietnam)

	Augmented Dickey Fuller Test			Philip Perron Test		
Variables	Level	Difference	Order of integration	Level	Difference	Order of integration
DLP	-1.51627	-3.47344	I(1)	-2.34953	-5.93669	I(1)
LG	-0.90406	-2.75535	I(1)	-2.26156	-6.08783	I(1)

Table 1c. Unit root test (Indonesia)

	Augmented Dickey Fuller Test			Philip Perron Test		
Variables	Level	Difference	Order of integration	Level	Difference	Order of integration
LP	-3.0635	-4.3132	I(1)	-2.03330	-4.4623	I(1)
LG	-1.4402	-3.7171	I(1)	-1.9561	-8.2461	I(1)

Table 2. Johansen co-integration test

	India		Vietnam		Indonesia	
	Trend	No trend	Trend	No trend	Trend	No trend
Trace Statistics	7.7497	27.2892	20.6061	21.4070	11.3435	23.4203
Critical values at 5%	15.4100	19.9600	15.4100	19.9600	15.41	19.96
Maximum-eigenvalue statistics	6.4686	22.3971	14.3958	14.3961	10.17776	21.12865
Critical values at 5%	14.07	15.67	14.07	15.67	14.07	15.67
Rank	0	1	1	1	0	1

Bivariate models

Based on the results from Johansen tests, the long-run equilibrium relationship between inflation and government spending can be estimated consistently by Ordinary Least Squares. According to table 3, the estimated coefficient of government spending is positive and statistically significant. These results indicate that in the long-run, government spending does have a positive impact on inflation all three countries. .

Table 3. Long-run co-integrating estimation (Ordinary Least Squares)

	India	Vietnam	Indonesia
Variables	LP	DLP	LP
LG	0.471334**	0.239695***	0.346576*
	[0.161243]	[0.163709]	[0.166656]
Time trend	0.07403*	0.010531*	0.110826*
	[0.001274]	[0.003883]	[0.002241]
Intercept	3.117323*	0.627454	0.001227
	[0.372579]	[0.421725]	[0.380948]
R^2	0.417987	0.404837	0.986765
Adjusted R^2	0.403064	0.305643	0.986069
SSR	0.709328	0.042498	0.155174
SSE	19.62273	0.021673	0.914998
DW-stats	0.55	2.14	0.41
Number of obs.	41	15	41

(Note: standard errors are in brackets . * denotes significant at 1% level, ** significant at 5% level, and *** significant at 10% level)

We examine the short-run dynamics between inflation and government spending through a vector error correction model (Table 4). From the results, there is evidence that government spending Granger causes inflation in the case of India in the short-run. The error correction terms is negative and statistically significant in the equation that has inflation as the independent variable. As inflation deviates from its long-run level, an error correction mechanism between inflation and government spending will influence the former converge back to its equilibrium level. The magnitude of adjustment is significant with absolute value of 0.779, which means that inflation would be adjusted by 0.779 deviation back to its long-run level after each period.

Table 4. Bivariate Vector Error Correction Model

	India		Vietnam		Indonesia	
Variables	D(LP)	D(LG)	D(DLP)	D(LG)	D(LP)	D(LG)
ECT(t-1)	-0.272841*	0.140169***	-0.001767	0.011608*	-0.027736*	-0.007746
	[-0.11833]	[-0.09866]	[-0.0079]	[-0.00282]	[-0.01086]	[-0.0141]
D(LP(-1))	0.4493	0.329005*	-	-	0.089939	0.213201
	[-0.16658]	[-0.13889]	-	-	[-0.17011]	[-0.2208]
D(DLP(-1))	-	-	-0.45206	-0.1252	-	-
	-	-	[-0.28204]	[-0.10064]	-	-
D(LG(-1))	-0.189522	0.437647*	0.503956	0.423047*	0.014267	-0.217027
	[-0.2024]	[-0.16876]	[-0.48112]	[-0.17168]	[-0.1288]	[-0.16718]
D(LG(-2))	-0.001998	-0.240774	-	-	-	-
	[-0.18557]	[-0.15472]	-	-	-	-
C	0.052956	-0.010664	0.015462	-0.007606	0.103075	-0.021404
	[-0.01955]	[-0.0163]	[-0.0197]	[-0.00703]	[-0.02284]	[-0.02965]
R^2	0.305152	0.414854	0.284422	0.810697	0.23545	0.138875
Adjusted R^2	0.196582	0.323425	0.045896	0.747596	0.169918	0.065065
S.E. equation	0.063566	0.04419	0.032704	0.004164	0.201621	0.339693
Number of obs.	38	38	13	13	39	39

(Note: Standard errors are in brackets. * denotes significant at 1% level and ** significant at 5% level. ECT denotes error correction term.)

