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Editorial

The SEBON Journal is a leading peer-reviewed journal covering the contributions that help to address the contemporary issues relating to the securities markets in Nepal. SEBON has been publishing SEBON Journal (ISSN: 2091 – 0584) containing the research-based articles in the area of securities markets since 2004. The objective of SEBON Journal is to publish high quality empirical, theoretical and methodological articles concerning securities markets in Nepal.

SEBON Journal Volume-X, 2023 contains the articles from the researchers working in different organisations. A total of eight manuscripts were received for publication in this volume. Initially, the manuscripts were assessed on the basis of instruction provided to the authors for preparing and submitting the manuscripts for publication. The submission of manuscript to SEBON Journal assumes that it is original work and that it has not been published either completely or substantially in part elsewhere. Initial assessment led to select five manuscripts for peer review and improvement. The comments and suggestions received under the blind review process resulted into three manuscripts only. Finally, the editorial board could consider the publication of only two manuscripts based on final revision and editing by the respective authors, namely, Investment Cashflows Sensitivity in Nepalese Enterprises: A GMM Estimation Approach; and Effect of Macroeconomic Variables on the Money Supply in Nepalese Economy.

The contribution and support of all stakeholders who played the key role in publishing this volume is duly acknowledged. It is believed that this volume will provide the readers at least some new insights in the area of securities markets of Nepal thereby inspiring the researchers, academicians, practitioners and policy makers to contribute in the respective field.

Editor-in-chief
September 2023

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Investment Cashflows Sensitivity in Nepalese Enterprises: A GMM Estimation Approach

KAPIL DEV SUBEDI, PhD[1]

ABSTRACT

The main objective of this study is to test the investment cashflows sensitivity of Nepalese firms after controlling the effect of Tobin's Q and assets tangibility. It assesses the robustness of investment cashflow sensitivity (ICFS) evidences by using dynamic panel regression viz; Generalised Methods of Moments (GMM) estimation approach to address the endogenity issues dominantly stressed in various econometric models. The data comprises the accounting observations (n=256) obtained from the annual reports of 16 non-financial companies listed in Nepal Stock Exchange Ltd. The estimation results confirm the robustness of investment-cashflows sensitivity in investment decisions of Nepalese firms under the both; Tobin's Q approach and accelerator approach. The result indicates the detrimental effect of financing constraints on firm's investment decisions, particularly when their internal cashflows are depleted. This confers a crucial implication, which is the existence of financial market frictions resulting adverse effect on firm's investment activities. Such frictions need to be alleviated to induce investment finance for businesses.

JEL Classification:
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Keywords:
Financing Constraints
Investment-Cashflow Sensitivity
Tobin's Q
Tangibility

I. Introduction

Since early periods, research on real investment and growth has been a central idea in development literatures. Extensive evidences from growth empirics demonstrate that "investment in capital goods is one of the most robust determinants of cross-country growth" (Levine and Renelt, 1992; Durlauf and Quah, 1999). Through the decade of 1990s and later, developing countries have widely adopted liberalisation and deregulation policies, with the private sector assigning a leading role in capital formation and real investment activities in driving economic growth. As a result,

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many studies in these developing countries have appealed the interests of scholars to investigating the behaviour of private investment (Guncavdi, Bleaney and Mckay, 1998).

In a market economy, specifically when firms compete freely to determine production and prices, the investment decisions made by these firms can be understood through the prices indicated in the capital markets. This means that firms invest in new capital when the market price of existing assets is significantly higher than the cost of replacing them, and vice versa. As a result, the fluctuations in investment demand in a market economy can be entirely explained by the expected future profitability of these capital (Peterson and Lewis, 2005). Therefore, at the firm level, investment decisions primarily depend on the expectations of managers regarding future profitability, and these decisions are driven by the goal of maximising shareholders' value. Early investment theories, therefore, held the belief that the rate of change in investment at the firm level is determined by the managers' expectations of future growth, which can be captured using the net present value (NPV) rule of capital budgeting.

However, the expected future profitability as a sole determinant of a firm's investment decisions holds true only in efficient financial market as postulated in Modigliani and Miller (1958) prototype. In real world, such an efficient capital market is non-existent. Various factors contribute to market imperfections, such as taxes, transaction cost, bankruptcy costs, information cost, agency cost, financial repression cost as well as issues related to irreversibility, uncertainties and business cycle risk, etc. These factors have been examined by different studies (Williamson, 1981, Myers and Majluf, 1984; Bernanke and Gertler, 1989; Cleary: 2006; Chen and Chen, 2012; Garcia and Gomez, 2019, etc.) in various countries and they conclude that all of these frictions result in increased cost associated with external capital (supply side constraints of finance) and cause the firms to be reluctant in investing even in projects with positive NPV.

When supply side constraints; mainly caused by external finance premiums, significantly impact the capital markets, the conventional NPV rule of investment loses its relevance. Instead, internal cashflows of the firm take on a crucial role as the primary determinant of investment decisions. In their seminal work, Fazzari, Hubbard and Peterson (1988), hereafter FHP (1988), proposed a theoretical model

that postulated an investment-cashflow sensitivity (ICFS) hypothesis, which could be relevant in a capital market characterised by complete information asymmetry and adverse selection problems. While empirically testing their hypothesis, they found that firms, even in highly industrialised countries, face constraints in accessing external capital, leading them to heavily rely on availability of internal cashflows for their investment. They also argue that during market slowdowns, firms experience a decrease in net worth, further exacerbating the adverse effects on their investment due to the unavailability of external finance.

Subsequent to FHP (1988), numerous studies (Gilchrist and Himmelberg,1995; Rajan, 1991; Kaplan and Zingales,1997; Cleary,1999; Shen and Wang, 2005; Almeida and Campello, 2007; Hovakimian and Hovakimian, 2009; George, and Qian 2011; Gautam and Vaidya, 2018) have tested the ICFS hypothesis in diverse economies. The findings have mixed results. For example; Rajan (1998) finds that investment is more sensitive to internal liquidity even to bank networked firms in German. Shen and Wang (2005) studies the ICFS of Taiwanese firms and the results show that investment is less sensitive to cash flow when a firm has a strong bank relationship. By contrast, when a firm has a weak bank relationship, the investment is sensitive to cashflow. Almeida and Campello (2007) tests investment–cash flow sensitivities of firms assuming that it should be increasing in the tangibility of firms' assets, only if firms are financially constrained. The results reinforced the prominence of assets tangibility in investment cashflow sensitivity of financially constrained firms. Though many studies report a consistent result indicating ICFS as a measure of financing constraints, some of the studies reject it. For example; Gilchrist and Himmelberg (1995) and Hovakimian and Titman (2006) argue cash flow is a noisy measure of firms' liquidity, and ICFS may not be the true measure of financing constraint in imperfect market. In a study of industrial sector's firms of India, Gautam and Vaidya (2018) finds varying degree of ICFS among the firms according to their differential financing status. In sum, most of the prior empirical evidences confirm the positive role of internal cashflows in stimulating their investment decisions. Moreover, these studies have indicated that if a firm faces internal financing constraints, capital markets are not efficient enough to finance the profitable investment opportunities resulting in under investment or suboptimal investment outcomes.

