2022 BOK Knowledge Partnership Program

with Nepal

Private sector credit growth and its impact upon real sector in the Nepalese economy

2022 BOK Knowledge Partnership Program with Nepal

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BANK OF KOREA

SUNG KYUN KWAN UNIVERSITY(SKKU)

NEPAL RASTRA BANK

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Executive Summary

Facing the economic shocks caused by the pandemic, Nepal monetary authorities have responded actively with expansionary monetary policies in addition to flexible accommodation in micro and macro-prudential policies resulting in a rapid increase of private credits in Nepal. Notwithstanding the swift and proper policy responses to the negative economic shock of the pandemic, Nepal economy came to face new challenges such as a sharp drop of foreign reserves and sporadic credit crunches in Nepal financial systems. Hence, it became imperative to figure out what went wrong in Nepal policy reactions to the pandemic and find the implications on optimal monetary policies and policy mix between financial regulatory policies and monetary policies to get out of the current impasse of financial instability.

Motivated by these backgrounds, the Nepal Rastra Bank research team and KPP-SKKU research team agreed to examine the impacts of private sector credit growth on real sectors of the Nepal economy and the implications on the optimal monetary policies with respect to private credits and the optimal policy mix between monetary policies and financial regulation policies about private credits.

Theoretical analysis via dynamic stochastic general equilibrium (DSGE) analysis on the impacts of private credit growth on real sectors of Nepal economy shows that the credit demand in Nepal is mostly driven by the financial wealth shock, while the credit supply by the deposit interest rate, i.e., financial intermediary costs. In addition, the credit demand and supply were less promoted by the policy shocks but rather mainly driven by the financial shocks in Nepal. Moreover, monetary policy shocks have limited impacts on credit demands in Nepal, and therefore, have limited impacts on real sectors in Nepal economy. On the other hand, financial shocks have significant shocks on credit demands, and therefore, might amplify the volatility in

real sectors of Nepal economy.

Empirical studies on the impacts of credit growth on real sectors of Nepal economy show much more explicit features. We estimate vector autoregressive regression with exogenous variables (VAR-X) models and conduct impulse response analysis to examine the impacts of private credit growth on real sectors of Nepal economy. While impulse response estimates are all statistically insignificant for annual data analysis, the quarterly data analysis exhibits statistically significant results. The results show that the increase of private sector credits would lead to significantly positive increase in real GDP growth rate with one year or one and a half year time lag. Moreover, the result indicates that significant results are derived mainly from private sector credits to corporate sectors.

The results of DSGE model analysis and VAR-X model analysis demonstrate that private credit growth in corporate sectors have significant impacts in improving GDP growth in Nepal as predicted by literature on the role of private credits working as channels for optimal resource allocation. Nevertheless, the sharp increase in the imports of consumer products resulting in rapid deterioration of current account balance and foreign reserves after private sector credit growth shows that efficient and rigorous micro and macro-prudential regulatory efforts over banking sectors are pre-requisite for sustainable management of private credits. In that context, the efforts to build up a micro-financial data collection system and refinement of micro & macro financial stress test models might be priority policy tasks to be tackled for the efficiency and stability of the financial system in Nepal

I. Introduction

Nepalese monetary authorities have responded to Covid19 economic shocks with active expansionary monetary policies in addition to more flexible approaches in macro and micro prudential policies. Such an active policy response by the Nepalese monetary authorities has been evaluated as proper and reasonable approaches while majority of developing economies have taken fairly limited policy responses to Covid19 crisis in comparison to advanced economies. As a result, private sector credits in Nepal is estimated to have increased by 26.4% in 2021 fiscal year.

However, by the time when the Covid19 crisis came to be under a controllable level in terms of newly infected cases, the active policy responses to the pandemic started to produce quite serious side effects such as very high inflation in the US and advanced economies. In a same context, the very active policy responses by the Nepalese monetary authorities have left unexpected outcomes such as a sharp increase of consumer goods' import and rapid deterioration of current account. As a result, foreign reserves of Nepal have dropped to dangerous level near to the amount just covering imports for 6 months, and the concerns about the possible liquidity crisis have been increased.

Motivated by these backgrounds, Nepal Rastra Bank (NRB) research team (led by Dir. Buddha Raj Sharma) and BOK-KPP research team (led by Young-Han Kim, Sungkyunkwan University) agreed to analyze the impacts of private sector credit growth on the real sector economy of Nepal. After reviewing the latest development of private sector credit growth in Nepal and the implications of the credit growth on real sector economies in general, the impacts of the private sector credits growth are examined by dynamic stochastic general equilibrium (DSGE) model analysis in addition to vector auto-regression with exogenous variables (VAR-X) model analysis.

Then, based on the findings on the impacts of private sector credit growth, the implications on the optimal monetary policy and credit growth policy are examined considering the positive role of the private credit growth to boost the real sector economic growth via efficient financial channeling in addition to possible negative effects as

observed in Nepal after the pandemic. In addition, considering the role of private sector credits in promoting investment and economic growth and the negative shock in foreign reserves and possible liquidity crisis after the sharp increase of private credits in Nepal, we examine the optimal policy mix between monetary policies including credit policies and financial regulatory policies including macro & micro-prudential policies.

NRB research team and the KPP-SKKU research team formed 3 sub-research teams to analyze i) the Structural features of private sector credit growth in Nepal, ii) the impacts of private sector credit growth on real sectors in the Nepalese economy, iii) implications on optimal policies with respect to private sector credit growth, as noted in details in the end of the report. Based on the team research activities, the general direction of the research and research methodologies were discussed and confirmed via the Kick-off seminar on July 26, 2022.

Private sector credits are considered as a driving force for economic growth when the credits are provided to productive sectors of economies with the potential technological efficiency. In addition, empirical evidence about the relationship between private sector credits provided to corporate sectors and the economic growth of emerging economies strongly support the positive relationship between private sector credit growth and economic growth in general.

Motivated by the unexpected sharp deterioration of foreign reserves and the possible liquidity crisis after rapid increase of private sector credits in Nepal, this KPP project focuses on identifying what went wrong with private credits in Nepal after the pandemic. In that context, through a dynamic stochastic general equilibrium (DSGE) model analysis, we examine the possible impacts of private credit growth on macroeconomic variables and economic growth by simulation based on the constructed DSGE model.

In addition, via a vector auto-regression model analysis with exogenous variables (VAR-X) as an empirical analysis of the impacts of the private credits on real sector economy in Nepal, we identify the empirical evidence on the relationship in Nepal.

Based on these theoretical and empirical evidence, this KPP project examines the policy implications on the optimal monetary policies including private sector credit policies and

the optimal policy mix between the optimal monetary policies and the optimal financial regulatory policies in Nepal. Details of the research collaboration between NRB research team and KPP-SKKU team are given as follows:

Topics	Authors
I. Introduction	Young-Han Kim
II. The Structural features of private sector credit growth in Nepal	
1. The development of private sector credit growth in Nepal and its implications	NRB Research Team led by Chop Kanta Subedi and Damber Subedi
2. The structural features of private sector credit growth and economic implications	Young-Han Kim
III. The impacts of private sector credit growth on real sectors in the Nepalese economy	
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2. Theoretical analysis of the impacts of private sector credit growth on real sectors in the Nepalese economy: Dynamic Stochastic General Equilibrium (DSGE) approach	Tae Bong Kim
3. Empirical analysis of the impacts of private sector credit growth on real sectors in the Nepalese economy: VAR-X (Vector Auto-regression with exogenous variables) Model approach	Hee Joon Han
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2. The optimal monetary policy and private sector credit policies in Nepal	Sangho Yi
3. The optimal policy mix of monetary policies and financial regulatory policies regarding private sector credits in Nepal	Jeonghwan Cho
V. Conclusions	Young-Han Kim

II. The structural features of private sector credit growth in Nepal

1. The development of private sector credit growth in Nepal and its implications

A. The latest development of private sector credit growth in Nepal: Backgrounds and major features

(1) Historical background

The history of the credit to the private sector dated back to the 1930s. The private sector credit in Nepal began with the disbursement of Rs. 1500 to Bhajuratna and Rs.3000 to Jaharuddhin in 1937[1] by Nepal Bank Limited (the first commercial bank of Nepal[2]). This was the first step in the formal financial system. Initially, there was only Nepal Bank Ltd which resulted in the formalization and development of the financial system slow, and almost stagnant. Later, Nepal Rastra Bank (NRB) was established in 1956 followed by Nepal Industrial Development Corporation in 1959, Rastriya Banijaya Bank Limited in 1966, and Agricultural Development Bank Limited (initially the development bank) in 1968. The establishment of the banking promotion board (BPB)[3] in 1968 also played a significant role in financial development (NRB, 2005). The pace of financial development got momentum only after the financial sector liberalization in the 1980s.

Until forty years of banking history from 1937 to 1977, Nepal's private sector credit

[1] https://nepalbank.com.np/personal/success-stories

[2] The bank also served as the banker of the government prior to the establishment of Nepal Rastra Bank.

[3] In order to develop banking habit among the people and banking system in the country, the NRB set up the banking promotion board in July 1968 with the representatives of the banks, the government and the trading communities. The main objective of the board was to promote banking activities all over the country through creating awareness among the general public on banking services both in terms of deposit mobilization and credit expansion for productive and consumption purposes.

was less than a billion rupees. For example, it was Rs.0.9 billion in 1977. The two commercial banks (government-owned) used to provide credit to the business sector, and the access to institutional credit was concentrated only on the big business houses and entrepreneurs. In this context, NRB formulated a policy in May 1974 to channelize institutional credit to the poorest sector of the economy and directed the commercial banks to lend compulsorily at least 5 percent to the priority sector (initially "small sector"). NRB also promoted rural financing and credit policy was directed towards achieving the goals like poverty reduction, social uplift of the people, and appropriate allocation of funds to cottage industries, enterprises, and farmers (NRB, 2005).

Nepal formally began the liberalization of the Nepalese financial system in 1984, allowing the entry of the private sector into commercial banks. As a result, the first private commercial bank; Nepal Arab Bank (now Nabil Bank Limited) was established in 1984 followed by Nepal Indosuez Bank (now Nepal Investment Bank Limited) in 1985 and Nepal Grindlays Bank (now Standard Chartered Bank Nepal Limited) in 1987 as the joint venture bank. In 1985, commercial banks were allowed to mobilize deposits in foreign currencies for the first time. The first phase of financial sector reform was implemented in 1985 with the Economic Stabilization Program of the IMF and the Structural Adjustment Program of the World Bank. Under these programs, interest rates were partially deregulated[4] since May 1986 and were completely deregulated in July 1989 (NRB, 1996). Among others, the reform program further liberalized the restriction on bank credit and strengthened RBB and NBL. Thereafter, NRB focused on indirect monetary control and increasing the role of the market (Shrestha, 2004). However, NRB mandated the commercial banks to lend at least 25 percent of the credit to productive sectors including 8 percent in the priority sector since 1988/89. The financial sector

[4] Before 26 May 1986, the interest rates of commercial banks were completely controlled by NRB. On 26 May 1986, NRB for the first time, deregulated the interest rate regime and allowed commercial banks to fix interest rates at any level above their minimum prescribed levels. These initiatives had a far-reaching impact in the development of the financial sector of the country, which was realized in the growth of the assets and services of commercial banks (Shrestha, 2004).

liberalization resulted in the number of banks and increased private sector credit.

After the re-establishment of democracy in 1991, Nepal liberalized international trade adopting a liberal trade policy in 1992[5]. The credit ceiling of commercial banks was removed in 1991 (Shrestha, 2004). In 1992, Nepal adopted the Enhanced Structural Adjustment Facility of IMF to further liberalize the financial sector. The current account was partially liberalized in 1992 and made fully convertible in 1993. Nepalese citizens were allowed to open a foreign currency bank account in 1992. The productive sector credit program was further revised and strengthened in 1994/95 and subsequently in 1996/97[6]. Finance companies entered the financial system in 1992 focusing on merchant banking, leasing services and hire purchases, and housing construction loans. In order to promote limited banking in non-banked rural areas, NRB granted a license to Saving and Credit Co-operatives in 1993 (Shrestha, 2004).

The enactment of the Finance Company Act in 1986 created a more competitive environment in the financial market, though, finance companies were established significantly since 1994. The enactment of the Development Bank Act, 1996 was another milestone for the development of the financial sector. All these policy initiatives attracted Nepalese and foreign investors in the banking sector. As a result, the growth of the financial sector was realized historically highest in terms of the number of BFIs in the decade 1990s. However, due to the poor supervision and regulation of the BFIs, the financial sector experienced some problems, resulting in a higher level of non-performing loans in the government-owned commercial banks. In this context, the World Bank, the IMF, and the Asian Development Bank jointly concluded that NRB needs to strengthen its regulatory and supervisory capacity. In order to address this problem, the Government of Nepal adopted Financial Sector Strategy Statement (FSSS) in 2000.

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[5] The first trade policy, 1983 with the slogan of "Exports for Development" was replaced by removing the trade barriers such as eliminating license quotas of imports and exports, establishment of industry and encouraging private sector participation in the financial sector.

[6] Among others, loans up to Rs. 5 million for the purchase of raw materials and machineries required for the export and pre-export industries added to the priority sector lending since 1996/97.

To help address the problems in the financial sector, the second phase of financial sector reform (2002-2006) was started in 2002. The reform program constituted the Poverty Reduction and Growth Reduction Facility of the IMF, the Financial Sector Technical Assistance Project and Financial Sector Restructuring Program of the World Bank, and the Rural Finance Sector Development Cluster program of the ADB. Among others, the major reforms were; strengthening the legislative and institutional framework for loan recovery, reengineering NRB, restructuring RBB, NBL, and ADBL, capacity building in the finance sector, and establishing a microfinance regulatory and supervisory framework.

In 2002, the new Nepal Rastra Bank Act was enacted to enhance the regulatory and supervisory capacity and the autonomy of NRB (NRB, 2005). NRB formulated its first monetary policy for FY 2002/03 immediately after the new NRB Act 2002. Also, the policy for the establishment of new BFIs was amended in 2002. After the implementation of the second phase of the Financial Sector Reform Program, the priority sector lending program had been gradually phased out by the end of FY 2006/07 though, the deprived sector lending is continued since 1990. In 2006, the Banks and Financial Institutions Act (BAFIA) was enacted as an umbrella act for the establishment, regulation, and supervision of all types of BFIs.

Nepal experienced a significant development of the financial sector in the decade of the 1990s, especially in terms of the number of institutions and volume of transactions. As of July 1990, there were only 7 BFIs which increased to 74 in July 2000. Similarly, private sector credit which was Rs.11.7 billion in July 1990, increased to Rs.109.4 billion as of July 2000. Also in the decade of 2000s, the size of the financial sector increased by more than five times in terms of the size of credit (Table 2-1). In 2011, NRB enacted merger by-Law and acquisition by-law in 2013. Later in 2016 NRB combined merger and acquisition by laws and put greater emphasis on bank consolidation.

Despite the reform, NRB has continued productive sector lending to channelize the resources into the high-priority sector in the economy. Currently, among others, commercial banks have to lend at least 40 percent to agriculture, energy, and MSMEs by mid-July, 2025, and B and C class financial institutions have to lend at least 20 percent

and 15 percent to the specific sector by mid-July 2024. Likewise, there is a continuation of the deprived sector lending program introduced in 1990. Initially, the target was 0.25 percent of total credit for newly established commercial banks and 3 percent for other operating commercial banks. Currently, 5 percent of total credit is made mandatory for all BFIs to invest in the deprived sector.

Table 2-1 shows the historical evolution of the number of BFIs and the credit to the private sector. It shows the large increase in the number of BFIs and credit since 1990, indicating the speed up in the financial sector development.

<Table 2-1> Historical development of private sector credit in Nepal

(unit: Rs. billion)

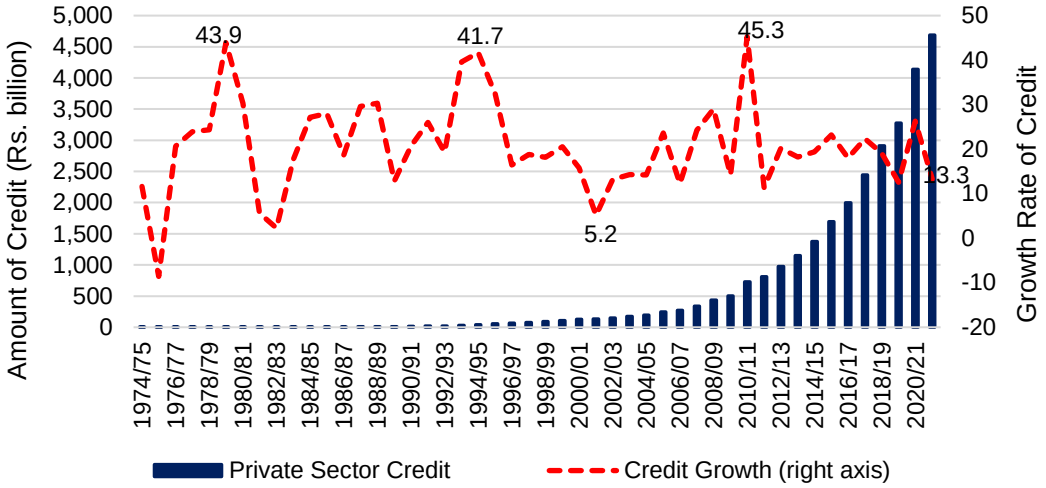
Fiscal Year (till time)	Number of BFIs*	Private Sector Credit
1975/76	4	0.7
1980/81	4	2.5
1990/91	7	14.1
2000/01	79	126.8
2010/11	218	727.3
2020/21	132	4,139.6
2021/22	125	4,689.0

*: Including microfinance financial institutions.

Source: Current Macroeconomic and Financial Situation, July 2022 and Quarterly Economic Bulletin, April 2022, Nepal Rastra Bank.

The evolution of private sector credit in Nepal can be analyzed by broadly dividing it into different phases. Before the 1980s, the financial system was highly regulated and controlled, including ceilings on the credit at the bank level. During the period 1985-2006, Nepal implemented many reforms and liberalized the financial sector which resulted in higher credit growth. For example, on average, credit grew by 22.8 percent during this period. Especially, after the reform in 2002, Nepal implemented more liberalized credit policies. Likewise, NRB adopted the BASEL framework and many micro-and macroprudential tools. The private sector credit increased by 18.9 percent on average during the period 2000-2022 (Figure 2-1).

<Figure 2-1> Historical trend of private sector credit in Nepal



Note: The growth in 2011 was due to the changes in data compilation (inclusion of development banks and finance companies in the monetary survey)

Source: Nepal Rastra Bank, July 2022

(2) Recent development and features of private sector credit

(a) The recent development of private sector credit in Nepal

The growth of the private sector credit was relatively higher in recent years. After the earthquake in 2015, the credit growth became high due to the post-earthquake reconstruction works, and recovery of the economy.[7] For instance, the credit increased by 32.1 percent in February 2017. Later, in 2017, Nepal entered into the federal structure which has also resulted in the expansion of economic activity and more investment demand. The completion of the federal election, the expectation of a stable government, and new federalism also caused the demand for more credit along with the expansion of economic activity. As a result, the credit growth became higher in 2018 (Figure 2-2). However, there was some level of liquidity problem from July 2017 to March 2018, which slowed down the credit growth.

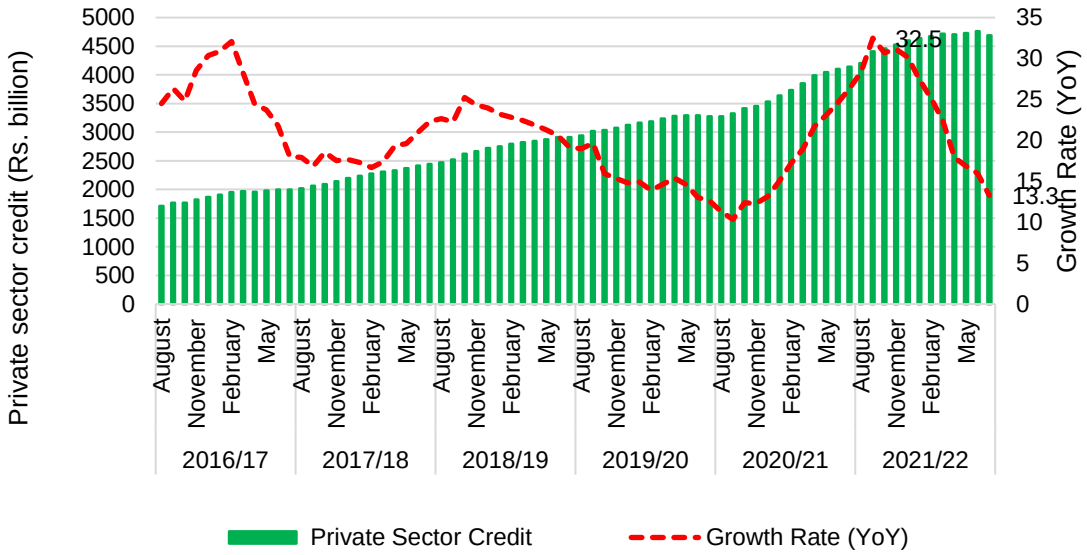
[7] The Government of Nepal planned to complete the post-earthquake reconstruction within 5 years. Post Disaster Need Assessment, 2015 estimated that total value of disaster caused by the earthquake was Rs. 706 billion or equivalent to USD 7 billion.

The credit growth slowed down after December 2018 due to the liquidity problem in the economy. Later, COVID-19 began, creating global uncertainty about the end of 2019. But, in the case of Nepal, it affected the economy more since March 2020. The Government of Nepal also implemented several measures to contain the virus such as travel restrictions and an economy-wide lockdown. The lockdown, subsequent business closure, and increased uncertainty caused a slowdown in economic activity and reduced the demand for credit. As a result, the credit growth slowed down, resulting in the lowest growth of 10.3 percent in September 2020.

After the reopening, and gradual availability of the COVID-19 vaccine, the economy entered the recovery phase. During the COVID-19 lockdown, NRB implemented several policy measures to support the economy such as lowering interest rates, and relaxation of regulatory and macro prudential measures. There was excess liquidity build-up along with the loose monetary policy stance, and low credit demand. Then, along with the economic recovery, the credit to the private sector increased and reached a higher level of 32.5 percent in September 2021 (Figure 2-2).

The excessive credit growth in 2021, and the potential overheating of the stock and real estate market resulted in higher import growth and gradual pressure on the balance of payments. Considering the pressure on the external sector, NRB adopted tight monetary policy, and macro prudential measures to slow down the credit growth, and thus relieve the pressure on the external sector. Moreover, the slowdown in remittance inflows also caused liquidity pressure in the economy. As a result, the growth of the credit to the private sector has slowed down since October 2021. Therefore, the growth rate of private sector credit remained at 13.3 percent in July 2022 (Figure 2-2).

<Figure 2-2> Recent development of private sector credit in Nepal

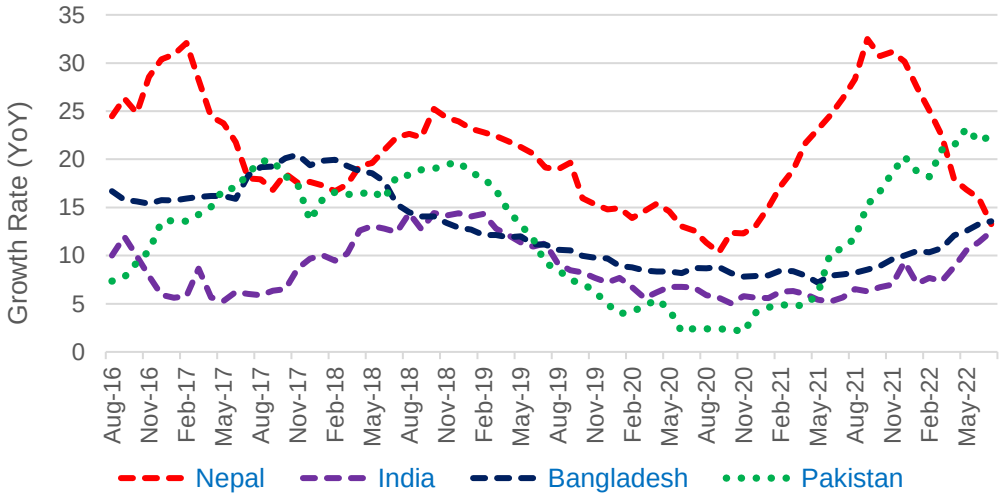


Source: Nepal Rastra Bank, July 2022

(b) Recent development of private sector credit in some South Asian Countries

The growth rate of private sector credit in Nepal is quiet higher in comparison to some of our neighboring countries. In the last six-years, the average growth rate (YoY) of private sector credit in Nepal is around 21 percent, credit growth of India is 9 percent and that of Bangladesh and Pakistan is 13 percent. The growth rate of credit in Nepal was higher to its neighboring countries in almost all the time, even in the period of Covid-19 pandemic. Also, the growth rate of private sector credit is highly volatile in Nepal followed by Pakistan, where as it is more or less volatile in India and Bangladesh. The steady increase of credit growth in Nepal, immediately after the Covid-19 pandemic seems to be unnatural comparing to its neighboring (Figure 2-3).

<Figure 2-3> Recent development of credit growth in Some South Asian Countries



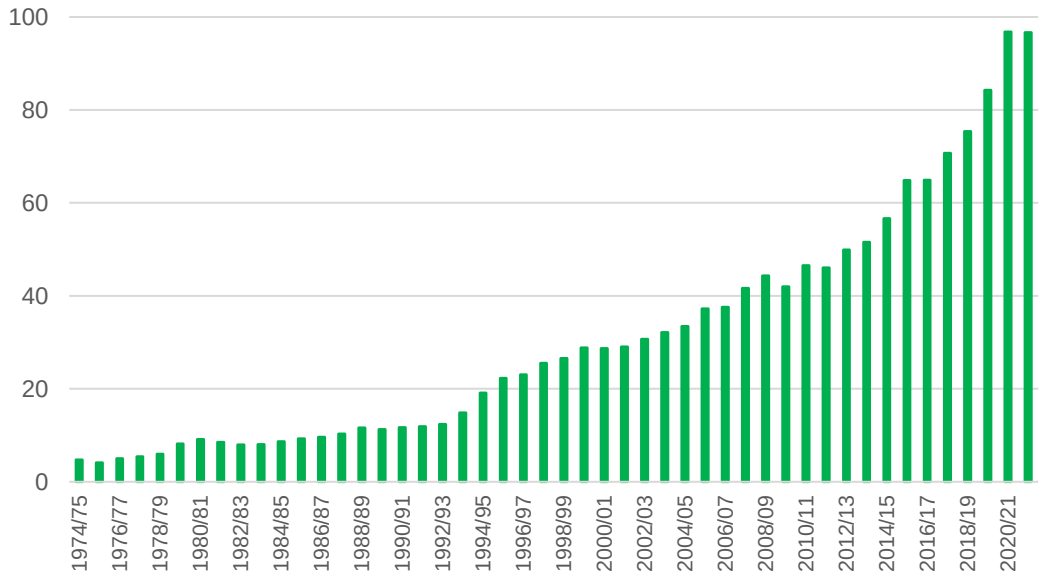
Source: Nepal Rastra Bank, Reserve Bank of India, Bangladesh Bank, State Bank of Pakistan

(c) Private sector credit and GDP

The credit to GDP ratio is taken as a key indicator of financial deepening. A higher credit to GDP ratio indicates that the banking sector has a high capacity in financing the real sector of the economy. Also, it indicates the robustness of the credit demand in the economy having a high degree of monetization.

The credit to GDP ratio of Nepal is steadily increasing, especially in the last five years. In 2000, the ratio was 28.8 percent which increased to 46.5 percent in 2011. With low economic growth and relatively high growth of credit, the ratio of private sector credit to GDP increased significantly in the last few years. The ratio increased significantly along with the credit growth during post-earthquake reconstruction, and later during the economic recovery from COVID-19. In July 2022, it has become 96.6 percent (Figure 2-4).

<Figure 2-4> Private sector credit to GDP ratio



Source: Nepal Rastra Bank, July 2022.

(d) Sectorwise credit and GDP

It is also important to look over the sectoral distribution of credit from a growth perspective. For this purpose, we simply take the ratio of sector-wise credit to that sector's GDP. This just gives us a comparison with some sectors having more share in credit relative to others considering their share in the economic activity. The ratio of the stock of credit to the manufacturing sector to the GDP of that sector is about 300 percent whereas such ratio for the agriculture sector is about 40 percent. Likewise, the wholesalers and retailers sector and the financial and insurance activities sector have higher credit to GDP ratios than the national average (Table 2-2). However, we need to be cautious for the interpretation because the credit goes more to the capital intensive sector such as manufacturing, and we are comparing stock to flow variables.

<Table 2-2> Sectoral credit to sectoral GDP

Sectors (Selected only)	Share in GDP			Credit to GDP		
	2019/20	2020/21	2021/22	2019/20	2020/21	2021/22
Agriculture	25.2	24.9	23.9	26.2	35.6	39.5
Manufacturing	5.1	5.4	5.6	306.7	322.5	299.9
Construction	6.2	5.9	6.2	162.7	188.8	75.0

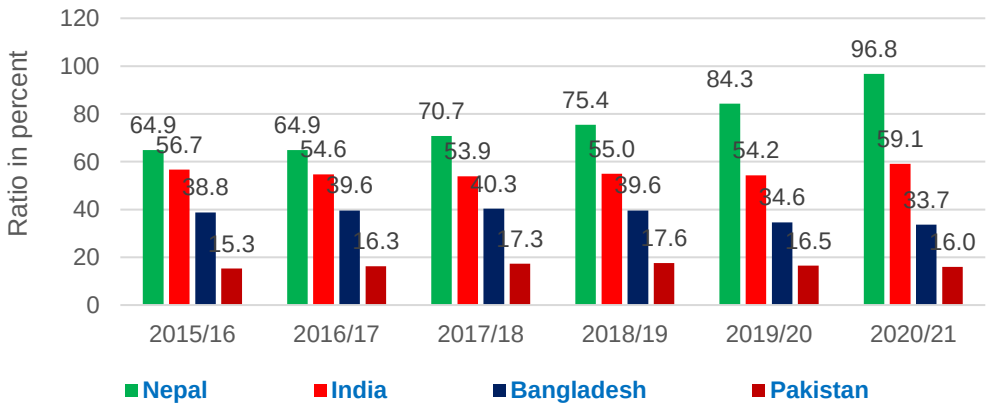
Wholesalers and Retailers	15.0	16.0	16.4	128.7	143.2	140.8
Transportations, Communication and Public Services	15.6	15.4	15.8	39.3	44.7	45.1
Financial and Insurance Activities	7.1	7.0	6.9	104.4	128.6	133.2
Service Industries	14.1	13.9	13.9	61.9	69.4	68.8

Source: Central Bureau of Statistics, April 2022, Nepal Rastra Bank, July 2022.

(e) Private sector credit to GDP ratio in some South Asian Countries

Compared to some countries in the SAARC region, private sector credit to GDP is much more higher in Nepal. As of 2021, the credit to GDP ratio was 16 percent in Pakistan, 33.7 percent in Bangladesh, 59.1 percent in India, and 96.8 percent in Nepal (Figure 2-5). This may also show that the degree of financial development is relatively higher in Nepal. However, it might be the case that the credit to GDP ratio is higher than what the level of economic development would justify. It could be non-sustainable and ultimately require a correction (Backe & Egert, 2007).

<Figure 2-5> Private Sector Credit to GDP in South Asian Countries



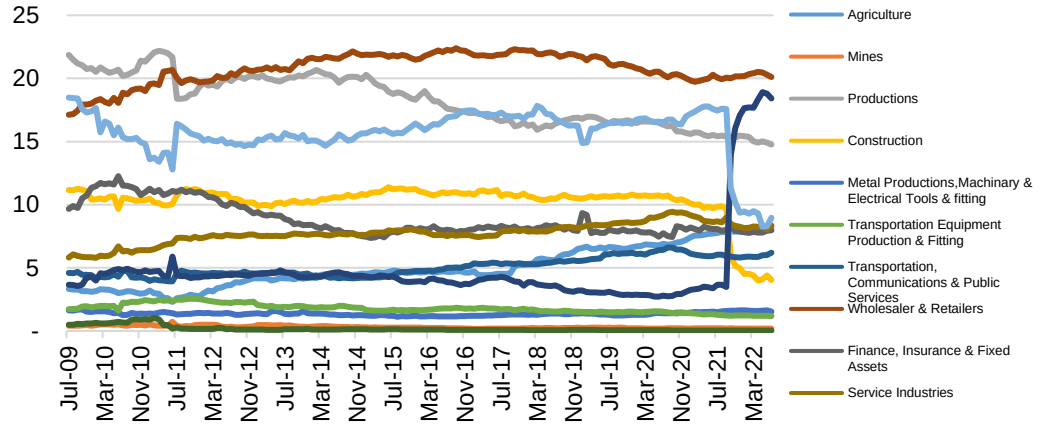
Source: Central Banks of the respective countries, 2021.

(f) Sector-wise Credit

We present the sector-wise share of credit in Figure 2-6. The wholesaler and retailer sector has the highest share of 20.1 percent. The second major portfolio of consumable

credit with 18.4 percent followed by production sector credit having 14.8 percent. Figure 2-5 shows that the share of the credit to the wholesaler and retailer sector is increasing over the years and the share of production sector credit has been decreasing significantly in the last decade.

<Figure 2-6> Sector wise credit by BFIs (in percent)



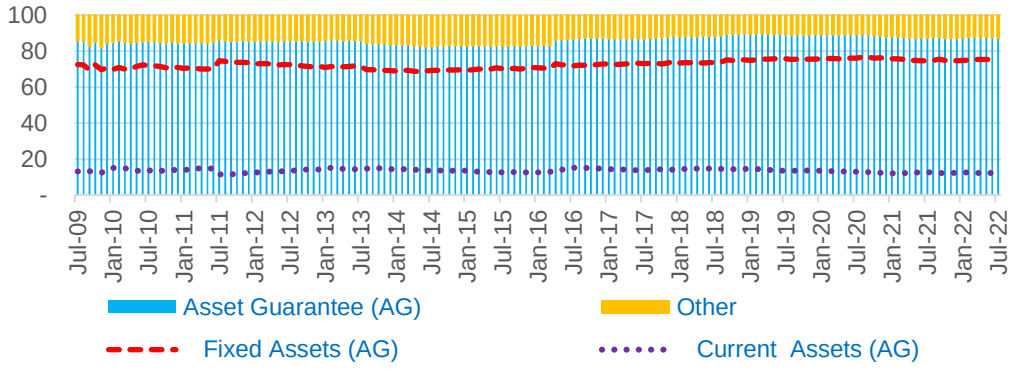
Note: The share of consumption loans increased and transportation, communications, and public services decreased significantly due to the changes in the data definition. The hire purchase loan, residential home loan up to Rs. 15 million, and personal loan less than Rs. 5 million without purpose have been categorized as consumption loans from their previous definition under construction. Likewise, education loans and professional and personal overdraft loans were reclassified as consumption loans from its previous other sector loans.

Source: Nepal Rastra Bank, July 2022

(g) Collateral-wise Credit

Most of the loan is collateralized by fixed assets, especially real estate. About 87 percent of the BFIs' outstanding loan is backed by the asset guarantee (AG), and the rest of 12.6 percent is backed by other collaterals. Also, out of total credit, 75 percent of the credit is collateralized by fixed assets (of AG), and 12 percent is collateralized by current assets (of AG). It should be noted that 66 percent of the total credit is collateralized by lands and buildings (real estate) as of July 2022 (Figure 2-7).

<Figure 2-7> Collateral of credit by BFIs (in Percent)

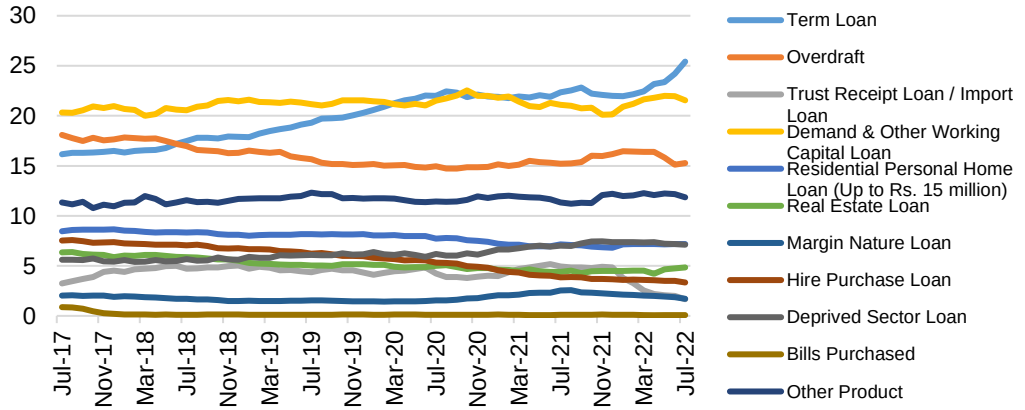


Source: Nepal Rastra Bank, July 2022

(h) Product wise credit

We can view the credit from the perspective of products, as shown in Figure 2-5. As of July 2022, the highest portion of the credit is occupied by term loans; accounting for 25.4 percent followed by demand and other working capital loans with 21.5 percent. Overdraft loans and other products are also holding a significant portion of total credit having 15.4 percent and 11.9 percent respectively. The top-most four types of credit products are occupying about the three-fourths share of the total outstanding loan. Also, more than one-fourth of the total credit portfolio falls under non-specific purpose loans (overdraft and other products). The credit portfolio of term loans and demand & working capital loans shows a quiet reversal pattern before and after the Covid-19 pandemic with a significant rise in term loans. In order to mitigate the potential damage during COVID-19, NRB encouraged businesses to borrow, increased the limit of borrowing from the same collateral, and rescheduled and restructured their loans. As a result, term loans increased significantly (Figure 2-8).

<Figure 2-8> Product wise credit of BFIs (in percent)

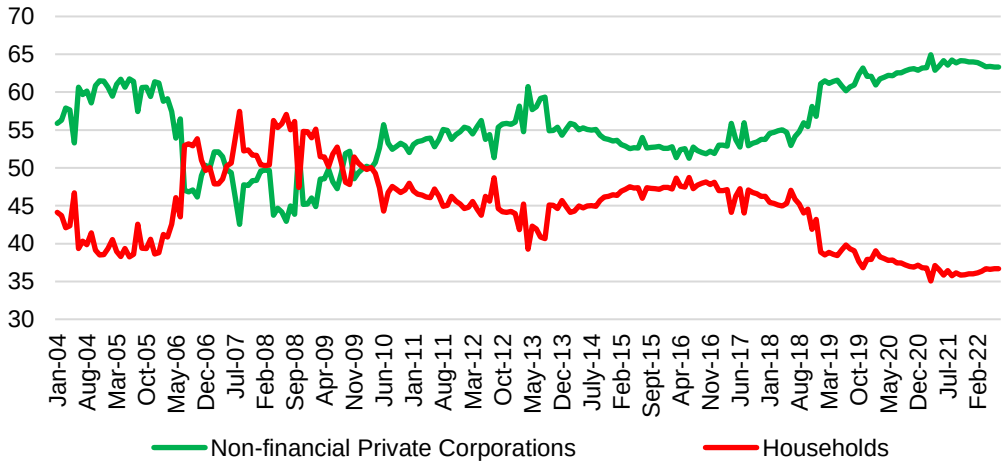


Source: Nepal Rastra Bank, July 2022

(i) Credit to households and corporations

Since the last decade, the credit to the private sector has shifted its dynamism, and the credit to corporations has exceeded the credit to households. Figure 2-7 shows that since 2010, the credit to corporations is higher than the households. The gap has widened especially after 2018. This coincided with the implementation federal structure in Nepal, and the policy of NRB to expand financial access through the establishment of at least a branch at each level. As of July 2022, almost two-thirds of the outstanding credit has been used by corporations (Figure 2-9).

<Figure 2-9> Share of households and corporations in credit

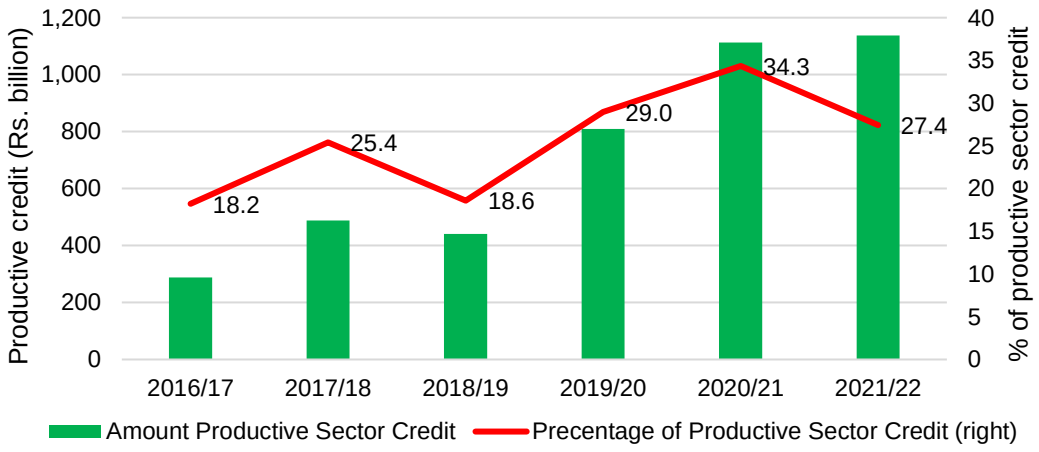


Source: Nepal Rastra Bank, July 2022

(j) Directed sector credit

Since 1974, NRB has been continuing with directed credit programs. Initially, priority sector credit, productive sector credit, and deprived sector credit were the programs under directed sector credit. But recently, the directed sector credit has been categorized into two parts: productive sector credit and deprived sector credit for commercial banks whereas specific sector credit and deprived sector credit for B and C class financial institutions. According to the latest provision, commercial banks have to lend at least 38 percent to the productive sector (agriculture, energy, and MSMEs) by mid-July 2023. A special focus has been kept on loans to the agriculture and energy sector. Similarly, B and C class financial institutions have to lend at least 19 percent and 14 percent of their total credit portfolio to the specific sector by mid-July 2023. As of mid-July 2022, productive sector lending by commercial banks stood at 27.4 percent (Figure 2-10).

<Figure 2-10> Productive sector credit by commercial Banks



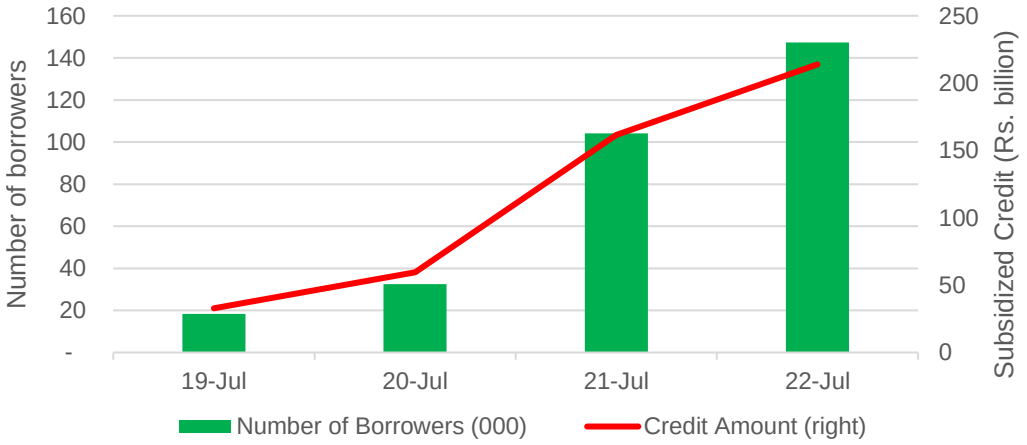
Source: Nepal Rastra Bank, July 2022

(k) Subsidized credit

The government of Nepal introduced the concessional loan program in the fiscal year 2014/15. Initially, the program was supposed to address the problem of increasing unemployment and migration of young people from the country and to attract young people to commercial agriculture and livestock. In the beginning, the interest subsidy was

4.0 percentage points. The program has been revised from time to time and now, the types of credit and the eligible areas have also been extended. Currently, there are ten types of credit plans in which a 5.0 percentage point of interest subsidy is provided. For the women entrepreneur loan, an additional 1.0 percentage point interest subsidy is provided. As of mid-July 2022, the total outstanding subsidized credit is Rs.213.89 billion for 147 thousand borrowers (Figure 2-11).

<Figure 2-11> Interest subsidy credit by BFIs



Source: Nepal Rastra Bank, July 2022

B. Implications of private sector credit growth in Nepal and future issues

The growth of private sector credit in Nepal was relatively high in recent years, especially after the COVID-19 pandemic. As a result, the size of private sector credit is almost equal to the size of GDP. Despite the important role of credit, excessive credit growth may have several implications for the economy. Recent surges in credit growth may be indicating a credit boom which may have quite different implications. In this section, we try to summarize the potential implications of credit growth in Nepal.

(1) Private sector credit and GDP growth

Private sector credit is one of the key indicators of financial development. And, literature shows that financial development supports economic growth. Thus, one of the potential implications of credit growth may be associated with economic growth. To examine whether there is any association, we show economic growth and the growth of private sector credit in Figure 2-12.

<Figure 2-12> GDP and credit growth

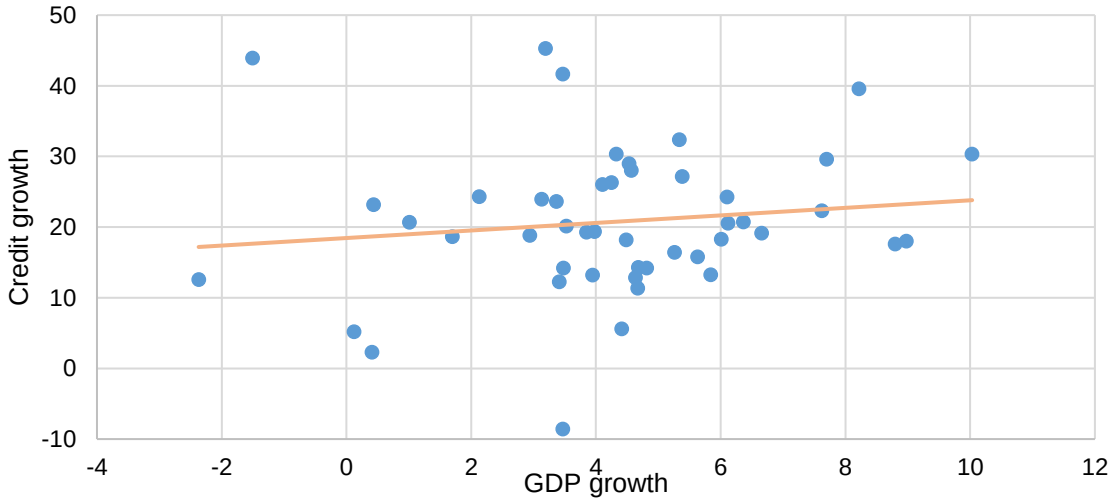
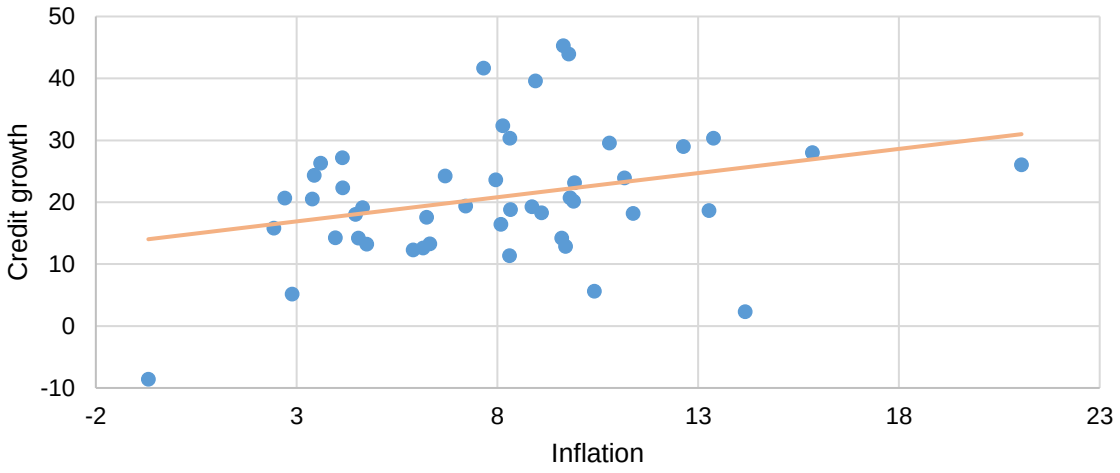


Figure 2-12 plots the credit growth against economic growth based on annual data for the period 1975-2012. The positively sloped trend line indicates a positive association between economic growth and credit growth. The correlation between economic growth and credit growth is 0.13 indicating that higher economic growth is associated with higher growth of the credit to the private sector. This positive relation validates our research question: is the growth of private sector credit supporting economic growth in Nepal?

(2) Private sector credit and inflation

Higher credit growth may have implications for inflation. This is because the private sector credit is a large component of the money supply, and inflation may be affected by the money supply. Figure 2-13 plots the inflation rate against the credit growth to the private sector. This figure indicates a positive association between inflation rate and credit growth, that is, higher inflation is associated with higher credit growth. The correlation between inflation and credit growth is 0.30 percent. This fact indicates that credit growth may have some potential implications for inflation in Nepal.

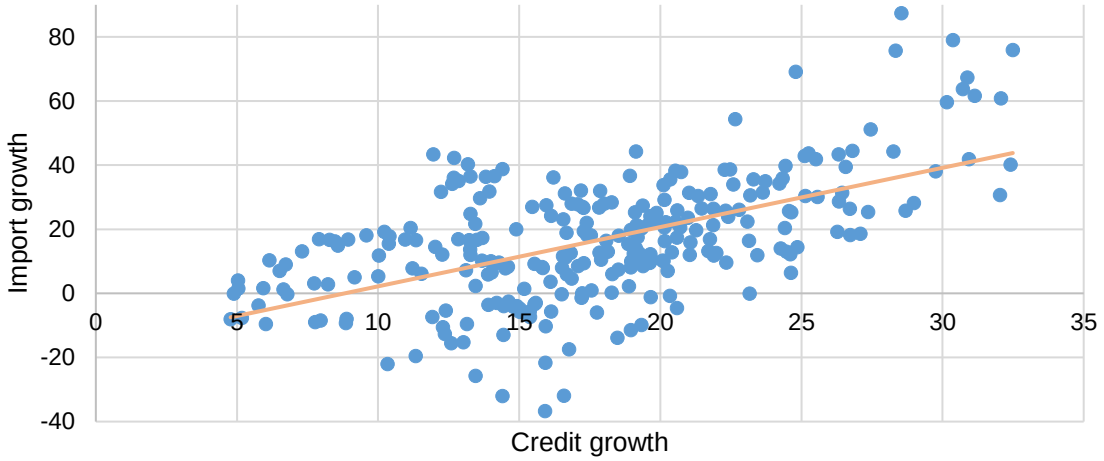
<Figure 2-13> Credit growth and inflation



(3) Private sector credit and import

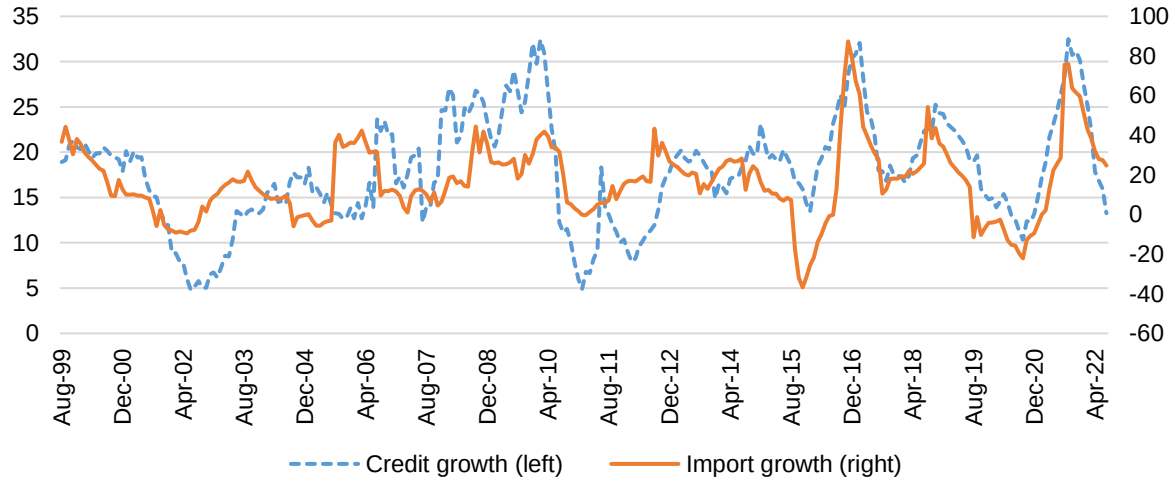
An important implication of credit growth may include the growth of imports. Since Nepal's economy is small, open, and shares a long porous border with India, the growth of credit may directly affect imports of goods given the high dependency on imports and low domestic production capacity. Credit growth directly affects consumption and investment expenditure by households, and firms which then affects imports of goods and services.