The error correction terms for all three countries do have the expected negative signs. They are statistically significant in the case of India and Indonesia but not for Vietnam. The results for India and Indonesia indicate that if inflation deviates from its equilibrium level, government spending will have an influence on bringing inflation back to its long-run level. The results also provide support to the Keynesian view that one of the possible channels through which government spending can influence inflation is through its effects on aggregate supply and aggregate demand. Government spending boosts aggregate demand through increase in public consumption and investment. In the short run, with supply being inelastic, increased demand will push prices up. On the supply side, as government raises its spending or public savings drops, interest rates will rise and investment of the private sector will consequently shrink. As a result, aggregate supply contracts, pushing prices even higher.

In summary, the results of the bivariate models show that government spending and inflation are positively correlated both in the long-run and short-run for India and Indonesia. In the case of Vietnam, government spending appears to have a positive impact on inflation only in the long-run.

Trivariate models

A potential problem with the above estimation results is omitted variable bias. It is likely that there is a third variable that may have influence on either or both government spending and inflation. If there is a variable that correlates with government spending and also influences inflation, the results

from above analysis may be biased due to endogeneity problem. In order to address these concerns, some additional variables will be added to the model to control for those potential biases. Theories suggest that exchange rate, GDP per capita and government revenue are relevant factors that may influence both the variables of interest. Therefore, each of those variables will be sequentially added to the VECMs to form tri-variate VECMs.

Long-run co-integrating equation

Table 5 shows that with GDP per capita included as another independent variable, government spending is statistically significant for all three countries. The marginal impact of government spending is positive in the cases of India and Vietnam but turns negative in case of Indonesia. For Vietnam, the variable is rather weakly significant. The GDP per capita variable is statistically significant for all three countries. While it negatively affects inflation in India and Indonesia, it shows a positive influence on inflation in Vietnam.

The inclusion of exchange rate to the equation produces results that are similar to the bivariate model. The government spending as share of GDP is both statistically significant and positive in the cases of India and Indonesia. In case of Vietnam, although the sign and size stay the same, government spending is not statistically significant. Also, results indicate that exchange rates do have an impact on inflation for India and Indonesia, all other things being equal. Meanwhile, exchange rates do not seem to statistically influence inflation in Vietnam.

Table 5. Trivariate cointegration between LP, LG and LPYC

	India	Vietnam	Indonesia
Variables	LP	DLP	LP
LG	0.44826*	0.234389^	-0.11951**
	[0.159454]	[0.151562]	[0.0681]
LYPC	-0.777892*	0.137699**	-1.069213*
	[0.236308]	[0.04626]	[0.092506]
Time trend	0.123994*	-	0.164733*
	[0.01544]	-	[0.0055]
Intercept	7.304135*	-0.335173	7.635224*
	[1.229561]	[0.283944]	[0.610092]
R^2	0.994	0.448	0.997
Adjusted R^2	0.993	0.356	0.997
Sum sq. resids	0.057	0.041	0.052
S.E. equation	0.087	0.020	0.073
DW-stats	0.500	2.250	1.089
Number of obs.	41	15	41

*Note: Standard errors are in brackets. *, **, and ^ denote level significance at 1%, 5% and 17%, respectively.*

Table 6. Trivariate cointegration between LP, LG and LER

	India	Vietnam	Indonesia
Variables	LP	DLP	LP
LG	0.406816*	0.206077	0.683339*
	[0.131744]	[0.245736]	[0.196573]
LER	0.219673*	0.270553	0.282269*
	[0.048408]	[0.189021]	[0.102537]
Time trend	0.061289*	-	0.084494*
	[0.002992]	-	[0.009786]
Intercept	2.010526*	-1.97921	-2.335963*
	[0.388686]	[1.288842]	[0.918979]
R^2	0.996	0.480	0.989
Adjusted R^2	0.996	0.339	0.988
Sum sq. resids	0.062	0.041	0.143
S.E. equation	0.140	0.019	0.759
DW-stats	0.826	2.540	0.467
Number of obs.	41	15	41

*Note: Standard errors are in brackets. * denotes significance at 1% level.*

Trivariate vector error correction models

These models will help explain the short-run dynamics between government spending and inflation as well as additional macro variables including GDP per capita and nominal exchange rate. The results are summarized in table 7 and 8.