Though numerous studies have investigated the investment cashflows sensitivities in several countries, most of the studies have been conducted with a focus on developed countries such as USA, Japan, Germany, Spain, Canada. Nevertheless, the results of those studies are mixed and they might be attributable to the different analysis methods and the countries' financial markets in which industrial sectors operate. Furthermore, there is a lack of consensus among the prior studies regarding the approaches and methods used to determine investment cashflows sensitivities (ICFS). In contrast, there have been very few studies that specifically explore the investment cashflow sensitivity in the context of emerging markets, particularly in Nepal (Pradhan and Kurmi, 2004; Subedi, 2017). Most importantly, Nepalese capital markets are characterised by problems noted with corporate governance, transparency and disclosures seriously dented, run with relatively weak contract enforcement and regulatory mechanisms, dominated with banking sectors companies and less diversified to real sectors (Koirala and Bajracharya, 2004). In such a market, firms seeking to finance new project possibly will face constraints from the investor's side. For example, a growth firm might be unable to finance its investment fully with its existing cashflows, leading to internal financing constraints. Moreover, Banks and debt-holders may impose restrictive covenants and demand high collateral particularly to protect against the risks of bankruptcy, resulting in debt constraints that impede the firm's borrowing capacity. Furthermore, equity markets may be affected by agency and asymmetric information problems, leading to equity constraints.

Considering the distinctiveness of Nepalese capital markets, this study aims to analyse the investment cashflows sensitivity of Nepalese firms controlling the effect of Tobin's Q (a proxy for investment opportunity). The key objectives of this study are to test the investment cashflows sensitivity of Nepalese firms and to see whether the financing constrains affect the ICFS or not. Additionally, the study pursues to explore how the consistency of investment cashflows sensitivity is influenced by a firm's debt capacity and tangibility as moderating factors. In methodological approach, it extends the investment cashflow literatures by using dynamic panel regression model (GMM) to address the endogeneity issue dominantly stressed in investment modeling.

The rest of this paper has been organised as follows. Section II provides the

review of literature on investment-cashflow sensitivity and its determining factors in industrial sector. Section III describes the methodology used in the study. Section IV presents the results and discussion. The conclusion and implications of research are incorporated in Section V.

II.Literature Review

There are several theories explaining the effect of capital market imperfections on firms' investment decisions. These theories can be categorised into “macro” and “micro" concerns regarding investment demand. The “macro” concern relates to cyclical variations in investment due to business cycle fluctuations, which are largely explained by market-based indicators of expected future profitability or the user cost of capital (Bernanke and Gilchrist, 1995). In contrast, “micro” concern borrows the idea of informational asymmetry in insurance and credit markets and applies it to investment decisions (Hubbard, 1998). Within this micro view, two significant frictions wedge the gap between the cost of internal and external finance. Firstly, informational asymmetry between borrowers and lenders increases the problem of adverse selection, where external suppliers of funds cannot distinguish between bad and good borrowers. To compensate with such “lemons”, lenders may require “premium”, thus increasing the cost of external funds. Another episode of "micro" concern is the incentive design problems in corporations. It is related to the use of funds by firm insiders or managers for the purposes other than the value maximising goals of shareholders. To cope with such incentive problems and control managerial actions to prevent moral hazards, the external investors demand a higher rate of return in their investment, resulting in external finance being more costly than internal capital (Townsend, 1979). These two “micro” concerns are most pervasive and critical frictions in a firm's investment decisions, leading to increased reliance on internal cashflows due to the higher costs associated with external finance.

The study by FHP (1988) is ground breaking in investment cashflow research, as it is the first of its kind to examine the influence of financing frictions, such as informational asymmetry and moral hazards problems, in causing adverse effects on investment decisions and resulting higher investment cashflow sensitivity. The study argues that the sensitivity of investment to internal funds should increase with the wedge between the costs of internal and external funds (*monotonicity hypothesis*).

The study reveals that financing frictions give rise to "financing hierarchies" among firms, leading to varying investment decisions based on whether internal or external finance is used. These results are found true even to large firms, particularly during tough periods. Hence, the results provide an empirical support to the existence of financing constraints among the large sections of the US firms and such constraints have implications in firm's investment decisions.

A number of articles, however, questions the sorting approach used by FHP (1988) to identify the level of financing constraints of firms. Kaplan and Zingales (1997) argues that the monotonicity hypothesis is not a necessary property of optimal constrained investment, and report new evidence that contradicts Fazzari et.al.'s findings. Cleary (1999) finds least ICFS among unhealthy and financially constrained firms and concludes that such behaviour of unhealthy firms could be attributed to their tendency of building financial slack for long-term value. Similarly, Sen and Wang (2005) attributes to a firm's strong bank relationship as a moderating factor that could change the firm's investment behaviour associated with internal cashflows. Erickson and Whited (2000), Gomes (2001), and Alti (2003) further show that the results reported by Fazzari et.al. are consistent with models in which financing is frictionless.

Almeida and Campello (2007) supports the financing constraints hypothesis of investment decisions and empirically discloses the intervening effect of tangibility (collateral) to alleviate the information problem in financial markets and induce investment decisions even in the crisis of internal cashflows. Chen and Chen (2012) on the other hand questions the investment cashflow sensitivity as a measure of financing constraints and ruled out the claim of decline of investment cashflow sensitivity due to deepening of financial markets. Analysing the data of the Vietnamese listed firms, Tran and Le (2017) finds that financial conditions of the market affect investment behaviour only for the firms with negative cash flows, which implies that better financial conditions alleviate the financing constraints and also the sensitivity of investment to negative cash flow. This study also suggests that this effect is greater for larger firms and firms without state ownership.

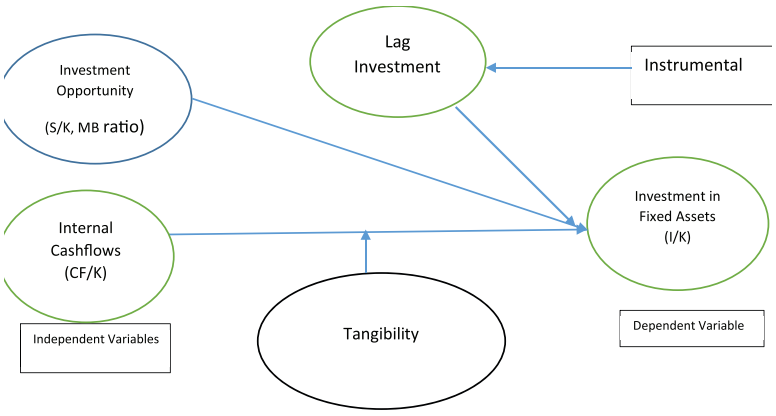
Gautam and Vaidya (2018) investigates the investment- cashflow sensitivity of Indian manufacturing companies stressing more on ex-post firm splitting criteria. In their view, liquidity constraints have considerable evidence to explain the

behaviour of corporate investment in India. It displays that the investment cashflow sensitivity (ICFS) is not consistent measure related to firm creditworthiness. A monotonic pattern can only be observed in ICFS if the sample splitting criteria impose more restrictions that are likely to exclude more firms classified as non-sensitive. It also indicates that the investments of non-sensitive ICFS companies are mostly funded by external capital. Non-sensitive firms invest heavily regardless of the availability of cash flow. Moreover, investments of positive ICFS companies are high cash flow sensitive as compared to other two groups. These findings seem to have some support for both Fazzari et.al. (1988) and Kaplan and Zingales (1997) perspectives.

Gupta and Muhakad (2019) examines the impact of financial development on corporate investment in terms of their influence on financing constraints and investment-cashflow sensitivity across the size, degree of financial severity and group affiliation of the firm. In this study, it is found that the Indian firms are revealed investment cashflow sensitivity supporting the financial constraint hypothesis. However, such sensitivity is reduced along with the increment of financial development specifically for small sized and standalone firms.

