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Deficit Financing with the National Saving Certificate and Its Macroeconomic Consequences on Bangladesh's Economy

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Keywords

NSC financing, budget deficit, fiscal policy, savings, investment, SVAR, Bangladesh

JEL Classification

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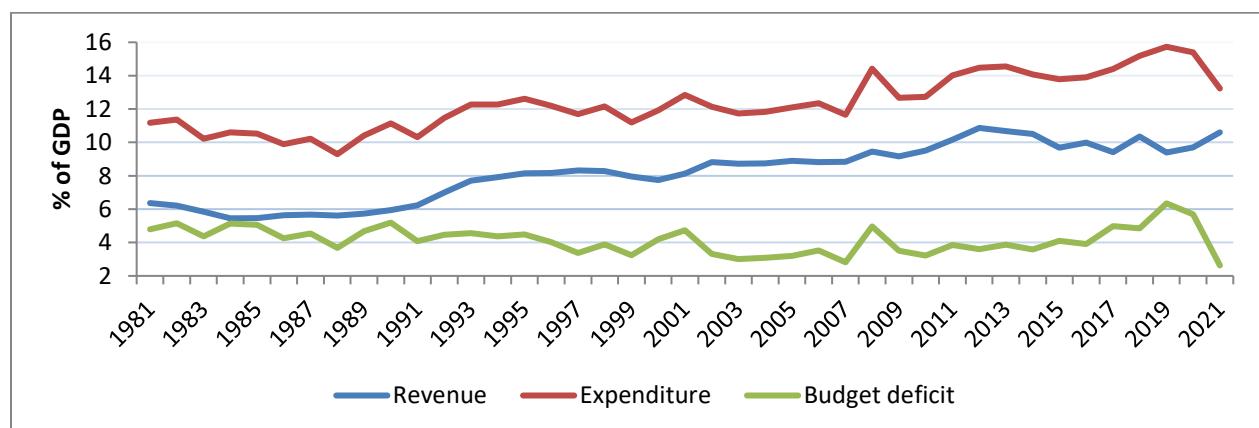
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1. Introduction

Bangladesh achieved a high GDP growth rate (6.43 per cent on average) over the last decade (FY¹12 to FY21) despite a slowdown in FY2019 due to the COVID-19 pandemic. However, domestic revenue, which was historically low, could not keep up with robust GDP growth. Government revenue was below 6 per cent of GDP until the introduction of the value-added tax (VAT) law in 1991. After that, revenue collection picked up gradually but still hovered around 9 per cent of GDP, which is one of the lowest in the world according to the IMF. Government expenditure, which was around 9 per cent of GDP in the early 1980s, also rose to around 14 per cent of GDP in the late 2020s (Figure 1). With such a low revenue base, the government has persistently run a budget deficit of around 4-5 per cent of GDP.

Figure 1 Revenue, Expenditure & Budget deficit



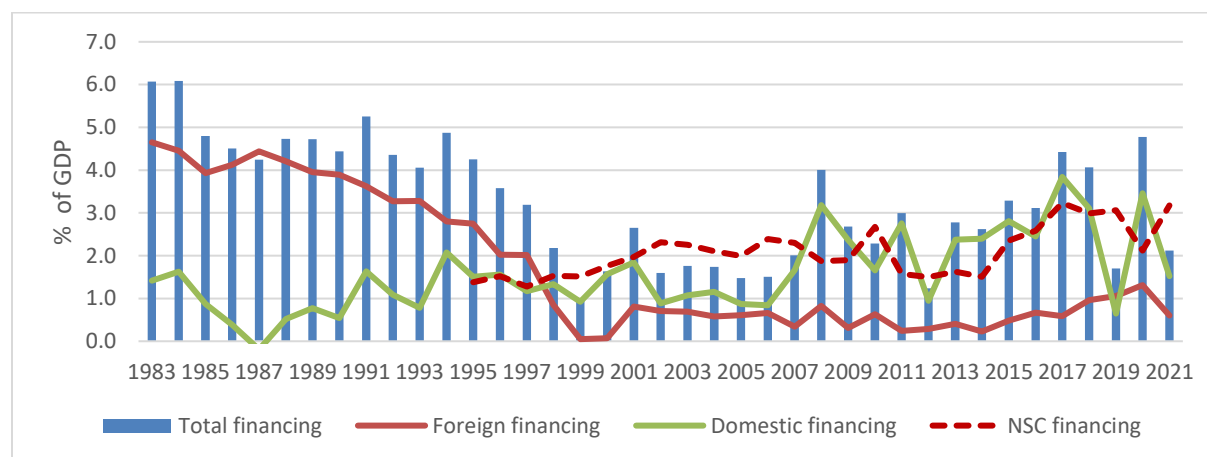
Source: Finance Division, Ministry of Finance, Bangladesh

The composition of the budget deficit has changed significantly over the years. In the early 1980s and 1990s, the major share of the budget deficit was financed from external sources as the government had access to concessional external finance as a low-income country. However, the share of external finance dropped below 1 per cent of GDP in the 2000s down from around 5 per cent of GDP in the 1980s (Figure 2). With a reduced flow of external finance, the government

¹ FY12 stands for the fiscal year 2011-12 that starts on 1st July 2011 and ends on 30th June 2012.

turned to domestic sources, such as banks (through treasury bills and bonds) and non-banks (through NSCs) to finance the budget deficit from FY07 onwards. The non-bank borrowing increased significantly, especially after FY13 on the back of higher NSC demand as (i) NSC interest rates are higher than the bank deposit rates and (ii) NSC holders enjoy tax concessions. The volume of NSC flow fluctuated significantly (Figure 2) as the government provides any amount of NSCs at a fixed interest rate.

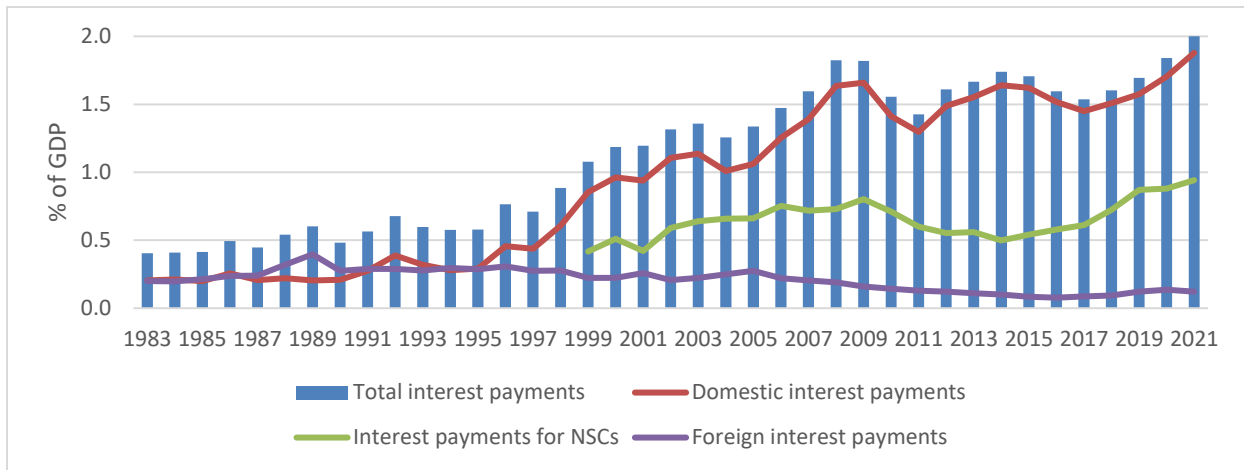
Figure 2 Budget financing sources



Source: Finance Division, Ministry of Finance, Bangladesh

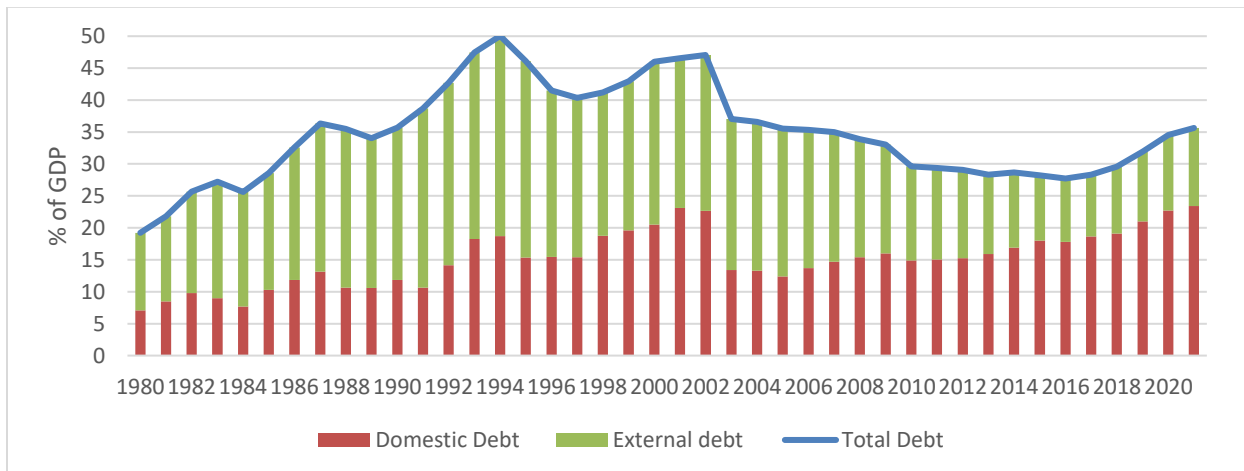
Budget financing with NSCs at a significantly higher interest rate (9.35-11.76 per cent) than the market rate (4-9 per cent) has resulted in a higher fiscal liability for the government. Total interest payments nearly quadrupled in the 2020s (approx. 2 per cent of GDP) than to the 1980s (0.5 per cent of GDP) (Figure 3), mainly because of the rising share of domestic financing led by NSCs. With a deficit-biased fiscal policy, a higher debt servicing cost is usually met through more borrowing that accelerates the debt stock (Easterly and Schmidt-Hebbel, 1993). Rising interest payments due to NSC financing have resulted in reversing the declining trend of the total debt and rapid accumulation of domestic debt, which climbed to 23.4 per cent of GDP at the end of FY21 from 12.4 of GDP at the end of FY05 (Figure 4).

Figure 3 Government's interest payments



Source: Finance Division, Ministry of Finance, Bangladesh

Figure 4. Composition of government debt



Source: IMF Historical Public Debt Database, IMF-WEO and Economic Resources Division, Ministry of Finance, Bangladesh

Despite the high debt services cost and rising domestic debt, Bangladesh experienced robust GDP growth during the last decade, which poses the question of whether NSC financing at a higher interest rate has contributed to domestic savings and investment and assisted in GDP growth. While a high GDP growth rate in the last decade has raised domestic savings and investment, private investment (7.28 per cent growth on average) fell behind public investment (9.57 per cent growth on average) during the period. Empirical literature provided by [Fischer and Easterly \(1990\)](#), [Easterly and Schmidt-Hebbel \(1993\)](#), and [Gale and Orszag \(2003\)](#) find that a sustained

budget deficit with too much domestic borrowing leads to a higher interest rate and crowds out private investment in developing countries. Therefore, it cannot be ruled out that budget financing with NSCs adversely affects the market interest rate and private investment in Bangladesh.

This study analyzes the macroeconomic impacts of over-dependence on NSCs for financing budget deficits on gross domestic savings, government consumption, government investment, private investment and GDP to investigate whether NSC flow mobilizes domestic savings and increases private investment or crowds out private investment. Using annual data from 1983 to 2021 and quarterly data from 2008Q3 to 2022Q2 and by employing a structural vector autoregression (SVAR) model with short-run restrictions, the study finds that a rise in the NSC interest rate does not increase gross domestic savings but increases the lending rate significantly. This indicates that NSC financing with a higher interest rate does not bring enough informal savings to the formal economy as the targeted small savers may not have significant investments in NSCs; rather, rich people may be the real beneficiaries of this saving scheme. Thus, deficit financing with NSC does neither promote savings nor qualify for the safety net objective as intended by the government. However, a rise in the NSC interest rate that raises NSC demand boosts government investment in the short run but does not increase government consumption, and depresses private investment and GDP as the lending rate rises.

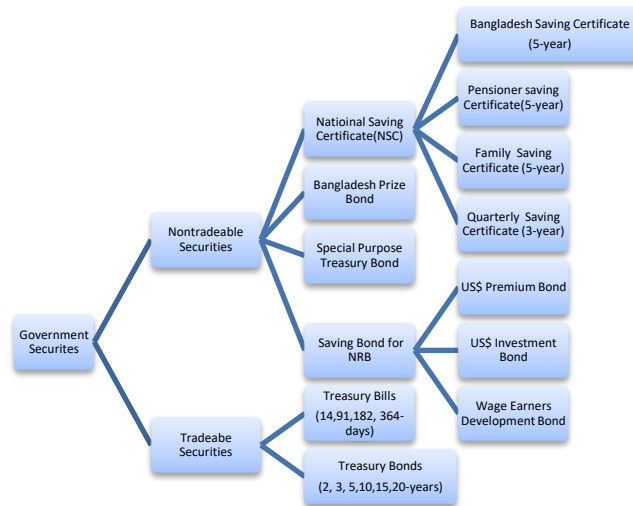
The remainder of this paper is organized as follows. Section 2 briefly discusses the background and characteristics of NSCs, Section 3 reviews relevant literature related to nonmarketable saving bonds, Section 4 discusses the analytical framework, model specification, and identification of the SVAR model, and data, Section 5 discusses impulse responses and forecast error variance decomposition from the baseline model, Section 6 checks the robustness of the baseline model with five alternative models and Section 7 provides conclusion and policy recommendations.

2. National Saving Certificates (NSCs): background and characteristics

NSCs, which were introduced in the former Indian subcontinent in 1944, are issued by the Department of National Savings (NSD) under the Ministry of Finance in Bangladesh. The original intent was to promote savings among a target group of people in the absence of a well-developed banking system and adequate safety nets as well as financing the budget deficit. The target group of people are women, senior citizens, retired government employees and physically handicapped people, who have small savings and usually don't access formal banking services. NSCs, which are redeemable upon maturity or before maturity, are sold by the central bank, commercial banks, and local offices under NSD and post offices. However, investors receive no interest payments if NSCs are redeemed before one year (minimum) and receive fewer interest payments if redeemed before maturity but after one year. The principal mode of redemption is receipt of payment at the issuing bank or post office. There is no secondary market for these instruments.

