Examining Rupee Reserves in Bhutan: An SVAR Approach

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Abstract

The substantial deterioration of rupee reserves in 2012 had detrimental effect on the economic growth in Bhutan. Therefore, this study investigates the implication of government investment on construction, private credit expansion and imports from India, on the rupee reserves through a four-dimensional SVAR approach. The results indicate that in the immediate term, it is the government construction expenditure, private credit growth and imports from India that deteriorates the rupee reserves. Over the medium period, it is found that the government investment on construction leads to private credit expansion. Though government investment on construction is desired for economic growth, policy makers, however, should strategize investments so that it does not create rapid private credit growth.

Introduction

Bhutan has seen unprecedented economic growth, averaging 8.15 percent (NSB, 2013) over the last decade, contributed mostly through investment in hydroelectric power constructions. In last ten years, the government investment on construction alone contributed around 9.0 per cent (NSB, 2013) to the real economic growth. The growth in government construction has also exhilarated the private construction industry. Subsequently, the private sector credit has also increased from Nu. 4017.9 million in 2003 to Nu.48751.8 million in 2013 (Royal Monetary Authority [RMA], 2013).

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Due to heavy reliant on imports, the terms of trade with India is almost always negative. With huge surge in demand for rupees, Bhutan experienced severe rupee shortage problem starting 2012. To keep up with the demand, the RMA resorted to selling US dollar 200 million, which converted into rupees 10,289.5 million. However, in just about three months, the rupee reserves depleted by almost 50 per cent and became a major concern for both RMA and the government (Cabinet Secretariat, 2012).

In a radical move by the RMA, vehicle loans, housing construction loans and other personal consumption related loans were stopped in order to reduce imports from India. With majority of the private construction industry stalled, such move had significant impact on the economic growth. The real economic growth rate is recorded at 2.05 (NSB, 2014) in 2013, which is the lowest growth rate over the last decade.

It is fundamental to know the root cause for rupee deterioration. Without finding the source, implementing policy initiatives like controlling loans may correct the economic imbalance in the short run but may have adverse effect in the long run. Therefore, this paper explores the causes of the rupee deterioration and suggests policy recommendations. While doing so, this study contributes in three different ways to the existing literatures.

Firstly, this study is an extension of the previous studies undertaken to study the causes of the rupee depletion. In the task force report (Cabinet Secretariat, 2012), the rupee shortfall is deemed largely as the consequence of deficit current account balance against India. Findings from the report suggest that, the government expenditure has no direct relationship with the rupee shortage and it is the financial sector credit growth that exerts pressure on the rupee reserves. However, the report does not explicitly mention the relationship between government expenditure and private credit growth. Therefore, this study explores such relationship and finds that over the medium term, there is

positive relationship between the government construction expenditure and private credit.

The Bhutan Chamber of Commerce and Industry (BCCI) representing the private sectors conducted an independent study on the rupee crisis. In the report (BCCI, 2012), it is found that, the government expenditure to fund hydropower projects had direct correlation with rupee reserves. This paper also discovers that government expenditure on construction has negative impact on rupee reserves at least in the short run. However, in the medium term, it is found that government construction expenditure increases the rupee reserves.

Rashid (2012) also investigated the causes of the rupee shortfall in Bhutan. He is of the opinion that the main cause is the rapid expansion of the money supply created by the inflows that are meant for hydropower projects. The excess liquidity created within the banks thus led to rapid increase in private credit, which ultimately is invested for imports from India and thus led to the rupee crisis. Similarly, in the study conducted by Ura (2013), he reasons that it is the fiscal sector expansion and credit growth that has led to terms of trade deterioration, which impinged on current account balance and ultimately created the rupee crisis. However, this study finds that there isn't enough evidence to prove that imports from India lead to depreciation in rupee reserves in the medium term.

Secondly, this paper is first of its kind, employing the Structural Vector Auto Regression (SVAR) model to investigate the Indian rupee reserves in Bhutan. Previous studies at best describe the association between variables but fail to overtly measure the simultaneous affect of different variables on the rupee reserves. Therefore, the SVAR model would best assess the situation because the SVAR framework is an empirical model, which allows in exploring the dynamic link within the variables of interest, following certain predetermined theories. The model makes it possible to

quantify the individual structural shocks and establish dynamic link through its impulse response function (Gottschalk, 2001).