Hence, on the basis of plethora of literatures discussed so far, the conceptual framework of this study can be articulated as displayed in figure 1.

Figure I: Research Framework



Source: FHP (1988), Cleary (2006) and Almeida and Campello (2007)

III. Research Methodology

This study is based on quantitative information obtained from financial statements of Nepalese non-financial firms. Hence, it follows the quantitative approach using descriptive and causal comparative research design. Secondary data are used for empirical testing for the firm's investment cashflows sensitivity. Majority of Nepalese listed companies comprises from banking, finance and insurance sectors. However, these companies are excluded from study because the nature of their investments is different from nonfinancial firms. Hence, this is primarily based on sample study of Nepalese listed companies from non-financial sector of economy that comprises manufacturing, hotel, hydropower, telecom and trading sector firms (N=62). Initially, all non-financial firms are considered for sampling, but those with missing observations on study variables for at least five consecutive years during the study period (1999/2000 to 2019/20) are excluded. Under this selection criteria, the final sample, thus constitutes an unbalanced panel of 262 firm-year observations representing 16 non-financial firms (n=16). Therefore, the sample size can be regarded as 24.61 percent of total population from non-financial sector listed companies. The sector of business, number of firms and number of observations that constitutes this study is presented in table I.

Table I
Sampling Frame and Sample of Study

S.N.	Sector	Sampling Frame (No. of Listed Firms)	Sample (No. of Firms)	No. of Observations
1	Manufacturing and Processing	19	6	104
2	Hotel Sector	4	3	58
3	Hydro Power	35	5	65
4	Trading Sector	4	1	20
5	Utility Sector	1	1	15
6	Total	63	16	262

This study follows the Generalised Method of Moments (GMM) approach. GMM is considered to have its ability to overcome the unobserved heterogeneity and endogeneity effect of independent variables along with instrument effect of lagged dependent variables. Endogeneity is the common problem in econometric estimation when financing frictions are taken as augmented variable in Q model

of investment. Tobin's Q mostly used as market opportunity of investment also suffers from measurement error when capital market fails to correct valuation of the firm. In sum, endogeneity is the condition of correlation of error term with explanatory variable like cashflows or in SEM correlation of two error terms with each other. Such a bias can therefore cause inconsistent coefficients and leads to wrong inferences. Mismeasurement, simultaneity and omitted variables bias are the common form of endogeneity. Therefore, only addressing these issues in statistical approach could fetch an unbiased result.

Arellano and Bond (1991) and Blundell and Bond (1998) have advanced the GMM models in investment equation that are considered to resolve the endogeneity issue in dynamic panel data regression. The casualty is not the steady concept rather it is dynamic over underlying phenomena. For instance, it is not only the current period cashflows that affect current investment, but rather the previous period's cashflows could also play equally important explanatory effect on investment. GMM approach has allowed to include the lags of the investment variable as an additional explanatory variable which is expected to use as instruments to control such endogenous relationship. This internal instrument is used to resolve this endogeneity under the existing econometric model (Roodman, 2009). In panel data, the GMM model reports consistent results under the different sources of endogeneity, viʒ, "unobserved heterogeneity, simultaneity and dynamic endogeneity". In earlier studies, however, only two lags of the dependent variables are considered sufficient to resolve the issue of endogeneity (Schultz et.al, 2010).

The GMM model internally transforms the data in which a variable's past value is subtracted from its present value (Roodman, 2009). This process of "internal transformation enhances the efficiency of the GMM model" (Wooldridge, 2012). Moreover, two kinds of transformation are proposed, viʒ; first-difference transformation known as one-step GMM and second-order transformation also called as two-step GMM. However, the one-step GMM has some restrictions. One step GMM could yield the loss of too many data (Roodman, 2009). To prevent such information loss, Arellano and Bover (1995) has suggested two-step GMM in which instead of differencing previous to current value, it subtracts the average of all future available observations of a particular variable (Roodman, 2009) so it is also called 'forward orthogonal deviations' that results 'more efficient and consistent

estimates for the involved coefficients' (Arellano and Bover, 1995).

Considering the nature of dynamic panel-data model, this study includes lagged value of dependent variable as regressors. In a simple model with one lag of the dependent variable 'Y' as a regressor and a vector of strictly exogenous regressors, X_{it} takes the following form;

Yit = ρyit−1 + βxit + ui + €it …….....……(1)

In equation (1), being regressors xit is assumed to be independent of error term ui, it can take either a fixed- or a random-effect term. Even though the error terms are assumed to be independent and identically distributed (*i.i.d.),* both the fixed and random effects model would produce inconsistent and bias estimators when y*i,t−1* and u*i*, the both are included in equation (1). On the other hand, OLS estimator also produces the inconsistent results since the lagged variable as regressor will be correlated with the error terms.

To overcome these issues of endogeneity, this study has adopted the system GMM estimator suggested first by Arellano and Bond (1991) and later by Blundell and Bond (1998). Bond et al. (2003), Brown et al. (2009), and Almeida and Campello (2007) who have also used this approach. This method is considered appropriate to deal with three important issues as follows;

First, in dynamic panel data, within fixed effects model will be biased if time period is relatively few. Second, most of the financial variables in equation (2) like investment, cashflows and Q are possibly endogenous and require to use instrumental variable. Finally, "when adjustment costs are high, firms may smooth investment in response to transitory shocks to cash flow, potentially obscuring the long-run relationship between investment and cash flow" (Brown and Peterson, 2009). Hence, in this case, GMM method is applied following Arellano and Bond (1991) and Blundell and Bond (1998) as follows;

I/Kit=*β*0+β1(S/Kit)+β2(CF/Kit)+L.(I/Kit)+*αi*++€it….....….(2)

In the given equation, L.(I/Kit.) is the one period lag operator (i.e., previous years investment), **(S/Kit)** is the variable proxied for investment opportunity, **(CF /Kit)** is the cashflows of the firm 'i' at period 't', α*i* is the unobserved firm effect or time invariant operator and €it is the error term. The number of period of lag in (I/K)

variable under Arellano and Bond (1991) estimation depends on the significance level of serial correlations of (AR1) and (AR2). Similarly, the Sargan test statistics are used to examine the validity of overidentification restrictions of model.

Following Almeida and Campello (2007), tangibility variable is also added in regression equation. The priori considers that the cash flow sensitivity to investment will be negative to tangibility particularly when firms fall in financially constrained status, that is, higher tangibility will result lower financing constraints and vice versa. Equation (3) is estimated to capture the investment function of a firm at period t.

I/Kit =β0 + β 1(S/Kit) + β 2 (CF /Kit) + β 3 L. (I/Kit) + β4Tangibilityit +αi+ €it ……..….(3)

Alternatively, this study has also used investment opportunities as proxied in Tobin's Q as a control variable for investment cashflow sensitivity. Therefore, in equation (4), it is estimated the investment function by using M/B ratio (Tobin's Q) as proxy for investment opportunities. The estimated equation has been specified as under;

I/Kit =β0 + β 1(Q) + β 2(CF/Kit) + β 3(I/Kit)+ β4Tangibilityit +αi ++ €it …….....… (4)

Based on literature review and research methodology discussed, the description of various explanatory variables and their roles and significance for modelling has been prescribed in table II.