Mainly, four types of saving certificates (Pensioner, Family, Bangladesh, Quarterly) with different maturities (3-5 years) and interest rates are offered by NSD (Figure 5 & Table A1). In earlier years, there were only two interest rates: one for the 5-year certificate and the other for the 3-year certificate. In July 2010, different interest rates were introduced for different saving certificates. The pensioner saving certificate (for retired government employees) pays the highest interest rate and the family saving certificate, which is designed for women (≥ 18 years) and men (≥ 65 years or above), pays the second highest interest rate. The Bangladesh saving certificate (5 years) and quarterly saving certificate (3 years), which are accessible to any citizen, pay slightly lower interest rates, but significantly higher than the bank deposit rate.

Figure 5. Government securities used for deficit financing in Bangladesh



Source: Bangladesh government securities report for FY2019-20 by Bangladesh Bank.

NSC interest rates, which are set and administered by the government, have been historically high and do not change frequently. Whenever NSC interest rates were reduced (in 1991, 1999, 2001, and 2010), its demand fell, and the government encountered difficulties in budget financing and eventually, revised NSC interest rates. For instance, NSC interest rates were reduced to the lowest level (10-11.04%) in July 2010 to boost the private sector. However, they were revised upward (12.59-13.45%) within two years (March 2012) as alternative sources of financing dried up (Barua and Rahman, 2006). The government reduced NSC interest rates (11.04 - 11.76%) on 23 May 2015, and this is still in force.

Non-price control measures, such as individual maximum threshold limits, and mandatory submission of national identity cards are often used to control demand for NSCs (Barua and Rahman, 2006). The government introduced (i) a national identity (NID) based database, (ii) mandatory tax identification number (TIN) to enforce individual maximum limit and (iii) raised source tax on the interest income from NSCs to ten per cent from five per cent to control NSC flow in FY20. In the latest move on 21st September 2021, the government created different segments for NSC investment to control NSC flow. The interest rate remains the same as it was in 2015 for investments up to 1.5 million BDT; however, it has been lowered for the next segment

(1.5 million BDT+ - 3.0 million BDT) and it is the lowest for any investment beyond 3 million BDT.

Although small savers with little knowledge of capital markets and little financial sophistication are supposed to purchase NSCs rich people including institutional investors can also purchase NSCs as there is no strict exclusion mechanism². The government is also lenient in borrowing with NSCs so that the private sector can access enough credit from the banking sector in the absence of a well-developed financial market. Consequently, the government borrows more when the demand for NSC is high and borrows less when the demand for NSC is low irrespective of its' financing requirement.

3. Literature review

While the empirical literature ([Fischer and Easterly \(1990\)](#), [Easterly and Schmidt-Hebbel \(1993\)](#), [Gale and Orszag \(2003\)](#)) argue that sustained budget deficit reduces national savings, increases interest rates and crowds out private investment, the fiscal authority in Bangladesh has relied on NSCs to finance the budget deficit as arguably they promote savings and provide a safety net (as interest subsidy) to the small savers. The excessive usage of NSCs for budget financing has been criticized by the IMF ([2017](#), [2018a](#), [2018b](#)) which argue that budget financing through NSCs i) increases the cost of government financing ii) weakens debt management due to uncontrollable NSC flow iii) reduces the liquidity of government securities markets and monetary policy effectiveness and iv) limits the supply of risk-free assets for deposit-taking banks. The IMF ([2018b](#)) estimated interest costs of 42.7 billion BDT (0.22% of GDP) from additional issuance of NSCs in FY2014-17. It recommended a change in the pricing mechanism of NSCs by linking their rates directly to government security yields or completely abolishing the scheme. [Paul \(2019\)](#) also argued that relying on high-interest-bearing NSCs for budget financing hinders private investment and leads to substantial interest payments for the government. He noted that NSCs are impeding

² No one requires declaring his sources of income while purchasing NSCs except pensioner saving certificate ([Uddin et al., 2019](#)).

the development of a bond market, as investors prefer the safer NSCs over the riskier capital market.

[Goacher \(1984\)](#) introduced non-marketable national saving instruments³ into the standard fix-price pseudo-dynamic IS-LM model developed by [Blinder and Solow \(1973\)](#) to analyze the effects of the British government's fiscal policy with non-marketable saving bonds. Although he found indeterminate effects of deficit-financed fiscal policies with these bonds, he suggested that money-financed fiscal policies with these bonds could generate a negative income multiplier. [Feltenstein and Iwata \(2002\)](#) analyzed the relationship between the demand for nonmarketable National Saving Scheme (NSS) and other financial instruments (saving deposits, fixed-term deposits, and foreign currency deposits) in Pakistan using annual data from 1981 to 1996. They found that a higher NSS interest rate negatively affects bank deposits and foreign currency deposits in Pakistan.

[Huh and Lee \(2021\)](#) examine the monetary policy transmission mechanism by using vector autoregression impulse responses while the government sets its interest rate for NSCs to conduct fiscal policy in Bangladesh. They find that NSCs affect the interest rate, M2, and inflation in a similar way to open market operation while monetary policy instruments (reserve money and repo rate) are ineffective in affecting the interest rate, money supply and inflation in Bangladesh. The study suggests that NSCs can be considered a special policy tool that affects the financial market although it is not the government's intention to affect the interest rate or money supply. [Saadat \(2021\)](#) investigates whether the Bangladesh government's budget financing with NSCs is similar to a Ponzi scheme using conditions set by [Ball et al. \(1998\)](#), [Mehrotra \(2017\)](#), [Trehan and Walsh \(1991\)](#), [Ahmed and Rogers \(1995\)](#), [Quintos \(1995\)](#), and [Bergman \(2001\)](#) with annual data from FY1999 to FY2019. The study casts doubt on sustaining a perpetual Ponzi scheme with all four types of NSCs given their higher interest rates.

While [Goacher \(1984\)](#) suggests that the British government's nonmarketable saving assets could generate a negative income multiplier and [Feltenstein and Iwata \(2002\)](#) found that nonmarketable

³ British government's national savings instruments pay relatively lower interest rates than other marketable bonds while Pakistan's NSS pays at a higher interest rate similar to Bangladesh.

NSS adversely affects bank deposits and foreign reserves in Pakistan, few empirical studies were conducted to investigate the impacts of NSCs on Bangladesh economy. To the best of my knowledge, no empirical research investigated whether NSCs promote savings or private investment or crowd out private investment or meet the social safety net objective as claimed by the fiscal authority in Bangladesh. This paper attempts to fill the gap in the literature by examining the theoretical arguments against NSCs made by IMF (2017, 2018a, 2018b) and Paul (2019) in an empirical framework and contributes to the literature on non-marketable saving bonds that are used by the fiscal authority in some countries.

4. Empirical framework

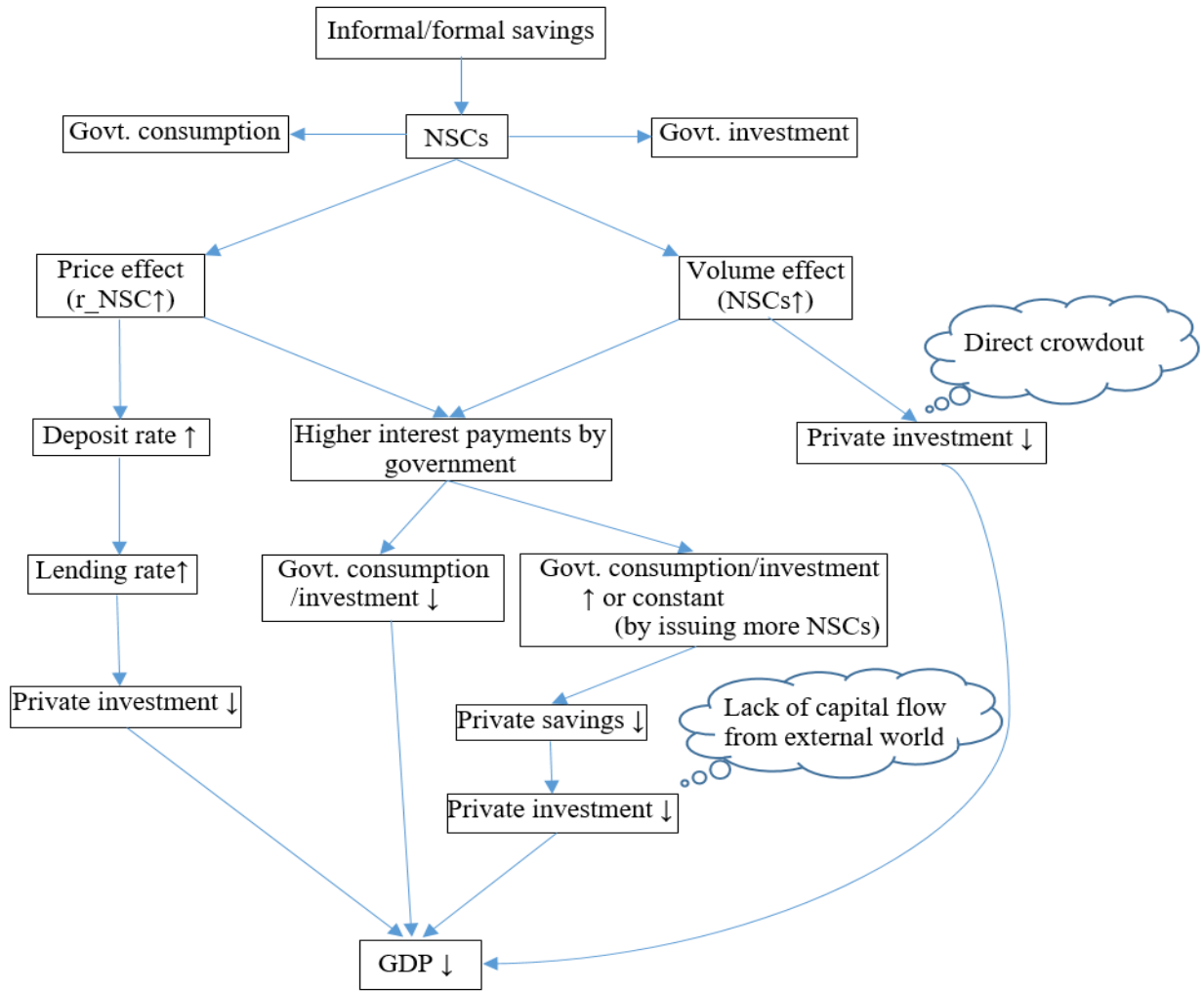
Budget financing with NSCs can affect the macroeconomy through several fronts: i) Direct crowding out of private investment when private savings goes for NSC investment ii) Indirect crowding out of private investment through a rise in the lending rate iii) Lower government consumption/investment due to a higher interest payments liability iv) Higher government consumption/investment in the short run with increasing NSC flow v) Rapid accumulation of government debt through higher interest payments and thus brings the question of debt sustainability. This paper focuses on the macroeconomic impacts of NSC financing on the lending rate, government consumption, government investment, private investment and GDP.

4.1 Analytical framework

Figure 6 shows how the macroeconomic variables interact with each other while the government conducts its fiscal policy with a high interest-bearing NSC. When NSCs flow to the government treasury, it is either used for government consumption (Pays and allowances, government purchase of goods and services) or government investment (annual development program). An NSC flow has two-dimensional effects on the macroeconomy through its price and volume. A higher NSC interest can affect the deposit rate and the lending rate and subsequently can affect private investment and GDP. A higher volume of NSCs can crowd out private investment directly when the government divert private savings to the government with a higher interest rate. A higher flow of NSCs increases the interest payment liability of the government. With a higher fiscal liability, the government must reduce its consumption or investment or it can temporarily increase

consumption or investment by selling more NSCs. However, if the government diverted too much public savings to its treasury by selling more NSCs, the private savings and investment would be affected adversely in the absence of a capital flow from the external world and thus, negatively affect GDP.

Figure 6 Macroeconomic impacts of the deficit financing with NSCs



4.2 SVAR model and identification

An SVAR model for Bangladesh's economy has been assumed as:

$$AX_t = B_0 + B_j * X_{t-j} + \epsilon_t \dots\dots\dots(1)$$

Where X_t is a set of endogenous variables (7×1) and matrix A represents the contemporaneous relationship among variables, \mathcal{E}_t (7×1) is a vector of structural disturbances with zero means.

The goal is to obtain the structural model that isolates the exogenous shocks and measures the impact of these shocks on the variables included in the model. As the structural VAR model cannot be estimated directly, it requires imposing restrictions on matrix A for identification.

Equation (1) can be written as the following reduced form VAR:

$$X_t = G_0 + G(L) * X_{t-j} + e_t \dots \dots \dots (2)$$

where, $G_0 = A^{-1} * B_0$, $G(L) = A^{-1} * B_j$, which is the lag matrix with $j =$ no of lag
 $e_t = A^{-1} * \mathcal{E}_t$, Matrix A relates the forecast error of the reduced form variables (e_t) with structural shocks (\mathcal{E}_t)

The contemporaneous relationship among variables is identified with a non-recursive identification strategy (Kim and Roubini, 2000) by imposing restrictions on contemporaneous parameters [A] based on the analytical framework (Figure 6). The ordering of the variables follows equation (3):

$$X_t = [r_NSC_t \quad GDS_t \quad GCONS_t \quad GINV_t \quad LR_t \quad PINV_t \quad GDP_t]' \dots \dots \dots (3)$$

where r_NSC stands for NSC interest rate, GDS stands for gross domestic savings, $GCONS$ stands for government consumption, $GINV$ stands for government investment, LR stands for lending rate and GDP stands for gross domestic product and t stands for time.

External sector variables are not included in the model since NSC financing is expected to mostly affect the domestic sector of the economy. Gross domestic savings instead of gross national savings are used to isolate the effect of secondary income (i. e. remittances) and external sector variables are not used in the model. Aschauer (1989) argues that public sector spending, especially in core infrastructures acts as complementary to the private sector production and generates substantial impacts on output (output multiplier of more than one for public investment and less than one for public consumption). Therefore, $GCONS$ and $GINV$ have been used separately in the model. The

lending rate, which affects private investment, is expected to be influenced by the NSC interest rate and therefore, it is included in the model.

Although the ordering of the variables is not important for the estimation of the VAR model, impulse responses derived from the model depend on how the variables are ordered in the system (Sims, 1980). The convention is that the most exogenous variable is placed first, and the most endogenous variable is placed last so that the variables in the higher order do not contemporaneously react to the variables in the lower order. Since the objective of this study is to assess the macroeconomic impact of excessive use of NSCs, and the government set the target of financing through NSCs with their interest rates at the beginning of the fiscal year, r_NSC is ordered first and is assumed as the most exogenous variable in the model. As the study examines whether NSCs' flow increases domestic savings, GDS is ordered after r_NSC followed by GCONS and GINV. Since GCONS is a recurrent expenditure, which is relatively stable whereas GINV is volatile as it depends on how the government finances its budget deficit, GCONS is ordered before GINV. As LR is an important determinant of private investment, it is ordered before PINV followed by GDP. When the government raises NSC interest rates, more NSCs flow into the government treasury which affects government consumption, government investment, private investment and GDP.