<Figure 2-14> Import and credit growth



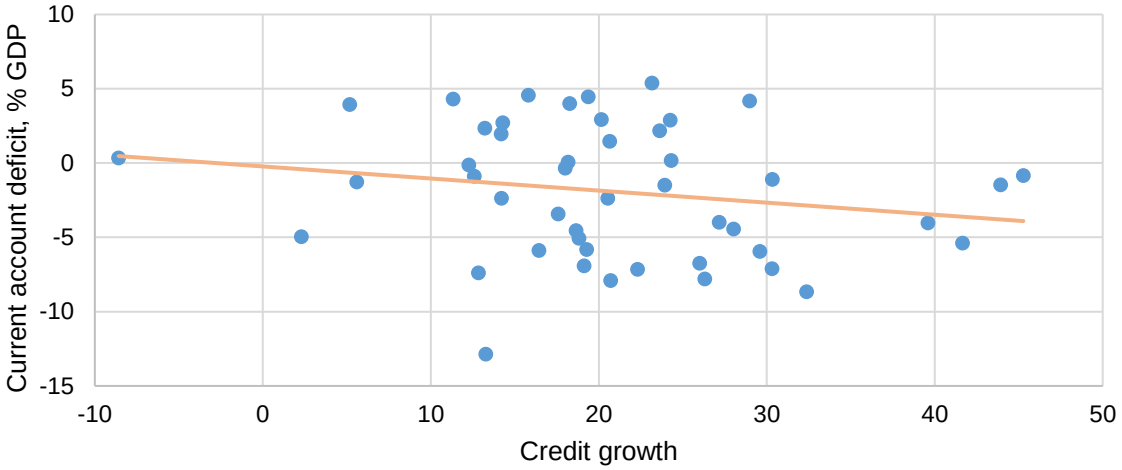
To show any association between imports and credit growth, we plot the growth of merchandise imports against credit growth for the period from August 1998 to July 2022 in Figure 2-14. We can see the positively sloped trend line, indicating that higher import growth is associated with higher growth of credit to the private sector. The correlation between import and credit growth is 0.58 suggesting a positive association between import growth and credit growth. Moreover, we show the evolution of credit and import growth in Figure 2-15 which suggests the comovement between imports and credit over the period.

<Figure 2-15> Credit and import growth



By affecting the imports, the credit growth may affect the trade balance, current account, and overall balance of payments. We show the current account deficit (% of GDP) and credit growth in Figure 2-16. This plot shows that a higher current account deficit is associated with higher credit growth. The correlation between current account deficit and credit growth is -0.19. Thus, the credit growth may have implications to the entire external sector through imports, and then the overall balance of payments.

<Figure 2-16> Current account deficit and credit growth

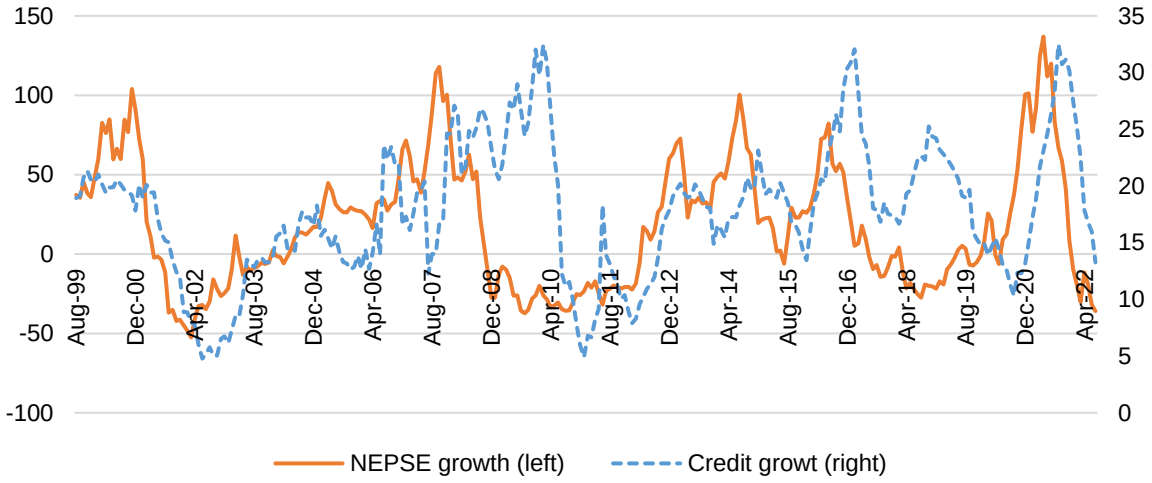


(4) Private sector credit and asset prices

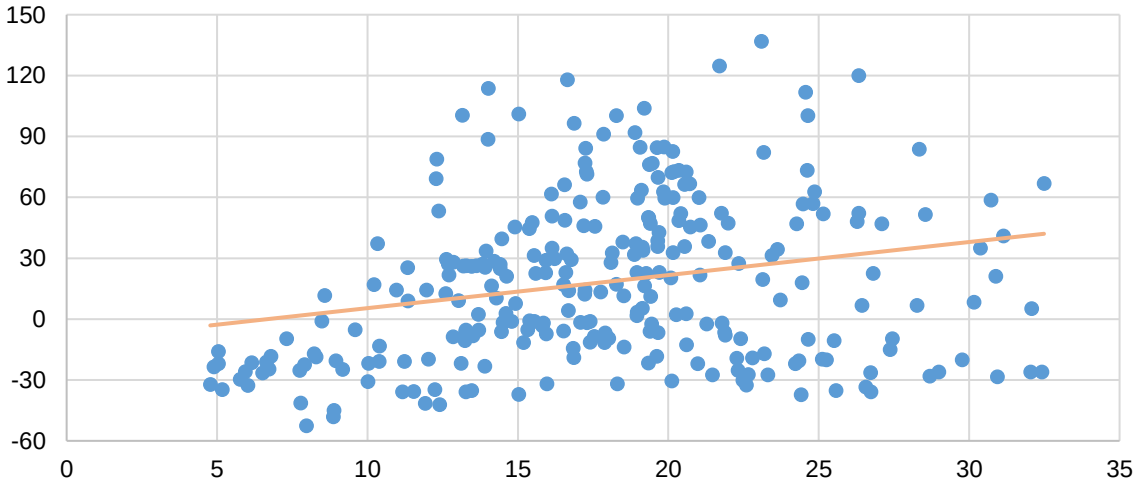
Excessive credit growth may fuel asset prices in the economy. Literature also shows that the credit boom and asset prices boom often come together. Thus, the credit growth in Nepal may also be affecting asset prices, especially fueling the boom in stock and real estate prices in the past. We have time series on the stock index, the NEPSE index, but we do not have time series on the housing and real estate prices.

Figure 2-17 shows the evolution of credit growth and the growth of the NEPSE index (both on a year-on-year basis). It shows that the NEPSE index is closely following the growth of credit to the private sector. The correlation between the NEPSE and credit growth is 0.25, suggesting a positive association. The scatter plot also shows this relation (Figure 2-18). This fact shows that credit growth may have implications for asset prices in Nepal.

<Figure 2-17> Credit and NEPSE growth



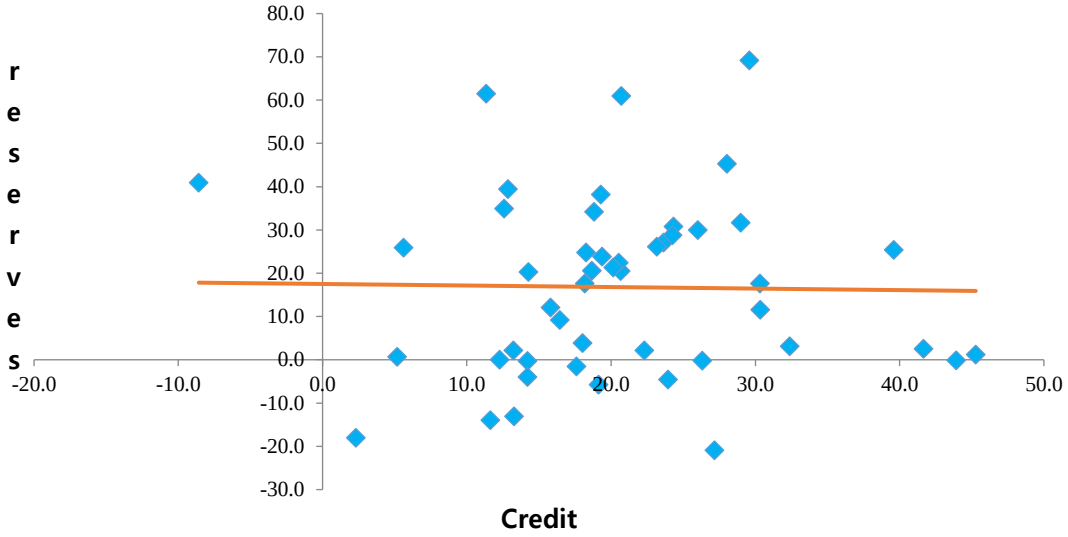
<Figure 2-18> Credit and NEPSE growth



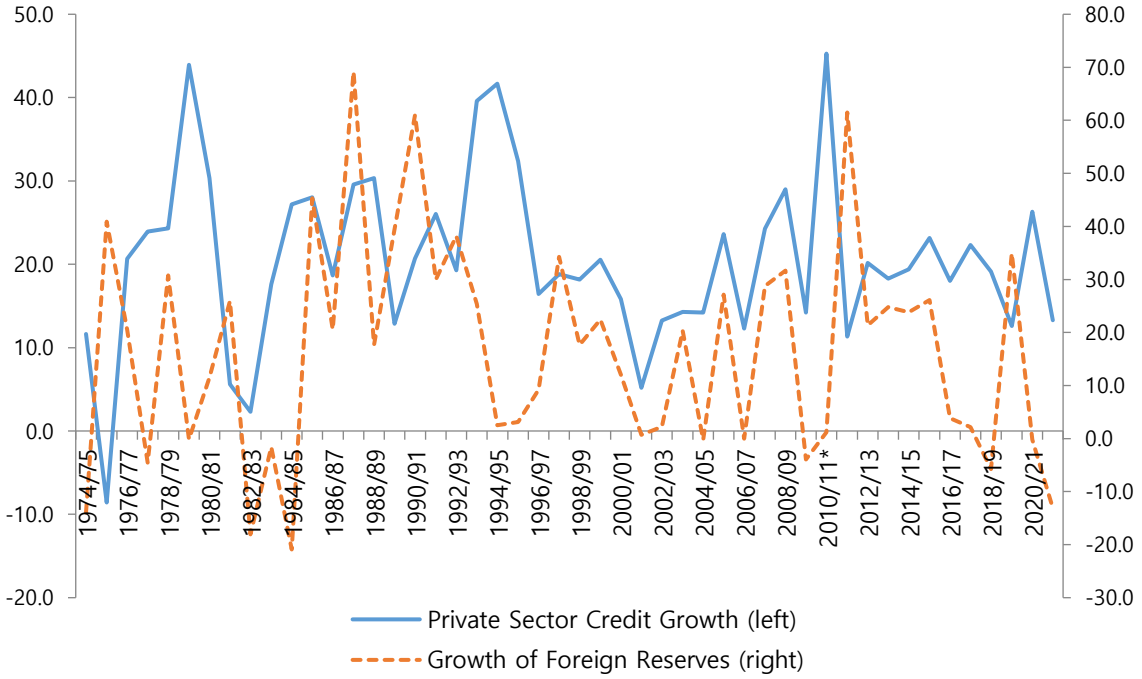
(5) Private sector credits and foreign reserves

Excessive credit growth may affect foreign reserves negatively through affecting imports of the economy. This plot shows that a credit growth has no associated with the changes in foreign reserve position. The correlation between private sector credit and foreign reserves growth is only -0.01773. Changes in credit growth indicates that there may have negligible implications for changes in foreign reserves position.

<Figure 2-19> Credit and Foreign Reserve Growth



<Figure 2-20> Credit and Foreign Reserve Growth



The above figure 2-20 shows the evolution of credit and foreign reserve growth which suggests in some years; both moved in opposite directions, for examples in FY 1976/77, 1980/81, 1994/95. Similarly, there is also the co-movement between credit and reserve growth from FY 2000/01 to FY 2009/10. Credit growth rose to 45.3 percent during 2010/11 due to change in data compilation methodology through inclusion of development banks and finance companies in the monetary survey. Moreover, there seems lagged effect of credit growth to which the foreign reserve growth of any period was affected by the immediately preceding time period changes of credit growth. In fact, foreign reserve growth was historically volatile over the years.

(6) Future issues

There are a couple of issues related to the credit to the private sector in Nepal. First, an important issue is how to channelize the credit to the more productive sector which helps

foster economic growth. In terms of the ratio of credit to GDP, there seems to be a comfortable level of credit expansion in the economy if we compare this ratio with other peer groups, especially low-income and lower middle-income countries. However, this ratio is still low compared to upper middle-income and advanced economies. Thus, it is equally important to channelize the credit to more productive sectors.

Second, achieving an optimal policy mix that includes credit, monetary/other financial policies, and external sector policies is also equally important. Nepal is a small open economy with an exchange rate peg with Indian Rupee and high trade integration with India. And, excessive credit growth seems to affect both the external sector through imports and asset markets. Thus, a credit boom may affect not only the asset markets (real estate, and stock market), but also the external sector, especially the pressure on the balance of payments and foreign exchange reserves. In this context, aligning the credit policies optimally with other policies such as monetary, and macroprudential policies is important. This is one of the emerging challenges in recent years.

Finally, it is important to balance the credit policies in view of liberalization in order to minimize market distortion that may arise from restrictive policies. There remain some credit policies that were debatable in the past during the financial sector reform program. Thus, one of the challenges is to optimize the benefits of these policies in relation to the potential regulatory costs in the context of Nepal.

2. The structural features of private sector credit growth and economic implications

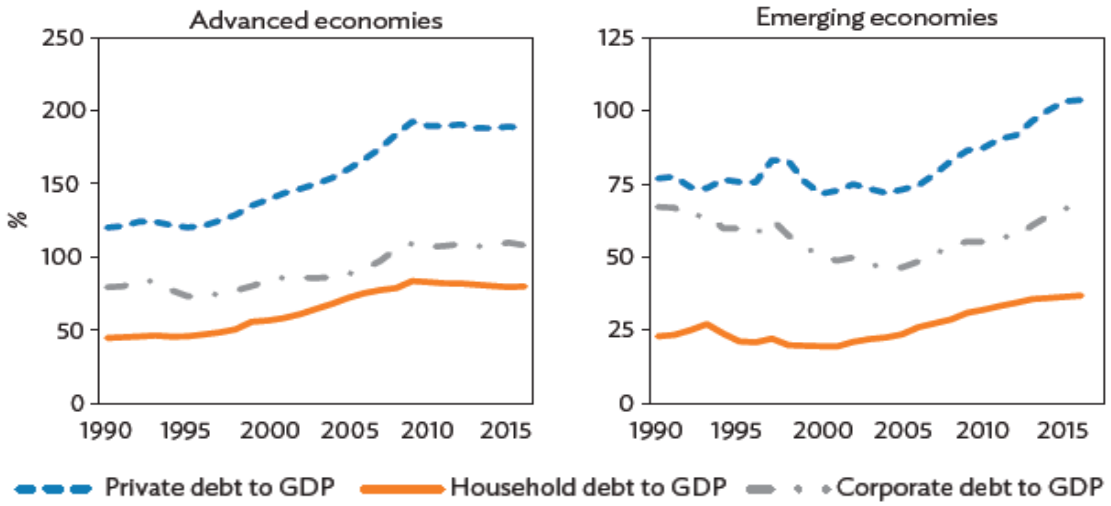
A. Private sector credit growth as an engine of industrial investment and economic growth

The private credits have been considered as an engine of economic growth since the credits work as channels to finance the productive sectors with potential technological efficiency. Especially, when the direct financing mechanism by corporate sectors via stock markets are not well established as in most emerging economies, private sector credits by banking sectors must be a major channel to finance potentially efficient firms.

Empirical evidences for the strong correlation between the growth of private credits to corporate sectors and the increased contribution of investment for economic growth abound. The private credit growth is supposed to increase corporate sectors' investment and consumers' consumption eventually leading to economic growth (Levine 2004; Garcia-Escribano and Han 2015). In addition, higher economic growth is also believed to foster credit growth with the higher collateral values and improved creditworthiness showing an endogeneity between credit growth and GDP growth (Garcia-Escribano and Han 2015).

In addition to this endogeneity problems, we face further issues such as i) the dynamic features of the contribution made by private credits for economic growth and ii) sectoral characteristics of private credits for economic growth. Law and Singh (2014) demonstrated that too much private credits might harm economic growth. Using a dynamic panel threshold technique over the data of 87 developed and developing countries, they showed that private credit growth can benefit economic growth only up to a certain threshold. Beyond the threshold level, they demonstrated that the further growth in the private credits might adversely affect economic growth implying that there is an optimal level of private credits for emerging economies.

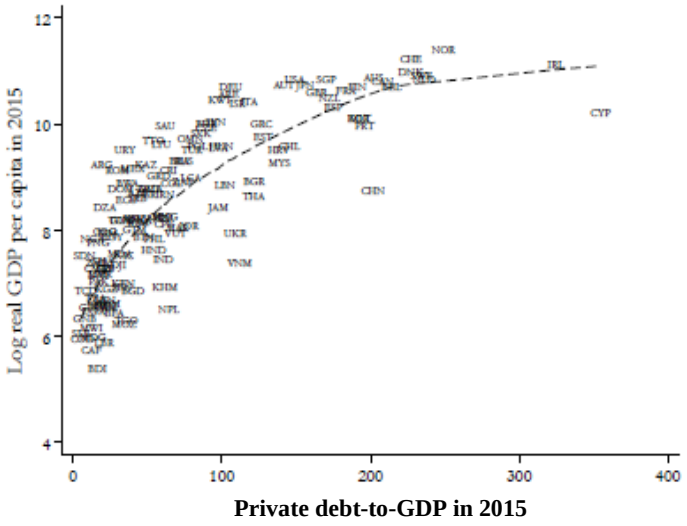
<Figure 2-21> Dynamic trends of private sector credits in advanced and emerging economies



Source: BIS Debt-Securities Database

The strong positive correlation between private sector credits and economic growth has been well demonstrated by Verner (2019) and Garcia-Escribano and Han (2015). Moreover, a strong concavity of the contribution by private sector credits for economic growth has been found with a higher effectiveness in less developed economies and reduced effect in advanced economy.

< Figure 2-22> Higher income countries have higher private credits with concavity



In addition, the contribution of private credits for economic growth varies a lot depending on different type and channels of private credits. The growth in the private credits towards households contributed to the growth of consumption, but little impacts on investments resulting in limited impacts of economic growth as reported by Ludvigson (1999). In addition, the increase in private credits to corporate sectors influence GDP growth mainly through investment, while the increase in consumer credits impacts mainly via the change in private consumption. (Garcia-Escribo and Han, 2015).

A comprehensive and seminal analysis on the impacts of credit growth by types of credits was provided by Mian, Sufi, and Verner (2017) focusing on differentiated effects of private credits to corporate sectors and credits to household sectors. Quite surprisingly, their results say that an increase in the household debt predicts lower GDP growth and higher unemployment in the medium run for a panel of 30 countries. In addition, the negative relation between the change in household debt to GDP and subsequent output growth is stronger for countries with less flexible exchange rate regimes. They also demonstrated that countries with a household debt cycle experience a sharper decline in growth after an increase in domestic household debt. Motivated by Mian, Sufi, and Verner (2017), Park, Shin and Tian (2018) examines the impacts of private credit growth on economic growth and financial recession in emerging economies. They demonstrate that both in advanced and emerging economies, corporate debt buildup causes more financial peaks than household debt buildups. In addition, corporate debt-induced financial recessions inflict a bigger damage on output than household debt-induced financial recessions in emerging economies.

These findings implicate that when the monitoring systems over banking sectors are working efficiently as in most advanced economies, private sector credits provided to households has less positive impacts on economic growth. However, with poorly performing monitoring systems on financial sectors, as in most less developed and emerging economies, corporate credits might be the source of aggravated financial instability in recession. In other words, the positive or negative impacts of private sector credits are mainly determined by accompanying financial monitoring and supervisory

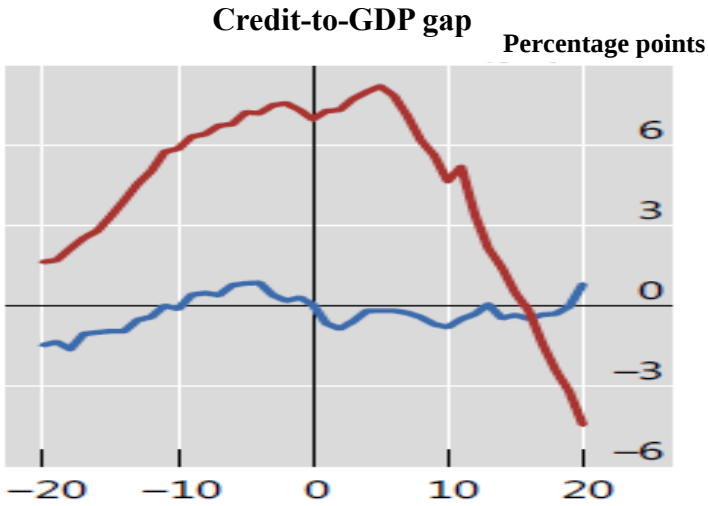
policy efforts both in advanced and emerging economies.

Nepalese economy, which is in the stage of early economic development, is supposed be heavily impacted by the growth of private sector credit growth. However, the empirical findings on the impacts of private sector credit growth in Nepal shows limited impacts on promoting economic growth as in the next chapter. These findings show that private sector credits are not effectively channeled to the productive sectors as a capital formation process implying micro-prudential policy efforts should be complemented in each stage of private credit extension.

B. Private sector credit growth as a source of financial instability

The rapid increase of private sector credits has been widely viewed as a source of financial instability leading to economic instability. The loose or expansionary monetary policies with low-for-long policy rates are supposed to induce the increase of private sector credits leading to higher risks of financial instability (Gourinchas and Obstfeld, 2012; Aikman et al, 2015). Especially, low interest rates in housing markets lead to households to take on larger mortgages spurring bigger housing market bubbles, eventually leading to financial instability (Taylor 2010). Empirical evidence has been provided that too rapid private sector credit growth can be a recent precursor of financial bubble collapse by Malikamas and Weigert (2022) as shown in the following diagram.

< Figure 2-23> Higher income countries have higher private credits with concavity



Note: The red line of the figure describe the private credits-to-GDP during 1985-2017, while the blue line represents credits-to-GDP during 1970-1984, while the horizontal axis represents the quarters before and after recession.

Although a higher private sector credit has been always considered as a source of financial instability, there are mixed perspectives on the role of monetary policies that might directly affect the level of private credits. Since a monetary policy has a wide impact on both the economy on both real sectors of economy and the financial markets, a contractionary monetary policy might be costly through lower performances in real sector economies.

In that context, there has been increasing argument that the policy target of financial stability should be addressed with targeted financial regulation and supervision rather than by a rough monetary policy (Svensson 2014). Nonetheless, there has been a strong argument supporting the role of monetary policies in that monetary policies might complement macro-prudential policies especially when the private sector credits are over the threshold level. Especially, when a low interest rate has encouraged the broad increase of the private sector credits, a contractionary monetary policy might complement macro-prudential policy and contribute to financial stability (Smets, 2014).

Bauer and Granziera (2017) has shown that the debt-to-GDP ratio rises in the short run following an unexpected tightening in monetary policy with the likelihood of a financial

instability and crisis being increased. They showed that in the long run, output recovers and higher borrowing costs discourage new lending, eventually leading to a lower level of the private sector credits. In addition, a lower debt-to-GDP ratio reduces the likelihood of financial instability. Bauer and Granziera (2017) also shows that the higher the initial value of the debt-to-GDP ratio, the more beneficial is the contractionary monetary policy in the long run, but the more destabilizing in the short run. Their findings implicate that in emerging economies with relatively high private sector credits, the contractionary monetary policy to prevent financial instability might aggravate the financial instability in the short run.

In a similar context, the impacts of monetary policies on private sector credits and financial stability have been examined by Gelain, Lansing, and Natvik (2015) and Alpanda and Zubairy (2017) using a dynamic stochastic general equilibrium (DSGE) model. They demonstrate that an unexpected tightening of policy rates can reduce private sector credits through housing sector by increased mortgage rates and discouraging new lending. Nonetheless, the contractionary monetary policies negatively affect the real sectors of the economy while the real debt is reduced only in moderate way. Therefore, the contractionary monetary policies might increase debt-to-GDP ratio in the short-run.

Based on a wide-spread recognition that higher private sector credits are a precursor of financial instability, active monetary policy responses as contractionary measures have been tried to reduce the level of private sector credits. These so-called 'leaning against the wind' monetary policy responses turned out to be quite costly by adding further negative shocks to real sector economies while the economies are already under the downturn pressure after the over-heated private credits with commencing financial instability (Ajello et al., 2016; Alpanda and Ueberfeldt, 2016; Svensson, 2016).

In general, the sharp increase of private sector credits over a certain threshold level is highly likely to induce financial instability. However, the monetary policies through contractionary approaches might reduce the absolute level of private sector credits, but deteriorates the performance of real sector economies, too. Therefore, in many cases, private credits-to-GDP ratio might be increased in short run, which might aggravate the

financial instability. In the long run, the real sectors might accommodate to the increased financing costs due to contractionary monetary policies with further reduced absolute level of private credits, eventually leading to a lower private credits-to-GDP ratio.

These findings implicate that the possible negative impacts of increasing private sector credits cannot be effectively reduced only by monetary policies, implying that simultaneous financial monitoring policy efforts via micro and macro-prudential policies are prerequisite for effective containment of financial instability due to private credits.

In Nepalese financial markets, the supply of private credits has been reduced by the Nepalese monetary authority's contractionary policies since late 2021. Even after this contractionary policy measures, it has not been observed significant negative impacts in Nepalese real sector economy, implying that still there is structural gap between financial markets and industrial structure in Nepal, and building up the virtuous circle of financial markets and industrial capital formation is the first priority issue in Nepal.

C. Possible clues for optimal private sector credit policies

Private sector credits have been believed to be engines of economic growth and development as a channel for optimal resource allocation providing more resources to more productive and prospective sectors in economies. Nevertheless, the types and patterns of private credits matter for real contribution for economic growth. Empirical evidences have been provided for the possible negative impacts of household credits on economic growth. Therefore, as long as the financial monitoring systems work efficiently, a higher ratio of corporate credits implies a higher probability for economic growth. However, when the financial monitoring systems including micro and macro-prudential policies do not function efficiently, a higher ratio of corporate debt can aggravate the financial instability especially in the downturn phase of financial and economic cycles.

In addition, the growth of private sector credits over a certain threshold level, the marginal contribution of private sector credits for economic growth is sharply decreasing while adding a higher probability of financial instability. A commonly accepted threshold

level of private sector credits for an emerging economy is 100% of GDP, while there is a very wide variation for different developmental stages and different political economic features.

Empirical studies on the relationship between the level of private sector credits and financial instability show a consistent positive relationship between two variables. In addition, although a contractionary monetary policy can lower the absolute level of private sector credits, the final impacts on financial stability are estimated to be quite mixed. Theoretical and empirical estimation results say that a short run effect of contractionary monetary policies on financial stability might be negative mainly due to a dominant negative impact on the real sector of economies, which increases the private credits-to-GDP ratio. In the long run, contractionary monetary policies might decrease the private credits-to-GDP ratio thorough corporate sectors' adaptation to a higher financial cost after contractionary monetary policies, and eventually reduce the financial instability.

These findings implicate that private sector credits are essential for dynamic and sustainable economic growth for all economies, especially at the early stage of economic development. However, as financial services get deepened and financial markets are saturated, the marginal contribution of additional private credits for further economic growth is reduced, that might be described as a diminishing return from further private sector credits. In addition, a higher level of private sector credits is strongly correlated with a higher risk for financial instability. Nevertheless, a contractionary monetary policy does not guarantee to reduce the financial instability. Therefore, it is strongly recommended from the very early stage of the growth in the private sector credits, an active financial monitoring efforts through micro and macro-prudential policies are preconditions for effective and efficient economic growth and development. Especially, in the later stage of financial deepening, well-designed and fine-tuned micro-prudential and macro-prudential policy efforts with respect to private sector credits are prerequisites not only for sustainable economic growth via private credits but to reduce the risks of financial instability due to a higher level of private sector credits.

III. The impacts of private sector credit growth on real sectors in the Nepalese economy

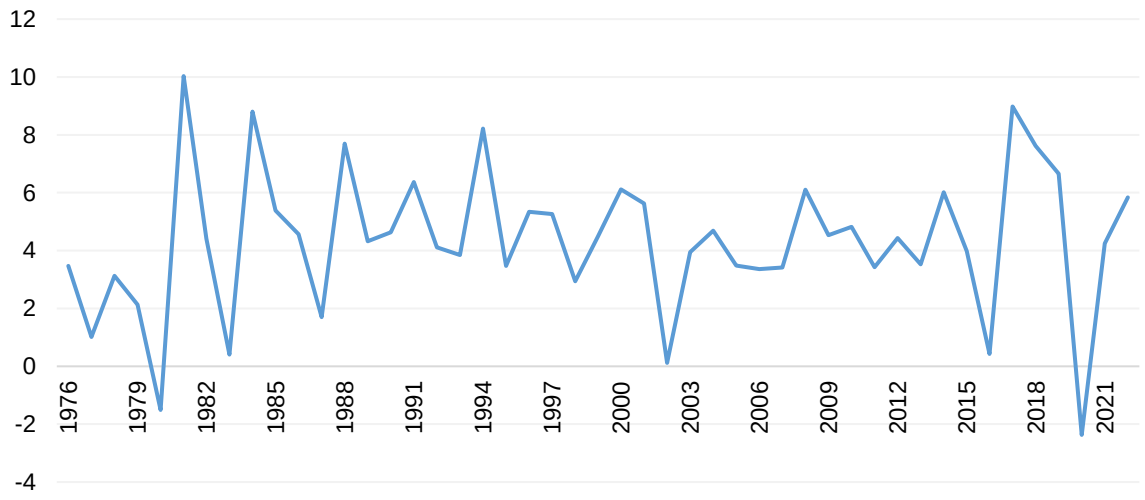
1. The latest development of real sectors in the Nepalese economy

We divide this chapter into different parts to cover the recent development in real sectors such as growth, inflation, structural transformation, and business cycles.

A. Economic growth: Evolution and recent development

Nepal's economic growth is historically low. Figure 3-1 shows the historical evolution of GDP growth. GDP grew by 4.3 percent on average during the period 1976-2022. Likewise, economic growth averaged 4.0 percent before the democracy of 1990. Nepal implemented economic reforms after the democracy such as liberalization of trade, and privatization of public enterprises, among others. Despite the reforms, the growth has been still low, averaged 4.4 percent during the period 1990-2022. Despite the reforms, growth was affected by Maoist insurgency during the period 1998-2006, and then a long political transition until 2015.

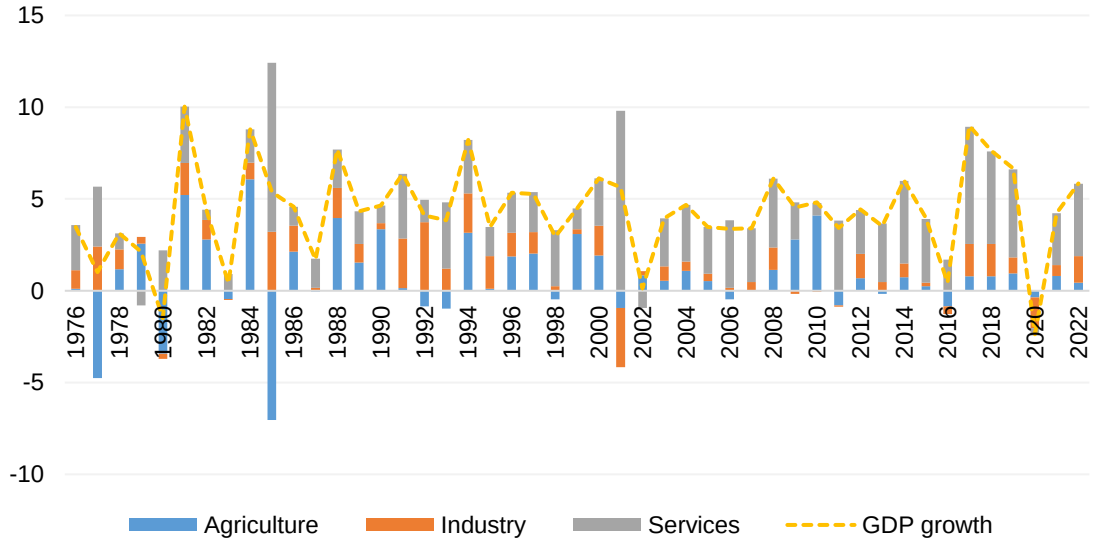
<Figure 3-1> Evolution of GDP growth



Economic growth is not only low but also volatile, indicating frequent shocks affecting the economy. For example, the standard deviation of GDP growth is 2.5. Since the agriculture sector covers a large share of GDP, which highly depends on monsoon and the availability of fertilizer, growth volatility is largely explained by weather shocks and subsequent volatility in agriculture sector growth (Figure 3-2). Moreover, the economy was also hit by frequent shocks. Some major shocks include severe drought in 1980, bad weather, drought, and flood in 1987, unfavorable weather and devaluation of the Nepalese Rupee with the Indian Rupee in 1993, increased conflict 2002-2006, earthquake in 2015 and later supply route disruption from India, and COVID-19 shocks.

Economic growth is largely coming from the service sector (Figure 3-2). Agriculture sector growth is more volatile, and as a result, the contribution to growth is lower despite its large share. The average GDP growth during 1976-2002 is 4.3 percent, in which agriculture contributes 0.77 percentage points, the industry contributes 0.84, and the service sector contributes 2.84 percentage points.

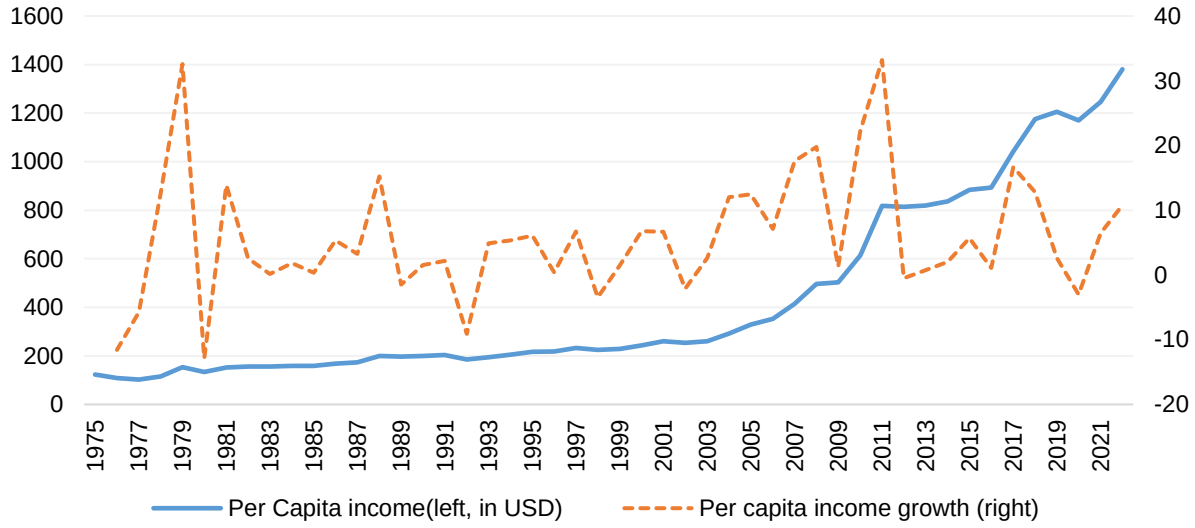
<Figure 3-2> Sectoral contribution to GDP growth



Due to the COVID-19 pandemic and associated lockdown in 2020, the economy contracted by 2.4 percent. Several policy measures, including fiscal, monetary, and other policies, have been implemented to reduce the impact of the COVID pandemic and

recover the economy. Thus, the economy expanded by 4.2 percent in 2021 and 5.8 percent in 2022.

<Figure 3-3> GNI per capita income and its growth

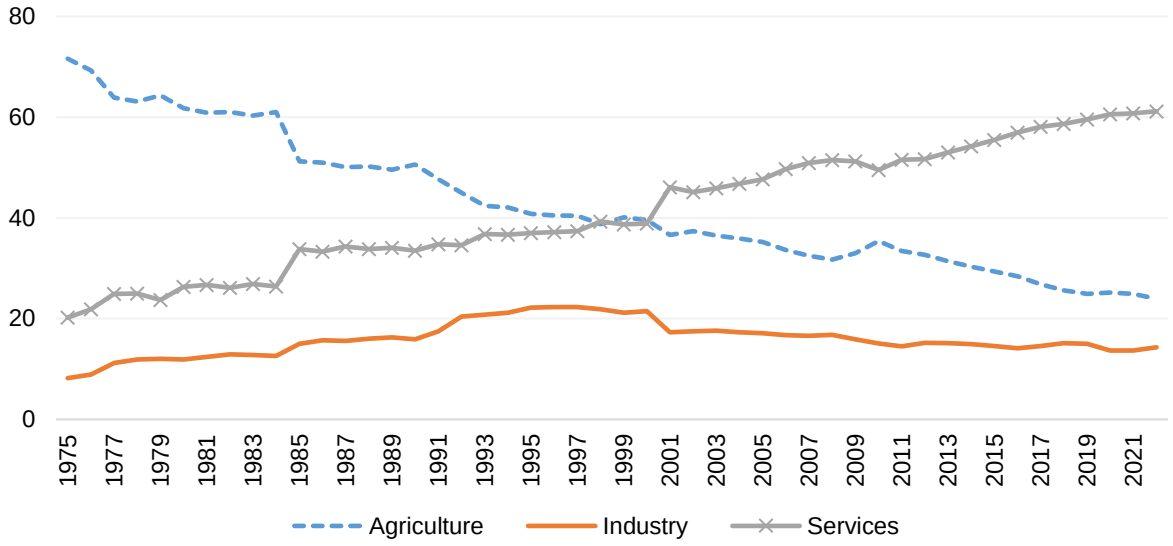


The growth of GNI per capita income is also low, and volatile (Figure 3-3). On average, per capita income grew by 5.7 percent during the period 1976-2022. Likewise, the growth is volatile with a standard deviation of 9.5 percent. Thus, the GNI per capita income was USD 122.79 in 1975 and reached USD 1380.7 in 2022.

B. Structural transformation of the economy

Structural transformation has been taking place rapidly in recent decades. Figure 3-4 shows how the structure of the Nepalese economy has evolved over time. In 1975, the share of agriculture in GDP was 71.6 percent, which reached 23.9 percent in 2022. On the other hand, the share of the service sector increased from 20.2 percent in 1975 to 61.2 percent in 2022. But, the share of the industrial sector remained stagnant despite its modest rise in the 1990s after liberalization. The share of the industry was 8.2 percent in 1975, increased to 22.3 in 1997, and declined to 14.2 percent in 2022.

<Figure 3-4> Structural transformation of Nepalese economy



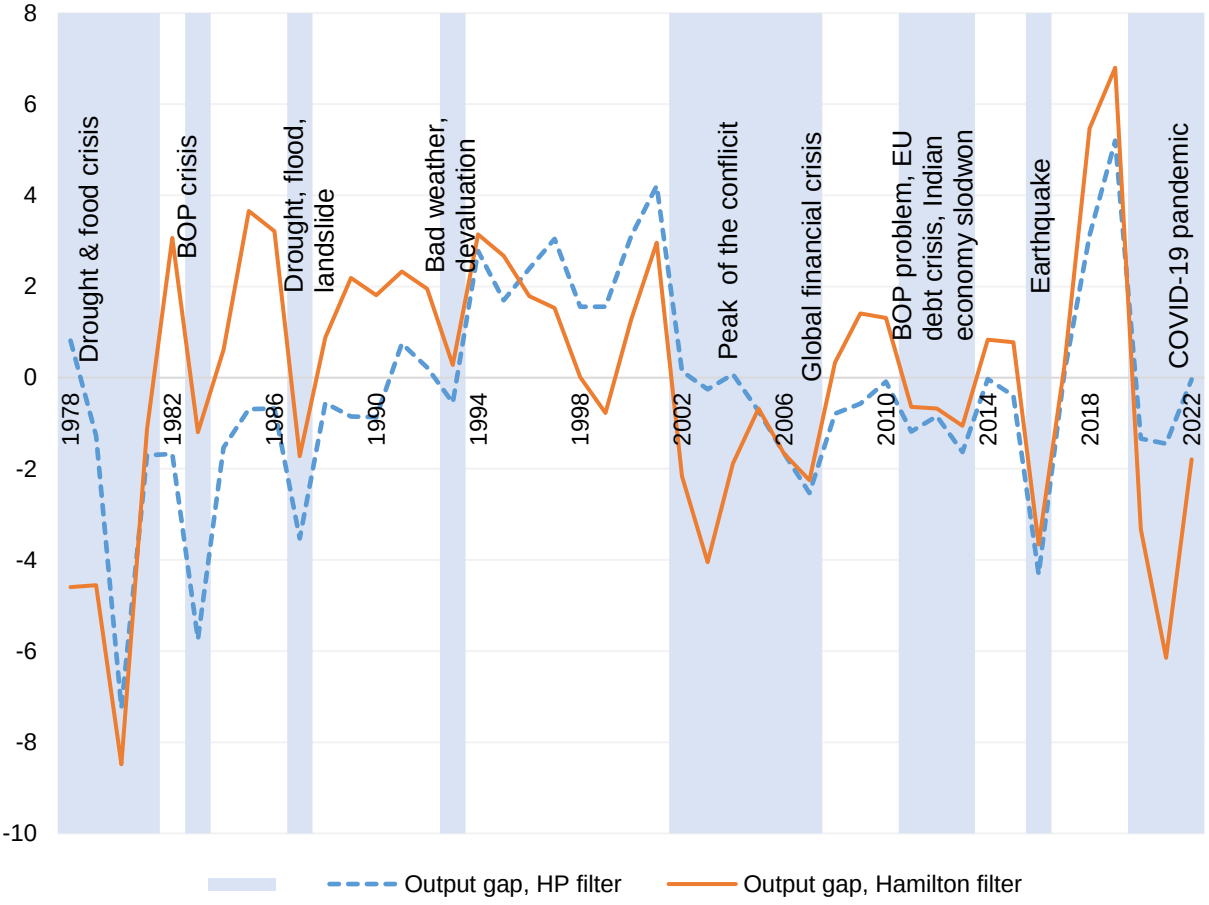
One crucial feature is that structural transformation is taking place without industrialization. This fact contrasts with the usual process of transformation. The economy is directly transforming from agriculture to service sector rather than moving from agriculture to industry and then service sector.

C. Business cycles

The Nepalese economy has not yet fully recovered from the COVID-19 pandemic. Figure 3-5 shows the output gap estimates based on the HP filter and Hamilton filter for the period of 1975-2022.

Recently, after the federal election in 2017, the economy was above potential, creating a positive output gap, due to the expectation of political stability after the formation of a majority government, and large government expenditure in the initial phase of fiscal federalism implementation. Then, the economy has been contracted after the COVID-19 pandemic shock. There is still a negative output gap, and the economy seems below potential after the COVID-19 pandemic hit in 2020. In 2022, the output gap estimates based on the HP filter and Hamilton filter were -0.03 percent and -1.79 percent of GDP respectively.

<Figure 3-5> Output gap (in % of GDP)



Historically, the Nepalese economy was hit by frequent shocks, causing a negative output gap. For example, the drought in 1980, and the balance of payment crisis in 1984 led the economy to below potential. After democracy in 1989, and the implementation of liberalization programs, the economy expanded with a positive output gap in the 1990s. During the peak of insurgency around 2002, and the political transition around 2006, the economy suffered infrastructure damage, especially transport and communication, as well as other supply chain problems. As a result, the economy was below potential most of the year during the 2000s. Likewise, the earthquake in 2015 caused the economy to remain below potential.

D. Sector-wise GDP growth and composition

Currently, there are 18 sectors in the national accounting from the production side. Table 3-1 shows the sector-wise composition of GDP and the growth of these sectors in recent years. The share of agriculture, forestry, and fishing is 20.3 percent in 2022, which is followed by wholesale and retail trade covering 13.9 percent. Other notable shares of the sectors include 4.8 percent by manufacturing, 5.2 percent by construction, 5.1 percent by transport and storage, 5.8 percent by financial and insurance activities, 7.4 percent by real estate activities, 6.9 percent by education, and 5.9 percent by public administration.

<Table 3-1> Sector-wise growth and composition of GDP

Industrial Classification	Growth (%)				Share in GDP (%)		
	2019	2020	2021	2022	2019	2020	2022
Agriculture, forestry, and fishing	7.9	3.6	5.7	7.8	21.6	22.2	20.3
Mining and quarrying	19.2	-7.1	5.3	11.3	0.6	0.5	0.5
Manufacturing	13.4	-9.5	14.7	16.1	5.0	4.5	4.8
Electricity, gas, steam, and air conditioning supply	9.3	19.2	3.5	34.9	0.9	1.0	1.2
Water supply; sewerage, waste management and remediation activities	1.2	2.0	2.5	1.8	0.5	0.5	0.4
Construction	7.6	-8.8	2.0	16.3	6.1	5.5	5.2
Wholesale and retail trade; repair of motor vehicles and motorcycles	14.7	-5.2	13.5	15.2	14.1	13.2	13.9
Transportation and storage	9.1	-16.4	8.9	25.0	5.6	4.6	5.1
Accommodation and food service activities	12.4	-33.3	16.5	15.6	2.0	1.3	1.4
Information and communication	5.5	3.8	5.5	5.6	1.9	2.0	1.8
Financial and insurance activities	11.0	16.8	6.1	9.7	5.4	6.2	5.8
Real estate activities	11.9	9.2	3.1	8.3	7.7	8.3	7.4
Professional, scientific and technical activities	9.9	8.0	4.9	9.8	0.8	0.9	0.8
Administrative and support service activities	29.3	9.0	4.9	10.5	0.7	0.7	0.7
Public administration and defense; compulsory social security	12.9	26.6	4.0	10.3	5.7	7.1	6.5
Education	14.6	14.7	2.8	12.1	6.5	7.4	6.9
Human health and social work activities	13.0	21.2	8.2	12.8	1.3	1.6	1.5
Others*	11.7	19.1	7.3	8.5	0.5	0.5	0.5

Note: Others include arts, entertainment and recreation, other service activities, and activities of households as employers, undifferentiated goods, and services producing activities of households for own use.

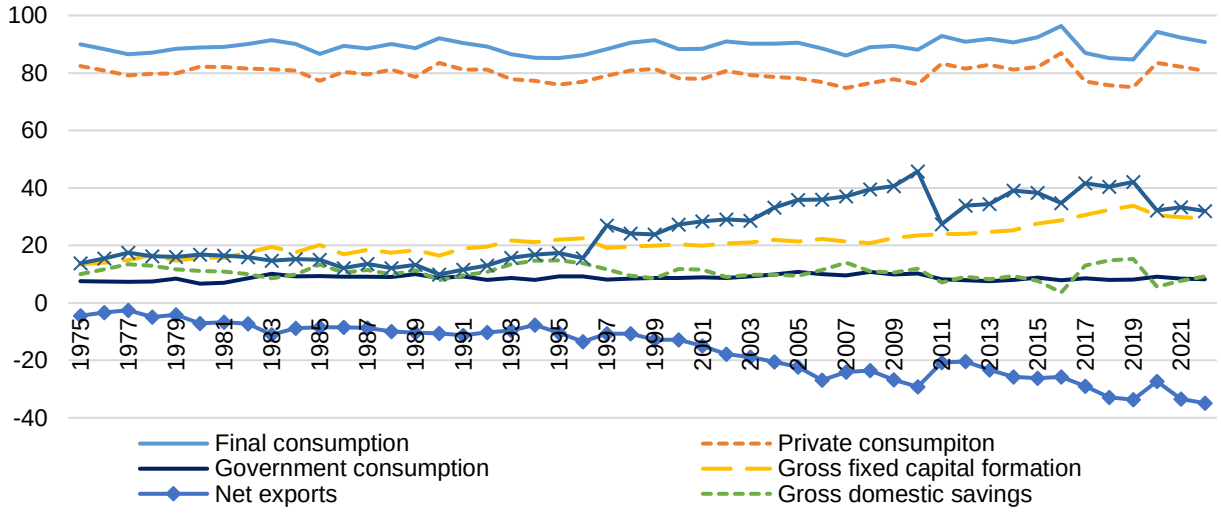
All sectors have had positive economic growth in the last two years, suggesting a recovery in all sectors. During the peak impact of the COVID-19 pandemic in 2020, six sectors had negative growth. In 2020, accommodation and food services activities declined by 33.3 percent, transport and storage declined by 16.4 percent, manufacturing by 9.5 percent, mining and quarrying by 7.1 percent, wholesale and retail trade by 5.2 percent, and construction by 8.8 percent.

We present selected indicators from the expenditure side of GDP in Figure 3-6. On the expenditure side, the share of final consumption in GDP is around 90 percent in years. In consumption, government consumption is around 8 percent, and private consumption is around 80 percent in recent years. The gross fixed capital formation has increased from 13.4 percent of GDP in 1975 to 29.4 percent in 2022. On the other hand, Nepal incurred a persistent trade deficit, which increased from -4.5 percent of GDP in 1975 to 34.9 percent in 2022.

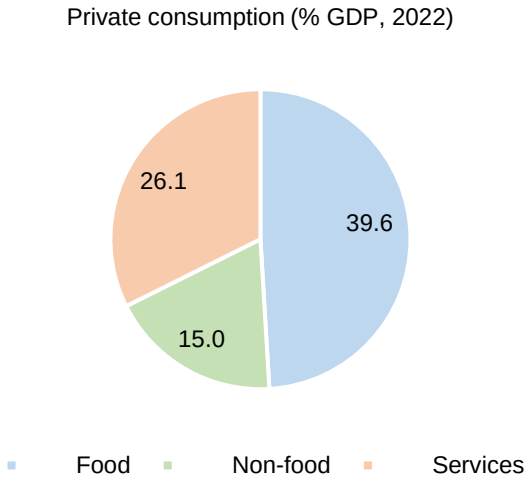
One interesting fact is that gross national savings has also increased significantly over the period. For instance, the gross national savings as a percent of GDP was 13.1 percent in 1975 to 32 percent in 2022. But the gross domestic savings is stagnant at around or below 10 percent over the period. Mainly, the gap is financed by the increased flow of workers' remittances in recent years.

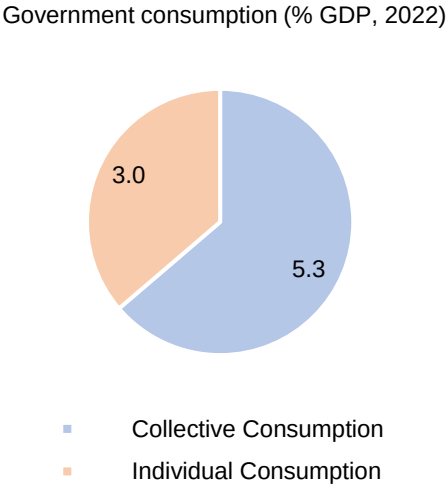
Figure 3-7 shows a further decomposition of private consumption (food, non-food, and durables), government consumption (collective, and individual), net exports (exports, and imports), and gross fixed capital formation (general government, state enterprises, and private). All figures are in percent of GDP in 2022. About 40 percent of GDP goes into food consumption. Likewise, more than 20 percent of GDP is capital formation by the private sector whereas the government sector does only about 6 percent of GDP.

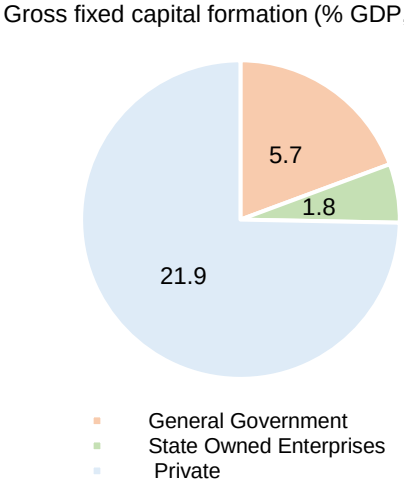
<Figure 3-6> Selected macroeconomic indicators

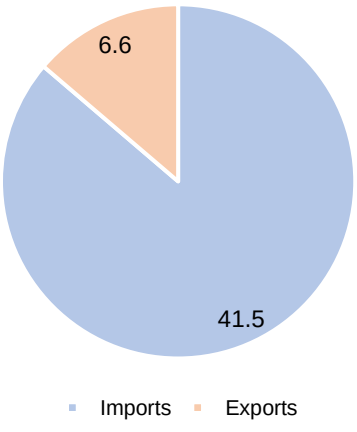


<Figure 3-7> Composition of expenditure components







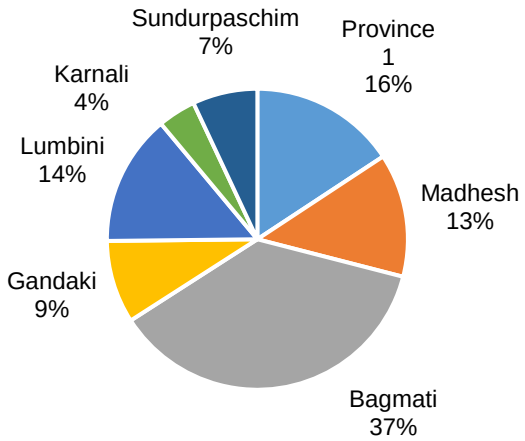


E. Province wise GDP

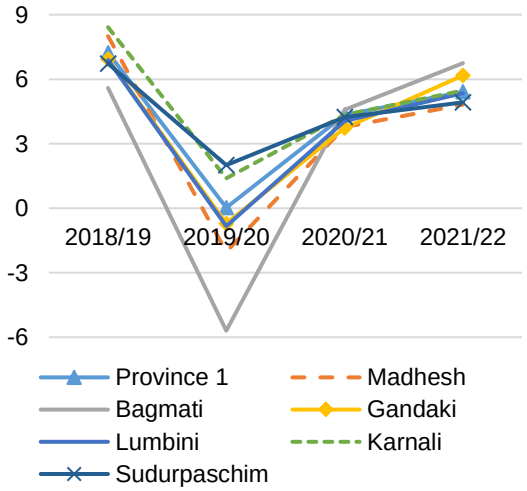
Nepal entered federalism in 2015, which divided the country into seven provinces. Central Bureau of Statistics, Nepal began computing provincial GDP after 2019. The data shows the concentration of economic activity in Bagmati province which includes the federal capital, Kathmandu. In 2022, Bagmati covers about 37 percent of GDP, followed by Province 1 covering 15.7 percent, Lumbini 14.1 percent, and Madhesh 13.3 percent. Likewise, Gandaki covers 8.9 percent, Sudurpaschim 7 percent, and Karnali 4.1 percent (Figure 3-8).

