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Central Bank Liquidity Management

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Introduction

Liquidity management of a central bank is defined as the set of instruments and framework used by a central bank in steering the amount of bank reserves to control their price i.e., short-term interest rates with the aim of achieving its ultimate goal of price stability. Central bank liquidity management involves assessing the need for liquidity in the banking system and supplying or absorbing the appropriate amount of liquidity through Open Market Operations (OMOs). In many countries including Sri Lanka, central bank liquidity management provision is related to core functions within its mandate. It constitutes an important pillar for the transmission of monetary policy and the smooth functioning of the payment system, as well as for safeguarding financial stability.

In a broader context, liquidity management of the Central Bank of Sri Lanka (hereafter CBSL) is a part of the monetary policy implementation framework. Hence, it is helpful to differentiate the monetary policy strategy from the operational framework. The monetary policy strategy illustrates how the relevant information on the economy is arranged to formulate the monetary policy decisions, the outcome of which is a certain level of short-term interest rates that are considered appropriate in terms of the CBSL's final objective of achieving price stability in Sri Lankan economy. In contrast, the operational framework comprises the set of procedures and instruments employed in implementing the policy decisions in practice, i.e., it steers the short-term market interest rates. Once the policy interest rates are announced, the monetary policy implementation framework modulates the liquidity conditions on a day today basis, aimed at steering the AWCMR[1] to achieve the expected outcomes of the monetary policy. However, setting the desired AWCMR is not only sufficient to effectively bring the short-term market interest rates in line with the monetary policy direction. Indeed, this must also be ensured by the liquidity management of the CBSL, through OMOs. Accordingly, this article offers a review of the role of the CBSL as the ultimate provider of liquidity to the banking system in Sri Lanka.

1 AWCMR is a weighted average rate of interbank call money transactions, among the Licensed Commercial Banks (LCBs) on an overnight basis. AWCMR serves as the operating target of the Central Bank's current monetary policy framework (FIT Framework).

Central Bank Liquidity

Recent distress in financial markets has led central banks around the world to re-examine their roles in providing "liquidity" to the financial system. Analysts often refer to different types of liquidity, that is, market liquidity, funding liquidity, and central bank liquidity (Bertsch and Molin 2016).

The 'market liquidity' is the ability to trade financial instruments on short notice, without a significant impact on market prices and it is an asset-or market-specific concept that describes the depth and resilience of a market. Next, 'funding liquidity' refers to how easily a financial institution raises funds through borrowings or sales of assets to settle obligations when it dues at a market-acceptable cost and it is an institution-specific concept. Finally, 'central bank liquidity', is the focus area of this article. Central bank liquidity refers to the sum of the balances of commercial banks' demand deposits at the central bank (Bertsch and Molin 2016). This is the most liquid and risk-free asset in the financial system and is also referred to as bank reserves. Banks demand reserves for several reasons such as fulfilling the reserve requirement stipulated by the regulator (regulatory motive) and catering to unexpected outflows that arise from day-to-day business activities (precautionary motives).

In the context of Sri Lanka, the banking system is considered to be in excess (deficit) liquidity on a given day if the deposit balances of Licensed Commercial Banks (LCBs) with the CBSL are higher (lower) than the balance that they would need to maintain in the reserve/settlement account. Based on such excess or deficit liquidity, the CBSL makes decisions on monetary policy implementation by employing appropriate tools. The CBSL's balance sheet is a good starting point to explain the conceptual background of liquidity management. The simplified version of the CBSL balance sheet, which constitutes the basis of the subsequent discussions is presented in Table 1.

Demand for Liquidity

The liquidity needs of LCBs mainly arise from two factors. First, the minimum reserve requirement also known as Statutory Reserve Requirement

Table 1: Simplified Balance Sheet of the CBSL

Assets		Liabilities	
Autonomous Liquidity Factors		**Autonomous Liquidity Factors**	
Net Foreign Currency Assets	XXX	Currency in Circulation	XXX
		Balances of Government and	
Net Domestic Currency Assets	XXX	Government Entities	XXX
		Other Autonomous Factors	XXX
Monetary Policy Instruments			
Reverse Repo operations	XXX	**Current Account/ Reserve holdings**	XXX
Standing Lending facility	XXX		
		Monetary Policy Instruments	
		Repo Operations	XXX
		Standing Deposit Facility	XXX
	XXX		XXX

(SRR)[2]. Second, liquidity needs arise due to autonomous factors. Autonomous factors of liquidity can be defined as the items in the central bank's balance sheet that, apart from monetary operations, provide or withdraw liquidity and thus affect the balance of the reserve accounts. These autonomous factors are generally outside the control of the CBSL as they are determined either by the behaviour of the public (e.g., currency in circulation) or by agency arrangements that are not under the control of liquidity management of the CBSL (e.g., government balances in the accounts of the CBSL). The most important autonomous factors are the net domestic assets, net foreign assets, currency in circulation, and the balances of the Government's current accounts with the CBSL. The change in these items provides or withdraws (increases or reduces) liquidity and thus directly and independently affects the reserve accounts of LCBs held with the CBSL. For example, foreign currency transactions such as purchases of foreign currency in the market by the CBSL and foreign currency loan receipts of the Government sold to the CBSL lead to changes in net foreign assets of the CBSL and increase the reserve balances of LCBs and thus increase in liquidity. Thus, any transaction that changes the balance sheet of the CBSL by crediting or debiting any reserve account maintained by a LCBs would cause changes to the central bank's liquidity (reserve) position. These two factors create the demand for liquidity among LCBs. The ultimate liquidity available to banking institutions is displayed under current account/ reserve holdings.

Considering the current account holdings as a residual or balancing item in the CBSL balance sheet, an increase in any item on the asset side of the CBSL balance sheet results in providing liquidity, i.e., it adds to the liquidity available to the banking system. In contrast, an increase in any liability item except reserve balances, leads to an absorption of liquidity from the banking system. Accordingly, when the sum of the autonomous factors is larger on the liability side of the CBSL balance sheet than the asset side, it implies that there is a liquidity deficit in the banking system and vice versa. This means that there is a demand, or a need, for liquidity in the banking system which the CBSL has to fulfill through its policy toolkit in discharging the CBSL's role as the mere provider of liquidity to the banking system (Supply of liquidity).

The Policy Toolkit to Supply of Liquidity

Like other central banks around the world, as the only stakeholder in the economy who could create/ supply liquidity in the financial system, the CBSL also possesses a comprehensive toolkit that affects the availability of liquidity. The assessment of the liquidity demand of the banking system described in the previous section is a key factor for the liquidity supply of the CBSL.

In its capacity as the liquidity provider, the CBSL supplies liquidity to the banking system in different ways. Amongst them, lending through OMOs is the principal liquidity management tool to manage reserve demand in the banking system. OMOs include repurchase and reverse repurchase (also known as repo/reverse repo) transactions, employing the purchase and sale of government securities in the secondary market as collateral. Repo/reverse repo auctions are conducted by

2 The SRR determines the minimum amount of reserves that each LCBs should hold, in the reserve account with the Central Bank, in proportion to the total rupee deposit liabilities of the respective bank, in terms of Section 32-34 of the Central Bank of Sri Lanka Act No 16 of 2023.

the CBSL to absorb/inject liquidity from/to the domestic money market. A repo auction is conducted to absorb liquidity and a reverse repo auction is conducted to inject liquidity into the domestic money market. Under repo auctions (a repo), the CBSL sells government securities on a temporary basis with an agreement to reverse the transaction after an agreed period. On the other hand, under reverse repo auctions (a reverse repo), the CBSL buys government securities on a temporary basis with an agreement to reverse the transaction after an agreed period. The tenure and the amount of the auction are determined based on the expected demand/need for liquidity. In general, repo/reverse repo auctions can be divided into short-term and long-term depending on the tenure of the particular auctions. Any term transactions carried out for a maximum period of seven days are called short-term auctions and transactions of more than 7 days up to the maximum period of three months are called long-term auctions. OMOs can be performed frequently and in any quantity and are therefore a useful method of liquidity and short-term interest rate management. Also, to provide/absorb liquidity on a permanent basis, the CBSL buys/sells securities in the secondary market on an outright basis. OMOs are conducted through a competitive bidding auction system, and these auctions are not directed at a specific financial institution. Also, these operations are conducted at the preference of the CBSL to regulate the aggregate reserve level to ensure the smooth functioning of the payments and settlements system and achieve the target for AWCMR in line with the monetary policy stance of the CBSL.