Thirdly, Tenhofen, et al. (2009) believes that the use of SVAR has become very popular in studying the monetary policy aspects but there is very limited literature investigating the fiscal policy facet. Since the current study deals with fiscal side of the economy, the study would significantly contribute to the limited literature written on the fiscal policy aspects of a country.

The findings from the study show that, in the short term, it is the government construction expenditure, private credit growth and imports from India that depletes the rupee reserves. Over the medium term, the impulse response analyses show that, government investment on construction significantly increases private credit and private credit expansion significantly reduces the rupee reserves. However, the impact of imports from India on rupee reserves is mixed in the medium term.

The rest of the paper is structured as follows. The next section presents the methodology, followed by the data, and then by empirical results of the short run SVAR model and impulse response function. The final section concludes and discuses the policy recommendations.

Methodology

The SVAR model allows the economic theories to serve as the basis for necessary restriction required for identification of the structural model (McCoy, 1997). Due to this main advantage, the SVAR framework is applied to account for relationship between different variables in the study. The kind of SVAR model for the study is based on AB model adopted from Amisano and Giannini (1997). In order to arrive at AB model, we first express the general model as:

$$Ay_t = \Omega(L)y_t + B\varepsilon_t \quad (1)$$

where y_t is the k vector of endogenous variables at time t, $\Omega(L)$ is a matrix polynomial in the lag operator, L of length p and ε_t is a vector of serially uncorrelated, zero-mean, structural shocks with an identity contemporaneous covariance matrix $(\Sigma_\varepsilon = E[\varepsilon_t \varepsilon_t'] = I)$. The parameter A and B is the $k \times k$ matrix.

In order for the endogenous variables to be expressed as a function of its lagged values, the equation (1) is expressed in a reduced form as:

$$y_t = A^{-1}\Omega(L)y_t + A^{-1}B\varepsilon_t \quad (2)$$

Equation (2) can also be written as:

$$y_t = A^*(L)y_t + u_t \quad (3)$$

where $A^*(L) = A^{-1}\Omega$ and $u_t = A^{-1}B\varepsilon_t$.

To better understand the shock and response, we subtract from each side of the equation (1) by the expected value of y_t implied by the model, conditional to the information available in time $t-1, E_{t-1}y_t$. This gives us, what is popularly known as the AB model:

$$Au_t = B\varepsilon_t \quad (4)$$

Where, A includes the structural contemporaneous coefficient and B is a diagonal matrix containing their reduced form estimates.

Identifying restriction

Following structural equation (4), the SVAR model can be just identified with appropriate ordering of the variables in matrix A because the orthonormal innovations, ε_t, makes it possible to identify restriction on A and B. The identification can be shown as:

$$A\Sigma A_i' = BB'_i \qquad (5)$$

The contemporaneous restrictions on A matrix are used to identify shocks to study the short-term responses. In order to do so, there is a need of at least $k(k+1)/2$ restriction imposed on $2K^2$ unknown elements in A and B. In order to identify A and B, at least $2K^2$ - $k(k+1)/2$ additional identifying restriction is needed.

The model is constituted of four endogenous variables, GCONST, PVTCRD, IMIN and IRR. Their errors of the reduced form VAR are:

$$u_t = u_t^{GCONST} + u_t^{PVTCRD} + u_t^{IMIN} + u_t^{IRR} \qquad (6)$$

and their structural disturbances are,

$$\varepsilon_t = \varepsilon_t^{GCONST} + \varepsilon_t^{PVTCRD} + \varepsilon_t^{IMIN} + \varepsilon_t^{IRR} \qquad (7)$$

where, GCONST is the government investment on construction, PVTCRD is the private credit, IMIN is the imports from India and IRR is the Indian rupee reserves in Bhutan. This model has a total of 32 unknown elements and 10 parameters, which can be identified. Therefore, at least 22 additional identifiable restrictions are used to identify the full model.

