Forecasting Loanable Funds in Nepal's Banking System: A VECM Approach

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ABSTRACT

This paper tries to examine the performance of VECM model to forecast the amount of loanable funds in the banking system of Nepal. For this, monthly data of 14 years starting from July 2007 to June 2021 have been used in the systematic process of modeling and forecasting practices. The VECM model was estimated with the training dataset covering from 2007 to 2015 followed by examination and validation with the testing dataset covering 2015 to 2020. The empirical results reveal that the supply side factors (government expenditure and BoP) of loanable funds have got dominant power in comparison to the demand side factors (industrial investment and consumption) while determining the amount of loanable funds in the banking system. The forecast performance indicators confirm that the selected VECM model is capable enough in explaining the variations of the determinants that bring changes in the monthly amount of loanable funds of the banking system. As suggested by the results, the VECM modeling approach could be used for forecasting of loanable funds at the BFIs' level in the banking system of Nepal.

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I. INTRODUCTION

Nepal as a least developed country having inadequate quality physical infrastructures is in enormous need of a large volume of investment. Shukla and Srivastava (2019) for a World Bank working paper estimate that Nepal needs to invest 10–15 percent of the country's Gross Domestic Product (GDP) annually over the next decade to close the infrastructure gaps. However, the capital spending of the Government of Nepal stood at only 6.3 percent of GDP in 2018/2019.

Another source of investment is the financial system which comprises of banking and non-banking financial segments. The non-banking segment—a combination of capital and debt markets—is relatively smaller but gradually developing and is unable to serve the investment requirements of the country. Therefore, the banking system has been playing a leading role in mobilizing loanable funds and filling the investment gaps of the economy. Hemchandra (2003) opines that the banking system plays an important role in reducing risk and vulnerability for disadvantaged groups thereby increasing the ability of individuals and households to access basic services like health and education, thus has a more direct impact on poverty reduction.

NRB (2009) claims that the banking system of Nepal has been performing the central role of raising the funds for productive investment and channeling the same to the real sector. Despite a remarkable growth of the Banks and Financial Institutions (BFIs), the system as a whole have been struggling to balance the demand for and supply of loanable funds. This is resulted in to the interest rate instability creating a hard time for businesses to predict their position in the market while various other players are looking into to tap the opportunities.

The problem of imbalance between the demand and supply of loanable funds has been a kind of recurring characteristics of Nepali banking system since long. Although few BFIs may be in a comfortable position, many of them have been facing shortage of loanable funds at their disposal to issue the fresh loans. Sometimes, it is also observed that the central bank has to mop up the surplus liquidity from the banking system for interest rate stability. Many times, the BFIs were found to be struggling to maintain the mandated Credit to Core Capital cum Deposit (CCD) ratio for regulatory requirement.[1] Especially, it seems that the banking system faces a severe shortage of loanable funds at a time when there is high demand for loans in the markets. This results into frequent change in the interbank rates making the market interest rates more volatile.

In this background, the main objective of this paper is to identify the best multivariate model which can better forecast the loanable fund of the banking system of Nepal. It also aims to identify the most significant determinants of loanable fund that may be instrumental to minimize the risks of balance sheet mismatch and interest rate instability.

This paper provides evidence that the BFIs, operating under the Intermediation of Loanable Funds (ILF) model, can benefit from the scientific forecasting models if they adopt a forecasting strategy within their business model. The organization of this paper has five sections. The next section is the review of literature followed by the methodology applied. Section four covers the results and discussion whereas the findings and conclusions of the empirical analysis have been presented in the last section.

II. REVIEW OF LITERATURE

A wide range of alternative sources and uses of fund have been shifting banking strategy away from safety i.e. minimum credit risks towards high profit and growth targets (Bansal & Mohanty, 2013). Such a shift has been fueling the complexity in decision making of banking industry, especially on accepting deposits and approving loans. Thomas (2018) argues that a good forecast helps the manager to curb information asymmetries and mobilize resources to their most productive uses. In the meantime, Hanh (2015) says that the banks issue short-term liabilities to lenders while making long-term loans to borrowers, which causes the demand-supply mismatch.

1 Till 2020 the BFIs were allowed to provide loan/credit up to 80 percent of their core capital and deposits (used to called CCD ratio). From 2021 BFIs are allowed to issue loans up to 90 percent of deposits and the ratio is called Credits to Deposits (CD) ratio.