Further, the CBSL also conducts liquidity-providing transactions through the standing window, which is open towards the end of the business day. The standing facility is a typical example of this type of transaction that can take place as and when required by a financial institution on based on the availability of the funding liquidity[3]. The standing facilities are two forms namely Standing Lending Facility (SLF) and Standing Deposit Facility (SDF). Under SLF, the CBSL provides collataralised liquidity directly to a particular financial institution to fulfill residual funding needs when conditions in the interbank money market are tight, or a particular financial institution faces short-term funding pressures. SDF provides an avenue for financial institutions to park the excess funding if any toward the end of the business day at the CBSL and earn interest on an overnight basis. The SRR also can be used to alter the short-term demand for reserve money and thus the short-term interest rate, although it is not a popular and frequently used policy tool, except to address a structural liquidity shortage/surplus. Additionally, the CBSL provides an interest free Intra-day Liquidity Facility (ILF) backed by government securities to the Participating Institutions (PIs) of the Real Time Gross Settlement (RTGS) system to avoid any disruptions that could arise due to any liquidity issues of PIs. In general, these are the conventional tools that the CBSL uses in liquidity management. Aside from conventional tools central banks have unconventional liquidity management tools to ensure monetary and financial stability. Extraordinary credit operations and emergency liquidity assistance can be particularly useful when the financial market suffers widespread shortages of market and funding liquidity. A summary of the CBSL liquidity policy tools is summarised in Table 2. Most central banks in developed countries use a combination of OMOs, standing facilities, and reserve requirements for managing liquidity and achieving their monetary policy objectives. The

3 Other than LCBs, Standalone primary dealers and the Employees Provident Fund are also considered as monetary policy counterparties for standing facilities.

Table 2: Summary of Liquidity Policy Toolkit

Instruments	Description	Interest rates
Open market Operations through repo and reverse repo auctions	Purchases and sales of government securities by the Central Bank for the purpose of monetary policy implementation (regulating the money supply) on a continuous basis.	The interest rate is determined by the competitive bidding system.
Intraday credit through Intraday Liquidity Facility (ILF)	Option for banks to borrow from the central bank during the day to ensure smooth functioning of the payment and settlement system	Interest-free facility
Standing facilities window	Option for banks to borrow or deposit reserve overnight in the Central Bank	Standing Deposit Facility Rate and the Standing Lending Facility Rate
Reserve Requirement	Use to address structural liquidity shortage/ surplus on a permanent basis	Not remunerated
Extraordinary Credit Operations	Facility to address market-wide liquidity shortage, and prevent systemic crisis.	Rate is determined by the Governing Board.
Emergency Liquidity Assistance (ELA)	Use to address acute liquidity shortages at individual banking institutions and prevent spillovers and contagion effects to the financial system.	Bank Rate

Source: Central Bank of Sri Lanka

appropriate balance between them will depend on the structure of local financial markets, and the way in which the central bank wishes to manage the market. OMOs generelly play a more prominent role than standing facilities especially when the markets are developed, and when the central bank has the ability to forecast liquidity flows accurately.

Conclusion

The main objective of monetary policy is to achieve and maintain price stability, which means keeping inflation low and stable. Under the current flexible inflation target framework, the CBSL expects to reduce the short-term volatility of interest rates that arises from fluctuations in liquidity in the domestic money market. For this purpose, the CBSL conducts monetary operations to amend the quantity (money supply, i.e., the total volume of money comprised of currency held by the public and deposits held at financial institutions) and price of money (interest rate) through an array of instruments. In this contest, liquidity remains an important variable in facilitating the process of monetary policy implementation, as market interest rates and credit creation are closely related to the liquidity conditions of banking institutions. OMOs is the key liquidity management tool used by the CBSL to manage reserve demand in the banking system. OMOs refer to the buying and selling of securities to inject or absorb liquidity in the market by the CBSL

to maintain AWCMR within the SRC. Without the CBSL intervention to offset liquidity fluctuations, short-term interest rates would be more volatile. This would result in obscuring the monetary policy stance of CBSL and possibly destabilising the financial system. Liquidity management, therefore is an essential part of efficient monetary operations and transmission of monetary policy in achieving the CBSL's objectives.

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Effective Public Debt Management under Current Macroeconomic Conditions: Asian Country Experiences

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Introduction

In the dynamic landscape of today's global economy, the role of public debt management has taken center stage, particularly in the context of Asian economies. As these nations continue to rise as economic powerhouses, effectively managing public debt has become not just a matter of fiscal prudence but a critical determinant of sustained growth, stability, and resilience. This article explores the "Effective Public Debt Management under Current Macroeconomic Conditions: Asian Country Experiences," explaining its significance, how it impacts nations across Asia, and what strategies are yielding success.

Asia's Economic Outlook

Asia's economic outlook is facing numerous challenges that are hindering its recovery. Despite a decline in the pandemic and easing restrictions, several persistent issues are causing concern. First, recurrent zero-COVID lockdowns in China have disrupted supply chains and economic activity. The Russian invasion of Ukraine has added geopolitical tensions to the region. Tightening financial conditions and weaker global growth are making it harder for developing Asian nations to regain momentum.

As a result, growth projections for developing Asia have been revised downward, with expectations of 4.2 per cent growth in 2022 and a modest improvement to 4.6 per cent in 2023. For 2024, growth is projected to further accelerate to 5.0 per cent. Inflation forecasts show a decrease to 4.4 per cent for 2022 and an increase to 4.2 per cent for 2023, followed by a stabilization at 4.0 per cent in 2024. While there are signs of recovery driven by increased mobility and domestic demand, global uncertainties temper these gains.

The region faces multiple risks, including geopolitical tensions, and tightening financial conditions. Escalating tensions between the United States and China, as well as the urgent challenge of climate change, further complicate the economic route.

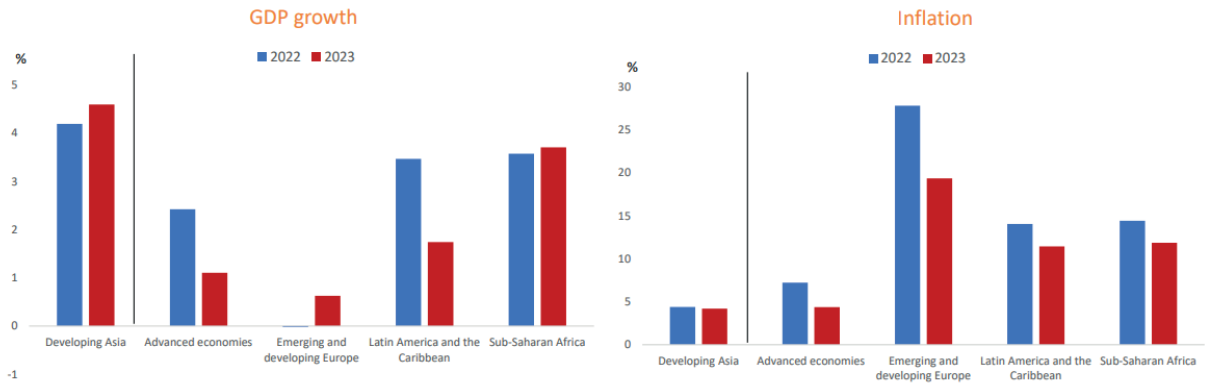
Despite these challenges, developing Asia is expected to outperform other regions in terms of growth and inflation due to its resilience and