After imposing the zero exclusion restrictions, the full model takes the following form:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ Y_{21} & 1 & 0 & 0 \\ Y_{31} & Y_{32} & 1 & 0 \\ Y_{41} & Y_{42} & Y_{43} & 1 \end{bmatrix} \begin{bmatrix} u_t^{GCONST} \\ u_t^{PVTCRD} \\ u_t^{IMIN} \\ u_t^{IRR} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{GCONST} \\ \varepsilon_t^{PVTCRD} \\ \varepsilon_t^{IMIN} \\ \varepsilon_t^{IRR} \end{bmatrix} \quad (8)$$

Impulse response functions

The impulse response function of the SVAR model can be derived from the Vector Moving Average (VMA) representation, which is obtained by rearranging equation (3), leading to:

$$y_t = (I - A^*(L))^{-1} u_t \quad (9)$$

The polynomial $(I - B(l))$ is assumed to be invertible.

Equation (9) can also written as:

$$y_t = \Xi(L) u_t \quad (10)$$

where $\Xi(L) = (I - A^*(L))^{-1}$

To better understand the MA representation, we expand the equation (10) as follows:

$$Y_t = u_t + (\Xi_1 \times u_{t-1}) + (\Xi_2 \times u_{t-2}) + \ldots \quad (11)$$

The coefficient in matrix polynomial $\Xi(L)$ can be expressed as:

$$\frac{\partial y_{t+s}}{\partial u_t} = \Xi_s \quad (12)$$

It follows that Ξ_s represents the response of output in period $t+s$ to a unit innovation in the disturbance term u occurring in period t, holding all other innovations at all other dates

constant. $s = 1, 2, 3, \ldots \infty$. The resulting plot gives the impulse response function of y_t to a unit innovation in u_t.

Ordering of the variables

The shock identification scheme in this study is based on Cholesky decompositions (Amisano and Giannini, 1997). Since, the Cholesky decomposition requires plausible ordering of the variables, findings from the previous studies and the related foreign literatures are used as the guide, in order to correctly identify the contemporaneous relationships between different structural shocks.

In a study conducted by Wu and Zhang (2009) on the effects of government expenditure on private investment, they found that, in the long run, government expenditure and foreign direct investment crowded in private investment. In addition, study undertaken by Funke and Nicke (2006) saw that government expenditure led to deterioration in trade account. Further, Zhou (2007) discovered that in developing countries with low political risk, international reserves and fiscal policy were related. But the reserves depended on the fiscal policy interventions of the government. Finally, it is uncovered that, in the developing economies, both current account deficit and credit expansion together with monetary expansion increased the risk of financial crises. The impact was found more robust in case of credit expansion than the current account (Ganioglu, 2013).

Directed by these studies and complemented by the local studies, the government investment on construction is ordered first because the disturbance is unlikely to be contemporaneously influenced by any other structural shocks in the model but only by itself. It is proven in the study conducted by the cabinet secretariat (2012) that government expenditure on construction of hydropower plants come in the form of rupee grants from India. So, the government investment on construction is determined by external forces beyond the variables in the model.

In the study conducted by the BCCI (2012), it is observed that more government expenditure led to growth in subsidiary activities and thus resulted into more credit growth. Therefore, private credit is ordered in the second place assuming that it would infiltrate into the model affecting other variables except for government investment on construction.

Imports from India take up the third position because regardless of the kind of development activities, majority of the goods are imported from India. So, it is assumed that, government investment on construction and private credit growth are all driven to affect imports from India and in turn it is assumed that imports from India will only affect the Indian rupee reserves. Finally, it is assumed that Indian rupee reserves respond to all the shocks of the aforementioned variables.

Data

The choice of variables is also purely determined by the prior studies conducted on the rupee crisis in Bhutan. The GCONST is proxied by the government gross capital formation on construction gathered from the national account series of the National Statistics Bureau (NSB). The PVTCRD is represented by net claims on private sector obtained from the annual report of the Royal Monetary Authority (RMA). In order to incorporate import variable into the model, the IMIN is defined as the ratio of imports from India over the total imports in the country, compiled from the balance of payment estimate with India published by the RMA. The IRR measures the rupee reserves available at end of the period and is taken from annual publication of the RMA.