A bank's current financial position is the result of past decisions for acquiring deposits and funds from other sources and investing these funds in alternative investment opportunities, such as loans and bond investments (Howrey & Hymans, 1978). Accordingly, Giroux (1979) opines that a bank's current decision on acquiring and investing funds will affect the bank's future position on availability of loanable funds for fresh loans that in turn helps determine profitability.

Diamond and Rajan (2009) highlight that the shortage of loanable funds in the banking system induce horizontal inequality among the BFIs making them vulnerable to systemic risks. This finding has been well recognized as balance sheet mismatch of BFIs which in turn rests on good forecasting of external economic factors and internal decision variables. A good forecast of the demand and supply side of loanable fund is an inevitable prerequisite for smooth functioning of the banking system and interest rate stability. Elekdag and Han (2012) reveal that forecasting of balance sheet is important. This was supported by a multi-country SVAR model where the authors identified that the domestic factors are more dominant than external factors in driving rapid credit growth in Asia.

However, an alternative literature opines that a sum of the domestic factors provides a very good approximation of total credit but does not capture all sources of influences. The role of international flows has been found instrumental to determine the availability of loanable funds in the domestic banking system of Europe (Lane & McQuade, 2013). The authors highlight the importance of a good forecasting model is one of the growing matters in empirical literature, especially in examining the determinants of loanable funds in the banking system.

Koray et al. (2016) found that the central bank funding and deposits are close substitute as alternative sources of loanable funds in the banking system of Turkey. Using bank level data of Tunisia, Moussa (2015) highlights the important role of forecasting of loanable funds—that depends on the bank specific as well as macroeconomic variables—to help determine the optimum level of liquidity necessary for smooth functioning of the banking system and interest rate stability. With respect to the role of financial intermediaries, Woodford (2010) argues that neither deposits nor equity are main source of loanable funds for the financial sector. The study reveals that an alternative source of loanable funds, which facilitates borrowers making them able to borrow is the central bank funding.

With reference to the global financial crisis of 2007-2009, Tran (2020) found that the banks with adequate funding liquidity are less likely to experience liquidity crunches. However, more reliance to deposit may prompt banks to be firmly cautious to offer more fresh loans in comparison to other banks. Similarly, with the data of BRICS countries, Dahir et al. (2019) show the effect of capital and funding liquidity on bank loan growth using a dynamic least squares dummy variable corrected (LSDVC) approach over the period between 2006 and 2015.

Using money supply approach, Shrestha (2013) examined the determinants of loanable funds in Nepali banking system from two different perspectives – mainstream and Post-Keynesian. Results show that disposable high-powered money found to be the major contributor to bring change in both of the monetary aggregates (M1 and M2) and in turn to affect the loanable funds available in the banking system. Most importantly, Cash Reserve Ration (CRR) and Open Market Operations (OMO) were the significant contributors to bring change in loanable funds. Similarly, Budha (2013) examined the bank lending channel of monetary policy transmission in Nepal using dynamic Arellano-Bond GMM estimation with annual data of 25 commercial banks. He found that the bank size (deposits) had a significant impact on loan supply in Nepal whereas capital base had no significant impact on bank lending. Findings also indicate that the supply of bank loans was significantly affected by GDP.

Timsina (2017) examined the effectiveness of the determinants of commercial banks' lending behavior in Nepal by using time series data with OLS method for the period 1975-2014. The results show that the GDP and liquidity ratio of banks have the greatest impacts on determining the bank lending in Nepal giving evidence for unidirectional causal relationship from GDP to private sector credit.

Although some macroeconomic models have been developed and used in Nepal, these are limited to few government authorities, especially with the central bank. All the models found to be developed for forecasting of macroeconomic variable and policy simulation, thus have not given priority for forecasting of loanable funds from the BFIs' perspectives. Amid such a situation, it is realized that the current paper on forecasting of loanable funds has significant contribution in forecasting of loanable funds from the perspective of BFIs.