Table 01: GDP Growth %

	2022		2023			2022		2023	
	Sep Update	Dec ADOS	Sep Update	Dec ADOS		Sep Update	Dec ADOS	Sep Update	Dec ADOS
Developing Asia (DA)	4.3	4.2 ↓	4.9	4.6 ↓					
DA excluding the PRC	5.3	5.4 ↑	5.3	5.0 ↓	Caucasus & Central Asia	3.9	4.8 ↑	4.2	4.2 –
					Kazakhstan	3.0	3.0 –	3.7	3.7 –
East Asia	3.2	2.9 ↓	4.2	4.0 ↓					
Hong Kong, China	0.2	-3.3 ↓	3.7	2.9 ↓	Southeast Asia	5.1	5.5 ↑	5.0	4.7 ↓
People's Rep. of China	3.3	3.0 ↓	4.5	4.3 ↓	Indonesia	5.4	5.4 –	5.0	4.8 ↓
Republic of Korea	2.6	2.6 –	2.3	1.5 ↓	Malaysia	6.0	7.3 ↑	4.7	4.3 ↓
Taipei,China	3.4	3.4 –	3.0	3.0 –	Philippines	6.5	7.4 ↑	6.3	6.0 ↓
					Singapore	3.7	3.3 ↓	3.0	2.3 ↓
South Asia	6.5	6.5 –	6.5	6.3 ↓	Thailand	2.9	3.2 ↑	4.2	4.0 ↓
India	7.0	7.0 –	7.2	7.2 –	Viet Nam	6.5	7.5 ↑	6.7	6.3 ↓
					The Pacific	4.7	5.3 ↑	5.5	4.8 ↓

Source: Asian Development Outlook database

Figure 01: GDP Growth and Inflation



Source: Asian Development Outlook database. IMF World Economic Outlook October 2022.

inherent strengths. However, the road ahead remains uncertain, with the global economy potentially facing a sharp deceleration in growth, a global recession, and ongoing unpredictability in China and Eastern Europe. Policymakers must navigate this complex landscape while contending with an array of risks that could shape the region's economic fortunes in the coming years.

Fiscal deficits, a significant indicator, reflect the gap between government revenues and expenditures. Countries may run fiscal deficits to stimulate economic growth, invest in infrastructure, or address social needs. However, sustaining large deficits over extended periods can lead to rising debt levels.

Fiscal deficits and public debt are closely intertwined. Continued deficits can increase the need for debt financing, which, if not managed prudently, can worsen the debt burden. Effective public debt management is essential to ensure that deficits are sustainable and do not lead to fiscal crises.

In summary, the macroeconomic landscape in Asian countries is characterized by a diverse array

of economic conditions. GDP growth, inflation rates, unemployment, and fiscal deficits all play a critical role in shaping the dynamics of public debt management. Effective management requires a well understanding of these conditions and the development of strategies that balance the need for debt financing with the priorities of fiscal stability and economic growth. It is within this complex landscape that Asian countries chart their course towards financial resilience and sustainable development.

Public Debt in Asian Economies

Debt Management Offices (DMOs) are facing numerous challenges, including global financial market uncertainty, rising debt levels in some countries, ongoing pandemic recovery, geopolitical risks from the Russian invasion of Ukraine, monetary tightening by central banks like the U.S. Federal Reserve, inflationary pressures, supply disruptions, and fiscal risks related to climate change. Despite these challenges, debt managers are tasked with meeting funding pressures while ensuring effective debt management.

In this complex economic landscape, Asian regional countries are providing valuable lessons in public debt management. Their experiences highlight effective practices tailored to the region's unique conditions, offering insights into achieving economic stability and growth amidst diverse challenges.

Republic of Philippine

The Republic of the Philippines has effectively managed its debt during elevated borrowing requirements and challenging macroeconomic conditions. Despite facing increased key metrics, the nation exhibited strength and quickness, experiencing significant economic growth of 5.7 per cent in 2021 and surpassing expectations in 2022. Fiscal prudence was evident, with a lower fiscal deficit for 2022 compared to the previous year, resulting in a favorable Deficit-to-GDP ratio of 7.3 per cent. The government successfully raised domestic financing, reflecting investor confidence, despite rising yields due to inflation and policy rate adjustments. Growth projections for 2023 are set at 6.0 per cent, with a slight increase to 6.2 per cent in 2024, indicating continued economic resilience and stability.

Investors remained interested in government securities, favoring shorter and medium tenors to manage inflation-driven risks while maintaining manageable debt levels. The Medium-Term Fiscal Framework will guide the economy back to high-growth levels, with a gradual withdrawal of fiscal support, public investments, and debt consolidation. The medium-term borrowing plan emphasizes domestic financing, aiming to reduce debt by 10 percentage points from 2023 to 2028.

The Philippines' strategy focuses on domestic financing, aiming for 75 per cent to 80 per cent from local sources to avoid external vulnerabilities and promote the development of the local bond market. Diversification of foreign bond issuances across various currencies continues to be important, ensuring access to multiple markets while avoiding supply-related increases in borrowing costs. The country maintains a medium to long liability portfolio, with an average maturity target of 7 to 10 years to mitigate refinancing risks.

To support financing needs, the Philippines actively encourages retail participation through financial literacy initiatives and technology. Retail investor engagement is facilitated through Bond Investments

101 sessions[1], digital ordering platforms for convenient placements, and Distributed Ledger Technology (DLT) apps[2] demonstrating the nation's commitment to effective debt management in a dynamic macroeconomic landscape.

Indonesia

Indonesia recognizes the importance of collaborative debt management to sustain its growth momentum and achieve a minimum annual growth rate of 5 per cent, a crucial milestone for its Indonesia 2045 vision. Loans from development partners offer more than just financial support; they also provide opportunities to enhance project governance and knowledge transfer. Indonesia actively contributes to developing financing instruments with its partners to achieve common goals.

To execute its loan strategy effectively, Indonesia emphasizes optimization, ensuring loans support economic recovery while maintaining borrowing cost efficiency. This involves thorough project planning stages, starting with the National Medium-Term Development Plan and progressing to the Medium-Term Planned External Loans and Planned Priority External Loans. Parliament's involvement in budget discussions is crucial to this strategy, with caps on the annual deficit-to-GDP ratio at 3 per cent and budget limits for Line Ministries.

Indonesia has adapted to evolving loan modalities, introducing the Results-Based Approach since 2017. Disbursements are linked to specific targets known as Disbursement Linked Indicators (DLIs) agreed upon between the government and lenders. In response to the COVID-19 pandemic, Indonesia demonstrated flexibility by significantly increasing its program loan amount to USD 4.5 billion in 2022, reflecting its adaptive and responsive approach to challenging economic conditions.

Georgia

The debt management strategy of this initiative aims to return to pre-pandemic levels of government-to-government (GG) debt to stabilize the fiscal landscape. It includes efforts to reduce dollarization to 65 per cent to mitigate currency risk. A significant feature is the use of a robust Public Investment Management (PIM) filter for investment projects to allocate funds to economically efficient ventures. Foreign exchange financing is reserved exclusively for projects meeting strict criteria. The initiative also adopts a reform-oriented program loans approach, emphasizing structural reforms as a lending condition, and focuses on developing the domestic security market for financial autonomy.

In line with this debt management strategy, an issuance strategy has been carefully planned. It involves shifting from 2-year to 3-year remaining maturity benchmark issuances to enhance

1 Bond Investments 101 sessions in the Philippines provide valuable educational opportunities for individuals interested in understanding and engaging in the world of bond investments. These sessions typically cover fundamental concepts, strategies, and risks associated with investing in bonds, empowering participants with the knowledge and tools to make informed investment decisions in the local and international bond markets. Such educational initiatives play a crucial role in enhancing financial literacy and helping Filipinos make prudent investment choices to achieve their financial goals.

2 Distributed Ledger Technology (DLT) apps in the Philippines represent a cutting-edge innovation that leverages blockchain technology to enable secure and transparent data management. These applications are poised to revolutionize various industries by providing efficient solutions for record-keeping, supply chain management, financial transactions, and more. As the Philippines explores the potential of DLT apps, it marks a significant step toward modernizing its digital infrastructure, enhancing data integrity, and promoting economic growth through technological advancement.

flexibility and market engagement. The practice of reopening International Security Identificaton Numbers (ISINs) until they reach 2.5 years of remaining maturity provides liquidity and investor opportunities. Securities with less than 1.5 years of remaining maturity are subject to Long-term Marketable Operations (LMO), including buy-back and switch operations. The strategy also commits to monthly issuances of long-term securities to improve predictability and market stability. Additionally, the launch of an 11-year benchmark issuance demonstrates a forward-looking approach to catering to diverse investor needs, further strengthening the debt management framework.