The availability of time series data cannot be traced back beyond 1983 in case of Indian rupee reserves, imports from India and private credit. Though, data produced by NSB is available from 1980, to align with RMA data, the analysis is carried out from 1983 until 2013 with annual data. Except

for the import figure, remaining variables are converted into their natural logarithms (*ln*).

Preliminary analysis

The descriptive statistics presented in Table 1 shows that, over the period 1983–2013, the IRR series averaged 1508.55 million, with a minimum reserve of 71 million and maximum reserves of 6160.2 million. The IMIN series is found to be negatively skewed and averaged 74.22 percent of the total imports. The variation in PVTCRD as compared to GCONST is phenomenal because the min-max ratio of PVTCRD is way high compared to that of GCONST.

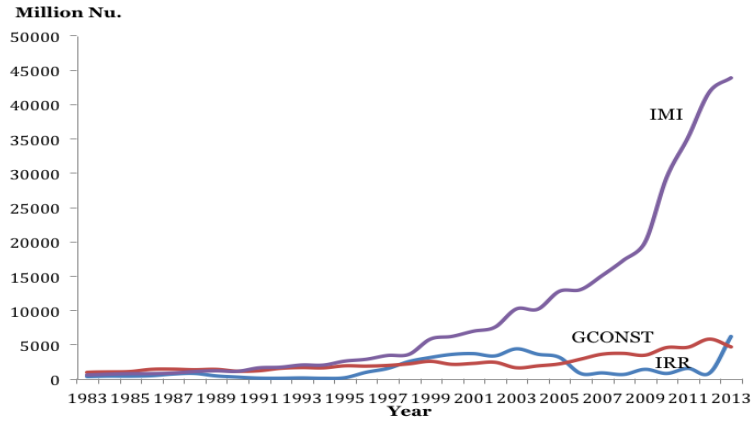
Table 1. Descriptive Statistics (1983-2013)

	GCONST	PVTCRD	IMIN	IRR
Mean	2308.88	8185.63	74.22	1508.55
Std. dev	1253.09	14079.61	8.53	1575.38
Min.	995.93	43.1	53.64	71
Max	5781.27	48751.8	88.43	6160.2
Min/Max ratio	5.80	1131.13	0.1572	86.76
Skewness	-0.5286	0.3353	-0.3590	0.4747
Kurtosis	4.2805	2.926	2.5405	3.4216

Figure 1 and Figure 2 portrays the movement in the variables over the review period. The relationships between the variables are hazy in the 1980's but starting 1990, the figures show that government investment on construction and private credit decreased the rupee reserves. By 1995, it becomes clear that the rupee reserves increased despite the increase in import from India and private credit. The relationship continues till 2003 and such upward movements could be due to huge increase in rupee inflow provided as grants, aids and loans from India for 7th and 8th five-year plan. Starting the 9th five-year plan, Bhutan saw huge increase in construction of hydro power plants and subsequent private construction industry boom. It can be

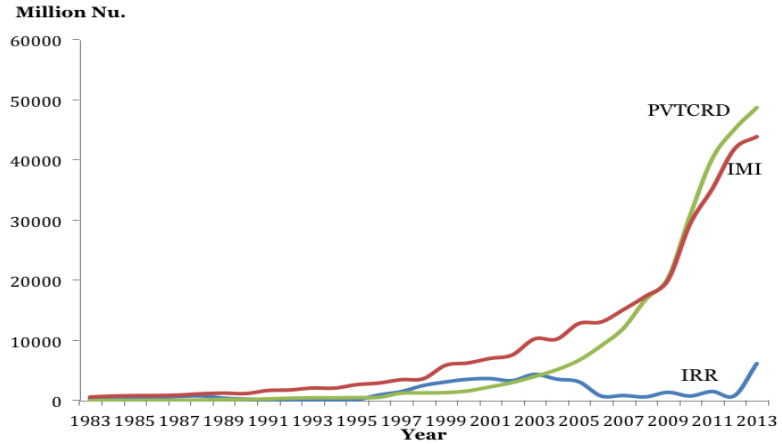
seen that with increase in government investment on construction, increase in imports, and increase in private credit deteriorated the rupee reserves.