Contemporaneous restrictions are specified according to the following equation:

$$\begin{bmatrix} e_t^{r_NSC} \\ e_t^{GDS} \\ e_t^{GCONS} \\ e_t^{GINV} \\ e_t^{LR} \\ e_t^{PINV} \\ e_t^{GDP} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ a_{41} & 0 & a_{43} & 1 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & a_{56} & 0 \\ a_{61} & 0 & a_{63} & a_{64} & a_{65} & 1 & 0 \\ a_{71} & 0 & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{bmatrix} * \begin{bmatrix} \mathcal{E}_t^{r_NSC} \\ \mathcal{E}_t^{GDS} \\ \mathcal{E}_t^{GCONS} \\ \mathcal{E}_t^{GINV} \\ \mathcal{E}_t^{LR} \\ \mathcal{E}_t^{PINV} \\ \mathcal{E}_t^{GDP} \end{bmatrix} \dots\dots\dots(4)$$

r_NSC does not contemporaneously react to other variables ($a_{12} = a_{13} = a_{14} = a_{15} = a_{16} = a_{17} = 0$) as it is assumed as the most exogenous variable in the model. Therefore, a structural shock to the NSC interest rate is assumed to equal the reduced form shock to the NSC interest rate. Since I examine whether a higher NSC interest rate brings informal savings into the formal economy, I assume that gross domestic savings is contemporaneously affected by the NSC interest

rate but is not affected by other variables ($a_{23} = a_{24} = a_{25} = a_{26} = a_{27} = 0$). Domestic savings is assumed to be contemporaneously affected by the NSC interest rate as it is a kind of deposit rate offered by the government. If a higher NSC interest rate boosts NSC demand and brings informal savings to the formal economy from small savers, it can contemporaneously affect gross domestic savings.

The government expenditure decision⁴ is made before the commencement of the fiscal year based on projected government revenue and finance. Among expenditure items, government consumption (i.e., pay & allowances, goods and services) is recurrent and usually met from domestic revenue. Therefore, it is assumed that government consumption is not contemporaneously affected by other variables ($a_{31} = a_{32} = a_{34} = a_{35} = a_{36} = a_{37} = 0$). The government investment decision is also made at the beginning of the fiscal year; however, it could be affected by government consumption (since both are part of the total government expenditure) as well as NSC financing contemporaneously. Therefore, it is assumed that government investment contemporaneously reacts to the NSC interest rate and government consumption but not to other variables ($a_{42} = a_{45} = a_{46} = a_{47} = 0$). Blanchard and Perotti (2002) also assumed that government expenditure does not contemporaneously respond to GDP.

As the lending rate reacts to both the private sector and public sector, it is assumed that the lending rate contemporaneously reacts to all variables except GDP ($a_{57} = 0$). The private investment equation is specified in a way that it does not contemporaneously react to gross domestic savings and GDP ($a_{62} = a_{67} = 0$) as there is a time lag between savings and investment. GDP equation is specified in a way that it contemporaneously reacts to government consumption, government investment, lending rate (through private investment channel), and private investment, but does not contemporaneously react to gross domestic savings ($a_{72} = 0$) as there is a time lag between savings and investment and hence to contribute to GDP.

⁴ Fiscal policy is declared approximately one month ahead of the fiscal year, which is subsequently discussed and passed in the parliament on or before 30th June with required modifications as the finance bill, which comes into effect from the first day (1st July) of the next fiscal year.

As the model includes 7 variables, it is necessary to impose minimum $(7^2-7)/2=21$ restrictions to just identify the structural model from the estimated VAR. However, four additional restrictions are imposed based on standard economic theory and how NSC financing works in Bangladesh. The over-identification is tested with calculated Chi-square (4) = 1.74, corresponding probability= 0.78. A probability greater than 0.05 indicates that imposed over-identifying restrictions cannot be rejected and therefore, they are valid.

4.3 Data

[Blanchard and Perotti \(2002\)](#), [Mountford and Uhlig \(2009\)](#), and [Caldara and Kamps \(2008\)](#) used quarterly data to identify fiscal policy shocks with the SVAR model, however, quarterly data of real sector variables for Bangladesh are not available. Transforming yearly data to quarterly generates measurement errors, which produce excess shocks (one shock for the variable itself and another shock for measurement error). These excess shocks can result in sizable bivariate correlations between estimated shock innovations, impeding their interpretation ([Pagan and Robinson, 2020](#)). Therefore, annual data (1983 to 2021, 39 data points) is used to estimate the baseline model and three alternative models. While using annual data for the model requires stronger assumptions, they have advantages over quarterly data ([Beetsma et al., 2008](#)). First, shocks from annual data are likely to capture actual fiscal shocks, since fiscal policy decisions are made once a year, especially true for developing countries with larger lags in the implementation of fiscal policy ([Diop and Ben Abdallah, 2009](#)). Second, it reduces the potential anticipation effects of policy changes as a given shock is less likely to be anticipated one year before ([Beyer and Milivojevic, 2021](#)). Third, there are no seasonal effects with annual data, which might be important for developing countries. However, quarterly data (2008Q3 to 2022Q2, 56 data points) are used to estimate two additional alternative models.

Among the four main types of NSC instruments, the interest rate of the 5-year Bangladesh Saving Certificate, which can be accessed by any citizen and has the longest data series has been used as a representative NSC interest rate. Annual data except interest rates are converted to real terms by deflating with a GDP deflator and then converted to per capita terms by dividing with the corresponding year's population like [Mountford and Uhlig \(2009\)](#), [Caldara and Kamps \(2008\)](#). Interest rates are adjusted with GDP deflator inflation. Quarterly data that are used in two

alternative models are deflated with CPI as the quarterly GDP deflator is not available and then seasonally adjusted with X13 (NSC, GCONS, GINV, PCR, QIIP) and STL decomposition (r_NSC and LR). X13 could not be used for all variables as some interest rate data are negative. All variables except interest rates are converted to natural log form to make them linear. Summary data descriptions, data statistics and data properties are given in Table A2, A3, and Figure A1.

Three formal unit root tests (Augmented Dickey-Fuller (ADF), Phillips Perron (PP), and KPSS tests) are conducted after visual inspection of line graphs and correlogram of all variables. r_NSC and LR are found I(0) with exogenous constant; GDS, GINV and PINV are I(0) with exogenous constant and trend; GCONS and GDP are I(1) with exogenous constant and trend (Table A4). Therefore, r_NSC, LR, GINV and PINV are used in level while GCONS and GDP are used in the first difference (\approx growth rate) in the VAR model. Before specifying the model, three major information criteria (Akaike information criterion (AIC), Schwarz information criterion (SIC), and Hannan-Quinn (HQ)) are checked to select the appropriate lag length (Table A5). With 39 annual data points, AIC and HQ criteria select 2 lags while SIC selects 1 lag. The model has been specified with 2 lags to avoid serial correlation in the residual (Table A7 & A8). From the institutional point of view, the government extensively uses the past two years' information for making fiscal decisions in the current year under its medium-term budget framework. Data are collected from IMF-IFS, IMF-WEO, and IBAS++ (Integrated budget and accounting system) of the Ministry of Finance, Bangladesh Bureau of Statistics, Bangladesh Bank and National Savings Department (Table A2). Eviews 11.0 software has been used in data processing and estimating results through impulse response functions and variance decompositions.

5. Empirical results

5.1 Impulse response functions

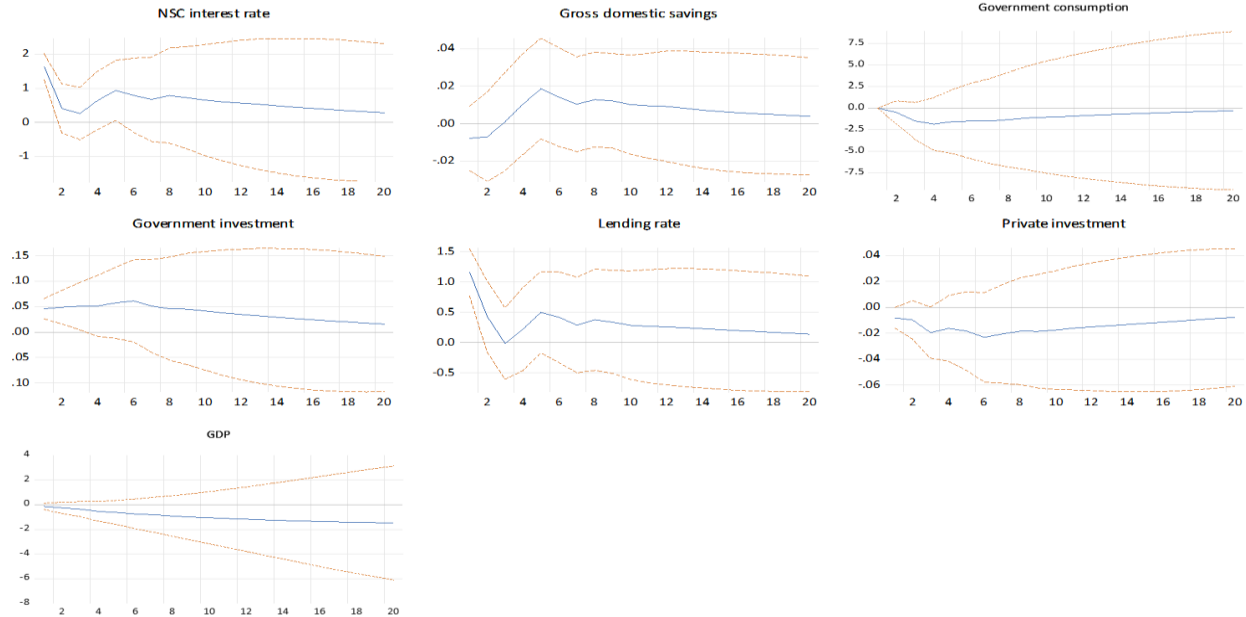
The impulse response functions (IRF) show the response (time path) of variables to an impulse (one standard deviation shock) in a variable in the VAR model. Confidence intervals around the impulse responses allow for parameter uncertainty in the estimation process inherently (Enders, 2015). The solid lines show the point estimates while the dotted line represents two standard

deviation error bands about the point estimates. Since the government increases the NSC interest rate to increase NSC flow to finance the budget deficit, the impact of NSC interest rate shock on other macro variables is reported. However, since the NSC interest rate affects the rest of the economy through its effects on the lending rate, the lending rate shock is also reported. Impulse responses are reported for 20 periods.

5.1.1 Impulse response functions to one standard deviation shock to NSC interest rate

Figure 7 shows the impulse responses of variables in response to one standard deviation shock to the NSC interest rate with 95% confidence bands. In response to an NSC interest rate shock, gross domestic savings does not respond significantly (top middle panel, Figure 7). A higher NSC interest rate may bring informal savings to the formal economy if the intended target group of small savers such as women, senior citizens, and physically handicapped people invest in NSCs significantly. However, if rich people invest in NSCs heavily motivated by their higher interest rates, domestic savings will not increase significantly as they are most likely to transfer their savings from one formal sector (banking sector or the stock market) to another (NSC investment). An insignificant response of the gross domestic savings indicates that the target group of small savers may have an insignificant investment in NSCs whereas rich people have the major share of investment in NSCs. When the NSC interest rate rises, the gap between the NSC interest rate and bank deposit rate widens, and NSCs become lucrative not only to the target group but also to rich people as no saving certificate except pensioner saving certificate asks for sources of income (Uddin et al., 2019). Therefore, rich people including institutional investors, companies, and pension funds are also keen to invest in NSCs. They even invest in NSCs in someone else's name (maybe family members) when they reach their maximum threshold limit for investment in NSCs (Kibria, 2019). Saadat (2021) compared NSCs with Ponzi schemes as they have i) high returns with the promise of little risk; ii) consistent returns irrespective of market conditions; iii) investors' inability (limited information and knowledge) to review how funds are being invested.

Figure 7 NSC Interest Rate Shock



Government consumption and GDP response are drawn from the accumulated response of government consumption growth and the accumulated response of GDP growth respectively as they are used in growth terms in the model.

The latest government’s reform on NSCs that puts a threshold level (1.5 million BDT) beyond which interest rates are downsized is still too high considering the level of per capita income (2591 USD in FY21) in Bangladesh. The question remains how many small savers have savings worth 1.5 million BDT, which could be invested in NSCs and receive benefits from higher NSC interest rates set by the government? After setting a new threshold level on 21st September 2021, monthly NSC sales dropped⁵ significantly in 2022. This suggests that rich people invest in NSCs much more than the intended small savers and NSC flow is highly sensitive to its interest rate. Had the intended small savers been the major investors in NSCs, the new threshold limit would not affect the flow of NSCs significantly as interest rates remain the same up to 1.5 million BDT. [Uddin et al. \(2019\)](#) found that most of the buyers of NSCs usually have access to formal financial services. The survey also found that the interest rate differential between the NSC interest rate and the bank deposit rate is the determining factor in investing in NSCs. This also suggests that small savers

⁵ Monthly NSC sales dropped 25%, 23%, and 25% respectively in October, November, and December of 2022 compared to the previous year (Major economic indicators, January 2023, Bangladesh Bank)

may not be the major investors in NSCs. Thus, deficit financing with NSCs is a misallocation of public resources as the government may end up paying higher interest rate subsidies to the rich. Therefore, the government cannot promote savings by only raising the NSC interest rate without developing the financial market as empirical data do not support this.

Government consumption does not respond significantly and it remains below the baseline for a long time in response to one standard deviation shock to the NSC interest rate (top right panel, Figure 7). Government consumption expenditures, such as pay & allowances, and purchase of goods and services, are recurrent and mostly financed from domestic revenue⁶. The government consumption decision is made before the commencement of the fiscal year and therefore, it is less likely to fluctuate with deficit financing through issuing NSCs (MOF, 2021). However, budget financing through raising the NSC interest rate increases the government's liability for higher interest payments, which could reduce the government consumption level permanently.