Strategies for Effective Debt Management in ESG (Environmental, Social, and Governance) and Green Transition

Incorporating ESG principles into debt management strategies, diversifying financing sources, and actively engaging with stakeholders committed to ESG objectives are essential steps in addressing the unique challenges presented by the intersection of sustainability goals and debt management. These strategies not only mitigate risks but also position organizations for long-term success in an increasingly ESG-focused financial landscape.

DMOs are increasingly focusing on green and transition finance as they become more conscious of the effects of the economic footprint and the benefits of integrating sustainability, mainly by adding Environmental, Social and Governance (ESG) considerations into debt issuance. There has been much progress with the development of the sustainable bond market in Asia. This includes both conventional and Sukuk bonds.

Thailand is fully committed to the United Nations Sustainable Development Goals (UNSDGs)

DMOs are increasingly focusing on sustainability by incorporating ESG considerations into debt issuance, particularly through sustainable bonds. Thailand is committed to the United Nations Sustainable Development Goals (UNSDGs), addressing climate change, poverty, inequality, and other social and environmental issues by 2030. However, Thailand faces debt management challenges as it funds its transition towards environmentally and socially responsible practices. The proceeds from financial instruments will be directed towards Green and Social projects aligned with the UNSDGs, emphasizing Thailand's commitment to sustainable development. This commitment extends over multiple budget years, highlighting the Kingdom's long-term dedication to ESG transition factors.

Indonesia Green Sukuk

The Indonesia Green Sukuk program is essential for financing the State Budget and promoting Islamic finance. However, it faces unique challenges in meeting stringent ESG requirements and transitioning to a green economy. The Debt Management Office (DMO) is crucial in managing government financing and debt portfolios, offering an opportunity for development through ESG and green transition efforts. This evolution involves developing ESG expertise, establishing risk management systems, and creating a green financing market. Aligning Islamic finance principles with sustainability is important, along with engaging stakeholders, updating ESG policies, and integrating ESG factors into daily operations. Identifying and measuring ESG risks, including environmental, social, and governance factors, is vital. Overcoming these challenges will strengthen the DMO and align government debt management with the goal of achieving Net Zero emissions while fostering sustainable economic growth.

ESG practices and challenges: Perspectives from Public Debt Management

Incorporating ESG considerations into public debt management practices presents opportunities and challenges. DMOs recognize the importance of transparency and proactive communication regarding government ESG initiatives to stakeholders like investors and credit rating agencies. This includes issuing ESG-labelled bonds and integrating ESG-related risk scenarios into debt analysis. However, there are hurdles, including difficulties in identifying relevant information, coordinating data gathering among public institutions, and accessing existing data due to bureaucratic barriers. Insufficient data, analysis capabilities, staff resources, and technical capacity further complicate the process, emphasizing the need for a concerted effort to advance ESG integration in public debt management.

Promoting Sustainable Development in Asia and the Pacific: The Role of the Asian Development Bank in Local Currency Operations

The Asian Development Bank (ADB) plays a significant role in promoting sustainable development in Asia and the Pacific through its local currency operations. In 2022, ADB disbursed local currency loans, accounting for 32 per cent of its total private sector loans, emphasizing its commitment to financial stability in the region. ADB's outstanding local currency loan portfolio reached approximately USD 2.5 billion, and it aims to diversify further by raising funding in seventeen local currencies. By 2023, this portfolio is projected to grow to USD 2.7 billion, with further growth to USD 2.9 billion expected in 2024. While ADB has no internal restrictions on local currency finance volume, market conditions can sometimes be limiting. Most local currency loans focus on private sector borrowers, aligning with regional economic growth and development efforts.

Enhancing Sri Lanka's Public Debt Management Through ESG Considerations: Opportunities and Challenges

Enhancing Sri Lanka's public debt management through ESG considerations presents both significant opportunities and challenges for the country's financial management practices.

Opportunities:

- *Alignment with Global Trends:* Integrating ESG considerations into public debt management aligns Sri Lanka with global trends in responsible finance. It can attract environmentally and socially conscious investors, thereby broadening the investor base.
- *Transparency and Accountability:* Incorporating ESG principles promotes transparency in government initiatives. Sri Lanka can provide clearer information to stakeholders, including investors and credit rating agencies, which enhances trust and confidence in the country's financial management.
- *Diversification of Debt Portfolio:* By exploring the issuance of ESG-labelled bonds and diversifying the debt portfolio to include sustainable instruments, Sri Lanka can tap into new sources of funding while contributing to sustainable development initiatives.
- *Risk Mitigation:* Incorporating ESG-related risk assessments helps identify potential

vulnerabilities and mitigate them. This proactive approach can enhance financial stability, which is critical for long-term economic growth.

Challenges:

- *Data Collection and Analysis:* Gathering relevant ESG data and building analytical capabilities can be a significant challenge. Sri Lanka needs robust systems to collect, analyze, and report ESG metrics effectively.
- *Market Constraints:* Sri Lanka might face constraints in the ESG bond market, including limited volume and tenor. This could affect the practicality of issuing ESG-labelled bonds.
- *Resource and Capacity Gaps:* Adequate resources and technical expertise are essential to integrate ESG principles effectively. Sri Lanka may need to invest in training and capacity-building efforts.
- *Coordination Across Institutions:* Coordinating efforts among various public institutions to collect and disseminate ESG data can be complex and require inter-agency collaboration.

In conclusion, enhancing Sri Lanka's public debt management through ESG considerations holds the promise of attracting responsible investors, promoting transparency, and contributing to sustainable development. However, addressing challenges such as data management and market constraints is crucial to realizing these opportunities fully. Overcoming these hurdles will be essential for Sri Lanka to successfully integrate ESG principles into its debt management practices.

Conclusion

In conclusion, the experiences of Asian countries in managing public debt under current macroeconomic conditions offer valuable insights for policymakers worldwide. These nations have shown resilience and adaptability in navigating the challenges posed by debt burdens, leveraging innovative strategies, and encouraging fiscal discipline. Effective public debt management remains a critical component of sustaining economic stability and growth in an ever-changing global landscape. By drawing on these Asian countries experiences and continuing to prioritize prudent fiscal policies, governments can better position themselves to secure long-term financial sustainability while promoting prosperity for their citizens.

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CLIMATE CHANGE: NAVIGATING THE STORM - HOW HUMAN RESPONSE CAN SHAPE A COMPASSIONATE FUTURE

H R D N Thilakaratne, Assistant Secretary, Secretariat Department

Introduction

Our planet stands at a crossroads, with the urgency of climate action becoming more critical every day. Picture this: rising sea levels swallowing coastlines, relentless heatwaves, powerful hurricanes, and devastating floods all happening with unprecedented frequency. These extreme events are not just random-they're wreaking havoc on ecosystems and reshaping biodiversity, pushing some species to the edge of extinction while others spread uncontrollably. Though climate change is a natural process that has unfolded over millennia, the speed at which it's accelerating today is driven by human actions. Since the Industrial Revolution, our relentless burning of fossil fuels and widespread deforestation have supercharged this process, causing alarming shifts in temperature and weather patterns. This rapid transformation is destabilizing the delicate balance of life on Earth. Dive into this and explore how our choices are shaping the future of our planet and why urgent action is essential to avert a crisis.

The Greenhouse Effect – Natural and Human Accelerated

Natural phenomena like forest fires and volcanic eruptions emit greenhouse gases into the atmosphere. These gases play a crucial role in trapping solar

heat, which helps regulate Earth's temperature. This natural process, known as the 'greenhouse effect,' is vital for creating the warm conditions necessary to support life on our planet. However, burning fossil fuels significantly boosts the concentration of greenhouse gases in the atmosphere (IPCC, 2021). This increased level of gases intensifies the greenhouse effect, raising Earth's temperatures to potentially harmful levels. The resultant warming triggers a host of environmental hazards and leads to unprecedented consequences of climate change, affecting ecosystems and human societies alike.