Figure 1. Plot of the GCONST, IMI and IRR (1983-2013)



Note: IMI is imports from India and not the ratio of total imports.
Source: Statistical Yearbook, NSB and Annual Publication, RMA.

Figure 2. A plot of the PVTCRD, IMI and IRR (1983-2013)



Note: IMI is imports from India and not the ratio of total imports.
Source: Statistical Yearbook, NSB and Annual Publication, RMA.

To further substantiate the relationship between variables, the Pearson's coefficient of correlation is presented in Table 2. It can be noted that, there is significant positive correlation between government investment on construction and private credit, however, the relationship of government investment on construction with imports from India and rupee reserves is found insignificant. The relationship between private credit, imports from India and rupee reserves is also found to be insignificant. Lastly, the relationship between imports from India and rupee reserve is found to be positive but still insignificant.

Table 2. Pearson's correlation matrix (1983-2013)

	GCONST	PVTCRD	IMIN	IRR
GCONST	1.00			
PVTCRD	0.9253*	1.00		
IMIN	-0.0012	0.1284	1.00	
IRR	0.2698	0.2819	0.1203	1.00

Note: * is the significance level at 1 percent.

In order to test for stationarity of the variables, standard Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root test is conducted on the variable. Since none of the variables are found to be stationary at levels except for imports variable, the variables are tested at first difference. All the variables are found stationary at first difference. For uniformity in the analysis, even the import variable is used at first difference in the study. The results are given in Table 3.

Table 3. ADF and PP Unit root test

Variables	ADF test	PP test
lnGCONST	-0.710	-0.568
dlnGCONST	-5.871	-5.923
lnPVTCRD	0.041	0.169
dlnPVTCRD	-5.551	-5.669

IMIN	-5.088	-5.074
dIMIN	-9.615	-12.099
lnIRR	-1.199	-1.451
dlnIRR	-4.462	-4.636

Note: At level, the critical values at 1 percent, 5 percent, and 10 percent are -3.716, -2.986, and -2.624 respectively. At first difference, the critical values at 1 percent, 5 percent and 10 percent are -3.723, -2.989 and -2.625 respectively. The term *d* represents the variables in first difference.

Empirical Results

The short run structural parameter estimates

The structural parameter estimates of matrix A and matrix B are presented in Table 4.

Table 4. The structural parameter estimates of matrices A and B

Matrix A

1	0	0	0
0.0001 (0.166)	1	0	0
–3.97** (1.346)	–0.163 (1.358)	1	0
–0.207* (0.052)	–0.222** (0.072)	–0.234** (0.074)	1

Matrix B

0.155* (.000)	0	0	0
0	0.136* (.000)	0	0
0	0	7.123* (.000)	0
0	0	0	0.391* (.000)

Note: Figures in the parenthesis are standard errors of the parameter estimates. *,**,*** are significance level at 1 percent, 5 percent and 10 percent respectively.

First, the contemporaneous coefficient relations are discussed followed by its significance. The matrix presented in Table 4 shows the coefficients along with its significance. It is found that, over the review period, GCONST, PVTCRD and IMIN are found to be an important determinant of the IRR.

The contemporaneous effect of GCONST on PVTCRD is found to be positive but insignificant whereas, the effect is negatively significant on both the IMIN and the IRR. The impact of GCONST on IMIN is counterintuitive but such relationship is possible in the short run. It indicates that increase in GCONST uses domestic sources first thereby reducing imports in the beginning. It also shows that increase in GCONST does not necessarily convert into imports immediately. The negative impact of GCONST on IRR shows that when there is a percent increase in GCONST, IRR deteriorates by 0.21 percent.

