Review

Financial, Digital and Green Banking Aspects of Monetary Policy

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Abstract: *Apart from monetary policy's impact on real GDP, inflation, interest rate and exchange rate, banks' financial impact, along with digitization and the green banking approach of Bangladesh Bank (BB), are elaborated in this paper. Financial crucial issues, securitization, balance sheet duration gap and operational issues related to banks are addressed. The salient features of digital currency and automation are another key aspect of central banking in relation to technological development. To maintain the ecosystem, green banking and deserter management aspect is also examined. Analysis regarding the mentioned issues will integrate the money and financial market with a due concentration on digitization and green banking to formulate integrated policy from the central banking perspective. For inclusive and sustainable growth, the shed of modern interest rate targeting monetary replacing monetary aggregate targeting monetary policy is also highlighted in this paper. Attaining the broader objectives of monetary policy by the conventional and growing Islamic bank segment is crucial in order to attain multidimensional objectives of monetary policy, which is illustrated in the different sections of this paper. Overall, the financial sector, including the priority sector like digitization and green financing from the central bank monetary policy perspective has huge importance for applying due diligence. Accordingly, the fundamentals of micro and macroeconomics, project financing, government deficit budget financing and the significance of monetary policy taking care of automation and green financing for inclusive growth is the thrust of this paper in brief.*

Keywords: Monetary Policy, Demand for Money, Interest Rates, Money Supply and Price Level.

JEL Classification: E52, E41, E43, E51, E31.

1. Introduction

The money market includes banks, financial institutions, micro-credit intuitions and foreign exchange markets. BB regulates the money market. However, micro-credit institutions are regulated by the Microcredit Regulatory Authority (MRA). Insurance is regulated by Insurance Development and Regulatory Authority (IDRA), share and bonds under the jurisdiction of Bangladesh Securities and Exchange Commission (BSEC), and all together form the financial market in Bangladesh. Individuals' preference relating to the combination of goods in terms of indifference curve (IC) as a starting point impacts the financial consequences, which may be regarded as the foundation of microeconomics. IC is a different combination of two goods, x and y, with the same level of utility, for example, 100. If a consumer chooses a combination of A (x and y goods), he would be indifferent about the combination of B. Some features of the indifference curve- i) The IC is downward sloping; if someone increases the combination for one

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good, he has to decrease the combination of other good to keep the utility at the same level. ii) Higher IC (IC_2>IC_1) represent the higher level of utility. iii) The IC within the quadrant cannot intersect each other. iv) IC cannot touch the x and y axis. Exception- a. If the product is a perfect substitute (tea and coffee) and b. for perfectly complementary goods (left and right shoe). v) IC is convex to the origin. Consequently, isoquant and isocost are dealt with by the producer following the individual's preference.

In microeconomics, operationally, firms' profit is maximized when revenue is more than cost. When the total revenue is highest and total cost is lowest, then profit is maximum with marginal revenue and marginal cost curve zero slope. As long as the average cost is less than the average revenue (price), firms experience abnormal profit. The loss will be made when the average cost is higher than the average revenue. Zero profit occurs when the average cost is tangent with the average revenue curve. Thus, firms' cost curve and revenue curve derived from profit crucially address the perfect competition, monopoly and monopolistic competition like banks of the economy dealing with market norms of monetary consequences including market failure as deviation from perfect competition and investment decision related to net profit and dividend, which is an important element of financial policy. IS-LM curve, the cornerstone of macroeconomics for financial development, may be elaborated as a fall in an interest rate increases the investment, employment, consumption and income(y), impacting the IS (investment-saving) curve, which is a downward slope. On the other hand, a rise in income (y) considering a fall in price with constant money supply in terms of real money (M/P) balance enhances the transaction demand and money demand with an upward-sloping LM (liquidity preference-money supply) curve. Combining IS-LM generate a downward-slopping aggregate demand curve (C+I+G+(X-M)) of the economy. Consequently, in two factors of the production system (capital and labor) assuming constant capital, the supply of labor rises as an increase in price with upward-slopping the aggregate supply curve. Accordingly, we get equilibrium in aggregate demand and supply with market clearing price starting from the IS-LM curve.

Bearing in mind the IS-LM consequences, the financial depth or financial deepening (M2/GDP) of our country is around 45%, which is more than 80% and 100% in India and East Asian countries. The size of market capitalization in our country is around 18% of GDP comparing over 100% in India. Consequently, in order to deficit budget financing, the government mainly rely on the money market rather capital market for issuing treasury bills/bonds. At the same time, due to structural rigidity (subsidy, demand and supply realization bottleneck), it is hard to implement monetary policy balancing interest rate, exchange rate, inflation and unemployment allowing market forces. Consequently, the captive policy in many cases hampers the central bank's autonomy. However, among others, a surge in foreign exchange reserves will contribute in enhancing financial deepening. The central bank deals with different regulations and guidelines that are complied with by the commercial banks maintaining risk appetite. Consequently, banks report all the data to the central bank following an integrated supervision system under macro and micro-prudential policy. Among others, human resource development, foreign exchange (DBO, OBO), financial projects, agricultural, CSME, refinance, deposit insurance, CIB, government debt management, automation, Islamic banking (mudaraba, musharaka, sukuk) sustainable and inclusive finance have due importance in central bank operation. In the monetary policy frontier, apart from fundamental analysis, the technical analysis, such as forecasted policy analysis system (FPAS) as well as quarterly projection model (QPM) to realize the trend and other factors of inflation and GDP, for example, taking into account surveys, backward, forward, learning, expectation and rational expectation models are crucial in central banking. However, the study shows that the mentioned macro-prudential policy works better than Taylor's rule-based monetary policy, specifically in a stressed situation.