Lagrange Multiplier tests are carried out to check for serial correlation in residuals of both bivariate and trivariate VECMs (Table 9). For India, the LM statistics and probability indicate serial correlation of order 1 in bivariate model but no serial correlation in both trivariate models. Results for Vietnam indicate that the bivariate model and trivariate model with exchange rate suffer from serial correlation of order 1 and trivariate model with GDP per capita serial correlation of order 2 and 4. This may be attributed to the small sample size. Finally, there is no sign of serial correlation in all models for Indonesia. As a result, while inferences about relationship among inflation, government spending, GDP per capita, and exchange rate appear to be unbiased, we need to take care in interpreting the results for Vietnam.

Table 7. Trivariate vector error correction models of LP, LG and LPYC

	India			**Vietnam**			**Indonesia**		
	D(LP)	D(LG)	D(LYPC)	D(DLP)	D(LG)	D(LYPC)	D(LP)	D(LG)	D(LYPC)
CointEq1	**-0.036557**	-0.052462	-0.01266	**-0.851583**	1.031517	0.291326	0.141639	**-0.54234**	**-0.34045**
	-0.01371	-0.01984	-0.01359	**-0.49981**	-0.24476	-0.17167	-0.23502	**-0.22936**	**-0.17586**
	[-2.66713]	[-2.64386]	[-0.93157]	**[-1.70382]**	[4.21448]	[1.69697]	[0.60266]	**[-2.36457]**	**[-1.93599]**
D(LP(-1))	0.222882	0.282585	-0.093487				-0.262152	**0.798515**	0.183834
	-0.15795	-0.22867	-0.1566				-0.29904	**-0.29184**	-0.22376
	[1.41110]	[1.23578]	[-0.59696]				[-0.87664]	**[2.73615]**	[0.82158]
D(DLP(-1))				-0.149949	**-0.695385**	**-0.322432**			
				-0.35982	**-0.1762**	**-0.12359**			
				[-0.41674]	**[-3.94651]**	**[-2.60887]**			
D(LG(-1))	**0.220485**	0.374248	-0.017663	0.125516	0.972151	0.079048	**-0.339415**	0.098454	0.080797
	-0.11592	-0.16782	-0.11493	-0.34642	-0.16964	-0.11899	**-0.18176**	-0.17738	-0.136
	[1.90204]	[2.23002]	[-0.15368]	[0.36232]	[5.73062]	[0.66433]	**[-1.86736]**	[0.55504]	[0.59408]

D(LYPC(-1))	**-0.490702**	-0.243237	0.05822	**1.685662**	0.239074	0.633202	-0.442314	0.424147	0.457444
	-0.21577	-0.31238	-0.21394	**-0.72588**	-0.35546	-0.24933	-0.38572	-0.37643	-0.28861
	[-2.27416]	[-0.77865]	[0.27214]	**[2.32222]**	[0.67257]	[2.53964]	[-1.14672]	[1.12677]	[1.58498]
C	0.09054	-0.001241	0.07004	-0.118399	-0.012931	0.028895	0.148617	-0.11197	0.014161
	-0.02046	-0.02962	-0.02028	-0.05655	-0.02769	-0.01942	-0.05246	-0.05119	-0.03925
	[4.42543]	[-0.04190]	[3.45284]	[-2.09367]	[-0.46693]	[1.48757]	[2.83311]	[-2.18719]	[0.36078]
R^2	0.43721	0.409542	0.087704	0.661321	0.83126	0.569896	0.200812	0.351848	0.212139
Adjusted R^2	0.343412	0.311132	-0.064346	0.491981	0.74689	0.354843	0.067614	0.243823	0.080829
Sum sq. resids	0.013294	0.027863	0.013068	0.015479	0.003712	0.001826	0.129472	0.123309	0.072488
S.E. equation	0.023535	0.034073	0.023335	0.043987	0.02154	0.015109	0.073449	0.071679	0.054957
F-statistic	4.661174	4.161604	0.576811	3.905294	9.852534	2.650035	1.507624	3.257088	1.61556
Log likelihood	70.32333	59.59335	70.57136	25.31985	34.60136	39.21194	37.31874	38.02597	45.72951

Note: Standard errors are reported below each estimated coefficients and t-statistics are in brackets.