Government investment responds positively (significant at 95% confidence level) until year 4 in response to one standard deviation shock to the NSC interest rate (left middle panel, Figure 7). While the recurrent expenditure is closely related to domestic revenue, development expenditure, such as annual development programs (infrastructure projects and logistics), which is expected to generate a higher return, is mostly met from external⁷ or domestic finance. The government used to depend on foreign financing to meet its development expenditures as the country had access to concessional loans (Figure 2). However, a reduced flow of foreign finance from 2000 onwards has prompted the government to rely on nonmarketable NSC bonds in the absence of a developed financial market. Whenever the government encountered difficulties in budget financing, it raised the NSC interest rate to increase its flow as a means of financing (Barua and Rahman, 2006). Since NSC flow plays a significant role in financing the development expenditure, a higher NSC interest rise would attract more investment in NSCs and may contribute to government investment

⁶ The government allocates a certain percentage of the projected revenue for its consumption expenditure.

⁷ External financing generally comes against foreign-funded projects. The flow of external finance depends on the execution rate of the project.

although the capacity of implementing agencies plays a vital role in the execution of government investment. However, a higher return is required from the development expenditure backed by expensive NSC financing.

Figure 7 (middle middle panel) shows that one standard deviation shock to the NSC interest rate has an immediate effect on the lending rate (significant until year 2). A higher NSC interest rate forces commercial banks to offer higher deposit rates to attract savings, otherwise people would invest in NSCs although it is meant for a specific group of people. If banks offer high interest rates to attract deposits, they will charge a higher interest rate for lending money. Therefore, a higher NSC interest rate causes the domestic lending rate to rise, supported by [Karim \(2019\)](#) who argues that fiscal expansion through selling a high interest-bearing bond pushes the market interest rate that mutes the output growth in Bangladesh in the short run. [Huh and Lee \(2021\)](#) also find that NSCs affect interest rates in a way like open market operations although it is not the government's intention. This is also evident from Figure A2, which shows how closely the lending rate moves with the NSC interest rate (Pearson correlation coefficient 0.88). The government has been trying to lower the domestic interest rate to a single digit⁸ to boost private investment in the recent past. However, a higher NSC interest rate does not help to lower the market interest rate as the NSC interest rate puts pressure on the domestic interest rate in the absence of a significant capital inflow from the external world.

Private investment responds negatively (significant at 95% confidence interval until year 3) in response to one standard deviation shock to the NSC interest rate (right middle panel, Figure 7). When the government borrows through NSCs by offering a higher interest rate, private savings are channelled to the government sector and thus, crowd out the private sector unless capital flows from external sources ([Gale and Orszag, 2003](#)). The size of foreign direct investment or foreign

⁸ Bangladesh Bank imposed a cap of 9% on the lending rate on 24th February 2020 to implement a single-digit interest rate from 1st April 2020 onwards, which was ultimately scrapped in its latest monetary policy statement declared for July-December 2023.

portfolio investment is not significant⁹ in financing the current account deficit in Bangladesh. This indicates that budget financing by raising the NSC interest rate is likely to raise the market interest rate and crowd out private investment as NSC financing does not bring new savings to the formal economy. [Ferrari et al. \(2018\)](#) suggest that if the interest rate of a government bond is higher than the level of the interest rate cap, a reallocation of credit takes place from the real sector to the sovereign. [Easterly and Schmidt-Hebbel \(1993\)](#) found that medium-term debt financing leads to higher interest rates in developing countries that depress private investment. Even if NSC financing is used for government investment, it can negatively affect private investment as [Hassan and Salim \(2011\)](#) and [Saidjada and Jahan \(2018\)](#) found that public investment negatively affects private investment in Bangladesh.

GDP does not respond positively (remains below the baseline for a long time) in response to a positive NSC interest rate shock (bottom panel, Figure 7) despite a short-term positive response of government investment. Empirical literature such as [Giovannini \(1983, 1985\)](#), [Schmidt-Hebbel et al. \(1992\)](#), and [Easterly and Schmidt-Hebbel \(1993\)](#) suggest that private consumption is not interest rate sensitive as substitution, income and wealth effects cancel each other (a consumer may substitute his consumption for tomorrow (substitution effect) or consume more today (income and wealth effect) by holding a high-yielding government asset. A higher NSC interest rate that raises the lending rate does not increase government consumption but depresses private investment can result in a negative income multiplier $(\frac{\partial Y}{\partial(Gcons/Pinv)} \frac{\partial(Gcons/Pinv)}{\partial(r_L)} \frac{\partial(r_L)}{\partial(NSC)} \frac{\partial(NSC)}{\partial(r_{NSC})} < 0)$ as [Rahman et al. \(2016\)](#) found that private investment plays a greater role than public investment in enhancing per capita GDP growth in Bangladesh.

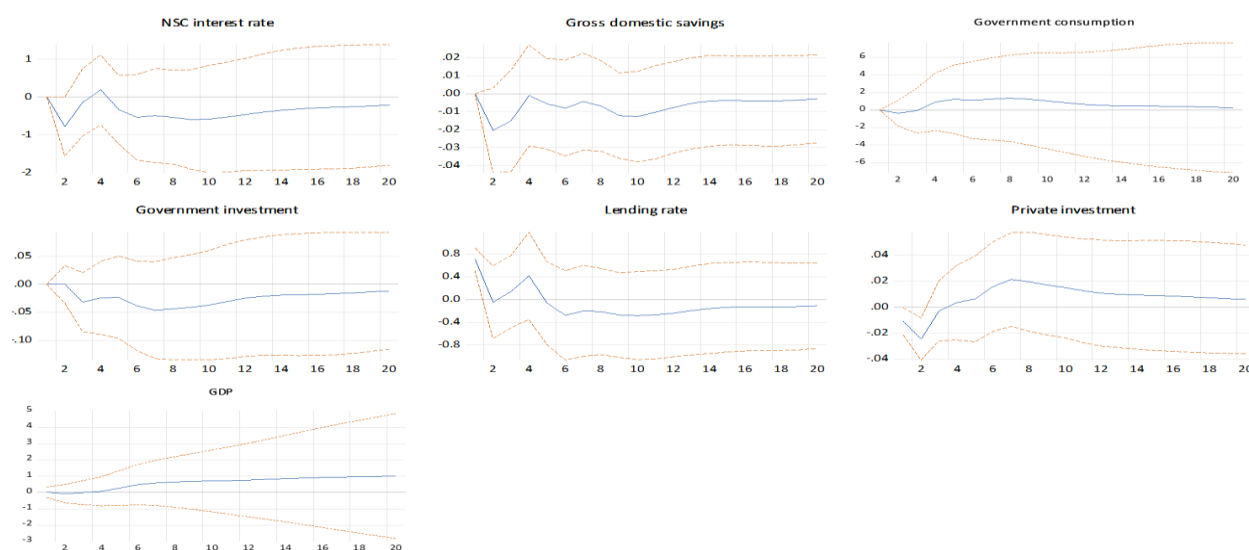
5.1.2 Impulse response functions to one standard deviation shock to the lending rate

In addition to the NSC interest rate shock, the lending rate is shocked in the VAR system to see how the lending rate shock affects the rest of the economy. Figure 8 (top left panel) shows that

⁹ Average FDI in the last 5 years (FY17 to FY21) was only 5.2% of GDP and Portfolio investment was only 1.5% of GDP (IMF-IFS statistics).

the NSC interest rate does not respond significantly in response to a shock in the lending rate. NSC interest is set at the beginning of the fiscal year and the rate is raised when the fiscal authority encounters difficulties in financing the budget deficits (Barua and Rahman, 2006). This supports that the NSC interest rate depends on NSC flow, not on the lending rate.

Figure 8 Lending Rate Shock



Government consumption and GDP response are drawn from the accumulated response of government consumption growth and the accumulated response of GDP growth respectively as they are used in growth terms in the model.

Gross domestic savings barely move (does not increase significantly, top middle panel, Figure 8) from the baseline in response to a one standard deviation shock to the lending rate. This indicates that a higher interest rate does not enhance the savings behaviour of the citizen in Bangladesh although McKinnon (1973) and Shaw (1973) argue that higher interest rates increase the efficiency of financial intermediation and increases investment through their effects on savings. A rise in the interest rate does not increase domestic savings in developing countries has also been supported by empirical literature. Giovannini (1985) did not find significant positive real interest elasticity of savings in seven Asian developing countries (Burma, India, Korea, Malaysia, Philippines, Singapore, and Taiwan). Easterly and Schmidt-Hebbel (1993) found little evidence that real interest rates increase private savings in a sample of ten developing countries and they suggest that increasing interest rates for domestic debt financing does not increase private savings. Muradoglu and Taskin (1996) found that determinants of household savings in developing countries are different from advanced countries because of inefficiencies in financial markets and liquidity constraints. They

suggest that a higher interest rate is not sufficient to induce higher savings in developing countries without sophisticated financial markets and the adaptation of new instruments.

Government consumption shows a muted response in response to a shock in the lending rate (top right panel, Figure 8). Government consumption expenditure, which is announced before the commencement of the fiscal year, is recurrent and depends on the projected domestic revenue in general. It is less likely to be related to how the budget deficit will be financed. Therefore, a rise in the domestic interest rate does not affect government consumption significantly. However, if the government finances its budget deficits at a higher interest rate, a higher interest payment liability might negatively affect the government consumption level in the future.

Government investment responds negatively w.r.t. the baseline in response to a shock in the lending rate (although not significant at a 95% confidence level, middle left panel, Figure 8). When the lending rate rises, the government must borrow at a higher interest rate to finance its budget deficit. This deficit finance is mostly used for development expenditure, i.e. annual development program, which is expected to generate a high return in the future (MOF, 2021). If the domestic interest rate rises, the government can take on development projects only with a higher return. Therefore, a lending rate rise would negatively affect government investment.

Private investment responds negatively (significant until period 3 at 95% confidence level) in response to a lending rate shock (middle right panel, Figure 8). When interest rates rise, the cost of capital goes up, an investor will invest in projects only with a higher return. Furthermore, the bond market in Bangladesh is still at the nascent stage¹⁰ dominated by government bonds. With a lack of financing options, private investment should be sensitive to an interest rate rise even though Ahmed and Islam (2004) found that it is moderately interest rate sensitive in Bangladesh. This finding also supports standard economic theory which entails that private investment is negatively affected by an interest rate rise.

¹⁰ The bond market size in Bangladesh is around 70bn USD (8% of GDP) dominated by government bonds (T-bill & bond 44%, NSC-52%) (Source-Bangladesh Bank)

In response to a lending rate shock, GDP barely moves from the baseline (bottom panel, Figure 8). A rise in the interest rate might increase private consumption due to a stronger wealth/income effect than a substitute effect (Blinder and Solow, 1973). However, private consumption is not interest rate sensitive as substitution, income and wealth effects nullify each other (Giovannini (1983, 1985); Schmidt-Hebbel et al. (1992); Easterly and Schmidt-Hebbel (1993). Credit controls in developing countries also block the effect of interest rates on consumption (Easterly and Schmidt-Hebbel, 1993). Therefore, private consumption is less likely affected by an interest rate rise. Since government consumption and government investment response are insignificant and private investment responds negatively, the overall impact on GDP should be negative. Khan and Reinhart (1990) found that private investment has a larger direct effect than public investment on economic growth from a sample of twenty-four developing countries.

5.2 Forecasts error variance decomposition

The VAR model allows the decomposition of the sources of error variance of each endogenous variable over time due to a specific shock. The forecast error variance decomposition shows the proportion of the movements in a variable is due to its own shock versus shocks due to other variables in the system. Table 1 shows the structural forecast error variance due to innovations in all variables. Each column represents the proportion of forecast error variance for a variable across a forecast horizon of 1, 4, 8, and 12 periods. The forecast error variance reinforces the results from impulse response functions.

Table 1 Variance Decomposition (in %)

<i>Innovations</i>	<i>Horizon</i>	<i>Proportion of forecast error variance</i>						
		<i>r_NSC</i>	<i>GDS</i>	<i>g_GCONS</i>	<i>GINV</i>	<i>LR</i>	<i>PINV</i>	<i>g_GDP</i>
<i>NSC interest rate (r_NSC)</i>	1	100	0	0	0	0	0	0
	4	53.50	5.22	16.44	1.32	10.69	9.19	3.64
	8	45.99	3.26	23.64	1.86	12.43	7.32	5.51
	12	44.84	2.51	21.12	3.97	16.59	5.69	5.28
<i>Gross domestic savings (GDS)</i>	1	2.18	97.82	0	0	0	0	0
	4	3.77	59.97	2.15	21.13	11.12	1.09	0.76
	8	12.21	47.40	5.50	15.61	9.57	4.31	5.40
	12	14.68	41.08	6.67	15.86	12.97	3.81	4.93
<i>Government consumption</i>	1	0	0	100	0	0	0	0
	4	8.64	4.70	75.29	0.35	7.59	0.84	2.59
	8	8.62	5.85	70.17	1.43	7.70	2.91	3.31

<i>growth</i> (<i>g_GCONS</i>)	12	8.74	6.11	69.16	1.69	8.21	2.86	3.23
Government investment (<i>GINV</i>)	1	40.39	0.00	9.02	50.59	0.00	0.00	0.00
	4	34.93	4.13	21.44	15.92	5.72	8.49	9.36
	8	38.08	3.47	22.44	9.47	13.59	5.50	7.45
	12	38.79	2.84	18.93	11.11	17.09	4.34	6.90
Lending rate (<i>LR</i>)	1	63.03	7.19	3.47	1.26	23.46	1.60	0
	4	35.50	8.88	34.48	2.18	15.68	2.13	1.14
	8	34.69	7.12	35.95	1.80	13.45	4.34	2.64
	12	34.99	6.41	33.75	2.64	15.69	3.86	2.65
Private investment (<i>PINV</i>)	1	10.02	5.73	7.20	16.10	18.70	42.24	0.00
	4	14.55	5.43	33.80	4.67	13.45	22.08	6.01
	8	22.97	3.04	34.34	3.75	17.56	13.59	4.76
	12	26.97	2.55	28.77	5.71	19.97	11.06	4.98
GDP growth (<i>g_GDP</i>)	1	1.91	0.02	25.25	3.93	0.06	23.11	45.73
	4	5.08	10.26	30.93	11.85	1.31	14.66	25.91
	8	6.33	10.61	27.90	12.79	6.65	13.04	22.66
	12	7.14	10.57	27.72	12.69	6.71	12.81	22.35

Variance decomposition of NSC interest rate: The variance of the NSC interest rate is due to its own shock (100 per cent) in the first year as it is assumed as the most exogenous variable in the system and is not contemporaneously affected by other variables. In the 4th year, the NSC interest rate can explain up to 53.50 per cent of its own variation while the lending rate can explain up to 10.69 per cent variation of the NSC interest rate. In the 12th year, 44.84 per cent variation of the NSC interest rate can be explained by its own shock and 16.59 per cent variation can be explained by the lending rate. As time progresses, the lending rate can explain more about the variance of the NSC interest rate. This suggests that the NSC interest rate has a strong influence on the lending rate.