Observable Impacts of Climate Change – Threat to Biodiversity and Human Livelihood

The impacts of climate change are becoming increasingly apparent across the globe. Higher temperatures are resulting in more frequent and intense heat waves. For instance, the World Meteorological Organization (WMO) reported that July 22, 2024, was the hottest day ever recorded, and June 2024 was the warmest month globally. The WMO also projects that the years from 2024 to 2028 might feature some of the highest temperatures ever documented. Under these circumstances, Biodiversity is increasingly under threat as countless species that rely on ecosystems like rainforests, coral reefs, and mangroves struggle to adapt to climate change. Additionally, habitable land is becoming scarcer, making it more challenging for humans to find suitable places to live. Human health is also at significant risk, with rising temperatures leading to more heat-related illnesses. These conditions could trigger mass migration and heighten the potential for conflicts (UNDP, 2024).

Moreover, the rising temperatures are causing polar ice sheets to melt, which in turn is raising sea levels. This increase poses significant risks to small island nations and coastal communities, making them more vulnerable to the consequences of climate change. The growing frequency of extreme weather events such as hurricanes, droughts, and floods, largely fueled by climate change, has become a critical global concern. These environmental disruptions severely affect agriculture, often resulting in the widespread destruction of crops and a significant reduction in food production. Consequently, these challenges lead to higher food prices, further exacerbating global food security issues.

Economic and Financial Implications

The global economy and financial systems are being profoundly impacted by the challenges posed by climate change. Developing countries need more resources and infrastructure to effectively respond to and mitigate the adverse effects of a changing climate. These nations urgently need support to adapt and reduce the impact of these environmental changes.

There is an increased risk of credit portfolios within financial systems being adversely affected by climate-related factors. Financial institutions that are particularly vulnerable to these risks may experience heightened credit risk, as the likelihood of defaults within their portfolios rises. Additionally, short-term fluctuations in output caused by the physical impacts of climate change can lead to higher prices and wages, thereby affecting inflation and undermining price stability (ECB, 2023). On the other hand, labor productivity declines as workers face heat intolerance and refuse to work in direct sunlight. The uncertainty generated by climate risks also leads to increased precautionary savings, which reduces the funds available for

investment. This shift results in lower equilibrium interest rates in the market (IMF, 2023).

Climate change poses significant challenges to maintaining price stability, affecting both the tools and the transmission mechanisms central banks rely on to manage the economy. As climate risks disrupt economic activities, they weaken the effectiveness of traditional monetary policy measures, such as interest rate adjustments, by altering how these policies are transmitted through the economy. Additionally, climate change pressures reduce the room for conventional monetary policy, primarily by pushing down the equilibrium real interest rate. This decline limits central banks' ability to stimulate economic growth during downturns. Moreover, the direct effects of climate change-such as extreme weather events, supply chain disruptions, and shifts in consumer behavior-add volatility to inflation dynamics, making it harder for central banks to achieve their price stability targets (ECB, 2023). As a result, the overall environment becomes more complex, challenging the traditional approaches used by central banks to manage economic stability.

World Bank reports suggest that developing countries highly vulnerable to climate change are likely to experience slower economic growth. This could push more than 100 million people, who already struggle with limited resources, into extreme poverty by 2030 (World Bank, 2024). On the global stage, efforts to cut greenhouse gas emissions vary significantly, with some countries taking substantial measures while others lag.

Global Commitments

The Paris Agreement, established during the 2015 United Nations Climate Conference (COP 21) in Paris, brings together 196 countries with the goal of limiting global warming to well below 2°C above pre-industrial levels, and ideally to 1.5°C (UNFCCC, 2015). This accord focuses on setting climate action standards, enhancing knowledge and capacity, and providing financial and operational support to boost resilience and reduce climate vulnerability. However, meeting these ambitious targets is not a task that any single country or individual can achieve alone. It requires global cooperation, including active participation from major emitters within the G20, to ensure significant and ongoing reductions in emissions.

Under the Paris Agreement, many countries, including Sri Lanka, have pledged to achieve net-zero emissions by 2050 or 2060. This goal means balancing emitted greenhouse gases with carbon sinks, like reforestation, afforestation, or technological carbon capture (IPCC, 2021). However, these commitments from developing countries depend on securing the promised climate finance. Adequate funding is essential to both mitigate climate impacts and adapt to the challenges posed by climate change (UNDP, 2024).

Each year, countries submit their Nationally Determined Contributions (NDCs) as part of the Paris Agreement to outline their efforts to cut emissions and adapt to climate change. These submissions are expected to show progressive improvements compared to the previous year's reports and are assessed every five years. Starting this year, countries will also provide transparent updates on their climate actions under the Enhanced Transparency Framework set by the Paris Agreement (UNFCCC, 2023). As a result, nations are continually updating their strategies to handle climate impacts, reduce their carbon footprint, and strive for a carbon-neutral economy.

The global adoption of renewable energy sources, such as solar and wind, is increasingly prevalent in the electricity sector, leading to more sustainable practices in both industry and transportation. Additionally, Artificial Intelligence (AI) is being utilized for climate research and sustainable agriculture, which relies on green energy. This shift toward green energy sources is proving to be more practical and economical compared to fossil fuels, while also helping to address climate change challenges. Further, the World Bank emphasizes the importance of climate financing, climate-related policy reforms, and global cooperation for an accelerated transition to a low-carbon economy. United Nations Development Programme (UNDP) thoroughly stresses the need for developing countries to balance their economic growth with environmental sustainability without relying on fossil fuels for energy in the future.

Conclusion

Addressing climate change presents an opportunity for countries to drive economic growth, foster innovation, and create new job opportunities, all while promoting gender equality. Embracing sustainable practices not only improves human health and living conditions by reducing pollution but also strengthens resilience to climate impacts. These initiatives facilitate access to affordable clean energy and set the stage for a more prosperous and sustainable future. Therefore, now is the crucial moment for taking bold climate actions to avoid further human suffering and create a better world. As United Nations Secretary-General António Guterres has aptly stated, "Like the meteor that wiped out the dinosaurs, humanity is having an outsized impact on our planet. In this climate crisis, we are not the dinosaurs; we are the meteor. We are not only in danger; we are the danger. Yet, we are also the solution. Our planet is sending us a message, and it's time we finally listen".

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- **Food and Agriculture Organization (FAO) (2023) -** Climate Change and Food Security. This report discusses how climate change affects agriculture, food production, and food security.
- **World Bank (2024) -** Economic Impacts of Climate Change. This document outlines how climate change impacts economic growth, particularly in developing countries.
- **United Nations Framework Convention on Climate Change (UNFCCC) (2015) -** Paris Agreement. This international treaty outlines global commitments to limit temperature rise and address climate change impacts.

Interconnectedness and Contagion Analysis of the Banking Sector and Balance Sheet Identity

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Introduction

In the modern financial landscape, financial institutions, financial markets, financial instruments, and financial infrastructure are highly concentrated and intricately interconnected. No financial institution can thrive alone, as they rely heavily on one another for liquidity, credit, investments, payment systems and access to markets. The financial sector's interlinkages are driven by several motives, including accessing low-cost borrowings, geographical expansion, promoting growth, transferring and sharing of risk, fostering financial innovations, and exploiting regulatory arbitrage. Interconnectedness in the financial sector characterizes a more developed financial system, enhancing flexibility in financing and investments (Alonso and Stupariu, 2019). The global financial systems are highly concentrated, with a small number of dominant institutions playing a major role in global financial intermediation while relying on a limited number of payment and settlement systems to operate (IMF, 2010). However, the increased interconnectedness within the financial sector could raise stability concerns as distress may spread more rapidly across the system, amplifying the risk of systemic disruptions. Interconnectedness plays a crucial role in determining the speed and intensity of contagion in the financial sector (Liu, Quiet and Roth, 2015). The stress in a bank could propagate to the other bank counterparties causing severe losses and/or liquidity issues through the established bilateral transactions, i.e., direct interconnectedness and through indirect interconnectedness which encompasses exposures to common assets and market sentiments (Roncoroni et al., 2019).