Table II
Explanatory Variables

Major Variables	Definitions/ Proxies	Expected Sign	Prior Studies
CF/K	Operating cashflows scaled by beginning of period capital	+	Fazzari et. al (1988), Kaplan and Zingales (1997), Cleary (2006)
Q	Year-end market price of equity per share divided by book value	+	Bernanke and Gilchrist (1995), Sen and Wang (2005), Chen and Chen (2012)
S/K	Sales revenue of the firm during the year divided by beginning of period capital stock	+	Erickson and Whited (2000), Gomes (2001), Alti (2003), Gautam and Vaidya (2018)
Tang.	Net book value of fixed assets divided by total assets	+	Almeida and Campello (2007), Gautam and Vaidya (2018)
L. inv.	Lags of the investment	+	Almeida and Campello (2007), Gupta and Muhakad (2019), Chen and Chen (2012

IV. Results and Discussions

Table III presents the descriptive statistics of investment, cashflow, tangibility and sales variable. It reports that the annual average investment to capital ratio (I/K) of sample firms is 14.67 **percent**. This figure is just 7.3 **percent** more than average rate of depreciation of sample companies. It suggests that average rate of fixed capital formation of sample firms is 7.37 **percent** merely. Interestingly this figure varies across the cross section of firms. The bottom 25th percentile of firms invests less than their average annual rate of depreciation but top 75th percentile of firms has higher rate of investment in comparison of their annual depreciation rate. Overall, the fixed investment rate of enterprises is not so encouraging.

Table III
Summary Statistics

Table III reports descriptive statistics for a sample of 16 non-financial Nepalese firms listed on NEPSE over the study period of 2000-2020. The dependent variable is I/K and is equal to change in net fixed assets plus depreciation divided by beginning of period net fixed assets. Q is measured by the M/B value ratio. Cashflow is the ratio of net income plus depreciation to beginning of period net fixed assets. Sales is the ratio of sales revenue divided by beginning of period net fixed assets. Leverage is the ratio of total debt to total assets. Tangibility is the ratio of fixed assets to total assets.

Variables	Mean	Std. Dev	P25	P50	P75	N
I/K	0.14675	0.1545	0.0194	0.0875	0.2470	244
S/K	2.3854	2.5057	0.3980	1.3384	3.6816	245
CF/K	0.3225	0.2762	0.1152	0.2573	0.4469	245
Q	2.5586	1.4710	1.4218	2.5291	4.1944	205
Tang.	0.695	0.1873	0.5422	0.7206	0.8507	262

Sales is the independent variable and it proxies for investment opportunities. Average sales of sample firms are two and half times more than their net fixed assets. Market to Book value ratio is the measure of investment opportunity and it is the proxy for Tobin's Q. Value of Q is 2.55 times showing the financial valuation of firm in market is more than its replacement cost. Leverage measure the indebtedness and financial risk of Nepalese enterprises. It shows the average debt level of the firms is 51.62 **percent** of their total assets.

Table III also reveals that in any given year, first 25th percentiles of firms do invest in plant and equipment very meager viz; 1.93 percent of their capital stock.

This figure is 8.75 **percent** for median firms and 24.7 **percent** for 75th percentile of firms. Surprisingly the bottom 25th percentile of firms have only 11.5 percent of their cashflows to fixed assets ratio in contrast to top 75th percentile which have 44.69 **percent** of cashflows to fixed capital formation. Overall, the investment rate of firms is distinctive to each other indicating that investment depends more on other variables with heterogeneity of firm's attributes by their level of internal cashflows and investment opportunity.

Table IV displays the matrix of correlation coefficients among the investment, cashflows, tangibility, and investment opportunity variables particularly of those that are used in subsequent regression analysis. There are several positive and significant correlations between investment and independent variables including 0.396 with cashflows (CF/K), and 0.189 with Market to Book ratio (Q). The observed relationship supports the importance of cashflows and investment opportunity (Q) in investment decisions. The firms with better cashflows and investment opportunities tends to improve its investment in fixed assets.

Table IV
Correlation Matrix

Table IV reports correlation coefficients of investment and cashflow variables for a sample of 16 non-financial Nepalese firms listed on NEPSE over the study period of 2000-2020. The dependent variable is I/K and is equal to change in net fixed assets plus depreciation divided by beginning of period net fixed assets. Q is measured by the M/B value ratio. Cashflow is the ratio of net income plus depreciation to beginning of period net fixed assets. Sales is the ratio of sales revenue divided by beginning of period net fixed assets. Tangibility is the ratio of fixed assets to total assets.

Variables	(1)	(2)	(3)	(4)	(5)
(1) I/K	1.000				
(2) S/K	0.131**	1.000			
(3) CF/K	0.396***	0.594***	1.000		
(4) Q	0.189***	0.082	0.319***	1.000	
(5) Tang.	-0.194***	0.327***	-0.185***	-0.152**	1.000

***, **, * represents coefficients are significant at 99%, 95% and 90% respectively. (2- tailed)

Firm's investment decision is correlated with market to book value ratio (Tobin's Q), sales and cashflows significantly. It is noticed that the relationship between these variables is positively strong and statistically significant. However,

collateral (tangibility) variable is negatively related with investment. These results do not support the role of tangibility, i.e., debt capacity in investment spending of firms.

In order to provide more concrete evidence that mismeasurement in investment opportunity as captured in Q or Sales/K is not explaining the cashflow results, it attempts to experiment with unbiased statistical techniques that produce consistent cashflow estimates even when such mismeasurement is prevalent. One of such experiment techniques belong to the approach of Almeida and Campello (2007). It estimates the baseline investment model using a GMM estimator that uses lagged investment variable as an internal instrument for investment opportunity. In estimating this instrumental variable model, it has been used the system GMM estimator proposed by Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998) respectively where differenced regressors are instrumented by their lagged levels.

An obvious feature of this empirical model is the improvement of estimators that might be suffered in mismeasurement of investment parameter due to endogeneity of lagged dependent variable. The recent evidence of Agca and Mozumdar (2017) also proposes the instrumental GMM estimator as one of the best empirical models. The findings are reported in table V. The joint significance of model is tested with Wald Statistics. Smaller P-Value (<0.05) suggests that the model is found appropriate under system GMM estimator upon which the analysis is performed. The results based on Q models reports that cashflows **(ß=0.277)** and tangibility **(ß=0.153)** are found positively significant, while M/B ratio**(ß=0.0021)** is positive but insignificant in the system GMM estimation. The results based on sales-based accelerator models reports that cashflows **(ß=0.29)** and tangibility **(ß=0.176)** are found positively significant, while sales coefficient **(ß=-0.0013)** is found negatively significant in the system GMM estimation. The lag investment variable is positive but not significant. As per priori, cashflows and tangibility, both are positive and statistically significant. It suggests that the investment decisions are not only sensitive to cashflows but also to the availability of collateral or debt capacity of the firms. Meanwhile, the coefficient of tangibility is robust and positive in both models of GMM estimation. Cashflow coefficients in both of the models are large and signifying its non-trivial role in explaining investment decision of

Nepalese enterprises.

Table V
Estimation results of investment reported under GMM equation approach

Table V represents the system GMM-Arellano and Bover (1995), Blundell and Bond (1998) approach regression results of investment regressed on sales, Tobin's Q, cashflows, tangibility, and lag investment variables to address endogenity problem as specified in dynamic panel model. AR1 and AR2 represent Arellano and Bond test (1991) for autocorrelation in first difference errors. Sargan test for the over-identifying restriction is also highlighted in the table.