III. RESEARCH METHODOLOGY

This paper follows the quantitative approach of research design. Malhotra and Dash (2016) believe that the quantitative design incorporates the statistical methods and econometric models and has got complementary strengths but do not have overlapping weaknesses. The time series data of 168 months from July 2007 to June 2021 have been used to examine the econometric models. Ex-post forecasting has been made for the period of July 2020 to June 2021 whereas ex-ante forecasting of loanable funds is done for July 2021 to June 2022. The secondary data were collected from the NRB monthly reports of Current Macroeconomic and Financial Situation and Industrial Statistics Information System of the Department of Industries.

A systematic result driven process has been adopted in the empirical analysis. Empirical analysis starts with the estimation of models using the training dataset (July 2007—June 2015) and the performance has been examined by the suitable tools. Secondly, testing and validation of the selected VECM model has been done with testing dataset (July 2015—June 2020). The best performed model is aforwarded for forecasting where forecast accuracy is examined with the help of pragmatic tools. Definition of variables used in this paper has been presented in Annex-1.

Model Specification

This paper uses the balance sheet approach where the fundamental equation of accounting ensures that the total assets of the entity is the summation of liabilities and equity for the given point in time. Both sides of the equation (1) for a typical banking system have been disaggregated and presented below.

Assets = Liabilities + Equity.. (1)

Table 1: A representative Balance Sheet of BFIs

Assets	Liabilities and Equity
Loans and Investment (Total Credits)-C	Deposits (total deposit liabilities)-D
Regulatory Reserves (CRR+SLR+...)-R	Capital Funds (Equity)-CF
Excess Reserves (Loanable Funds)-LF	Debt Funds (Bond/Debenture)-B
Interbank Lending (short-term assets)-I	Interbank Borrowing (short-term funds)-I
Claim to Central Bank (R-REPO+…)-N	Owe to Central Bank (REPO+SLF+RF+…)-M

Source: Author's creation based on theoretical frameworks

Table 1 provides the key building blocks for the model specification. Equation (1) ensures that both sides of the Table 1 must be in equilibrium

i.e. $C + R + LF + I + N = D + CF + B + I + M$ .... (2)

The interbank lending of one bank is the interbank borrowing of the others i.e. I – I = 0. Similarly, regulatory reserve requirements (R) is exogenously determined by the Central Bank (NRB) and the ratio remains almost constant for the longer run. Thus, the rate of change of $\overline{R}$ will be insignificant (i.e.≈0) in the very short interval of time, a month. At the same time, the amount of debt funds (B) of BFIs is very less around 0.4 percent (i.e. B≈0) of total deposits of the banking system.2 Therefore, the resulting fundamental equation of loanable funds would be the following:

$$LF = D + CF - C + (M - N)$$

Or, $LF_t = D_t + CF_t - CR_t + ON_t$ .... (3)

Where; LF_t = Loanable funds available in the banking system

D_t = Total Deposits with the BFIs (supply of fund)

CF_t = Total Capital Funds of BFIs (share equity)

CR_t = Outstanding Credits of the BFIs (demand for fund)

ON_t = Net money injection through OMO (policy factor)

2 Findings of the High Level Committee (December, 2018) formed by the Ministry of Finance, Government of Nepal to study the issues of financial and capital markets and forward the recommendation to the concerned authorities.

In the loanable funds equation, the demand function (bank credits) is defined as:

$CR_t = CN_t + ID_t + \pi_t + I_t$ ....(4)

Where, CR_t = Total outstanding bank credits

CN_t = Total Consumption Expenditures (domestic demand)

ID_t = Planned Investment of Industrial sector (Investment demand)

π_t = Percentage change in Consumer Price Index (Inflation rate)

I_t = Interest Rate (weighted average interbank rate)

Similarly, the supply function of loanable funds (deposits) is structured in the given equation:

$D_t = GE_t - CC_t + BP_t + I_t$ ....(5)

Where: D_t = Total Outstanding Deposits with the BFIs

CC_t = Currency outside the Banking System (behavioral factor)

GE_t = Total Government Expenditure

BP_t = Balance of Payments

I_t = Interest Rate (weighted average interbank rate)

The final model of loanable funds is obtained by substituting the demand function (equation 4) and supply function (equation 5) in equation).