The short run increase in PVTCRD is found to have negative impact on IMIN and IRR. However, the effect is found insignificant on the IMIN but is significant at 5 percent confidence level on the IRR. The contemporaneous coefficient suggests that, when there is 1 percent increase in PVTCRD, the IRR decreases by 0.22 percent in the short run. This finding concurs to the judgment made by Rashid (2012), Ura (2013) and Cabinet Secretariat (2012), where it is believed that it is the credit growth that has led to depletion in IRR.

Similarly, IMIN is found to have negative impact on the IRR and the effect is found significant at 5 percent confidence level. The coefficient in the matrix indicates that, IRR decreases by around 0.23 percent, when there is 1 percent increase in IMIN. Thus, it shows heavy reliance on imports, which drains the rupee reserves.

However, the belief that increases in GCONST and PVTCRD leads to increase in imports from India cannot be supported at least in the short run. The transmission mechanism, which leads to depletion in IRR needs to be further studied as it is beyond the scope of this paper. Most probably, such is possible through services payments, remittances and other sources.

The results generated in the econometric models rely on certain assumptions about the variables that are used. When

the assumptions are not met, the results become doubtful (Osborne & Waters, 2002). In order to validate the results, three post estimation tests are conducted in this study and results are presented in Table 5, Table 6 and Table 7 in the appendix. First, the eigenvalue test finds that the model satisfies the eigenvalue stability condition. Second, the Lagrange multiplier (LM) test suggests no autocorrelation. Finally, Jarque-Bera (J-B) normality test confirms that all the variables are normally distributed.

The structural impulse response analysis

To further corroborate the results, the structural impulse response analysis is carried out to show the medium term scenario. The impulse response function helps in understanding the persistence and dynamic effects of shocks on policy and non-policy related variables. In the model, the structural impulse response analysis is going to assist in determining the affects of one standard deviation increase in government investment, private credit and imports from India on target variables like private credit, imports from India and Indian rupee reserves. The dynamic responses of GCONST, PVTCRD, IMIN, and IRR are predicted up to 10 years ahead using the bootstrap percentile 95 percent confidence intervals.

Figure 3. Response of IRR to various shocks

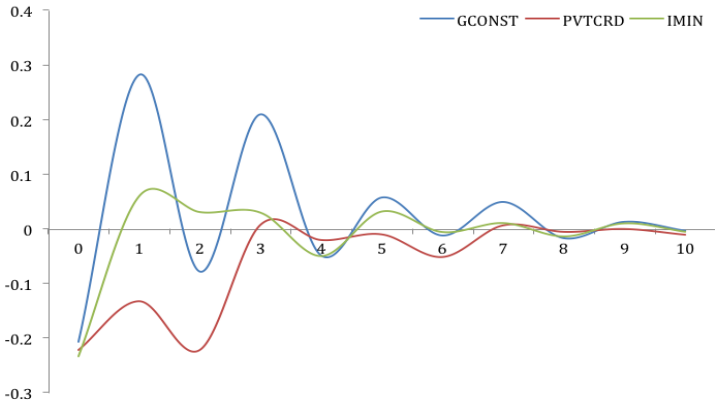


Figure 3 shows the response of IRR to various shocks. The blue line depicts the response of IRR to increase in GCONST. The result remains quite heterogeneous however, the persistence of response is more positive meaning, when there is positive shock on GCONST, there is increase in the IRR. Such positive response from IRR shows that government investment on construction actually helps improve rupee reserves. Such impact over the medium term could be due to 'matching funds' grants received from India for the development activities. As explained in the study conducted by taskforce (Cabinet Secretariat, 2012, p. 13), 'matching funds' are those government expenditure, financed through grants and loans received in Indian rupee. It is believed that such funds would rather help increase rupee reserves.

The red line shows the impulse response analysis of PVTCRD on IRR. It can be seen that the plunge in the IRR remains significant for almost 7 years. Though the IRR tends to increase by end of the third year but the effect is short lived and decreases until the seventh year before the response becomes insignificant. It shows that, increase in PVTCRD significantly leads to fall in IRR over the medium term horizon.