Investment/K	Q Model		Accelerator Model	
	Coefficient	Std. Errors	Coefficient	Std. Errors
Lag Investment	0.06063	(0.0803)	0.05505	(0.8222)
Cashflows	0.27714 ***	(0.0473)	0.29635***	(0.0450)
Tangibility	0.15300***	(0.0679)	0.17637 **	(0.0742)
M/B Ratio (Q)	0.00214	(0.00726)	-	-
Sales	-	-	-0.00135***	(0.0057)
AR1	0.008	-	0.001	-
AR2	0.715	-	0.595	-
Wald Chi2 (P-value)	0.0000		0.0000	
Sargan Test of Overid. Restrictions	0.270	-	0.509	-
Sargan Test of Exogeneity	0.354		0.325	
No of Groups	16		16	
No of Observations	208		226	

***, **, * represents coefficients are significant at 99%, 95% and 90% respectively. (2- tailed)

Furthermore, model diagnostic tests are performed by using Arellano and Bond (1991) test; also known as AR(1) and AR(2) tests for testing first order and second order serial correlation. In both of the models AR (1) and AR(2) are statistically significant. The p-value of first order serial correlation accepts the null since it is less than 5 percent while AR (2) rejects the null. AR(2) greater than 0.05 means that the second lag of investment is appropriate endogenous regressor in the given equation. AR(1) and AR(2) shows the significance level of the null hypotheses

where Ho is assumed as no autocorrelation in first differenced errors of the first order and second order test respectively. The p-values for AR (1) and AR (2) in Q model are reported 0.008 and 0.715 respectively; these values prevent the rejection of the null hypothesis for AR (2). The same is the case of accelerator model as well. Sargan test also fails to provide any evidence of overidentification restrictions, with p-values of 0.270 and 0.509 for Q and accelerator model respectively. Lastly the Sargan test of exogeneity of instrument subsets like cashflow, sales and tangibility accept the null (since Ho is assumed exogenous) since p- values are more than 5 percent in both models. Sargan test of overidentification restrictions confirms that the both models are not weakened by many instruments since the P-values are more than 5 percent.

V. Conclusion and Implication

Firm's investment is positively correlated with sales, Tobin's Q and cashflows and all these coefficients are statistically significant. However, tangibility is negatively correlated with investment. It shows that the firm's sales, MB ratio and cashflows have some properties to explain the investment ratio. More importantly, when the firms internal cashflows improves significantly, the firm's investment ratio also increases adequately. These results support the findings of Fazzari (1988), Chen and Chen (2012) and Gautam and Vaidya (2018), among others.

In econometric analysis, Generalised Methods of Moment approach was applied. On estimating the factors determining the firm's investment decisions, it is found that cashflows is the robust determinant of investment in Nepalese companies. In the study of FHP (1988), Q is negative for financially constrained firms but are positive and significant for other two classes of not-financially constrained firms. However, in this study, the regression results of Market to Book (Q) ratio and Sales to Capital (S/K) ratio taken as a proxy for investment opportunities (IOs) are mixed and inconclusive. Equally, the coefficient of lag investment to capital ratio as an instrumental variable in GMM estimator is positive but insignificant. Results of tangibility variable is found significant and positive that supports the findings of Almeida and Campello (2007).

The large cashflow coefficients in both models indicate the enforcing role of financial factors in firms' investment decisions. Fundamentally, larger cashflow coefficient means more frictions prevalent in financial markets that impedes

firms to raise external capital for investment. Prior research, such as the works of Erickson and Whited (2000), Gomes (2001), Alti (2003) and others, emphasised the importance of carefully selecting parameters in ICFS studies. The previous studies raise concerns that the cashflow coefficients during the current period might be correlated with future profitability, leading to distorted results. To check the robustness of results over different estimation techniques, the additional parameters like tangibility and lag investments are also regressed jointly in GMM estimations, but the cashflow coefficient results were not dissimilar in any cases.

The series of tests undertaken in this study consistently displayed the robustness of investments cashflows sensitivity of Nepalese firms. These results support the capital market imperfection hypothesis on firms' investment behaviour. It provides support for earlier studies that claims investment–cash flow sensitivity as a consistent measure of a firm's financial constraints. Nevertheless, to the extent of observing positive and significant investment–cash flow sensitivity for all firms, it can still be argued that financing still remains one of the reasons to restrict the investment demand of Nepalese enterprises. Thus, central bank should be aware of this aspect and be prepared to reframe its monetary policies to address the financial market imperfections which will help to alleviate investment constraints for businesses. To extend this line of enquiry, the future research can develop a potential approach that would involve categorising firms into two groups; financially constrained and unconstrained. Through a comparative analysis of the variation in investment cashflow sensitivity between these two groups, a more profound understanding of financial market frictions and their influence on investment could be gleaned.

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Effect of Macroeconomic Variables on the Money Supply in Nepalese Economy

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ABSTRACT

This study examines the effect of macroeconomic variables on the money supply in Nepalese economy. Money supply is the dependent variable. The independent variables are GDP, inflation, exchange rate, deposit interest rate, lending interest rate, import and export. The study is based on time series data for the period from 2000/01 to 2019/20. The correlation coefficients and regression models are estimated to test the significance and importance of different macroeconomic variables on money supply in Nepalese economy. The result shows that GDP growth rate, deposit interest rate, inflation, export and exchange rate have a positive impact on money supply. It indicates that higher the GDP growth rate, deposit interest rate, inflation, export and exchange rate, higher would be the money supply. Similarly, the result shows that lending interest rate has a negative impact on money supply. It indicates that increase in lending interest rate leads to decrease in money supply.

JEL Classification:
E20, E50, E31

Keywords:
Money Supply
Gross Domestic Product
Inflation
Exchange Rate
Interest Rate
Balance of Payment.

I. Introduction

Money supply plays a crucial role in an economy and holds significant importance for various economic agents, financial markets, and policymakers. Central bank (Nepal Rastra Bank in Nepal) uses money supply as a key tool for implementing monetary policy. By adjusting the money supply, central bank can influence interest rates, inflation, and economic activity to achieve specific policy objectives like price stability, economic growth, and full employment. An appropriate level of money supply is essential for controlling inflation. If the money supply grows too rapidly, it can lead to inflationary pressures as there is more money chasing the same amount of goods and services. Conversely, insufficient money supply growth can

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result in deflationary pressures, which can be detrimental to economic growth. All the countries around the world have carried out macroeconomic regulation through monetary and fiscal policies to promote national economy and making it stable and healthy. Through monetary policy, the government can handle the relationship among maintaining steady economic development, adjusting economic structure and managing inflation expectations. Using instruments of monetary policy affecting intermediate targets and through changing intermediate targets, monetary policy achieves final targets. Intermediate target of monetary policy, money supply, has a very important role in macroeconomic regulation (Jing-Xin and Yuan, 2012). Additionally, the supply of money can be regulated through changes in liquidity ratio as well as money outside the bank (in the hands of the non-bank public) through the bank discount rate. Changes in the banks' discount rate affect the money supply by affecting the volume of discount loans and the monetary base. A rise (fall) in discount loans increases (reduces) monetary base and expands (shrinks) money supply in the economy (Onwumere *et al*., 2012).