Islamic banking modes of finance 1.partnership taking care of musharakah along with mudarabah and al-wadiah 2. Trade/sale (bai-murabah, bai-muajjal, bai-salam, bai-istasna) 3. Ijarah/lease (hire-purchase, hire-purchase under shirkatulmelk, sukuk) and corjehasana are done considering efficient uses of goods and services, addressing morality and profit-share ratio (PSR) for optimum inflation and real GDP, ignoring conventional intrinsic value and speculative demand of money. Islamic insurance or takaful (family, institutional, micro, general) and shariah-based capital market with due diligence, along with Islamic banking, prohibits interest (riba), gambling (maysir) and uncertainty (gharar) comprising Islamic financial system for all. Like conventional banks in Islamic banking, for monetary expansion inflation and real GDP are considered, taking into account deposit and lending growth and associated risk factors. Macro prudential policy, for instance, loan classification and provisioning, calculation and maintenance of capital against risk-weighted assets, and advance deposit ratio lending to economic priority sectors in Islamic banks are broadly similar to conventional banks. To ensure cash flow (CF) based project financing net present value (NPV), which is NPV= CFn/ $(1+r)^n$and Internal Rate of Return (IRR) that is r_a + (NPVa/NPVa-NPVb)x r_b- r_a need to be maximized. From the microeconomic and macroeconomic perspective, Cobb-Douglas production function $Q=AL^aK^b$ addressing returns to scale and lower incremental capital-output ratio (ICOR= Capital investment amount 32% / economic growth of 8%) can be judicially dealt with.

Bank financial health can be examined based on different financial ratios (Financial Ratio Analysis), parametric (Stochastic Frontier Analysis) and non-parametric (Data Envelopment Analysis) methods to get an efficient outcome (technical, allocative and cost efficiency). However, due to the presence of moral hazard, agency problems and asymmetry market failure may occur. In such cases, among others, banks may go for a merger based on a projected scenario analysis of financial outcomes. It may be mentioned that in 2008, owing to the global financial crisis in the USA JP Morgan acquired Washington Mutual Bank to avoid market failure and ensure a robust economy. Due to the FED interest rate hike and other financial consequences of recent times Signature Bank, Silicon Valley Bank and First Republic Bank, for adverse treasury bonds exposure in terms of lower valuation, face the challenge of survival. Accordingly, Citizen Bank acquired the Signature Bank, for example, to lower financial adverse impact mainly governed by the FED financial stability agenda implementation. In this light, in our country, from the prompt corrective action (PCA) framework point of view, taking care of financial indicators such as classified loans, advance deposit ratio, Capital to Risk Weighted Asset Ratio (CRAR), Return on Equity (ROE) and Return on Assets (ROA) central bank may apply road map for ensuring financial soundness taking care of policy consistency issue of Edward Prescott. In the digital frontier, payment systems automation is gaining momentum. Banks, payment system operators, and providers, for instance, are engaged in providing safe and quick financial services. Asset-backed central bank digital currency (CBDC) is developing against the decentralized crypto currency. Secured and authentic block-chain is the basis of CBDC. For maintaining ecosystem green banking and natural deserter management, considering financial derivatives related to weather and climate is important. BB, using f its own funds and foreign funds, is working closely to take care of sustainable financial development. Banks' corporate social responsibility (CSR) fund's lion portion is dedicated to disaster management. Funding for renewable energy is also treated as a priority agenda.

2. Literature Review

Abdullah and Yusop (1996) conducted the Error Correction Estimates and established the presence of feedback between money and GDP depending on cointegration between the stipulated variables. In order to achieve diversified knowledge in relation to government financial debt in Bangladesh, a study on debt management and OMOs is pursued eventually. The function of debt management performance on the solidity of economic growth and development, with particular emphasis on Nigeria, has been crucially examined altogether by Adepoju et al. (2007). As an endogenous factor, Money Supply depends on business attributes, which is advocated by the banking school. Chowdhury et al. (1995) demonstrated empirical evidence of Bangladesh bringing together Prices, Money, Income and Interest rates. From economic perspective, the one-way bet is attributed to Soussa (2000). Friedman (1963) claims that Money Supply initially resolves the level of inflation in a country following a monetarist interpretation of inflation. Friedman (1963) attributed Inflation as always and everywhere, a monetary phenomenon. Hossain (2011) empirical results show that Money and Income are cointegrated in Bangladesh, resulting in a stable long-run relationship between the two variables. Jones and Sattar (1988) were able to establish the causal relation between Money- GDP and Money-Inflation in the case of Bangladesh depending on the Granger Causality Test using monthly data covering June 1974-December 1985.It is argued by LeRoy and Porter (1981) that under the assumption of constant discount factor stock prices were too volatile with fluctuation in future dividends. In the economic business cycle, our country has observed continuous price surges, especially of food items, in the domestic market frontier in the set of global rises in food prices according to Mortaza and Rahman (2008). The paper argued that, especially in developing countries, such price fluctuations in the international commodity markets have brought to the forefront the impacts of foreign price changes on inward inflation. The relationship between import and domestic prices in our country in the timeframe 2000-2008 is analyzed in this paper. The mentioned study analyzed Pass Through elasticity of import prices on domestic prices using monthly data. It is important in relation to policy formulation for our country's perspective to correctly align the exchange rate and trade-related policies in the short-run domestic realities coupled with the long-run view of enhancing domestic production according to the inference of the study. Debt management and OMOs, especially for developing countries, are dealt with by Srinivasan (2011). The analytical foundations that show how financial lubrication is provided via collateral chains are addressed by Tobias and Hyun (2009).

3. Methodology

Operational secondary information based on central bank publication is consistently verified before incorporating in this paper. Result-oriented financial, digital and green banking qualitative and quantitative analysis is used as the underlying elements. Different think tank and stakeholder views and economic diagnosis shed light on elaborating financial, digital, and green banking aspects (Figure 01).

Figure 01: Research Framework

Interest rate targeting monetary policy

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Inclusive and sustainable financial policy analysis

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Call money as an operating target of monetary policy

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Reserve money and broad money as information variables

↓

Inflation and GDP as final goal

Source: Author's Compilation

4. Monetary Policy Concerned with Financial Stability

There are four types of Monetary Policy such as Interest Rate Targeting, Monetary Aggregate (M2 and reserve money) Targeting, Interest Rate Targeting and Inflation Targeting (developed country) monetary policy. We are in the process of interest targeting monetary policy replacing monetary aggregates targeting. In the interest rate targeting, we target interbank call money rate, bearing in mind the bank's liquidity, which comprises cash in tills, CRR, Taka balance and foreign currency balance with BB, including encumbered treasury bills and bonds holding. Mainly through open market operations (OMOs) tool combining standing deposit and lending facility, policy rate (repo rate), BB Bills, Bangladesh government Islamic investment bonds, refinance and foreign currency sale and purchase BB maintains the call money rate in desired level ensuring real return in deposit as well as satisfying Taylor equation. In the Taylor rule, call money rate is a function of inflation trend, real return, output gap and desired and actual inflation deviation. Interbank call money rate moves around the policy rate with upper and lower bands shown below in the interest rate targeting framework. In the interest rate targeting monetary policy, call money is the operating target, broad and reserve money are information variables and inflation and real GDP are goals. Initially, for banks and financial institutions and other lending rates, six-month moving average rate of treasury bills (SMART) plus some premium was applied. Recently, market-based deposit rates and lending rates are enforced considering economic and financial consequences. Key issues of conventional banking interest rate targeting monetary policy interest rate corridor (Figure 2).