The green line demonstrates the response of IRR to increase in IMIN. The figure shows that increase in the IMIN leads to immediate decrease in the IRR and lasts for almost 8 to 9 months into the first year. By end of the year, the IRR improves and remains so for two years before IRR decreases again till the end of fourth year. After brief increase in the fifth year, the IRR decreases again before the response turns negligible. The inexplicable relationship between the two variables show weak evidence to prove that imports from India deteriorate rupee reserves in the medium term.

There is a need for further research on this relationship between IMIN and IRR but such results could be possible because there is huge illegal transaction taking place, which is possible through the porous border along the southern

towns in Bhutan. In the study conducted by Taneja (1999), it is found that unofficial trade between India and Bhutan amounted to US$ 31.3 million compared to official trade records of US$ 7 million in 1994. Furthermore, there is a mention of streamlining the distribution of goods and services with India as recommendation in the taskforce report (Cabinet Secretariat, 2012, p. 46). Moreover, since private construction activities are mostly carried out by Indian expatriate workers, it looks like, remittances of those expatriate workers leads to depletion in rupee reserves. In the annual report (RMA, 2013), it is mentioned that the outward remittances by those workers amounted to Nu. 1.8 billion in 2011/2012. To add on, loans, aids and grants from India which comes in as rupee could be overshadowing imports from India and that is why we can see increase in rupee reserves when there is import.

Detailed individual impulse response analysis graph is provided in Figure 4 in the appendix. The middle line depicts the responses and those outer lines are the standard deviations from the estimated impulse response. The first graph shows the response of PVTCRD to increase in the GCONST. Initially, GCONST leads to decrease in PVTCRD but the impact remains only for a year. Starting second year, PVTCRD responds positively till the end of seventh year with brief change during the fifth year. The result indicates that, there is no immediate impact on the PVTCRD from the increase of GCONST, however, over the medium term, the GCONST significantly increases the PVTCRD.

The second graph shows the impulse response analysis of the GCONST on IMIN. Imports from India decreases for few months initially but by the first year, there is significant increase in imports from India. Though the response becomes negative by second year but bounces back by third year and significantly increases during the fifth year. After that, the impact becomes negligible. It signifies that the GCONST can lead to increase in IMIN over the medium term.

As displayed in the fourth graph, increase in PVTCRD significantly increases the IMIN for two years, after which IMIN decreases before it bounces back by fourth year. The increase in IMIN continues for another two years before decreasing by sixth year after which the impact become negligible. It shows that, increase in PVTCRD also leads to imports at least during the first few years, after that the impact remains mixed.

Conclusion and Recommendations

This study used the structural VAR model to investigate the causes of rupee deterioration in Bhutan. In the short run, the study found that government construction expenditure, private credit expansion and imports from India deteriorated the rupee reserves. Over the medium term, the study uncovered that government investment on construction significantly increased the rupee reserves and private credit. The study also discovered that expansion in private credit significantly deteriorated the rupee reserves even in medium period.

The results indicate that private credit growth is the cause for rupee deterioration both in the short and the medium term. Therefore, private credit should be monitored regularly by the RMA. By doing so, a timely intervention can help mange rupee deterioration in the future. On the other hand, banks should encourage private credits that are meant for investment into agriculture and manufacturing industries. As imports from India instantly worsen the rupee reserves, economic growth spurred by manufacturing and agricultural production would definitely improve terms of trade with India and thus reduce the surge in demand for Indian rupees.

As the fiscal measure initiative, essential and non-essential commodities need to be properly researched and defined in the Bhutanese context. Once the two commodities can be segregated, tax on non-essential commodities need to be heavily imposed. Such initiatives will improve the government exchequer and will condense pressure on the rupee reserves.

Essential items that are within the production capacity of Bhutan should be encouraged with subsidies and tax holidays. Without such measure in place, imports from India will continue due to India's relative advantage over prices compared to Bhutan.

Lastly, the government should be mindful that the increase in private credit is a result of government investment on construction in the medium term. Therefore, the government should be extra cautious in implementing its planned development activities. Huge investment on construction simultaneously or in succession is not recommendable. If such development activities are spread over longer period of time, the rush for private credit can be minimized and lessen the strain on rupee reserves.