Province-wise economic growth data shows that all provinces are in the recovery phase after COVID-19 (Figures 3-9). In 2022, the growth rate in Bagmati and Gandaki were more than 6 percent, and in all other provinces, it is about 5 percent. Moreover, after COVID-19, Bagmati province seems to be affected more than other provinces, with economic growth of -5.7 percent in 2020. Interestingly, Karnali and Sunderpaschim have had positive economic growth since 2019.

<Figure 3-8> Province wise GDP



<Figure 3-9> Province wise growth



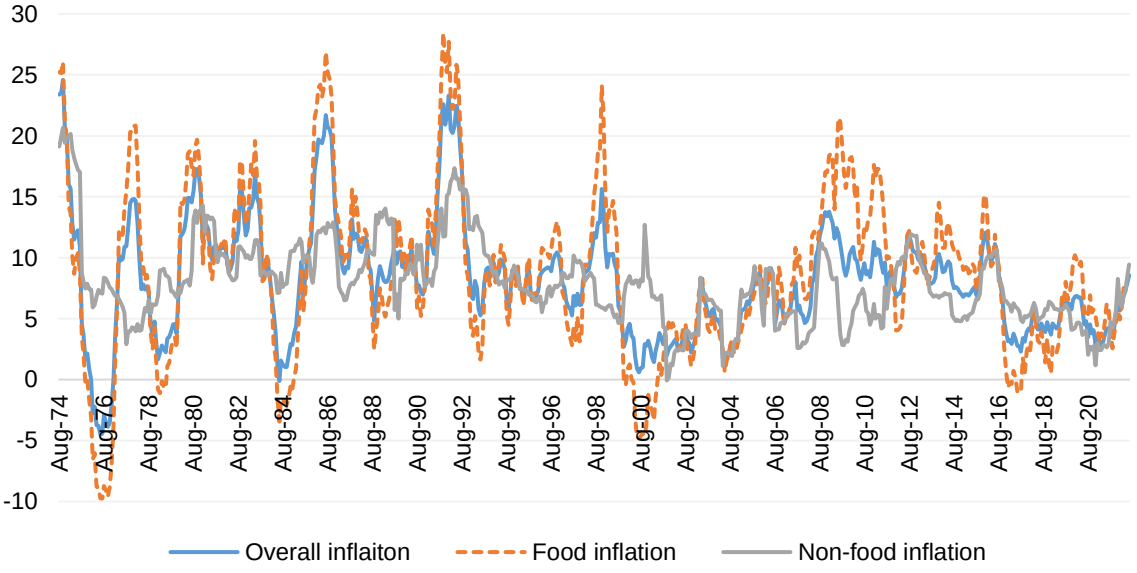
F. Inflation

Inflation remained high and volatile for most of the period during 1974-2022. Figure 3-10 shows the historical evolution of food, non-food, and overall CPI inflation. Inflation averaged 8.1 percent during 1974-2022. Accordingly, food, and non-food averaged 8.6 and 7.9 percent. Historically, food inflation has remained more volatile than non-food inflation. The standard deviation of food, non-food, and overall CPI inflation was 4.7 percent, 6.7 percent, and 3.4 percent respectively. Inflation was more volatile before 2000 than the later period.

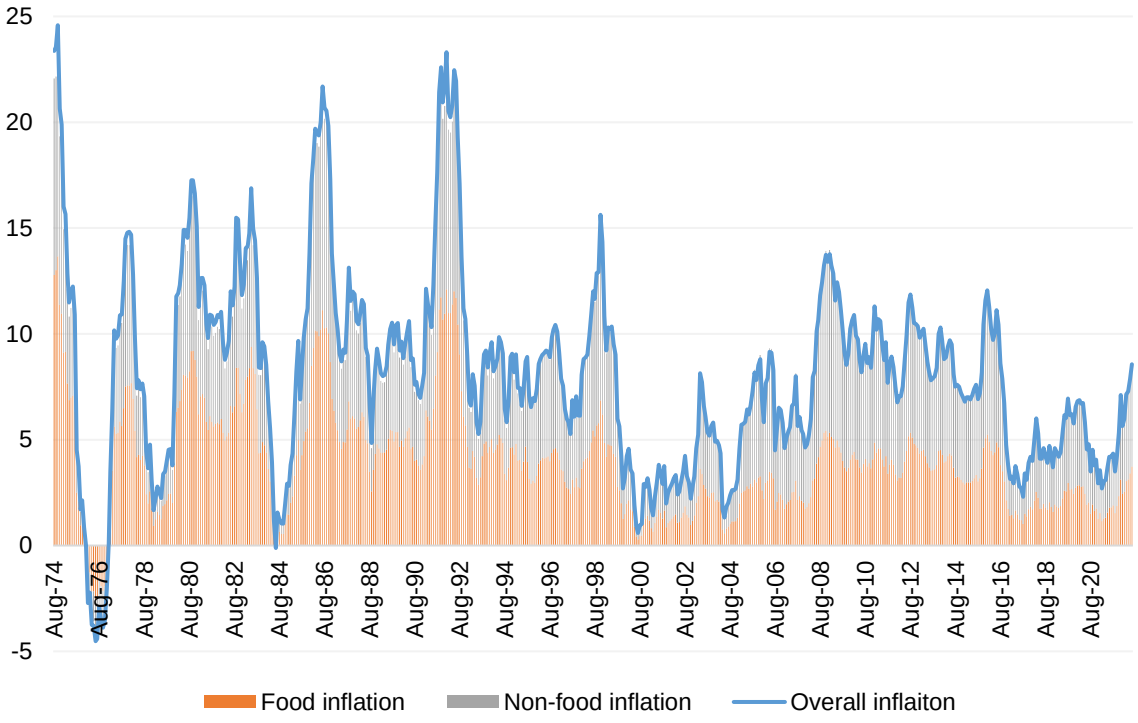
Food inflation contributes more to overall inflation before 2000 (Figure 3-11). Later, the contribution of non-food inflation is more than food. For example, in the average inflation of 9.6 percent before 2000, food inflation contributes 4.9 percentage points, and remaining by non-food inflation. In contrast, of the average 6.6 percent inflation after 2000, food inflation contributes only 2.8 percentage points.

After the COVID-19 pandemic, inflation has accelerated more recently. In 2019, overall inflation was 4.6 percent, which reached 6.2 percent in 2020. In 2021, it was 3.6 percent. More recently, in June 2022, CPI inflation reached 8.6 percent. Likewise, food, and non-food inflation also reached 7.4 percent and 9.4 percent respectively.

<Figure 3-10> Food, non-food, and overall CPI inflation



<Figure 3-11> Contribution of food, and non-food inflation



2. Theoretical analysis of the impacts of private sector credit growth on real sectors in the Nepalese economy: Dynamic Stochastic General Equilibrium (DSGE) model approach

A. Introduction

Macroeconomic models such as DSGE models have been useful to understand the fundamental relationship between aggregate variables of an economy. Particularly, New Keynesian synthesis on top of the neoclassical framework in the DSGE literature has been a key mechanism to derive monetary policy implications. Consequently, New Keynesian DSGE models have been heavily studied among many central banks. However, the DSGE models have faced challenges after the global financial crisis started in late 2008. Of many criticisms on DSGE models, one limitation was the lack of dynamics in financial sector which has been the source of crisis in the global financial crisis. One of many proposed modifications in DSGE literature, therefore, was to incorporate balance sheet effects of a financial constraint. This type of models is mostly known as a financial friction model and received wide attention since the emergence of the global financial crisis.

Moreover, COVID-19 pandemic in recent years have raised many questions regarding the macroeconomic conditions along with the deteriorating financial market developments. Additionally, understanding whether this type of pandemic shock is an aggregate supply or aggregate demand shock has become important agenda since only then can relevant policy responses be proposed to cope with such shock. The Nepalese economy was no exception to the two episodes of the global financial crisis and COVID-19 pandemic. Credit booms and busts are common phenomena during these types of crisis. It is important to understand and rigorously analyze how these types of economic crisis propagate through macroeconomic variables and financial variables. Hence, this chapter will be devoted to understanding Nepalese economy via a DSGE model with a financial friction and explain the sources of credit booms and busts.

There are two popular approaches for the financial friction in DSGE models. The first

approach is to allow collateral in the borrowing constraint, as in Kiyotaki and Moore (1997). The introduction of this collateral constraint amplifies the mechanism of an aggregate shock through the balance sheet effect, depending on the level of net asset. This specification has been successfully applied to identify the relationship between business cycle fluctuations and real estate prices, as in Iacoviello (2005) and Iacoviello and Neri (2010). However, this approach is too sensitive to various structural parameters, such as the ratio of financially constrained households, a degree of heterogeneity between idiosyncratic productivities and the elasticity of inter-temporal substitution in utility, as Mendicino (2012), Kocherlakota (2000), and Cordoba and Ripoll (2004) have mentioned.

The second approach is to introduce a financial accelerator mechanism, as in Bernanke et al. (1999). The model identifies the financial leverage cost induced by a risk-hedging debt contract between a financial intermediary and a risk-neutral entrepreneur. In other words, financial risk is reflected in the borrowing price, in contrast to the collateral constraint. This model similarly produces an amplification mechanism for an aggregate shock, albeit via the counter-cyclical financial leverage cost. Moreover, the financial accelerator model has an advantage, especially in terms of empirical analysis, since the price measures of the financial market, such as loan interest rate and deposit interest rate, are identified, which can be directly mapped into data, in contrast to quantity measures. Exploiting this advantage, Christensen and Dib (2008) and Christiano et al. (2010) have applied this model to large-scale DSGE models for various empirical analyses.

<Table 3-2> Related literature on the Korean economy

	Economy	Financial Friction	Labor Friction	Banking
Gertler *et al*. (2007)	SOE	similar to BGG	X	X
Chung∗ (2011)	SOE	BGG	X	X
Lee∗ (2011)	Closed	KM & BGG	X	X
Alp et al. (2012)	SOE	BGG	X	X
Moon and Lee∗ (2012)	SOE	GGN	X	X
Kim∗ (2012)	SOE	BGG	X	X
Bae∗ (2013)	SOE	BGG	X	O
Kang and Suh (2017)	SOE	BGG	Matching	X

Joo∗ (2019)	Closed	BGG	X	O
Kim (2022)	SOE	BGG	Involuntary	O

∗: References in Korean

SOE: Small Open Economy, Closed: Closed Economy

BGG: Bernanke *et al*. (1999), KM: Kiyotaki and Moore (1997), GGN: Gertler *et al*. (2007)

The above table 3-2 shows a list of several studies who have applied financial friction DSGE models, to analyze the Korean economy. The earliest financial friction model that was applied to the Korean economy was that of Gertler et al. (2007), who demonstrated that the financial accelerator model[8] duly captured the financial crisis of 1997–1998 and the counterfactual experiment implied that the fixed exchange rate would have exacerbated the crisis. Chung∗ (2011) similarly adopted the financial accelerator model and showed that the monetary policy designed in response to the exchange rate was not desirable in terms of social welfare, while the model also accounted for the behavior of the Korean economy during the global financial crisis of 2007–2008. Alp et al. (2012) also confirmed that the counterfactual experiments under the financial accelerator model implied that the exchange rate flexibility and interest rate cuts implemented by the Bank of Korea substantially softened the impact of the global financial crisis in 2007–2008. Moon and Lee∗ (2012) illustrate the responses of macroeconomic variables with various structural shocks using the estimated model and find that the business cycle fluctuations of exchange rate, external debt, and investment are substantially affected by the country risk premium shock via the financial accelerator mechanism. Kim∗ (2012) and Bae∗ (2013) also report that the estimated models show a significant influence of financial market disturbances on investment and output in terms of business cycle fluctuations. In addition, Bae∗ (2013) finds that the monetary policy established in response to the exchange rate or asset prices improves social welfare compared to the conventional Taylor rule that responds to the output gap and inflation gap only. Interestingly, this is a

[8] The financial accelerator model refers to Bernanke et al. (1999), while the collateral constraint model refers to Kiyotaki and Moore (1997).

contrasting result from Chung∗ (2011) in the case of the exchange rate responding to the monetary policy. The significant difference between Chung∗ (2011) and Bae∗ (2013) seems to be the introduction of the banking sector[9] that identifies the spread between the lending and deposit interest rates. Although the author has not explicitly analyzed the role of the banking sector by comparing one with it and one without it, these results seem to imply that the monetary policy responding to the exchange rate is likely to stabilize the economy via the banking sector channel.

Joo∗ (2019) adopts the financial accelerator mechanism in both the firm and banking sectors and confirms that the estimated model implies that the financial accelerator mechanism is more important for the firm's business cycle behaviors relative to the banking sector. However, the model assumes a closed economy that is restricted to domestic macroeconomic conditions only. Lee∗ (2011) also assumes a closed economy model but adopts both a financial accelerator mechanism and collateral constraint. While the collateral constraint dampens the effect of total factor productivity (TFP) shock, the financial accelerator mechanism amplifies the effect of monetary policy shock. Finally, Kang and Suh (2017) adopt the financial accelerator model and labor market friction with a search and matching framework, which is a key departure from previous studies. They found that a household's weak bargaining power suppressed the real wage increase during the recovery period after the global financial crisis of 2007—2008, while the unemployment rate decreased. However, this model lacks the ability to identify the labor market participation rate, which is potentially important for explaining labor market behaviors during and after the global financial crisis, as Erceg and Levin (2014) have mentioned.

Finally, the model employed in Kim (2022) adopts the financial accelerator mechanism, involuntary unemployment, small open economy, and banking sector. Kim (2022) finds that the financial risk shock has a significant effect on investment. Sixth, the global financial crisis was driven by aggregate demand shocks, aggregate supply shocks, and

[9] The model follows Edwards and Végh (1997).

foreign shocks. However, the pandemic crisis was mostly driven by adverse aggregate supply shocks, while the adverse foreign shocks' contributions were short-lived. Moreover, policy shocks played important roles in dampening the adverse effects of shocks, especially on output and unemployment rates.

The model specifications adopted in this chapter mostly follow those of Kim (2022) except for the labor friction. Since there is limited data on labor market data in Nepal, the labor market in the model will be in abstract form. However, as the Nepalese economy is heavily influenced by foreign conditions, the assumption of a small open economy seems natural following Kim (2022). Also, this study focuses on business cycle fluctuations of credit supply and demand by simulation exercises, such as impulse response functions, variance decompositions, and implied volatilities of variables. The financial friction model in Kim (2022) naturally defines both credit supply and demand explicitly to perform all of these exercises.

More importantly, this chapter will assess how the types of structural shocks that have contributed toward the macroeconomic and financial variables such as credit supply and demand by demonstrating historical decom- positions. The historical decompositions will allow us to understand various sources of the credit booms and busts historical developments. Lastly, although the banking sector specification in this study is not a crucial departure, it is assumed to extend the data dimension because it includes observation series, such as the credit supply and demand, which can potentially help in the estimation of structural parameters related to the financial market.

In the following, Section (2) illustrates the benchmark model; Section (3) shows the estimation results, various simulations, and historical decom- positions; while Section (4) summarizes and concludes this chapter.

B. Model

The key departure of Bernanke et al. (1999) financial accelerator model from the standard New Keynesian model is the identification of an entrepreneur and a financial intermediary. The entrepreneur is a risk-neutral agent who operates the capital stock to provide capital services to goods- producing firms. The entrepreneur has access to the financial market to borrow from financial intermediaries, such as banks, so that debt financing is possible. The model explanation presented below is illustrated in detail only with those key departures, while the rest of the model, which consists of New Keynesian components with a small open economy assumption, is summarized in the appendix in terms of equilibrium conditions[10].

(1) Capital producer

The capital market is perfectly competitive; therefore, a representative capital producer can be assumed. The capital producer purchases the physical capital stock after depreciation, $(1-\delta)k_{t-1}^{s}$, from the entrepreneur in the current period, and sells the next period′s physical capital stock, k_t^s, by producing capital stock with a new investment, i_t[11]. The following equation is the physical capital evolution process with an investment adjustment cost[12].

$$k_t^s = (1-\delta)k_{t-1}^s + \xi_t^i\left(1-S\left(\frac{i_t}{i_{t-1}}\right)\right)i_t \tag{1}$$

The price of the capital stock, q_t, varies over time due to the investment adjustment

[10] The New Keynesian model with the small open economy assumption is close to that of Kim (2014), except for the non-stationary growth of output. The model employed herein focuses only on business cycle fluctuations; thus, all the variables are stationary.

[11] We distinguish the physical capital stock, k_t^s, from capital service, k_{t+1}^d, as capital service reflects the capital utilization, u_{t+1}. Thus, $u_{(t+1)k_t^s} = k_{t+1}^d$.

[12] A quadratic investment adjustment cost function, $S\left(\frac{i_t}{i_{t-1}}\right)$, is assumed, as in (F.2).

cost. In addition, an investment-specific technology shock, ξ_t^i, is added to explain the business cycle fluctuation of the investment. By denoting the relative price of the capital stock, q_t, and that of the investment, $\frac{p_t^i}{p_t}$, the profit function of this capital producer is

$$\Pi_t^k \equiv q_t k_t^s - q_t(1-\delta)k_{t-1}^s - \frac{p_t^i}{p_t} i_t$$

The profit maximization of this problem under the capital evolution process, (1) above, provides the optimality conditions associated the capital stock, k_t^s, and the investment, i_t.

(2) Entrepreneur

There exists a continuum of risk-neutral entrepreneurs, indexed by j. At period t, the j^{th} entrepreneur purchases the capital stock, $k_{j,t}$, which will be utilized in the next period, with their own real net worth, $nw_{j,t}$, in addition to debt, $d_{j,t}^e$, financed by financial intermediaries. Hence, the following constraint is the balance sheet of the j^{th} entrepreneur.

$$d_{j,t}^e = q_t k_{j,t} - nw_{j,t} \geq 0 \quad (2)$$

Each entrepreneur faces an idiosyncratic productivity shock, which is a source of heterogeneity among entrepreneurs. This entrepreneur-specific shock is reflected in the capital services that are provided to the goods-producing firms. We denote this idiosyncratic shock by ω, which is assumed to have a log-normal probability density.

$$\Pr[\omega \leq x] = F(x; \sigma_t^\omega)$$

The above-mentioned probability density for $\log \omega$ has a mean of μ^ω with a standard deviation of σ_t^ω[13]. Moreover, σ_t^ω is an exogenous volatility process that is referred to as "financial risk shock," as in Christiano *et al*. (2014). Furthermore, the information on

[13] $\mu\hat{}\omega$ satisfies $\int_0^\infty \omega dF(\omega; \sigma^\omega) = 1$

the j^{th} idiosyncratic productivity, ω_j, is hidden so that information asymmetry is present. Owing to this asymmetry, a costly state verification problem arises, as will be discussed further herein.

To derive the optimal debt contract between the entrepreneur and the financial intermediary at period t, the expected return at period $t+1$ should be explicitly illustrated. Therefore, let us first start with the decision on capital utilization, u_{t+1}, at period $t+1$ after the idiosyncratic productivity shock, $\omega_{j,t+1}$, is realized. The j^{th} entrepreneur decides on the capital utilization, u_{t+1}, to maximize the following profit[14]:

$$\max_{u_t+1}[u_{t+1}r_{t+1}^k(1-\tau_k)-\frac{\Phi(u_{t+1})}{\xi_{t+1}^i}+\frac{\delta\tau_k}{\xi_{t+1}^i}]\omega_{j,t+1}k_{j,t}^s$$

The entrepreneur provides the capital service[15], $u_{t+1}\omega_{j,t+1}k_{j,t}^s$, to the firms from which the entrepreneur earns $r_{t+1}^k(1-\tau_k)$ after tax for each unit of capital service. The entrepreneur also bears a capital utilization cost, $\frac{\Phi(u_{t+1})}{\xi_{t+1}^i}$, and receives a tax deduction from the depreciation of capital stock, $\frac{\delta\tau_k}{\xi_{t+1}^i}$. After utilizing the capital, the entrepreneur resells the remaining physical capital stock to the capital producer at the end of period $t+1$. Thus, the gross return from operating one unit of physical capital stock for the entrepreneur is, R_{t+1}^k.

Based on the expected return at period $t+1$, the entrepreneur needs financial leverage to purchase the new physical capital from the capital producer at the end of period t. Financial leverage is attained via a standard debt contract with a financial intermediary. The standard debt contract, as in Townsend (1979), is a result of the costly state verification problem of idiosyncratic productivity in the future. The contract states that the financial intermediary provides the funds, for instance, $d_{j,t}^e$, and, in return, the

[14] Note that u_{t+1} is not j specific because of the symmetric optimality conditions between entrepreneurs, which will be evident.

[15] Note that $k_{j,t+1}^d = u_{t+1}k_{j,t}^s$. Thus, the market-clearing condition for the physical capital market is $\int_0^\infty \omega k_{j,t}^s dF(\omega) = k_t^s$, whereas that for the capital service market is $\int_0^\infty \omega u_{t+1}k_{j,t}^s dF(\omega) = k_{t+1}^d$.

entrepreneur pays a gross interest rate[16], $Z_{j,t+1}$, if the idiosyncratic productivity is above a certain threshold level, say, $\bar{\omega}_{j,t+1}$. Furthermore, the contract also specifies that if the idiosyncratic productivity is below the threshold level, the financial intermediary bears the auditing cost to verify the true state of the entrepreneur and acquires the remaining book value of the entrepreneur's asset. This threshold value, under which the entrepreneur decides to default, is, in other words, a cut-off value for the idiosyncratic productivity that should satisfy the following condition:

$$\bar{\omega}_{j,t+1} R^k_{t+1} q_t k^s_{j,t} = Z_{j,t+1} d^e_{j,t} \tag{3}$$

This condition implies that the interest that the entrepreneur pays back to the financial intermediary should be indifferent to the return from operating capital stock under the productivity whose level is at the cut-off value.

Given the standard debt contract between these two entities, the financial intermediary's zero-profit condition can be exploited, as the financial intermediary sector is assumed to be perfectly competitive. Given the optimality condition of the financial intermediary, the expected return from the loan to the entrepreneur should be equal to the market-wide loan rate, for instance, R^e_t. Thus, the zero-profit condition of the financial intermediary is

$$(1-F(\bar{\omega}_{j,t+1};\sigma^{\omega}_t))Z_{j,t+1} d^e_{j,t} + (1-\mu_e)\int_0^{\bar{\omega}_{j,t+1}} \omega dF(\omega;\sigma^w_t) R^k_{t+1} q_t k^s_{j,t} = R^e_t d^e_{j,t} \tag{4}$$

The first term on the left-hand side is the expected return when the entrepreneur's productivity is above the cut-off value, while the second term is the return when the productivity is below the cut-off value. Using (3) and introducing auxiliary variables to represent the probabilistic density functions, the zero-profit condition can be rearranged .

The entrepreneur chooses the capital stock purchase, $k_{j,t}$, at period t and also a schedule of cut-off value, $\bar{\omega}_{j,t+1}$, for each realization of aggregate shocks in period $t+1$. Hence, the optimization problem is

[16] This interest rate does not depend on the idiosyncratic productivity shock; however, it does so on the realization of the aggregate shocks. In a sense, this interest rate is idiosyncratic risk-free, but not aggregate risk-free.

$$\max_{k_{j,t}} \mathbb{E}_t \left[\max_{\bar{\omega}_{j,t+1}} \left\{ \int_{\bar{\omega}_{j,t+1}}^{\infty} \left(R_{t+1}^k q_t \omega k_{j,t+1} - Z_{j,t+1} d_{j,t}^e \right) dF(\omega; \sigma_t^{\omega}) \right\} \right]$$

under the zero-profit condition, as in (4). Note that the choice of the cut-off value, $\bar{\omega}_{j,t+1}$, is within the expectation sign because it should be chosen for each aggregate state in period $t+1$. The optimality condition for $k_{j,t+1}$ will be j-specific and, thus, cannot summarize the equilibrium condition for the entrepreneurial sector. To induce the equilibrium condition in terms of aggregate variables only, the optimization problem of the entrepreneur should be stated in terms of the capital to net-worth ratio or debt to capital ratio. Only then can the optimality conditions be symmetric across the entrepreneurial sector. Therefore, by defining $\kappa_{j,t} \equiv \frac{q_t k_{j,t}}{nw_{j,t}}$ and using the balance sheet constraint, (2), the problem can be restated as follows:

$$\max_{\kappa_{j,t}} \mathbb{E}_t \left[\max_{\bar{\omega}_{j,t+1}} \left\{ \left(1 - \Gamma\left(\bar{\omega}_{j,t+1}; \sigma_t^{\omega} \right) \right) \frac{R_{t+1}^k}{R_t^e} \right\} \right] \kappa_{j,t}$$

subject to (A.5). (A.6), which is the first-order condition associated with $\bar{\omega}_{j,t+1}$, implies that $\bar{\omega}_{j,t+1} = \bar{\omega}_{t+1}$. Consequently, $\frac{d_{j,t}^e}{q_t k_{j,t}^s} = \frac{d_t^e}{q_t k_t^s}$due to (A.5) and $\kappa_{j,t} = \kappa_t$.

To maintain the stationarity of the accumulating net-worth, the entry and exit of the entrepreneurs are assumed to be determined exogenously. With $1 - \zeta_t$ probability, the entrepreneurs exit, while a fixed amount of start-up funds, W^e, is added to the book value of entrepreneurs. Thus, the aggregate net-worth of the entrepreneurial sector is

$$nw_t = \zeta_t V_t + W^e$$

V_t is the entrepreneurs' book value before exit and entry. ζ_t is the survival probability, which is a function of an exogenous process, $\tilde{\zeta}_t^e$. A disturbance to this exogenous process is the financial wealth shock.

$$\zeta_t = \frac{1}{1 + \exp(-\bar{\zeta}^e - \tilde{\zeta}_t^e)}$$

The remaining book values for the exited entrepreneurs are either consumed away, c_t^e, or transferred back to households, T_t^e.

$$(1 + \tau_c) c_t^e = (1 - \zeta_t) \gamma_e V_t$$
$$T_t^e = (1 - \zeta_t)(1 - \gamma_e) V_t$$

(3) Financial intermediary

The banking sector consists of financial intermediaries that provide financial mediation between households' deposits and entrepreneurs' loans. The banking sector is assumed to be perfectly competitive, and thus, the problem, henceforth, can be solved in representative terms. The financial intermediary receives deposits, d_t^h, from households and lends funds, d_t^e, to entrepreneurs. This financial intermediary must hold a certain level of reserves with a portion, γ_b, of the deposits, while also bearing the costs of providing services to both households and entrepreneurs. These cost functions are Γ_t^h and Γ_t^e, which are, in a sense, reduced forms that may characterize the behaviors of financial intermediaries[17]. In sum, the period t profit function for the financial intermediary is

$$\Pi_t^b = R_{t-1}^e \frac{d_{t-1}^e}{\Pi_t} + \Gamma_t^h(1-\gamma_b)d_t^h - R_{t-1}^h \frac{d_{t-1}^h}{\Pi_t} - \Gamma_t^e d_t^e.$$

R_t^h is the deposit interest rate and R_t^e is the loan interest rate. The cost functions associated with financial services are

$$\Gamma_t^h = \exp\left(\Gamma^{h_0} - \Gamma^{h_1}\left(\frac{\tilde{d}_t^h}{\tilde{d}_t^e} - \frac{\bar{d}^h}{\bar{d}^e}\right) + \xi_t^h\right)$$

$$\Gamma_t^e = \exp\left(\Gamma^{e_0} - \Gamma^{e_1}\left(\frac{\tilde{d}_t^h}{\tilde{d}_t^e} - \frac{\bar{d}^h}{\bar{d}^e}\right) + \xi_t^e\right)$$

The cost functions are assumed to be elastic to the aggregate deposit--loan ratio[18], $\frac{\tilde{d}_t^h}{\tilde{d}_t^e}$. In this way, when the deposit-loan ratio exceeds the steady-state level, the net receipts from deposits reduce, and thus, the costs associated with deposit services rise, while the costs

[17] A structural form of the banking sector may be modeled as in Christiano *et al*. (2014), but we decide to identify the banking sector in a rather parsimonious way as this paper does not pay attention to the micro-founded behaviors of the banking sector.

[18] This deposit-loan ratio is assumed not to be specific to the financial intermediary, implying that the representative financial intermediary does not internalize its own deposit--loan ratio but rather depends on the aggregate level. If internalized, the cost function derivatives are $\Gamma_t^e\left(1-\Gamma^{e_1}\frac{d_t^h}{d_t^e}\right)$ and $\Gamma_t^h\left(1-\Gamma^{h_1}\frac{d_t^h}{d_t^e}\right)$. However, these functions do not qualitatively alter the overall dynamics of the model.

to loan services reduce. In addition, there are constant terms, Γ^{h_0} and Γ^{e_0}, in the cost functions that explain the interest rate spreads at the steady state, as will be made clearer with the equilibrium conditions presented below. Moreover, these cost functions allow for fluctuations by the exogenous disturbances, ξ_t^h and ξ_t^e, respectively.

Thus, the representative financial intermediary chooses deposit, d_t^h, and loan, d_t^e, to maximize the following stream of profits that are discounted with the stochastic discount factor because this entity is owned by households.

$$\max_{d_t^e, d_t^h} \mathbb{E}_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \frac{\lambda_\tau}{\lambda_t} \Pi_\tau^b$$

The FOCs associated with this problem after relating to the household's equilibrium conditions are as follows:

$$\Gamma_t^e R_t = R_t^e \tag{5}$$

$$(1-\gamma_b)\Gamma_t^h R_t = R_t^h \tag{6}$$

Thus, the spread between the risk-free interest rate and loan interest rate is explained by Γ_t^e, and the spread between the risk-free interest rate and deposit interest rate is described by $(1-\gamma_b)\Gamma_t^h$. Furthermore, these spreads are elastic to the financial soundness of the financial intermediaries. Combining those two conditions, (5) and (6), the steady state implies that

$$\frac{(1-\gamma_b)\exp(\Gamma^{h_0})}{\exp(\Gamma^{e_0})} = \frac{R^h}{R^e}$$

Summarily, the loan--deposit interest rate spread is identified in a reduced form, which is in terms of these cost functions.

(4) Households

There exists a continuum of homogenous households and a continuum of households members within a representative household. Household members are assumed to differ in

types of labor service, $i \in [0,1]$. As in Merz (1995), the income risks among the household members are fully shared within the household and, thus, allocations, such as consumption, are symmetric regardless of their labor service[19]. Hence, the lifetime utility of a representative household is

$$V_0 \equiv \mathbb{E}_0 \int_0^1 \sum_{t=0}^{\infty} \beta^t \upsilon_t \left\{ \log\left(c_{it}^h - \vartheta_c c_{it-1}^h\right) + \psi_d \frac{\left(d_{it}^h\right)^{1-\vartheta_d}}{1-\vartheta_d} - \varphi_t \psi_n \frac{\left(n_{it}^s\right)^{1+\vartheta_n}}{1+\vartheta_n} \right\} di$$

Each household member, i, who are employed in the i type of labor market, is specified by n_{it}^s. Note that ϑ_n is the inverse of the Frisch elasticity, while ψ_n is the substitution elasticity. Deposit in utility[20] is assumed in this model to induce a supply of deposits to the financial intermediaries, and this can be interpreted as a reduced form that may reflect households' needs for financial services. The function form shows that this term is separable from consumption and labor supply, although it has an elasticity of ϑ_d and a substitution elasticity of ψ_d.

Lastly, some of the features that are common in medium-scale New Keynesian models, such as habit consumption, whose degrees are parameterized by ϑ_c and two preference disturbances, υ_t and φ_t, are adopted. υ_t is an intertemporal preference shock, as in Primiceri *et al*. (2006), and φ_t is a labor supply shifter, as in Hall (1997) and Chari (2007).

The household member i's budget constraint is

$$\begin{aligned} &(1+\tau_c)\frac{p_t^c}{p_t} c_{it}^h + d_{i,t}^h + b_{it} + ex_t b_{it}^W + W_e \\ &= (1-\tau_w) w_{it} n_{it}^s + R_{t-1}^h \frac{d_{it-1}^h}{\Pi_t} + R_{t-1} \frac{b_{it-1}}{\Pi_t} + R_{t-1}^W \Gamma^W(\cdot) \frac{ex_t b_{it-1}^W}{\Pi_t} + T_t^g + T_t^e + \Pi_t^h \end{aligned}$$

p_t is the numerarie in the model. p_t^c is the price of the final consumption goods, which is a composite of domestic and imported goods. d_{it}^h is the deposit holdings and b_{it} is the government bond holdings, while R_t^h and R_t are the interest rates associated with these two holdings, respectively. Households pay start-up funds for the entrepreneurs.

[19] In addition, the utility function needs to be separable between labor supply and consumption.

[20] This specification is similar to money in utility that generates the money demand.

w_{it} is the wage rate for an i-type labor service when employed, which is n_{it}^{s}. τ_c and τ_w are the consumption and wage taxes, respectively. T_t^g is a lump-sum transfer from the government[21], T_t^e is some portion of the remaining assets from exited entrepreneurs, and Π_t^h summarizes all the profits earned from the ownerships of other entities, such as capital producers, financial intermediaries, final goods producers, intermediate goods producers, and import and export goods distributors.

The open economy's feature is reflected in this model by specifying the foreign bond holdings from the international financial market. Each household member has foreign bond holdings, b_{it}^{W}, which are specified in terms of foreign currency, and the exchange rate, ex_t, is considered in the budget constraint. The foreign interest rate, R_t^W, is exogenous to domestic households because of the assumption of a small open economy. To fill the gap between the domestic and foreign interest rates, the country risk premium, $\Gamma^W(\cdot)$, is specified. This premium takes the functional form of (F.3). The premium has a constant parameter that can be calibrated to match the long-run average spread between the domestic and foreign interest rates. Furthermore, it has time-varying components, a debt-elastic term, and an exogenous shock. The debt-elastic term guarantees the stationarity of the small open economy model, as shown in Schmitt-Grohé and Uribe (2003). The equilibrium conditions can be derived through a standard optimization problem.

C. Empirical analysis

The model specified in this paper is brought to an estimation using Bayesian methodology with data from the Nepalese economy. This section begins with a data description, followed by the results from the estimation. In addition, simulation exercises, such as impulse response functions, are reported, and the historical decompositions of the variables of interest are investigated at the end of this section.

[21] Negative means the lump-sum tax.

(1) Data

Table 3-3 summarizes the sample data for the macroeconomic variables used for the estimation. Most of data for Nepal are provided by Nepal Rastra Bank. Foreign interest rate, R^W, was only exception, imported from U.S. FRED database. The data sample starts from the year of 1974/75 until recent year, 2020/21 at annual frequency. In order to relate key credit supply and demand variables in the model, deposits of bank financial institutes has been used as the proxy for the saving deposit variable, d_t^h, while the private sector credit for the borrowing, d_t^o. National income accounts such as GDP, consumption, investment, export and import, are all real terms at the price of 2014/15 and CPI is 100 based on year 2014/15 as well.

<Table 3-3> Sample data

Data	Units	Periods	Notations
GDP	Rs.(2014/2015)	1974/75-2020/21	y_t^o
Consumption	Rs.(2014/2015)	1974/75-2020/21	c_t^o
Private Investment	Rs.(2014/2015)	1974/75-2020/21	i_t^o
Export	Rs.(2014/2015)	1974/75-2020/21	x_t^o
Import	Rs.(2014/2015)	1974/75-2020/21	M_t^o
Exchange Rate	Rs. per Dollar	1974/75-2020/21	γ_t^{exo}
Inflation Rate on CPI	2014/2015=100	1974/75-2020/21	Π_t^o
3-month U.S. treasury bill	APR %	1974/75-2020/21	$R_t^{W,o}$
Deposits of BFIs	Rs.	1974/75-2020/21	$d_t^{h,o}$
Private Sector Credit	Rs.	1974/75-2020/21	$d_t^{e,o}$

This study focuses on business cycle implications; thus, detrended time series data are necessary to match stationary variables in the model. The following vectors show how the time series data are mapped to the variables in the theoretical model. The GDP, its expenditure components, credit supply and demand are detrended by the Hodrick-Prescott filter[22]. This kind of data treatment is less common with Bayesian estimations, and GDP

[22] Tilde notations on variables represent H-P filtered series, while hat notations on variables represent the log-deviations from steady states

growth rates may be a better option. However, we decide to use the Hodrick-Prescott filter because the GDP growth rates and those variables have shown non-stationarity in the sample period of Nepalese economy. DSEG model is limited by a strict balance growth path and thus cannot reconcile non-stationarities of those variables simultaneously. Inflation rate is considered to be stationary in principle and thus used in levels, while the structural parameters associated with the long-run levels of these variables are calibrated to match the means of the data, as explained in the following subsection. The labor market indicators are also used in these levels.

$$\underset{\text{Variables in the model}}{\begin{bmatrix} \hat{y}_t^s \\ \hat{c}_t \\ \hat{\imath}_t \\ \hat{x}_t \\ \widehat{M}_t \\ \gamma_t^{ex} \\ \Pi_t \\ R_t^W \\ d_t^h \\ d_t^e \end{bmatrix}} = \underset{\text{Observed Data}}{\begin{bmatrix} \tilde{y}_t^o \\ \tilde{c}_t^o \\ \tilde{\imath}_t^o \\ \tilde{x}_t^o \\ \widetilde{M}_t^o \\ \gamma_t^{exo} \\ \Pi_t^o \\ R_t^{W,o} \\ d_t^{h,o} \\ d_t^{e,o} \end{bmatrix}}$$

(2) Calibrations

The calibration schemes are listed in Tables 3-4 and 3-5. Table 3-4 shows the steady states of some selected macroeconomic variables that are calibrated to match the long-run means of the sample data. The long-run risk-free interest rate is assumed to be 9% per annum. Accordingly, interest rate spreads are calibrated to match the differences in the long-run means between this risk free interest rate and deposit/loan interest rates. The long-run annual inflation rate is 8%, which is approximately the mean of inflation rate in the sample. The government debt-to-GDP and government spending-to-GDP ratios are 40% and 8.4%, respectively.

<Table 3-4> Calibrated steady states

Variables	Values	Descriptions
R_{ss}	1.09	Risk-free Interest Rate
Π	1.08	Target/ Long-run Inflation Rate
$\frac{R_{ss}^{h}}{R_{ss}}$	$\exp(-0.03)$	Deposit-Risk free Interest Rates Spread
$\frac{R_{ss}^{e}}{R_{ss}}$	$\exp(0.02)$	Loan-Risk free Interest Rates Spread
$\bar{\tilde{b}}$	0.40	Government Debt-Aggregate Demand Ratio
$\frac{g_{ss}}{y_{ss}^{d}}$	0.084	Government Spending-Aggregate Demand Ratio

Table 3-5 lists the parameters calibrated in the model. The subject discount factor is pinned down by the Euler equation of the household's equilibrium conditions because the inflation rate and risk-free interest rate are already calibrated. The capital income share and depreciation rate are common values in the literature. The government debt elasticity is assumed to be 0.05, while three types of tax rates are provided by Nepal Rastra Bank. Home biases are assumed to reflect a greater preference for domestic goods in consumption and more concentration on foreign imported goods in investment. Parameters related to financial friction, such as entrepreneurs' cut-off values for default, survival rate, and consumption ratio, are assumed to follow Kim (2022) since there was no micro-evidence regarding this parameters. The parameters for the cost functions of financial services are calibrated to match the spreads presented in Table 3-4.

<Table 3-5> Calibrated parameters

Parameters	Values	Descriptions
β	$\frac{\Pi}{R_{ss}}$	Subjective discount factor
ψ_d	0.05	Elasticity of deposit in utilities
α	0.3	Capital income share
δ	0.10	Depreciation rate
T_1	0.05	Government debt elasticity
n^c	0.85	Home bias in consumption goods
n^i	0.35	Home bias in investment goods
τ_c	0.13	Consumption tax rate
τ_w	0.36	Wage tax rate
τ_k	0.30	Capital income tax rate
$\Gamma^{R_0^W}$	0.00465	Domestic-Foreign interest rate spread
μ_e	0.1	Monitoring cost
$\bar{\omega}$	Implies 5% default rate	Entrepreneurs' cut-off value for default
ζ	0.976	Entrepreneurs' survival rate
γ_e	0.10	Entrepreneurs' consumption ratio
γ_b	0.07	Banks' reserve ratio
Γ^{h_0}	$\frac{R_{ss}^h}{R_{ss}}/(1-\gamma_b)$	Deposit-bond interest rates spread
Γ^{e_0}	$\frac{R_{ss}^e}{R_{ss}}$	Loan-bond interest rates spread

(3) Model estimation

The Bayesian estimation methodology is adopted for the model. To implement the estimation and perform various simulation exercises using the estimated model, the model is linearized around the deterministic steady states. Because the structural parameters are highly nonlinear, the random walk Metropolis--Hasting algorithm is applied, and the proposal density is based on the mode computed by the Monte Carlo optimization method in Dynare package program[23]. The measurement errors were not specified because there

[23] The acceptance rate was 34.11%, indicating a reasonable property of the proposal density.

was no stochastic singularity problem[24]. For the convergence of chains, two and half million Monte Carlo Markov Chain draws after the two and half million initial burn-in draws are collected to report the posterior distributions. Tables 3-6 and 3-7 report the prior and posterior distributions of the structural parameters. Most prior distributions follow conventions in the literature, as pioneered by Smets and Wouters (2005).

[24] There are 15 structural shocks in the model, while the observables are 12.

<Table 3-6> Prior and posterior distributions I

Description		Prior Distr.			Posterior Distr.				
		Distr.	Mean	St. Dev.	Mode	Mean	St. Dev.	5%	95%
ϑ_c	Habit persistence	Beta	0.50	0.20	0.6218	0.7991	0.1054	0.4948	0.7757
ϑ_n	Frisch labor elasticity	Gamma	1.50	0.50	4.8664	3.8413	0.8415	3.7913	5.8807
ϑ_d	Liquidity preference	Gamma	1.50	0.50	4.2306	4.8319	0.2950	3.8695	4.6833
ψ_n	Labor disutility	Normal	9.00	2.00	8.2295	8.1760	0.7032	7.3003	9.1430
κ	Investment adjustment cost	Normal	5.00	1.00	1.3535	0.8722	0.3881	0.8836	1.9139
ϕ_2	Capital utilitization cost	Beta	0.50	0.20	0.6049	0.4554	0.1215	0.4456	0.7655
Γ^{b^W}	Country risk premium	Beta	0.50	0.15	0.4745	0.4682	0.0429	0.4158	0.5246
ε	Domestic good s. e.	Normal	8.00	1.50	9.1148	7.8201	0.6060	8.2400	9.9179
ε_M	Import good s. e.	Normal	8.00	1.50	8.0166	6.8539	0.7864	6.8681	8.9342
ε_x	Export good s. e.	Normal	8.00	1.50	7.9848	7.1581	0.6416	7.1788	8.8593
ε_W	Foreign good s. e.	Normal	8.00	1.00	6.4088	7.1498	0.4813	5.8681	7.1527
ε_c	Domestic/foreign consumption s. e.	Normal	8.00	1.50	5.3728	6.3749	0.7020	4.4373	6.2997
ε_i	Domestic/foreign investment s. e.	Normal	8.00	1.50	9.2290	7.4427	1.1366	7.6666	10.7361
η	Labor service s. e.	Normal	8.00	1.50	4.6781	4.6192	0.5186	4.0757	5.4287
θ_p	Domestic price rigidity	Beta	0.50	0.15	0.0766	0.0795	0.0277	0.0431	0.1160
θ_M	Import price rigidity	Beta	0.50	0.15	0.0746	0.0517	0.0254	0.0443	0.1083
θ_x	Export price rigidity	Beta	0.50	0.15	0.2987	0.3717	0.0612	0.2153	0.3793
θ_w	Wage rigidity	Beta	0.50	0.10	0.1898	0.2419	0.0531	0.1186	0.2608
χ	Good price indexation	Beta	0.50	0.15	0.2710	0.1554	0.0877	0.1511	0.3823
χ_M	Import price indexation	Beta	0.50	0.15	0.3558	0.4493	0.1092	0.2009	0.4878
χ_x	Export price indexation	Beta	0.50	0.15	0.3786	0.4497	0.0843	0.2697	0.4859
χ_w	Wage indexation	Beta	0.50	0.15	0.7056	0.6880	0.0623	0.6234	0.7873
γ_R	Taylor rule: interest rate smoothing	Beta	0.75	0.15	0.6199	0.5174	0.0981	0.4913	0.7424
γ_π	Taylor rule: inflation gap	Normal	1.50	0.15	1.3235	1.2671	0.0592	1.2405	1.3980
γ_y	Taylor rule: output gap	Normal	0.25	0.05	0.2296	0.2434	0.0238	0.1979	0.2600
$\gamma_{g_{ex}}$	Taylor rule: exchange rate gap	Beta	0.25	0.10	0.2922	0.3147	0.0533	0.2115	0.3536
γ_{g_y}	Fiscal rule: automatic stabilizer	Beta	0.50	0.10	0.5699	0.4793	0.0897	0.4629	0.7064
Γ^c	Consumption import cost	Beta	0.50	0.15	0.1662	0.2856	0.0878	0.0721	0.2969
Γ^i	Investment import cost	Beta	0.50	0.15	0.2985	0.2040	0.0778	0.1951	0.4007

Note: 1) Posterior distributions are based on second half of five million MCMC draws.

2) Statistics of posterior distributions are rounded up to four decimal places.

3) “s.e.” stands for substitution elasticity.

<Table 3-7> Prior and posterior distributions II

Description		Prior Distr.			Posterior Distr.				
		Distr.	Mean	St. Dev.	Mode	Mean	St. Dev.	5%	95%
ρ_A	TFP AR(1)	Beta	0.50	0.15	0.3014	0.2801	0.0643	0.2191	0.3836
ρ_{ξ_i}	Investment technology AR(1)	Beta	0.50	0.15	0.5267	0.4813	0.0801	0.4308	0.6386
ρ_v	Intertemporal preference AR(1)	Beta	0.50	0.15	0.4157	0.2321	0.1034	0.2741	0.5445
ρ_φ	Intratemporal preference AR(1)	Beta	0.50	0.15	0.3213	0.2723	0.0871	0.1996	0.4351
ρ_g	Gov't consumption AR(1)	Beta	0.50	0.15	0.3940	0.4479	0.0812	0.2695	0.4870
ρ_{R_w}	Foreign interest rate AR(1)	Beta	0.50	0.15	0.8389	0.8329	0.0494	0.7739	0.8975
ρ_{b_w}	Country premium AR(1)	Beta	0.50	0.15	0.7162	0.6465	0.0635	0.6244	0.7937
ρ_{γ_w}	Foreign demand AR(1)	Beta	0.50	0.10	0.6395	0.6110	0.0390	0.5907	0.6884
ρ_{π_w}	Foreign inflation AR(1)	Beta	0.50	0.10	0.2481	0.2943	0.0440	0.1901	0.3034
ρ_μ	Price markup AR(1)	Beta	0.50	0.15	0.6439	0.6134	0.0794	0.5455	0.7498
ρ_{σ_ω}	Financial risk AR(1)	Beta	0.50	0.15	0.6462	0.7309	0.1330	0.4840	0.8072
ρ_ζ	Financial wealth AR(1)	Beta	0.50	0.15	0.4292	0.3686	0.0379	0.3822	0.4768
ρ_{ξ_h}	Deposit rate premium AR(1)	Beta	0.50	0.15	0.6295	0.5889	0.0695	0.5376	0.7210
ρ_{ξ_e}	Borrowing rate premium AR(1)	Beta	0.50	0.15	0.7581	0.7540	0.0472	0.6989	0.8200
$\sigma_{R,y}$	Correlation R^w, y^w	Normal	0.00	0.25	-0.0007	-0.0023	0.0046	-0.0064	0.0050
$\sigma_{R,\pi}$	Correlation R^w, Π^w	Normal	0.00	0.25	0.0574	0.0466	0.0384	0.0059	0.1047
$\sigma_{\pi,y}$	Correlation Π^w, y^w	Normal	0.00	0.25	-0.2118	-0.1871	0.0231	-0.2429	-0.1827
$\sigma_{y,\pi}$	Correlation y^w, Π^w	Normal	0.00	0.25	-0.2789	-0.0996	0.1287	-0.4408	-0.1091
μ_{ξ_h}	Deposit rate premium MA(1)	Beta	0.50	0.15	0.2719	0.3381	0.0744	0.1710	0.3696
μ_{ξ_e}	Borrowing rate premium MA(1)	Beta	0.50	0.15	0.5898	0.6367	0.0727	0.4850	0.6728
σ_v	Intertemporal preference shock s.d.	InvGamma	0.01	0.10	0.1155	0.1792	0.0356	0.0808	0.1743
σ_φ	Intratemporal preference shock s.d.	InvGamma	0.01	0.10	0.0075	0.0047	0.0046	0.0036	0.0133
σ_{ξ_i}	Investment technology shock s.d.	InvGamma	0.01	0.10	0.0712	0.0050	0.0494	0.0058	0.1332
σ_A	TFP shock s.d.	InvGamma	0.01	0.10	0.0560	0.0603	0.0108	0.0411	0.0688
σ_m	Monetary policy shock s.d.	InvGamma	0.01	0.10	0.0243	0.0365	0.0098	0.0133	0.0395
σ_g	Government consumption shock s.d.	InvGamma	0.01	0.10	0.2663	0.2428	0.0223	0.2385	0.2948
σ_{R_w}	Foreign interest rate shock s.d.	InvGamma	0.01	0.10	0.0135	0.0129	0.0016	0.0116	0.0156
σ_{b_w}	Country risk premium shock s.d.	InvGamma	0.01	0.10	0.0327	0.0299	0.0069	0.0245	0.0417
σ_{γ_w}	Foreign demand shock s.d.	InvGamma	0.01	0.10	0.4287	0.5345	0.0681	0.3409	0.5243
σ_{π_w}	Foreign inflation rate shock s.d.	InvGamma	0.01	0.10	0.0447	0.0349	0.0098	0.0328	0.0580
σ_{σ_ω}	Financial risk shock s.d.	InvGamma	0.01	0.10	0.0159	0.0098	0.0209	0.0038	0.0467
σ_ζ	Financial wealth shock s.d.	InvGamma	0.01	0.10	0.6315	0.6508	0.0457	0.5744	0.6890
σ_{μ_d}	Price markup shock s.d.	InvGamma	0.01	0.10	0.0066	0.0051	0.0034	0.0035	0.0108
σ_{ξ_h}	Deposit rate premium shock s.d.	InvGamma	0.01	0.10	0.0075	0.0084	0.0008	0.0065	0.0085
σ_{ξ_e}	Borrowing rate premium shock s.d.	InvGamma	0.01	0.10	0.0128	0.0163	0.0073	0.0045	0.0234

Note: 1) Posterior distributions are based on second half of five million MCMC draws.
2) Statistics of posterior distributions are rounded up to four decimal places.
3) "s.d." stands for standard deviation.

First, the posterior estimates indicate volatilities of certain structural shocks are relatively large. The standard deviation parameters of the foreign demand shock, σ_{y_w}, and financial wealth shock, σ_ζ, are estimated to be quite large. It would be quite straightforward that external economic conditions are likely to influence Nepalese economy since she is a small open economy, especially through international trade. This will be more apparent once long-run variance decompositions are presented as below. Also, a large degree of the financial wealth shock is likely to have reflected the instability of Nepalese financial market. Secondly, the Calvo-Yun probability parameters that reflect price and wage rigidities are worth mentioning herein. These are estimated to be particularly low compared to typical evidence from the US economy, as in Christiano *et al*. (2005) and Smets and Wouters (2005). This result presumably implies that the short-run non-neutrality of money is weaker than that of the US economy. However, since this model estimated at annual frequency, the price rigidity parameter may be lower than the typical quarterly model.

(4) Model simulations

This subsection reports the impulse responses to five structural shocks: investment technology shock, TFP shock, monetary policy shock, foreign interest rate shock, and financial wealth shock. First, a positive investment technology shock directly induces an investment increase owing to its efficiency in investment goods, as shown in figure 3-12. As the overall aggregate demand increases but less than output increase, the inflation rate decreases, thereby inducing a decrease in the interest rate that follows the Taylor rule. Moreover, the investment increase is large for more than a year. This is possible through the external financing of the entrepreneurs in the financial friction model, which is evident from the increase in the credit demand that is absent otherwise. Hence, the financial accelerator mechanism amplifies investment responses, imports, and exports by increasing the credit demand in response to investment technology shocks.

Figure 3-13 shows the impulse response function of the TFP shock. A positive TFP

shock increases the output while it decreases the inflation rate because it is an aggregate supply shifter. As aggregate income is equivalent to output due to national income identity, the income increase induces a positive wealth effect, and thus increases consumption. And two forces are at play in these impulse response functions for investment, credit demand, export and import. First, the deflationary effect induces the price competitiveness of exports in the international market and, at the same time, stronger domestic demands for domestic goods relative to imported goods. Second, the deflationary effect also affects the financial condition of entrepreneurs in the financial friction model. Given that debt contracts are established based on nominal prices, deflation exacerbates the real debt burden of entrepreneurs with the price rigidity present. This is known as "Fisher deflation channel," as explained by Christiano *et al*. 2010. Hence, credit demand should decrease. However, the overall results indicate that investment and credit demand rise strongly, implying that the "Fisher deflation channel" is not so pronounced with this estimated model. Furthermore, output rises mainly due to meeting the increase in foreign demand for domestic goods. This result seems to be due to the weak price rigidities of the estimated financial friction model. Therefore, the financial friction model amplifies the responses of output, investment, and exports with regard to the TFP shock.