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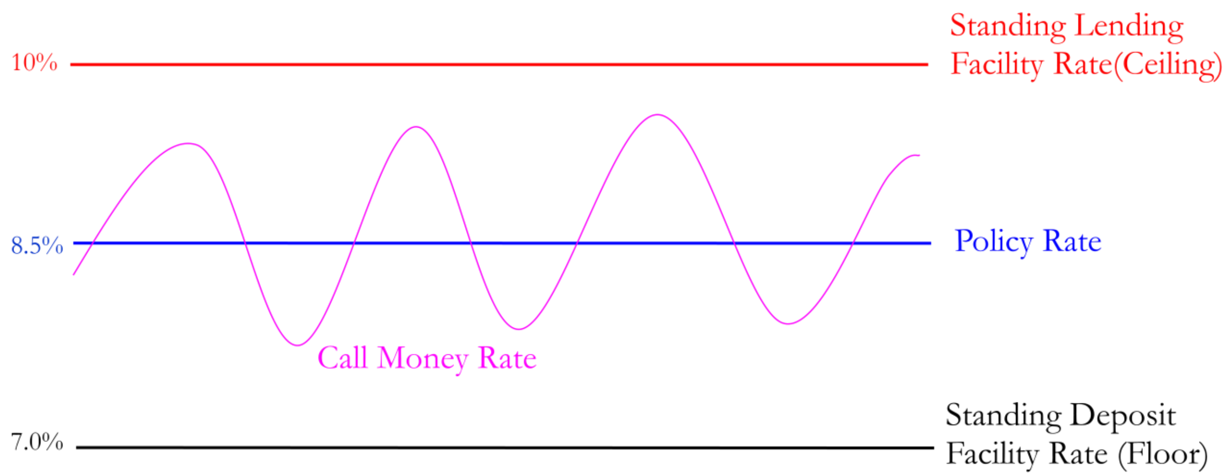
Figure 2: Interest Rate Corridor (IRC)



Source: Bangladesh Bank, 2024

Classical economics approach assumptions and limitations are full employment, invisible hand and long run. Features are 1) Say's law that supply creates its own demand. 2) Wage price flexibility model: wage cuts reduce the cost of production, and lower prices increase output with full employment. 3) Interest rate flexibility model balancing saving equal investment and goods market equilibrium, and 4) Money market equilibrium dealing quantity theory of money- Fishers equation (transaction demand for money), Cambridge equation (precautionary demand for money) and Friedman monetarist approach (inflation is monetary phenomena). This is the case of fundamental monetary policy. Keynesian economics approach assumptions and limitations are short-run, perfect competition, constant resources and a closed economy. The aggregate demand (AD) & aggregate supply (AS) derived from summing individuals' needs. AD is the maximum amount the individuals are ready to pay. AS is the minimum amount that the producers expect. Here, the government has a role to impact the AD. Effective demand matching AD & AS occurs before full employment level as, among others, wage and inflation adjustment is not instantaneous, which is 1 to 1. Fiscal policy derives from the Keynesian approach and it introduces interest rate with speculative demand for money in relation to investment multiplier (1/1-MPC) times I (investment). Both mentioned monetary and fiscal policies are used for creating and reducing demand addressing consumption (C), investment (I) and government expenditure (G) in terms of output, income and employment.

The intrinsic value of Taka against foreign currency relies on exports, foreign remittances, manufacturing items, non-conventional goods, development of IT, foreign direct investment (FDI), foreign loans and country's inclusive and sustainable investment resilience. Flexibility in exchange rate rather than fixed has greater potential to enhance the value of Taka in terms of central bank autonomy and mobility of goods and services. Favorable terms of trade (TOT) with sufficient foreign exchange reserves will enhance the quality of life, promoting manufacturing investment share in GDP rather than real estate for instance, taking into account the diversified export base in the country. Balancing the inflation and interest rates promoting output and reducing unemployment in an open economy considers the absolute and comparative advantage for maintaining purchasing power and finances in the money norms. Mundell-Fleming model enhances the Keynesian IS-LM model advocating that an economy cannot simultaneously cannot maintain free capital movement, fixed exchange rate and independent monetary policy. Consequently, crawling peg exchange rate system has emerged balancing interest rate, output and inflation considering small open economy also with a view to Phillips curve, financial stability and welfare. In the exchange rate frontier, Crawling Peg is a system of exchange rate adjustments in which a currency with a fixed exchange rate is allowed to fluctuate within the upper and lower band. The par value of the stipulated currency and the band of rates is adjusted dynamically, taking care of exchange rate volatility.

The equilibrium exchange rate can be determined following Real Effective Exchange Rate (REER) based exchange rate. Recently, to boost up the foreign exchange reserve, the currency SWPA between banks and BB has been introduced considering interest rate differential of secured overnight financing rate (SOFR) and policy rate at maturity. The basis of the economy is loans or savings. Keynesian economic system encourages loan-based development of the private and public sectors with monopoly power of government for printing money. Accordingly, consumption, the weighty variable of GDP, will expand by relying on loans, impacting the enhancement of output. In this system, the central bank will supply money based on public and private sector demand, maintaining characteristics of fiat, among others, with minimal importance on the required reserves of banks. Many developed countries follow this norm with their loan amounting to 100% of GDP. While, broadly the Austrian school of thoughts consider savings is to be the fundamental of economy for creating capital. High savings and increasing capital flow will gradually reduce the price of goods and services enhancing consumption. In this system, the mostly gold-baked traditional money supply is supported because the gold supply will not increase overnight like fiat money. Traditionally (in the past), the world was under this system. Limitations of excessive supply of fiat money remind us to consider the benefit of gold standard central bank money. However, we have loans of roughly 40% of our GDP supporting the traditional approach of savings along with a fiat system for encouraging investment. Consequently, in our country, we are a mixing traditional and fiat monetary systems with high (17%) required reserve maintaining requirements before loans by the banks and consumption through investment like fiat money are following with advance deposit ratio of 87% and 92% for conventional and Islamic bank, which amplifying the solidity of the banking and economic system of our country. In the Dynamic Stochastic General Equilibrium (DSGE) model, interactions among individuals, firms, monetary and macro prudential policies and mentioned policies impact on GDP and inflation, for example, are observed. In this regard implicit (algebraic) equations are derived necessarily identifying parameters (calibrated) and variables along with taking care of integers, rational, irrational and complex numbers in brief. Posteriors are calculated relying on likelihood and prior addressing the Bayesian approach for comparing the desired variables mean. Simulation of interested variables, for instance, demonstrates that macro-prudential policy (Basel III) performs better comparing Taylor rule-based monetary policy in the case of financial deserter. Accordingly, monetary policy has great concern for financial stability, which is briefly elaborated in the following sections.