Table 8. Trivariate vector error correction models of LP, LG, and LER

	India			**Vietnam**			**Indonesia**		
	D(LP)	**D(LG)**	**D(LER)**	**D(DLP)**	**D(LG)**	**D(LER)**	**D(LP)**	**D(LG)**	**D(LER)**
CointEq1	**-0.482041**	0.439559	0.21608	**-0.821273**	0.430998	**-0.57982**	**-0.166442**	0.231607	0.309964
	-0.14486	-0.10902	-0.22279	**-0.50922**	-0.20147	**-0.23358**	**-0.10324**	-0.12183	-0.26955
	[-3.32759]	[4.03196]	[0.96989]	**[-1.61280]**	[2.13928]	**[-2.48232]**	**[-1.61214]**	[1.90109]	[1.14995]
D(LP(-1))	0.56694	0.185903	0.187571				0.351403	0.156974	**-1.252959**
	-0.17842	-0.13428	-0.27441				-0.19821	-0.23389	**-0.51748**
	[3.17748]	[1.38447]	[0.68356]				[1.77290]	[0.67114]	**[-2.42127]**
D(DLP(-1))				0.010965	**-0.35176**	0.140516			
				-0.3901	**-0.15434**	-0.17894			
				[0.02811]	**[-2.27911]**	[0.78526]			
D(LG(-1))	-0.152427	0.208113	-0.03285	0.136278	0.608067	0.129798	-0.075017	-0.206678	-0.32311
	-0.15335	-0.1154	-0.23584	-0.47325	-0.18724	-0.21708	-0.1505	-0.17759	-0.39292
	[-0.99401]	[1.80334]	[-0.13929]	[0.28796]	[3.24760]	[0.59793]	[-0.49846]	[-1.16380]	[-0.82234]

D(LER(-1))	0.055638	**-0.131005**	0.321824	-0.664977	**-0.463049**	0.256777	0.021296	-0.023422	0.063386
	-0.10555	**-0.07943**	-0.16233	-0.62081	**-0.24562**	-0.28476	-0.07913	-0.09338	-0.2066
	[0.52713]	**[-1.64926]**	[1.98256]	[-1.07115]	**[-1.88526]**	[0.90172]	[0.26911]	[-0.25082]	[0.30680]
C	0.032988	-0.005051	0.01709	0.029352	0.012162	0.029877	0.072081	-0.013077	0.218416
	-0.01515	-0.0114	-0.0233	-0.0235	-0.0093	-0.01078	-0.02384	-0.02814	-0.06225
	[2.17787]	[-0.44309]	[0.73362]	[1.24910]	[1.30812]	[2.77180]	[3.02315]	[-0.46480]	[3.50871]
R^2	0.337052	0.553674	0.216585	0.460768	0.824633	0.664803	0.165234	0.222942	0.177609
Adjusted R^2	0.259058	0.501165	0.124419	0.191151	0.736949	0.497204	0.067026	0.131523	0.080858
Sum sq. resids	0.060795	0.034432	0.143796	0.024645	0.003858	0.005185	0.220138	0.30653	1.500514
S.E. equation	0.042286	0.031823	0.065033	0.055503	0.021959	0.025459	0.080465	0.094951	0.210078
F-statistic	4.321512	10.54437	2.349935	1.708976	9.404647	3.96664	1.682489	2.438691	1.835722
Log likelihood	70.70566	81.79179	53.91838	22.29674	34.35098	32.42838	45.61409	39.15839	8.187606

Note: Standard errors are reported below each estimated coefficients and t statistics are in brackets.

Table 9. VECM Residual Serial Correlation LM Tests

India			Vietnam			Indonesia		
Bivariate LP and LG								
Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	14.15119	0.0068	1	13.46826	0.0092	1	6.649436	0.1556
2	1.659458	0.7981	2	4.858974	0.3021	2	5.281282	0.2596
3	3.446443	0.4861	3	4.342287	0.3617	3	2.407482	0.6613
4	1.557526	0.8164	4	6.042345	0.196	4	0.353803	0.9861
5	6.734956	0.1506						
N	37		N	13		N	39	
Trivariate LP, LG, LYPC								
Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	3.726684	0.9285	1	3.858528	0.9205	1	1.754352	0.9948
2	8.224286	0.5117	2	20.12565	0.0172	2	7.846506	0.5497
3	7.271365	0.6089	3	14.38932	0.1091	3	7.553372	0.5797
4	10.63256	0.3017	4	19.39637	0.022	4	12.0644	0.2097
5	12.27719	0.1981						
N	29		N	13		N	29	
Trivariate LP, LG, LER								
Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	3.012606	0.9638	1	6.658287	0.6726	1	6.195708	0.7202
2	3.44301	0.9441	2	17.93288	0.036	2	8.644322	0.4707
3	3.007511	0.964	3	7.463247	0.589	3	8.835971	0.4526
4	3.943984	0.9151	4	13.90947	0.1256	4	4.177406	0.8994
5	8.285824	0.5056				5	3.244564	0.9538
N	38		N	13		N	39	

As GDP per capita is included in the VECM (Table 7), the results show the error correction terms are a statistically significant and negative for India and Vietnam but not for Indonesia. The magnitudes of correction of inflation back to its equilibrium level after each period vary widely with 85% for Vietnam and only 3% for India.