Variance decomposition of gross domestic savings: The variance of gross domestic savings in the first period is due to its own shock (97.82 per cent) and the NSC interest rate shock (2.18 per cent). Over time, the NSC interest rate can explain more (up to 14.68 per cent in the 12th year) about gross domestic savings' variation. However, throughout the shock period, government investment has a strong influence on gross domestic savings. If government investment stimulates GDP growth, it can influence gross domestic savings.

Variance decomposition of government consumption growth: The variance of government consumption growth can be explained by its own shock in the 1st year. Since government consumption decisions are taken at the beginning of the fiscal year, it is assumed that other variables do not affect government consumption contemporaneously. Government consumption

growth can be explained more by its own shock consistently. Even in the 12th period, government consumption growth can explain up to 69.16 per cent of its own variation while the NSC interest rate can explain 8.74 per cent and the lending rate can explain 8.21 per cent of its variation. This supports that government consumption is less sensitive to budget financing with NSCs.

Variance decomposition of government investment: Government investment can explain up to 50.59 per cent of its own variance while the NSC interest rate can explain up to 40.39 per cent of the variation of government investment in the 1st period. NSC interest rate and government consumption consistently explain more about the variation of government investment. In the 8th year, the NSC interest rate can explain up to 38.08 per cent and government consumption growth can explain up to 22.44 per cent variation of government investment. This reflects the government's reliance on NSCs for financing the budget deficit in the recent past. Any consumption expenditure by the government directly affects its investment expenditure as both are parts of total government expenditure.

Variance decomposition of lending rate: More than 63.0 per cent variation of the lending rate can be explained by the NSC interest rate while its own shock can explain up to 23.46 per cent of its variation in the 1st year. Over time, government consumption growth explains more about the lending rate, however, the NSC interest rate consistently explains more (34.99 per cent in year 12) about the variation of the lending rate. This indicates that the NSC interest rate is a strong determinant of the lending rate in Bangladesh despite weak monetary policy transmission and credit control as supported by [Huh and Lee \(2021\)](#).

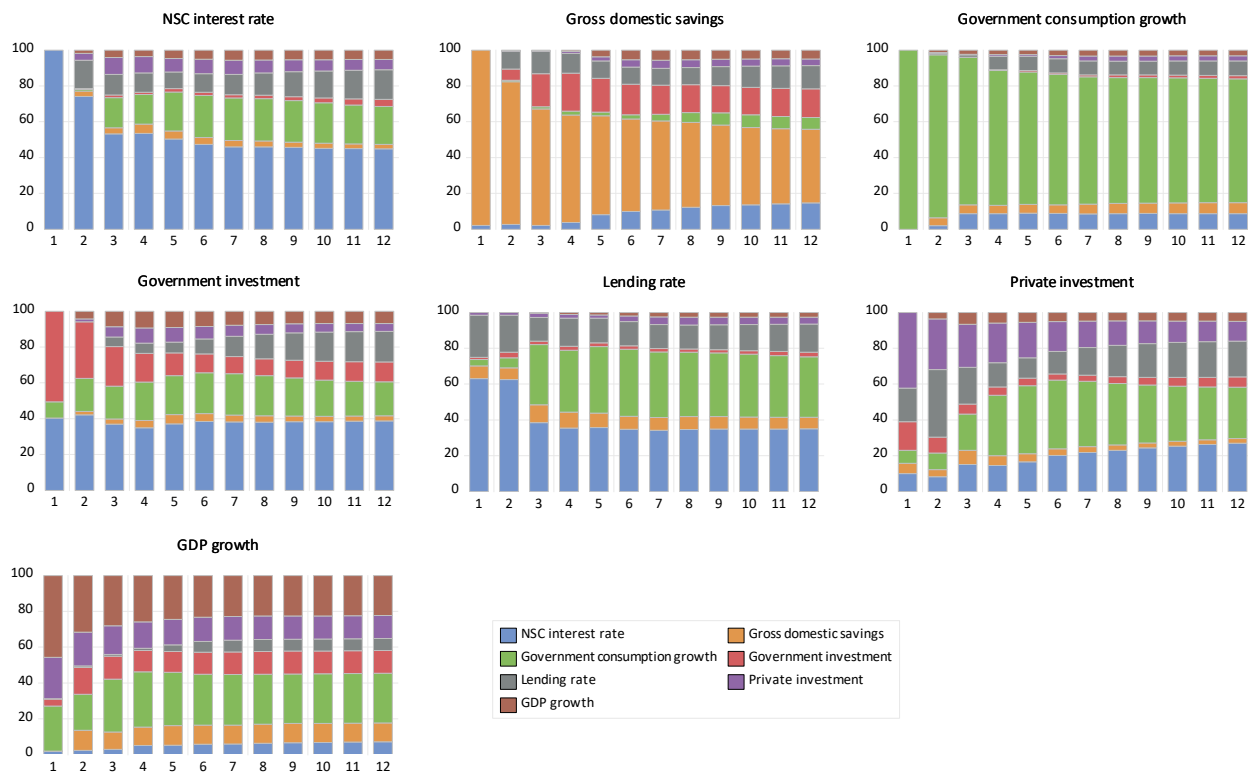
Variance decomposition of private investment: A 42.24 per cent variation of private investment can be explained by its own shock while an 18.70 per cent variation can be explained by lending rate, and a 16.10 per cent variation can be explained by government investment in the 1st period. When government investment addresses core infrastructural bottlenecks, such as streets, highways, airports, mass transit, and water systems, it can improve the productivity of the private sector ([Aschauer, 1989](#)). However, when government investment is less productive, it adversely affects private investment. The lending rate consistently explains private investment as a rise in the lending rate increases the cost of capital and thus, adversely affects private investment. Over

time, the NSC interest rate can explain more (26.97 per cent in year 12) about private investment. This suggests that the NSC interest rate has a strong influence on private investment in Bangladesh.

Variance decomposition of GDP growth: GDP growth can explain up to 45.73 per cent of its own variation while government consumption growth can explain up to 25.25 per cent and private investment can explain up to 23.11 per cent of its variation in the 1st year. Government consumption growth and private investment consistently account for a large variation in GDP growth. However, a higher government consumption would leave fewer resources available for the private sector to invest. Therefore, NSC financing should be cautiously used so that it does not adversely affect private investment and GDP growth.

Overall, forecast error variance decomposition reinforces the findings from impulse response functions. Figure 9 shows the graphical presentation of the forecast error variance decomposition of all variables.

Figure 9 Forecast error variance decomposition



6. Robustness check with alternative specifications

The stability of the VAR model (Table A6), no serial correlation in the residual (Table A7) and the residuals are normal (Table A8, Figure A3) indicating that the shocks are orthogonal, and the impulse responses are valid and reliable. The baseline model is robust to five alternative specifications of the model (three with annual data and two with quarterly data). In the first alternative specification, the lending rate is replaced with the deposit rate as the baseline model assumes that NSC interest rate shock affects the lending rate through its effects on the deposit rate. The results remain qualitatively the same with some minor changes at the significance level (Figures A4.1 & A4.2). An NSC interest rate shock does not increase gross domestic savings, however, increases the deposit rate significantly until year 2. Although an NSC interest rate shock boosts government investment in the short run, it depresses private investment (which remains below the baseline for a long time) and GDP as interest rate rises. A shock in the deposit rate depresses private investment (significant until year 3), government investment (not significant at 95% confidence level), and GDP (not significant).

In the second alternative specification, the model is estimated with a truncated sample size (from 1983 to 2019) to isolate the effects¹¹ of the COVID-19 shock and the interest rate cap imposed by the Bangladesh Bank. The results remain qualitatively similar with some minor changes at the significance level (Figures A5.1 & A5.2). An NSC interest rate shock does not boost gross domestic savings; however, it increases the lending rate significantly until year 2. Although an NSC interest rate shock boosts government investment in the short run, it depresses private investment (remains below the baseline for a long time) and GDP as the lending rate rises. A shock in the lending rate depresses private investment (significant at 95% level until year 3) and government investment (remains below the baseline), and thus, adversely affects GDP.

In the third alternative specification, the lending rate is kept but government consumption is dropped that does not respond significantly in response to the NSC interest rate shock in the baseline model and estimated a 6-variable VAR (r_NSC, GDS, GINV, LR, PINV, and GDP). The

¹¹ GDP growth drastically fall to 3.45% in FY2020 due to the COVID-19 shock

results remain qualitatively similar with some minor changes at the significance level (Figures A6.1 & A6.2). An NSC interest rate shock does not increase gross domestic savings, however, increases the lending rate significantly until year 2. Although an NSC interest rate shock boosts government investment in the short run, it depresses private investment and GDP as the lending rate rises. A shock in the lending rate depresses private investment, government investment, and GDP (responses of government investment and GDP are not significant at 95% confidence level).

In the fourth alternative specification with quarterly data, the NSC flow (volume) is used to see how the macro aggregate responds in the presence of NSC flow in the model. Private sector credit (PCR) and quantum index of industrial production (QIIP) are used as a proxy¹² for PINV and GDP respectively and a 7-variable VAR (r_NSC, NSC, GCONS, GINV, LR, PCR, and QIIP) is estimated. This model generates qualitatively similar results to the baseline model except for a small change in the significance level (Figures A7.1 & A7.2). In response to the NSC interest rate shock, neither government consumption nor government investment responds significantly. However, an NSC interest rate shock depresses private credit growth (also at level) as private savings flows for NSC investment. A shock in the lending rate does not increase government consumption or government investment or private credit growth (also at level) but depresses industrial output (bottom right panel, figure A7.2).

In the fifth alternative model with quarterly data, the NSC flow is kept but the lending rate is replaced with the deposit rate as the NSC interest rate affects the lending rate through the deposit rate. The responses are qualitatively similar except for the level of significance (Figures A8.1 & A8.2). In response to a shock in the NSC interest rate, the deposit rate rises until quarter 4, but government consumption, government investment or private credit does not respond significantly. In response to a shock in the deposit rate, government consumption, private credit and industrial production slow down while government investment does not rise significantly. This indicates that

¹² Quarterly data on private investment and GDP are not available. Industrial production data (34.61 per cent of GDP in FY21) are used as a proxy for GDP like previous studies, such as [Afrin \(2017\)](#), [Alam \(2015\)](#) as quarterly service sector data (53.3 per cent of GDP in FY21) are not available.

if NSC financing with a higher interest rate affects market interest rates, such as the deposit rate, it would adversely affect the macro economy.

Most of the impulse responses in the fourth and fifth alternative specifications (with quarterly data) are not significant at the 95% confidence band. The insignificant impulse responses may come from weak monetary policy transmission mechanisms in Bangladesh as found by [Alam \(2015\)](#), [Afrin \(2017\)](#), [Paul \(2019\)](#), [Hossain and Ibon \(2020\)](#), and [Huh and Lee \(2021\)](#). Furthermore, credit control by imposing a cap on interest rates reduces the speed of monetary policy transmission ([Ferrari et al., 2018](#)). However, both the lending rate and the deposit rate rise significantly (although the response is short-lived) in response to the NSC interest rate shock in all alternative specifications. Although private investment or private credit does not drop significantly in all alternative specifications, the positive significant response of the lending rate/deposit rate indicates that private investment or private credit is most likely adversely affected by the NSC interest rate rise. Overall, impulse responses from all alternative specifications are qualitatively similar except for the level of significance. This suggests that the baseline model is robust to alternative specifications including different data frequencies.

7. Conclusion

This study has analyzed the macroeconomic impacts of extensive usage of NSCs in financing the budget deficit in Bangladesh. The effects of the NSC interest rate shock and lending rate shock on gross domestic savings, government consumption, government investment, private investment, and gross domestic product (GDP) are analyzed in a seven-variable SVAR framework by using annual data from 1983 to 2021 and quarterly data from 2008Q3 to 2022Q2 in a close economy environment. In addition, five alternative models (three with annual data and two with quarterly data) are estimated to check the robustness of the model. A shock in the NSC interest rate increases the lending rate but does not increase gross domestic savings. This implies that NSC financing with a higher interest rate does not bring enough informal savings to the formal economy as NSC demand may not be driven by the intended target group of small savers; rather, rich people invest more in NSCs motivated by their higher interest rates in the absence of a strict exclusion mechanism. Empirical findings ([Giovannini \(1983, 1985\)](#), [Schmidt-Hebbel et al. \(1992\)](#)) also

suggest that only a real interest rate rise does not increase private savings in developing countries as economic agents are constrained by underdeveloped financial markets. While a higher NSC interest rate causes additional interest payments¹³ for the government, a higher lending rate resulting from a higher NSC interest rate depresses private investment and output.

A shock in the lending rate does not increase gross domestic savings also confirming that a higher interest rate bearing NSC bond cannot promote domestic savings in Bangladesh. Further, the lending rate shock depresses private investment, which also confirms that if a higher NSC interest rate pushes the lending rate (as private savings are drawn by the government), it would adversely affect private investment. While private consumption usually follows the permanent long-term income of individuals and is roughly stable (Friedman, 1957), private investment varies significantly with rising interest rates. Therefore, any interest rate rises either from a monetary policy shock or from an NSC interest rate shock affects private investment and output negatively and can generate a negative income multiplier despite a short-term rise in government investment.

While the objective of the fiscal policy is to increase the efficiency of public expenditure, attain faster economic growth and reduce poverty in Bangladesh (Islam and Biswas, 2005), NSC financing with a higher interest rate misallocates public resources (interest rate subsidies can go to the rich) and adversely affects the lending rate, private investment and GDP. Therefore, issuing NSC with a higher interest rate neither promotes savings nor qualifies to meet the government's safety net objective as intended. If the government sticks only to the target group of small savers with a slightly higher interest rate than the market rate, the effect might be insignificant. However, a compliance-based measure is difficult to administer.