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Appendix

Figure 4. The individual structural impulse response graph

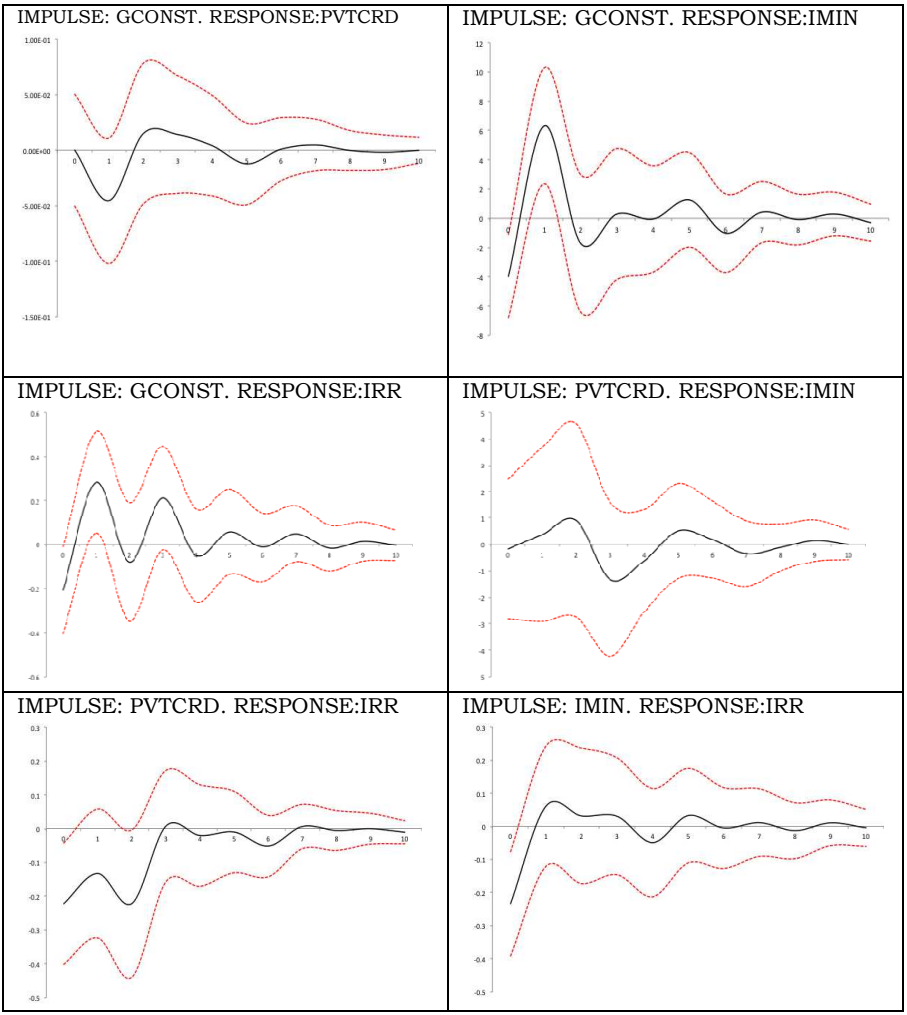

Table 5. Eigenvalue stability condition

Eigenvalue				Modulus
-	0.7299358	+	.03338777i	0.730699
-	0.7299358	-	.03338777i	0.730699
	0.6525171			0.652517
-	0.05999279	+	.602482i	0.605462
-	0.05999279	-	.602482i	0.605462
-	0.00830813	+	.5796631i	0.579723
-	0.00830813	-	.5796631i	0.579723
	0.3253977			0.325398

All the eigenvalues lie inside the unit circle. VAR satisfies stability condition.

Table 6. LM test for autocorrelation

Lag	χ^2	df	Prob>χ^2
1	15.2898	16	0.50352
2	13.0273	16	0.67076

Table 7. Jarque-Bera test for normality of residual

Equation	χ^2	df	Prob>χ^2
dlngconst	3.217	2	0.20017
dlnpvtcrd	0.531	2	0.7668
dimin	0.848	2	0.65455
dlnirr	1.259	2	0.53284
ALL	5.855	8	0.66347