For India, the immediate impact of government spending on inflation is positive and statistically significant. A one percent increase in government spending in this period will lead to an increase of 0.22% in inflation in the following period. GDP per capita also has a statistically significant and negative short-run impact on inflation.

In the case of Vietnam, an increase in GDP per capita does seem to have a statistically significant and positive impact on inflation. Meanwhile, if inflation increases, the immediate impact on government spending and GDP per capita in the following period is expected to be negative .

For Indonesia, despite the insignificant error correction term, an increase in government spending surprisingly has a negative immediate impact on inflation. One percent increase in government spending will lead to a 0.33% decrease in inflation in the following period. This may be attributed to the crowding-out effect of government spending on private sector's investment and consumption, whose contraction leads inflation to decrease. At the same time, government spending can also rise in response to an increase in inflation. Also, there are inherent mechanism for government spending and GDP per capita to correct themselves to long-run level, evidenced through the negative and statistically significant error correction terms.

With exchange rates added to the VECM as another endogenous variable, the estimated error correction terms are statistically significant and have negative signs as expected for all three sampling countries. The magnitudes of correction range from the highest for Vietnam to the lowest for Indonesia. In the case of Vietnam, a positive change in inflation does have a short-run negative impact on government spending. Also, exchange rate is cointegrated with inflation and government spending, adjusting itself back to equilibrium level at a speed of 57% of the deviation in each period.

For Vietnam, government spending is negatively affected by both inflation and exchange rates. Higher prices of domestic goods as well as imports would reduce the amount of goods consumed by the government.

Finally, in the case of Indonesia, inflation does have short-run impact on exchange rate but an unexpected negative sign. According to theory of purchasing power parity, as domestic prices go up, Indonesia's currency would depreciate against the US Dollar or a higher exchange rate. The unexpected negative influence of inflation here may be attributed to effects of inflation on other macroeconomic variables such as interest rates and foreign exchange flows. As inflation rises, interest rates may also rise, drawing short-term investment inflows and boosting demand for domestic currency.

6. Conclusion

The current paper examines the impact of government spending on inflation in three Asian emerging market economies of India, Vietnam and Indonesia. The approaches adopted include cointegration model and Vector error correction model. The contribution of the paper is examining

and comparing how differently government spending affects inflation in the three sampling countries in the long-run and short-run using both bivariate and trivariate models.

The results show that government spending does have a positive impact on inflation in the long-run in all three sampling countries. This implies that the differences in institutions and governance system of these countries hardly affect, or negligibly if any, the long-run impact of government spending on inflation. Also, government spending and inflation are cointegrated, which means that there is a mechanism that makes inflation adjust itself back toward long-run equilibrium level. This cointegrating relationship is either a direct one between government spending and inflation, or an indirect one through a third variable. To address the potential problem of omitted variable bias, GDP per capita and exchange rates were in turn included as a third variable in the trivariate models.

In the short-run, there is a cointegrating relationship between government spending and inflation, which is either a direct or indirect link through interactions with GDP per capita or nominal exchange rate. For India, government spending appears to have positive short-run impact on inflation, which is consistent with the Keynesian view. However, in the case of Indonesia, this short-run impact is negative, suggesting a crowding out effect of government spending on private investment in the spirit of Neo-classical school. Meanwhile, for Vietnam, the direction of the short-run impact runs from inflation to government spending.

Admittedly, the sample size is small for Vietnam, which can cause bias problem. Also, other factors relating to inflation such as money supply, interest rates, government debt have not been included in the current paper. However, the impact of government spending has been discerned with well-specified models. Unexpected increases in government spending will likely put upward pressure on inflation, which in turn may hurt growth. The results provide a case for more prudence in government spending if Asian emerging market economies such as Vietnam, India, and Indonesia are to sustain their economic growth. For future studies, it would be useful to look at the impact of different components of government spending such as defence and non-defence spending, and expenditure for social development.

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