The findings of this study have important policy implications for Bangladesh. First, the National Savings Scheme that was introduced long before the independence (in former British India) when the saving rate was low, and the financial system was weak has lost its relevance as the country has made significant progress and the banking system has developed in the last fifty years to

¹³ Additional fiscal cost = (NSC interest rate- market lending rate) * NSC volume, which could otherwise be used for productive government expenditure

mobilize savings. The government is not required to mobilize savings through the issuance of NSCs as it distorts the market interest rates (also found by [Huh and Lee \(2021\)](#)). Second, the way NSC financing operates (i.e., the quantity is determined by demand only as supply is perfectly elastic at a fixed interest rate.), the fiscal authority cannot make a reliable cash projection and often ends up borrowing with NSCs at a higher interest rate even when it does not require any financing, which is not consistent with the efficient public finance. A flexible NSC interest rate (linking with the market interest rate) would help to control the flow of NSCs when the government does not require financing. Third, as NSC financing does not increase domestic savings as the rich invest heavily in NSCs, the government should delink budget financing from the social safety net objective and introduce a dedicated social safety net program for the poor. A lower NSC interest rate may also help in this case as the narrow interest rate gap with the market would not attract the rich significantly. Fourth, budget financing with NSCs at a higher interest rate is equivalent to the fact that the government competes with the private sector in obtaining private funds that push interest rates, which depress private investment and GDP. The government may use NSC financing at a limited scale in the absence of external finance; however, overwhelming use of it may result in a negative income multiplier as market interest rates rise and private investment crowds out. The government should develop the financial market and adopt new instruments to mobilize private savings and enhance investment and output rather than relying on NSCs for meeting budget deficits.

This study is a preliminary investigation based on empirical data in a relatively short period. Further research based on a longer data horizon would provide more reliable results. A cap on the lending rate may distort the effects of the NSC interest rate on market interest rates although the effectiveness of caps is often mitigated using non-interest fees and commissions ([Ferrari et al., 2018](#)). However, this does not invalidate the results as they are robust to several alternative model specifications including one that precludes the sample period of COVID-19 shock and interest rate cap (alternative specification 2). Overall, the study effectively shows how overdependence on NSCs for budget financing can adversely affect the Bangladesh economy.

Appendix A

Table A1. Features of NSCs

Type	Who can purchase	Interest rate*	Maximum Limit
Quarterly saving certificate (3-year)	Any citizen \geq 18 years	Year 1- 10%, Year 2- 10.50% Year 3- 11.04%	Single - 3 M BDT Joint - 6 M BDT
Bangladesh saving certificate. (5-year)	Any citizen \geq 18 years	Year 1- 9.35%, Year 2- 9.80% Year 3- 0.25%, Year 4- 10.75% Year 5- 11.28%	Single - 3 M BDT Joint - 6 M BDT
Family saving certificate (5-year)	Women \geq above 18 years, Men \geq 65 years, any physically challenged adult	Year 1- 9.50%, Year 2- 10.00% Year 3- 10.50%, Year 4- 11.00% Year 5- 11.52%	4.5 M BDT
Pensioner saving certificate (5-year)	Retirees from public offices or their descendent	Year 1- 9.70%, Year 2- 10.15% Year 3- 10.65%, Year 4- 11.20% Year 5- 11.76%	5 M BDT

A national ID card and Tax Identification Number are mandatory for the purchase of any certificate.

*Year-end interest will be applied if anybody redeems the certificate before it matures., M stands for Million

Table A2. Data description and sources

	Variable	Code	Description	Source
Annual	Population			Bangladesh Bureau of Statistics (BBS)
	Gross Domestic product	GDP	@ FY2016's constant price, converted to per capita term by dividing with population, natural log.	IMF-IFS
	NSC interest rate	r_NSC	Interest rate of 5-year Bangladesh Saving Certificate, adjusted with GDP deflator inflation.	Bangladesh Bank (BB)
	Lending rate	LR	Adjusted with GDP deflator inflation.	IMF-IFS
	Deposit rate	DR	Adjusted with GDP deflator inflation.	IMF-IFS
	Gross domestic savings	GDS	@ FY2016's constant price, in per capita terms, natural log.	BBS
	Government consumption	GCONS	@ FY2016's constant price, in per capita terms, natural log.	IMF-IFS
	Government investment	GINV	@ FY2016's constant price, in per capita terms, natural log.	BBS
	Private investment	PINV	@ FY2016's constant price, in per capita term, natural log.	BBS
	Consumer Price Index	CPI	@ FY2010's constant price	IMF-IFS
Quarterly	NSC interest rate	r_NSC	Interest rate of 5-year Bangladesh Saving Certificate, adjusted with CPI inflation, seasonally adjusted with STL decomposition.	BB
	Lending rate	LR	Adjusted with CPI inflation, seasonally adjusted with STL decomposition.	IMF-IFS
	Deposit rate	DR	Adjusted with CPI inflation, seasonally adjusted with STL decomposition.	IMF-IFS
	NSC flow	NSC	Deflated with CPI, seasonally adjusted with X13	Department of National Savings

Government consumption	GCONS	Constructed from monthly fiscal, and macro-fiscal reports of the Finance Division, MOF, deflated with CPI, seasonally adjusted with X13, natural log.	Finance Division, MOF
Government investment	GINV	Constructed from monthly fiscal, and macro-fiscal reports of the Finance Division, MOF, deflated with CPI, seasonally adjusted with X13, natural log.	Finance Division, MOF
Private Sector Credit	PCR	Deflated with CPI, seasonally adjusted with X13, natural log.	IMF-IFS
Quantum Index of Industrial Production	QIIP	@ FY2010's constant price, seasonally adjusted with X13, natural log.	IMF-IFS

Table A3. Descriptive Statistics

	r_NSC	LR	GDS	GCONS	GINV	PINV	GDP
Mean	7.24	5.98	9.53	8.34	8.33	11.22	7.24
Median	7.13	5.76	9.57	8.21	8.31	11.14	7.13
Maximum	14.67	13.59	10.67	9.21	9.46	12.03	14.67
Minimum	-1.62	-2.55	8.47	7.81	7.37	10.68	-1.62
Std. Dev.	3.13	2.87	0.66	0.45	0.57	0.42	3.13
Skewness	-0.18	-0.25	0.16	0.47	0.29	0.42	-0.18
Kurtosis	3.51	4.54	1.89	1.87	2.26	1.88	3.51
Jarque-Bera	0.64	4.24	2.19	3.53	1.44	3.21	0.64
Probability	0.73	0.12	0.34	0.17	0.49	0.20	0.73
Sum	282.48	233.06	371.72	325.23	324.71	437.62	282.48
Sum Sq. Dev.	372.82	312.28	16.78	7.71	12.39	6.72	372.82
Observations	39	39	39	39	39	39	39

All variables are in per capita logarithm form except the NSC interest rate & lending rate

Table A4. Unit root test

Variables	ADF		Phillips-Perron		KPSS		Integrated Order	Exogenous component
	Level	1 st Diff	Level	1 st Diff	Level	1 st Diff		
R_NSC(C)	-2.75	-6.26***	-2.60	-7.88***	0.21	0.16	I(0)	Const
LR(C)	-2.48	-6.33***	-2.50	-7.80***	.22	0.26	I(0)	Const
GDS(C,T)	-4.17***	-7.29***	-4.18***	-8.03***	0.13	0.30	I(0)	Const+Trend
GCONS(C,T)	-1.51	-4.60***	-1.52	-4.39***	0.19	0.06	I(0)	Const+Trend
GINV(C,T)	-1.64	-5.72***	-1.86	-5.72***	0.12	0.13	I(0)	Const+Trend
PINV(C,T)	-4.01	-4.33***	-3.75	-4.36***	0.15	0.36	I(0)	Const+Trend
GDP(C,T)	-1.27	-5.29***	-1.26	-5.26***	0.20***	0.08	I(1)	Const+Trend

Table A5. VAR Lag Order Selection Criteria

Endogenous variables: R_NSC GDS_PC G_GCONS_PC GINV_PC LR_IFS PINV_PC G_GDP_PC

Exogenous variables: C @TREND

Sample: 1982 2021(Included observations: 37)

*Note: selection calculation does not impose restricted VAR coefficient restrictions

Lag	LogL**	LR	FPE	AIC	SC	HQ
0	-123.1663	NA	3.92E-06	7.414396	8.023933	7.629286
1	-14.55315	164.3875	1.67E-07	4.192062	6.934976*	5.159068
2	52.67702	76.31532*	8.92e-08*	3.206648*	8.08294	4.925769*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

SC: Schwarz information criterion

AIC: Akaike information criterion

HQ: Hannan-Quinn information criterion

Table A6. VAR Stability Test

Roots of Characteristic Polynomial

Endogenous variables: R_NSC GDS_PC G_GCONS_PC GINV_PC LR_IFS PINV_PC G_GDP_PC

Exogenous variables: C @TREND

Lag specification: 1 2

Root	Modulus
0.877269	0.877269
0.821582	0.821582
0.522134 - 0.601879i	0.796795
0.522134 + 0.601879i	0.796795
0.639490 - 0.399204i	0.753865
0.639490 + 0.399204i	0.753865
0.655231	0.655231
0.036909 - 0.650140i	0.651186
0.036909 + 0.650140i	0.651186
-0.236065 - 0.592431i	0.637731
-0.236065 + 0.592431i	0.637731
-0.557668 - 0.287162i	0.62726
-0.557668 + 0.287162i	0.62726
-0.45005	0.45005

No root lies outside the unit circle, VAR satisfies the stability condition.

Table A7. VAR Residual Serial Correlation LM Test

Null hypothesis: No serial correlation at lag h				Sample: 1982 2021		
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	79.96494	49	0.0034	2.032647	(49, 45.0)	0.0087
2	53.82296	49	0.295	1.096598	(49, 45.0)	0.3783
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	79.96494	49	0.0034	2.032647	(49, 45.0)	0.0087
2	135.5625	98	0.0072	1.171209	(98, 15.2)	0.3820

*Edgeworth expansion corrected likelihood ratio statistic.

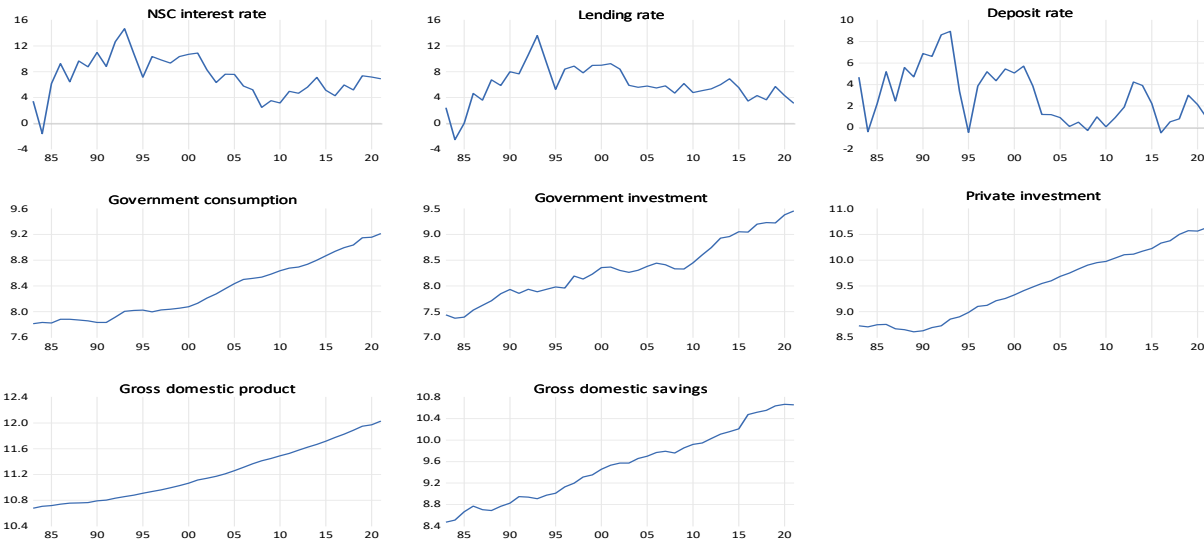
Table A8. VAR Residual Normality Test

Orthogonalization: Cholesky (Lutkepohl)
 Null Hypothesis: Residuals are multivariate normal (Sample: 1982 2021)

Component	Jarque-Bera	df	Prob.
1	1.195736	2	0.5500
2	1.265164	2	0.5312
3	1.598678	2	0.4496
4	2.610534	2	0.2711
5	0.679809	2	0.7118
6	1.028143	2	0.5981
7	1.180102	2	0.5543
Joint	9.558167	14	0.7937

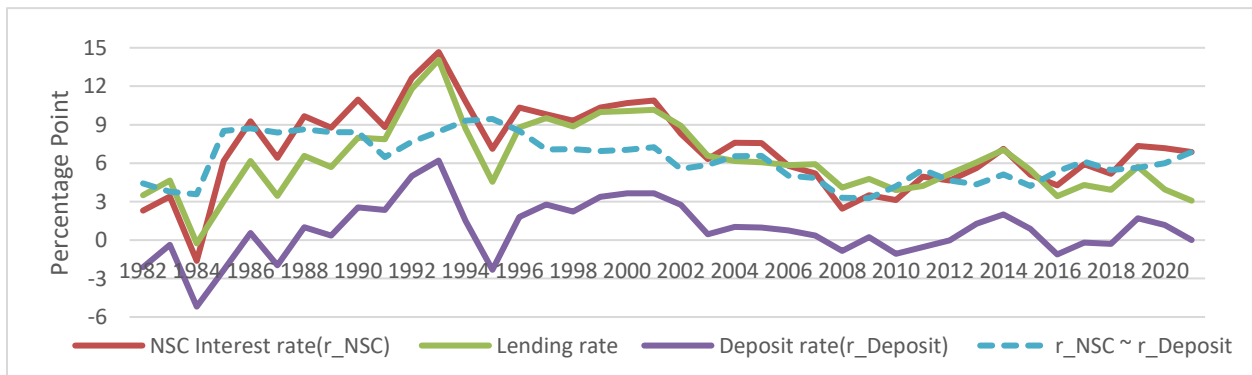
*Approximate p-values do not account for coefficient estimation

Figure A1. Data Properties



All variables except interest rates are in per capita, natural logarithm.