In the run up to the Global Financial Crisis (GFC), banks were excessively borrowing to benefit from low interest cost and relied heavily on non-conventional, innovative funding sources. The funds raised were often reinvested into complex financial instruments of other financial institutions. The rise in leverage among banks was fuelled by profit-seeking motives, lax lending standards and insufficient oversight and governance that contributed to increased interconnectedness in the financial sector (Reserve Bank of Australia, 2023). The closely knitted financial interlinkages have been identified as one of the major causes that contributed to the widespread GFC (Claessens and Kose, 2013). Financial affiliations could deepen the interdependencies within a financial system, acting as channels for contagion risk. During the GFC, excessive financial leverage and significant

liquidity mismatches at a few large financial firms triggered a series of shocks. These shocks were transmitted globally due to the extensive interconnections within the financial system.

Financial institutions within a financial system are comprised of different classes, each characterized by distinct corporate structures and regulatory regimes. Despite the differences, they engaged in provisioning of financial services, particularly in financial intermediation (Alonso and Stupariu, 2019). The heterogeneity in regulatory frameworks prompts less regulated non-bank financial institutions to exploit regulatory arbitration seeking comparative advantages over well-regulated financial institutions (Buchak et al., 2018) and vice versa. Regulatory arbitration could pose a severe risk on the financial system as financial institutions are profoundly interconnected irrespective of their regulatory architecture. Non-bank financial institutions largely cater to less credit worthy borrowers, as stringent capital requirements and regulatory constraints limit the ability of banks to extend credit to this segment through traditional banking channels. Any build-up of imbalances within less-regulated financial institutions could be contagious to thriftly supervised financial institutions potentially resulting a systemic risk through interconnectedness. This paper focuses on the interconnectedness within the banking sector and elaborates on the micro-foundations used to develop the Interconnectedness and Contagion Analysis (ICA) model.

Balance Sheet Identity with Interbank Exposures

The micro-foundation of banking sector interconnectedness and contagion analysis model is built on the stylised balance sheet identity of a licensed bank, inspired by Espinosa-Vega and Sole (2010) and CoMap[2] approaches. The stylized balance sheet can be used to assess probable systemic implications of interbank linkages and potential contagion effect.

Slightly modified balance sheet identity of a bank is presented below.

$$\sum_j x_{ji} + \gamma_i + y_i + a_i = c_i + d_i + b_i + \sum_j x_{ij}$$

Inspired by Espinosa-Vega and Sole (2010), Covi, Gorpe and Kok (2019) and Fukker and Kok (2021)

Where;

x_{ji} bank i 's loans to bank j, representing the interbank loan portfolios of the bank i. On the flipside, this could also be interpreted as bank j's obligations to bank i. Hence, $\sum_j x_{ji}$ represents the portfolio of interbank loans of bank i.

γ_i – stock of high-quality liquid assets maintained by bank i.

y_i – stock of illiquid assets of bank i which is assumed to be unencumbered and sellable only at a discounted price.

a_i – stock of any other assets of bank i.

c_i – represents bank i's Capital

d_i – stands for non-bank deposits held by bank i.

b_i – long-term and short-term borrowing excluding interbank borrowings

x_{ij} – bank i 's obligations to bank i and $\sum_j x_{ij}$ indicates the total interbank borrowings by bank i.

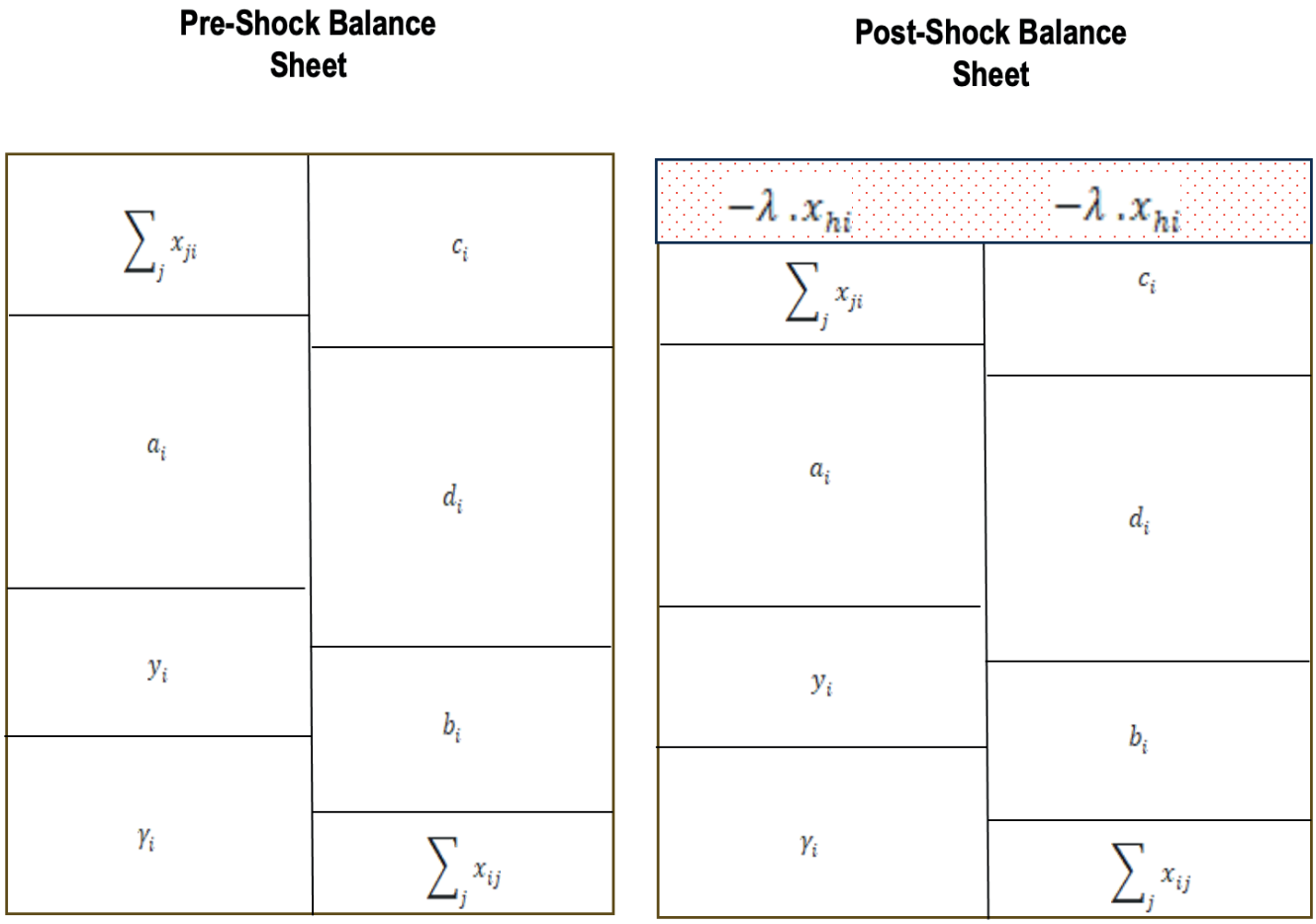
2 Contingent Mapping (CoMap) methodology as presented by Covi, Gorpe and Kok, 2019 and Fukker and Kok, 2021.

Equation (1) above characterizes the typical bank balance sheet identity before modelling a potential shock. As outlined above, ICA models contagion risk due to interconnectedness via solvency and liquidity channels. Contagion through solvency channel propagates due to credit shocks and fire sale loses where former resembles the default risk and the latter indicates the impact of a funding shock. Interbank exposures are mostly unsecured by nature and a potential bank failure/default may affect the stylized bank balance sheet identity.