We know the quantity theory of money is $MV=PY$.

$$\ln M+\ln V=\ln P+\ln Y$$

=lnM=lnP+lnY-(lnV)

=7.5%+6.5%-2% =12% M2 growth is expected for FY 2023-24, for instance.

Here, M is broad money, Y is real GDP, P is price and V is income velocity of money (GDP/M2). It may be mentioned that in our monetary policy the reserve money is the Operating Target, the M2 is the Intermediate Target and real GDP and inflation are goals. To achieve these goals BB uses direct and indirect monetary tools.

Banks' lending ability to the private sector and government sector derives from deposit growth, which is the liability component of broad money (M2) addressing net foreign assets and net domestic assets of capital formation. According to the recent trend, banks' deposit growth amount in a financial year is almost equal to credit to the government sector (roughly over Tk.1 lac and 25 thousand crore) for deficit budget financing. A significant amount of banks' liquidity (cash in tills+ foreign currency balance+ local currency deposit with central bank+ unencumbered securities minus required reserves, which is CRR and SLR) is unencumbered approved security, that is, treasury bills and bonds. Operationally, through repo, banks are mortgaging these government securities to the central bank and, among others, generating money for private sector credit, encouraging securitization. This process is less inflationary than taking high-powered money or reserve money from the central bank. Considering money multiplier 5, reserve money of Tk.1 creates broad money amounting to Tk.5. This is the insight of loanable funds creation of Bangladesh in terms of financial consequences. Milton Friedman argues money supply is the root cause of inflation. In the interest rate targeting monetary policy regime through call money interest rate, the central bank takes actions to control inflation. Maintaining areal return, that is, a bank deposit rate more than the inflation rate is the agenda of Taylor rule-based monetary policy. According to the central bank perspective, inflation may occur from the past undesired surge in money supply, supply shock and inflation expectation. A rise in inflation may reduce unemployment by lowering the interest rate, addressing the Phillips curve. Overvalued foreign currency based on the real effective exchange rate (REER) has a tendency of capital flight in the expectation of devaluation in future, resulting in bad money driving out good money according to Gresham's law. Enhanced interest rates appreciate local currency. In this regard, lower-cost foreign currency borrowing with local unchanged exchange rates prevailing for a long time eventually may signal volatility in exchange rates like the East Asian financial crisis of 1997. So, the central bank needs to be prudent in maintaining the exchange rate considering the interest rate differential of the partner countries. Consequently, we may have to consider the exchange rate overshooting, which is the area of Rudiger Dornbusch. Higher domestic inflation, considering interest rates, may benefit the borrowers with an adverse impact on the economy. Lower interest rates than Treasury bills/bonds badly impact the bank's loan increasing risk. Bank loans need to be more than government risk free rate accommodating general prohibition handling deficit budget financing. The domestic desired interest rate and allowing proper devaluation of exchange rate will enhance export, remittance, foreign direct investment, and balance of payment (BOP) financial account inflow with the rise in foreign exchange reserve increasing money supply and impacting GDP positively. Higher US Fed interest rate momentum may create an outflow of capital with the devaluation of local currency generating huge financial loss. Consequently, balancing interest rate, exchange rate, inflation, and GDP is crucial in terms of the operational perspective of the central bank considering traditional, commanding, mixed and marked-based economic norms of the country.

Joseph Stiglitz refers to monopolistic competition. In our country, banks are maximizing and, in some cases, optimizing profit following monopolistic competition norms. Corporate and non-corporate financing is the main source of income for banks with due attention to household and internet banking, magnetizing huge population for mobilizing low-cost savings deposits and pursuing efforts for profit, which requires, for example, on average Tk.12.50 safeguarding capital against Tk.100 loan, enhancing bank capital needs from different sources depending on risk appetite considering operational point of view. Environmentally friendly financing, for instance, balancing fossil fuel and renewable energy and automaton of the conventional banking system for ensuring the pace of the fourth industrial revolution along with establishing digital bank and taking care of job losses and benefits agenda related to use of application programming interface (API), data mining and artificial intelligence (AI) are significant. Moreover, central bank policy intervention to address market failure is crucial for promoting productivity and innovation. For sustainable and inclusive financial growth, the realization of the mentioned issues is vital from the perspective of the banking ecosystem. Operationally, the financial consequences of the company, including banks for business and related institutions' actions in order to channelize monetary funds encouraging investment can be elaborated as follows: Formation of private (share transfer restriction) and public limited company (share transfer non-restriction) including listed from Registrar of Joint Stock Companies and Firms addressing memorandum and article of the association are vital to start a business. Office of the Chief Controller of Imports and Exports facilitates import and export registration certificates (IRC & ERC). Paid-up capital, deposit and other bank-related issues are under the jurisdiction of the central bank. Domestic and foreign company registration with Bangladesh Investment Development Authority and other Economic Zones ensure tax and other incentives for doing business. Financial statements along with balance sheet and off-balance sheet impacting cash flow apart from duly land mortgage provide asset back to run a company (for banks along with central bank permission accommodating sufficient capital and loan provisioning required). Moreover, listed companies need to follow the procedure of the Central Depository of Bangladesh Limited, Stock Exchange, Securities and Exchange Commission for initial public offering and pursuing trade through brokerage houses and institutional investors. Microcredit Regulatory Authority and Insurance Development Authority are other regulators. Among others, FinTech and startup businesses also need due compliance process. Crucially, as an exit plan investment bank for merger and acquisition has a role. In the USA, Chapter 7 and Chapter 11 deals with bankruptcy. Meticulously, sometimes company financial matters are neither black nor white but gray as both parties broadly, the depositor and investor, have a self-interest, especially in addressing the banks' distress capital (classified loans, rescheduling and write-off), which is roughly one-fourth of the total loan.