Figure A2. Interest rates (Infl. adj.) movements



Source: Bangladesh Bank & IMF-IFS

Figure A3. VAR Structural Residuals

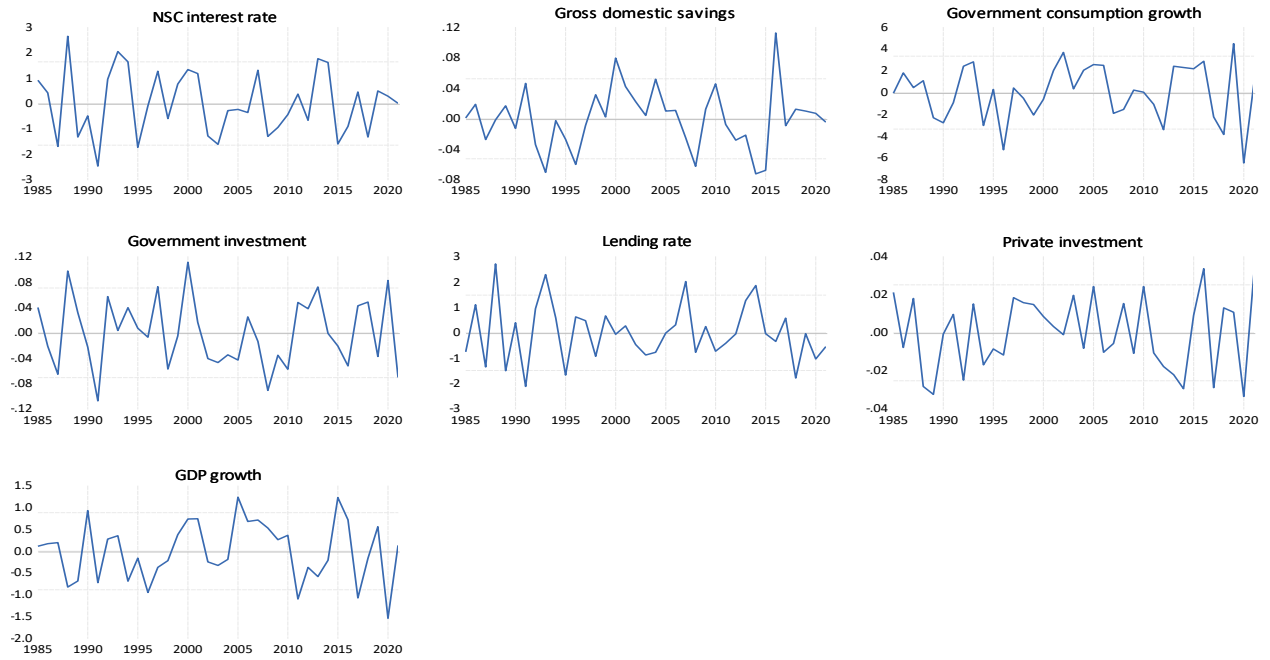


Figure A4.1 Impulse responses to one standard deviation shock to NSC interest rate (alternative 1)

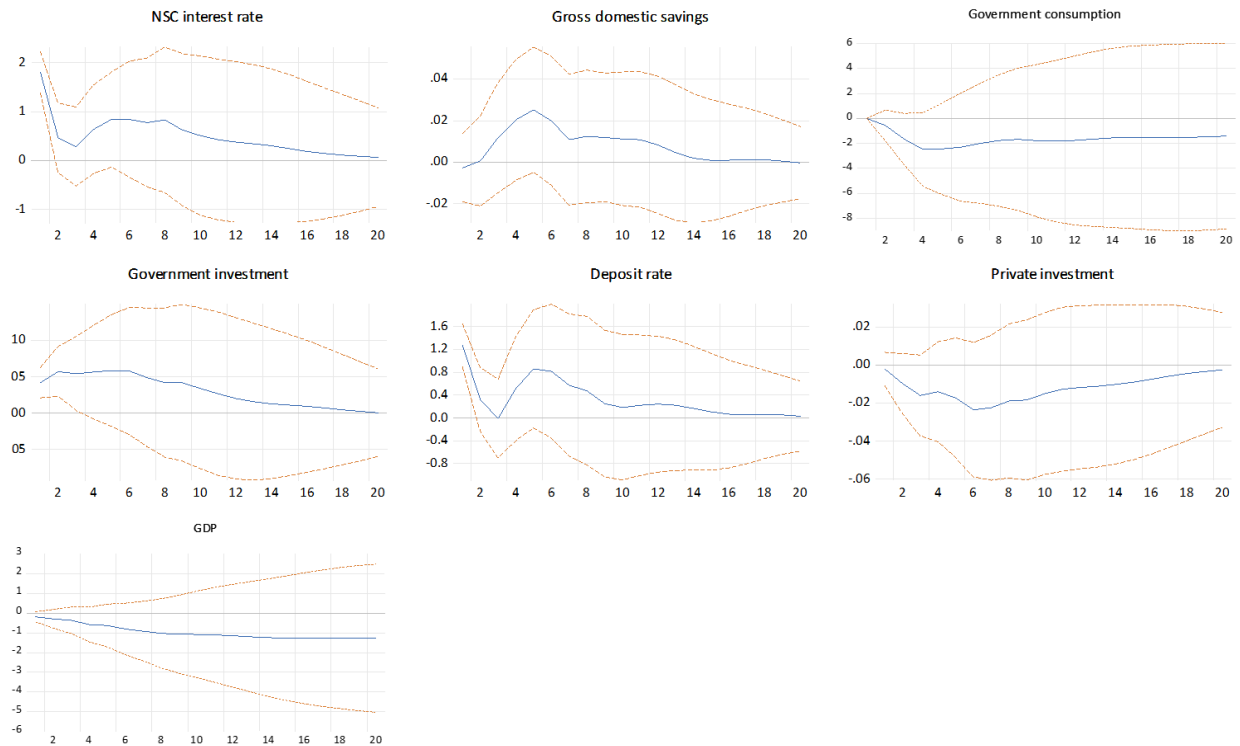


Figure A4.2 Impulse responses to one standard deviation shock to deposit rate (alternative 1)

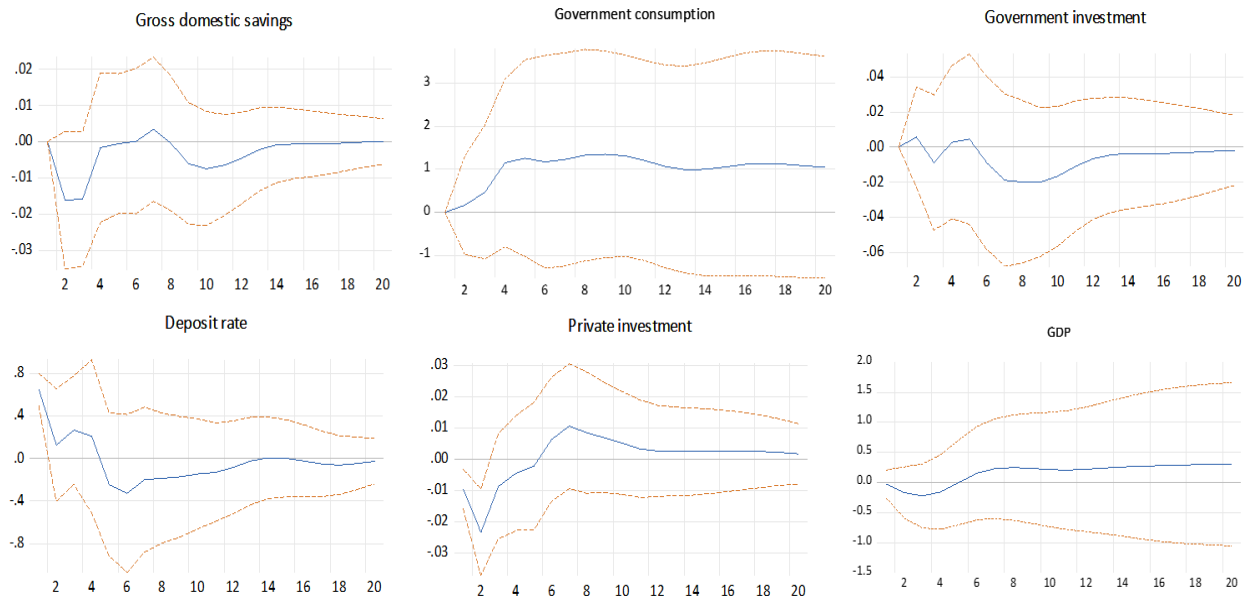


Figure A5.1 Impulse responses to one standard deviation shock to NSC interest rate (alternative 2)

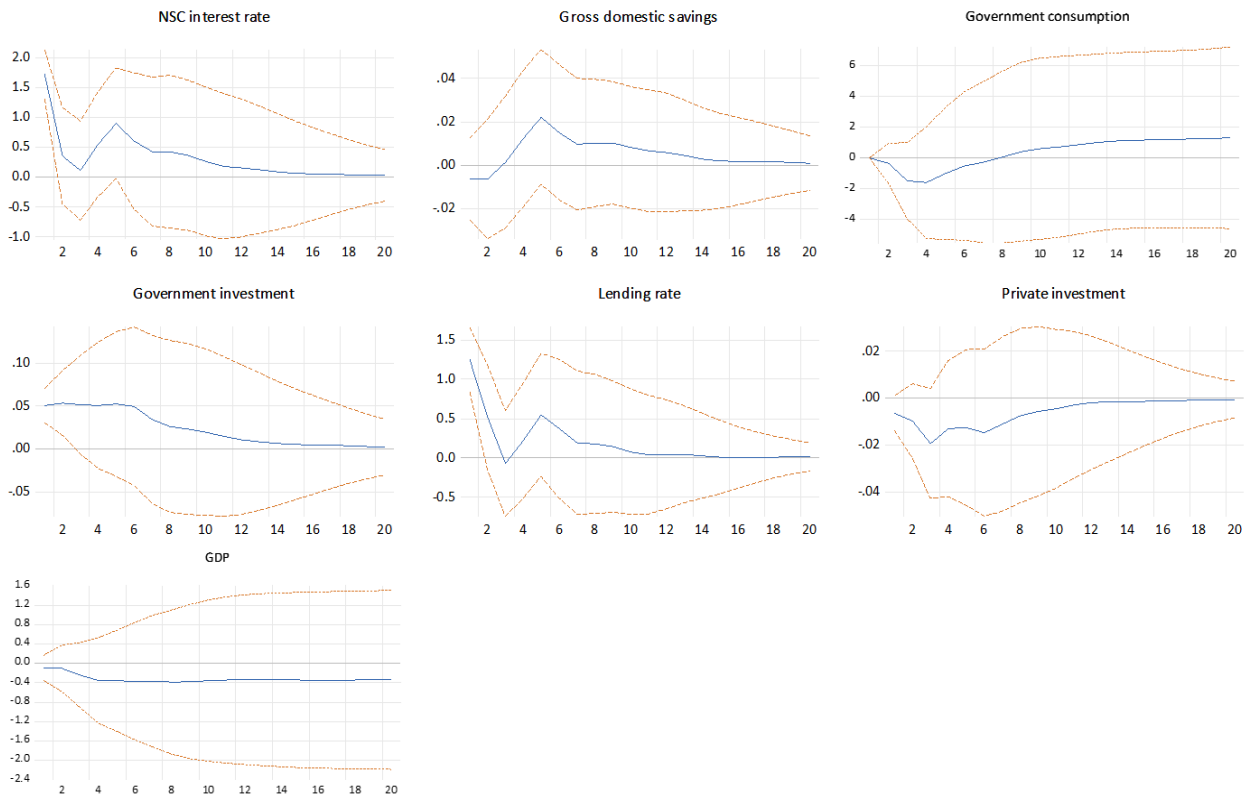


Figure A5.2 Impulse responses to one standard deviation shock to lending rate (alternative 2)

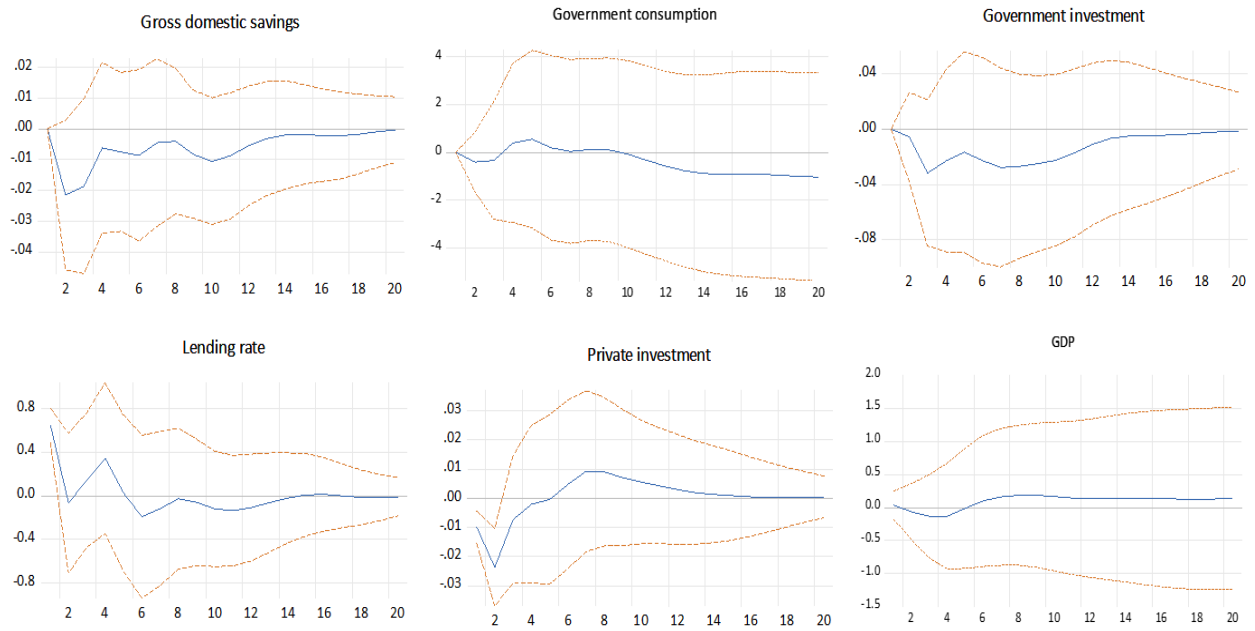


Figure A6.1 Impulse responses to one standard deviation shock to NSC interest rate (alternative 3)

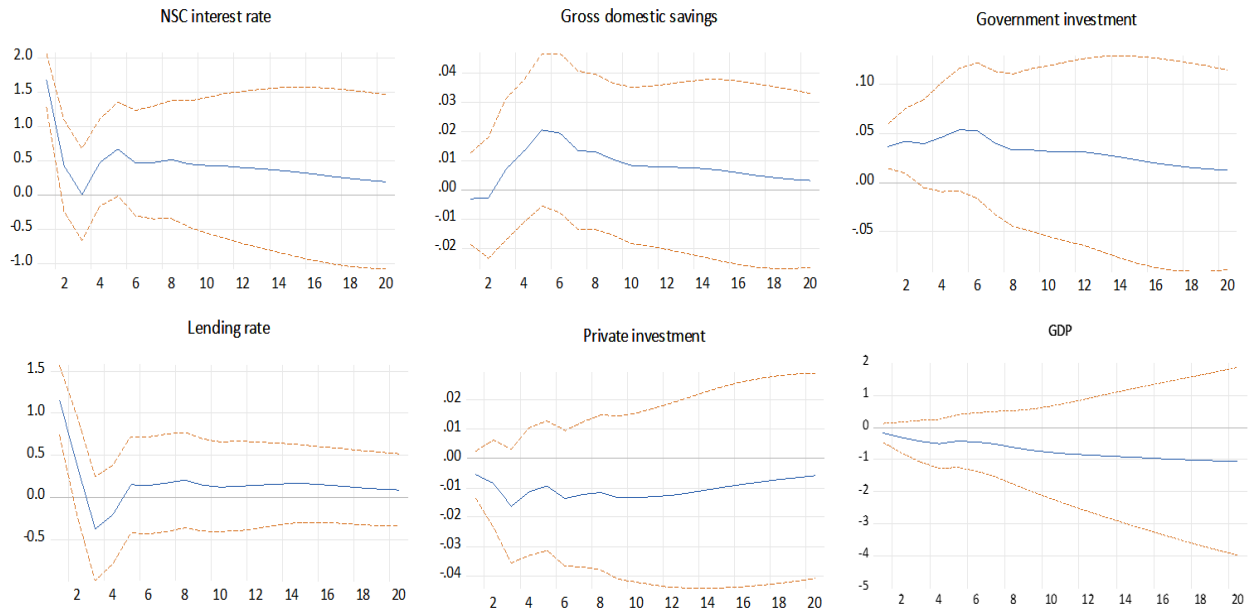


Figure A6.2 Impulse responses to one standard deviation shock to lending rate (alternative 3)