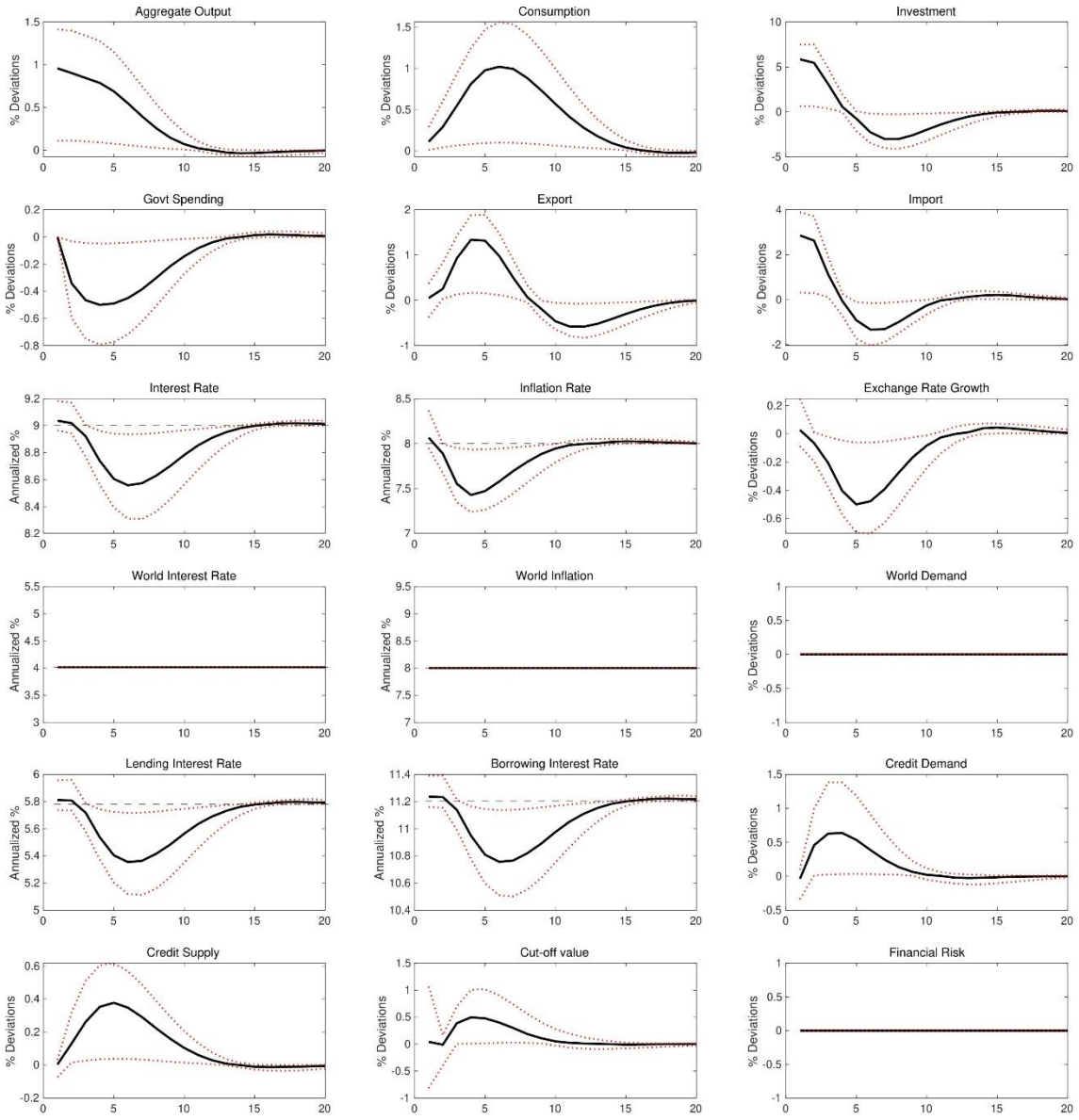
Figure 3-14 shows the impulse response functions of the monetary policy shock. The impulse response functions are drawn based on one standard deviation of the monetary shock; therefore, the quantitative magnitudes rely on the posterior estimates of the shock's volatility. The interest rate rises approximately by 110bp in the estimated model The contractionary effect on output is quite strong. This result is somewhat surprising, considering that price and wage rigidities are estimated to be very low. The contractionary monetary policy raises the external financing cost that entrepreneurs must bear, thus reducing credit demand and investment further.

Figure 3-15 shows the impulse response functions of the foreign interest rate shock. The balance of payments in the model in which foreign reserves are absent implies an exact trade-off between the financial and current account balances. Foreign interest rate

increases induce capital outflows to satisfy the uncovered interest rate parity condition. Nonetheless, net exports should be increased to offset capital outflow. This is mainly driven by more exports in the financial friction model and with less imports. Hence, the output rises while domestic demands are weak. Credit demand rises initially to meet the output expansion coming from exports increase, however, the increase of financing cost eventually decreases credit demand.

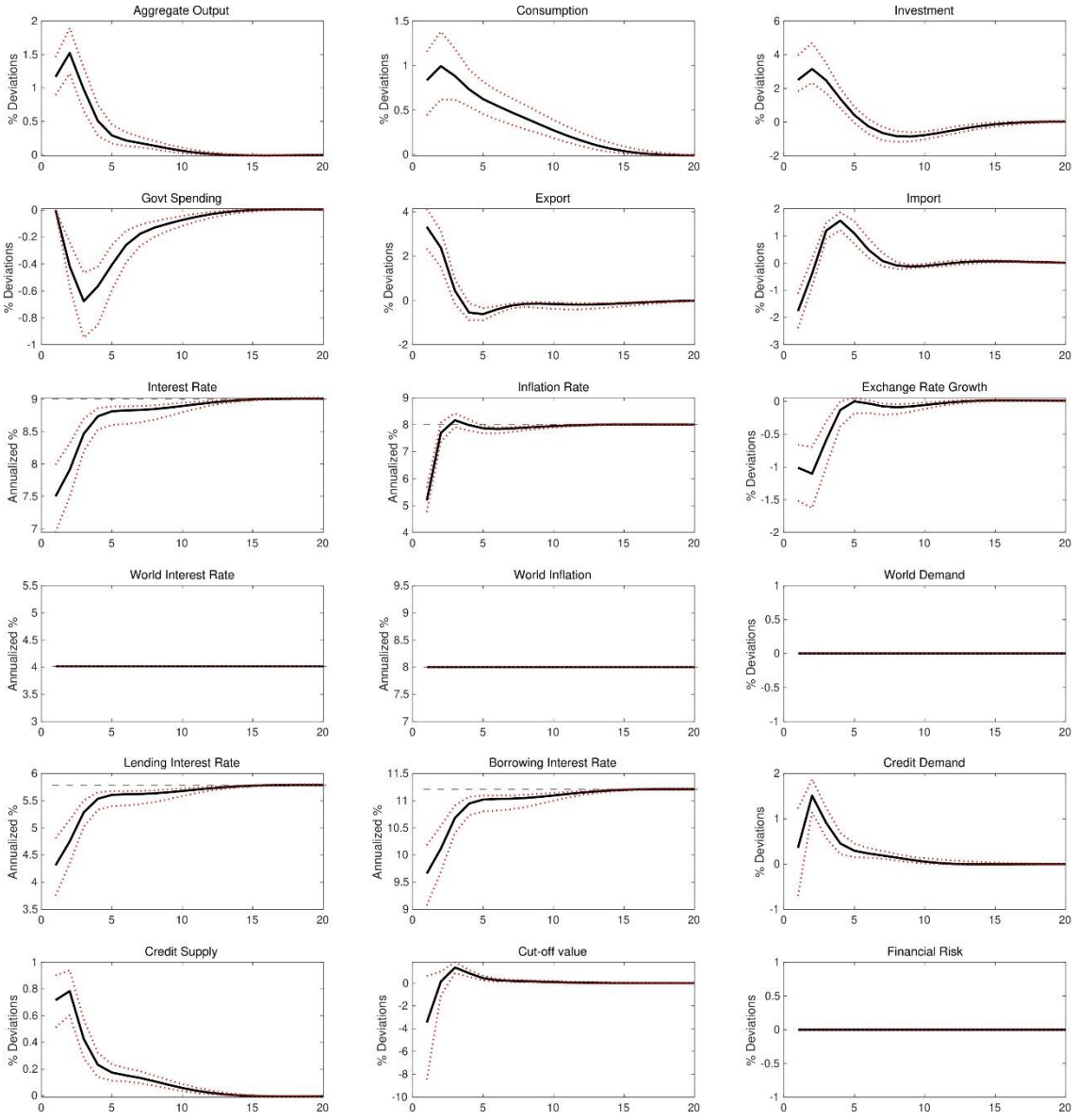
Finally, the impulse response functions for the financial wealth shock that is only present in the financial friction model are plotted in Figure 3-16. A positive financial wealth shock implies favorable conditions for entrepreneurs and thus induces an increase in credit demand to meet increase in investment. Hence, output, export and import increase. This shock also has an inter-temporal substitution effect on consumption which decreases initially and thus increasing credit supply while increases later from increased income.

<Figure 3-12> IRFs to investment technology shock, $\varepsilon_t^{\xi_i}$



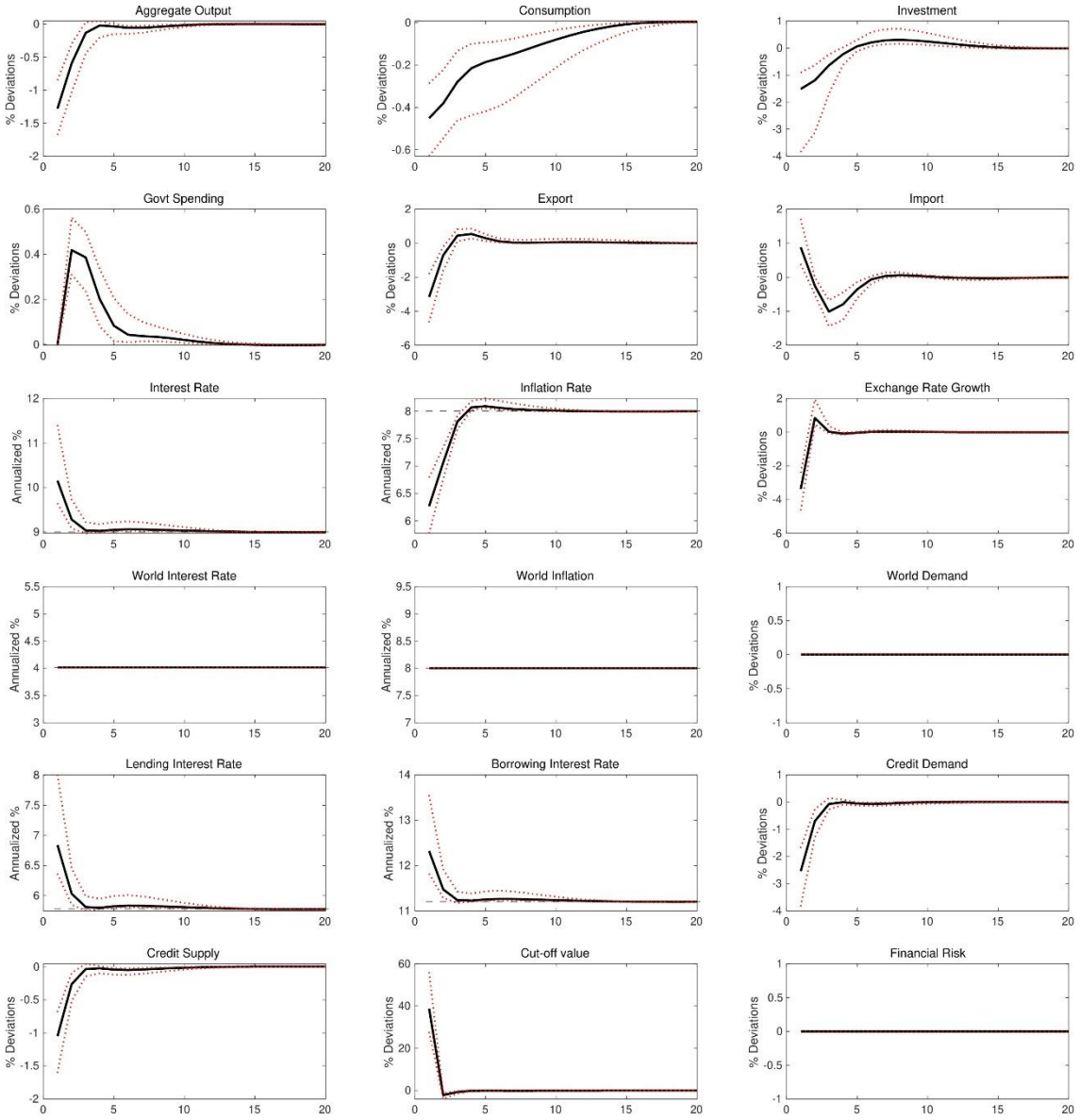
Note: 1) Black solid lines are posterior median IRFs.
Red dotted lines are Bayesian credible intervals with lower bound, 10%, and upper bound, 90%.
Black dashed lines are the steady state levels of selected variables; interest rates and inflation rates.
2) Units on y-axis may differ across variables: % is percentage in levels, % deviation is log-deviation from steady states and Annualized % is percentage per annum.

<Figure 3-13> IRFs to TFP shock, ε_t^A



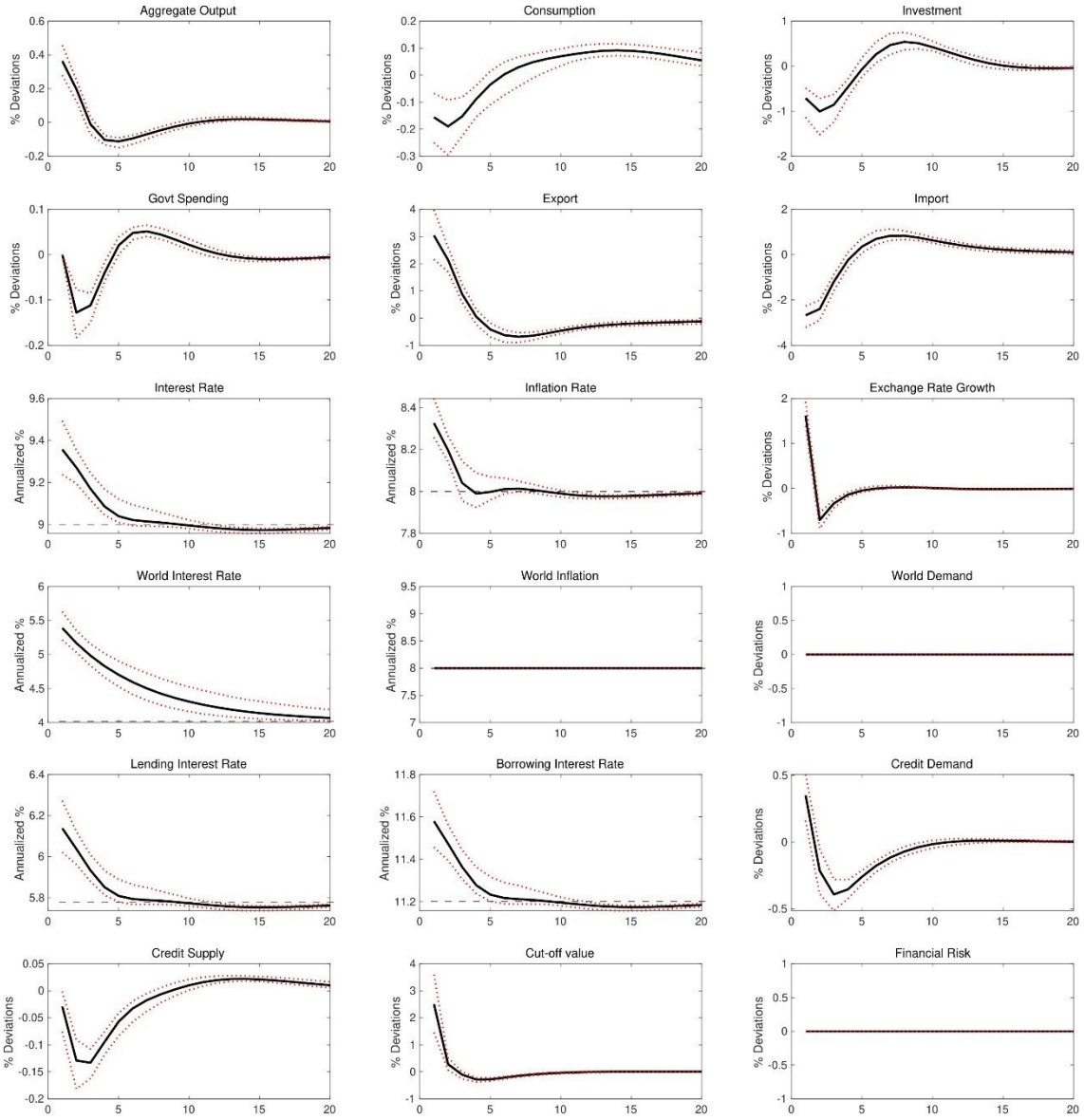
Note: 1) Black solid lines are posterior median IRFs.
Red dotted lines are Bayesian credible intervals with lower bound, 10%, and upper bound, 90%.
Black dashed lines are the steady state levels of selected variables; interest rates and inflation rates.
2) Units on y-axis may differ across variables: % is percentage in levels, % deviation is log-deviation from steady states and Annualized % is percentage per annum.

<Figure 3-14> IRFs to monetary policy shock, ε_t^m



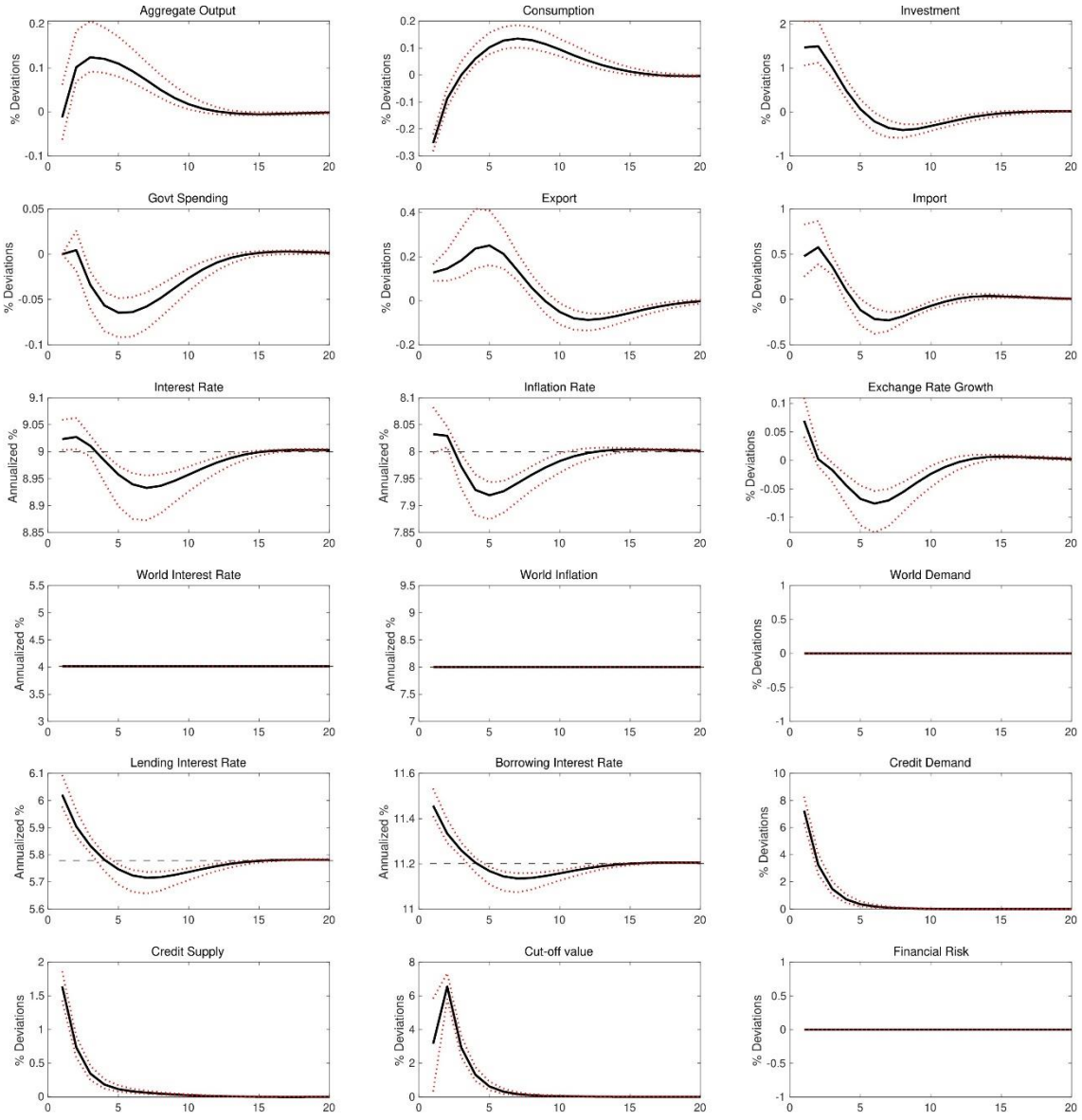
Note: 1) Black solid lines are posterior median IRFs.
Red dotted lines are Bayesian credible intervals with lower bound, 10%, and upper bound, 90%.
Black dashed lines are the steady state levels of selected variables; interest rates and inflation rates.
2) Units on y-axis may differ across variables: % is percentage in levels, % deviation is log-deviation from steady states and Annualized % is percentage per annum.

<Figure 3-15> IRFs to foreign interest rate shock, $\varepsilon_t^{R_w}$



Note: 1) Black solid lines are posterior median IRFs.
Red dotted lines are Bayesian credible intervals with lower bound, 10%, and upper bound, 90%.
Black dashed lines are the steady state levels of selected variables; interest rates and inflation rates.
2) Units on y-axis may differ across variables: % is percentage in levels, % deviation is log-deviation from steady states and Annualized % is percentage per annum.

<Figure 3-16> IRFs to financial wealth shock, ε_t^{ζ}



Note: 1) Black solid lines are posterior median IRFs.
Red dotted lines are Bayesian credible intervals with lower bound, 10%, and upper bound, 90%.
Black dashed lines are the steady state levels of selected variables; interest rates and inflation rates.
2) Units on y-axis may differ across variables: % is percentage in levels, % deviation is log-deviation from steady states and Annualized % is percentage per annum.

The next table 3-8 summarizes impulse responses of key variables of interest in this model. Each structural shock is identified in a distinct way that induces various responses of other macroeconomic variables, hence can be interpreted independently. Overall, the

credit demand, $\hat{d}_t^e$, which is the main focus of this chapter is increased by six shocks[25] while decreased by five shocks[26]. Foreign interest rate shock induces the credit demand increase initially but decrease afterwards.

<Table 3-8> Impulse responses: Summary

unit: %

	$\hat{y}_t^s$	Π_t	R_t	$\hat{c}_t$	$\hat{\imath}_t$	$\hat{d}_t^e$
ε^{υ}	+	+	+	+	-+	+
ε^{φ}	-	+	+	-	-	-
ε^{ξ_i}	+	-	-	+	+-	+
ε^{A}	+	-	-	+	+	+
ε^{m}	-	-	+	-	-	-
ε^{g}	+	+	+	-	-	-
ε^{R_w}	+	+	+	-+	-+	+-
ε^{b_w}	+	+	+	-+	-+	-
ε^{yW}	-+	-	+-	+	+-	-
ε^{π_w}	+	+	-	+	+	+
$\varepsilon^{\sigma_\omega}$	-	-	-	+-	-	+
ε^{ζ}	+	+-	+-	-+	+-	+
ε^{μ}	-	+	+	-	-	-
ε^{ξ_h}	+	+-	+-	-+	+-	+
ε^{ξ_e}	-	-+	-+	+-	-	+

Note: responses to positive (increase in ε) shock

Table 3-9 shows the long-run variance decompositions for variables of interest. First, domestic shocks, such as investment technology, TFP, borrowing interest rate and inter-temporal preference shocks, are the main driving forces for the output fluctuations in this model. This property is also consistent with consumption and investment. Naturally, both export and import are influenced by foreign demand shock and other foreign shocks.

[25] Inter-temporal preference shock, investment technology shock, total factor productivity shock, foreign inflation shock, financial risk shock, financial wealth shock, deposit interest rate shock and borrowing interest rate shock

[26] Monetary policy shock, government spending shock, country risk premium shock, foreign demand shock and price markup shock

More interestingly, the shocks contributions towards credit demand and supply are somewhat distinct. The credit demand, d_t^e, is mainly driven by the financial wealth shock. This likely reflects the financial soundness of entrepreneurs in Nepalese economy heavily influences the credit demand fluctuations. On the other hand, the credit supply, which is defined as the saving deposit of the households, is mostly determined by the deposit interest rate shock. This would imply that the households' saving decisions are severely influenced by the deposit interest rate. Last but not least, the estimated model implies the intra-preference shock, ε_t^v has almost no influence on most of variables. This might be caused by the lack of observables on labor market related variables in the estimation.

<Table 3-9> Long-run variance decompositions

unit: %

	$\hat{y}_t^s$	$\hat{c}_t$	$\hat{\imath}_t$	$\hat{x}_t$	$\widehat{M}_t$	Π_t	$\hat{d}_t^e$	$\hat{d}_t^h$
ε^v	11.55	44.79	19.62	3.86	2.86	22.07	13.52	3.73
ε^φ	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
ε^{ξ_i}	18.87	18.12	28.49	1.68	4.79	5.64	2.45	1.48
ε^A	21.35	12.55	7.39	3.92	1.86	32.93	3.69	2.55
ε^m	8.92	2.19	2.19	2.73	0.69	16.07	7.40	2.68
ε^g	11.27	3.46	1.86	0.98	0.41	3.83	0.85	0.58
ε^{R_w}	0.93	0.59	1.01	3.81	3.87	0.76	0.54	0.10
ε^{b_w}	4.32	1.54	3.25	15.02	14.09	2.97	2.80	0.45
ε^{yW}	1.25	4.63	3.15	44.04	63.19	6.06	4.86	1.13
ε^{π_w}	3.60	0.16	0.10	20.38	2.33	2.53	0.19	0.06
$\varepsilon^{\sigma_\omega}$	0.17	0.12	0.38	0.03	0.04	0.07	0.59	0.09
ε^ζ	0.38	0.54	1.65	0.09	0.22	0.15	58.34	5.86
ε^μ	1.38	0.65	0.74	0.13	0.07	0.93	1.78	0.41
ε^{ξ_h}	0.06	0.04	0.16	0.01	0.03	0.03	0.02	79.60
ε^{ξ_e}	15.95	10.62	30.00	3.33	5.57	5.97	2.97	1.28

To check the performance of the estimated model, the implied volatilities of the estimated model and those of the data are provided in Table 3-10. Although the volatilities of consumption and investment are overly excessive compared to the data, the overall implied volatilities are well within the boundaries of data. Particularly, the credit demand

and supply are relatively well fitted.

<Table 3-10> Volatilities of the estimated models and data

Variables	Data	Estimated Model	Relative Ratio
$\hat{y}^s$	0.0189	0.0501	2.6516
$\hat{c}$	0.0198	0.0605	3.0547
$\hat{\imath}$	0.0698	0.2094	2.9992
$\hat{x}$	0.1531	0.2203	1.4385
π	0.0942	0.0499	0.5297
$\hat{d}^e$	0.0596	0.1065	1.7868
$\hat{d}^h$	0.0856	0.0769	0.8984

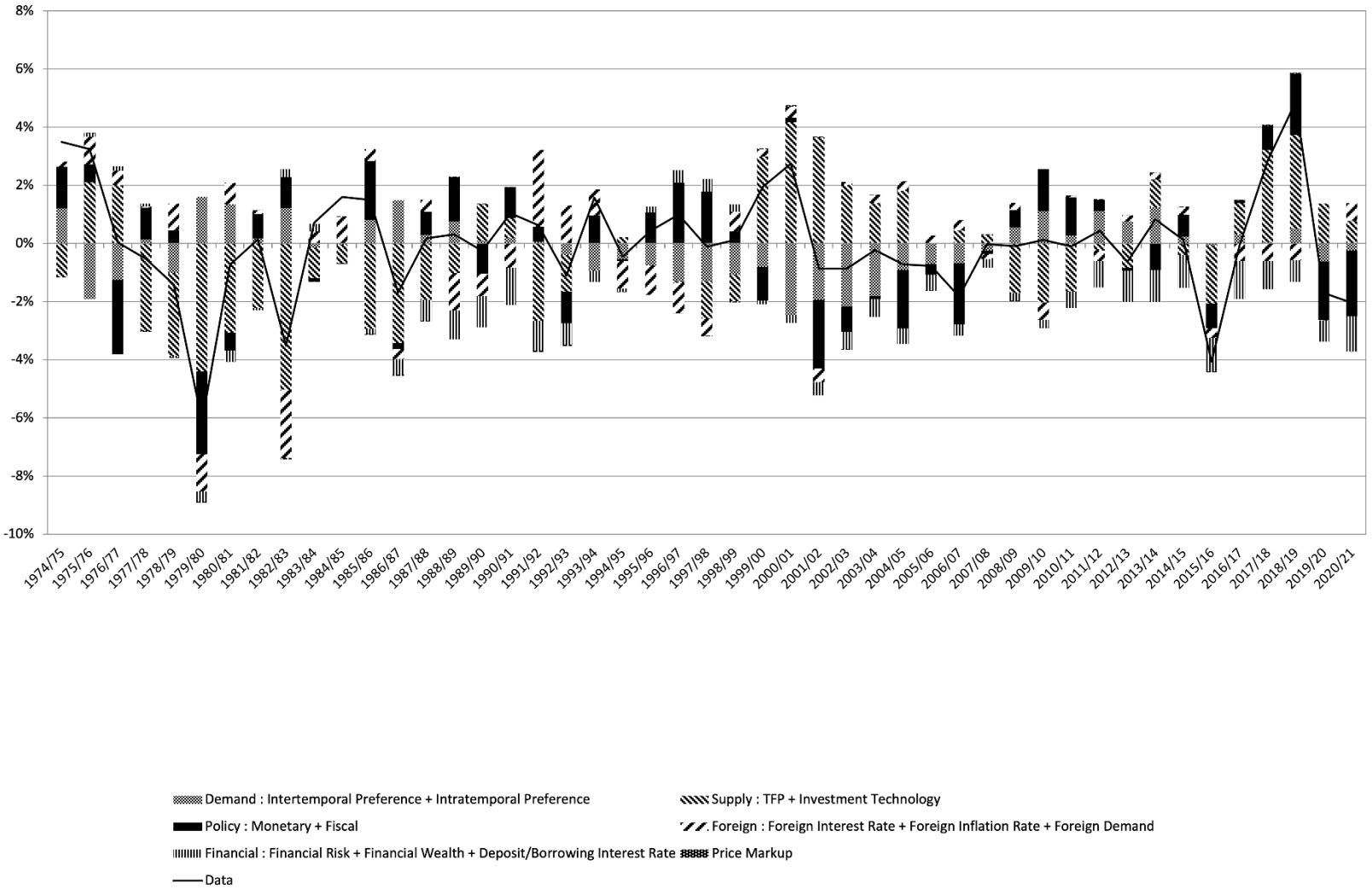
Note: 1) Volatilities are standard deviations of variables.
2) Estimated models are based on posterior modes of parameters
3) Relative ratios are implied volatilities of the model divided by volatilities of data
4) $\hat{X}$ is log-deviation of a variable X

(5) Historical decompositions

This subsection presents the historical decompositions and pays particular attention to the global financial crisis and the recent COVID-19 pandemic crisis. To obtain more comprehensible decomposition graphs, the shocks are grouped into six categories: aggregate demand, aggregate supply, policy, foreign, financial, and markup shocks.

Figure 3-17 shows the historical shock decompositions of GDP fluctuations. Overall, fluctuations in the GDP are driven by aggregate demand and supply shocks. Mid-2000s were negatively affected by aggregate demand shocks and policy shocks. And aggregate supply shocks generated GDP contractions during the global financial crisis period from 2008 to 2009, while policy shocks turned into expansionary phase to cope with the crisis. However, the COVID-19 pandemic periods around 2020 were quite different from the global financial crisis but rather similar to early 1980s. Aggregate demand shocks and financial shocks were mainly contractionary, while the policy shocks were not expansionary but surprisingly contractionary. This seems to reflect that the policy responses of Nepal were not responding strongly to COVID-19 pandemic but rather were being conservative.

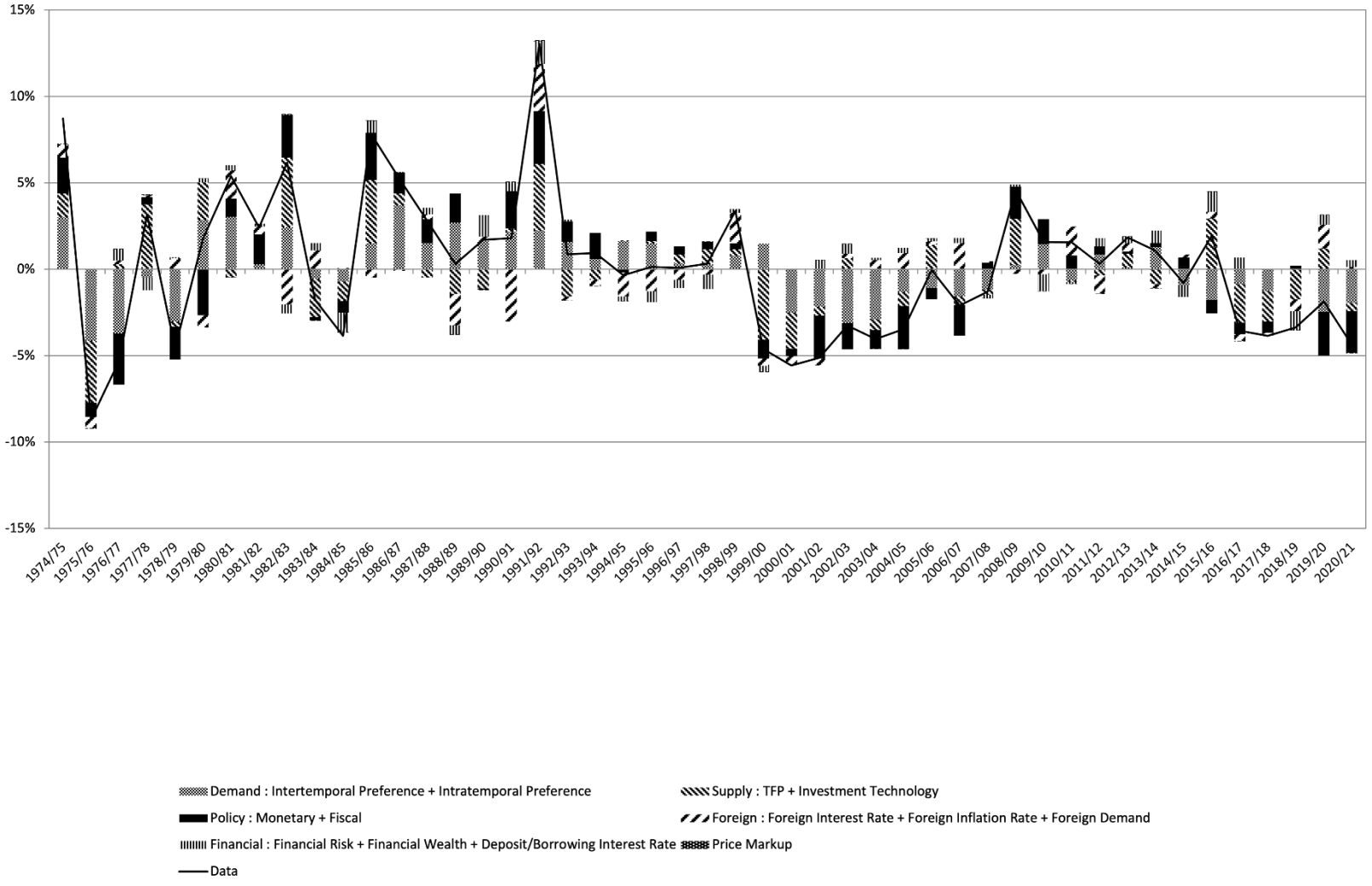
<Figure 3-17> Historical shock decomposition of the GDP (HP Detrended)



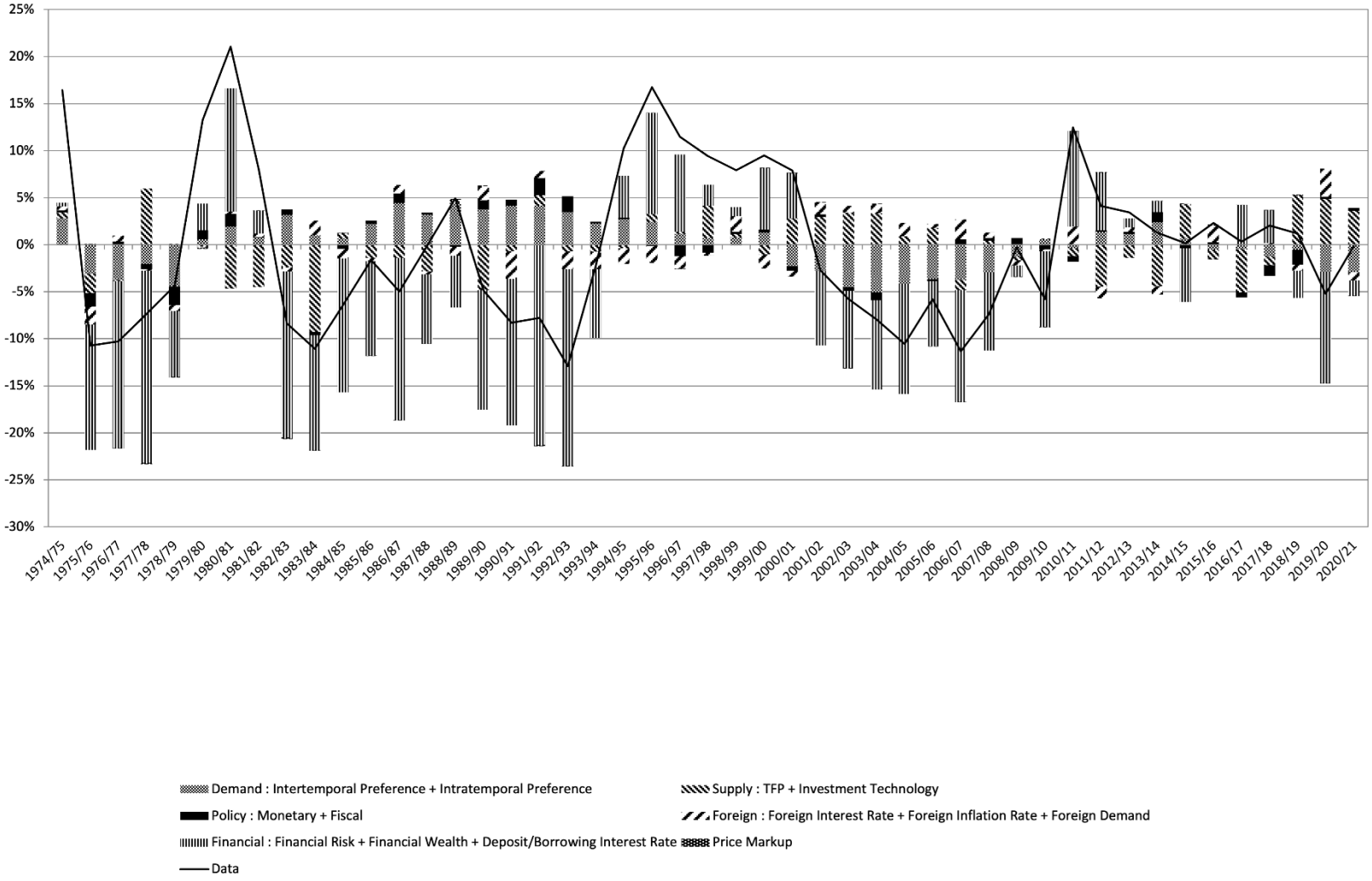
The decomposition of inflation rate is similar to that of GDP as shown in figure 3-18. Inflation rate fluctuations were quite volatile in the early periods of the sample. Early 1990s were especially high, and followed by lower inflation rates from early 2000s to mid-2000s. During these lower inflation rate periods, aggregate demand shocks were deflationary and, moreover, policy shocks were also deflationary. Around the global financial crisis, however, inflation rate increased, probably due to excessive exchange rate rise resulting in rise of import price, and this is captured by the aggregate supply shock in this estimated model. More recently, the inflation rate has been lower than the long-run average owing to the contractionary aggregate demand shocks and conservative policy shocks.

Distinct features of the global financial crisis and COVID-19 pandemic crisis are also evident with credit demand and supply. Figure 3-19 and figure 3-20 show the historical decompositions of credit demand and supply, respectively. Both credit demand and supply are mostly driven by the financial shocks as expected. Financial shocks particularly contracted the credit demand in mid-1970s, mid-1980s to early 1990s and mid-2000s. The beginning of the global financial crisis and COVID-19 pandemic was also similar since credit demand decreased mainly due to the financial shocks. Credit supply, on the other hand, is more influenced by the aggregate supply shock than the credit demand. During the global financial crisis, on top of contractionary aggregate supply shocks, credit supply was exacerbated when the financial shocks were worsening. More recently, the credit supply is lower mainly due to the contractionary financial shocks. Most surprisingly, the policy shocks had little roles in promoting both credit demand and supply during those crisis episodes. This result does not necessarily imply the policies were not relevant to cope with the crisis episodes, but rather the propagations of the policy shocks are likely to be limited to some degree. Among the number of hypotheses, the estimated model has an evidence of weak price rigidity, implying the weak non-neutrality of the monetary policy.

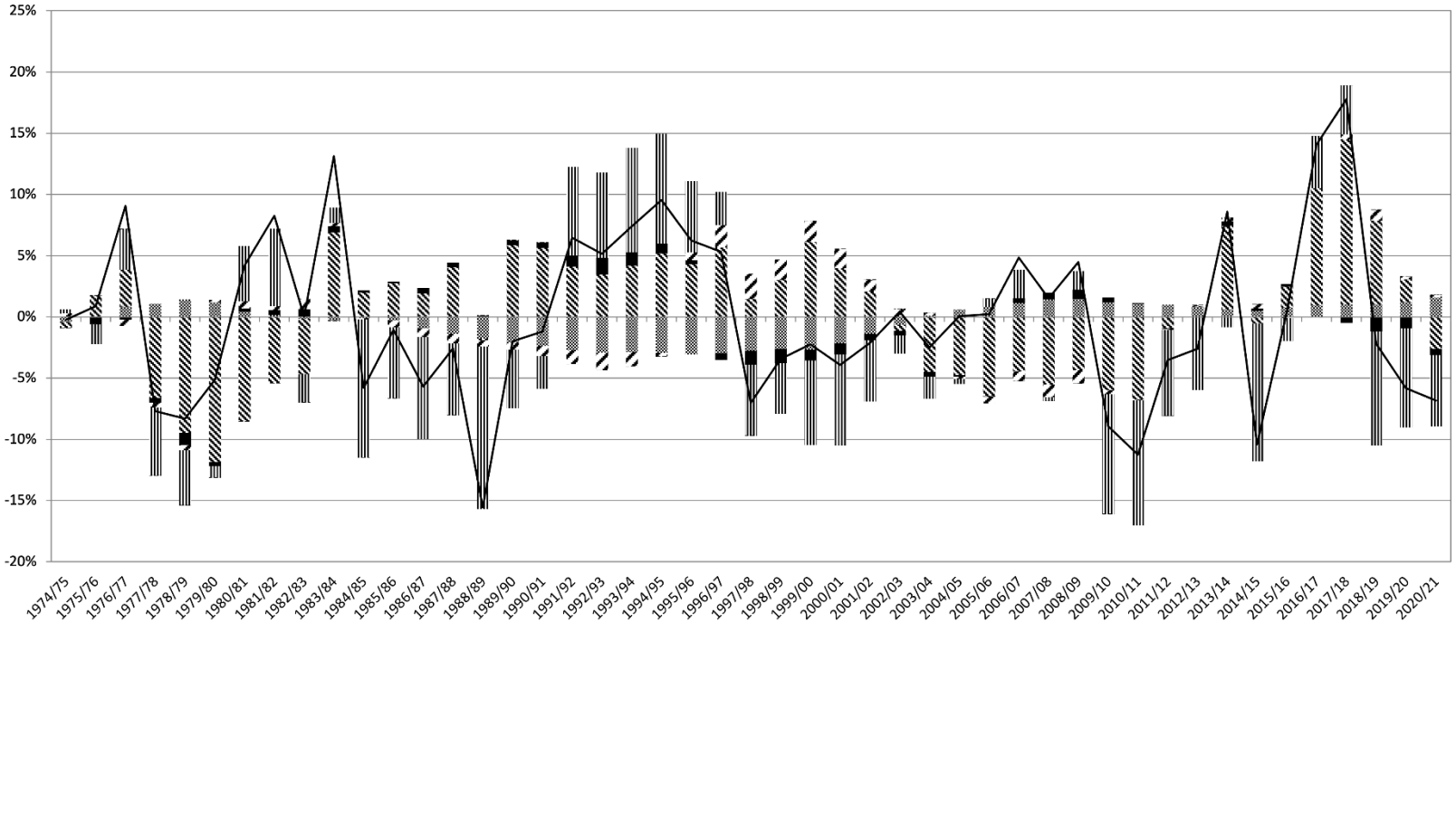
<Figure 3-18> Historical shock decomposition of inflation rate (Demeaned)



<Figure 3-19> Historical shock decomposition of credit demand (HP Detrended)



<Figure 3-20> Historical shock decomposition of credit supply (HP Detrended)



D. Conclusion

This chapter attempts to provide some backgrounds for understanding the business cycle fluctuations of the Nepalese economy by identifying linkages between macroeconomic and financial market variables in a unified framework. To this end, this chapter uses a DSGE model that has a financial accelerator mechanism along with the common features of a small open economy and those of medium-scale New Keynesian models. The proposed model was able to identify both credit demand supply explicitly and to analyze how the credit demand respond to various type of structural shocks. Lastly, the model has been brought to estimation in order to understand Nepalese economy, historical decompositions of variables of interests have been reviewed with a focus on two crisis episodes - the global financial crisis and the COVID-19 pandemic. The following is a summary of the overall assessments.

First, the estimated model has low price and wage rigidities, implying weak money non-neutrality. Second, “Fisher deflationary effect” was not strong and, hence, the credit demand was not affected by the deflationary shocks. Third, credit demand is mostly driven by the financial wealth shock, while the credit supply by the deposit interest rate(in the form of financial intermediary cost) shock. Fourth, the estimated model has the implied volatilities of key variables relatively close to data, especially with credit supply and demand. Fifth, the historical decompositions of GDP fluctuations indicate the global financial crisis and COVID-19 pandemic crisis differ in terms of sources of shocks. Aggregate supply shocks were the main cause of GDP contractions during the global financial crisis, while aggregate demand shocks and policy shocks during the pandemic crisis. Sixth, the credit demand and supply were less promoted by the policy shocks but rather mainly driven by the financial shocks. However, this result does not necessary imply the policy responses in those periods were not relevant, but, rather, the propagations of policy shocks are likely to be limited in this estimated model.

The macroeconomic models developed so far have attempted to make rigorous assessments of past crisis episodes, so that more efficient policy responses can be

implemented in future crises. The empirical analysis performed in this study presents historical evidence of the Nepalese economy using the most up-to-date DSGE model. The evidence in this paper should hopefully provide some guidelines for future extensions in terms of academic research and also for potential policy decisions in response to new challenges.

3. Empirical analysis of the impacts of private sector credit growth on real sectors in the Nepalese economy: VAR-X (Vector Auto-Regression with Exogenous variables) model approach

We first adopt the VAR-X model and estimate impulse response functions to analyze how private sector credit growth dynamically affects real sectors in the Nepalese economy. The VAR-X model can be written as

$$Y_t = A_0 + \sum_{j=1}^{p} A_j Y_{t-j} + \sum_{j=0}^{q} F_j X_{t-j} + \epsilon_t,$$

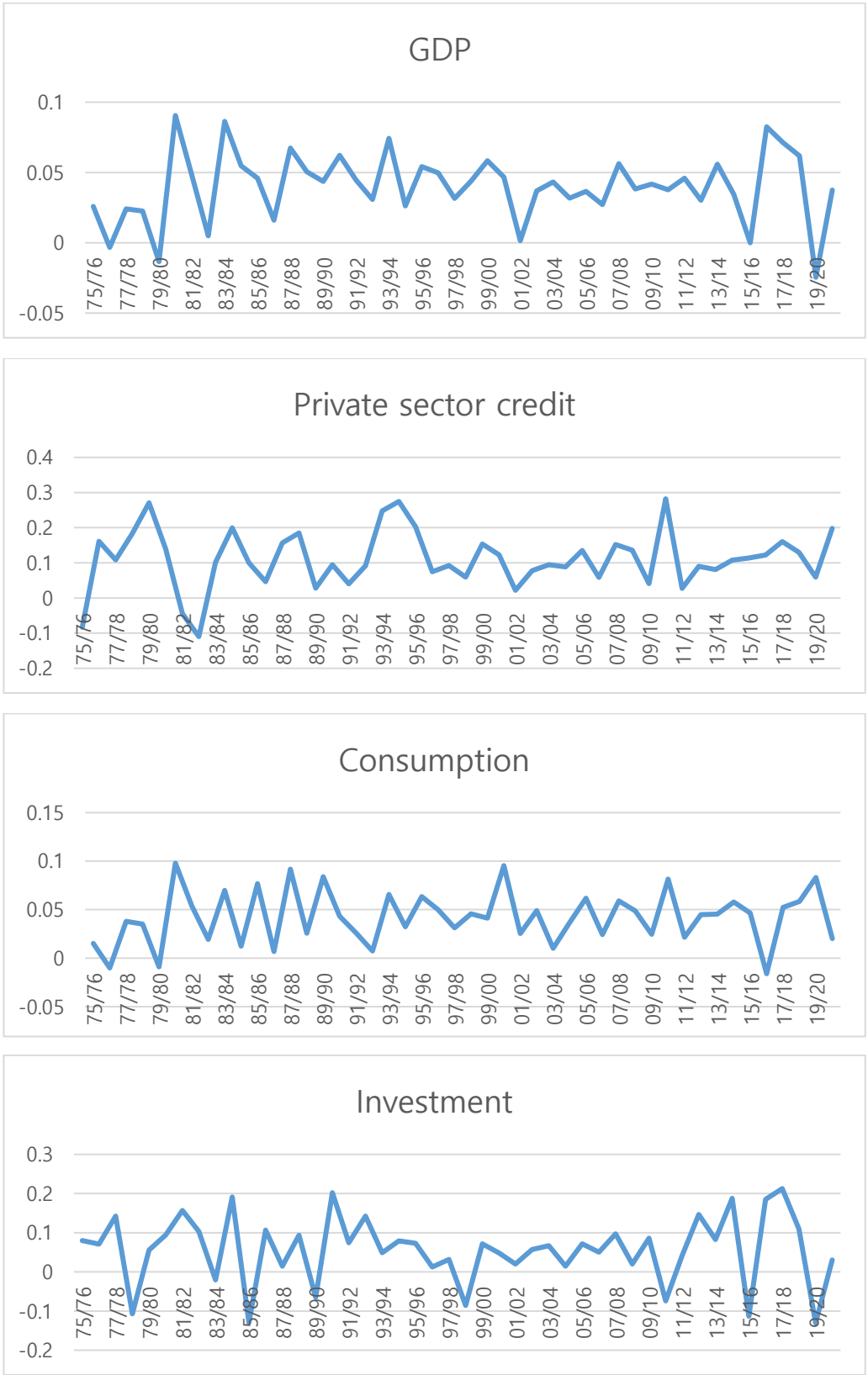
where Y_t is a vector of endogenous variables and X_t is a vector of exogenous variables. We consider, as endogenous variables, private sector credit, GDP, consumption, gross investment, inflation, and NEPSE stock index and exchange rate. As exogenous variables, we try the number of tourist arrival, GDP in India, and GDP in Saudi Arabia.