It may be noted that we have started financial deregulation since 1991. Likewise, we have to rely on the invisible hand of the market for balancing between market and mixed economy for enhanced welfare, maintaining historical ethics of economics of plain, fair and truthful norms of good governance with financial (fiscal) responsibility act, especially allowing green financing/ climate is the main concern of policy intervention, maintaining the prudent and friendly flow of capital to the market and among others for accommodating global trade affairs of Paul Krugman, caring sustainable and inclusive three-dimensional economic growth. From the financial perspective of monetary policy, deficit financing to the national budget is crucial, among others, to build the yield curve of government treasury bills and bonds. In order to increase the budget amount to over 20% of GDP for implementing more economically and socially demanding

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projects taking care of overall deficit budget financing of 5% or more, the revenue collection to GDP needs to be over 13% through an equitable basis concentrating direct tax. From the balance of payment (BOP) frontier of monetary policy, net exports need to enhance in terms of volume like Vietnam (developing country) with due attention to foreign direct investment and financial account inflow, taking care of productivity and technology for rapid and sustainable GDP growth. To face the developing country graduation in 2026 and onward, the soft loan facility needs to be accommodated with market rate along with expansion of export addressing trade imbalance and competitiveness with India and China, which currently import goods of roughly USD 900 billion and USD 3 trillion in a year for instance. At the same time, investment momentum in special economic zones and offshore and onshore banking higher inflow of foreign capital as a game changer has due importance from the monetary policy operational perspective. These will result in a higher overall balance of BOP with increased foreign exchange reserves in the reserve money, balancing asset quality between domestic and foreign sources, bringing an upward shift in money multiplier as well as financial deepening. Conventionally, monetary policy deals with GDP, inflation, interest rate exchange rate and unemployment. The Fed, for maintaining a non-accelerating inflation rate of unemployment or NAIRU, follows a balanced policy rate caring inflation and long-term bonds moderate interest rates. Likewise, BB monetary policy considers real GDP growth and inflation as dual mandates. To achieve this goal, a monetary and credit program is designed, which is implemented using Open Market Operations (OMOs) tools like Repo, Reverse Repo, BB bills, foreign exchange buy/sell, auction of government Islamic bonds, refinancing and debt market tools includes auction of treasury bills and bonds. At the same time, interbank call money rates and risk-free government treasury bills and bond rates are maintained to establish an orderly situation in the financial market. The market interest rate directly affects the valuation of Bills and Bonds and the assets and liability of banks. If the market interest rate undesirably goes up following the call money rate and long-term Treasury bill the bank's assets and liabilities duration gap occurs. In such cases, banks need to pay higher interest on deposits (liability) comparing loans and advances (assets). Moreover, financial indicators such as classified loans, advance-deposit growth, CRAR, ROA and ROE are crucially important taking into account monetary policy tools operation.

4.1 Direct Tools

Direct tools are variations in reserve ratios termed CRR and SLR. Currently, CRR for all scheduled banks are 4%, and SLR for conventional banks is 0% of their total demand and time liabilities. However, for the Islamic banks, the CRR is 4% and SLR is 5.5%.Now the bank rate is 4%, which is another direct tool.

4.2 OMOs Indirect Tools

OMO is a change in Policy Rates, such as Repo and Reverse Repo rates. Presently, 1) Repo and 2) Reverse Repo rates (standing deposit facility) are 8.5% and 7.0%. Other OMOs tools are: 3) the 7-day, 14-day and 30-day BB bills. 4) Bangladesh government Islamic investment bond (BGIIB). 5) FX intervention, that is buying/ selling of foreign currency by BB and 6) refinance.

4.3 Government Debt Management Indirect Tools

For gaining momentum in this sector and effective valuation of Bills and Bonds, secondary yield curve may be introduced by the BB accommodating the following agenda addressing the duration gap:

- Anonymous order matching for trade held in different price quotes.
- Secondary trade.
- Two-way price quote. If trade is not held, then the market will receive a signal according to bid and ask quote.

For robustness monetary policy has great concern in terms of financial issues. In implementing monetary policy along with GDP, inflation, interbank call money rate and unemployment BB need to accommodate the financial consequences such as interest rate development, classified loans, advance-deposit growth, CRAR, ROA and ROE.

4.4 Real GDP Growth

The real GDP growth rate was 6.03% in FY 2022-23 (Table 1). Consulting fundamental analysis the technical study such as broadly General Method of Moment (GMM) related to ARDL model shows money supply has positive impact on GDP. DSGE model posterior calculation relying on likelihood and prior also support this inference. The national budget real GDP target is 6.50% for FY 2023-24, which through monetary and fiscal policy need to be achieved.

Table 1: Real GDP Growth

	FY 2022-23 (Provisional)	FY 2023-24 (Target)
Real GDP growth,% (Base:2015-16)	6.03	6.5
Per capita income (USD)	2824	

Source: Bangladesh Bank, 2024

4.5 Inflation

Point-to-point CPI Inflation is9.41% in December 2023 (Table 2). Contrarily, the 12-month Average Inflation is 9.48% in the same month.The econometric exercise vector error correction model (VECM) exhibits the positive impact of reserve money on inflation. In this VECM equation omitted variables correlation with dependent and independent variables are scrutinized for robust inference. Monetary policy has a role in maintaining a 7.50% national budget declared inflation rate considering reality.

Table 2: Inflation

	December 2023	FY2023-24 **Budget Target**
12 month average, %	9.48	7.50
Point-to-Point, %	9.41	…

Source: Bangladesh Bank, 2024

4.6 Interbank Call Money Rate

We know there are four types of monetary policy regime.

1) Exchange Rate Targeting

2) Monetary Aggregate Targeting

3) Interest Rate Targeting and

4) Inflation Targeting

We are in the process of moving towards an interest rate targeting regime. The interbank call money rate will be the operational target, the broad money and inflation will be the information variable and goal. Balancing call money inflation, GDP, unemployment and exchange rate are combined. Proper call money also contributes to moderate yield rates of government treasury bills and productive investment. The weighted average interbank call money rate was 9.36% at the end of January 2024 (Table 3).