According to Jhingan (2008), an alteration in the level of economic activities that affect the desire of the economic agents in terms of currency holding in relation to the deposits determines the supply of money. Shirvani and Bayram (2014) analyses the determinants of money supply in the United States (US). The study establishes that excess reserve and currency ratios are important determinants of money supply in the US. In India, Lodha and Lodha (2012) assesses the money multiplier and high-powered money as the determinants of money stock. The study shows that the high-powered money and money multiplier positively contributes to the growth in money supply between 1981 and 2012. In Bangladesh, Muhammad and Islam (2010) empirically examines the money stock function using Ordinary Least Square (OLS) approach. The study establishes that the bank rate, financial liberalisation and external resources control the level of money stock. In Ghana, Sanusi (2010) assesses the determinants of money supply. The study suggests that prior to the 1990s, fiscal deficits determine money supply. However, in the aftermaths of the 1990s, the banks net foreign assets are the major determinant of the supply of money. In Nigeria, Odior (2013) analyses the supply of money. The study adopts a time-series GMM model. The study presumes that broad money supply depends upon changes in monetary base and the money multiplier. The results reveal a positive but partially stable relationship between the base money

and money supply, and money multiplier and money supply. Bakare (2011) assesses the supply of money determinants with its impact on inflation. The study suggests that credit to the private individuals or sector is a positive determinant of money supply. Moreover, Chigbu and Okorontah (2013) explores whether the supply of money is exogenous. The study confirms that the real income and the interest rate co-integrate with the supply of money. The study also shows that the money stock is controlled endogenously through a change in the level of real income, real rate of interest and value of money.

Ahmed and Mortaza (2010) finds that in the short-run, changes in the money supply seem to affect real variables like GDP and employment levels because of price-rigidity (price-stickiness) and imperfect information flow in the markets. Rasheed (2011) reveals a negative and significant effect of money supply on economic growth. Similarly, Nwankwoeze (2010) finds that there is a negative relationship between money supply and economic growth. Ahuja (2010) explains that money supply as the total stock of monetary media of exchange available to the society for use in connection with the economic activities of the country. Moreover, Nouri and Samimi (2011) explores that the money supply is positively related to the economic growth of Iran. Ogunmuyiwa and Francis (2010) finds that the money supply has a positive impact on economic growth at 5 percent significant level. In addition, Anyanwu and Kalu (2015) examines the relationship that exists between money supply and economic growth. The study shows that change in money supply (M2) has a significant effect on output in the Nigerian economy. The study also shows that there are significant strong multiple correlations among Real GDP, money supply and commercial banks' loans and advances. Furthermore, Omotor (2010) shows long-run positive impact of money supply on economic growth. According to Omoke (2010), M2 appears to have a strong causal effect on the real output as well as prices. Huang (2001) finds that money supply and mild inflation rate are the key determinants of high economic growth rate capable of creating employment opportunities, poverty reduction, higher per capita income and standard of living that culminate into economic development. Hussain and Haque (2017) shows a positive link between money supply and output. Zapodeanu and Cociuba (2010) finds that long run and short co-integration between money supply and gross domestic product. Adusei (2013) finds that there is negative impact between money supply and economic growth. In addition, Ihsan and Anjum (2013) finds that money

supply (M2) has a negative and insignificant impact on the economic growth of Pakistan. Furthermore, Hameed and Amen (2011) finds that growth in the money supply greatly affects GDP.

Ifionu and Akinpelumi (2015) finds that inflation has inverse and significant relationship with money supply (M2) and exchange rate (EXR) and all other variables such as gross domestic product (GDP) have a positive and significant impact on the money supply. Kenneth *et al*. (2016) shows that money supply and trade openness are significant determinants of real GDP. Furthermore, Marshal (2016) reveals that the money supply has negative impact on economic growth. Mansor (2005) finds a significant relationship between real GDP and money supply. Obaid (2007) shows that there is causal relationship between money supply (M2) and real GDP in Egypt.

In the context of Nepal, Rana (2020) examines the effect of inflation and money supply on output growth in Nepal. The study finds that money supply in Nepal leads to output growth in the long-run as well as short-run. However, inflation negatively affects the output growth both in the long-run and short-run. Mahara (2020) explores the relationship between money supply, inflation, capital expenditure and economic growth in Nepal. The study shows that there is a significant long-run positive relationship between money supply, capital expenditure, and growth. The study also reveals that, there is a unidirectional causation from money supply and capital expenditure to real economic growth in Nepal. Adhikari (2018) finds significant relationship among money supply, real GDP, inflation and balance of payments. Similarly, Bhusal and Silpakar (2011) finds that broad money supply has a positive impact on economic growth.

The majority of studies on this topic have used time series data, which limits the ability to draw causal inferences. A more rigorous approach would be to use a panel data set, which would allow for the control of unobserved factors that may affect both the money supply and the macroeconomic variables. Most studies have focused on a limited number of macroeconomic variables, such as inflation, interest rates, and GDP. It would be interesting to examine the effects of other variables, such as the exchange rate, deposit interest rate, lending interest rate, import and export. Despite significant research on the relationship between money supply and macroeconomic factors in developed economies, there exists a research gap in

the context of developing economies such as in Nepal. While studies in advanced economies have explored the impact of macroeconomic variables, such as inflation, output, and interest rates on money supply, there is a paucity of research focusing on the unique dynamics and challenges faced by developing economies.

The above discussion reveals that there is no consistency in the findings of various studies concerning the effect of macroeconomic variables on money supply. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted using more recent data.

The study attempts to address the inquiry on: What is the relationship between money supply and different macroeconomic variables; namely GDP, inflation, exchange rate (with USD), interest rate: deposit and lending, balance of payment, import and export? Do GDP, inflation, exchange rate (with USD), and interest rate: deposit and lending, balance of payment: import and export, have impact on money supply? And which factor plays the most important role in explaining money supply in Nepal?

II. Objectives of the Study

The main purpose of the study is to analyse the effect of macroeconomic variables on the money supply in Nepalese economy. Specifically, it assesses the relationship of GDP, inflation, exchange rate, interest rate, balance of payment on money supply in Nepal, examines the impact of different macroeconomic variables; namely GDP, inflation, exchange rate, interest rate, balance of payment on money supply in Nepal, and determines the factors that play the most important role in determining the impact of money supply in Nepalese economy.

III. Importance of the Study

Money supply growth is often associated with inflationary pressures. Understanding the effect of macroeconomic variables on the money supply can help identify the drivers of inflation and assist policymakers in maintaining price stability in the economy. The money supply affects investment and consumption patterns in an economy. Researching the impact of macroeconomic variables on the money supply can reveal how changes in these variables influence business investment

decisions and consumer spending behaviour and fluctuations in the money supply can influence exchange rates and international trade. Studying the relationship between macroeconomic variables and money supply can provide valuable insights into exchange rate management and its implications for a country's trade balance.

IV. Methodological Aspects

The study is based on secondary data which are gathered for 20 years from 2000/21 to 2019/20. The main sources of data include Economic Survey published by Ministry of Finance, World Development Indicator database of World Bank, and Quarterly Economic Bulletin published by Nepal Rastra Bank. The data are extracted for the money supply, GDP, inflation, exchange rate (USD), deposit interest rate, lending interest rate, export and import.

The Model

The econometric models employed in this study tries to analyse the determinants of money supply in Nepal. The dependent variable is money supply. The selected independent variables are gross domestic product (GDP), inflation, exchange rate, interest rate (lending rate and deposit rate) and balance of payment (export and import). Thus, the following model is designed to test the hypothesis.

$$MSit = \beta 0 + \beta 1\ GDPit + \beta 2\ INFit + \beta 3\ ERit + \beta 4\ DIRit + \beta 5\ LIRit + \beta 6\ BoPXit + \beta 7\ BoPMit + eit$$

Where,

MS = Money supply, broad money supply, is defined as the total value of money available in an economy at a point of time (M2), Rs. in Million.

GDP = Gross domestic product growth rate is measured by the change in nation's gross domestic product, in percent.

ER = Exchange rate is defined as the real exchange rate between the Nepalese Rupees against US currencies.

DIR = Deposit interest rate is the amount of money paid out in interest by a bank or financial institution on cash deposits, in percent.

LIR = Lending interest rate is measured by interest income from loans and advances as a fraction of total loans and advances, in percent.