$LF_t = GE_t - CC_t - DF_t + BP_t - \pi_t + ON_t + CF_t$ ....(6)

Where DF is demand factor, sum of investment and consumption

The VECM form of model to be examined would be the following:

$\mu = LF_t - (\alpha + \beta_1 GE_t - \beta_2 CC_t - \beta_3 DF_t + \beta_4 BP_t + \beta_5 \pi_t + \beta_6 ON_t + \beta_7 CF_t)$ ......(7)

IV RESULTS AND DISCUSSION

This paper follows the systematic process of modeling and forecasting which starts from estimation of tentative model called training of model. The second step is testing of the selected model and finally validation of model with forecast performance. First of all, the properties of time series data were examined with the suitable tests. The unit root (stationarity) property of the variables has been examined with the help of ADF test. Table 2 indicates that the variables included in the paper are *I*(1) stationary as all of the coefficients are significant at 5 percent.

Table 2 : ADF Unit Root Test Results

Variables	Intercept				Trend and Intercept			
	Level		First difference		Level		First difference	
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value
LF	-3.144	0.0234	-3.124	0.0248	-3.214	0.0816	-3.191	0.0863
DF	-0.6707	0.8481	-12.0883	0.0001	-9.4405	0.0000	-12.0194	0.0000
π	-6.9199	0.0000	-9.3619	0.0000	-6.9433	0.0000	-9.3122	0.0000
CF	-12.121	0.0000	-8.709	0.0000	-12.257	0.0000	-8.868	0.0000
ON	-5.971	0.0000	-5.352	0.0000	-5.973	0.0000	-5.356	0.0000
BOP	0.5673	0.9881	-8.1879	0.0000	-6.0088	0.0000	-8.2753	0.0000
GE	-8.691	0.0000	-5.558	0.0000	-13.283	0.0000	-10.381	0.0000
CC	-15.767	0.0000	-12.175	0.0000	-15.880	0.0000	-12.350	0.0000

Source: Author's estimation from the sample data

Estimation of VECM Model

VECM estimate confirms the cointegrating relationships among the variables included in the model and examine the long-run and short-run relationships for each of the variables. Table 3 indicate that the model fits well with about 0.85 R-squared and significant F-statistics.

Table 3 : VECM Cointegration Relations

Variables	Coefficients	S.E.	t-stat
Loanable Funds (LF)	1.000	-	-
Government Expenditures (GE)	-7.7045	3.7665	-2.0455*
Capital Funds (CF)	0.4325	6.1296	0.0706
Inflation Rate (π)	1.9653	0.9363	2.1349*
Currency Outside BFIs (CC)	-11.8271	5.0042	-2.3634*
Demand Factors (DF)	1.1108	0.9035	1.2295
Balance of Payment (BP)	-0.7514	0.2914	-2.5781*
Net-OMO (ON)	0.4250	0.3673	1.1573
Constant (Intercept)	-37.2928	-	-
Coefficient of Determination (R^2)	**0.8460**	**F-statistic**	**2.8925**
Adjusted R-squared (Adj. R^2)	**0.5535**	**S.E. Equation**	**11.2339**

Source: Author's estimation with sample data
** Indicates significance at 5 % level*

Results show that four of the independent variables (i.e. GE, π, CC and BP) have been significantly contributing to determine loanable funds in the long run. However, the signs obtained for π and CC are not as correct as expected. Inference may be drawn that Rupees one billion increase in government expenditures and BOP respectively contribute to increase about Rs. 7.7 and Rs. 0.75 billion of loanable funds in the long run.

For the short-run relationships, the error correction equation of loanable fund (dependent variable) has been estimated and analyzed. The number of optimal lags identified by AIC and HQ criteria are eight and the selected lags for VECM estimate are one period less (P–1) i.e. 7 for this model. The resulted model is given below.

$$\Delta LF_t = \alpha_1 + \alpha_2 \mu_{t-1} + \beta_1 \sum_{i=1}^{7} \Delta LF_{t-i} + \beta_2 \sum_{i=1}^{7} \Delta GE_{t-i} + \beta_3 \sum_{i=1}^{7} \Delta CF_{t-i} + \beta_4 \sum_{i=1}^{7} \Delta CC_{t-i} + \beta_5 \sum_{i=1}^{7} \Delta DF_{t-i} + \beta_6 \sum_{i=1}^{7} \Delta BP_{t-i} + \beta_7 \sum_{i=1}^{7} \Delta ON_{t-i} + \beta_8 \sum_{i+1}^{7} \Delta \pi_{t-i} + e_t \quad \text{..................(8)}$$

The error correction term (-0.1835) of this equation is within the theoretical range of zero to one and statistically significant. This indicates that any deviation in the loanable funds from its long run equilibrium path due to short-run changes in independent variables gets corrected at the rate of about 18 percent per month.