Table 3: Interbank call money rate

	31 January 2024
Weighted average inter-bank call money rate, %	9.36

Source: Bangladesh Bank, 2024

4.7 Emphasis on SME Credit for Generating Employment

Total SME loan disbursement amount for FY23 was Taka 2241.04 billion. This is 8.06% higher than that of FY 22. The disbursement amount in FY23 was Taka 627.47 billion. Boosting employment in Bangladesh is crucial for real wage, inflation and GDP growth determination from fundamental Classical, Keynesian and Neoclassical economic points of view. The contribution of agriculture, industry and service sectors in Bangladesh employment is 40%,20% and 40% respectively, in the 7 crore employed population. Specifically, cottage, micro and small enterprise (CMSE) with Tk. 2.5 lakh can create 1 job, for instance. Accordingly, Tk. 1 crore investment in the CMSE sector may contribute to40 jobs. The central bank suggested 25% of total bank credit in the CMSME sector amounting Tk. 2.5 lakh crore can contribute to 1 crore jobs in the country. Now broadly, CMSE sector employment is 79 lakh with 19% bank credit. Consequently, financial deepening (broad money/nominal GDP) from 50% to 100% may magnetize one-third of unbanked people of the total population, contributing more to overall employment exploring potentiality.

4.8 Interest Rate Development

The Policy rate (repo rate), Standing Lending Facility (SLF) and Standing Deposit Facility (SDF) are 8.50%, 10.00% and 7.00% (Table 4), respectively, for balanced economic development considering monetary policy.

Table 4: Interest Rate Development

	May 2024
Policy Rate (%) Repo	8.50
SLF Rate (%)	10.00
SDF (%)	7.00

Source: Bangladesh Bank, 2024

4.9 Classified Loans

The ratio of total classified loans to total outstanding loans of commercial banks was 9.93% at the end of September 2023 (Table 5). Also, the ratio of net classified loans to net outstanding loans became 1.22% on September 2023. Classified loan is the indicator of bank health. The classified loans crucially impact the monetary policy.

Table 5: Classified Loans

	September2023
Total classified loans/Total outstanding loans, %	9.93
Net classified loans/Net outstanding loans, %	1.22

Source: Bangladesh Bank, 2024

4.10 Advance-Deposit Growth

Bangladesh Bank set the advance-deposit ratio (ADR) at 87% for conventional scheduled Banks and 92% for Islamic Banks effective from 15 April 2020. The ADR stood at 79.33% with 9.70% year-over-year deposit growth and 9.75% advance growth at the end of November 2023 (Table 6). Digitization of payment systems enhancing banks' deposit base will imperatively contribute to this segment.

Table 6: Advance-Deposit Growth

	November 2023
Deposit (growth, %)	9.70
Advance (growth, %)	9.75
Advance-Deposit Ratio (%)	79.33

Source: Bangladesh Bank, 2024

4.11 Capital to Risk Weighted Asset Ratio (CRAR)

The Capital to Risk-Weighted Asset Ratio (CRAR) in the banking sector was11.08% in September 2023 (Table 7). Cushion relating to calculating Effective Risk Weighted Assets and sufficient capital will absorb the unwanted shock of the banks following Basel norms.

Table 7: CRAR

	September2023
Industry total (%)	11.08

Source: Bangladesh Bank, 2024

The capital adequacy ratio (risk-weighted assets dividing capital) of banks is 12.50% of risk-weighted assets, which includes general provisions amount of banks. But the specific provision depending on the base for provision is separated from the capital and generally treated as reserve in banks' balance sheet.

4.12 Return on assets (ROA)

To understand ROA, knowledge of the financial statement interaction of a bank is a prerequisite. Among other banks i) Accounting Balance Sheet item loans and advances are adjusted with deposits also taking into account all other items resulting in a balance between liabilities and assets. ii) The Profit & Loss Account's interest income, interest paid and other operating expenses, including loan provision, ultimately generate retained earnings, which, after tax and dividend, are added to the paid-up capital of the balance sheet. iii) The Cash Flow statement mainly consists of interest receipts and payments segregated into cash balances with Bangladesh Bank and other Banks, for example, reflecting the strength of banks. Balance Sheet items guarantees/commitments may translate into vulnerability in the bank's balance sheet if a situation occurs. However, the ROA in the banking industry is 0.41% in September 2023 (Table 8).

Table 8: ROA

	September 2023
Industry total (%)	0.41

Source: Bangladesh Bank, 2024

4.13 Return on Equity (ROE)

The ROE in the banking industry stood at 7.46% in September 2023 (Table 9). Required knowledge about the company's balance sheet and market information will guide the people for a better understanding of ROE, allowing monetary policy impact.

Table 9: ROE

	September 2023
Industry total (%)	7.46

Source: Bangladesh Bank, 2024

5. BB's Digitization Consequences

BB's Payment Service Department (PSD) integrates mobile financial services, payment service providers, payment service operations and Fintech to encourage new Payments, Clearing and Settlement systems to facilitate financial transactions with rapid circulation of money in the growing economy. PSD engages with Automated Cheque dealing systems, electronic fund Transfer Networks, Real Time Gross Settlement (RTGS) and establishment of countrywide payment switch of Bangladesh. We may highlight BB's automation initiative in terms of electronic fund transfer (EFT) following government instruction. Every month, a medical allowance message for government pension holders is forwarded to the individual beneficiary's cell phone by the Auditor General (AG) office, for instance. In this regard, basically, the Ministry of Finance allocate ministry/department-wise funds following the national budget in the government IBAS++ (integrated budget and accounting system) software. Accordingly, the AG office, after verification and justifying requests from different agencies make instruction to the BB through GETPH (government electronic transaction processing hub). The connection of

IBAS++ and GETPH is established through a third server. At the time of placement of funds by the AG office in the IBAS++, the concerned individual receives a message for medical allowance. At the same time, BB's PAD (public accounts department) receives instruction from the AG office and accordingly transfers funds to the beneficiaries' bank account and through SCROLL software BB inform the Debit and Credit position of the respective Account position to the Bangladesh government. It may be mentioned that among others, through NBR (National Board of Revenue) taxes, BB receives money in government accounts and on the basis of different AG offices (over 700 points) electronic instructions and cheques BB through EFT and other procedures make payment to the beneficiary. However, government payment instructions are always honored by the BB. If there are insufficient funds in the government account, BB generate funds to the national government account through the Ways and Means and Overdraft facility, establishing BB's financing to the government. Financial programming (algorithm) helps to write the data in the memory cell utilizing an electronic digital signal, and lighting is used to read the data as well. The colored graph is visible, converting number scale 256 (maximum of byte) into binary using basic RGB (red, green and blue) in terms of pic-gel. Smartphone-based financial data, for instance, is transferred in the relevant internet service provider tower in the form of electromagnetic waves, which are connected with cable. Starlink, through establishing satellite in the world's lower orbit trying to enhance internet connectivity momentum including remote areas financial incidence.