INF = Inflation rate is defined as general increase in prices of goods and services over a period of time in Nepal, in percent.

BoPX = Balance of payment of export, Rs. in Million.

BoPM= Balance of payment of import, Rs. in Million.

The following section describes the independent variables used in this study along with formulation of hypothesis.

Gross Domestic Product

Gross domestic product (GDP) is the total monetary value of all the finished goods and services produced within a country's borders in a specific time period. Aslam (2016) examines the impact of money supply on Sri Lankan economy. The study finds that money supply is positively related to the GDP product of Sri Lanka. Similarly, Ifionu and Akinpelumi (2015) states that gross domestic product has a positive impact on money supply. Further, Ihsan and Anjum (2013) finds that money supply is positively associated with GDP growth. The study concludes that money supply needs aggressive control to boost the economy. Moreover, Marshal (2016) finds that money supply (proxy by M2) has a positive and significant linkage with real GDP in Nigeria. Based on it, this study develops the following hypothesis:

H1: There is a positive relationship between GDP and money supply.

Inflation

Inflation is the rate at which the value of a currency is falling and consequently the general level of prices for goods and services is rising. Chaudhry et al. (2015) examines the monetary policy and its inflationary pressure in Pakistan. The study shows that money supply is the main cause of inflation while any increase in interest rate is responsible for reducing inflationary pressure in Pakistan. Likewise, Ofori et al. (2017) shows that a long-run positive relationship between money supply and inflation in the context of Ghana. Moreover, Mbongo et al. (2014) states that money supply and exchange rate have significant positive impact on inflation in the context of Tanzania. Further, the study indicates that the current inflation can be influenced by the past state inflation. Inflation has a positive and significant

relationship with money supply (Nyong, 2001). Based on it, this study develops the following hypothesis:

H2: There is a positive relationship between inflation and money supply.

Exchange Rate

Exchange rate is the price of one currency in terms of another currency. Exchange rates are largely determined by the operations of demand and Supply. Akpan and Atan (2012) reveals that there is strong and direct impact of changes in the exchange rate on output. Similarly, Mpofu (2011) finds that money supply and exchange rates have a strong positive relationship. Levin (1997) shows that the money supply growth causes the exchange rate to either overshoot or undershoot. Cornell (1982) finds that announcement of an unexpected jump in the money supply is accompanied by an increase in interest rates and an appreciation of the dollar. Further, Megaravalli and Sampagnaro (2018) finds that exchange rate has a positive and significant relationship in long-run with money supply. Based on it, this study develops the following hypothesis:

H3: There is a positive relationship between exchange rate and money supply.

Lending Rate

Lending rate is measured by interest income from loans and advances as a fraction of total loan and advances. Beutler et al. (2020) analyses the transmission of realise interest rate risk to bank lending. The study concludes that bank lending is mainly driven by the banks' capital rather than their liquidity situation. The study also concludes that macro-economic factors such as inflation and money supply have negative relationship with lending interest rate. In addition, Ogunyomi (2010) examines the influence of broad money supply, minimum rediscount rate, liquidity ratio, exchange rate, and political stability on bank lending in Nigeria for the period 1975– 2009. The study reveals that broad money supply and political instability have negative and significant influence on commercial bank lending in Nigeria. Moreover, Bhattarai (2020) determines the commercial banks' lending in Nepal. The result shows that investment portfolio, cash reserve ratio and bank size have positive and significant effects on loan and advance. However, the macroeconomic variables such as money supply and inflation rate have negative relationship with the lending rate and loan and advance. Based on it, this study develops the following

hypothesis:

H4: There is a negative relationship between lending interest rate and money supply.

Deposit Interest Rate

Ebiringa and Ezeji (2012) finds that deposit interest rate has a significant positive impact on money supply. According to Athukorala and Sen (2003), inflation rate has positive and insignificant effect on total deposits. The study also shows a positive relationship between deposit interest rate and money supply. Moreover, Beck and Hesse (2009) finds a positive and significant relationship between deposits and interest rate margin. The study also shows a positive association between deposit interest rate, GDP and money supply. Furthermore, Masson et al. (1998) examines the private savings behaviour of industrial and developing countries. The study finds that GDP growth, real interest rate, and changes in the term of trades were positively correlated to savings and money supply. Based on it, this study develops the following hypothesis:

H5: There is a positive relationship between deposit interest rate and money supply.

Export

According to Lequiller and Blades (2006), the term export derives from the goods and services out of the port of a country. There exists a positive relationship between money supply and exports (Broll and Eckwert, 1999). Astuti et al. (2015) finds that export has a positive effect on the economic growth and money supply of the country. In addition, Huchet-Bourdon and Korinek (2011) finds that exports are more sensitive to changes in real exchange rate levels than their volatility. In addition, the study also shows positive relationship between money supply and export. Additionally, Alper (2017) shows that there is a significant positive relationship of money supply with the exports of high-technology, medium-technology, final and intermediate goods. Based on it, this study develops the following hypothesis:

H6: There is a positive relationship between export and money supply.

Import

Import is the value of all goods and services that has been transported in the country from the rest of the world. Acharya (2012) finds that export and import of Nepal is positively influenced by real GDP of trade partner countries and money supply.

Mutana et al. (2018) reports that GDP, terms of trade, trade liberalisation, money supply and FDI have significant and positive long-run relationship with trade balance. Further, Roy and Rayhan (2011) states that that Bangladesh's trade flows are significantly and positively determined by the size of Bangladesh's economy and its partners and money supply. Based on it, this study develops the following hypothesis:

H7: There is a positive relationship between import and money supply.

V. Results and Discussion

Descriptive Statistics

Table I presents the descriptive statistics of selected dependent and independent variables during the period of 2000/01 to 2019/20.

Table I
Descriptive Statistics

The table I shows the descriptive statistics of dependent and independent variables for the study period from 2000/01 to 2019/20. The dependent variable is MS (Money supply- the total value of money available in an economy at a point of time, Rs. in Million). The independent variables are GDP (Gross domestic product growth rate is measured by the change in nation's gross domestic product, in percent), INF (Inflation rate is the general increase in prices of goods and services over a period of time in Nepal, in percent), ER (Exchange rate is the real exchange rate between the Nepalese Rupees against US currency), DIR (Deposit interest rate is the amount of money paid out in interest by a bank or financial institution on cash deposits, in percent), LIR (Lending interest rate is measured by interest income from loans and advances as a fraction of total loans and advances, in percent), BoPX (Balance of payment of export, Rs. in Million) and BoPM (Balance of payment of import, Rs. in Million).

Variables	Minimum	Maximum	Mean	S. D.
MS	186,120.90	3,582,137.65	1,123,054.99	1,044,398.33
GDP	0.12	7.91	4.48	1.93
INF	2.44	12.62	6.61	2.88
ER	64.72	112.60	85.47	16.02
DIR	3.25	6.83	4.90	1.34
LIR	8.86	12.85	11.06	1.09
BoPM	49,822.70	1,418,535.30	453,415.23	411,013.17
BoPX	10,850.49	97,109.50	79,520.87	21,272.60

Correlation Analysis

Having indicated the descriptive statistics, the Pearson correlation coefficients are computed and results are presented in Table II.