It is not possible to present the coefficients of all regressors of error correction equation due to large number of (56) regressors in the model. Thus, the values of regressors—which are statistically significant up to 10 percent—have been presented below (Annex II). The results clearly show that recent changes in all of the independent variables including previous values of loanable funds itself seem to be instrumental to bring about change in loanable funds.

Residual Diagnostics

Table 4 confirm that the error terms of the selected model are IID white noise since all of the null hypothesis for homoscedasticity, no serial correlation, no

ARCH effect and normality of residuals cannot be rejected at 5 percent level of significance.

Table 4 : Residual Diagnostic for VECM Model

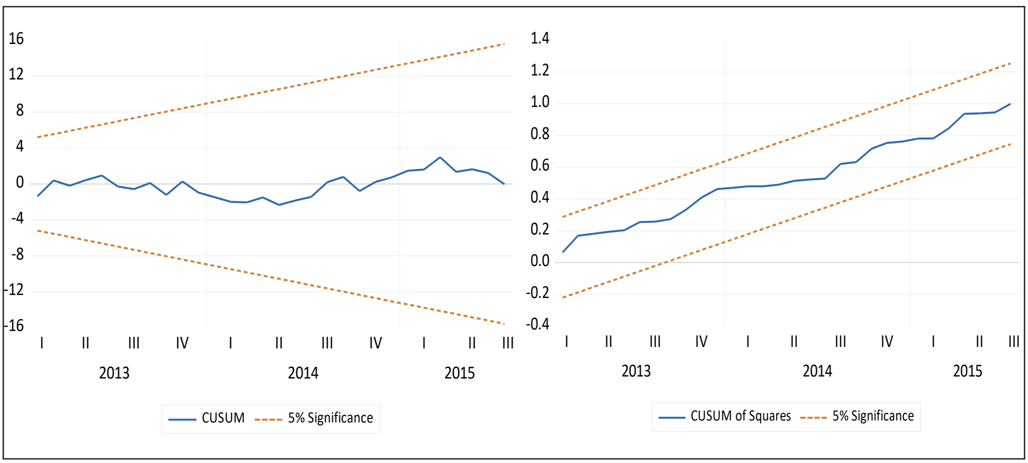
Test Name	Null (H_0)	Test-Stat	P-value	Decision
Breusch-Godfrey LM test	No serial correlation at up to 11 lags	F (0.5836)	0.8280	H_0 accepted at 5% significance level
Jarque-Bera Normality test	Error terms are normally distributed	JB(2.3780)	0.3045	H_0 accepted at 5% significance level
Breusch-Pagan-Godfrey test	Homoscedasticity (no heteroscedasticity)	F (0.9230)	0.6131	H_0 accepted at 5% significance level
Heteroscedasticity LM-test	No ARCH effects in the model	F (0.8173)	0.5180	

Source: Author's estimation

Stability Test

To check the parameter stability Cumulative Sum of Recursive Residual (CUSUM) and CUSUM of square test performed and the results have been plotted below (Figure 1). The plot confirms the stability as the residuals are within the range of ±5 percent significance level.

Figure 1 : CUSUM Plots for VECM Model



Validation of Model

In this step, the selected VECM model has been examined with the testing dataset. Main objective is to test and validate the selected model before forwarding the model for forecasting use. VECM long-run coefficients obtained with the testing dataset found very encouraging where all of the coefficients (but inflation) have got theoretically correct signs and are statistically significant. The short-run error correction term (-0.1928) also found to be similar indicating that any short run deviation in the loanable funds from its long run equilibrium path due to changes in independent variables converges at the rate of about 19 percent per month.

Table 5 indicate that the VECM test model has satisfied all conditions of IID but the null hypothesis of normality cannot be accepted. However, the model is acceptable since normality is asymptotic property and once the sample size increases the error terms get normalized.