In computer programming, the software is used to convert the instructions to lower-level machine language, and application software practically enhances the computer work dynamically using hardware input, output, storage devices and processing units. The processor utilizes stored device data such as RAM and ROM, considering the temporary and permanent memory operability of the computer. Machine learning, data science and artificial intelligence in the banking industry can be done through program languages such as Python, for example, with due concentration in Java, C++ and R. Competitive programming deals with expertise in the implementation of data structure, coding, operator, conditional statement, loop and solving efficient algorithm. Among others deploying Google Colab's new notebook the functionality of Editor in Python can be started, for instance. Sequentially need-based programming language can be implemented for better performance of digitization of the banking sector. Mobile financial services, internet banking and electronic transactions, for example, depend on domestic faster manufacturing of integrated circuits (IC) or chips basically, which are small electronic devices made with multiple interconnected electronic components simply termed as transistors, capacitors and resistors. These mentioned components are etched onto a small piece of semiconductor (silicon). It may be noted that IC is widely used in electronic devices, including smart phones and computers, to perform crucial functions such as processing and storing information (digital signal), among others, taking care of the demanding need of financial digitization in the country arising from the fourth industrial revolution. Moreover, in order to enhance financial literacy through digital media platforms nowadays, the role of one's own diversified satellite is also intensively prominent matching the global pace of financial professionals' capacity building. The importance of internet connectivity bearing in mind smooth payment system can be highlighted as Internet Service Provider (ISP), for example, through broadband (cable) and cell phone (wireless) Subscriber Identity Module (SIM) depending on speed (bandwidth) and consistency of signal provide internet throughout the country. As an example, 4G connectivity will provide around 10 Mbps, whereas on 3G, the average internet speed is3.75 Mbps. The file which takes 20 minutes to download in a 3G network, will take mostly 5 to 6 minutes with 4G connectivity. At the same time, upload also receives momentum. Noted that the first submarine cable, SEA-ME-WE 4, in Cox's Bazar, the backbone of the internet supplies around 850 GBPS bandwidth. WI-FI channelizes or distributes broadband internet to multiple devices like cell phones and computers, maintaining separation of user needs unlimited basis. However, eventually, telecommunications (cellular, wire, cable and satellite) related issues are governed by the Bangladesh Telecommunication Regulatory Commission with a special concentration of financial transaction infrastructure like the National Payment Switch Bangladesh (NPSB). Cyber security in the financial frontier is another crucial issue. Technology related to critical cyber security deals with email security solutions, antivirus software and next-generation firewalls (NGFWs). Protecting servers, computers, electronic systems, networks, mobile devices, and data from malicious attacks is the arena of cyber security practice. A computer virus is termed as type of malicious software or malware that spreads between computers and causes damage to software and data. Broadly, malware attacks can be protected through anti-malware by scanning all incoming data infecting a computer, promoting financial digitization.

5.1 Features Related to Central Bank Digital Currency (CBDC) Accommodating Automation Pace of Monetary Policy

Like the Reserve Bank of India (RBI) pilot scheme, BB may also consider the CBDC in the coming future. Money has transaction, precautionary and speculative demand. Bearing in mind these consequences, CBDC is evolving. CBDC is the Legal Tender issued by a Central Bank backed by assets. Except for the difference in form (digital rather than paper), it will carry the entire characteristic and value of paper currency. It would also appear as liability side Currency in Circulation on a central bank’s economic balance sheet matching assets.CBDC unit has a role as a Mode of Payment, a Store of Value and a Unit of Account characteristics. Technological Efficiency, Financial Inclusion, Protection of Money as a Public Utility, Security of transactions, Banking Competition, low-cost cross-border payments are some potential features of CBDC. Secured and authentic block-chain is the basis of CBDC. Each block stores information about individual transactions (date, time and amount) and each one is linked with the previous one using cryptography. It may be mentioned that ‘block chain’ is a particular type of Distributed Ledger Technology, which Stores and Transmits necessary data in packages called Blocks that are connected to each other in a Digital Chain. Block Chains deploy Cryptographic and Algorithmic methods to record and synchronize desired Data across a Network in an immutable fashion. While, crypto-currency is a digital asset issued by private entities or private networks, engineered to function as a Medium of Exchange and address the speculative demand. This currency mostly is not backed by assets. Crypto currency's legality varies from country to country due to risk association. Minimal supervision associated with crypto-currency. Litecoin, Ethereum Bitcoin and Ripple are the example of crypto currencies. Starting from 2011as a prime initiator the Dutch Bangla Bank Limited (DBBL) and bKash introduced Mobile Financial Service (MFS) using e-money in transactions. This e-money is issued against fiat money. The MFS attempt is strictly regulated by the BB. This segment received quick momentum, and significant portions of the people are now using e-money/wallets through different MFS. Some examples of fintech in Bangladesh are online platforms that offer peer-to-peer lending, crowd funding, e-commerce payment solutions, digital wallets, robo-advisory services, and others. The fintech solutions cater to the needs and preferences of the tech-savvy and young population who are looking for alternative ways to access formal financial services.