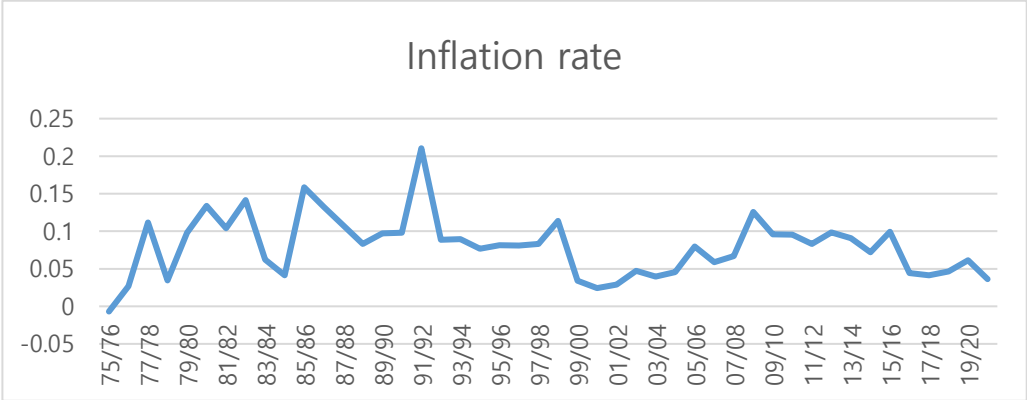
A. Annual data analysis

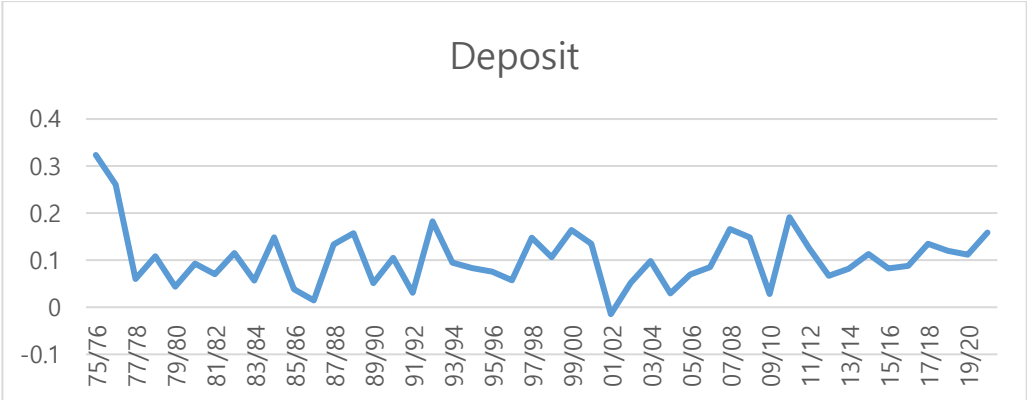
(1) Data availability

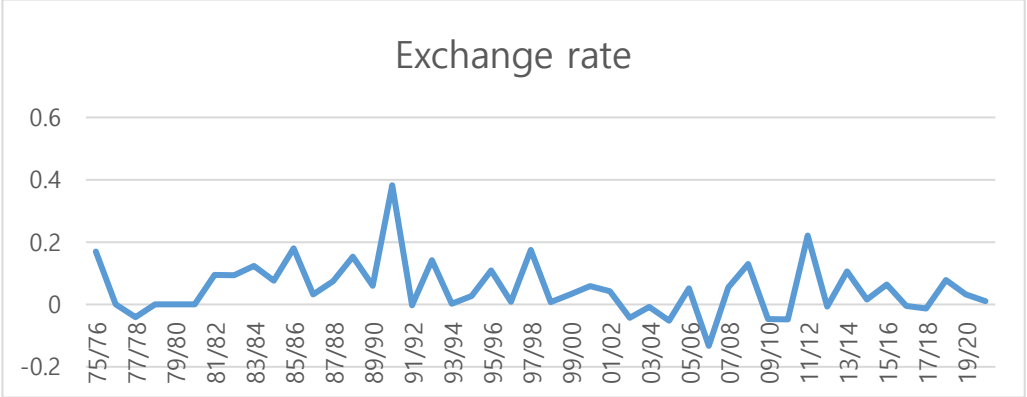
Annual macroeconomic time series are available from 1974/75 to 2020/21. After converting each variable into its annual growth rate, the total sample size becomes 46. It should be noted that the fiscal year generally begins on July 16 in Nepal. Therefore, for example, the period 1974/75 implies July 16, 1974 to July 15, 1975. We convert nominal private sector credit to real value by using the CPI index. Figure 3-21 provide annual growth rates (log difference) of real macroeconomic variables we consider. For annual data analysis, we do not include the NEPSE index and interest rate because they are unavailable for the sample period; NEPSE index is available from 1993/94 and interest rate (weighted average lending rate is available from 2011/12.

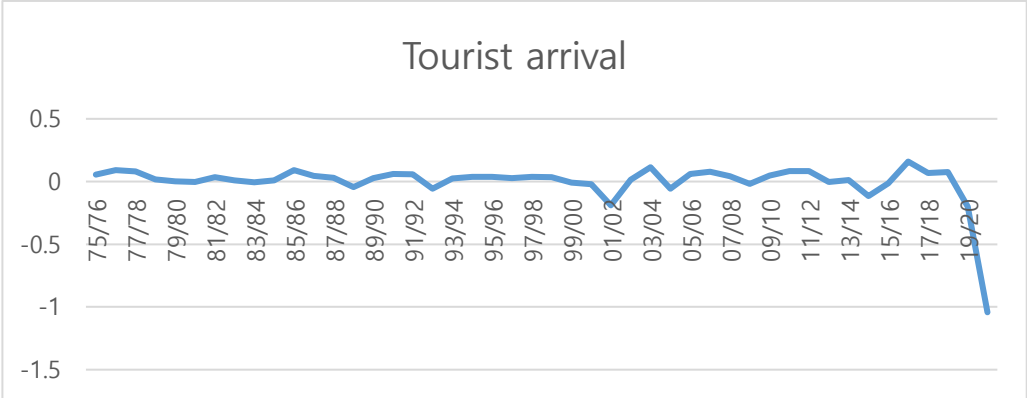
<Figure 3-21> Annual growth rate of real macroeconomic variables

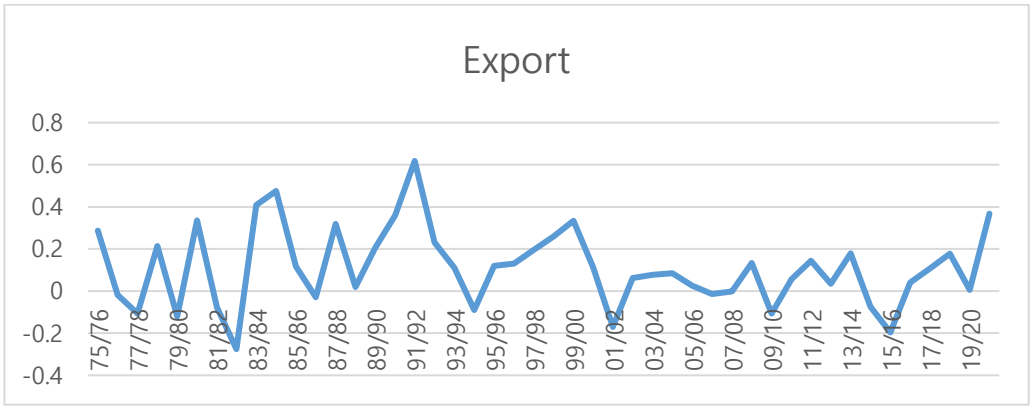


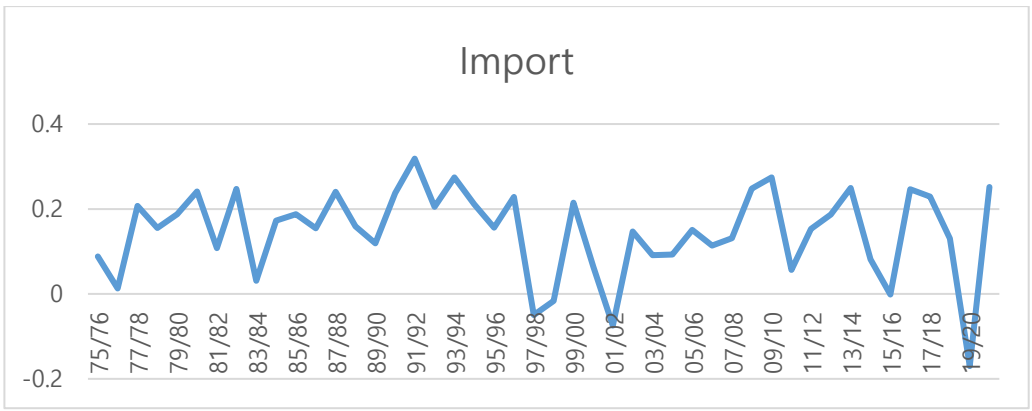

Inflation rate
0.25
0.2
0.15
0.1
0.05
0
-0.05
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20

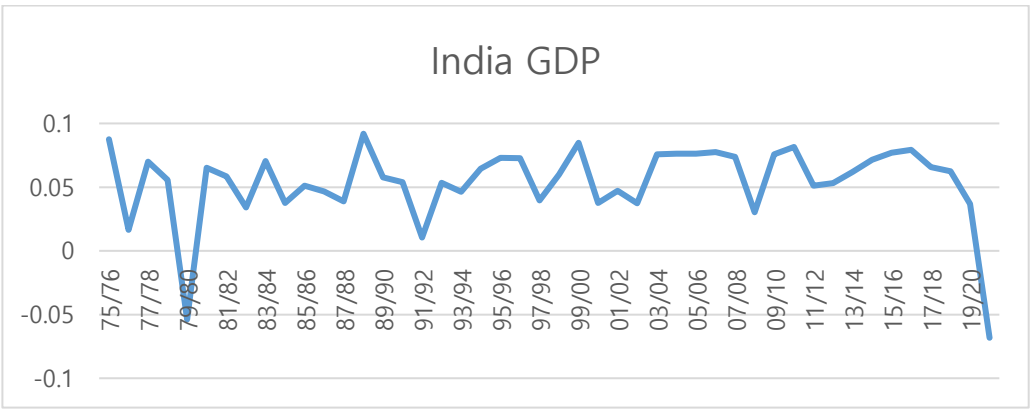

Deposit
0.4
0.3
0.2
0.1
0
-0.1
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20

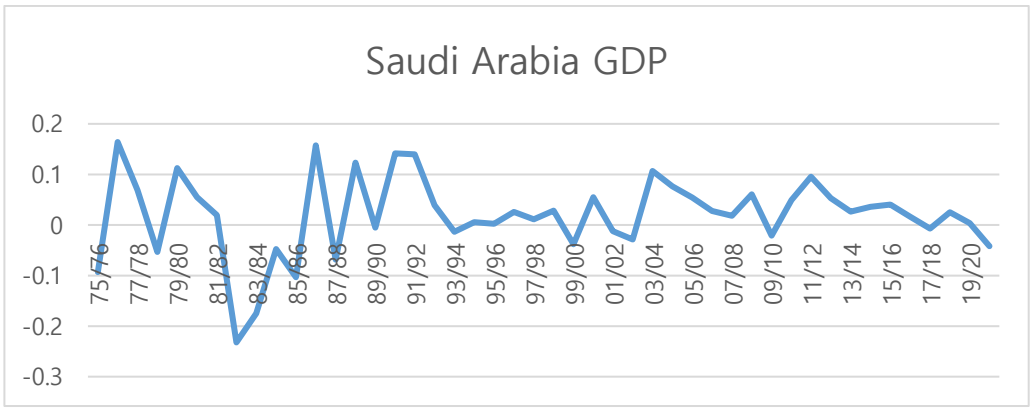

Exchange rate
0.6
0.4
0.2
0
-0.2
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20


Tourist arrival
0.5
0
-0.5
-1
-1.5
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20


Export
0.8
0.6
0.4
0.2
0
-0.2
-0.4
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20


Import
0.4
0.2
0
-0.2
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20


India GDP
0.1
0.05
0
-0.05
-0.1
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20


Saudi Arabia GDP
0.2
0.1
0
-0.1
-0.2
-0.3
75/76
77/78
79/80
81/82
83/84
85/86
87/88
89/90
91/92
93/94
95/96
97/98
99/00
01/02
03/04
05/06
07/08
09/10
11/12
13/14
15/16
17/18
19/20

(2) VAR-X model specification

Since the sample size is only 46, it is not desirable to include many variables as endogenous variables because it would require too many parameters to estimate. Hence, we tried various combinations of three to five endogenous variables. It is known that model specifications based on the AIC are generally better in finite samples even if BIC and HQ provide consistent estimate of the optimal lag. Hence, we choose the lag, p in a VAR-X model, by using the AIC.

When Y_t=(Private sector credit, GDP, inflation)', VAR(2)-X model is chosen as

$$Y_t = A_0 + \sum_{j=1}^{2} A_j Y_{t-j} + F_0 X_t + \epsilon_t.$$

It does not make a substantial difference to include exogenous variables such as tourist arrival, GDP in India or GDP in Saudi Arabia. We confirm that the residual does not exhibit serial correlation, which implies model specification is fine.

When Y_t =(Private sector credit, Investment, Consumption, inflation)', VAR(2)-X model is also chosen and including exogenous variables still does not make any substantial difference in estimates.

(3) Impulse response analysis

Figure 3-22 presents impulse response functions for Y_t=(Private sector credit, GDP, inflation)'. In Figure 3-22, a black line is a dynamic response of GDP growth rate or inflation rate when the growth rate of private sector credit increases by its one standard deviation. Red dotted lines in Figure 3-22 are 95% confidence intervals based on bootstrapping. Since the confidence intervals include zero for all horizons, impulse response estimates are all statistically insignificant.

<Figure 3-22> Impulse response functions for annual data 1

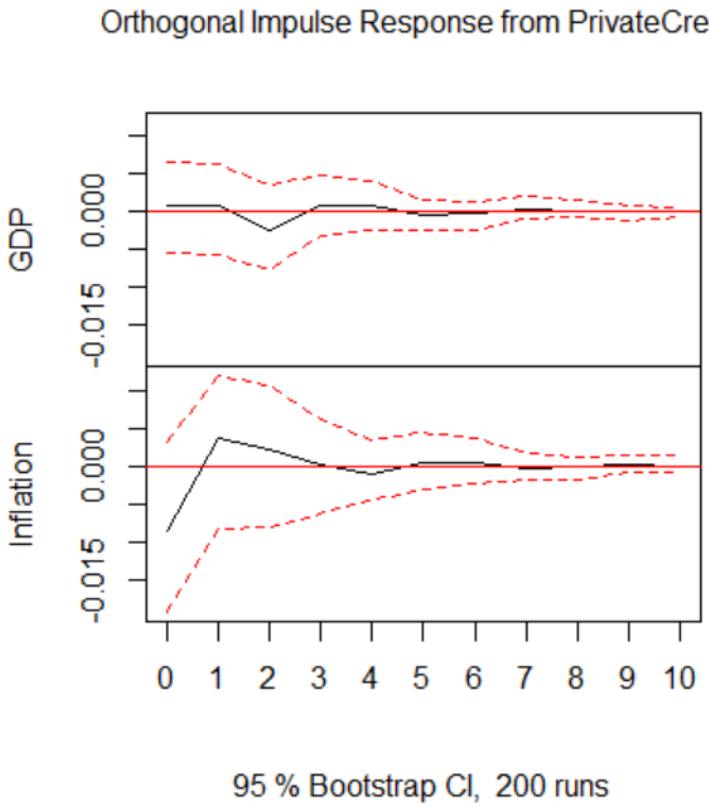
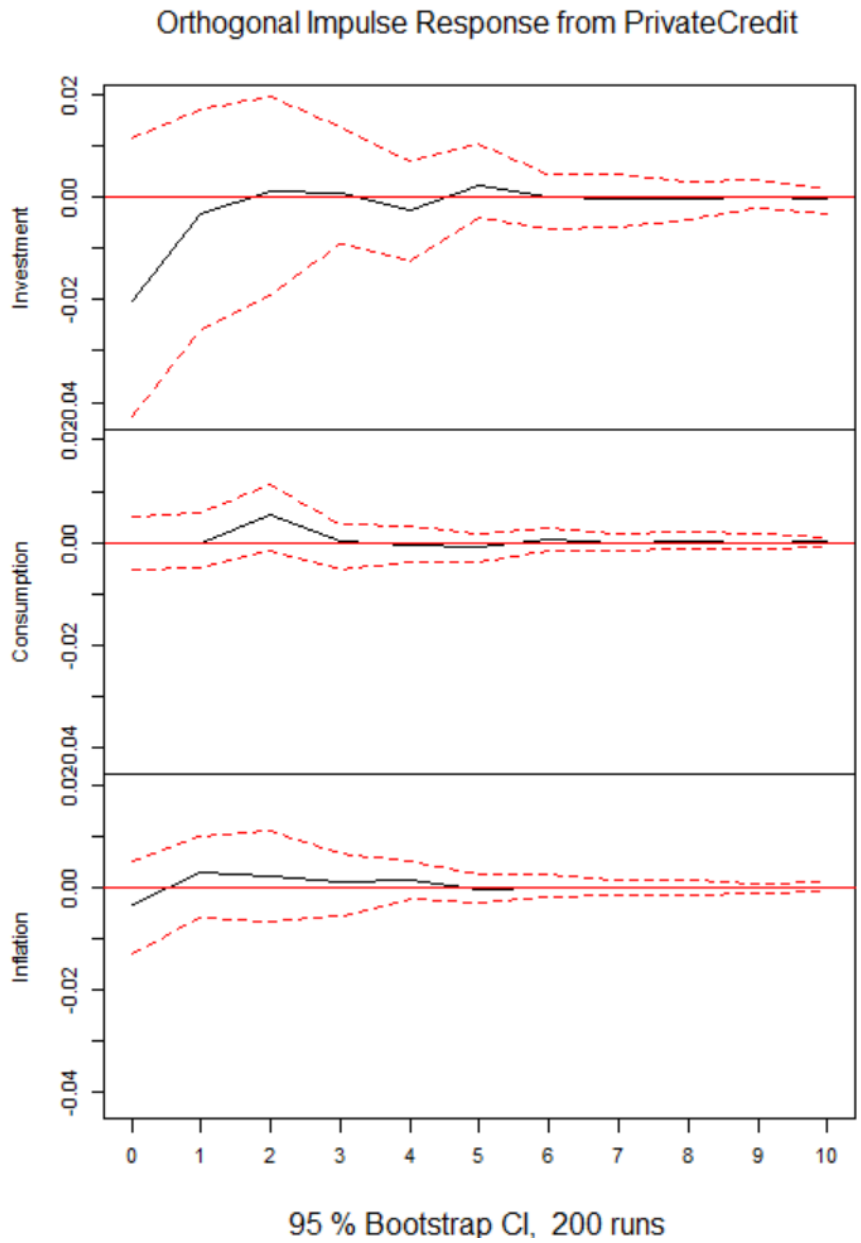


Figure 3-23 presents impulse response functions for Y_t =(Private sector credit, Investment, Consumption, inflation)'. It provides dynamic responses of investment growth rate, consumption growth rate, or inflation rate when the growth rate of private sector credit increases by its one standard deviation. Similarly to the previous case, all impulse response estimates are statistically insignificant. It is hard to obtain statistically significant and meaningful result when we investigate impulse response functions of annual data. This could be because sample size is small. We next consider quarterly data and we have slightly more observations in the quarterly frequency.

<Figure 3-23> Impulse response functions for annual data 2



B. Quarterly data analysis

(1) Data availability

We analyze quarterly macroeconomic time series from 2005/06Q2 to 2020/21Q1, which leads to 60 observations for each time series. More specifically, we use year-on-year growth rates instead of quarter-on-quarter growth rates. It is because quarter-on-quarter growth rates exhibit seasonality. While quarterly real GDP is available from 2004/05Q1, the NEPSE index is available from 2004/05Q2. Therefore, we consider year-on-year growth rates from 2005/06Q2. For quarterly data, consumption and investment are unavailable. Instead, detailed private sector credits such as credit to household and credit to corporations are available.

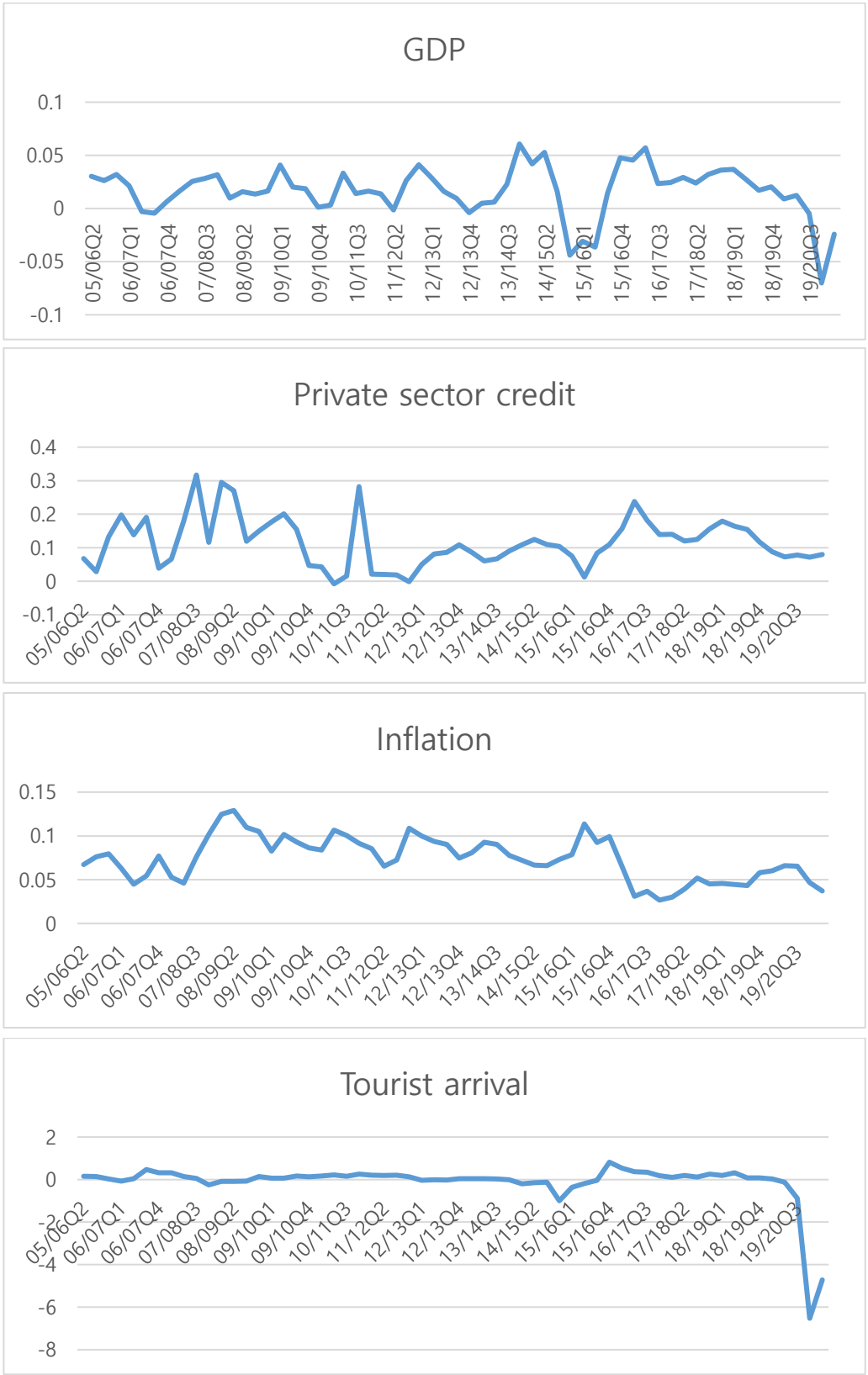
(2) VAR-X model specification

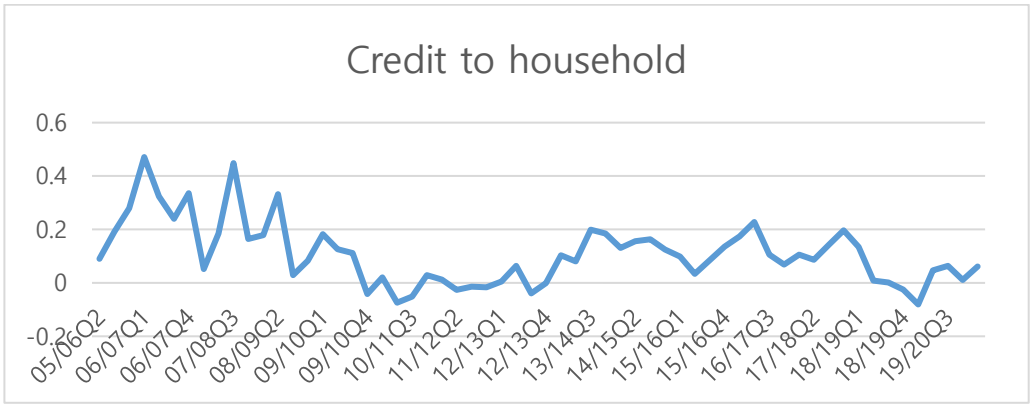
As in the previous annual data analysis, we choose the lag, p in a VAR-X model, by using the AIC. When Y_t=(Private sector credit, GDP, inflation)', VAR(4)-X model is chosen as

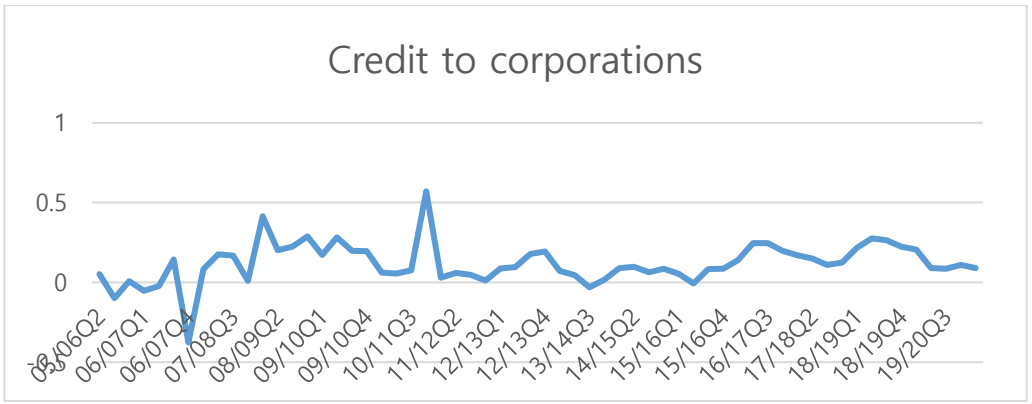
$$Y_t = A_0 + \sum_{j=1}^{4} A_j Y_{t-j} + F_0 X_t + \epsilon_t.$$

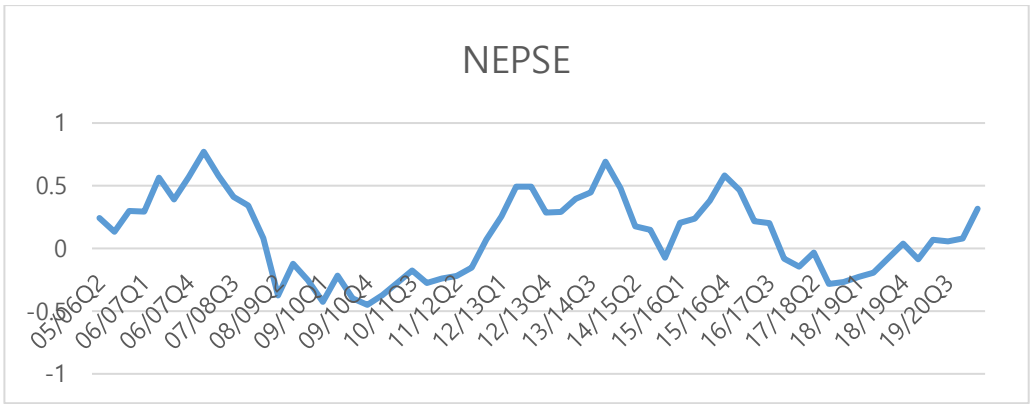
As the exogenous variables, we consider the number of tourist arrival. We confirm that the residual does not exhibit serial correlation, which implies model specification is fine. It should be noted that, contrary to the annual data case, it makes a substantial difference to include the exogenous variable. If we do not include the exogenous variable, the VAR(3) is chosen by the AIC. In this case, impulse response estimates are statistically insignificant for all horizons.

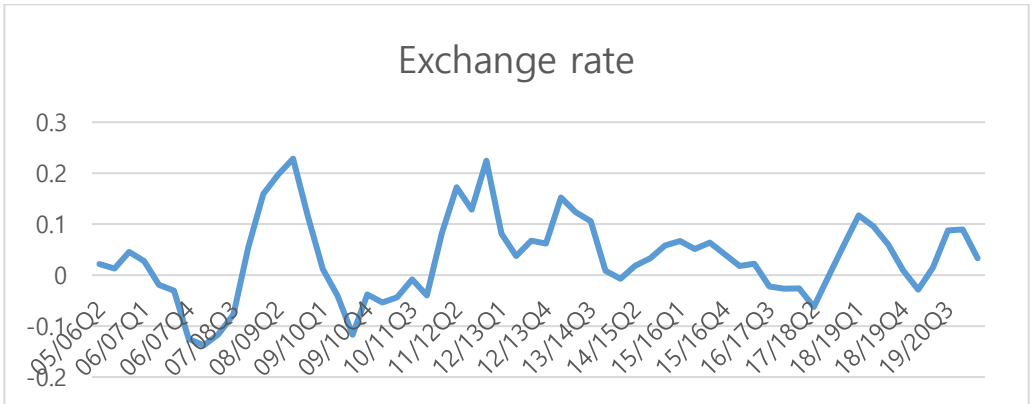
<Figure 3-24> Quarterly growth rate of real macroeconomic variables




Credit to household
0.6
0.4
0.2
0
-0.2
05/06Q2
06/07Q1
06/07Q4
07/08Q3
08/09Q2
09/10Q1
09/10Q4
10/11Q3
11/12Q2
12/13Q1
12/13Q4
13/14Q3
14/15Q2
15/16Q1
15/16Q4
16/17Q3
17/18Q2
18/19Q1
18/19Q4
19/20Q3


Credit to corporations
1
0.5
0
-0.5
05/06Q2
06/07Q1
06/07Q4
07/08Q3
08/09Q2
09/10Q1
09/10Q4
10/11Q3
11/12Q2
12/13Q1
12/13Q4
13/14Q3
14/15Q2
15/16Q1
15/16Q4
16/17Q3
17/18Q2
18/19Q1
18/19Q4
19/20Q3


NEPSE
1
0.5
0
-0.5
-1
05/06Q2
06/07Q1
06/07Q4
07/08Q3
08/09Q2
09/10Q1
09/10Q4
10/11Q3
11/12Q2
12/13Q1
12/13Q4
13/14Q3
14/15Q2
15/16Q1
15/16Q4
16/17Q3
17/18Q2
18/19Q1
18/19Q4
19/20Q3


Exchange rate
0.3
0.2
0.1
0
-0.1
-0.2
05/06Q2
06/07Q1
06/07Q4
07/08Q3
08/09Q2
09/10Q1
09/10Q4
10/11Q3
11/12Q2
12/13Q1
12/13Q4
13/14Q3
14/15Q2
15/16Q1
15/16Q4
16/17Q3
17/18Q2
18/19Q1
18/19Q4
19/20Q3

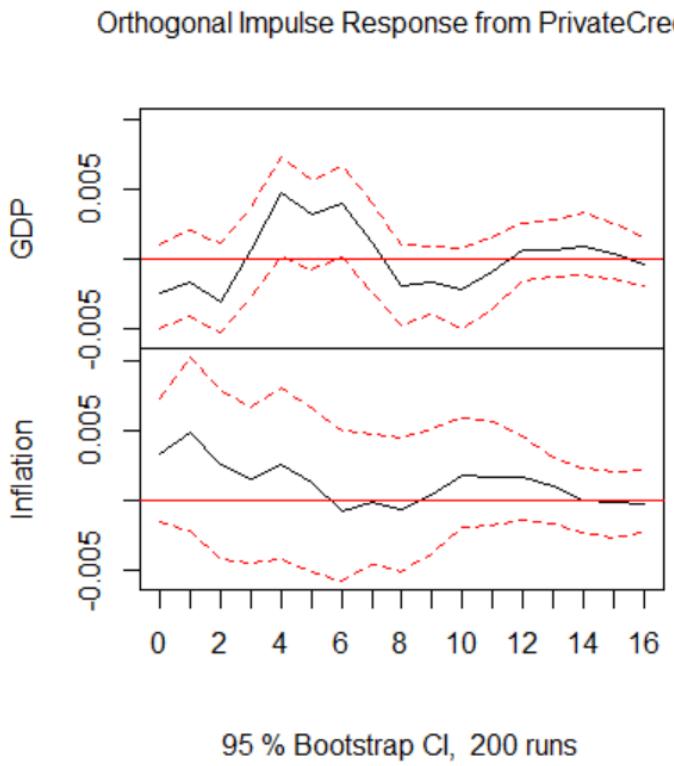
When Y_t=(Private sector credit to household, GDP, inflation)', VAR(5)-X model is chosen. When Y_t=(Private sector credit to corporations, GDP, inflation)', VAR(3)-X model is chosen. In both cases, we use the number of tourist arrival as the exogenous variable.

(3) Impulse response analysis

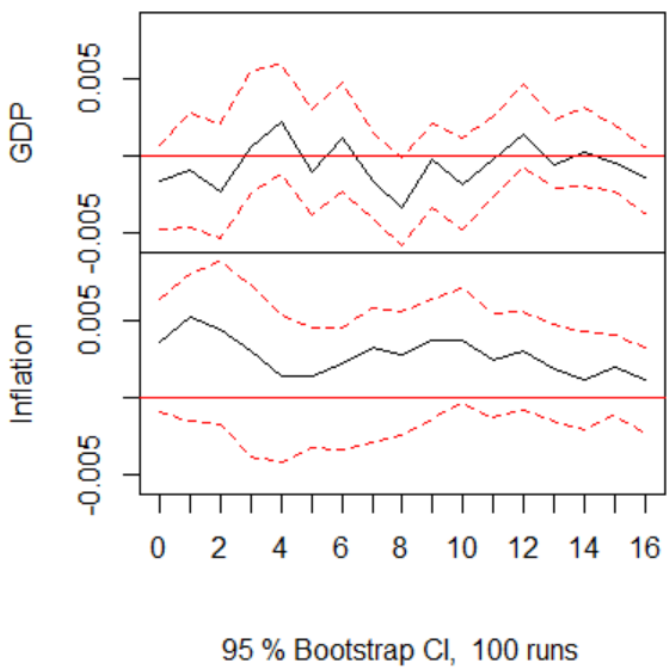
Figure 3-25 presents impulse response functions for Y_t=(Private sector credit, GDP, inflation)' when the growth rate of private sector credit increases by its one standard deviation. The real GDP growth rate increases in four quarters and the impulse response estimates are statistically significant at the horizon 4 and 6. The increase of private sector credit has a positive impact on economic growth in one year or one and a half year. The response of inflation rate is positive, but it is statistically insignificant for all horizons.

We consider the impact of details of private sector credit. Figure 3-26 presents impulse response functions for Y_t=(Private sector credit to household, GDP, inflation)' and Figure 3-27 provides impulse response functions for Y_t=(Private sector credit to corporations, GDP, inflation)'. The results show that impulse response estimates of GDP growth rate are statistically insignificant when there is a shock to private sector credit to household, but it is statistically significant and positive when there is a shock to private sector credit to corporations at the horizon 4. These results imply that the positive impact on economic growth is derived by credit to corporations. We can deduce that private sector credit to corporations lead to investment and, consequently, is followed by economic growth in a year. However, GDP growth rate increases only slightly (0.005) at the horizon 4 when there is a shock to private sector credit to corporations. If financial system is less developed, resource allocation could be inefficient and the contribution of credit to corporations to economic growth could be limited. Therefore, it is necessary to implement some policies to enhance the efficiency of financial system for substantial contribution of private sector credit to corporations to economic growth.

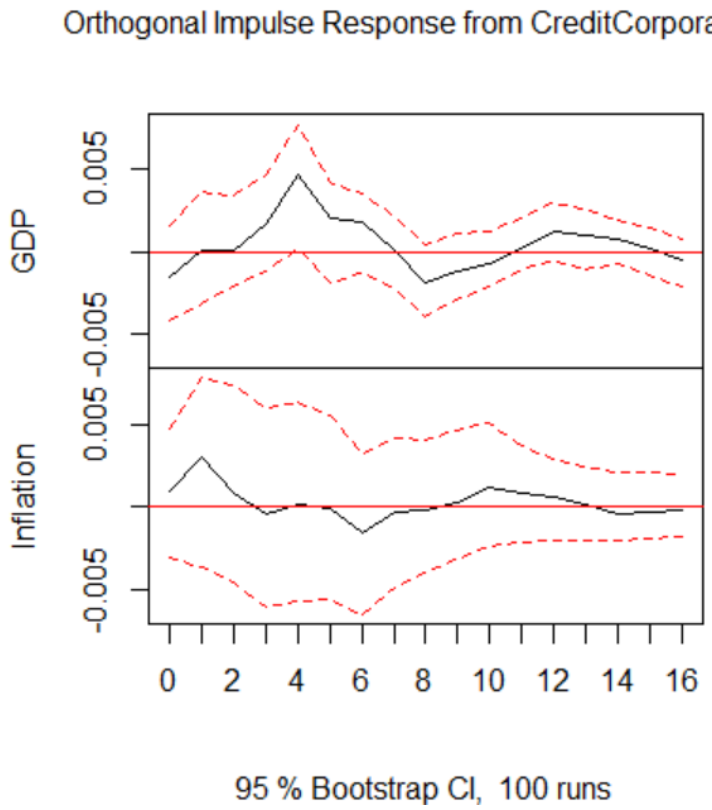
<Figure 3-25> Impulse response functions for quarterly data 1



<Figure 3-26> Impulse response functions for quarterly data 2



<Figure 3-27> Impulse response functions for quarterly data 7



C. Nonparametric estimation

(1) Annual data

The relationship between GDP growth rate and private sector credit growth rate could be nonlinear. We conduct nonparametric estimation;

$$y_t = m(x_t) + \epsilon_t,$$

where $m(\cdot)$ is an unknown and smooth function. We obtain the Nadaraya-Watson (local constant) estimate of $m(\cdot)$. We adopt the Gaussian kernel and the cross-validation bandwidth selection. However, it should be noted that the sample size is not large enough to derive meaningful interpretation.

Figure 3-28 presents the nonparametric estimates for annul data when $x_t = Private\ sector\ credit$. Figure 3-28 (a), (b), and (c) provide the results for $y_t = GDP$, $y_t = Consumption$, and $y_t = Investment$, respectively. The estimation results show that the relationship between private sector credit and real economic variables could be nonlinear.

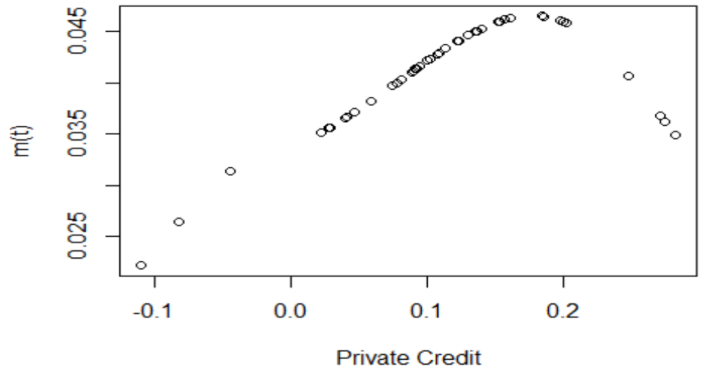
(2) Quarterly data

We conduct similar nonparametric estimation for quarterly data. But, for quarterly data, it is necessary to account for the large decrease of GDP growth rate due to the COVID-19. We control for this effect by using the number of tourist arrival. We first run the OLS regression of GDP growth rate on tourist arrival. Second, we use the residual as the dependent variable in the kernel regression.

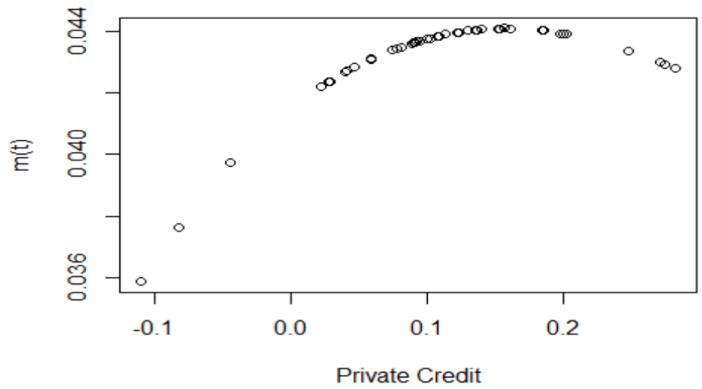
Figure 3-29 presents the nonparametric estimates for quarterly data when $y_t = GDP$. Figure 3-29 (a), (b), and (c) provide the results for $x_t = Private\ sector\ credit$, $x_t = Credit\ to\ household$, and $x_t = Credit\ to\ corporations$, respectively. The result shows nonlinear relationship between GDP growth rate and private sector credit. However, the result for credit to corporations could be meaningless.

<Figure 3-28> Nonparametric estimates for annual data

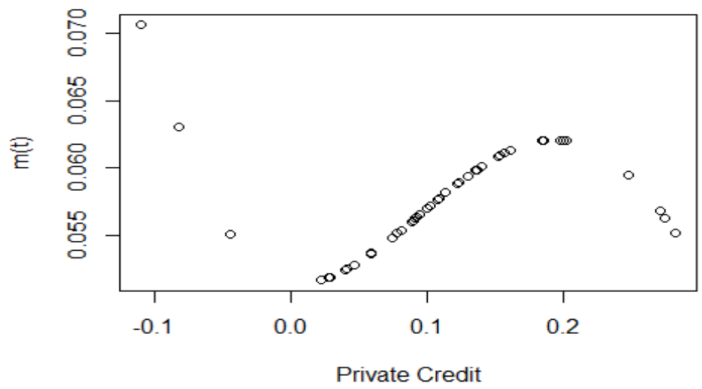
(a) y_t=GDP



(b) y_t=Consumption

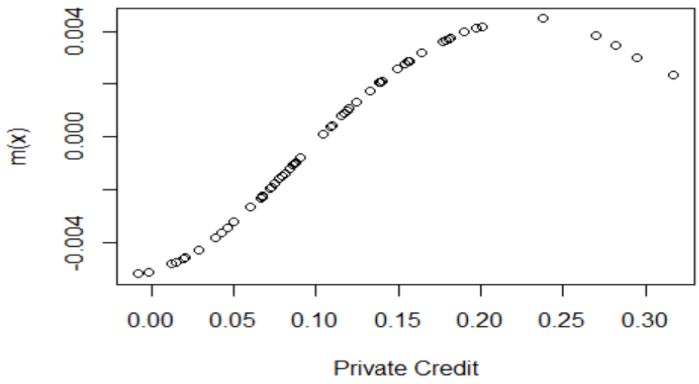


(c) y_t=Investment

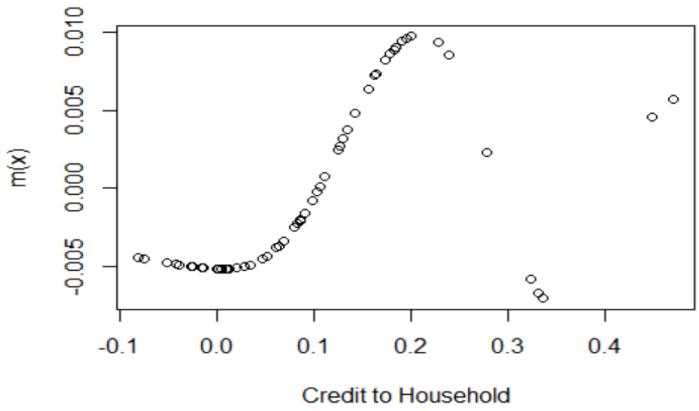


<Figure 3-29> Nonparametric estimates for quarterly data

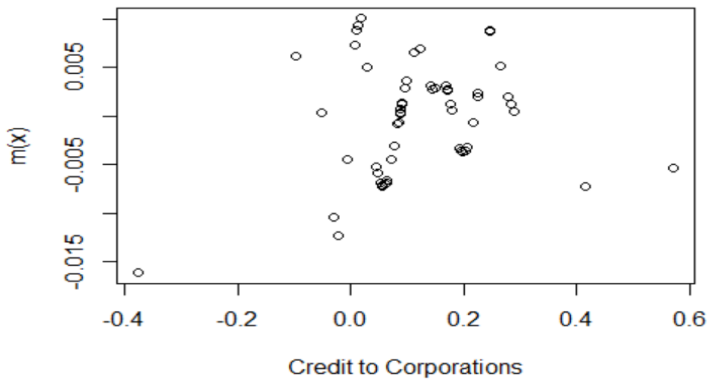
(a) x_t=Private sector credit



(b) x_t=Credit to household



(c) x_t=Credit to corporations



IV. Implications on optimal policies with respect to private sector credit growth

1. The development of policies related to private sector credit growth in Nepal: Policy adopted by NRB and other Nepal governmental agencies

The growth of the private sector is an important element in the country's sustainable development. Credit to the private sector is considered an effective tool for monetary policy transmission mechanism. It promotes growth which further supports employment generation. Policies formulated by the central bank have a direct impact on private sector credit growth as the primary source of funding to the private sector is through banks and financial institutions.

Nepal is in a transition period to graduate from the least developing country to a middle-income developing country by 2026. The private sector plays a key role in achieving the target for the smooth graduation process. According to National Planning Commission (NPC), Nepal requires an investment of Rs. 1,770 billion annually until 2030 to meet the target set by the United Nations-backed Sustainable Development Goals. The private sector is expected to contribute Rs. 382 billion per year, whereas households are expected to contribute Rs. 88.5 billion per year of the total sustainable investment requirement.

The 15th five-year plan of the government targets private sector credit growth to reach 21 percent by the fiscal year (FY) 2023/24, against 19.4 percent growth in the FY 2018/19. Nepal Rastra Bank set a 19 percent private sector credit growth target for the fiscal year 2021/22, compared to a 26.3 percent increase in the previous fiscal year, FY 2020/21. Actual private sector credit growth for fiscal year 2021/22 was 13.1 percent.

Nepal entered into a three-year Structural Adjustment Programme (SAP) with the International Monetary Fund (IMF) in 1988/89 with the aim of increasing the role of market forces in the financial system. With the success of SAP, Nepal entered into another

three-year Extended Structural Adjustment Facility (ESAF) in 1992/93. One of the core priorities of the ESAF program was to enhance private sector participation in the development of the financial system and increase competition and efficiency of the overall financial system.

Nepal implemented the financial sector reform program beginning in 2002. This reform program resulted in significant changes in Nepal's financial sector, especially in the area of financial infrastructure building, reform in financial policies, and further liberalization of the banking sector. As a central bank of the country, Nepal Rasta Bank has formulated various policies that are in favor of promoting private sector credit. These policies are guided by the Nepal Rastra Bank Act 2002, the Bank and Financial Institution Act 2017, the unified directive, and various other bylaws. The increase in private sector credit by 36 times in the last two decades and 5 times in the last decade shows that the initiatives taken by the central bank are successful in increasing private sector credit and ultimately contributing to sustainable economic development. Key initiatives taken by Nepal Rastra Bank and resulting achievements that have helped to boost private sector credit growth are discussed below.

A. Access to finance

Access to finance and financial inclusion are the key enablers for private sector credit growth. Out of 753 local bodies in the country, commercial bank branches are present in 752 local bodies and provide banking services. This is possible due to the “commercial bank branch in each local body” initiative taken by Nepal Rastra Bank back in 2018. The population served per branch by banks and financial institutions was 4,566 as of mid-July 2022. The number of deposit and loan accounts has increased significantly in the last 5 years and has reached 44.3 million and 1.8 million respectively, bringing a large number of underbanked and unbanked population to the banking ecosystem. According to the report published by Nepal Rastra Bank, the population with at least one bank account is estimated to be 67.3 percent in mid-June 2020. As of mid-July 2022, the total number of

banks and financial institutions licensed by Nepal Rastra Bank stood at 126 comprising 26 commercial banks, 17 development banks, 17 finance companies, 65 micro-finance financial institutions, and 1 infrastructure development bank with altogether 11,528 branches. Improvement in access to finance has helped in the availability of financial resources to businesses, firms, households, and individuals for the acceleration of economic activities.

B. Merger by law

The first merger bylaw was promulgated by Nepal Rastra Bank in 2011 and was amended in the following year. In 2013, NRB came up with the acquisition bylaw. Nepal Rastra Bank enacted a Merger Bylaw, 2016 with one of the objectives being to strengthen the capital base of the financial system and develop its competitive landscape, which is one of the appropriate strategies for increasing banking capacity as well as reducing managerial and operational costs. The number of BFI's involved in the merger and acquisition process reached 245 out of which the license of 178 BFI's was revoked, forming 67 banks and financial institutions as of mid-July, 2022. Such consolidation has helped in strengthening the financial sector and building competitive institutions. The increased capital base of banks and financial institutions as a result of mergers and acquisitions has aided in the facilitation of larger loans to individual clients, which was previously impossible without multiple banking and consortium financing.

NRB has incentivized banks and financial institutions involved in the merger and acquisition process. Some of the incentives are relaxation in regulatory ratios such as credit to deposit ratio, cash reserve ratio, and statutory reserve ratio, relaxation in sectorial lending targets, and waiver in the cooling period for the board of director members and senior officers.

The study survey done by Nepal Rastra Bank in April 2022 (Optimal Number of Banks and Financial Institutions in Nepal) pointed out that the appropriate number of commercial banks in Nepal is eleven to fifteen.

C. Increase in bank capital

To strengthen the capacity of banks and financial institutions, the NRB mandated banks and financial institutions to increase their minimum paid-up capital requirement by at least four times through its monetary policy FY2015/16. Commercial banks were required to maintain Rs. 8 billion of paid-up capital, whereas national-level development and financial companies were required to maintain at least Rs. 2.5 billion and Rs. 800 million of paid-up capital respectively. As a result, the average capital fund of commercial banks, development banks, finance companies, and micro-finance institutions has increased by four and a half, five, four, and five folds, respectively, between 2015 and 2021. An increase in the capital base due to the regulatory provision has strengthened the lending capacity of banks and financial institutions.

D. Interest subsidized loan

Concessional loans are extended for a maximum period of five years in order to improve the living standards of economically disadvantaged communities by supporting agriculture-related businesses, expanding employment opportunities, cultivating entrepreneurial skills, and creating a workforce of self-employed individuals. The interest rate on such a loan is two percentage points above the bank base rate, payable by the end user. Depending on the type of loan, the interest subsidy ranges from two percent to six percent for such loans.

The NRB has set a threshold on the minimum number of loans that banks and financial institutions need to provide by mid-July, 2022 depending on the category of financial institutions, which is presented in Table 4-1.

<Table 4-1> Minimum number of loans required by the BFIs under the subsidized loan

Type	Requirement*
Commercial Banks	Total 500 loans or 10 loans per branch whichever is higher
Development Banks (National Level)	Total 300 loans or 10 loans per branch whichever is higher
Development Banks (Others)	At least 200 loans
Finance companies	At least 100 loans

Note: Excluding commercial agriculture and livestock loan

Interest subsidized loans are provided in ten different categories, starting from Rs. 0.2 million to Rs. 50 million. The total amount of subsidy claimed by banks and financial institutions on interest subsidized loans as of mid-July,2022 is Rs.16.96 billion. Details on categories of interest subsidized concessional loan, per customer limit, the number of loans, and outstanding principals are shown in Table 4-2:

<Table 4-2> Outstanding interest subsidized loans

SN	Types of loans	Per client limit (Rs.)	Number of loans	Outstanding principals (Rs. In Million)
1	Commercial agriculture and livestock loan	50,000,000	60,545	139,234.1
2	Educated youth on self-employment loan	700,000	157	76.1
3	Project loan for youth-returnee migrant workers	1,000,000	952	564.2
4	Women entrepreneur loan	1,500,000	84,001	70,996.1
5	Dalit community business development loan	1,000,000	1,097	582.3
6	Higher, technical, and professional education loan	500,000	148	36.5
7	Housing loan for earthquake victim	300,000	208	32.3
8	Loan to textile industries	50,000,000	255	2358.5
9	Loan to training by CTEVT approved institutions	200,000	2	0.3
10	Youth self-employment Loan	500,000	28	8.9
	Total		147,393	213,889.1

Fiscal policy for 2022/23 has allocated an additional Rs. 13.59 billion for interest subsidies on concessional loans. Likewise, fiscal policy has announced that the interest rate on the concessional loan will be discounted by an additional one percent for businesses run by deprived people in backward areas. Such incentives contribute to the socioeconomic well-being of people who have limited or no access to financial resources.

E. Directed sector lending

The directed sector lending policy formulated by Nepal Rastra Bank has ensured an adequate supply of credit to the productive sectors in order to support inclusive economic growth and has mandated banks and financial institutions to extend a minimum level of credit to the agriculture, energy, tourism, and MSME sectors. In 1988/89, Nepal Rastra Bank mandated commercial banks to lend 25 percent of the outstanding credit to the productive sector, including 8 percent of priority sector lending. This program was discontinued in the phases after the implementation of the financial sector reform program in 2002.

NRB introduced the directed lending program in 2010/11 in the name of productive sector lending wherein commercial banks were required to lend at least 20 percent of their outstanding credit to the agriculture, energy, tourism, and cottage and small industries. Currently, commercial banks must extend at least 15 percent of their total loan portfolio in the agriculture sector by mid-July 2023, according to a directive issued by Nepal Rastra Bank. Similarly, 10 percent and 15 percent of loans have to be extended to the energy and MSME sectors by mid-July 2024. At least 40 percent of the total loan portfolio has to be allocated to the directed sector by mid-July 2024. As of mid-July 2022, commercial banks had disbursed 27.64 percent of total loans to the directed sector, compared to the target of 28 percent.

By mid-July 2023, development banks and finance companies must make at least 20 percent and 15 percent of their loans to agriculture, micro, small and medium enterprises (MSMEs), energy, and tourism, respectively.

In addition to this, Nepal Rastra Bank has directed banks and financial institutions to arrange separate operating desks for facilitating credit to small and medium enterprises (SMEs) and enhancing financial access.

F. Deprived sector lending

With the objective of economic upliftment of the low-income and socially marginalized community by supporting their income and employment-generating activities, Nepal Rastra Bank initiated the deprived sector lending facility in 1990. Initially, newly established banks were required to lend 0.25 percent of their loan portfolio to the deprived sector, whereas banks that had been in operation for more than 3 years were required to lend 3 percent of their total loan portfolio to the deprived sector. Banks and financial institutions are now required to lend at least 5 percent of their total loan portfolio to the socially deprived sector in order to meet the microcredit demand of the poorer sections of society.

As of mid-July 2022, total deprived sector lending extended by banks and financial institutions is 7.27 percent of the total loan portfolio, out of which commercial banks, development banks, and finance companies have extended 6.83 percent, 11.25 percent, and 8.16 percent respectively.

G. Refinancing facility

Nepal Rastra Bank introduced a refinance facility for the first time in January 1967 for export and industrial credit.