Table 5 : Residual Diagnostics for VECM of Loanable Funds Test Model

Test Name	Null (H_0)	Test-Stat	P-value	Decision
Breusch-Godfrey LM test	No serial correlation at up to 3 lags	F (0.6203)	0.5433	H_0 accepted at 5% significance level
Jarque-Bera Normality test	Error terms are normally distributed	JB(13.7764)	0.0001	H_0 rejected at 5% significance level
Breusch-Pagan-Godfrey test	Homoscedasticity (no heteroscedasticity)	F (1.0842)	0.4096	H_0 accepted at 5% significance level
Heteroscedasticity LM-test	No ARCH effects in the model	F (0.1583)	0.6932	

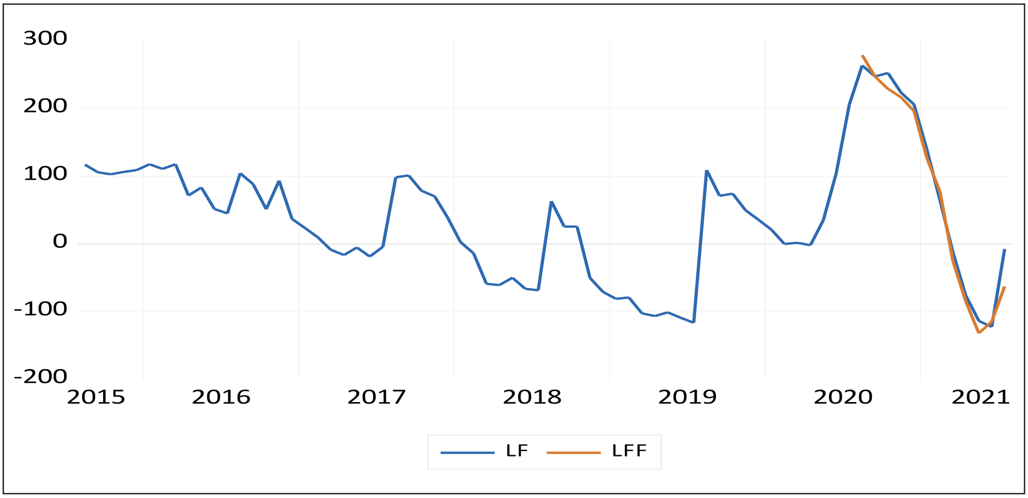
Source: Author's estimation

Ex-post Forecasting

This covers forecasting of loanable funds for the period of July 2020 to June 2021. The model is estimated with the testing dataset and forecasts were made for the said period taking 3 (4-1) number of lags as indicated by AIC.

Forecasts are made in billion rupees of loanable funds. Figure 2 confirms that the line plots of actual (LF) vs. forecasted (LFF) series almost overlap to each other over the forecast period indicating that the VECM made good forecasts.

Figure 2 : Ex-post Forecast vs Actual Series of Loanable Funds



The forecast performance indicators found to be satisfactory where RMSE is 20.31 whereas MAE and MAPE are respectively 15.35 and 79.19. The Theil coefficients also support the results of error coefficients i.e. both U_1 & U_2 as well as bias proportion of U_1 are acceptable. All of these indicators help to confirm that the ex-post forecasts are as accurate as possible or close to the observed values.

Ex-ante Forecasting

Here ex-ante forecasting of loanable funds has been made for the period of July 2021 to June 2022. In the process, the values of independent variables for the same period were forecasted using simple exponential smoothing method. Then the selected VECM model has been estimated with the dataset of July 2015 to June 2021 followed by forecasting of LF for the next 12 months.