6. BB’s Green Banking Initiatives

BB launched the Green Banking Wing for policy formulation and monitoring of different arena of Green Banking such as environmental risk management, green finance, climate risk fund, green marketing, in house environmental management, green branch, online banking, green product innovation and green strategic planning activities of banks and financial intuitions of the country for solidity in ecosystem and implementing sustainable monetary policy. BB has a refinance agenda for green products and renewable energy amounting to BDT 2 billion. BB is also executing an Asian Development Bank-backed refinance plan for brick kiln efficiency improvement amounting to USD 50 million.BB works to formulate policy and monitor the Customer Social Responsibility activities of banks and financial institutions. BB is occupied for disaster management and social responsibility funds. Establishment of Green Transformation Fund amounting to BDT 5000cr. for refinance to the export and productive industrial sector, such as water use efficiency in water conservation and management, wet processing, resource efficiency, waste management and recycling, energy efficiency, renewable energy, heat and temperature management, air ventilation and circulation efficiency and work environment improvement schemes. Allowing diversity in green banking weather derivatives may be considered to face the upcoming environment related challenges. Study reveals that weather derivative is a transaction through which payments are made based on weather-related measurements, such as temperature, rain, snow or wind speed from one party to the other. Weather-related risks can use weather derivatives to transfer, share or otherwise hedge against such risks, taking into account the business. Literature on financial weather derivatives describes the following green issues, which may be adopt by the BB in long run.

- A weather derivative, among others, to promote green banking is a financial instrument used by individuals or companies to hedge against the risk of weather-related aspects.
- Derivatives for green finance can be done through Over-The-Counter (OTC) trade through brokers and also via Organized Exchange.
- If weather events occur or if losses are incurred due to certain weather-related events, derivatives provide a cushion to the contract holders.
- Agriculture, energy, travel and tourism, for instance, are some sectors that address financial weather derivatives to solve the risks related to the weather taking care of green finance.

6.1 National Adaptation Plan of Bangladesh (2023-2050)

To enhance the country’s adaptive capacity and resilience to climate change impacts National Adaptation Plan of Bangladesh (2023-2050) has been enacted. This comprehensive and long-term plan identifies 18 priority sectors and 125 adaptation actions, covering areas such as agriculture, water resources, coastal zones, health, disaster management, urban development, and gender.

6.2 Energy Efficiency Implementation

Implementing low-carbon development initiatives in various sectors such as transport, industry, renewable energy, energy efficiency, forestry, and waste management. Bangladesh has set a plan by 2030 will reduce its greenhouse gas emissions by 5% from business-as-usual levels or by 15% with international support. Bangladesh has also committed to achieving 100% renewable energy by 2050.

7. Results and Discussion

For inclusive and sustainable growth current financial, digital and green banking aspects are elaborated in this paper. Bearing in mind parametric and nonparametric issues related to monetary policy the financial ratios, indicators and economic consequences are analyzed meticulously considering the pace of automation and environment for maintaining the ecosystem. Interest rate targeting regimes in terms of monetary policy and its operational interaction will contribute to reaching the economy in a higher frontier, taking care of balanced GDP growth and inflation. Prudent elaboration of financial issues with a multidimensional approach will create room for further research to shift towards inflation rate targeting monetary policy regimes like developed countries. The qualitative and quantitative economic policy outcome of the paper is the approach for monetary policy integration for development.

8. Conclusion

Economically, the IS and LM curves generate aggregate demand and briefly labor is aggregate supply. Furthermore, monetary and fiscal policy from the demand side addresses the supply side industrial (manufacturing), agile service and agriculture sectors with incentives and subsidies in Bangladesh. Net export, along with a supply of foreign remittance, matches the demand side consumption and short investment in transportation infrastructure and energy sector. Recent knowledge-based banking is concentrated in FinTech, such as peer-to-peer lending, crowd-funding, and robo advisory services, for example, for the tech-savvy person taking into account digitization, artificial intelligence and big data analysis. Moreover, sustainable finance and climate change adaptation with special concern in carbon footprint is another crucial issue. Study shows in our banking system, roughly fifty percent of adults have bank accounts, and with them, only fifteen percent have access to credit. Relying on financial inclusion, different financial products of the banks and government, the unbanked, preferably marginal people of the rural and urban areas need to be included in the banking system for higher financial deepening with lower currency growth maintaining prudent bank interest rates in the new interest rate targeting monetary policy regime of the country. Besides the dual mandate of maintaining inflation and real GDP growth rate, understanding of monetary policy impact on the financial frontier, pace in digitization and green banking are also important for economic development. Among others keeping balance in the described financial indicators is utmost necessary for implementing efficient and credible monetary policy. For a faster and efficient payment system digitization requires due importance. Among others, this paper also takes the initiative to elaborate on green banking for maintaining an ecosystem derived from efficient monetary policy.

References

1. Abdullah, A. Z., & Yusop, Z. (1996). Money, inflation and causality: The case of Malaysia (1970-92). *Asian Economic Review, 38*(1), 44-51.
2. Adepoju, A. A., Salau, A. S., & Obayelu, A. E. (2007). The effects of external debt management on sustainable economic growth and development: Lessons from Nigeria. University of Ibadan and Ladoke, Akintola University of Technology, MPRA Paper 2147.
3. Bangladesh Bank. (2024). Annual Report.
4. Chowdhury, A. R., Dao, M. Q., & Wahid, A. N. (1995). Monetary policy, output and inflation in Bangladesh: A dynamic analysis. *Applied Economics Letters*, *2*(3), 51-55.
5. Friedman, M. (1963). *Inflation: Causes and consequences. Asia Publishing House, New York.*
6. Hossain, M. A. (2011). Money-income causality in Bangladesh: An error correction approach. *The Bangladesh Development Studies*, *34*(1) 39-58.
7. Jones, J. D., & Sattar, Z. (1988). Money, inflation, output, and causality: The Bangladesh case, 1974-1985. *The Bangladesh Development Studies*, *16*(1), 73-83.
8. LeRoy, S.F., & Porter, R.D. (1981). The present-value relation: tests based on implied variance bound. *Econometrica, 50*, 1345-1371.
9. Mortaza, M. G., & Rahman, H. (2008). Transmission of International Commodity Prices to Domestic Prices in Bangladesh. *Bangladesh Bank Working Paper Series*: *WP 0807.*
10. Soussa, F. (2000). Too big to fail: moral hazard and unfair competition. *Financial stability and central bank*s.
11. Srinivasan, V. (2011). Leveraging people and technology for value creation. *Corporate Finance, Bharat Petroleum Corporation Limited, India.*
12. Tobias, A., & Hyun, S. S. (2009). The shadow banking system: Implications for financial regulation. *Federal Reserve Bank of New York Staff Reports no 382.*