With the security of a good loan, Nepal Rastra Bank provides refinance facilities to banks and financial institutions in the form of a loan for a maximum period of one year at a concessional interest rate. NRB introduced the Refinance Procedure, 2020 with the objective of minimizing the impact of Covid-19 on the economy. The total limit of the refinance fund was increased to 212 billion to provide refinance in the following three

different broad categories.

(1) MSME refinance

The maximum refinancing amount available to micro, small, and medium-sized businesses is Rs. 1.5 million per client. Banks and financial institutions are charged a 4 percent concessional interest rate, which is then passed on to the end customer at a maximum rate of 7 percent interest rate.

(2) Special refinance

Refinance provided to priority sectors specified by the bank, such as export, women's entrepreneurship, health service providers, hospitals, less than 10 MW hydropower etc., falls under special refinance where 2 percent interest is charged to the BFIs by the NRB and is then provided to end costumers at the maximum rate of 5 percent interest by banks and financial institutions.

(3) General refinance:

The refinance, excluding MSME and special, is provided by Nepal Rastra Bank to the BFIs at a concessional interest rate of 5 percent, with the end customer benefiting at a maximum rate of 7 percent.

Nepal Rastra Bank offers refinance in one of two ways: providing a lump sum amount to banks and financial institutions in bulk for selected customers, or approving individual clients' refinance applications after a thorough investigation.

As of mid-July 2022, NRB has approved the refinance of Rs. 264.43 billion and the total outstanding refinance is Rs. 111.96 billion. The central bank's provision of refinancing has helped in bringing confidence to the businesses and firms that were hard hit by the Covid-19 pandemic and acts as a catalyst to revive the businesses. As the economic impact of Covid-19 is gradually under control, the NRB through its FY 2022/23

monetary policy has limited refinancing facility to the available refinance risk-bearing funds by prioritizing sectors such as agriculture and other productive sectors, export-related businesses, highly impacted sectors by Covid-19 and SMEs.

H. Business continuity loan

The government of Nepal introduced business continuity loans under the Business Continuity Loan Procedure, 2020, to assist tourism, cottage, small and medium industries-related businesses, and firms that are unable to pay wages and salaries due to the impact of COVID-19 on their respective businesses. Businesses and firms get funds to cover their business continuity expenses under this scheme. For highly affected sectors, the limit of such loans is Rs. 100 million whereas for moderately affected and least affected sectors such limit is 70 million and 50 million respectively. Under this provision, the total loan approved as of mid-July 2022 is Rs. 974 million.

I. Credit rating

The credit rating regulation was introduced by the Securities Board of Nepal in 2011 for public and right issuances of shares, debentures, and other debt instruments.

It has been made mandatory by Nepal Rastra Bank to conduct credit ratings of the borrowers and use them as a basis while providing a loan of 500 million or more to a single loanee, and such a rating should be updated once every two years. Such rating has to be done by credit rating agencies. There are three credit rating agencies currently operating in Nepal; they are ICRA Nepal Limited, CARE Ratings Nepal, and Infomerics Credit Rating Nepal Limited.

J. Interest capitalization

The interest capitalization facility is available during the moratorium period of the loan

and is extended to national priority sectors such as hydropower projects, transmission lines, cement industry, medicine industry, cable car projects, sugar industry, hospitals, and touristic hotels earning foreign currency, etc., given prior approval from the Nepal Rastra Bank. Such facility of interest capitalization brings confidence among the business communities in investing in infrastructural projects of national importance.

K. Grace period and loan restructuring/rescheduling

Generally, a grace period of one year is provided in the term loan of newly constructed project. Upon approval of the higher management of the banks, the grace period can be extended by weighing the project report submitted by the borrower. This will help businesses to focus on the construction work during the initial days and repay the principal and interest amount from cashflow generated by the business.

Banks and financial institutions are allowed to either restructure or reschedule the loan based on a written work plan submitted by the borrower. Before reconstructing or rescheduling the loan, at least 25 percent of the total interest receivable should be collected from the borrower.

L. Interest rate related

Generally, there is an inverse relationship between interest rate and private sector credit growth. With the objective of creating a competitive environment in the financial sector, Nepal Rastra Bank completely deregulated the interest rate in the market in August 1989. Interest on loans and advances charged to customers by banks and financial institutions should be calculated using the Nepal Rastra Bank's base rate. The NRB introduced the concept of the base rate to commercial banks for the first time in FY2012/13, which was then extended to development banks and financial companies the following year and is computed as the sum of the cost of funds, cost of SLR, cost of CRR and operating cost.

The premium that is added to the base rate cannot be increased during the tenure of a

loan. If the loan is disbursed as a flexible interest rate scheme, interest on the loan can be changed on a quarterly basis upon a change in the base rate. Borrowers have the flexibility of selecting either an adjustable interest rate or the fixed interest rate on a personal nature loan such as a home loan, housing loan, auto loan, vehicle loan, hire purchase loan and other loan with a tenure of more than a year. Base rate and weightage average interest rate on the credit of commercial banks reached 9.54 percent and 11.62 percent respectively in mid-July 2022.

Banks and financial institutions are required to charge a base rate plus a maximum of 2 percentage points premium on a base rate on a loan of up to Rs. 20 million made to businesses engaged in food production, animal husbandry, fishery, export-related businesses, productive industries based entirely on domestic raw materials, handicrafts, and other skill-based businesses. Land that is not connected by road can also be accepted as collateral for such a loan up to Rs. 2 million. Such loan has to be disbursed within seven days of the application received date. If not, the customer should be informed in a written form with a reason for application rejection. A provision of a maximum of 2 percentage points on the base rate has been made while determining the interest rate for the credit mobilized to private sectors for the construction of information technology and industrial park.

Loans extended up to 50 million to productive sector businesses related to tea, coffee, orange production, dairy products, animal husbandry, etc. can be given based on the project itself as collateral.

The maximum penal interest rate that banks and financial institutions can charge their borrowers if they miss a loan payment has been set at 2 percent, preventing banks and financial institutions from charging haphazard penal interest. Interest on penal charges is prohibited.

The NRB implemented a 6 percent interest rate spread in 1993. It was discontinued after the reform in 2002, and reintroduced in FY 2013/14. Commercial banks must now maintain an interest rate spread (the difference between the average interest rate on credit and deposit) of 4 percent, while development banks and finance companies must maintain

a spread of 4.6 percent. The following action is taken by Nepal Rastra Bank against the banks and financial institutions violating interest rate spread requirements:

a. Restriction in new branch expansion

b. Restriction in refinance facility

c. Restriction in dividend distribution

d. Action to be taken to the board of directors and CEO as per NRB Act, 2002, if the spread is not brought down to the threshold within the same quarter.

M. Upper caps on credit limit

Nepal Rastra Bank introduced Single Obligor Limit (SOL) for the first time in 1988/89 in order to lower the risk element associated with an overconcentration of bank resources on a single borrower. Credit limits were set at 50 percent of capital funds for fund-based loans and advances and 100 percent of the capital for non-funded loans for a single customer, firm, company, or interconnected groups.

In order to minimize concentration risk, Nepal Rastra Bank issued a directive to limit the maximum credit threshold to individual clients in different economic sectors. The maximum loan that banks and financial institutions can make to a single client, firm, or company is 25 percent of the total core capital. However, for loans provided to productive sectors such as exports, SMEs, transportation infrastructure, medicine production, agriculture, tourism, cement industry, and so on, the single obligor limit is increased to 30 percent of the core capital.

The single obligor limit has been increased to 50 percent of the total paid-up capital for hydropower and renewable energy projects, electricity transmission lines, and cable car construction projects.

N. Margin lending

NRB issued the directive regarding loans against shares for the first time in the fiscal

year 2005/2006. Banks and financial institutions are allowed to extend margin lending facilities against the pledge of dematerialized listed securities as collateral. The valuation of such shares is done on the basis of the last 180 working days' average price of the stock or the current market price quoted on the Nepal Stock Exchange, whichever is lower. A loan against the share of up to 70 percent of the total stock valuation can be provided for a maximum of one year. Restructuring and rescheduling of the loan provided against the share is prohibited.

The single obligor limit for margin nature loans is 120 million from entire banks and financial institutions. Bank and financial institutions are permitted to extend credit facilities to the extent of 40 percent of the core capital on margin nature loans.

O. Loan-to-value ratio (LTV)

In 2009/2010, the loan-to-value ratio was set for the first time on lending against the collateral of land and housing as well as real estate.

The loan-to-value ratio set by the central bank for real estate loans was 40 percent of the fair market value of the collateral in the case of Kathmandu Valley and 50 percent in other places. The fiscal year 2022/23 monetary policy has reduced the loan to value ratio of the real estate loan on the collateral inside and outside the Kathmandu valley to 30 percent and 40 percent, respectively. The loan-to-value ratio is set at 60 percent for personal residential home loans and government-approved housing projects. The loan-to-value ratio for a first-time home buyer is set at 70 percent for a residential home loan up to Rs. 15 million.

A loan issued for the purpose of purchasing a personal vehicle has a maximum loan-to-value ratio of 50 percent, whereas an electrical vehicle has a maximum loan-to-value ratio of 80 percent. For vehicle loans other than personal use, banks can fix the loan-to-value ratio based on the risk and reward associated with the project.

P. Debt service to income ratio

Debt service to income ratio is set at 50 percent for personal loans such as term loans, hire purchase loans, personal overdraft loans, and home loans. The debt-to-service income ratio for first-time home buyers is set at 60 percent.

Q. Consortium financing

The NRB has issued a directive for consortium formation, operation, and other consortium-related issues. It is mandatory that multiple bank lending of 2 billion or above has to be financed through consortium financing. Such loans are extended to manufacturing as well as the service sector and may vary from fixed-term loans to working capital loans.

R. Digital lending

In order to promote digital lending, Nepal Rastra Bank has directed banks and financial institutions to ease loan approval processes to the limit of Rs. 200 thousand with minimum procedural requirements and enable hassle-free digital approval of the loan. Such products have been introduced by a number of banks in the country, promoting digital lending. The central bank has issued a digital lending guideline wherein loans up to the limit of Rs. 500 thousand can be granted digitally to salaried employees, professionals, and businessmen whose primary account is managed by the bank, whereas such limit is Rs. 200 thousand for non-salaried account holders.

S. Covid 19 impact and proactive measures

The covid 19 pandemic has caused unprecedented challenges to the economy worldwide. Central banks around the world took unconventional measures to reduce the

economic impact of the pandemic and its aftereffects.

According to a later study on the effects of noble Covid-19 on the Nepalese economy conducted by Nepal Rastra Bank, the country's economy shrank by 1.9 percent in the fiscal year 2021/22 compared to the previous fiscal year. According to a survey conducted in July 2020, only 4 percent of businesses were fully operational, compared to 35 percent that were partially operational and 61 percent that had completely shut down during the first lockdown period (March to June 2020), resulting in a 22.5 percent reduction in employment and an average wage reduction of 18.2 percent. The first follow-up poll conducted in December 2020 reveals that 54 percent of enterprises were fully operational, 37 percent were partially operational, and 9 percent were shut down completely during that time.

The second follow-up survey done in June 2021 shows that 4 percent of the businesses were completely shut down, whereas 15 percent were partially operated, and 81 percent of the industries/businesses were fully operated. The third follow-up survey done in December 2021 shows that 87 percent of the businesses were fully operated during the study period.

Nepal Rastra Bank has proactively implemented monetary, macroprudential, and other regulatory measures to support economic recovery after the pandemic and maintain financial stability.

Cash reserve ratio was reduced by 100 basis points from 4 percent to 3 percent and again lifted to 4 percent from FY2022/23 monetary policy and Statutory Liquidity Facility (SLF) rate was reduced from 6 percent to 5 percent in order to ease the liquidity in the banking sector and then SLF rate was gradually increased to 7 percent and now 8.5 percent as a part of contractionary monetary policy. Banks and financial institutions were no longer required to maintain a counter-cyclical buffer (CyCL) that was due in July 2020. CyCL buffer has been suspended until 2023. The size of the refinance fund was increased by around 4.12 times to 212 billion to provide subsidized funding at a concessional interest rate for the priority sectors such as MSME, export, manufacturing, agriculture, etc. that were hardly impacted by the pandemic.

Businesses that used the working capital loan facility received an additional working capital loan worth 20 percent of the approved loan amount. For firms or businesses that do not use working capital loans, an additional 10 percent was added to their existing term loan limit. Such an extended loan could be used only for an activity such as procurement of inventories, paying staff salaries, or giving continuity to the business.

The loan rescheduling/restructuring facility was provided to the hard-hit sectors by covid-19 upon paying 10 percent of the payable amount.

Nepal Rastra Bank directed banks and financial institutions to extend a grace period of a maximum of two years based on the impact of Covid-19 on the business. A grace period of one year was extended to the projects that could not come into operation and to the highly affected sectors by Covid-19. For the moderately and least affected sectors, the grace period was extended by 9 months and 6 months, respectively. The grace period for hotels was extended to a maximum of 2 years.

Banks and financial institutions were allowed to extend the repayment date of short-term loans such as demand loans and cash credit loans by 6 months. Similarly, 9 months and 6 months of time extensions were allowed for the installment-based loan based on the severity of the impact by Covid-19.

Projects that have already received approval from the NRB on interest capitalization were given an additional extension on interest capitalization.

T. Shift to productive sector lending

Banks and financial institutions focus on investment in productive sectors to help in economic transformation as well as poverty alleviation. In response to the external sector pressure and scarcity in the availability of loanable funds in the banking sector, Nepal Rastra Bank has tightened non-productive sector loans by raising the risk weightage asset (RWA) of the major four types of credit. The risk weightage asset of personal overdraft loan, personal hire-purchase loan, real estate loan for land acquisition and development, and lending against share has been increased to 150 percent from the existing 100 percent

whereas the risk weightage asset of trust receipt loan/import loan has been increased to 120 percent. An increase in RWA discourages banks' lending to less productive sectors as it has a direct impact on the capital adequacy mandate of the banks and financial institutions.

U. Restrictive measures on controlling private sector credit on the less productive sector

The expansion of private sector credit to the productive sector aids in meeting the target of economic growth. The major chunk of private sector credit has been used in less productive sectors creating an adverse impact on the country's economy. An increase in imports, a reduction in the country's foreign currency reserves, and a deficit balance of payment has resulted in pressure on banking system liquidity. To prevent the economy from being hit by external shocks, the government of Nepal and the central bank have taken various initiatives in recent months.

In April 2022, the Government of Nepal officially banned the import of ten luxurious and non-essential goods applicable till mid-July 2022, in response to the liquidity crunch and depleting foreign exchange reserves. Major goods that were banned are luxurious cars and motorcycles above 250 cc, all types of liquor, cigarettes, tobacco products, playing cards, some snacks and potato chips, diamonds, mobile phones above $600, and color televisions above 32 inches etc. The import ban has been continued, including restrictions on the import of motorcycles greater than 150 CC and mobile phones above $300 until mid-December 2022 citing the problem of depleting foreign exchange reserves.

Furthermore, in March 2022, Nepal Rastra Bank reduced the daily import quota of gold from 20 kg to 10 kg a day in order to prevent the depletion of foreign currency reserves. The cash margin requirement for the import of certain non-essential goods has been revised to 100 percent. Goods whose margin requirement has increased are alcoholic drinks, tobacco, silver, furniture, sugar, mineral water, energy drinks, marble, tiles, ceramics, motorcycles, scooters, and automobiles.

V. Regarding financial resource collection

Generally, there is no restriction on the deposit collection limit for commercial banks. However, development banks and financial companies can only collect 20 and 15 times of the total capital fund in the form of deposits and borrowings. Banks and financial institutions are permitted to borrow up to 25 percent of the total deposit.

(1) Borrowing from foreign institutions

Banks and financial institutions are allowed to borrow up to 100 percent of the total core capital from foreign banks and financial institutions, pension funds, hedge funds etc. for a maximum period of five years, which strengthens the banking sector's financing capacity. So far, thirteen banks have borrowed 51.45 Billion rupees from foreign institutions. Banks and financial institutions are allowed to accept 10 percent of the total deposit as an institutional deposit from a single firm or company whereas the total institutional deposit of the BFIs cannot exceed 50 percent of the total deposit.

(2) Debenture

Commercial banks are required to issue debenture of at least 25 percent of the paid-up capital by mid-July 2022, which acts as a source of long-term funding for financing. Agriculture Development Bank, which is the pioneer bank in agriculture sector lending, is eligible to issue agriculture bonds as a long-term source of financing in the agriculture sector. Similarly, with an objective to ease long-term funding in the energy sector, commercial banks are authorized to issue energy bonds in Nepalese currency. So far, Rs 24 billion of agriculture bonds and Rs. 17 billion of energy bonds have been approved by Nepal Rastra Bank. As of mid-July 2022, the total outstanding debenture is 136.99 billion.

(3) Hedging bylaw

The government of Nepal has introduced the Hedging Bylaw, 2019 with the aim of encouraging foreign investment in infrastructure projects including hydropower, transmission lines, fast track, train, monorail, and selected government projects in Nepal by minimizing the risk of foreign exchange fluctuation risk to the potential investors. Foreign investors are protected against the uncertainty of potential loss incurred by fluctuation in foreign exchange rates with the implementation of this bylaw.

W. Micro-finance institution role in private sector credit

The microfinance sector, which has grown rapidly since the early 1990s, is an effective tool for poverty alleviation and a means of increasing financial access to the rural sector of society. Microfinance in Nepal started with the inception of the Small Farmers Development Project (SFDP) in 1975 when the Agriculture Development Bank began a collateral-free group-based lending program to the poor people in the country on the basis of a group guarantee. Microfinance was even acknowledged as an official poverty alleviation mechanism in the country's sixth plan (1980–84).

Microfinance services are primarily targeted at low-income individuals to provide micro-credit facilities to those who do not have direct and easy access to formal banking services. Individuals or groups who cannot afford collateral but have the skills and desire to engage in economic activities are given small loans.

There are currently 65 microfinance institutions that are licensed by Nepal Rastra Bank, among which 4 institutions are in the wholesale lending business. Retail lending microfinance institutions are allowed to extend credit to their member to the maximum limit of Rs. 1.5 million. Poor and low-income individuals are given collateral-free credit facilities up to the maximum limit of Rs. 0.5 million per member based on the group guarantee. This limit has been extended to Rs. 0.7 million when the loan is a good loan for consecutive two years. The maximum ceiling of the loan provided to low-income

individuals against the collateral is Rs. 0.7 million and is extended to Rs. 1.5 million in the event a loan is serviced continuously for 2 years. The collateral-based loans provided by microfinance institutions cannot exceed one-third of the total loan portfolio. The maximum interest on credit that can be charged by microfinance institutions to their clients is capped at 15 percent.

As of mid-July 2022, microfinance institutions have extended Rs. 449.7 billion loans to 3.3 million borrowers which represent a deprived section of society.

X. Infrastructure development bank

With the objective of funding large infrastructure projects via financing in shares, securities, and loans, the Government of Nepal and Nepal Rastra Bank envisioned the concept of a large infrastructure development bank with a minimum capital requirement of Rs. 20 billion. Currently, one infrastructure development bank is in operation in a country as per the provision made in Bank and Financial Institution Act, 2017.

Y. Other Financial Institutions

Employee Provident Fund (EPF) and Citizen Investment Trust (CIT) and cooperatives are the major contractual savings institutions that mobilize the savings into investment and issue a loan to their members.

(1) Employee Provident Fund

The Employee Provident Fund (EPF), established in 1962 under the Employees Provident Fund Act, 1962 manages the provident fund on behalf of the government of Nepal for government, public enterprises, and private sector employees. Currently, around 598,000 employees from 24,100 contributing offices are associated with the EPF scheme. EPF provides various types of loan facilities such as house loans, education loans,

revolving loans, house maintenance loans, and land purchase loans to its members. As of mid-July 2022, EPF has disbursed Rs. 200 billion loan to its provident fund contributors and Rs. 68.5 billion in project financing and corporate entities.

EPF provides housing loans to its contributors for the purpose of building new houses, adding floors to the houses, and buying a house. Each contributor is given a maximum limit of Rs.10 million, not exceeding the collateral value, with a maximum repayment period of 20 years, including the grace period.

(2) Citizen Investment Trust (CIT)

The Citizen Investment Trust, set up in 1991, is a public financial statutory institution ownership by Nepal government that manages various types of retirement schemes for domestic and foreign investors, encouraging people to save and promote investment, and contribute to the economic development of the nation. CIT mobilizes private and institutional savings, extends loans and advances, and works as an issue manager. Without any lengthy paperwork, the depositor receives up to 80 percent of the total savings on retirement funds. The amount of such loan provided as of mid-Apr, 2022 is Rs. 36.016 billion.

(3) Cooperatives

Cooperatives play an important role in achieving developmental goals in the least developed countries. Locally established savings and credit cooperatives promote member savings and credit expansion with the aim of socio-economic empowerment in the socially backward community.

29,886 cooperatives collected Rs. 477 billion in deposits and extended credit of Rs. 426 billion as of mid-July 2020. Such credit facility has been utilized by more than 7.3 million members. Cooperatives in Nepal have contributed to increasing financial access in the country along with promoting entrepreneurship, enabling social empowerment, and

poverty reduction. Government fiscal policy of FY2022/23 emphasized that the cooperative sector will be mobilized in the economic development of the country with the slogan **"Mantra of Cooperatives: Self-reliant economy"**. In addition, cooperatives will be made to mobilize at least 50 percent of the total investment in the productive sectors with the objective of uplifting the standard of living of poor, vulnerable, marginalized, and economically disadvantaged people.

The fiscal year 2022/23 budget has envisioned establishing a second-tier regulatory agency to effectively regulate, inspect, and supervise saving and credit corporations and non-governmental organizations conducting financial transactions beyond the jurisdiction of Nepal Rastra Bank.

Z. Other measures in private sector credit growth

Various other regulatory provisions are made by Nepal Rastra Bank in order to promote sustainable economic development by facilitating smooth private sector credit growth.

Banks and financial institutions are required to assess environmental and climate risks while sanctioning or renewing loans. Environmental and social risk management guidelines have been issued by NRB that help in addressing the issue of climate change and reducing the carbon footprint.

Borrowers utilizing more than 5 million loans from the banking sector are required to have a Permanent account number (PAN). Such a provision helps in developing the transparency and accountability of the borrowers.

The Government of Nepal has made a provision to incorporate 80 percent of the funds provided to 753 local governments as a source of deposit while calculating the Credit to Deposit (CD) ratio. The move of the government came at easing the liquidity shortage of the loanable fund. Banks and financial institutions are permitted to mobilize such additional funds only in the productive sectors but not for the import and trading-related businesses. Banks and financial institutions were required to maintain a 90 percent CD ratio by mid-July,2022.

Hence, efforts taken by the government and Nepal Rastra Bank have helped in promoting private sector credit growth and, ultimately on sustainable economic development. Such policies need to be reviewed periodically, and appropriate measure has to be taken in order to prevent the economy from falling into possible chaos.

2. Understanding monetary policy and optimal monetary policy in Nepal

Credit[27] supplied in the economy can ultimately contribute to economic growth by reallocating limited resources. However, if a shock occurs in the real or financial sector in a situation where credit is biased toward some industries or excessively supplied, it can lead to a financial crisis and significantly dampen real economic activities (Kim et al., 2020).

In the process of financial development such as financial liberalization and innovation, economic growth has been achieved through credit supply in developed and emerging countries, but there have been many cases of financial crisis and economic recession. This situation is well explained by rapid changes in liquidity, such as the credit boom before the 2007-09 global financial crisis(GFC) or the credit crunch immediately after COVID-19, and credit expansion in the process of overcoming it.

<Table 4-3> Number of countries experiencing financial crises

(Unit: case)

	Banking crisis	Currency crisis	Sovereign debt crisis
Developed Countries	29	13	2
Emerging Countries	89	106	60
Total	118	119	62

Sources: Kim et al.(2020)

In the case of a small open economy, economic policy is greatly influenced by various factors such as economic structure, economic relations with neighboring countries, and historical context. These factors, which have a great influence on a country's overall economic policy implementation, determine how the central bank operates monetary

[27] Private credit consists of household credit and corporate credit. The former can be defined as the sum of loans from financial institutions and government loans, and the latter can be defined as the sum of non-financial corporate bond issuance, financial institution loans, and government loans.

policy, including especially the monetary policy regime, policy objectives, and instruments.

Nepal's central bank policymakers are very interested in the ripple effect of financial institutions' credit expansion to companies and households. Attention is also being paid to the relationship between credit and economic growth, as well as the relationship between credit expansion and the financial crisis. In particular, there is not only a linear relationship between credit and the financial crisis, but if the size of credit (debt) exceeds a certain threshold, the risk may increase significantly. The economic ripple effect of credit and the nonlinear relationship between credit and the financial crisis can vary depending on the various conditions in which the country lies.

In order to understand the optimal monetary policy of Nepal's central bank and to derive specific measures, it is necessary to comprehensively consider the economic and institutional characteristics related to monetary policy and the mechanism of monetary policy operation.

Therefore, before evaluating Nepal's recent monetary policy operation and looking at optimal monetary policy operations, this section will first discuss major issues related to the central bank's monetary policy today, such as the monetary policy framework (MPF), policy objectives, and transmission channels. Next, in that Nepal is adopting an exchange rate peg, the types and characteristics of the exchange rate system, advantages and disadvantages in monetary policy operation according to the exchange rate peg, and changes in the central bank’s role in connection with the exchange rate system will be examined. In particular, given that there was a significant change in the international consensus on the role of the central banks in the wake of the GFC, a change in perspective on the relationship between price stability and financial stability is summarized and presented.

The reason for adopting this approach is that a full understanding of what the central bank intends to achieve through monetary policy and the monetary policy regime adopted to achieve these objectives will lead to implications that will help the Nepalese central bank implement its desirable monetary policy.

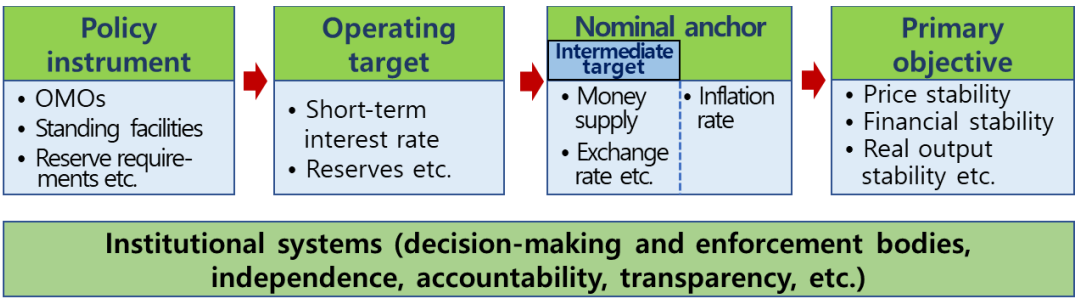
A. Understanding central bank's monetary policy

(1) Monetary policy framework

In order for the central bank to establish and implement monetary policy, there must be economic and institutional arrangements that can support it, such as the primary objectives, nominal anchor, operating targets, policy instruments, and systems necessary for decision-making. It is called a monetary policy framework (MPF).

Prior to the GFC, as one of primary objectives of monetary policy, price stability was mainly emphasized. Since then, however, as it is recognized that it is important to prevent financial imbalances in advance, financial stability is also accepted as an important objective along with price stability.

<Figure 4-1> Components for monetary policy framework



Source: BOK (2017).

A nominal anchor serves as a link between the central bank's monetary policy instruments and the primary objective, and usually refers to indicators such as the money supply, exchange rate, and inflation rate. The central bank selects one of several nominal anchor indicators, sets a target level for the indicator, and then implements monetary policy to achieve it (BOK, 2017). These nominal anchors must meet several criteria, such as a stable relationship with the ultimate objectives, central bank controllability, and transparency and simplicity.

Therefore, the nominal anchor can be said to be a key factor in the evaluation of the

central bank's policy stance, policy decision-making, accountability, and external communication. Since it is difficult for the central bank to directly control the nominal anchor like the final objectives, controllable indicators are selected and used as 'operating targets'. In general, short-term market interest rates or reserve requirements play a role.

(2) Monetary policy regime

Although the primary objectives and policy tools in the components of the aforementioned MPF are similar for each country, the nominal anchors to be selected for the conduct of monetary policy may differ depending on the economic structure of each country, the degree of financial market development, etc. As such, the selection of the nominal anchor is differentiated, so it becomes the standard for classifying the monetary policy regime.

In this respect, the exchange rate system has a close relationship with the monetary policy regime. The exchange rate system can be divided into a fixed exchange rate system and a floating exchange rate system. In the fixed exchange rate system, a specific fixed exchange rate level serves as a nominal anchor of the economy, whereas the floating exchange rate system requires separate indicators such as the money supply or the inflation rate. When the exchange rate, money supply, and inflation rate are nominal anchors, they are called ‘exchange rate targeting’, ‘monetary targeting’, and ‘inflation targeting’, respectively. The monetary targeting and the inflation targeting are currently the most widely adopted monetary policy regime under the floating exchange rate system.

<Table 4-4> Exchange rate system, monetary policy regime and nominal anchors

System	Monetary Policy Regime	Nominal anchor
▪ Fixed exchange rate	Exchange rate targeting	Exchange rate
▪ Floating exchange rate	Monetary targeting	Monet supply
	Inflation targeting	Inflation rate

Monetary policy regime is much narrower in scope than the MPF, referring to specific elements that constitute the MPF (e.g., daily policy operation tools to achieve policy objectives, application methods, specific procedures, etc.), and includes policy tools such as open market operations (OMOs) and reserve requirements, and matters related to their operations (IMF, 2022). This also contains setting and adjusting the reserve requirement ratio, interest rate applied by policy tools, target institutions, eligible securities, maturity, and frequency of OMOs (Kim and Kim, 2015).

(a) Exchange rate targeting

The exchange rate targeting aims to fix the exchange rate between the home currency and the foreign currency at a certain level. Hernce, the monetary policy regime of a country that has adopted a fixed exchange rate system can be said to be a 'exchange rate targeting' (IMF, 2022). The fixed exchange rate system is largely divided into strict pegs and soft pegs. The currency board and the US dollarization correspond to the former, and the pegs(e.g., conventional peg, crawling peg) and the bands correspond to the latter. In particular, both of latter are characterized by allowing small fluctuations based on the central exchange rate.

<Table 4-5> Types of exchange rate system and number of countries adopting it

(As of end of April 2022)

System	Monetary Policy Regime	No. of country (%)
Hard peg	Currency board	11 (5.7)
	No separate legal tender	14 (7.3)
Soft peg	Conventional peg	40 (20.7)
	Stabilized arrangement	24 (12.4)
	Crawling peg*	27 (14.0)
	Pegged exchange rate within horizontal bands	1 (0.5)
Floating exchange rate	Managed floating	32 (16.6)
	Free floating	32 (16.6)
Others	Other managed arrangement	12 (6.2)

Note: An asterisk(*) indicates that a crawl-like arrangement is included.

Source: IMF(2022)

Under the exchange rate targeting, policy tools such as interest rate adjustment or foreign exchange market intervention are used to maintain the exchange rate at a certain level. For example, when the value of the domestic currency falls sharply due to an increase in demand for the dollar, the domestic interest rate is raised to increase the demand for the domestic currency, or the central bank directly participates in the foreign exchange market and reduces the excess demand for the US dollar by selling the dollar and buying the local currency.

(b) Monetary targeting

Monetary targeting is a method to achieve an intermediate target by setting the rate of increase in monetary indicators (e.g., M1, M2) as an intermediate target. It is based on the monetarists' claim that "inflation is always, and everywhere a monetary phenomenon". In other words, since the money supply has the greatest influence on inflation, the inflation target can only be achieved by suppressing the increase in the currency.

The target variable is a monetary indicator that has the most stable relationship with inflation and growth. In this case, it is difficult for the central bank to directly control the money supply, which is an intermediate target, so an operating target is necessary. In other words, the policy objective is achieved through the channel of monetary policy, that is, policy tools → operating target → intermediate target → final objectives. The operating target should be a variable that the central bank can control well while maintaining a stable relationship with the intermediate target, and short-term market interest rates and monetary base have usually played a role.

The monetary targeting contributed greatly to price stabilization in many countries in the 1970s. However, in the 1980s, as the relationship between money supply and inflation became unstable due to progress in financial innovation, most developed countries abolished it. An intermediate target strategy should presuppose a stable relationship between the intermediate target and the policy objectives, but the achievement of the intermediate target no longer guarantees the achievement of the objectives.

(c) Inflation targeting

The inflation targeting (IT) is a method in which the central bank presents an inflation target to be achieved during a given period in advance and operates monetary policy accordingly. It predicts future inflation by using various information variables such as the money supply, interest rate, and exchange rate, and adjusts the operating targets (e.g., short-term market interest rate) so that the actual inflation rate approaches its target.

The IT has become the most widely adopted monetary policy regime by central banks around the world today.[28] The IT is different from the intermediate target strategy of the monetary targeting or the exchange rate targeting in that it achieves the final target, price stability, by adjusting the short-term market interest rate, which is the operating target, without an explicit intermediate target. In other words, the money supply and exchange rate are used as information variables, not target variables.

(3) Traditional objectives of monetary policy

The objectives of monetary policy have changed according to the times, and in some cases similar but different objectives have been set according to the circumstances of each country. Central banks in most countries have dual objectives: monetary stability[29] and financial stability. In addition, the stability of the real economy also appears as a policy objective of the central bank.

(a) Price stability

The most important task in the history of central banks in the 1970s was to overcome the Great Inflation. For this reason, price stability is the most frequently mentioned in the modern central bank's policy objectives. Regarding the concept of price stability, it is accepted as stable when the inflation rate is maintained at a generally low level (e.g.,

[28] After being first introduced in New Zealand in 1990, it has spread to some advanced countries such as Canada, the UK and Sweden, emerging market countries such as Korea and Mexico, and countries with transition systems such as the Czech Republic and Poland, and is operating in 45 countries as of 2021 (IMF, 2022).

[29] It is defined as internal and external stability of currency value, but is used in the same sense as price stability.

around 2% annual growth rate) based on a single indicator such as consumer price index.

(b) Financial stability

Unlike price stability, financial stability is difficult to define through a single indicator due to the various sectors (e.g., financial markets, financial institutions, etc.), the interconnectedness between these sectors, and the complexity of financial phenomena. For this reason, financial stability has been defined in various ways. Usually, there is a method in which the preconditions for financial stability are presented and then, if they are satisfied, it is defined that financial stability has been achieved. For instance, Orr (2006) argues that, as a prerequisite for financial stability, all risks in the financial system should be appropriately recognized, distributed, and managed by being reflected in the price. From a slightly different angle, there is a way to define financial stability as a state in which there are no factors that cause financial instability. Crockett (1997) divided financial stability into 'stabilization of financial institutions' and 'stabilization of financial markets', which constitute the financial system, and defined financial instability as a state in which economic activity is potentially damaged due to changes in asset prices in financial markets or distrust in the ability of financial institutions to fulfill contractual obligations.

(c) Real output stability

Along with price stability, real output stability is often one of the objectives of monetary policy. In the case of the US FRB, the unemployment rate is used as a variable indicative of the real economy due to the legal provision of ‘maximum employment’. In many other countries, labor market variables like the unemployment rate are also used. In general, when calculating the cost of economic fluctuations, most studies consider the inefficiency of the commodity market rather than the labor market.

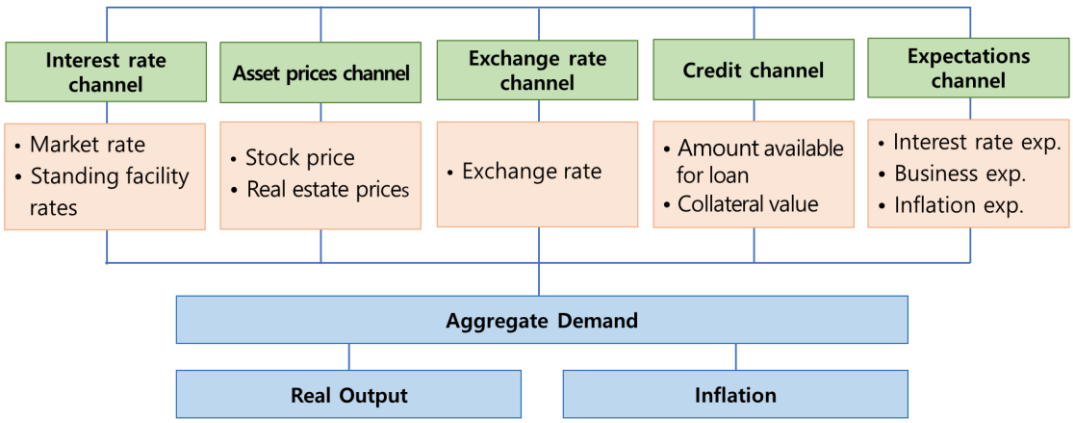
(4) Monetary policy transmission

Monetary policy affects the real economy, including production and prices, through various channels. The transmission channel can be divided into interest rate, asset price, exchange rate, credit, and expectations channels (BOK, 2012 and 2017).

(a) Interest rate channels

The interest rate channel refers to how the central bank affects the market interest rate by changing the policy rate. For example, when the central bank lowers the base rate, short-term market interest rates such as CD (negotiable *C*ertificate *Deposit*) rates immediately fall, and interest rates on long-term bonds with maturities of more than one year, such as government bonds and corporate bonds, and deposit and loan rates at banks are also under downward pressure. When the market interest rate fluctuates, consumption and investment increase or decrease, affecting GDP and price level. When interest rates fall, households increase consumption and businesses expand investment, helping to revive the sluggish economy.

<Figure 4-2> Monetary policy transmission channels (before the GFC)



Sources: BOK(2012 and 2017)

(b) Asset price channels

The asset price channel is the monetary transmission channel through which monetary policy affects the real economy by changing the value of assets(e.g., stocks). For example, when the central bank's accommodative monetary policy increases surplus funds in the financial market, the demand for assets such as stocks and real estate also increases, leading to an increase in asset prices. In this case, households have increased their wealth, so consumption will increase, and in the case of companies, it will be easier to raise funds due to the booming stock market, which will lead to expansion of investment.

(c) Exchange rate channels

The exchange rate channel refers to the channel through which monetary policy affects the exchange rate and the changed exchange rate affects the real economy, such as exports and production. For example, if the rate of return on domestic assets falls due to the central bank's rate cut, demand for foreign assets with relatively high returns increases. As a result, the demand to sell the local currency and buy the US dollar increases, causing the local currency's value to fall (the exchange rate rises). In addition, when the exchange rate rises, the export price in dollars decreases, resulting in an increase in exports and an increase in domestic production.

(d) Credit channels

The credit channel is the channel through which monetary policy influences bank lending and spreads to the real economy. In the above-mentioned interest rate, asset price, and exchange rate channel, monetary policy affects price variables in the financial market and spreads to the real economy. However, credit channels differ in that monetary policy affects bank loans, which are quantitative variables, and spreads to the real economy, such as corporate investment.

The credit channel is divided into a bank lending channel and a balance sheet channel depending on whether the supply or demand side of credit is emphasized. The bank

lending channel emphasizes the ability of banks to supply loans. For example, if the central bank implements an accommodative monetary policy by lowering the policy interest rate, etc., the available funds in the market will increase and bank loans will expand, which in turn increases investment and consumption. The balance sheet channel, on the other hand, emphasizes fluctuations in the capital demand of businesses and households. For example, if the central bank implements tightening monetary policy, such as an interest rate hike, asset prices will fall, resulting in a decrease in net assets on the company's balance sheet, which leads to a decrease in loan demand and a decrease in investment due to a decrease in the value of collateral.

(e) Expectations channels

The expected channel is a channel that affects investment and consumption and changes prices by changing the economic and inflation expectations of economic agents through the current monetary policy. For example, if the central bank signals the market that interest rates will remain low for a considerable period of time, long-term market interest rates will be lowered, which will increase corporate investment and household consumption, which will lead to an increase in production and inflation.

The importance of the expectations channel is being emphasized in that, if the expectations channel works smoothly in a situation where trust in the central bank is high, the ripple time of monetary policy can be reduced and the policy effect can be increased. Since long-term market interest rates are affected by market expectations for future short-term market interest rates, central banks can enhance the effectiveness of monetary policy by accurately communicating policy intentions to the market.

(5) Changes in the role of central banks regarding policy objectives

During the GFC, there were various debates related to asset prices and monetary policy, and new views on price and financial stability related to monetary policy implementation were presented. One of the representative debates about how to respond to asset price

movements is the so-called "lean vs. clean" debate about how central banks should respond to asset prices (<Box 4-1>).

During the debate over the financial crisis, the conventional view that price stability complements financial stability has also changed. A counterexample to the conventional view that financial stability is achieved automatically when price stability is achieved has been presented, and it has also been confirmed that achieving price stability is not easy if financial instability persists.

In terms of monetary policy, a new perspective(e.g., risk-taking channel) on the transmission mechanism of policies different from expectations theory was also presented. Grasping the impact of monetary policy on the real economy and various side effects has become a necessary task to secure macro-prudentiality. Below, we will examine the relationship between price stability and financial stability through the debate on the asset price and monetary policy.

(a) Price stability and financial stability

① Conventional wisdom

According to this wisdom, the relationship between price stability and financial stability is complementary (<Table 4-6>). Credit boom and consequent high inflation can cause financial instability by encouraging excessive investment and borrowing, while price stability contributes to financial stability by reducing asset price volatility. In the mid- to long-term, financial stability also contributes to price stability through productivity improvement and effective operation of monetary policy transmission channels (Issing, 2003). Reinhart and Rogoff (2008) also pointed out that inflation is the main cause of the financial crisis. According to this view, since price stability is a sufficient condition for financial stability, there is no trade-off between the two. Therefore, it is sufficient for monetary policy to focus on price stability.

<Table 4-6> Relationship between price stability and financial stability (Traditional views)

Price stability → Financial stability	Financial stability → Price stability
▪ Eradication of myopic behavior due to money illusion - Inducing rational decision-making of financial transaction parties	▪ Helping to operate the transmission channel of monetary policy
▪ Improving the efficiency of resource allocation by distinguishing between relative price changes and changes in level of price - Prevention of deviation of asset price from underlying value	▪ Providing information necessary for monetary policy: forecasting the future, etc. ▪ Asset price bubble → consumption Increase → inflation pressure (wealth effect)
▪ Improve financial conditions and reduce volatility in the financial market by expanding savings resources and reducing risk-premium	▪ Financial crisis → deflation → contraction equilibrium → recession
▪ Improving the economic system's ability to absorb shocks by strengthening the average convergence tendency	—
▪ Contributing to financial stability by enabling long-term contracts	—

Sources: Geraats (2010) and others.

Meanwhile, according to the traditional view, monetary policy and financial stability policy should be operated separately[30], and the central bank only needs to focus on price stability and respond limitedly and indirectly to financial imbalances such as rapid asset price fluctuations rather than proactively or directly. Since asset price changes affect inflation, it is preferable to respond indirectly to the extent that asset price changes affect inflation rather than reacting to the asset price itself (Bernanke and Gertler, 1999).

[30] This is called Tinbergen's separation principle.

<Box 4-1>

"Lean or clean" argument on the GFC

There has been a so-called "lean vs. clean" debate regarding how the central bank should respond to asset price bubbles through monetary policy (White, 2009; Issing, 2011). The GFC brought about a major change in the perception of price stability and financial stability.

• *Clean approach*

This is the Fed's crisis response strategy before the occurrence of the GFC, in which the asset price bubble bursts and then settles down. Asset price bubbles are difficult to detect in advance, and it is considered inefficient to manage them through interest rate adjustments (Blinder and Reis, 2005). In addition, there is a possibility that a bubble will form only in certain assets among various assets, and if the bubble of a specific asset bursts through an interest rate adjustment, normal economic activity may also be contracted. Therefore, monetary authorities believe that it is desirable to "mop up" the financial market after the bubble burst instead of directly bursting the bubble (Greenspan Consensus).

• *Lean against the wind approach*

As a generally accepted strategy after the occurrence of GFC, it is a method of actively suppressing bubble formation in the process of rising asset prices. This approach started from the view that the GFC was driven by accommodative monetary policy. In other words, most central banks that have adopted the IT focused on the price stability target in a narrow sense. As a result, it is true that there were criticisms for not actively responding to changes in the financial market, such as asset price changes, financial institution leverage, and system risk situations.

It is widely accepted that post-GFC price stability is a necessary but not a sufficient condition for financial stability. According to Borio and White (2004) and others, financial imbalances may occur when asset prices rise sharply or credit expansion is too fast even in a situation where prices are stable. It is also pointed out that the cost of resolving the crisis during the GFC is huge (Mishkin, 2011). There is also an argument that prior suppression of the bubble is advantageous in terms of the welfare of economic agents (Cecchetti et al., 2001). It is also an important reason that the central bank's proactive response can suppress the moral hazard or herd behavior of economic agents (Loisel et al., 2009).

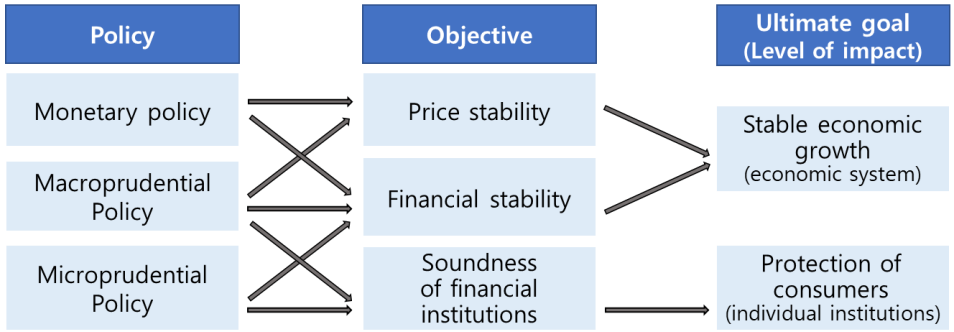
② New perspective

Apart from the debate on the causes of the GFC, it was argued that price stability does not automatically guarantee financial stability and that there is a trade-off between the two. At low inflation, the central bank has little incentive to actively respond to credit expansion and rising asset prices, so there is a possibility that financial imbalances will accumulate and spread (Borio and Lowe, 2002). Historically, a significant number of cases of bubble spread and collapse occurred during the period of price stabilization (Borio and White, 2004). Hannoun (2010) also argued that GFC was caused by excessive debt accumulation and risk preference under low inflation.

It has been confirmed that a large-scale crisis such as the GFC causes severe depression, mass unemployment, and price instability. Accordingly, the recognition that it is essential to consider factors of financial instability in the process of establishing monetary policy has spread as the central bank's prevention of a financial crisis is not inconsistent with the long-term objective of monetary policy.

Against this background of change of perspective, the relationship between price stability and financial stability was found to be much more complex than previously thought (Schoenmaker and Wierts, 2011). As seen in <Figure 4-3>, Price and financial stability influence each other and may be complementary or conflicting. Monetary policy to promote price stability can affect financial stability, and measures to secure the soundness of financial institutions affect the effectiveness of monetary policy, which ultimately affects price stability.

<Figure 4-3> Overall policy framework for monetary and financial system



Source: Schoenmaker and Wierts (2011)

After the GFC, the past argument that monetary policy and financial stability policy (especially macroprudential policy) should be separated was found to be incorrect, and the argument that the central bank should proactively and directly respond to the accumulation and spread of financial imbalances became persuasive. Since price stability is not a sufficient condition for financial stability, it is necessary to directly respond to financial instability such as a surge in asset prices in order to secure macro-prudentiality even if inflation does not deviate from the target.

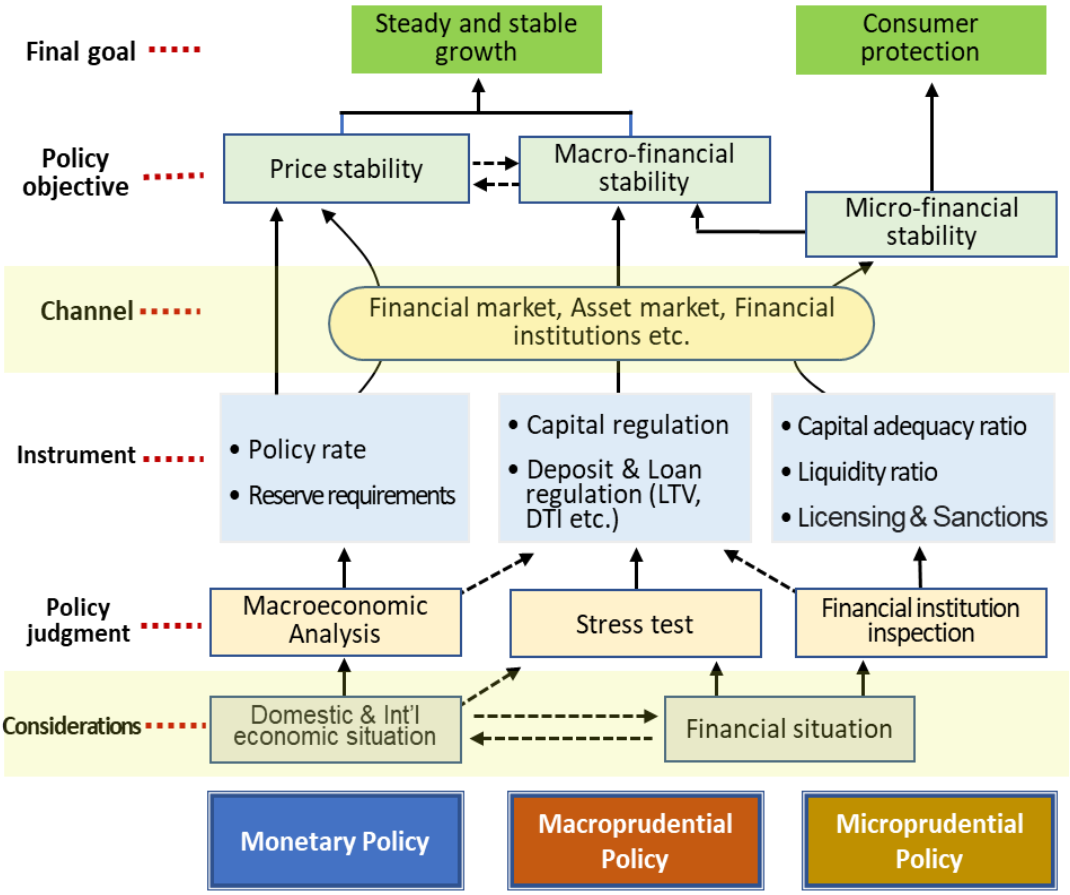
As a result of empirical analysis using the DSGE model, there is also a study result that macroeconomic stability is improved when directly responding to financial instability by including variables related to financial stability in the interest rate rule (Kannan et al., 2009). Of course, if the central bank proactively and directly responds to financial instability, a trade-off in which inflation deviates from the appropriate level may appear in the short term.

In order to solve this problem, it is necessary to have independent policy measures aimed at price stability and financial stability, that is, interest rate policy and macroprudential policy (Svensson. 2010).

Meanwhile, the trade-offs between monetary policy and macroprudential policy can be considered in terms of two aspects(<Figure 4-4>). First of all, these policies are primarily aimed at the financial sector. All of these policies are implemented through the financial sector, including financial institutions, financial and asset markets. If one policy influences the financial sector, it may undermine other policy objectives or reduce the

effectiveness of other policies. In other words, the interference effect between each policy may appear and influence each other.

<Figure 4-4> Relationship between monetary, micro- & macroprudential policy



Note: Dotted arrows indicate indirect channels.
Source: Kim et al.(2011), and others

Next, there is a difference in policy point of view. Monetary policy and macroprudential policy may need to apply different perspectives on common economic phenomena. Both policies depend on macroeconomic indicators related to finance, and indicators related to the financial transaction status of individual economic agents. However, because the attributes of price stability and financial stability are different, there are often the cases that different viewpoints are applied. In monetary policy, these indicators are mainly used to forecast real economic activity from a forward-looking perspective. On the other hand,

in macroprudential policies these indicators are used to check whether unusual phenomena occur in the financial sector and to prepare countermeasures. Accordingly, there is often the possibility of taking different measures for the same phenomenon.

(b) A new perspective on monetary policy transmission: Risk-taking channel

After the GFC, the transmission channel of monetary policy that has received new attention is the risk-taking channel. This channel has distinct characteristics that are different from existing channels such as interest rate, asset price, exchange rate, and credit channel. In other words, existing channels focus on the impact on the real sector, so there is little link to the stability of the financial sector, while risk-taking channel focuses on changes in individual banks' risk-taking behavior and the possibility of instability in the financial sector (Choi and Yoon, 2018).

Existing research results on how the risk-taking channels works in relation to the investment behavior of financial institutions can be summarized in four aspects. First, there is a way in which monetary policy works by influencing the valuation of banks' assets and the cash flows of corporations and households. Easing monetary policy can reduce banks' perceptions of risk by raising asset and collateral values (Borio and Zhu, 2008). Monetary policy changes the balance sheet and leverage conditions of financial institutions(lenders). In particular, banks facing a decline in leverage due to central bank rate cuts, may seek credit expansion, which may increase bank risk (Adrian and Shin, 2009). If the low interest rate persists, not only will asset and collateral values rise, but also the market volatility will decrease as interest rate volatility decreases, which may lower the risk perception of banks. Banks' perception of risk may also weaken as the risk on the asset side of the balance sheet (B/S) decreases when interest rates fall (Altunbas et al., 2014).

A second mechanism is that monetary policy influences bank risk by reinforcing the bank's incentive to the search for yield (Rajan, 2005). As indirect investment expanded due to the development of the capital market, and inflation stabilized in the 2000s and low interest rates continued, asset managers took on a greater burden in order to expand their profits(their

remunerations). The structure of managerial bonus schemes for asset managers and deficiencies in supervision and regulation also reinforced excessive risk-taking. In addition, if the low interest rate trend continues, asset managers of financial institutions will prefer high-risk, high-return investments to achieve the target rate of return.