Figure 3: Actual vs Ex-ante Forecasts of Loanable Funds

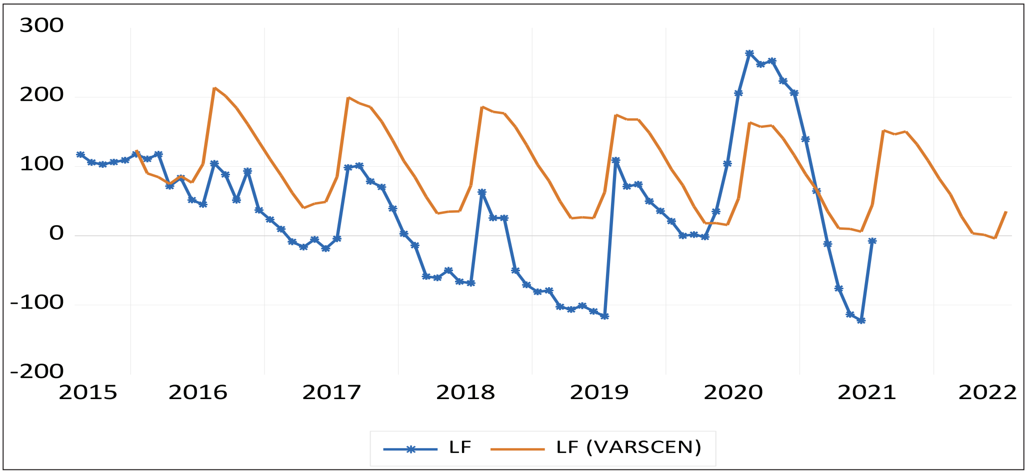


Figure 3 confirms that the ex-ante forecasts of loanable funds seem to follow the similar path as followed by the actual values. The performance indicators of ex-ante forecasts are higher than that of the same indictors obtained during ex-post forecasts. This is a strong evidence for forecast efficiency of VECM model.

V. FINDINGS AND CONCLUSION

The comparative analysis of ex-post and ex-ante forecasts indicators found that the VECM model produces satisfactory forecasts of loanable funds for Nepali banking system. Although the performance may vary in comparison to other models, still forecast accuracy measures indicate that the VECM forecasts are far better than the naive forecasts. In terms of the determinants, government expenditure and BoP found to be the most significant to bring positive change in the loanable fund in the long-run. Whereas, net amount injected via OMO (policy factor) found to be instrumental in maintaining required amount of loanable finds (liquidity) in the short-run. This reinforces the active role of monetary authority for management of loanable funds in the economy.

Since empirical analysis and practice of forecasting with econometric model adds value for evidence based decision making for BFIs, it is worth considering for the BFIs to inbuilt the forecasting strategy within the business model with suitable institutional arrangement and resource allocation. Finally, this study tries to explore an avenue of modeling and forecasting in the banking system of Nepal. However, a single study conducted in a certain scope and limitations may not be the perfect but definitely opens opportunity for more specific and customized studies further.

ANNEX I
DEFINITION OF VARIABLES

Loanable Funds (LF): The dependent variable of this study which represents the amount of funds readily available in the banking system to offer new credits. To obtain the amount of loanable funds, we have to deduct the uses of funds (UF) from the sources of funds (SF).

LF = SF – UF

Or, LF = $D_t + C_p - (C_r + RRR + V_r)$ .... (1)

Where, LF = total loanable funds available with the BFIs

D_t = total deposits cum liabilities of BFIs

C_p = total capital funds of BFIs

C_r = total credits of BFIs

RRR = amount kept for regulatory reserve requirements

V_r = voluntory reserve for day-to-day of operations of BFIs

Equation (1) gives the theoretical definition of loanable funds. In order to figure out the actual size of loanable funds available in the banking system, each of the components listed in the right hand side of the equation (1) have been further defined.

D_t = as per NRB report

C_p = as per NRB report

C_r = as per NRB report

RRR = $0.2\,(D_t + C_p)$

V_r = $0.015\,(D_t)$

There is no uniform rule about the voluntary reserves (V_r) that BFIs should hold with them to ensure smooth daily operation. One of the working papers of IMF by (Gray, 2011) highlighted the importance of voluntary reserves for smooth operations of the BFIs and prevent shortage of funding liquidity, especially for withdrawal of deposits by the customers. The paper found—from a survey of 121 central banks—that the BFIs were given freedom to maintain the voluntary reserve as per their requirements although there were some mandatory provisions in the past. However, the survey results reveal that the BFIs were keeping—in an average—about 1.5 percent of their deposits liabilities as voluntary reserve or funding liquidity.