Modelling the Credit Shock

The credit shocks capture the impact of one entity defaulting on its liabilities to another. In the interbank market, a credit default by one bank, i.e. bank h, on the claims of bank i could potentially cascade to other banks within the sector. The magnitude of the credit loss resulting from the default by bank h, depends on the applicable Loss Given Default (LGD) rate denoted by λ, where λ ∈ [0,1]. The LGD represents the irrecoverable loan exposures of bank i extended to bank h, after accounting for collaterals, provisions, and other credit mitigants. Consequently, the balance sheet of bank i contracts by the amount of irrecoverable amount, (i.e. $\lambda . x_{hi}$) which is being absorbed by the excess capital of bank i. Interbank loan portfolio of bank i is expected to contract by $\lambda . x_{hi}$ with a corresponding impact on the capital of latter bank.

Illustration 1: Effect of a Credit Shock on a Bank's Balance Sheet



Inspired by Espinosa-Vega and Sole (2010), Covi, Gorpe and Kok (2019) and Fukker and Kok (2021)

Generally, interbank exposures are considered uncollateralized, where $\lambda = 1$, resulting in the credit shock being equal to the total loan exposures to bank h. In an event of a simultaneous default[3] where $h \in [1,2,..n]$, total credit loss to bank i is given by $\sum_{j \in h} \lambda . x_{hi}$.

Illustration 1 depicts the impact of a credit shock on bank i, comparing the pre - and post- shock balance sheets.

Modelling the Funding Shocks

The ensuing section identifies the stylized bank balance sheet identity following a funding shock which is triggered by a potential withdrawal of interbank funding. As the money market liquidity conditions tightens, a defaulting bank or a bank at the verge of failing may not rollover its claims to other banks. It is assumed that banks are unable to replace the funding formerly provided by the defaulting bank, $x_{ih'}$, (Espinosa-Vega and Sole, 2010) particularly under heightened market conditions. This instigates fire sale of assets by bank i to restore the loss of funding, at a discount. The total fire sale losses (FS_i) includes fire sale losses arising from disposing of excess[4] high quality liquid assets (and usable illiquid assets (FSy_i). The total fire sale losses could also be viewed as additional high-quality liquid assets and illiquid assets that shall be disposed of to compensate for the drop in current market price of such assets. Therefore, bank i shall additionally dispose its assets equivalent to total fire sale losses to compensate for the decrease in market prices with the corresponding adjustment to capital of bank i. This is because the current fire-sale price is below the initial price, forcing Bank i to dispose of additional assets to withstand the funding shock caused by interbank funding withdrawals.

In an event of interbank claims that could clearly be distinguished as short term and long term with the required granularity of data, the interbank withdrawal could be confined to short term interbank claims to represent the imminent funding shock, if necessary. This facilitates further calibration of short-term funding pressure encountered by bank i, resulting from non-rolling of funding by the defaulting bank to bank i.

Simultaneous Modelling of Credit and Funding Shocks

The ICA models both credit and funding risks simultaneously, anticipating that a defaulting bank would withdraw its claims from other banks in an effort to meet liquidity requirements. Hence the revised balance sheet identity would be as follows.

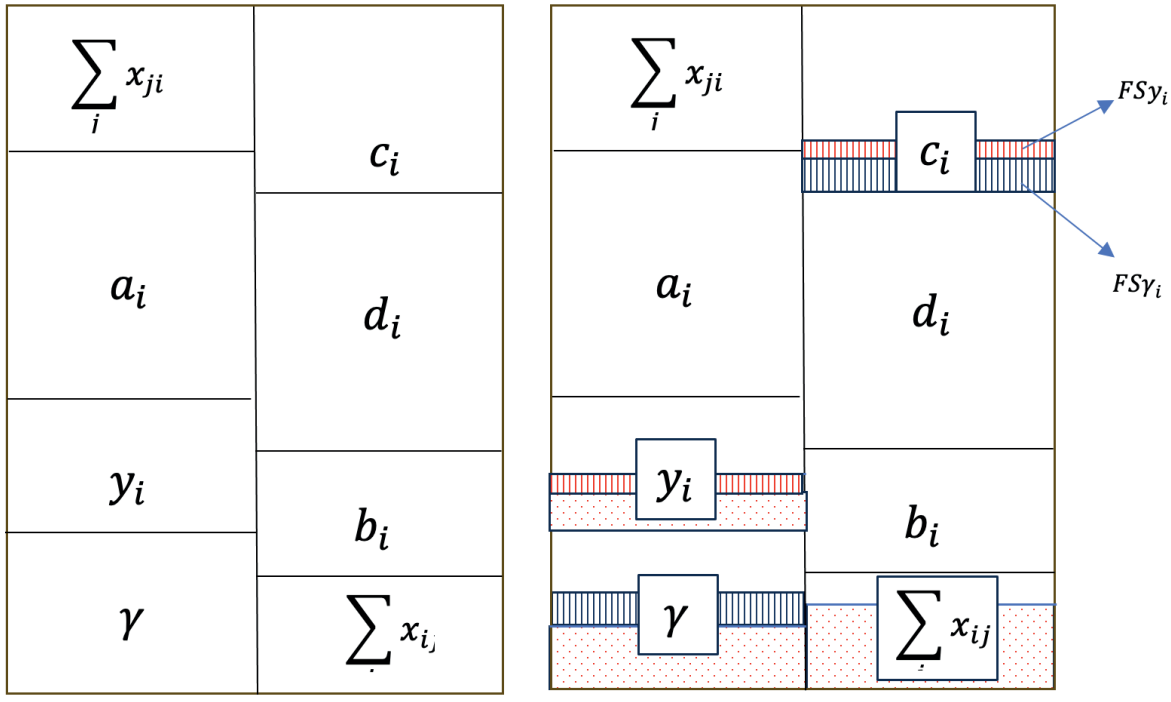
Conditions for Solvency Default and Conditions for Liquidity Default

The changes in a bank's stylized balance sheet, induced by interbank defaults and the inability to roll over funding in the interbank market are presented in illustration 3 above. The resulting credit and funding shocks on bank induced by an assumed bank failure (h) at $t=0$, could potentially make bank i vulnerable if the minimum solvency and liquidity thresholds are not met. The solvency

3 Simultaneous failures could potentially arise from adverse macro-financial conditions which Macroprudential Stress Test analysis attempts to model through its adverse scenarios. Alternatively, the results of Macroprudential Stress Test under adverse scenario are used to simulate simultaneous bank failures.

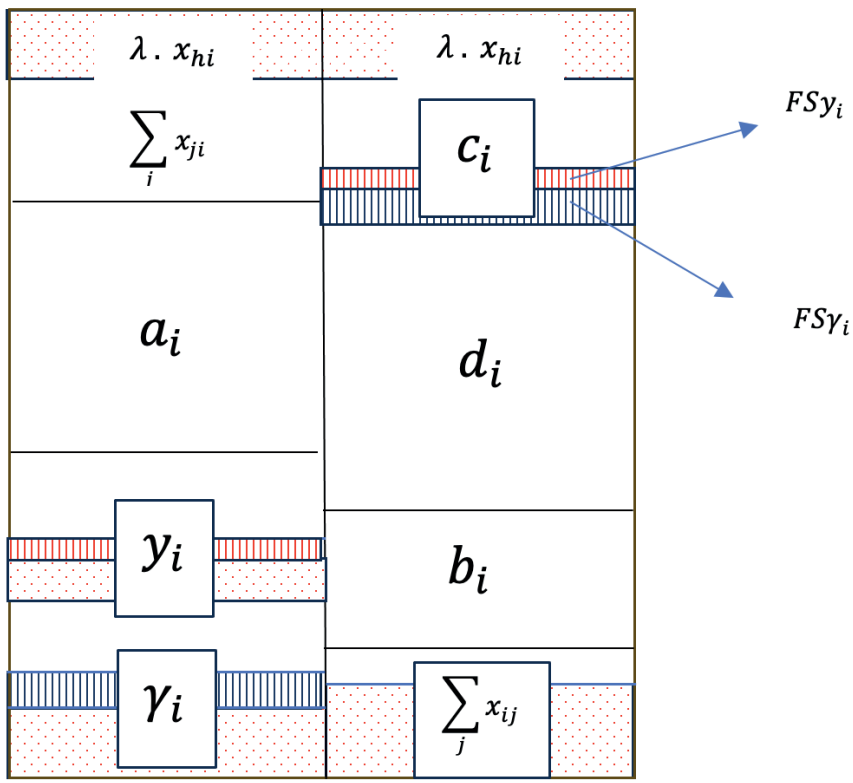
4 Excess of high-quality liquid assets refers to the stock of such assets maintained above the minimum regulatory requirement. The ICA framework has the agility to accommodate potential forbearances on liquidity requirements availed to the banking sector during a crisis.