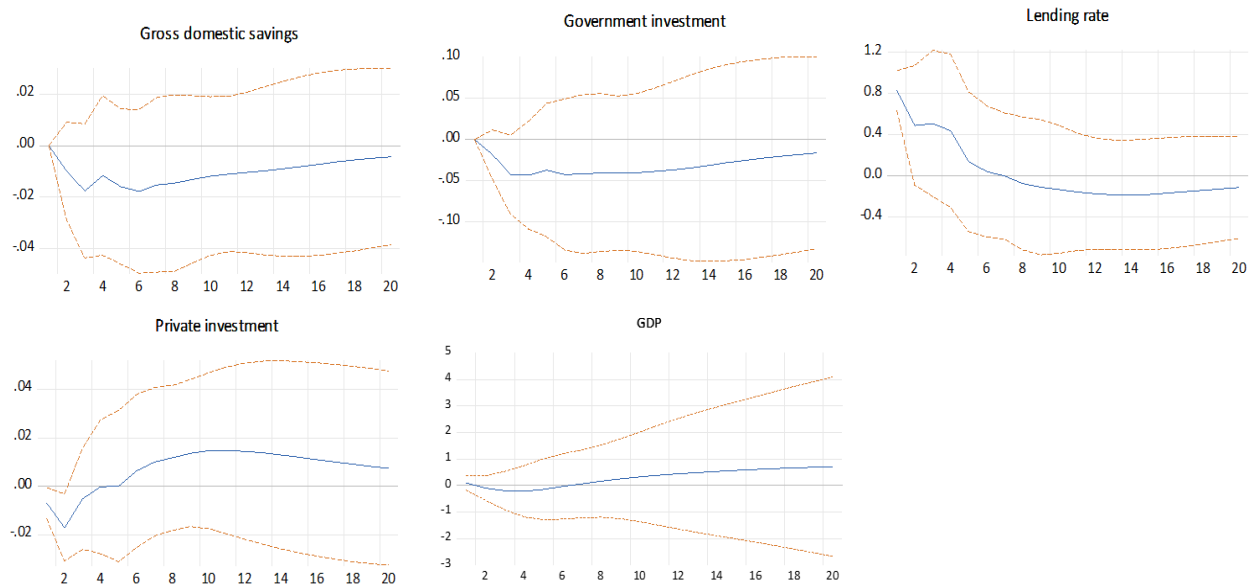


Figure A7.1 Impulse responses to one standard deviation shock to NSC interest rate (alternative 4)

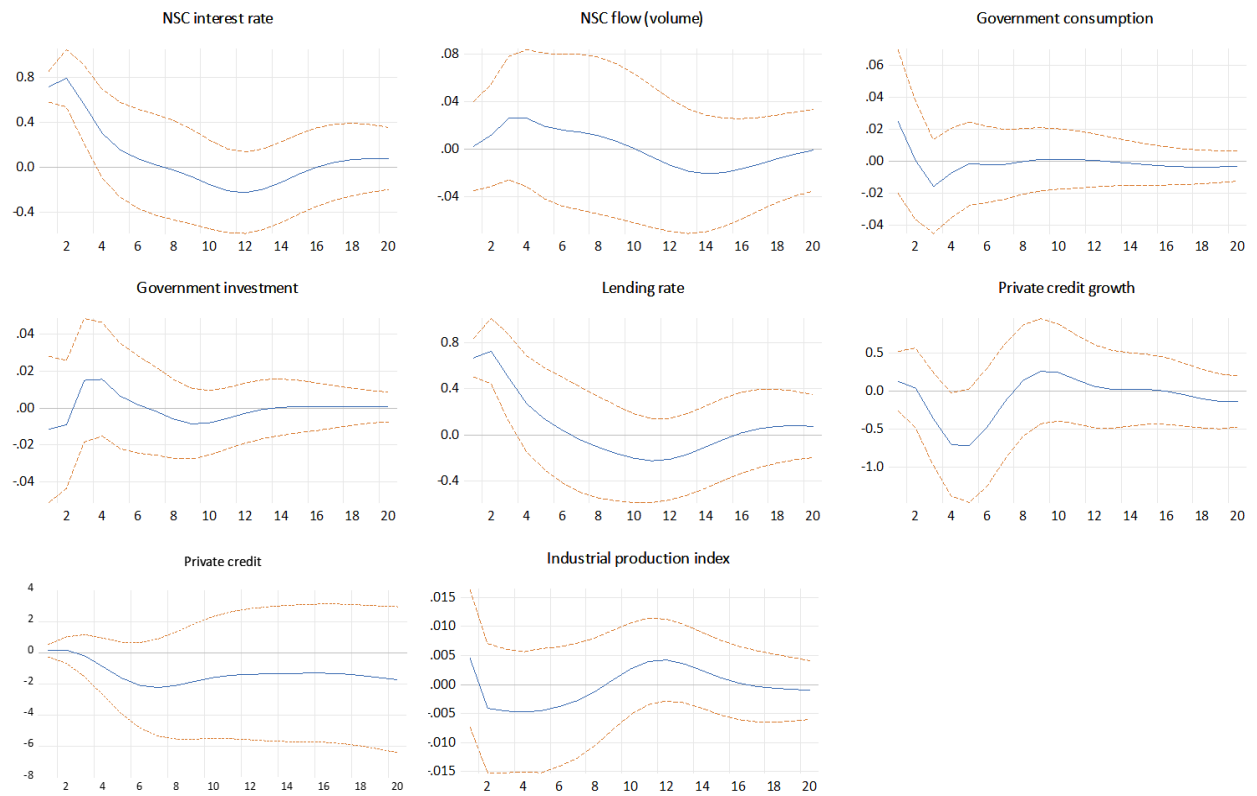


Figure A7.2 Impulse responses to one standard deviation shock to lending rate (alternative 4)

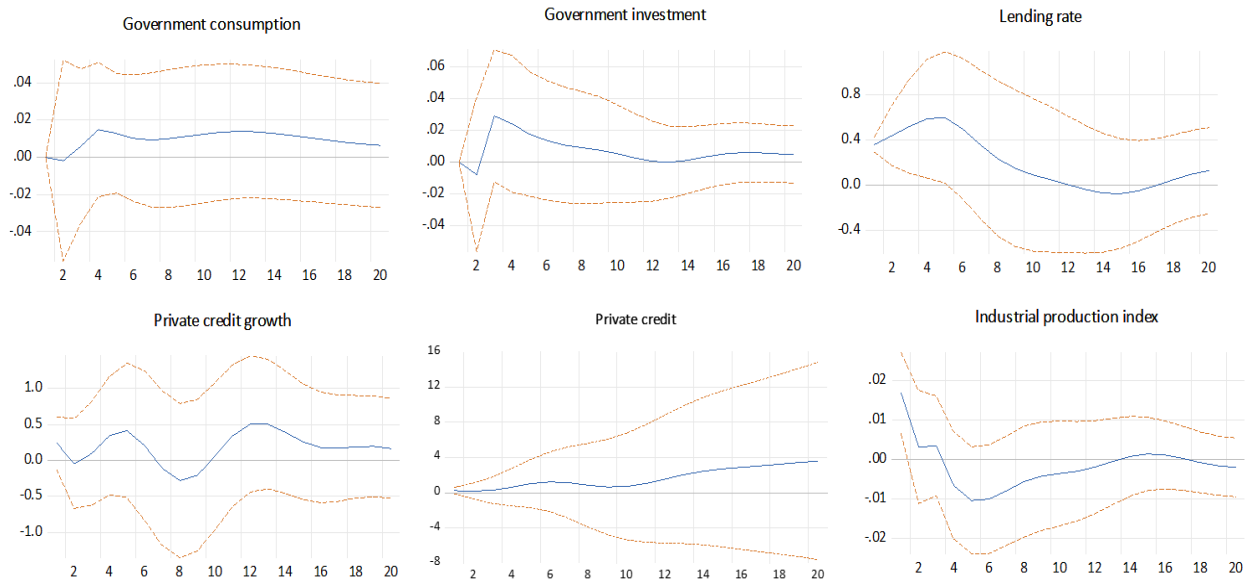


Figure A8.1 Impulse responses to one standard deviation shock to NSC interest rate (alternative 5)

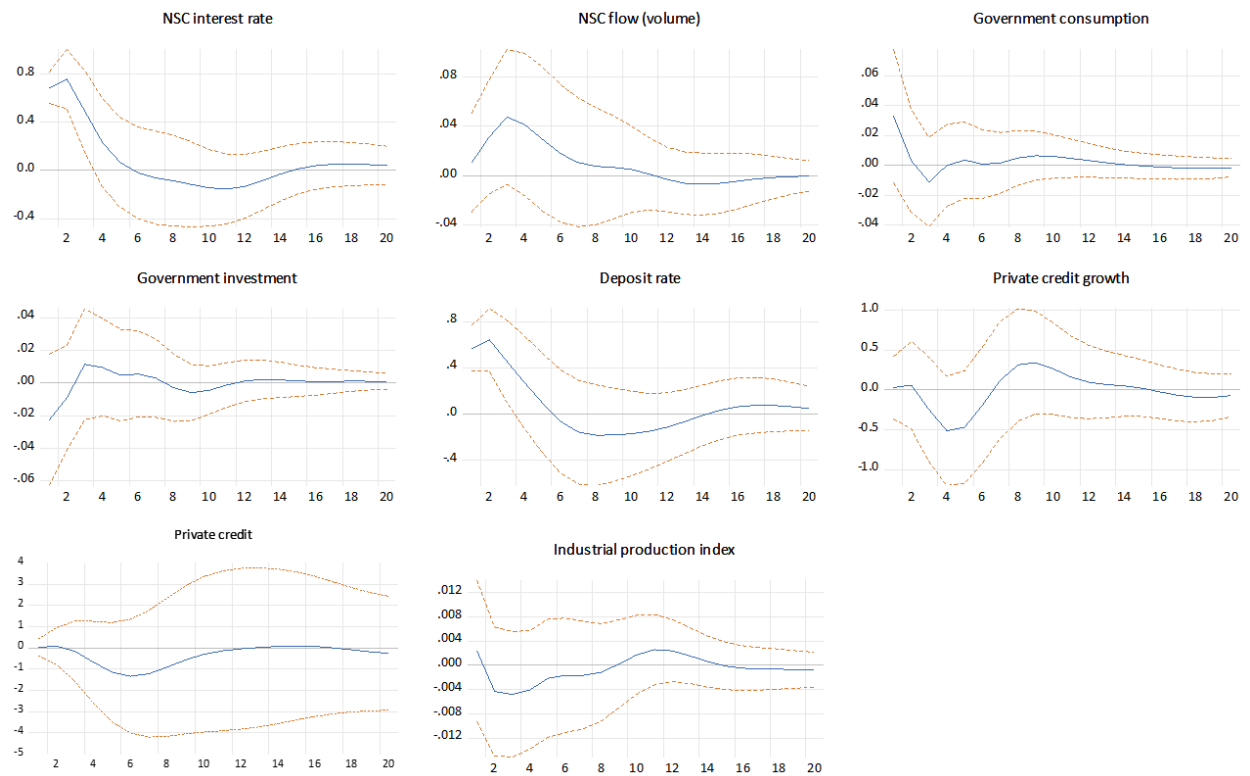
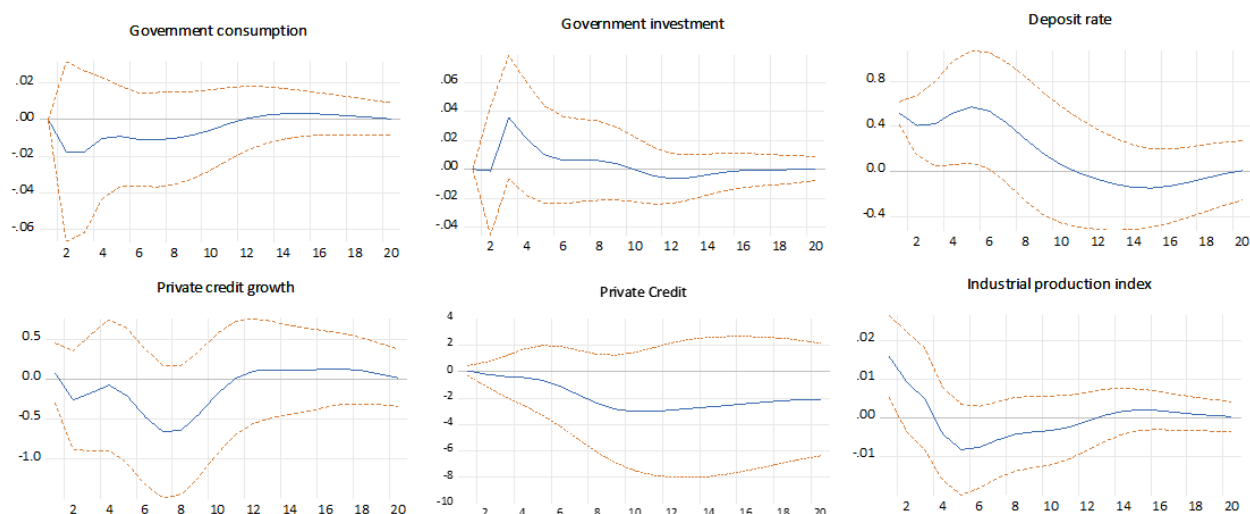


Figure A8.2 Impulse responses to one standard deviation shock to deposit rate (alternative 5)



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