Third, there is a mechanism by which habit formation works. As the economy recovers when interest rates are cut, consumption expenditure increases faster than the minimum cost of living. Investors' risk aversion is influenced by habit formation, and consumption increases faster than normal during economic expansion. As a result, investors take more risk (Campbell and Cochrane (1999). Therefore, easing of monetary policy can increase real economic activity and reduce investors' risk aversion. If this relationship is extended, an accommodative change in monetary policy will be perceived as a new stimulus before a full-fledged recovery of the real economy, and accordingly investors will increase their risk preferences.

Finally, the central bank's communication policy or the characteristics of the policy response function can affect investors' risk preferences. Until the end of the 1980s, the prevailing view was that it was necessary to shock economic players by operating in an opaque direction to enhance monetary policy influence on the real economy rather than insisting that the central bank's monetary policy should be operated transparently to secure reliability. On the other hand, in the 1990s, with the introduction of the IT, the stable management of market expectations was important, and for this purpose, it was widely recognized that transparency in policy operation and reinforcement of communication are desirable to secure the influence of monetary policy. With regard to central bank policy making, the higher the transparency and predictability, the less uncertainty in the market, which can strengthen banks' risk appetite. For example, if it is certain that the central bank will respond with an expansionary monetary policy when the stability of the financial system is threatened, banks can increase their risk a little more (Borio and Zhu, 2008).

B. Nepal’s monetary policy framework and operations

So far, we have looked at various matters related to the central bank, such as the central bank's monetary policy objectives, its transmission channels, changes in the central bank's role, and changes in its perspective on the relationship between policy objectives. These issues are a summary of international discussions, and they are judged to be useful for evaluating the monetary policy operation of Nepal’s central bank and seeking future policy measures based on an understanding of the central bank's role.

This subsection examines the monetary policy framework (MPF), policy objectives, and the current status of policy operations of the NRB.

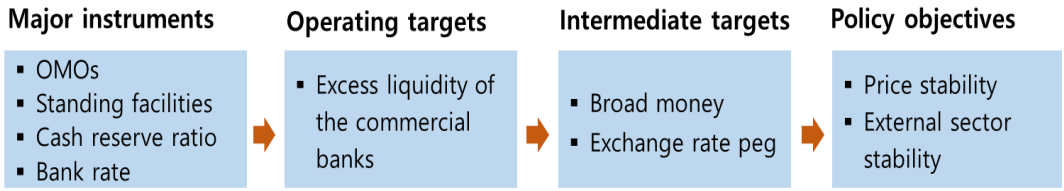
(1) Monetary policy framework in Nepal

NRB has not officially announced its MPF since its establishment in 1956. However, Nepal's monetary policy regime can be defined as exchange rate targeting in that the nominal anchor of the policy is the exchange rate peg with the Indian currency (IC). In other words, under the exchange rate peg system, the exchange rate has served as a particular nominal variable.[31]

In 2002, the NRB made its first official announcement regarding Nepal's MPF. This was to clarify the monetary policy framework and increase policy transparency. The NRB announces its monetary policy direction for the next fiscal year in July or August every year. Despite some revisions to monetary policy-related regulations, the MPF has remained largely unchanged since its explicit announcement in 2002. The basis of Nepal's current MPF follows the 2002 NRB Act. The key components of Nepal's current MPF are depicted in <Figure 4-5>.

[31] Nepal has changed to the Indian currency (IC) peg from 1956 to 1983, the basket peg from 1983 to 1993, and the Indian currency peg again after 1993.

<Figure 4-5> Key components of the Nepalese MPF



Source: Budha (2015)

(2) Monetary policy objectives of the NRB

Since the establishment of the NRB, the main policy objectives have been price stability and balance of payments stability. These policy objectives were set during the period from the 1987/88 fiscal year to the 1990/91 fiscal year, when Nepal's restructuring took place. The NRB also stated that one of the policy objectives for 2000 was to "achieve the economic growth rate of 6% or more, the planned target while supplying the economy with an appropriate level of liquidity". These policy goals are evaluated as considering a small open economy with a low level of financial development.[32]

Currently, the explicit objectives of monetary policy include price stability (constraining the CPI inflation rate to a certain level) and stability in the external sector (maintaining foreign exchange reserves to sustain the peg system). Also, the broad money (M2) indicator is being used as an intermediate target along with the exchange rate peg.

Although the NRB had also announced the implementation of a policy system based on the total amount of money with a fluctuating monetary supply (M2) as an intermediate target of the policy, the existing exchange rate peg to the Indian currency (IC) has been maintained since 1993.

[32] The economic scale (nominal GDP) is $33.7 billion (2020), the share of the financial industry (relative to GDP): Nepal is 5.3% (2020/21), and the IMF FD Index is only 0.199 (2020).

(3) Monetary policy tools and operating targets

(a) Policy instruments

Policy authorities, especially the NRB, have sought various policy measures to promote stable economic growth through financial development. Nepal, which has a high degree of external dependence, has the problem of being easily caught up in a financial crisis or credit crisis in the event of domestic or international shocks. Accordingly, the NRB prepares and applies various policy measures suitable for its own situation.

The NRB began to use monetary policy instruments after the mid-1960s. Monetary policy was carried out in the direction of regulating the supply and demand of credit in the economy through direct instruments rather than indirect instruments based on market principles.[33]

Direct instruments include interest rate regulation, compliance with the cash reserve ratio (CD ratio) and statutory liquidity ratio. Interest rate regulation is a method of fixing interest rates on deposits and loans. The cash reserve ratio is a system in which commercial banks reserve more than a certain percentage of their total deposit liabilities in the NRB. The NRB also introduced margin requirements for loans/advances for financing import trade and refinancing facilities for industrial and export trade.

Nepal's monetary policy has undergone significant changes since the implementation of the restructuring program in the mid-1980s. The NRB gradually changed its policy instruments from a direct method to a market-based indirect method. Deregulation on interest rates began in 1984, and interest rate regulations were abolished in 1989 (Thapa, 2005 and 2015).

As indirect instruments of monetary policy, OMOs are the tool that influences monetary aggregates. In 1988, the NRB introduced treasury bills auction system to manage liquidity with banks, followed by outright purchase and sale of treasury bills in 1994 and repos in treasury bills in 1997. These transactions led to the development of OMOs. In addition, the NRB

[33] It was with the enactment of the Commercial Bank Act in 1963 that the NRB officially began to operate credit control, a traditional function of the central bank.

emphasized cash reserve requirements and margin rates in order to control the liquidity of commercial banks. For monetary management purposes the NRB was given the authority to issue its own bonds, and then began issuing own bonds in 1991 to absorb excess liquidity.

Meanwhile, despite the interest rate liberalization policy, a policy to control the interest rate spread was introduced in 1992, but was abolished with the implementation of the financial sector reform program in 2002. The statutory liquidity ratio (SLR) regulation introduced in 1974 has since been abolished and reintroduced. As such, Nepal's monetary policy tools have been continuously changed to reflect the economic situation.

A brief description of the major policy instruments frequently used by the NRB today is as follows:

Open Market Operations: OMOs, which buy and sell government securities, are used to regulate liquidity in the banking system and to influence short-term interest rates. OMOs are primarily used to absorb excess liquidity or provide liquidity to the banking system. OMOs are divided into outright sale and purchase transaction and repo (repurchase agreement) transaction. Outright sales and repo transactions are used to 'absorb' excess liquidity in the banking system, while outright purchases and reverse repo transactions are used to provide liquidity to the system. OMOs are also classified as regular, fine-tuning, and structured OMOs. Regular OMOs are performed for only 7 days, fine-tuning OMOs for up to 3 months, and structured OMOs for up to 6 months (NRB, 2014).

Bank rate: This is the interest rate applied when commercial banks borrow from the NRB to respond to an unexpected liquidity shortage. It is applied to the last-lender loan and is 8.5% in September 2022.

Cash reserve ratio (CRR): It is the ratio of the total amount of vault cash held by commercial banks and the reserves deposited by the bank with the central bank (i.e, fractional reserves) to the total deposits of customers. In other words, it refers to the ratio of reserve requirements to total deposits (liabilities) subject to accumulation of reserve requirements. In recent years, the role of reserves, the main policy instrument of monetary policy, has declined. Neither the excess reserves nor the required reserves are subject to interest. CRR was not applied to foreign currency deposits.

Standing liquidity facilities (SLFs) *and auction-based interest-paying deposit collection schemes*: SLFs are provided to banks to manage short-term liquidity shortages. And the NRB introduced an auction-based interest-paying deposit collection in 2014 to absorb the structural liquidity surplus.

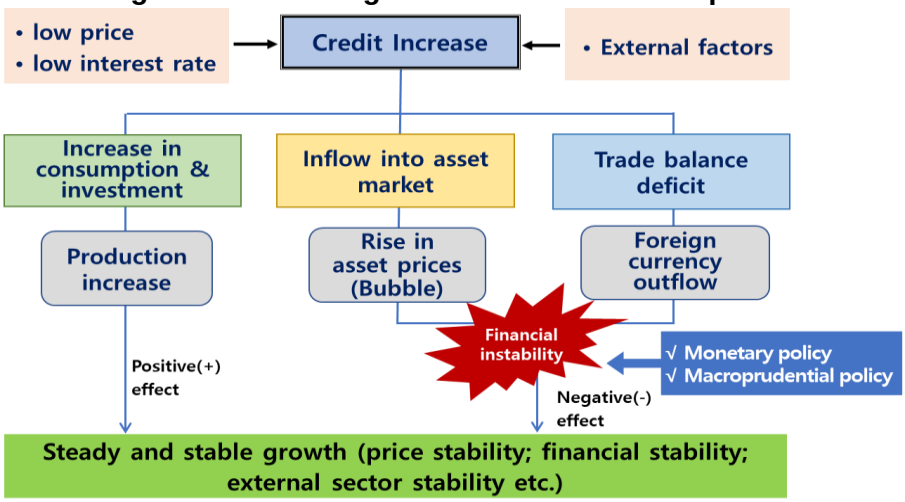
(b) Operating targets

The explicit operating targets of NRB monetary policy is excess liquidity of commercial banks. Therefore, the NRB conducts monetary policy focusing on liquidity management in the financial system.

C. Finding the optimal monetary policy for NRB in the future

Under the given external environment and economic system such as exchange rate system and the monetary policy framework, the NRB's role is to achieve long-term sustainable economic growth by promoting the stability of the real economy in the short term. The relationship between Nepal's recent credit growth and its economic effect is depicted in <Figure 4-6>. In the process of achieving the final goal of sustainable and stable economic growth, various policy measures will be mobilized to avoid facing a financial crisis that may occur. In particular, in relation to the economic effect of credit expansion, it is necessary to think about what and how the NRB should use to achieve its given policy objectives.

<Figure 4-6> Credit growth and economic impact



(1) Monetary policy and financial stability

Traditional monetary policy based on interest rate adjustment is mainly a tool for price stability. Therefore, the interest rate policy should focus on stabilizing private inflation expectations in the long term, but should be operated flexibly so that the growth rate converges to the potential level in the short term.

In relation to financial stability, it is desirable to set whether or not to use monetary policy in a direction with little side effect in consideration of the trade-off between financial and price stability. In addition, central bank's transparency, accountability, and communication with the market, which play an important role in the process of forming expectations of economic agents, are also very important in the operation of monetary policy.

Meanwhile, as discussed above, the following two views oppose the use of interest-rate policy for the purpose of suppressing unbalanced accumulation in the financial sector. In other words, there is an argument that interest rate policy should be used only for price stability and financial stability should be dealt with as a macroprudential policy measure, whereas there is an argument that an interest rate policy should be used when necessary because macroprudential policy measures alone are insufficient to ensure financial stability. Before the GFC, there was a tendency to focus on asset price bubbles, but after the crisis, credit bubbles are considered together with asset price bubbles, but there is a tendency to pay more attention to credit bubbles.[34]

(2) Harmonization of policies

Whether the central bank pursues price stability and financial stability at the same time has been a long-standing challenge, and in the past, the two objectives tended to be dealt with separately. However, after the GFC, there is a trend to give the central bank a role in achieving financial stability. Accordingly, the trade-offs between the two objectives may actually appear in the policy implementation process. In the case of Nepal, it is necessary

[34] Mishkin(2008) divided the bubble into credit-driven bubble and irrational exuberance bubble, and insisted on discussing the credit-driven bubble with high risk of financial crisis among them.

to examine the background and cause of the trade-off between price stability and financial stability, which are the policy objectives, and to find a way to reduce or resolve the trade-off (policy harmonization).

There are many fundamental factors that cause trade-offs between policy objectives, but insufficient analysis of financial and economic conditions may be the main cause. The narrow view of monetary policy, lack of awareness about financial stability, and inappropriate policy responses can also be seen as a result of not obtaining adequate information through financial and economic conditions. And the lack of policy tools can also lead to a trade-off between policy goals (price stability and financial stability).

Weakening or eliminating the cause of the trade-off can be a way to alleviate the trade-off between price stability and financial stability. If insufficient analysis of financial and economic conditions is an important cause of the trade-offs between price stability and financial stability, the activities of checking financial and economic conditions need to be different from the previous ones. And, policy changes such as broadening the scope and horizon of monetary and macroprudential policies and fully recognizing the importance of financial stability need to be considered. In addition, developing policy measures to enhance financial stability will help alleviate the trade-offs between monetary policy and macroprudential policy.

<Table 4-7> Causes of trade-off and reconciliation measures

Backgrounds or causes	Reconciliation measures
▪ Insufficient analysis of financial and economic conditions	• Strengthening the Surveillance
▪ Narrow view (exclude factors to consider)	• Extend policy scope and time horizon
▪ Lack of Financial Stability Policy Instruments	• Development of financial stability policy Instruments
▪ Inappropriate policies	• Establishing a policy framework for proper Policymaking
▪ Lack of awareness of financial stability	• Recognizing the Importance of Financial Stability
▪ Lack of policy operation system	• Establishing an appropriate policy framework
▪ Excessive emphasis on financial stability when conducting monetary policy	• Establishment of an proper policy framework to prevent over-cooking phenomenon
▪ The existence of policy imperfections, differences in perspectives and methods of policy execution	• Recognition of trade-offs, partial sacrifice of policy objectives, etc.

(3) Search for optimal monetary policy measures

(a) Adoption a proactive policy approach

NRB needs to devise more active measures to mitigate or resolve conflicts by fully considering factors to be taken into account in monetary and macroprudential policies and reflecting them in each policy. In addition, a macroprudential policy system that harmonizes with monetary policy should be expanded.

(b) Expansion of policy target scope and time horizon

If monetary policy and macroprudential policy are operated with maximum consideration of economic conditions from a long-term perspective, the trade-offs will be largely resolved. In the process of reflecting financial instability factors in implementing monetary policy, in order not to harm the policy goals or tools, the monetary policy horizon must be extended.

The fundamental reason why the goal of monetary policy is sacrificed in the process of reflecting factors of financial instability into policy is that the scope of consideration of monetary policy is narrow and the time horizon is short, so factors of financial instability are not properly recognized. If the central bank fails to consider financial instability factors in a timely manner and causes a financial crisis, a serious economic recession or weakening growth potential will be inevitable, and these results will go against the long-term goal of monetary policy.

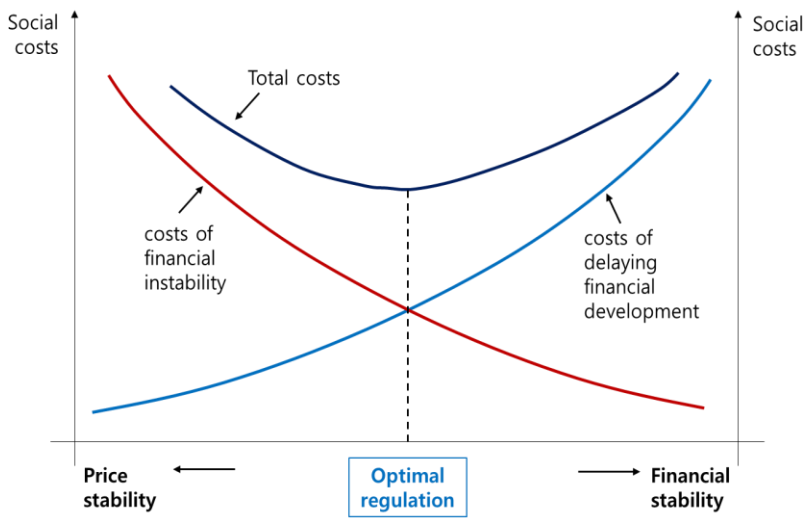
(c) Mutual recognition of considerations

Even if the possibility of conflict increases due to the expansion of the scope of consideration of the two policies, it is important to mutually consider the factors unique to each policy and the effects and limitations of each policy. First of all, in the process of implementing monetary policy, factors such as financial instability are recognized by examining trends in the financial market and asset prices, and it is decided whether to reflect them in monetary policy. Whether or not monetary policy responds to financial

unrest factors will depend on the nature and impact of financial unrest factors and the presence or absence of policy measures to calm financial unrest. Next, in macroprudential policy, factors such as macroeconomic conditions and monetary policy decisions should be taken into consideration to closely examine factors of financial instability. Since macroprudential policy does not have its own area, but is related to various policies, it is necessary to reflect the policy effects of policies other than monetary policy in macroprudential policy.

Meanwhile, it should be noted that if the central bank overemphasizes financial stability in the process of adding macroprudential policies to the existing monetary policy, the harm can be greater. This is because, if policy authorities excessively guarantee financial stability, a problem may arise that encourages moral hazard among market participants. In other words, market participants' risk-seeking activities, which are recognized as a new ripple channel of monetary policy, are strengthened, which may eventually lead to the socialization of risk. The best way to reduce the conflict between the two policies is to operate them harmoniously through mutual consideration. Instead of focusing on one policy goal, mutual consideration is more efficient in reducing implicit social costs (<Figure 4-7>).

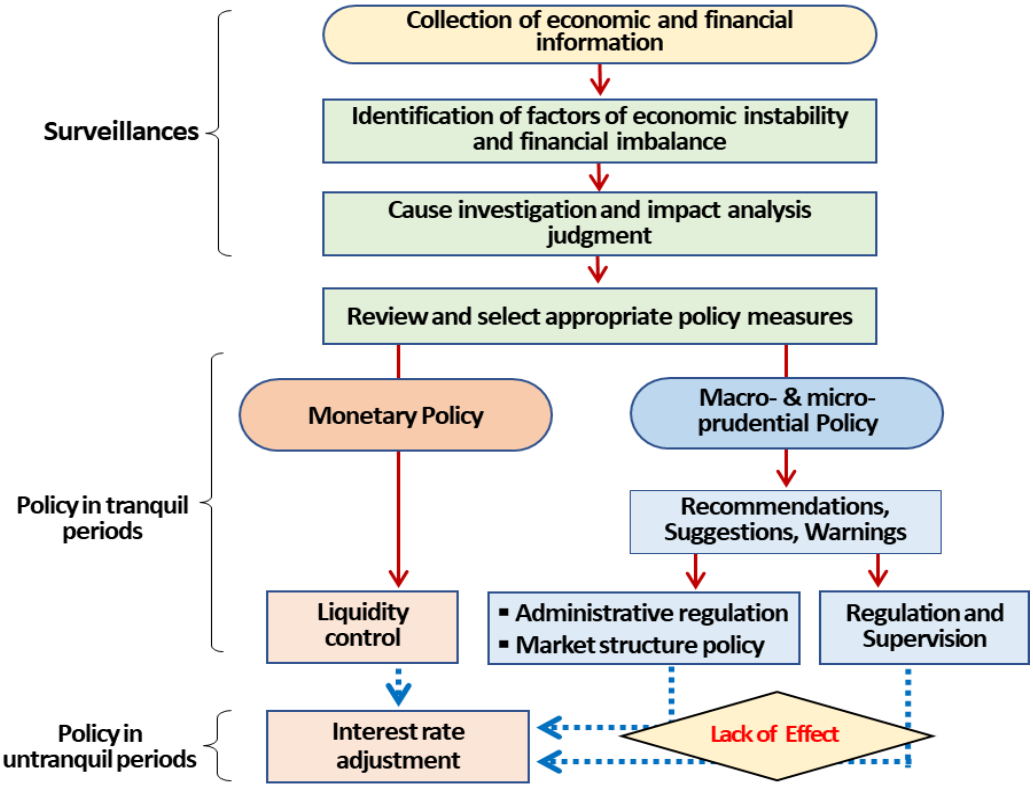
<Figure 4-7> Harmonization between price stability and financial stability



(4) Design of an effective policy implementation framework

Mitigating the trade-off between monetary policy and macroprudential policy depends on establishing a policy system that can harmonize the two policies. As explained earlier, both policies target the financial sector in common and their utilization indicators overlap considerably. And the ultimate goal of the two policies is the same in terms of maintaining stable economic growth. However, the focus of the policy is different, and accordingly, the policy tools to be mobilized are different. The outline of the policy implementation framework is shown in <Figure 4-8>.

<Figure 4-8> Monetary policy and micro- & macroprudential policy framework



Therefore, there is no significant difference between monetary policy and macroprudential policy at the stage of analyzing the financial and economic situation and recognizing problems. Of course, at the stage of recognizing a problem, analyzing its cause and effect, and mobilizing policy measures, a different perspective can be applied.

And based on this analysis and judgment, the capacity to mobilize appropriate policy measures or derive a combination of policy measures is required.

In order to build an effective policy framework that focuses on harmonizing monetary policy and macroprudential policy, NRB need to ① reinforce pre-examination activities on financial and economic conditions, ② review changes in monetary policy operation methods, and ③ analyze the causes and effects of financial instability. And it need to ④ diversify policy measures to enhance the effectiveness of each policy.

These four more detailed recommendations are:

(a) Reinforcement of prior surveillance activities

Preliminary surveillance activities on financial and economic conditions can be considered from two aspects. First of all, information gathering activities will be strengthened. Establish a system that can efficiently carry out monetary policy and assess risks in the financial sector in advance. In order to faithfully collect information used for monetary policy and macroprudential policy, the problems of the existing information collection system should be supplemented. Qualitative information, including market intelligence disseminated in the financial market, is also collected at the same time. While developing various information variables necessary for carrying out monetary and macroprudential policies, it is necessary to expand the contents of reporting and improve the reporting method so that financial institutions that produce financial information can voluntarily disclose risk factors when they exist.

Next, it is imperative to introduce and apply new economic and financial analysis techniques. Regarding risk, efforts should be made to develop techniques that can accurately identify problems in the financial sector, taking into account the fact that it is difficult to build an ideal model[35] and that it is difficult to achieve financial stability in real situations even if pre-determined criteria are met. In addition, it is necessary to further

[35] For example, macro-finance economic forecasting model, etc.

strengthen analysis from a microscopic perspective, in addition to the existing financial analysis focusing on aggregate indicators and price variables. In the analysis of financial information, the analysis competency should be focused on preliminarily checking whether the issue to be processed as a factor of financial instability becomes a policy target. It is necessary to evaluate the risks of financial instability factors causing macroeconomic damage, determine whether they are subject to policy, and decide whether to respond with monetary policy or macroprudential policy. Therefore, it is important to cultivate the ability to analyze specific financial issues instead of the total quantitative indicators, which have been the main subject of central bank analysis.

(b) Seeking changes to the monetary policy operation method

NRB should seek ways to consider factors of financial instability in monetary policy or ways to operate in harmony with macroprudential policies. As a way to reflect financial instability factors when implementing monetary policy, we can consider using the Taylor Rule considering asset price variables. In addition, measures to harmoniously operate monetary policy and macroprudential policy should be sought.

If monetary policy is to determine the policy rate, macroprudential policy is to influence the interest rate margin (Ingves, 2011). When the two policies are decided in the same direction, the effect can be greater. Of course, the two policies may inevitably or intentionally be decided in different directions on a case-by-case basis or depending on the circumstances, but in principle, the monetary and financial authorities need to coordinate so that the two policies are decided in the same direction. In particular, it is widely accepted that the effect of monetary policy and macroprudential policy in response to asset price rises are magnified if they are executed simultaneously (IMF, 2009).

(c) Improving the ability to analyze the causes and effects of financial instability

When factors of financial instability are detected, economic harms are evaluated to determine whether they are subject to policy, and whether to respond with monetary policy or macroprudential policy. When financial instability factors and financial

imbalances are detected, the underlying cause of the phenomenon is found or the resulting impact is analyzed. It is often not easy to find the cause of the financial instability. A conventional countermeasure is to respond mechanically according to conventional judgment, for example, raising interest rates when the problem is recognized as increasing credit supply. However, suppressing credit supply without knowing the underlying cause of the expansion of credit supply is not a desirable countermeasure. This is because, despite measures to curb credit supply, if the fundamental cause is not resolved, economic agents may find a way to evade the measures, or if there is no means of avoiding the measures, credit may increase later after the measures are implemented.

In view of various practical difficulties, the bow-tie analysis method[36] can be applied as one of the techniques to analyze the causes and effects of financial instability. Through this method, it is possible to establish a framework for a comprehensive and systematic analysis of causes and effects centering on financial instability factors.

<Box 4-2>

Bow-tie analysis method

The bow-tie method began to be used in the 1970s and was initially called a Cause-Consequence Diagram. This analysis method is widely applied to evaluate risks and prepare countermeasures in various fields such as corporate management and production sites. The reason why the Bow-tie method is widely applied is that it has the following advantages:

① Comprehensiveness can be secured in cause and effect analysis centering on risk factors. It is more effective in diagnosing causes and preparing countermeasures than in the case of recognizing a one-to-one correspondence by considering the interrelationships of various events and phenomena.

② It provides the basis for risk assessment, such as being able to grasp the degree of risk by element and comprehensively evaluating risk by considering multiple factors at the same time.

③ By presenting various risk factors in non-quantitative terms, it can be easily used by non-

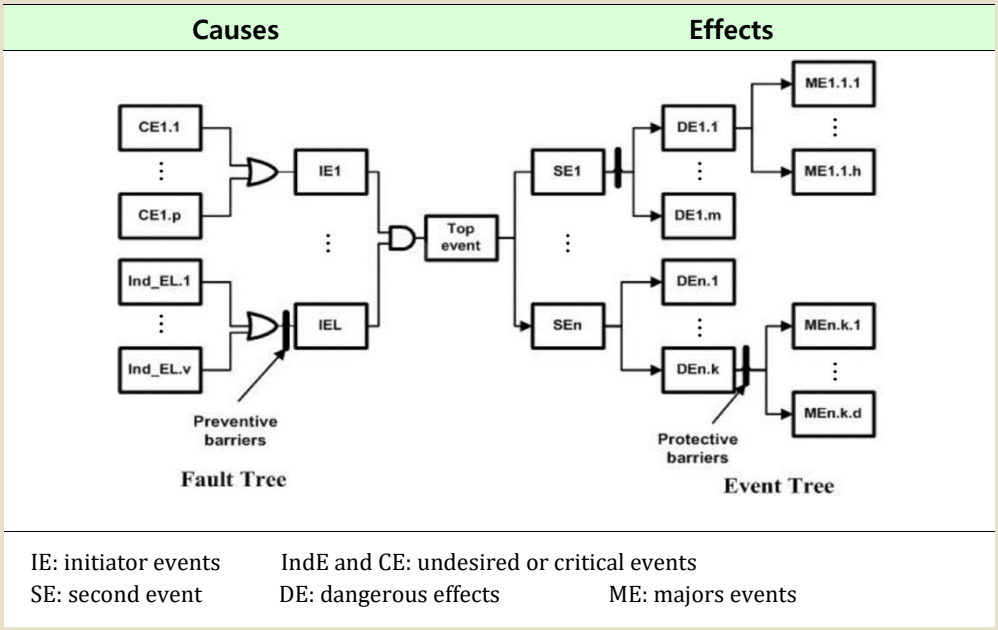
[36] This is a risk management method that enumerates causes and effects centering on events (financial instability) in which risks are visibly manifested.

experts, and accordingly, it is suitable for enhancing the understanding of those in charge of risk management.

④ It provides a basis for finding an appropriate response method for each risk factor and mobilizing effective means to reduce ripple effects. Through the identification of risk factors, organizational division of duties is possible, and management responsibilities can be assigned correspondingly.

The most important concept in the bow-tie analysis is the 'top event', which corresponds to a situation or event in which a potential risk is manifested. On the left side of the top event, initiator events and undesired events are placed. On the right side, events that may appear ex post or incidentally are listed according to the occurrence of the event. This includes dangerous effects and major events that will emerge if these events develop.

<Figure 4-9> Bow-tie analysis model



IE: initiator events IndE and CE: undesired or critical events
SE: second event DE: dangerous effects ME: majors events

Source: Badreddine et al.(2009)

(d) Diversification of policy instruments

Reasonable search for policy tools for monetary policy and macroprudential policy can ultimately resolve the conflict between monetary policy and financial stability policy by reducing policy mistakes. Therefore, if a countermeasure is prepared through analysis of causes and effects of financial instability factors, appropriate policy measures should be

developed and presented.

In addition to policy tools such as regulation as a legal device, atypical capabilities such as finding financial unrest factors in advance and preparing countermeasures can also be policy tools. In particular, since the NRB also performs the financial supervision function, policy effects can be further enhanced by developing and utilizing atypical capacities as policy instruments.

(5) Additional considerations

(a) Various forms of uncertainty

The central bank's monetary policy decisions are made in highly uncertain economic conditions. The uncertainty facing central banks arises from a number of factors. First of all, in many cases, information on economic shocks is lacking. Policy responses should vary according to economic conditions, but the range, intensity, and duration of frequent shocks are unknown at the beginning. In particular, in a small open economy, it is not easy to determine the strength and degree of policy response to external shocks such as soaring oil prices.

Second, from the perspective of economic analysis, there is uncertainty due to restrictions on the availability of data (data uncertainty). This occurs because the economic outlook, non-observed variables (e.g., potential growth rate, GDP gap) and various indicators do not properly reflect the economic situation due to measurement errors. Macro indicators such as nominal interest rates and exchange rates can be obtained in real time or on a daily basis and are subject to few corrections. However, aggregate indicators such as GDP and CPI are not only impossible to obtain in real time, but are also revised several times as information increases for statistical compilation. Also, potential GDP is not officially announced by statistical agencies. There is no choice but to rely on the results obtained with various measurement techniques, but the problem is that the trend of potential GDP may change depending on the estimation time, period, and estimation method. Third, there is uncertainty about the parameter values of the model (parameter uncertainty). This occurs because the relationship between the policy ripple

channel and economic variables is not accurately known. In reality, policy-makers often do not know exactly how the economy works. Policy makers usually set up economic models to find out how the economy reacts under certain circumstances and to obtain forecasts. Within the model, there are parameters that represent interactions between variables. Parameters are estimated by statistical techniques, but are obtained in an uncertain state. Fourth, there is also uncertainty about the model itself that is referred to when implementing policies (model uncertainty). Model uncertainty arises from the process of representing complex and variable economic phenomena with simple formulas. Policy authorities seek countermeasures by establishing an economic model and analyzing policy lags and economic ripple effects. Based on the theory, we want to create a model that reflects the real economy well, but it is impossible to accurately explain the real economy due to the variable economic structure. In particular, in a small open economy such as Nepal or an economy with frequent institutional changes and high growth volatility, uncertainty in the process of structural change is inevitable.

Considering these uncertainties, it is desirable for the NRB to reduce unwanted economic fluctuations through gradual adjustments rather than aggressive interest rate adjustments when operating its monetary policy.

(b) Making the most of the advantages of the exchange rate peg system

As already explained in Nepal's monetary policy framework (Section B), Nepal has adopted an exchange rate targeting system pegged to the Indian currency (IC), whereby the exchange rate serves as a nominal anchor for monetary policy.

The exchange rate targeting has its advantages and disadvantages. First of all, the advantages include the fact that actual prices and expected inflation can be lowered by fixing the value of the home currency to the anchor currency of a country with stable economy and prices, and that it is advantageous to attract foreign capital because there is no exchange risk. In particular, in the case of a small open economy with high external dependence, it is known that the stabilization of import prices due to the exchange rate stabilization has a great effect and can quickly lower the public's high inflation expectations. These advantages served as an important

reason for Nepal to adopt the exchange rate peg system.

Meanwhile, the exchange rate target system restricts the implementation of monetary policy that suits the country's conditions, and if the exchange rate level deviates from the economic fundamentals, it can be easily attacked by speculators. If demand for Indian rupees increases significantly and the price of rupees rises, the central bank must supply rupees and intervene in the foreign exchange market to absorb domestic currency or increase domestic currency demand by raising interest rates to maintain a fixed exchange rate. This means monetary tightening, so if the domestic economy is in a downturn, the economy could be further depressed. In addition, if a fixed exchange rate is maintained through the intervention of the central bank in a country where there is pressure to increase the exchange rate (depreciation of the value of the home currency) due to inflation or slow growth, it may be attacked by speculators who expect an overvalued currency to depreciate.

Therefore, Nepalese policy authorities must fully understand and respond to the advantages and disadvantages of the exchange rate peg system when operating monetary policy. In particular, efforts should be made to expand foreign exchange reserves to stabilize the external sector, that is, to maintain the peg system.

(c) The business and financial cycles

Macroeconomic variables show a cycle of high or low situations compared to the long-term trend. Monetary and macro-stabilization policies seek to reduce the economic and social costs by mitigating the amplitude of these cycles. This is because the volatility of the economy can rather increase if expansionary policies are implemented in an overheated economy or contractionary policies are implemented when the economy is slowing down. In this regard, it is very important to accurately grasp the current situation of the economy through analysis of business and financial cycles.

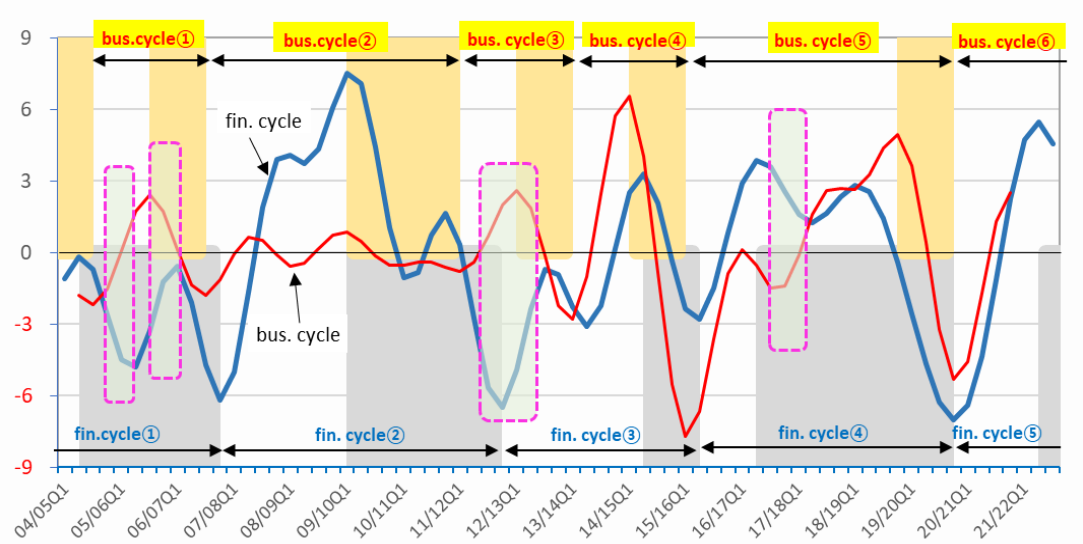
Prior to the GFC, policy authorities in major countries analyzed macroeconomic cycles based on real variables and responded by mobilizing policy tools based on this. However, after the GFC, as a result of focusing on the business cycle analysis in the past, the degree of imbalance between the real economy and finance was not sufficiently grasped, and the

argument that the financial crisis occurred because of this became persuasive. Since an economic downturn caused by a financial crisis or credit crisis entails enormous costs, it is necessary to devise appropriate policy measures through an analysis of the financial cycle in addition to the existing business cycle.

Since this view can be applied to the Nepalese economy as it is, it is meaningful to find policy implications by extracting Nepal's business and financial cycles.

As a result of extracting Nepal's business and financial cycles[37], there are some times when both cycles shows procyclicality, while there are other times when they are diverged. This can be confirmed by <Figure 4-10>. Contrary movements appeared during the periods 2004/05Q4~2005/06Q2, 2005/06Q3~2006/07Q1, 2011/12Q1~2012/13Q2, and 2016/17Q3~2017/18Q2 (dotted box in the Figure). Except for these periods, the two cycles generally showed a similar pattern, and although there was a slight time difference, this synchronism appeared more clearly after the fiscal year of 2015/16.[38]

<Figure 4-10> The evolutions of financial and business cycles in Nepal



Note: Upper shaded areas indicate contraction of the business cycle, lower shaded areas indicate contraction of the financial cycle.

[37] However, the cycle analysis was limited due to the short time series of Nepal's GDP and credit data, and it was not possible to grasp the current year's situation as recent data (especially GDP) were not available.

[38] In Nepal, information on the reference cycle dates, which mean the peaks and troughs of the business cycle, has not been officially announced by the national statistical authorities (see <Appendix A> for identification of the business cycle reference dates).

Meanwhile, as a result of analyzing available data, Nepal's financial cycle tends to have a longer cycle and larger amplitude than the business cycle. This characteristic phenomenon is a general phenomenon that also appears in other countries (Classens et al, 2011; Kim and Lee, 2015).

Depending on the circumstances of these financial and business cycles, the relationship between monetary and macroprudential policies may be complementary or contradictory. Therefore, it is necessary to take this finding into account when combining policies.

(d) Strengthening policy communication

Recently, central banks in major countries have recognized efficient communication activities as a prerequisite for enhancing monetary policy performance. Accordingly, the organization in charge of communication is being expanded, while communication is being strengthened through various channels such as publication of monetary policy reports, press releases, press conferences, websites, and social media. Such communication activity itself is recognized as one of the various tools of monetary policy.

In particular, many central banks publish a report called the Monetary Policy Report on a quarterly or semi-annual basis (refer to <Box 4-3>). This report is the most important tool for the central bank's monetary policy communication. It describes various information on monetary policy, such as policies implemented by the central bank, factors to consider when making policy decisions, evaluation of economic conditions, and future policy operation direction. Through this, the market and the people can evaluate the existing monetary policy and predict the future monetary policy direction. Therefore, the central bank's monetary policy report has become one of the important means for economic agents to obtain comprehensive information on monetary policy decisions.

The NRB has established and published its monetary policy plan since fiscal year 2002/03 in accordance with the NRB Act of 2002. In addition, after reviewing economic and financial conditions semiannually from 2003/04 and quarterly from 2016/17, policy tools are changed if necessary. Currently, the NRB prepares and publishes a report corresponding to the Monetary Policy Report once every fiscal year (in July or August),

and it releases the summary reports of the first quarter review, mid-term review, and third quarter review of the fiscal year.

However, as the importance of monetary policy communication is growing, it is necessary to increase the number of publications of comprehensive monetary policy reports rather than condensed ones, to at least twice a year by referring to the cases of major countries, and to further expand the contents of the reports. This is because the monetary policy report is one of the basic tools of conveying information such as the inevitability of conflicting policy measures to economic agents and the financial market.

<Box 4-3>

Publication of monetary policy reports in other countries

Central banks in most major countries publish their "monetary policy reports" and submit them to the parliament. The obligation to submit to the parliament is statutory. In the case of the United States, the chairman of the Fed attends the National Assembly and explains the *Monetary Policy Report to the Congress*. Looking at the number of publication, the United States publishes it twice a year, the UK's Bank of England publishes it four times a year, and Sweden publishes it five times a year, coinciding with the number of monetary policy meetings. Meanwhile, the ECB does not publish a separate policy report, but publishes an *Economic Bulletin* in about two weeks after the monetary policy decision meeting (eight times a year).

Meanwhile, in the case of the Bank of Korea, the current "BOK Act" stipulates that an evaluation report on the implementation of monetary and credit policy, that is, a

"*Monetary Policy Report*" should be prepared and submitted to the National Assembly at least twice a year (Article 96 Paragraph 1). According to the law, it is required to report to the National Assembly at least twice a year, but as communication has become more important, it is now published four times a year. Two of these are half-yearly reports, and the other two are in the form of an abbreviated quarterly interim report.

By including the contents that cannot be included in the resolutions and press conferences in the report, the contents discussed when deciding the direction of monetary policy can be informed to economic agents and the financial market.

BOK's Monetary Policy Report history

- 1998: Published for the first time following the complete revision of the Bank of Korea Act
- 2001: Start of publication in English
- 2004: The number of publications was increased twice a year due to the revision of the Bank of Korea Act (Article 96)
- 2016: Increased the number of publications to 4 times a year

Contents of the Monetary Policy Report

- Summary
- Conditions for operating monetary and credit policy: world economy, real economy, prices, Financial and foreign exchange market conditions
- Operation of monetary and credit policy: base rate determination, financial intermediary support loans, other market stabilization measures, etc.
- Future Monetary and Credit Policy Direction: Economic outlook, growth and price outlook, key considerations for future monetary and credit policy operation
- Appendix: Key resolutions and decisions of the Monetary Policy Board, Monetary Policy Board discussions
- Box: Recent economic and financial market issues

3. The optimal policy mix of monetary policies and financial regulatory policies regarding private sector credits in Nepal

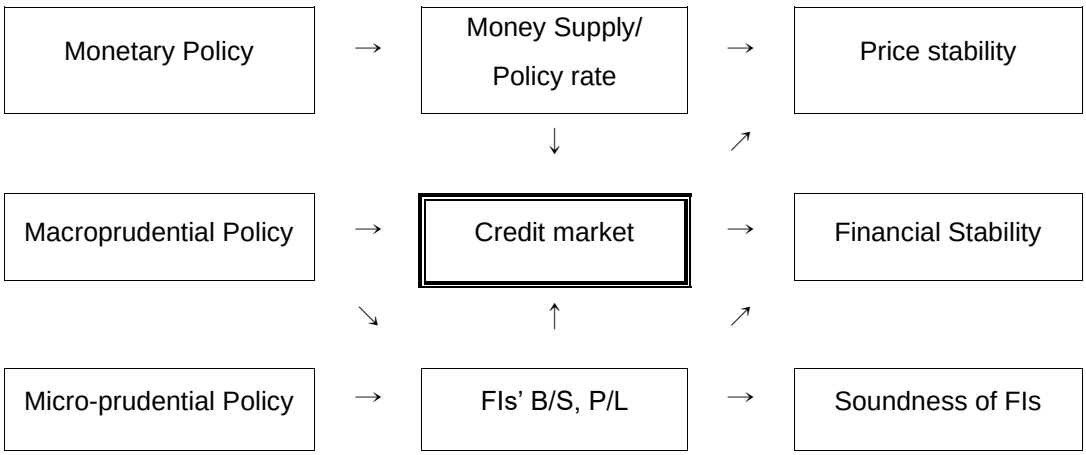
A. Policy mix for credit expansion

(1) The need for policy mix

In the event of excessive credit expansion, the central bank directly controls the total credit through tight monetary policies such as the money supply, interest rates, and reserve requirements, thereby pursuing the real economic goal of price stability and economic growth. However, the central bank's monetary policy affects the real economy and financial stability through various channels, sometimes resulting in conflicting results on prices and real economy stability and financial stability. For example, austerity monetary policy is likely to significantly increase instability in the financial system, such as increasing the risk of default by restricting borrowing conditions of economic players and negatively affecting the profitability of banks.

Unlike monetary policy that affects the macroeconomy broadly, micro and macroprudential policies can more effectively respond to financial imbalances because they can focus policy effects on specific sectors or financial institutions that are overheating in the economy. Therefore, in order to identify and suppress financial imbalances accumulated in the process of excessive credit expansion and potential risks in the financial system, an appropriate policy mix of micro and macroprudential policies along with monetary policy is essential.

<Figure 4-11> Policy mix between monetary policy, macro-prudential policy and micro-prudential policy



(2) Interrelationship between monetary policy and macroprudential policy

The cases where monetary policy affects the stability of the financial system are as follows. First of all, austerity monetary policy can directly cause instability in the financial system by worsening borrowing conditions of economic players and increasing the risk of default. Raising policy interest rates increases the burden of borrowers' repayment, which leads to a decrease in income and a weakening of their ability to repay debts and dampens overall economic activities. In addition, falling asset prices reduce borrowers' net assets and reduce access to new loans, raising the default rate and worsening bank profitability, raising the risk of eventually falling into an unstable financial system.

On the other hand, easing monetary policy affects financial stability by changing the risk-taking attitude of economic actors. For example, under the low-interest rate trend, economic players increase the proportion of investment in risky assets to obtain higher returns. In addition, low interest rates can lower borrowers' default risk and expand lending opportunities to lower credit ratings, which can lead to a sharp increase in private sector debt and overheating of the economy. Through this process, easing monetary policy accumulates system risks in the financial system, and makes the financial system very vulnerable to internal and external shocks.

In the COVID-19 pandemic, Nepal and other countries around the world have implemented accommodative monetary policies because it was inevitable under the circumstances at the time to revitalize the economy by expanding the credit supply to economic players despite these risks.

Monetary policy also affects the financial sector through exchange rates. The rise and fall of the exchange rate affects the domestic financial market conditions through the inflow and outflow of external funds. If foreign funds flow in due to interest rate hikes, the exchange rate will fall (increase in the value of the won) and domestic economic players will increase their dependence on overseas borrowing, which will put a heavy burden on the domestic economy due to increased foreign debt repayment burden and lack of foreign currency liquidity.

Monetary policy and macroprudential policy have different policy goals, but both policies need to operate in the form of an appropriate policy mix. This is because each policy can have a negative or positive effect on each other in the implementation process. For example, if macroprudential policy measures such as LTV ratio regulation and Counter Cyclical Capital Buffer(CCyB) are used during the economic recovery, monetary policy authorities can maintain an easing monetary policy away from concerns about the side effects of credit expansion. In an open economy, rising interest rates can lead to an increase in domestic credit and an increase in the risk of exchange rate fluctuations due to the expansion of capital inflow. Under these circumstances, if capital inflows and outflows are properly managed by macroprudential policies, monetary policy authorities can relieve inflationary pressure by tightening monetary policy without worrying about the side effects of interest rate hikes.

After all, when macroprudential policy and monetary policy are properly operated but complementary to each other, it helps to achieve each other's policy goals. Since there is a separate macroprudential policy for financial stability, monetary policy can concentrate on the policy goal of price stability. In addition, macroprudential policies implement policies to prevent financial instability when monetary policy is operated too moderately or non-traditional monetary policy is forced to be operated.

On the other hand, depending on the situation, a conflict between the two policies may occur. For example, if financial instability(credit contraction) occurs while inflation exceeds the target level, monetary policy authorities will use austerity to curb inflation, while macroprudential policy authorities will try to ease the level of soundness regulation, fearing a contraction in credit supply to the real economy. On the contrary, although inflation is below the target level, trade-offs can occur even in situations where the credit market is feared to overheat. This is because macroprudential policy authorities want to prevent system risks in the asset market in advance by suppressing excessive credit expansion through the use of soundness measures, while monetary policy authorities have an incentive to choose an easing policy stance for fear of deflation.

In the end, it is important to efficiently derive a policy mix between macroprudential policy and monetary policy for stable operation of the macroeconomy, and for this, it is necessary for policymakers who implement both policies to share their judgments on the current economic situation and consult to find the best policy combination.

<Table 4-8> Relationship between monetary and macroprudential policies according to economic and financial conditions

		Real cycle: price situation		
		Above target level	**Close to target level**	**Below target level**
Financial cycle: financial situation	Overheating	complementary	independent	contradictory
	No imbalance	independent	independent	independent
	Contraction	contradictory	independent	complementary

(3) The relationship between macroprudential policy and micro-prudential policy

Another policy sector to consider in the operation of policy mix between monetary policy and macroprudential policy is micro-prudential policy. In the past, the concerns about micro-prudential policies have been mainly focused on the risks and soundness of individual financial institutions, which is a necessary condition for the stability of the entire financial system. However, in order to improve the stability of the financial system more effectively, the supervisory policy centered on the soundness of individual financial institutions needs to be supplemented with a macroprudential policy from the perspective of the entire system. This is because the behavior and regulatory practices of financial institutions that seem reasonable at the individual institution level can lead to increased instability of the entire system (fallacy of composition).

In general, in the early stages of credit expansion, each policy authority tends to have a consensus view on system risk assessment, while conflicts between policy authorities are likely to be highlighted when switching to a downturn or a credit contraction period.

In a period of credit expansion when banks' leverage rises and system risk levels rise, both macro and micro-sound institutions are likely to agree to strengthen the level of capital and liquidity regulation. For example, micro-supervisors will check credit criteria for borrowers as banks' balance sheets expand rapidly, while macroprudential authorities will monitor the movements of macro-financial stability indicators and impose economic buffer capital if necessary. However, this complementary situation changes when the financial cycle shifts to a downward phase and losses begin to occur. Micro-supervisors will want individual banks to be able to cope with potential additional losses by maintaining appropriate levels of capital. On the other hand, macroprudential authorities will be interested in maintaining credit supply to the real economy by allowing them to use buffer capital accumulated during the economic upturn. Therefore, it is necessary to coordinate policy measures between micro-prudential policies and macroprudential policies through sharing the perception of which phase it is located between the real cycle

and the financial cycle.

<Table 4-9> A combination of micro- and macro-prudential policies according to the phases of the financial cycle

	Boom period	Recession period
Micro-prudential Perspective	- micro-supervisory indicators are good - Suppressing system risk is not a key responsibility → Greater concern about falling bank profitability when using macroprudential policy measures	- Loss absorption of individual institutions are reduced → A Negative position on the use of buffer capital(CCyB) from a macroprudential perspective
Macroprudential Perspective	- Excessive credit expansion raises system risk concerns → Use of measures such as a accumulating additional buffer capital(CCyB) and strengthening LTV ratio, etc.	- Concerns about excessive credit contraction → Active use of buffer capital (CCyB) and easing LTV ratio, etc.

(4) Implementation of the optimal policy mix according to the financial and real cycle phases

Since the financial cycle and the real cycle are not always synchronized and the cycle is different, it is necessary to distinguish the phase combination of the two cycles in order to consider the optimal policy mix. When the phases of the real and financial cycles are similar, if the optimal policy mix is implemented through harmonious operation between monetary policy and macroprudential policy, a greater policy effect can be obtained even through a lower level of policy responses. For example, if both policy authorities implement expansionary policies when the real cycle gap and the financial cycle gap are negative (-), monetary policy will slightly expand the financial cycle in addition to the real cycle, and macroprudential policy will affect the real cycle in addition to the financial cycle, which will contribute to enhancing other policy effects.

When the two cycle phases are different, a conflict between the two policies may occur, so a higher intensity of policy response is required than when policies are carried out

individually. For example, if the real cycle gap is negative (-) and the financial cycle gap is positive (+), monetary policy should be operated in an expansionary manner and macroprudential policy should be tightened, but monetary policy raises the financial cycle in addition to the real cycle, resulting in a conflict between the two policies.

From the perspective of macroprudential policy authorities, a negative real cycle gap means that monetary policy needs to be expanded, so it is necessary to operate financial policy more tightly in consideration of the amplification effect of the financial cycle by monetary policy.

In the past, many studies have shown that the financial sector has a procyclical property that expands the real cycle by interacting in the same direction as the real sector, but recently, there has been views that the imbalance between real and financial sectors may deepen as the financial cycle expands regardless of the real economy situation. According to these views, the real and financial cycles do not always synchronize, and sometimes the direction of movement can be reversed. If the gap between the real and financial cycles occurs, it is likely to take an inappropriate policy response to the economic situation and the result could lead to a financial crisis.

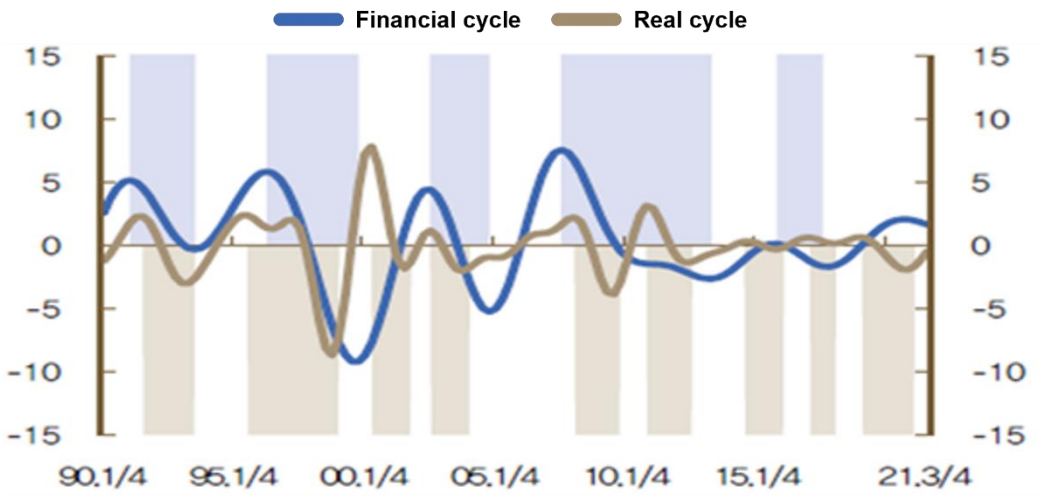
Reflecting this view, in the case of the United States, even after the financial cycle entered an upward phase in the early 2000s, it adhered to expansionary monetary policy to cope with the sluggish real economy, and some studies argue that systemic risks accumulated in this process contributed to the global financial crisis (Borio, 2012)

On the other hand, in the case of Korea, it can be found that the policy association was properly operated according to the situation between the financial cycle and the real cycle. According to Lee Jung-yeon and Hong Joon-sun (Evaluation of the recent situation and characteristics of Korea's financial cycle, 2022), the second quarter of 2013 to the fourth quarter of 2017 correspond to the sixth cycle of Korea's financial cycle. In 2013, policy authorities implemented macroprudential policies to ease real estate regulations while implementing easing monetary policies such as interest rate cuts to stabilize the financial sector and boost the real economy. In particular, as the recovery of the Korean economy has been weaker than expected since 2013, the government implemented policies to

revitalize housing transactions to expand household income, and regulations related to the real estate market and household loans continued to be eased.