Table II
Pearson's Correlation Coefficients Matrix

The table II shows the bivariate Pearson's correlation coefficients of dependent and independent variables for the study period from 2000/01 to 2019/20. The dependent variable is MS (Money supply the total value of money available in an economy at a point of time, Rs. in Million). The independent variables are GDP (Gross domestic product growth rate is measured by the change in nation's gross domestic product, in percent), INF (Inflation rate- ncrease in prices of goods and services over a period of time in Nepal, in percent), ER (Exchange rate- the real exchange rate between the Nepalese Rupees against US currency), DIR (Deposit interest rate is the amount of money paid out in interest by a bank or financial institution on cash deposits, in percent), LIR (Lending interest rate is measured by interest income from loans and advances as a fraction of total loans and advances, in percent), BoPX (Balance of payment of export, Rs. in Million) and BoPM (Balance of payment of import, Rs. in Million).

Variables	MS	GDP	INF	ER	DIR	LIR	BoPM	BoPX
MS	1							
GDP	0.35	1						
INF	0.06	-0.20	1					
ER	0.93**	0.24	0.06	1				
DIR	0.39	0.51*	0.01	0.29	1			
LIR	-0.10	0.45*	-0.43	0.08	0.72**	1		
BOPM	0.94**	0.47*	0.10	0.92**	0.39	0.10	1	
BOPX	0.01	0.46*	-0.47*	0.16	0.23	0.41	-0.02	1

***, * indicate that the results are significant at 1% and 5% levels respectively.*

Table II shows GDP growth rate is positively correlated to money supply. It indicates that increase in GDP growth rate leads to increase in money supply. Similarly, there is a positive relationship between inflation and money supply. It shows that higher the inflation rate, higher would be the money supply. Furthermore, exchange rate is positively related to money supply which indicates that higher the exchange rate, higher would be the money supply. Similarly, there is a positive relationship between deposit interest rate and money supply. It reveals that increase in deposit interest rate leads to increase in money supply. Further, the result shows that there is negative relationship between lending interest rate and money supply.

It indicates that increase in lending interest rate leads to decrease in money supply. Similarly, there is positive relationship between import and money supply. It indicates that increase in import leads to increase in money supply. The result also shows that export has a positive relationship with money supply. It indicates that increase in the export leads to increase in money supply in Nepal.

Regression Analysis

Having indicated the Pearson correlation coefficients, the regression analysis has been computed and the results are presented in table III. More specifically, it shows the regression results of GDP economic growth, inflation, exchange rate, lending interest rate, deposit interest rate, BoP of export and BoP of import with money supply.

Table III
Estimated regression results of GDP growth, inflation rate, exchange rate, deposit interest rate, lending interest rate, BoP of export and BoP of import on money supply

The results are based on time series data of Nepal for the study period of 2000/01 to 2019/20 by using the linear regression model. The model is MSit = β0 + β1 GDPit + β2 INFit + β3 ERit + β4 DIRit + β5 LIRit +β6 BoPXit + β7 BoPMit + eit. Where the dependent variable is MS (Money supply- the total value of money available in an economy at a point of time, Rs. in Million). The independent variables are GDP (Gross domestic product growth rate is measured by the change in nation's gross domestic product, in percent), INF (Inflation rate-increase in prices of goods and services over a period of time in Nepal, in percent), ER (Exchange rate-the real exchange rate between the Nepalese Rupee against US currency), DIR (Deposit interest rate is the amount of money paid out in interest by a bank or financial institution on cash deposits, in percent), LIR (Lending interest rate is measured by interest income from loans and advances as a fraction of total loans and advances, in percent), BoPX (Balance of payment of export, Rs. in Million) and BoPM (Balance of payment of import, Rs. in Million).

Model	Intercept	Regression Coefficients of							Adj. R_bar^2	SEE	F-value
		GDP	INF	ER	DIR	LIR	BoPM	BoPX			
1	12.87	0.14							0.03	0.97	1.49
	(22.96)**	(1.22)									
2	12.67		0.12						0.08	0.94	2.59
	(23.49)**		(1.61)								
3	8.79			0.06					0.38	0.45	74.69
	(15.86)**			(8.64)**							

4	12.2				0.26				0.08	0.94	2.64
	(14.85)**				(1.63)						
5	13.85					-0.03			0.05	0.94	0.02
	(5.85)**					(0.15)					
6	2.69						0.86		0.64	0.24	309.40
	(4.37)**						(17.59)**				
7	17.21							0.33	0.05	0.87	0.13
	(1.68)							(0.36)			
8	2.68	1.42					0.87		0.87	0.24	146.51
	(4.22)**	(0.21)					(16.41)**				
9	2.46		0.03		0.06		0.87		0.85	0.22	119.21
	(4.12)**		(1.31)		(1.48)		(16.21)**				
10	-0.71	0.03	0.01	0.11	0.1	-0.83	0.74	0.41	0.91	0.09	313.8
	(0.25)	(1.88)	(0.78)	(2.05)*	(3.21)**	(2.23)*	(7.91)**	(2.06)*			

***, * indicate that the results are significant at 1% and 5% levels respectively.*

Table III shows that the beta coefficients for GDP growth rate are positive with money supply. It indicates that GDP growth rate has a positive impact on money supply. This finding is similar to the findings of Ifionu and Akinpelumi (2015). Similarly, the beta coefficients for inflation rate are positive with money supply. It indicates that inflation rate has a positive impact on money supply. This finding is consistent with the findings of Mbongo et al. (2014). Similarly, the beta coefficients for exchange rate are positive with money supply. It indicates that the exchange rate has a positive impact on money supply. This finding is similar to the findings of Megaravalli and Sampagnaro (2018). Similarly, the beta coefficients for deposit interest rate are positive with money supply. It indicates that the deposit interest rate has a positive impact on money supply. This finding is similar to the findings of Beck and Hesse (2009). Similarly, the beta coefficients for lending interest rate are negative with money supply. It indicates that the lending interest rate has a negative impact on money supply. This finding is consistent with the findings of Ogunyomi (2010). Similarly, the beta coefficients for import are positive with money supply. It indicates that the import has positive impact on money supply. This finding is consistent with the findings of Mutana et al. (2018). The study reveals that the beta coefficients for export are positive with money supply. It indicates that export has a positive impact on money supply. This finding is consistent with the findings of Roy and Rayhan (2011).

VI. Summary and Conclusion

In an economic system of the country, money supply decision holds importance for economic development and effectiveness and efficiency of monetary mechanism. Money supply decisions directly and indirectly affects other economic aspects of the country, which is reflected in the macroeconomic and economic variables of the country. Money supply decision differs country to country on the basis of size of economy, factors of economy, influence of particular factors and other constraints. Thus, the central bank needs to concentrate on money supply decision around those key determinants and factors for contributing to achieve better economic growth and output situations. This study attempts to examine the effect of macroeconomic variables on the money supply in Nepalese economy. The study is based on time series data with 20 observations for the period of 2000/01 to 2019/20.

The study shows that the GDP growth rate, inflation rate, exchange rate, deposit interest rate, BoP of export and BoP of import have positive impact on money supply in Nepalese economy. Similarly, lending interest rate has a negative impact on money supply. The study is concluded that increase in import leads to increase in money supply and the import followed by exchange rate is the most influencing factor that explains the money supply in Nepalese economy.

VII. Limitation and Future Scope

The study has employed linear regression model in analysing the relationship between macroeconomic variables and the money supply in Nepalese economy. This study has assumed the linear relationship between the dependent variables and independent variables. Thus, this study has not considered the 'non-linearity' biases. This study is limited to selected macroeconomic variables affecting money supply. Further, the study can be done by using some advanced statistical tools such as non-linear statistical tools and bidirectional causality tools. The study employed the regression model for the data analysis. However, other studies have used advanced econometric models and tests such as Augumented Dickey Fuller Test, Phillip Perron unit root test, Johansen cointegration test, vector error correction model to analyse the data.

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