In Nepal, it was mandatory for BFIs to keep 2 percent of their domestic deposits as cash in vault. The monetary policy of FY 2003/04 has abolished this provision and made BFIs voluntarily accountable to manage the minimum cash requirements (NRB, 2020). Considering this, it is assumed that the Nepali banking system holds about 1.5 percent of total deposits as a voluntary reserve in addition of the RRR. The actual size of loanable funds can be obtained as follows:

$$LF = (D_t + C_p) - Cr - 0.2(D_t + C_p) - 0.015(D_t)$$

$$\text{Or, } LF = (1 - 0.2)SF - C_r - 0.015(D_t) \quad \text{.......... (2)}$$

$$(\because D_t + C_p = SF)$$

The proportion of total outstanding credits (C_r) to the sources of funds (SF) indicates the average CCD ratio of the banking system for a particular period of time. Thus, equation (2) can written as:

$$LF = 0.8(SF) - CCD(SF) - 0.015(D_t)$$

$$\text{Or, } LF = (0.8 - CCD_t)SF - 0.015\,(D_t) \quad \text{.......... (3)}$$

Equation (3) gives the actual size of loanable funds for a particular period of time where 0.8 is the maximum permissible CCD ratio and CCD_t is the actual CCD ratio of the banking system for a given period of time. Whereas, 0.015* D_t gives the level of voluntary reserve BFIs hold for day-to-day operations.

Credits (C_r): This is total outstanding credits of the banking system.

Deposits (D_t): This is the size of deposits of the banking system.

Net amount of OMO (ON): This is the policy variable and measures the degree of policy intervention by the NRB. Data have been carefully calculated by subtracting the total amount of money mop up from the markets from the total money injected into the markets.

Capital Funds of BFIs (CF): This is the sum total of BFI's paid-up capital and reserve funds.

Inflation Rate (π): This is the monthly percentage change in the Consumer Price Index (CPI).

Interest Rate (R): This is the monthly average of interbank rates.

Government Expenditure (GE): Sum total of all expenditures made by the federal government.

Currency Outside the Banking System (CC): The proxy of currency held by the public.

Balance of Payments (BOP): This is the net foreign receipts on the country's banking system.

Domestic Demand Factor (DF): A proxy of investment demand (proposed by the industries during registration) and consumption demand (VAT collection÷13%).

ANNEX II

VECM Short-run Relationships of Loanable Funds Model

Regressors	Coefficient	Std. Error	t-Statistic	Prob.
Error Correction Term	0.183515	0.073316	2.503059	0.0180
D(LF (-1))	-0.501875	0.224809	-2.232449	0.0332
D(LF(-5)	-0.575082	0.260712	-2.205814	0.0352
D(GE(-2))	-1.230799	0.727616	-1.691550	0.1011
D(GE(-4))	-1.161911	0.625464	-1.857679	0.0731
D(GE(-5))	-0.917660	0.474062	-1.935739	0.0624
D(CF(-1))	0.968362	0.585776	1.653128	0.1087
D(CF(-7))	0.950833	0.439801	2.161961	0.0387
D(CC(-1))	3.857564	1.457887	2.645997	0.0128
D(CC(-2))	2.676710	1.308686	2.045342	0.0497
D(CC(-3))	2.972961	1.359426	2.186923	0.0367
D(CC(-4))	2.234289	1.198640	1.864020	0.0721
D(CC(-5))	2.164343	0.991632	2.182607	0.0370
D(CC(-6))	1.844147	0.704767	2.618675	0.0138
D(CC(-7))	1.111893	0.432428	2.571280	0.0153
D(DF(-1))	0.427235	0.256537	1.865392	0.1062
D(DF(-2))	0.598280	0.277651	2.154789	0.0393
D(DF(-3))	0.635283	0.284049	2.236524	0.0329
D(DF(-4))	0.563217	0.244400	2.304484	0.0283
D(DF(-5))	0.378420	0.202891	1.865141	0.0720
D(DF(-6))	0.467057	0.202599	2.305326	0.0282
D(DF(-7))	0.305826	0.154976	1.973379	0.0577
D(BP(-2))	0.424034	0.132725	3.194839	0.0033
D(ON(-1))	0.286281	0.150279	1.905004	0.0664
D(ON(-2))	0.314846	0.143234	2.198117	0.0358
D(ON(-6))	0.298195	0.172978	1.723887	0.0950
D(π (-2))	-7.849852	4.132024	-1.899760	0.0671
D(π(-7))	-6.509581	2.712175	-2.400133	0.0228
R-squared	0.846057	Mean dependent var		0.524655
Adjusted R-squared	0.553565	S. D. dependent var		16.81327
S. E. of regression	11.23392	Akaike info criterion		7.917795
F-statistic	2.892582	Durbin-Watson stat		1.854580
Prob(F -statistic)	0.001142			

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