However, since 2016, the housing market has overheated, with real estate prices soaring, and policy authorities have strengthened the macroprudential policy of strengthening real estate regulations and household loan regulations to stabilize the housing market. But, in the period after 2016, the financial cycle was a period of expansion, while the real cycle was a period of contraction. Therefore, monetary authorities implemented easing monetary policies such as interest rate cuts as prices fell below the target level. As a result, it is evaluated that, in a situation where the real economy and the financial situation conflict, a policy mix was properly implemented by easing monetary policy to support real economic growth and macroprudential policy to maintain financial stability by suppressing financial imbalances.

<Figure 4-12> Relationship between financial and real cycle

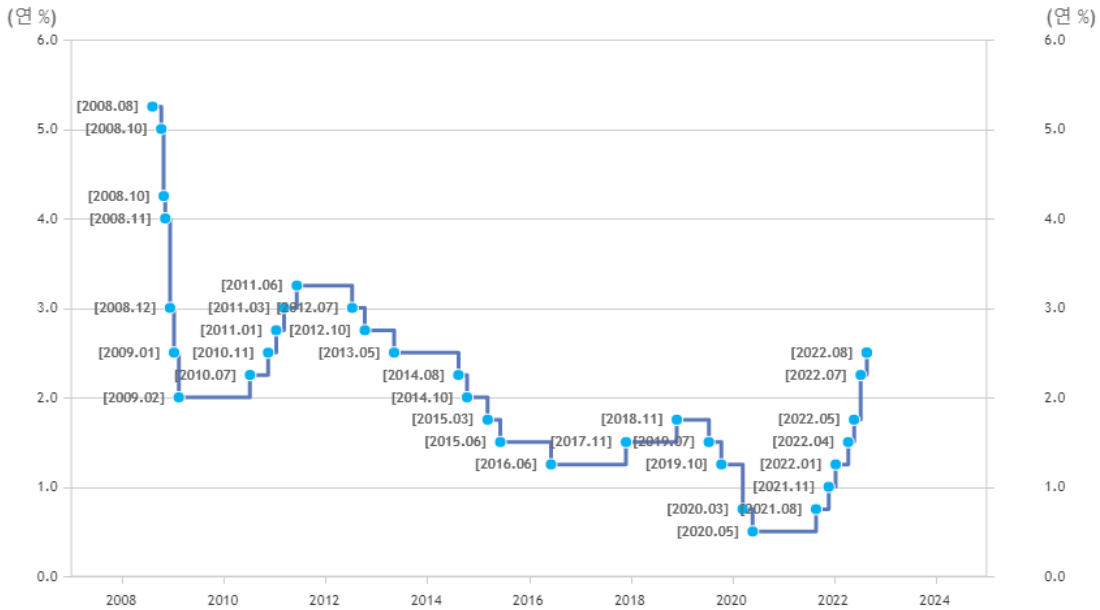


Note: Shading represents the contraction phase of each cycle
Source: Lee Jung-yeon and Hong Joon-sun (2022)

Meanwhile, during the COVID-19 pandemic, credit easing measures such as interest rate cuts and liquidity supply to support activities of economic players and flexible financial regulations to support the real economy by the financial sector are one of the examples of effective policy mixes between monetary policy and micro and macroprudential policy. On the other hand, the recent situation since the COVID-19

pandemic situation stabilized from the second half of 2021 can be seen as a case where the financial situation and the real situation coincide in the opposite direction to the COVID-19 pandemic period. During the COVID-19 pandemic between 2020 and 2021, credit expanded rapidly in the process of the government supporting economic activities for economic actors, and prices have risen excessively due to various internal and external factors such as rising raw material and energy prices and the Ukrainian war. As a result, the government has been implementing strong monetary tightening policies such as several interest rate hikes to curb rising inflation levels. On the one hand, measures to curb household debt growth introduced since 2019 are still maintained, and therefore, it can be said that the policy directions are consistent in terms of policy mix between monetary policy and macroprudential policy.

<Figure 4-13> Changes in the Bank of Korea base rate



Source: BOK Website(http://www.bok.or.kr/

<Table 4-10> Financial easing measures during the COVID-19 pandemic in Korea

- Bank's consolidated LCR and foreign currency LCR were eased (extended to March of 2022) *Consolidated LCR 100% → 85%, foreign currency LCR 80% → 70% - Deferred application of bank loan-to-deposit ratio (extended to March of 2022) *Exemption from sanctions for violations within 5% of the loan-to-deposit ratio (100%) - Adjustment of the weight of private business loans (extended to December of 2021) * Reduce the weight of private business loans to 100% → 85% - Suspension of the application of the liquidity ratio of savings banks and credit companies (extended to March of 2022) * Exemption from sanctions for violations within 10% of liquidity ratio (100%) - Deferred application of the loan-to-deposit ratio of savings banks and mutual finance companies (extended to March of 2022.) * Sanctions exemption for violations within 10%p of the loan-to-deposit ratio (100%) for savings banks, 80-100% for mutual finance) - Suspension of the application of the mandatory loan ratio in the savings bank business area (extended to March of 2022) * Sanctions are exempted for violations within 5%p of the mandatory loan ratio (30~50%) - Temporary easing of insurance liquidity evaluation standards (extended to March of 2022) * When evaluating the management status, the liquidity-related evaluation grade is increased by one grade.

Source: Financial Supervisory Committee(https://www.fsc.go.kr)

<Table 4-11> Household debt and real estate policies in Korea

Period	Contents	Policy
2013	Strengthening support for home buyers (temporary reduction of transfer tax, abolition of heavy transfer tax for multiple homeowners) (4/1)	Deregulation
	Inducement of conversion of lease demand to sales (reduction of acquisition tax, abolition of differential imposition on multiple homeowners, expansion of supply of low-interest long-term mortgages, etc.) (8/28)	
2014	The LTV/DTI ratio was eased to 70%, and the tax on excess profits from reconstruction was abolished (7/24)	
	Mitigating the number of years necessary for reconstruction, lifting the green belt area, reducing the period of restricting resale in public housing sites in the Seoul metropolitan area and of obligation to live, etc. (9/1)	
2015	Preparation of guidelines for advancement of loan screening for mortgage loans, such as setting loan limits based on borrower's ability (12/14)	Tighter regulation
2016	Strengthening collective loan management, etc. (8/25)	
	Prohibition of resale of pre-sale rights in overheated speculation areas such as Gangnam 4-gu, strengthening the first priority subscription conditions (11/3)	
2017	Strengthening the resale restriction period in Seoul, lowering the LTV and DTI regulatory ratio, Restriction on the number of houses for reconstruction union members, etc. (6/19)	
	Designation of overheated speculation zones and speculation zones, improvement of the requirements for applying the ceiling on the sale price, Implementation of the taxation on reconstruction excess profit, restrictions on the transfer of reconstruction members' status in overheated speculation zones, and Restriction on the resale of members' right to sell, etc. (8/2)	
	Introduction of new DTI and DSR and downward revision of the LTV and DTI regulatory ratio for investment purposes (10/24)	
	Supply of public rental housing by life stage and income level, Supply of public housing, etc. to ordinary people and actual consumers without housing (11/29)	
2018	Prohibition of mortgage loans when purchasing new houses in regulated areas(buying expensive houses for non-residential purposes and purchasing additional houses for multiple homeowners) (one homeowner is allowed only for actual demand), Restrictions on loan limits for life stabilization funds in speculative areas, Restrictions on lease loan guarantees by multiple home owners and limitations on LTVs in speculative areas (8/27, 9/13)	
2019	Household debt growth rate is managed within the nominal GDP growth rate (by 2021) (1/28)	

2021	. Managing household debt growth to 4% by 2022 . The banking sector promotes the introduction of buffer capital to cope with the economy . Stepwise expansion of DSR by borrower . Development of the management system of Non-residential Mortgage loans, etc (4/29)	

Source: Press releases from related ministries such as Ministry of Land, Infrastructure, and Transport, the Ministry of Strategy and Finance, Financial Supervisory Commission, etc.

Meanwhile, according to the results of deriving Nepal's real and financial cycles in the previous section (<Figure 4-13>, there are periods when the two cycles are synchronized with each other, but also when they are separated.

Therefore, in the case of Nepal, it can be seen that the policy mix between monetary policy and macroprudential policy should be properly operated according to the situation between the financial cycle and the real cycle.

According to <Figure 4-13> in the previous section, there were several times when the two cycles were opposite before 2018, but after that, the two cycles were generally similar, and in particular, the two cycles were clearly synchronized during the Covid-19 pandemic. Therefore, the NRB had no great difficulty in operating a policy mix between monetary policy, micro- and macroprudential policy in the same direction to curb excessive credit expansion and the resulting financial instability during the same period.

B. Nepal's policy mix in the recent credit expansion process

(1) Major policy mix during COVID-19 pandemic

NRB actively implemented proactive countermeasures to mitigate the impact of COVID-19. These measures are designed to support rapid economic recovery by providing uninterrupted support for financial services, including monetary policy measures to expand liquidity to sectors hit by COVID-19, as well as micro and macroprudential policy measures to maintain financial stability, such as easing the LTV ratio, increasing the operating loan limit, and easing cash reserve requirements. Details

of these measures are as follows.

(a) Liquidity-related measures

The central bank's benchmark interest rate was cut from 6% to 5% and the cash reserve requirement was reduced by 100bp (4% → 3%), thereby maintaining appropriate liquidity in the banking system. The benchmark interest rate has risen to 8.5% through two hikes in 2022, and the cash reserve ratio has also been raised again to 4%.

(b) Measures concerning capital adequacy

The bank's counter-cyclical buffer, which was scheduled to take effect in July 2020, was postponed until 2023 to meet continued liquidity demand.

(c) Allow grace period for loan repayment

Banks and financial institutions were allowed to extend the grace period for loans for projects whose normal operations had become difficult. This grace period extension was applied for one year for severely affected sectors, nine months for intermediate levels, and six months for the least affected sectors, and two years for hotel businesses

(d) Loan maturity and restructuring

Banks and financial institutions have been allowed to adjust maturity or structure if borrowers repay 10% of their loan balance (later reduced to 5%) for loans to business sectors severely affected by COVID-19.

(e) Additional support for operating fund loan limits

Recognizing the lack of cash or funds in the entity, the NRB allowed Banks and financial institutions to increase the working capital loan limit by 20%. In the case of companies that do not use operating fund loans, the limit has been expanded so that an

additional 10% of the existing loan limit can be used. The additional loan limit support was used only for activities essential for continuing business, such as employee salary payment and purchase of raw materials.

(f) Extending the maturity of a short-term loan

The repayment deadline for short-term loans (e.g., checking loans, cash-service loans) was extended by six months (the deadline arriving in mid-July 2020 was extended to mid-January 2021).

In addition, the NRB allowed Banks and financial institutions to extend the repayment deadline for installment loans by six to nine months depending on the severity of the shock caused by COVID-19. The repayment period was extended to the end of July 2021, and for businesses with moderate or small shocks, the repayment period was extended to mid-April 2021 and mid-January 2021, respectively, without any penalties.

(g) Relaxation of interest capitalization regulations

Interest capitalization regulations have been eased and interest capitalization can be extended until mid-January 2021 for borrowers who have already been approved by the NRB.

(h) Business continuity loan

Most companies and industrial activities were suspended due to COVID-19, which caused many companies to have difficulty in cash flow. The Nepalese government has been able to secure funds for business continuity at low interest rates for companies that have to pay wages and salaries even during the lock-down. Companies in severely affected sectors could borrow up to Rs. 100 million, while those in moderate and least affected sectors could borrow Rs. 70 million and Rs. 50 million, respectively.

(i) Deferral of seizure measures

The seizure process was suspended until the end of July 2021 for companies and individuals who were unable to fulfill their loan repayments in time due to the influence of the COVID-19 pandemic.

(2) Evaluation of policy mix during COVID-19 pandemic

Thanks to various policy measures by the Nepalese government and NRB, Nepal's economy has entered a phase of recovery from the COVID-19 shock, and economic activities are expanding. As a result, in 2022, credit for the private sector surged, expanding money supply and rising asset prices, and inflationary pressure is growing as domestic demand increases amid rising prices of raw materials such as oil.

At this point, it is important for the NRB to continue to assess the macroeconomic risks accumulated in the credit expansion process and the potential risks to financial stability and to adopt appropriate policy measures accordingly. The policy mix of monetary policy, macroprudential policy and other micro-prudential policies that have been implemented to cope with the changed situation since the COVID-19 period should be reviewed. It is important to be cautious and evaluate the overall development of the macroeconomic and financial sectors in this regard, as the reversal of existing regulatory measures taken during the pandemic may affect potential financial stability. As a result, Nepal's central bank is implementing measures such as restoring liquidity supply and financial easing, such as raising the key interest rate twice (5% → 7.0% → 8.5%) in 2022.

Meanwhile, it is necessary to evaluate in detail the impact of the significant increase in credit expansion during the COVID-19 period on the real economy, check whether any potential risks have been accumulated in the financial system, and devise policy measures to address them.

<Box 4-4>

Key contents of NRB's monetary policy in FY22/23

As the expansion of liquidity supply to support COVID-19 damage has led to a surge in product imports, a decrease in foreign exchange reserves, and inflation over the past two years, the policy has shifted to curb loans and money supply

- By setting the credit expansion target of financial institutions to 12.6% (19% of the previous year) and setting the money supply growth rate to 12% (18% of the previous year), reducing the amount of money and reducing demand to curb inflation
- The policy interest rate was raised by 1.5%p to 8.5%, the cash reserve ratio was raised by 1%p to 4%, and the Statistical Liquidity Ratio to commercial banks was raised by 10% → 12%
- On the other hand, loans to productive sectors such as agriculture and manufacturing are expanded by lowering interest rates on loans to productive sectors

In general, two countermeasures should be considered: quantitative management and qualitative management. Quantitative management is a monetary policy measures to prevent excessive increase in credit volume compared to economic size, and qualitative management refers to an approach to check vulnerability and reduce risk of credit borrowers.

In order to properly implement macroprudential policies, it is first necessary to evaluate potential risk factors that may exist in the financial system due to credit expansion and to check vulnerable sectors. In addition, it is necessary to check through stress tests to evaluate the soundness of financial institutions and the impact on the financial system in the event of an external impact in the future. To this end, it is necessary to have an appropriate system to check and evaluate potential risk factors and vulnerabilities in the financial system in Nepal, and to establish an appropriate soundness policy group system to address or supplement identified risk factors and vulnerabilities.

C. Future policy tasks and implementation measures for Nepal

In order to recover the total credit volume, which has increased significantly in the process of policy response to overcome the COVID-19, it is necessary to check the debt burden of credit borrowers, the possibility of bad loan conversion due to interest rate hikes, and how much financial institutions' management conditions deteriorate and their losses can be endured through capital and loan provisions. In particular, in terms of total volume, it is necessary to suppress credit expansion, but at the same time, consideration should be given to what policy considerations are needed to smoothly support real users who are vulnerable.

Currently, Nepal also has to control the greatly expanded credit situation thanks to its easing monetary policy during the COVID-19 situation, while appropriate credit supply must continue in some industrial sectors and regions. Therefore, unlike monetary policy responses that affect the overall macroeconomy, selective policy measures targeting specific sectors or specific borrower classes are needed, and in this regard, measures of microprudential and macroprudential policies are needed.

(1) First of all, it is necessary to check whether there was borrowing beyond the debt burden capability of credit borrowers in the process of expanding credit, whether there was excessive concentration in specific sectors, and which sectors have vulnerabilities. For this analysis, detailed indicators for identifying the characteristics of each loan sector and type, and detailed indicators for evaluating the borrower's capability of debt burden are needed.

In the case of monetary policy, macro-data dependence is high, but in the case of macroprudential policy for financial stability, micro-data is much more useful for detailed analysis of the phenomenon.

In determining detailed policy measures for household debt and real estate market, Korean policy authorities have determined the types of specific policy measures and the

intensity of measures based on microdata such as household income structure, credit rating situation, and borrowing size by sector. For this detailed analysis, the Bank of Korea divides the household loan and corporate loan sectors into separate parts in the Financial Stability Report and uses various indicators to check the vulnerabilities and potential risk factors of household and corporate borrowers in certain sectors as well as the entire household and corporate sectors. In this regard, even in the case of NRB, a microdata collection channel for detailed analysis should be established. When handling loans by financial institutions, standardized micro-information should be collected and regularly reported to the NRB. The contents of the information and data contained in the template reported by banks and financial institutions to the NRB should be greatly reorganized and expanded.

In this regard, the IMF has proposed a policy recommendation to reform the NRB's data collection system to enable timely and reliable collection of financial supervisory data, and the establishment of a supervisory information system (SIS) is underway with the IMF's technical support. In particular, the IMF emphasized the importance of detailed information on the soundness of bank loan assets and will propose a report template that can collect information on borrowers, classification of loan soundness, and the level of banks' loan-loss reserves. (IMF Staff Report, January 2022)

<Table 4-12> Risk indicators for credit situation assessment

Sector	Key risk indicators
Total amount of Credit	①Macroeconomic data (such as total credit or credit growth), ②Leverage ratio by sector, ③Credit/GDP gap, ④Non-core/core debt ratio, etc
Household credit	①Household credit situation, ②Household debt status by income quintile/credit rating. ③The ratio of loans to disposable income, ④The ratio of financial liabilities to financial assets, ⑤Loan classification by use of funds, vulnerable borrowers' status, ⑥LTV/DSR situation, ⑦Bank/non-bank household loan delinquency rate, ⑧Interest rate structure and maturity structure, etc
Corporate credit	①Corporate loan and debt ratio by company size, ②Loan status by industry, ③Financing in the capital market, ④Ratio of operating profit from sales by company size and industry, ⑤Interest compensation ratio by company size and industry, etc.
Credit supply channel	①Bank/non-bank financial institution delinquency ratio/NPL ratio, ②Delinquency rate and NPL ratio by borrower/loan type/borrower characteristics, ③Financial institutions' profitability/equity capital ratio/loan-loss reserves ratio, etc
	①Status of mutual transactions between financial institutions and industries, ②Transmission risk of insolvency, ③Concentration risk, etc

Meanwhile, the Bank of Korea's loan behavior survey can be used as one of the ways to obtain information on the credit supply situation of banks and financial institutions. The Bank of Korea is conducting a loan behavior survey for loan officers of financial institutions to understand the credit supply situation in the financial market and to understand potential risks. The survey, which is conducted regularly on a monthly and quarterly basis, evaluates credit demand and supply conditions and future credit demand and supply prospects just before the survey date, and evaluates changes in credit demand

and supply conditions and potential risk factors in the credit market. Important matters identified through the loan behavior survey are used as useful information when establishing policies related to the credit market, and are reported as information to the Monetary Policy Committee which is a decision-making body for monetary and financial policies.

In particular, the information on loan demand and potential risks identified through the loan behavior survey is very useful in establishing micro and macroprudential policies for household debt management. Apart from the survey items such as loan supply, demand trends, and potential risks that are regularly investigated every quarter, special survey items are added to obtain market trends and information if policy authorities need to quickly grasp information on specific issues. Through special survey items, for example, it was checked whether the government's household debt measures showed effective policy effects in the loan market, and if necessary, measures were supplemented. Special survey items are also used as useful means to understand financial stability issues such as banks' foreign exchange liquidity and banks' interest margin fluctuations due to changes in the central bank's benchmark interest rate, as well as financial markets and financial institutions' situations related to monetary policy.

Given that the micro-information collection system from financial institutions is still somewhat insufficient in Nepal, the Nepalese central bank can use the loan behavior survey to quickly obtain information on credit market trends and to establish monetary and financial stability policies. If the question items of the loan behavior survey used by the Bank of Korea are appropriately reorganized to suit the situation of the Nepalese financial market, and special survey items are added if necessary, NRB will be able to collect timely information on financial market issues.

<Box 4-5>

Overview of the survey on loan behavior of financial institutions
(Trend in Q1 2022 and forecast for Q2 2022)

☐ Period of survey: March 15, 2022 to March 31, 2022

☐ Target institutions: A total of 204 financial institutions
- 18 domestic banks, 26 mutual savings banks, 8 credit card companies, 10 life insurance companies, and 142 mutual financial associations

☐ Target: Officer of a middle position or higher in charge of credit supply of the target institution

☐ Survey method: Electronic survey (postal survey for mutual financial associations) and interviews

☐ Contents
- To investigate trends over the past three months (January to March 2022) and prospects for the next three months (April to June 2022) on the loan attitude of financial institutions, credit risk, and loan demand

☐ Calculation of index
- To calculate the index by weighted averaging of 5 response items* regarding last quarter trends and outlooks for the next quarter on loan attitude, credit risk, and loan demand

* ①Largely relaxed[increased] ②Somewhat relaxed[increased] ③unchanged ④Somewhat strengthened[decreased] ⑤Largely strengthened[decreased]

** [("Largely relaxed(increased)" response weight × 1.0 + "Somewhat relaxed (increased)" response weight × 0.5] - ("Largely strengthened(decreased)" response weight × 1.0 + "Somewhat strengthened(decreased)" response weight × 0.5)] × 100

- The index is distributed between 100 and -100, and if the index is positive (+), the number of financial institutions that responded relaxation (increase) is greater than the number of financial institutions that responded strengthened(decrease), and if negative (-) means the opposite

☐ Index Announcement: In the month after the end of each quarter (January, April, July, October)

* Loan Behavior Survey Question Item(2022.3/4Q) : attached as an appendix

In addition to these business reports and surveys from banks and financial institutions, the Bank of Korea established a household debt DB as one of its own measures to secure microdata. Household debt DB was established with reference to the New York Fed's "Consumer Credit Panel" in the United States to secure micro-statistical data needed to establish policies related to household debt. Household debt DB is a panel DB that collects credit information of more than 1 million people (about 2.4% of the total credit active population) from a Korean credit information inquiry company (NICE Evaluation Information Co. Ltd.), and accumulates it in a statistically usable form. Unlike existing survey data released more than six months after a year, quarterly data is updated in two months in case of the household debt DB, so it is not only timely but also reliable because it is based on actual data, not surveys. In the case of Nepal, it is necessary to review a plan to establish a Nepalese household debt DB by benchmarking the household debt DB of the Bank of Korea from a long-term perspective.

(2) While suppressing the increase in the total amount of loans, but to ensure that loans are handled to actual users and those with financial difficulties, it is necessary to guide the loan to be handled within the scope of the borrower's repayment ability. Measures such as adjusting the LTV and DTI ratios and restoring or strengthening regulatory measures that were relaxed during the COVID pandemic (e.g., countercyclical capital buffer, limit of the working capital loan, etc.) should be taken.

Typically, it is necessary to strengthen LTV, a regulatory means to handle loans within the value of collateral assets, and to curb excessive loan demand by adjusting the DTI and DSR ratios that regulate loan limits based on borrowers' income, but to induce actual users to borrow within their capabilities. In addition, in order to reduce the risk of debt burden to whole economy from a long-term perspective, it is necessary to recommend or induce loans with fixed interest rates rather than variable interest rates, prolonging loan maturity, and repayments of principal and interest in installments.

<Table 4-13> Micro and Macroprudential policy measures of NRB

Sector	Key policy measures
Whole economy	Counter cyclical capital buffer(CCyB), Capital conservation buffer, Leverage ratio, etc.
Household sector	Upper limit on household credit growth, mortgage loan ratio, Debt-to-income ratio, etc.
Corporate sector	Real estate mortgage loan ratio, Foreign currency loan ratio, etc.
Liquidity sector	Liquidity buffer requirements, liquidity ratio, loan to deposit ratio, cash reserve ratio, foreign exchange reserves restrictions, restrictions on foreign exchange financing, etc.
Others	Supervision of liquidity system risks and collective dumping risks in the non-banking sector (such as securities lending market limits) Measures to mitigate risks due to increased interconnection (restriction on loan limits between financial institutions, etc.)

(3) In order to absorb losses in the event of loan delinquency or bad loans in the process of credit contraction, it is important to maintain the management soundness of financial institutions.

According to the NRB's Financial Stability Report analysis, Nepalese banks' capital adequacy and loan-loss reserves are good, so they can withstand shocks. However, even though the amount of real estate-related loans are reduced to within the regulatory ratio, more than two-thirds of bank loans are still secured with fixed assets such as land and buildings, so it should be noted that asset price volatility may be exposed to risk.

Meanwhile, according to the results of the stress test conducted in 2021, Nepalese financial institutions are evaluated to have resilience even if liquidity shocks, credit shocks, and market shocks come. However, it is necessary to steadily expand the capital capacity of financial institutions in preparation for external shocks as some banks do not appear to meet the regulated capital ratio in the event of a large impact and a complex shock. In particular, as sharp interest rate hikes are underway around the world, it is necessary to check the changes in debtors' repayment ability, the possibility of bad loans, and the effect on the management situation of financial institutions through stress tests.

The stress test conducted by NRB includes the direct impact of external shocks on the management situation of financial institutions, but does not include only the secondary impact assessment, but also does not reflect the transfer effect of mutual transactions between financial institutions and financial sectors. Therefore, in the event of an actual external shock, the effect on the management situation of financial institutions may be much greater than the test results. NRB needs to upgrade its stress test model that reflects secondary impact assessment and mutual transactions between financial institutions. If necessary to improve the stress test model of NRB, it is necessary to consider upgrading the stress test model in the future by referring to the Bank of Korea's experience in developing the SAMP model.

However, in order to build a macro stress test model such as the Bank of Korea's SAMP model, it is necessary to meet high levels of conditions in the amount and quality of data. All banks participating in the stress test need to have quarterly data compiled by unified standards, and each bank needs balance sheets, asset types, and profit and loss data. In addition, these data should be comparable data between banks and by period. Therefore, a step-by-step approach is needed in that it is difficult to prepare a data system necessary to build a macro stress model in a short period of time. First of all, after introducing an initial version of the macro stress test model that can capture system risks, it is necessary to use it in the Nepal stress test model step by step from the applicable modules among SAMP's detailed modules in consideration of the development level and data system construction in the long term. The BOKST-07 model can be used as an initial version of the macro stress test. Using this model, it is necessary to interconnect the credit risk model, market risk model, and liquidity risk model of NRB that are operating individually into one integrated system. Through this integrated system, it is possible to evaluate the risk of the banking system caused by changes in banks' BIS capital ratios for various macroeconomic shocks or scenarios.

<Table 4-14> Stress test models in Nepal and Korea

	NRB Stress Test model	BOK	
		BOKST-07 model	SAMP model
Key characteristics	Micro-prudential purpose, Check the soundness of individual institutions	Evaluation of the Stability/ Resilience of the Financial System in Response to Macroeconomic Shock	Macro stress test reflecting 2nd round effect and multi-impact effect
Target Risks and Modules	- Credit risk (NPL situation), - Market risk (interest rate and - Exchange rate risk), - Liquidity risk (deposit withdrawal)	-Credit risk (PD estimate) -Market Risk (VaR), -Interest rate risk (interest rate VaR), -Estimation of BIS Ratio in Crisis	-Macro risk factor probability distribution module, -Bank Profit and Loss module, -Bankruptcy transmission module, -Funding liquidity transmission module, -Multi-period module, -System Risk Measurement Module
Shocks	- Decline of real estate prices, - Interest rates & exchange rates rise, - Bank run Shock	-Financial shock (interest rate, stock price, exchange rate), -External shocks (oil prices, etc.), -Decline in real estate prices	12 macro risk factors, - Actual variable (4), - Financial variables(4), - Overseas variable (4)
Others	- Assessment of the soundness of individual banks, - Without interbank transfer effect, - Non-banking not included	-Assessing the resilience of the financial system through scenario and sensitivity analysis, -Transition effect and non-banking not included	-Estimated losses in the banking system -Measurement of maximum expected losses, number of insolvent banks, etc. *In 2018, it advanced to non-banking NBIT Stress test model

(4) For macroprudential policies to stabilize the financial system, it is important to establish a solid cooperative system between the government in charge of fiscal policy,

monetary authorities, regulators, and other related institutions. In the case of Korea, close cooperation on necessary policy responses is being achieved by sharing awareness of domestic and foreign economic conditions and financial stability through "Macroeconomic and Financial Conferences" involving the Ministry of Strategy and Finance, the central bank, and financial regulators. In the case of Nepal, the NRB is carrying out monetary policy and banking supervision policy together, which is advantageous for policy coordination, but it should work closely with the government in charge of fiscal policy and other related agencies.

Internally within the NRB, it is also important to promote personnel exchanges among employees in both sectors to share perceptions of financial and economic conditions between the monetary policy sector and the supervisory policy sector, and to strengthen cooperation among working-level employees in recognition of financial issues.

<Box 4-6>

Macroeconomic and financial conference in Korea

- Basis for establishment

: Regulations on the establishment and operation of the Macroeconomic Finance Conference (Presidential Directive)

- Objective

: To efficiently analyze and evaluate macro-soundness, such as economic conditions at home and abroad, trends in financial and foreign exchange markets, risk factors, etc. and to maintain close cooperation through smooth exchange of information among related authorities

- Composition

: Deputy Minister of Strategy and Finance, Deputy Chairman of the Financial Services Commission, Senior Deputy Governor of the Bank of Korea, Senior Deputy Governor of the Financial Supervisory Service, Vice President of the Korea Deposit Insurance Corporation, and Head of the International Financial Center

- Meetings: Regular meetings (If necessary, occasional meetings)

(5) With Nepal's economic growth and industrial development stage still at an early stage, it is necessary to increase credit in the private sector for rapid economic development for Nepal's rapid industrialization and industrial capital accumulation

In order for credit growth in the private sector to lead to efficient industrial investment and ultimately contribute to real economic growth, credit expansion policies linked with precise industrial policies must be implemented. In addition, micro- and macroprudential supervision should be effectively conducted in parallel to prevent financial instability in the private sector credit supply process and post-management process after credit supply. In light of the level of financial industry development in Nepal, the NRB's micro-

supervision and macroprudential policy framework seems to be relatively appropriately established. In the process of greatly expanding credit in the private sector during the COVID-19 pandemic, the NRB has effectively responded to prevent instability in the financial system through micro-supervisory measures and macroprudential regulations.

However, in order to continue to secure the stability of the Nepalese financial system, there remain some tasks that need to be addressed. Above all, in order to properly operate the NRB's micro and macroprudential policy instruments, it is necessary to have the tools and system to quickly recognize and effectively evaluate the potential risks to the stability of the financial system. Specifically, it should be possible to collect micro-data and information that can grasp the credit growth path and borrower attributes in detail. In addition, a system that can effectively analyze and evaluate potential risks with micro-data (e.g., the macro-stress test model, etc.) should be developed.

At the same time, it is necessary to establish a policy coordination mechanism that can derive an optimal policy combination at all times between monetary policy and micro-sound and macroprudential policy.

V. Conclusions

The monetary authorities of Nepal have responded actively to an unprecedented negative shock caused by the pandemic with expansionary monetary policies and flexible approaches in financial regulatory policy measures, which is construed as reasonable policy responses. Nevertheless, as the pandemic is about to subside, after such active policy efforts to minimize the negative shocks of pandemic, Nepal economy came to face a sharp deterioration of foreign reserves and sporadic credit crunches in financial systems.

To figure out what went wrong in Nepal, this project focused on the impact of private sector credit growth on real sector economy in Nepal. After reviewing the general dynamic trends of private sector credits in Nepal, we examined the effects of private sector credit growth on real sector economies of Nepal via a dynamic stochastic general equilibrium (DSGE) model analysis and vector auto-regressive model analysis with exogenous variables (VAR-X).

The estimation results show somewhat mixed features mainly due to limited data availability in terms of period and data horizon. Nevertheless, we can derive a rough estimation that notwithstanding the current financial turmoil due to sharp decrease of foreign reserves and possible liquidity crisis, the progressive approaches by the Nepal monetary authorities to provide more resources to potentially productive and efficient sectors should be continued, considering the empirical evidences that private credits to corporate sectors significantly contributed to the economic growth in Nepal.

However, the current turmoil in foreign reserves and possible liquidity crisis are another strong evidence that there are huge room for improvement in financial monitoring in terms of micro and macro-prudential policies in Nepal. It is considered to be almost true that the majority of emergency aids via expansionary monetary policies after pandemic had been siphoned to imports of consumer goods including luxury goods and housing investments. In that context, we come to face a grave financial policy postulate that active policy efforts to boost up private sector credits in Nepal for more dynamic industrialization and economic development should go in parallel with the very close

financial micro and macro-monitoring systems. The exact path for the optimal policy mix between active private credits policies for dynamic growth and financial regulatory policies to minimize the financial instability is more likely to be found when the Nepalese monetary authorities come to have more long-term perspectives in economic and political context.

Although it has been found that the private sector credit growth in Nepal has had relatively limited impacts on economic growth in real sectors, the role of efficient private sector credit growth cannot be overemphasized considering the very early stage of industrialization and economic development of Nepal. In that context, it is recommended that the private sector credit policies should go together with the industrial development policies to maximize the effectiveness of private sector credit growth as an engine of economic growth. In addition, from the very early stage of loan making process, strict micro-prudential policy efforts should be complemented to prevent the possible waste of the private sector credits in addition to macro-prudential policy efforts to minimize possible financial instability. To build up the optimal policy mix mechanism, further efforts to establish reliable micro-financial data collection system should be preceded.

Appendix

A. Measuring the business and financial cycles in Nepal

(1) Concepts and measurement methods

(a) Concepts

The business cycle refers to the cyclical fluctuations in the real sector. On the other hand, the financial cycle generally refers to changes in perceptions and attitudes toward financial risks, or periodic fluctuations in financial variables caused by the interaction of those changes with financial constraints (Borio, 2012). The business cycle can usually be extracted by identifying conditions where the size of real GDP is larger or smaller than its long-term average level. Financial cycles can be measured through changes in total credit (credit to businesses and households).

(b) Measurement method

In the case of Nepal, the CBS does not officially announce information on the reference cycle dates, which means the peak and trough of the business cycle. Accordingly, finding the business cycle reference dates of Nepal's economy can be an important task. First, a band pass (BP) filter method was applied to the quarterly real GDP level to extract the business cycle. For the cycles thus extracted, the phases of expansion and contraction of the cycles were determined through Turning Point (TP) analysis. In the first step of the TP method, 4 quarters before and after a specific point in the indicator level, that is, a total of 8 quarters, are compared, and the highest value in the quarter is classified as a peak, and the lowest value as a trough. In the second step, among the tentative cycles identified based on the candidate peaks and troughs found in the first step, the final cycle

is selected if the length of the expansion and contraction phases is at least 4 quarters and the cycle length is 8 quarters or more.

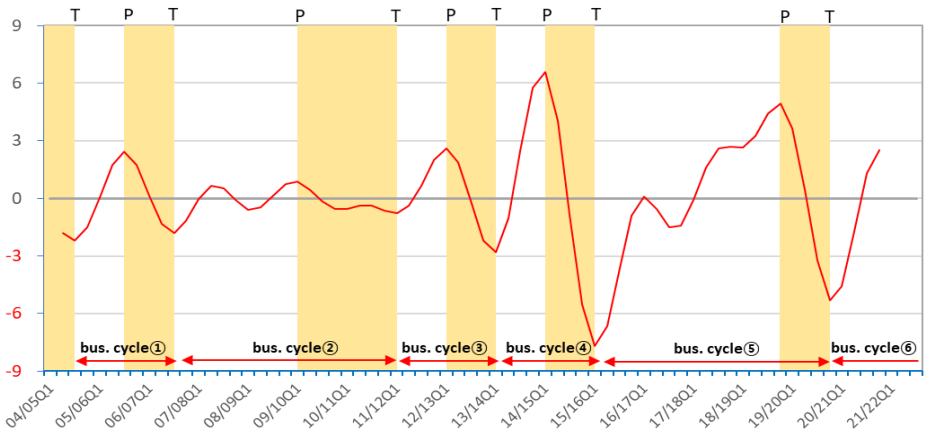
The financial cycle was calculated by applying the BP filter as in the business cycle. The rest of the details are the same as when calculating the real cycle.

(2) Results of measuring the business and financial cycles

(a)The business cycle

The business cycle extracted by the BP filter method for the real GDP of Nepal from 2004/05Q2 to 2020/21Q4 is shown in <Figure A-1>. The average duration of the cycle was 12.2 quarters.

<Figure A-1> The business cycle and its Peaks and Troughs



Note: P and T stand for the peak and trough of the business cycle in terms of GDP, respectively, and the shaded area indicates the phase of economic contraction.

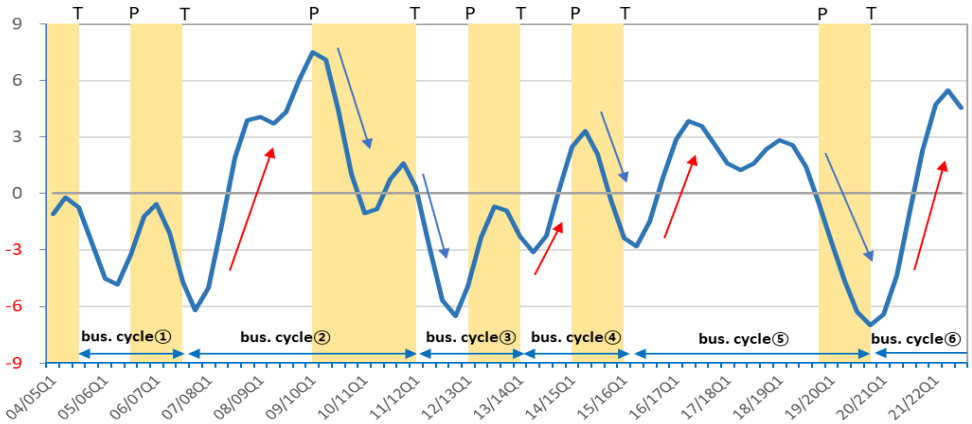
<Table A-1> Duration of the business cycle and the peaks

	Cycle period	Peak	Duration(quarter)	
Cycle ①	2004/05Q3 ~2006/07Q3	2005/06Q3	8	Average cycle: 12.2
Cycle ②	2006/07Q3 ~ 2011/12Q1	2009/10Q1	18	
Cycle ③	2011/12Q1 ~ 2013/14Q1	2012/13Q1	8	
Cycle ④	2013/14Q1 ~ 2015/16Q1	2014/15Q1	8	
Cycle ⑤	2015/16Q1 ~ 2019/20Q4	2018/19Q4	19	
Cycle ⑥	2019/20Q4 ~ ··	··	··	

(b) The financial cycle

The financial cycle extracted by the BP filter method for the level of real total credit from 2004/05Q1 to 2021/22Q3 (deflated by dividing total credit by CPI) is shown in <Figure A-2>. The financial cycle is drawn against the background of the expansion and contraction periods identified on the basis of the business cycle. Through this figure, it is possible to identify the phenomenon of synchronism or discrepancy between economic fluctuations and financial cycles.

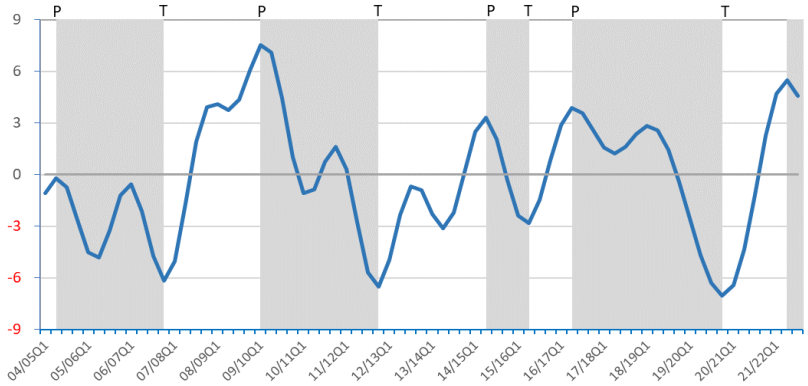
<Figure A-2> The financial cycle and economic fluctuations



Note: P and T stand for the peak and trough of the business cycle, respectively, and the shaded area indicates the phase of economic contraction.

Meanwhile, the expansion and contraction periods of the financial cycle itself can be confirmed through <Figure A-3>. Compared to <Figure A-2>, there is a difference between the beginning and end of the contraction phase.

<Figure A-3> The expansion and contraction of the financial cycle

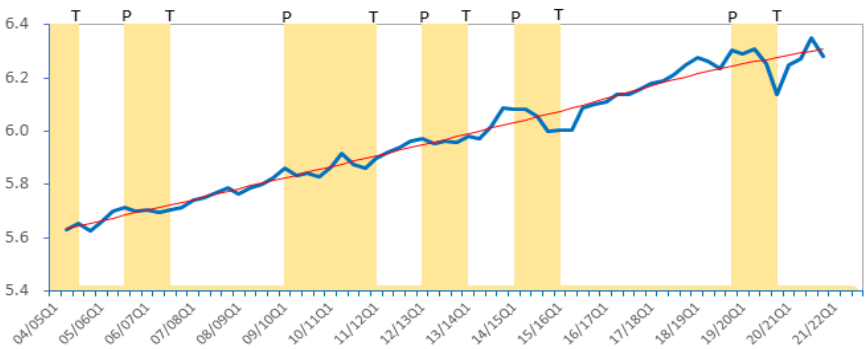


Note: P and T stand for the peak and trough of the financial cycle, respectively, and the shaded area indicates the phase of financial contraction.

<Table A-2> Duration of the financial cycle and the peaks

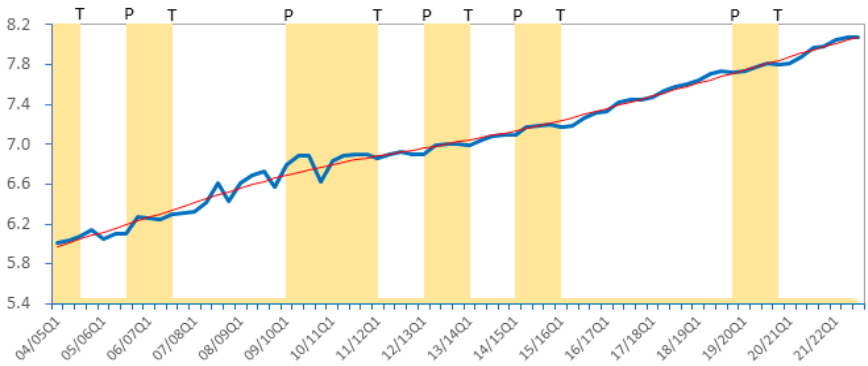
	Cycle period	Peak	Duration(quarter)	
Cycle ①	·· ~ 2006/07Q4	2004/05Q2	8	Average cycle: 17.3
Cycle ②	2006/07Q4 ~ 2011/12Q4	2009/10Q1	18	
Cycle ③	2011/12Q4 ~ 2015/16Q2	2014/15Q2	8	
Cycle ④	2015/16Q2 ~ 2019/20Q4	2016/17Q2	8	
Cycle ⑤	2019/20Q4 ~ ··	··	··	

<Figure A-4> Real GDP and its trend of Nepal



Notes: 1) The vertical axis is the logarithmic value of real GDP
2) Long-run trend is calculated with HP filter (λ=1400)
3) P and T stand for the peak and the trough in terms of GDP, respectively , and the shaded area indicates the phase of economic contraction.

<Figure A-5> Real total credit and its trend of Nepal



Notes: 1) The vertical axis is the logarithmic value of real credit

2) Long-run trend is calculated with HP filter (λ=1400)

3) P and T stand for the peak and the trough in terms of GDP, respectively , and the shaded area indicates the phase of economic contraction.

B. * Loan Behavior Survey Question Item(2022.3/4Q)

1. Lending Attitude

<Large corporations>

1. Has there been any change in the loan handling standards or loan policies for large corporations of your institution in the past three months (including the month of preparation of the survey table)?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(1-1) In the case of responding to the above question that the loan handling standards of large corporations have changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

2. Is there any change in your institution's loan handling standards or loan policies for large corporations over the next three months?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(2-1) In the case of responding to the above question that the loan handling standards of large corporations would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

<Small and medium corporations>

3. Has there been any change in the loan handling standards or loan policies for SMEs of your institution in the past three months (including the month of preparation of the survey table)?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(3-1) In the case of responding to the above question that the loan handling standards of SMEs have changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

4. Is there any change in your institution's loan handling standards or loan policies for SMEs over the next three months?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(4-1) In the case of responding to the above question that the loan handling standards of SMEs would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

<Household Loan: general> * a credit Loan, a credit card Loan, etc.

5. Has there been any change in the loan handling standards or loan policies for general household loans of your institution in the past three months (including the month of preparation of the survey table)?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(5-1) In the case of responding to the above question that the loan handling standards for general household loans have changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

6. Is there any change in your institution's loan handling standards or loan policies for general household loans over the next three months?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(6-1) In the case of responding to the above question that the loan handling standards of general household loans would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

<Household Loan: housing Related> * a housing mortgage Loan, etc.

7. Has there been any change in the loan handling standards or loan policies for housing-related household loans of your institution in the past three months (including the month of preparation of the survey table)?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(7-1) In the case of responding to the above question that the loan handling standards for housing-related household loans have changed(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

8. Is there any change in your institution's loan handling standards or loan policies for housing-related household loans over the next three months?

	Greatly strengthened	Somewhat strengthened	No change	Somewhat relieved	Greatly relieved
Lending attitude (Comprehensive Opinion)					
Loan collateral requirements					
Interest rate spread					
A loan limit					
Loan grace period					
The longest expiration period					
Warranty Requirements					
Conditions for extension and re-handling					

(8-1) In the case of responding to the above question that the loan handling standards of housing-related household loans would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Financial Institution	Equity capital ratio			
	Financing conditions			
	A fund management policy			
	Credit soundness management			
Market	Internal and external business conditions and uncertainty			
	Performance of specific industries/corporates			
	Collateral value (Real estate, etc.)			
	Competition among financial institutions			
Policy	Regulatory policy			
	Monetary policy (Policy Interest Rate, etc.)			
Others	( )			

2. Loan Demand

<Large corporations>

9. Has there been any change in the demand for loans to large corporations in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(9-1) In the case of responding to the above question that the demand for loans to large corporations in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Demand for operating funds			
	Demand for facility funds			
	Demand for extra funds			
	Financial status (ex. internally retained earnings)			
Market	Financing through corporate bonds, etc			
	Raising funds through capital increase, etc			
	Internal and external economic conditions and uncertainties			
	Competition among financial institutions			
Interest rates	Loan interest rate (Base rate)			
	Loan interest rate (Spread rate			
Others	( )			

10. Is there any change in the demand for loans to large corporations in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(10-1) In the case of responding to the above question that the demand for loans to large corporations in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Demand for operating funds			
	Demand for facility funds			
	Demand for extra funds			
	Financial status (ex. internally retained earnings)			
Market	Financing through corporate bonds, etc			
	Raising funds through capital increase, etc			
	Internal and external economic conditions and uncertainties			
	Competition among financial institutions			
Interest rates	Loan interest rate (Base rate)			
	Loan interest rate (Spread rate			
Others	( )			

<Small and Medium corporations>

11. Has there been any change in the demand for loans to SMEs in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(11-1) In the case of responding to the above question that the demand for loans to SMEs in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Demand for operating funds			
	Demand for facility funds			
	Demand for extra funds			

	Financial status (ex. internally retained earnings)			
Market	Financing through corporate bonds, etc			
	Raising funds through capital increase, etc			
	Internal and external economic conditions and uncertainties			
	Competition among financial institutions			
Interest rates	Loan interest rate (Base rate)			
	Loan interest rate (Spread rate			
Others	( )			

12. Is there any change in the demand for loans to SMEs in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(12-1) In the case of responding to the above question that the demand for loans to SMES in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Demand for operating funds			
	Demand for facility funds			
	Demand for extra funds			
	Financial status (ex. internally retained earnings)			
Market	Financing through corporate bonds, etc			
	Raising funds through capital increase, etc			
	Internal and external economic conditions and uncertainties			
	Competition among financial institutions			
Interest rates	Loan interest rate (Base rate)			
	Loan interest rate (Spread rate			
Others	( )			

<Household Loan: general> * a credit loan, a credit card loan, etc.

13. Has there been any change in the demand for general household loans in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(13-1) In the case of responding to the above question that the demand for general household loans in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Changes in household income			
	Consumption of durable goods such as passenger cars			
	Education expenses, medical expenses etc.			
	Housing expenses such as monthly rent			
	Demand for housing purchase funds			
	Demand for lease funds			
Market	Internal and external economic conditions and uncertainties			
	Changesin house prices or volume of transactions			
Interest rates	Loan interest rate(Base rate)			
	Loan interest rate(Spread rate			
Others	( )			

14. Is there any change in the demand for general household loans in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(14-1) In the case of responding to the above question that the demand for general household loans in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Changes in household income			
	Consumption of durable goods such as passenger cars			
	Education expenses, medical expenses etc.			
	Housing expenses such as monthly rent			
	Demand for housing purchase funds			
	Demand for lease funds			
Market	Internal and external economic conditions and uncertainties			
	Changesin house prices or volume of transactions			
Interest rates	Loan interest rate(Base rate)			
	Loan interest rate(Spread rate			
Others	( )			

<Household Loan: housing Related> * a housing mortgage Loan, etc.

15. Has there been any change in the demand for housing-related household loans in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(15-1) In the case of responding to the above question that the demand for housing-related household loans in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Changes in household income			
	Consumption of durable goods such as passenger cars			
	Education expenses, medical expenses etc.			

	Housing expenses such as monthly rent			
	Demand for housing purchase funds			
	Demand for lease funds			
Market	Internal and external economic conditions and uncertainties			
	Changesin house prices or volume of transactions			
Interest rates	Loan interest rate(Base rate)			
	Loan interest rate(Spread rate			
Others	( )			

16. Is there any change in the demand for housing-related household loans in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Loan demand					

(16-1) In the case of responding to the above question that the demand for housing-related household loans in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Changes in household income			
	Consumption of durable goods such as passenger cars			
	Education expenses, medical expenses etc.			
	Housing expenses such as monthly rent			
	Demand for housing purchase funds			
	Demand for lease funds			
Market	Internal and external economic conditions and uncertainties			
	Changesin house prices or volume of transactions			
Interest rates	Loan interest rate(Base rate)			
	Loan interest rate(Spread rate			
Others	( )			

3. Credit Risk

<Large corporations>

17. Has there been any change in the credit risk of large corporations in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(17-1) In the case of responding to the above question that the credit risk of large corporations in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Corporate performance such as profitability			
	Debt repayment capacity			
	Financial status such as reserves			
	Mergers, acquisitions and restructuring			
Market	Internal and external economic conditions and uncertainties			
	Collateral value of real estate, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

18. Is there any change in the credit risk of large corporations in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(18-1) In the case of responding to the above question that the credit risk of large corporations in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Corporate performance such as profitability			
	Debt repayment capacity			
	Financial status such as reserves			
	Mergers, acquisitions and restructuring			
Market	Internal and external economic conditions and uncertainties			
	Collateral value of real estate, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

<Small and Medium corporations>

19. Has there been any change in the credit risk of SMEs in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(19-1) In the case of responding to the above question that the credit risk of SMEs in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Corporate performance such as profitability			
	Debt repayment capacity			
	Financial status such as reserves			
	Mergers, acquisitions and restructuring			
Market	Internal and external economic conditions and uncertainties			

	Collateral value of real estate, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

20. Is there any change in the credit risk of SMEs in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(20-1) In the case of responding to the above question that the credit risk of SMEs in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Corporate performance such as profitability			
	Debt repayment capacity			
	Financial status such as reserves			
	Mergers, acquisitions and restructuring			
Market	Internal and external economic conditions and uncertainties			
	Collateral value of real estate, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

<Household Loan: general> *a credit loan, a credit card loan, etc.

21. Has there been any change in the credit risk of general household loans in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(21-1) In the case of responding to the above question that the credit risk of general household loans in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Debt repayment capacity			
	Financial soundness of low credit and low-income class			
	Increase or decrease in the share of multiple debtors			
	Changes in household income by employment Status			
Market	Internal and external economic conditions and uncertainties			
	Changes in the collateral value of houses, apartments, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

22. Is there any change in the credit risk of general household loans in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(22-1) In the case of responding to the above question that the credit risk of general household loans in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Debt repayment capacity			
	Financial soundness of low credit and low-income class			
	Increase or decrease in the share of multiple debtors			
	Changes in household income by employment Status			
Market	Internal and external economic conditions and uncertainties			
	Changes in the collateral value of houses, apartments, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

<Household loan: housing related> * a housing mortgage loan, etc.

23. Has there been any change in the credit risk of housing-related household loans in your institution in the past three months (including the month of preparation of the survey table)?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(23-1) In the case of responding to the above question that the credit risk of housing-related household loans in your institution has changed (①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Debt repayment capacity			
	Financial soundness of low credit and low-income class			
	Increase or decrease in the share of multiple debtors			
	Changes in household income by employment Status			

Market	Internal and external economic conditions and uncertainties			
	Changes in the collateral value of houses, apartments, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

24. Is there any change in the credit risk of housing-related household loans in your institution over the next three months?

	A significant increase	A slight increase	No change	A slight decrease	A significant decrease
Credit Risk					

(24-1) In the case of responding to the above question that the credit risk of housing-related household loans in your institution would change(①,②,④,⑤), how much did the following factors affect it?

		No impact	Slightly affected	Greatly affected
Borrower	Debt repayment capacity			
	Financial soundness of low credit and low-income class			
	Increase or decrease in the share of multiple debtors			
	Changes in household income by employment Status			
Market	Internal and external economic conditions and uncertainties			
	Changes in the collateral value of houses, apartments, etc.			
	Profitability of exports such as exchange rates			
	Interest burden due to changes in loan interest rates			
Others	( )			

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III. The impacts of private sector credit growth on real sectors in the Nepalese economy	**NRB research team led by Birenda Budha** **Tae Bong Kim** **Hee Joon Han**
IV. Implications on optimal policies with respect to private sector credit growth	**NRB research team led by Rabin Bhandari and Buddha Raj Sharma** **Sangho Yi** **Jeongwhan Cho**
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