Illustration 2: Effect of a Funding Shock on a Bank's Balance Sheet



Inspired by Espinosa-Vega and Sole (2010), Covi, Gorpe and Kok (2019) and Fukker and Kok (2021)

Illustration 3: Effect of a Credit and Funding Shock on a Bank's Balance Sheet



Inspired by Espinosa-Vega and Sole (2010), Covi, Gorpe and Kok (2019) and Fukker and Kok (2021)

constraint assesses banks' ability to withstand credit losses and fire sale losses, considering their excess capital above the minimum regulatory requirement. A bank is considered distressed when it cannot weather the credit and fire sale losses resulting from a (hypothetical) bank failure. This distress may cascade to other banks within the banking sector. The capital constraint can be denoted as follows.

$$c_i - c_i^d < \sum_{j \in h} \lambda \, . x_{ji} + FS_i$$

Where,

c_i^d= Minimum amount of required capital$_t$ + $CCoB\ i + DSIBi$.

C_i– is the reported capital level of bank i.

$CCoB_i$– Amount of Tier I capital assigned for Capital Conservation Buffer of bank i and

$DSIB_i$– Amount of Tier 1 capital assigned as the Capital Surcharge for Domestic Systemically Important Banks.

Therefore, c_i - c_i^d represents the excess capital of bank i.

Further, a bank becomes distressed via liquidity channel when the funding shock exceeds the excess high quality liquid assets and the stock of illiquid assets. As the excess high quality liquid assets falling below the regulatory minimum threshold after completely disposing of illiquid assets, the bank is under a dire liquidity condition. The excess high-quality liquidity buffer and usable illiquid assets that a bank prudently maintains may diminish at an accelerating rate as liquidity conditions in the money market tightens, potentially leading to significant fire-sale losses. This distress may cascade to other banks within the banking sector.

Propagation of Credit and Funding Shocks Across the Banking Sector

Triggering a distress event, i.e., a hypothetical bank distress at $t = 0$, propagates within the banking network as it transmits through solvency and liquidity channels. The trigger bank is linked to other banks through bi-lateral, bi-directional interbank exposures[5] causing distress to cascade to several additional banks. As the conditions for solvency and liquidity defaults satisfies, more banks fall victim to contagion risk. These additional bank distresses in response to the initial exogenous shock leads to the first contagion round (aka. contagion level) of distresses within the banking sector (Covi, Garpe and Kok, 2019). These additional bank distresses, both individually and collectively, could induce further distresses in few other banks leading to the second round of contagion. The contagion cascade continues until no more additional banks are found distressed. As the contagion round/level increases, the cumulative bank losses increase, reflecting the amplification effect of the contagion risk.

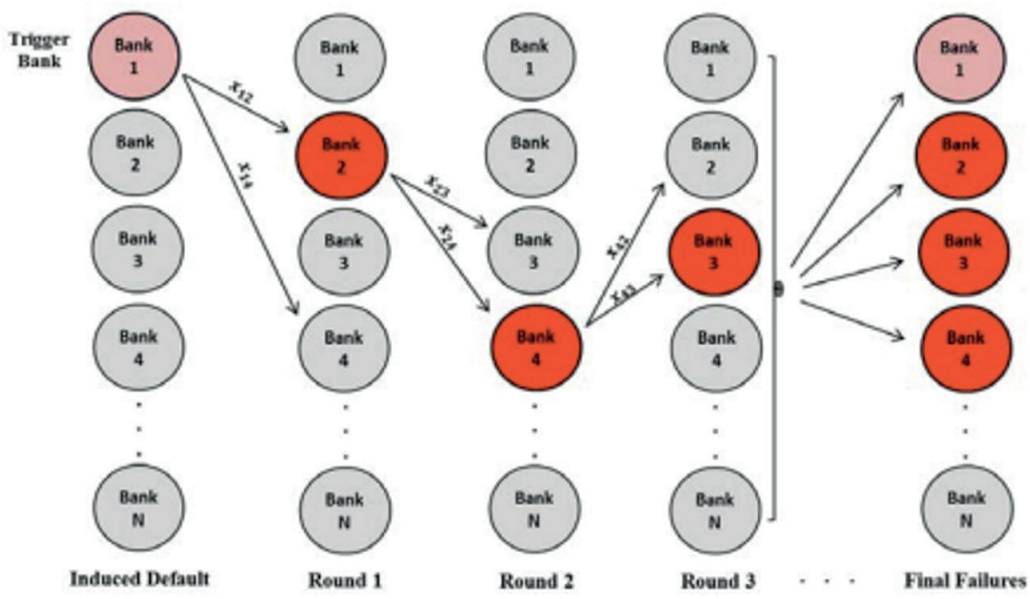
The algorithm above is iterated to simulate a hypothetical distress for each bank in the banking network, i.e. $\Upsilon \in [1,2..N]$, separately at t = 0. The results of the simulations will be recorded to assess the level and extent of contagion and vulnerability within the banking network.

Policy Implications

The ICA framework discussed in this paper focuses on solvency and liquidity constraints within a banking network as the shock propagates through these respective channels. The framework assigns equal weight to the solvency and liquidity conditions

5 Indirect interconnectedness has not been considered in the ICA model

Figure 1: Contagion Path and Rounds of Defaults



Source: (Covi, Garpe and Kok, (2019) which was inspired by Espinosa-Vega and Sole (2010).

of both individual banks and the broader banking sector, allowing for an optimization analysis to be performed. In general, macroprudential instruments tend to focus either on solvency or liquidity conditions of the banking system, depending on the context and risk horizon. Few instruments possess the flexibility to effectively calibrate both. The ICA is one such robust frameworks that provide the flexibility to model and calibrate these core elements. The ICA framework can be integrated into macroprudential policy making both as an 'ex post' crisis management tool and 'ex ante' preventive measure (Fukker and Kok, 2021).

As a crisis management tool, ICA could be valuable, alongside other instruments, in recommending the liquidation, resolution, or regulatory interventions for affected banks, considering their systemic implications and helping to contain the accumulation of systemic losses due to contagion. The framework could also be used to identify considerations such as systemic liquidity shortages and frictions in capital raising, which could potentially endanger the stability of the system (Fukker and Kok, 2021). Targeted measures that could be implemented for solvent and viable banks, as outlined in the EU Bank Recovery and Resolution Directive, include state guarantees to back liquidity facilities provided by the central bank, state guarantees for new liabilities, and precautionary recapitalization by the state. The ICA methodology is particularly useful in facilitating these targeted measures, as it offers a more holistic perspective by accounting for both the direct and indirect implications of solvency and liquidity considerations. The methodology could also be used as a pre-emptive measure to ensure the stability of the banking sector by containing the contagion risk resulting from high impact events. This includes calibrating the optimum capital level to minimize the need for further capital infusion in future. Moreover, results of ICA framework could be used to complement calibration of Domestic Systemically Important Bank Buffer and Systemic Risk buffers.

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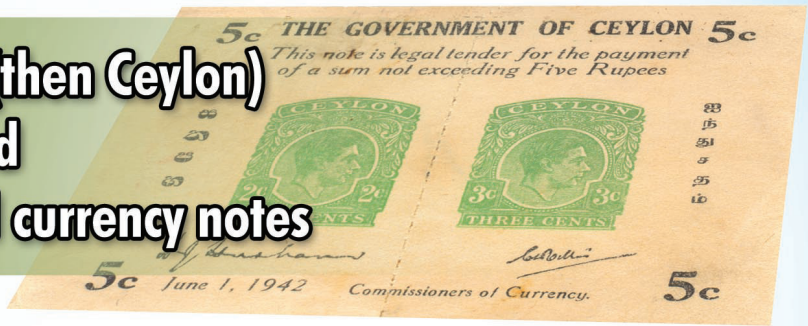

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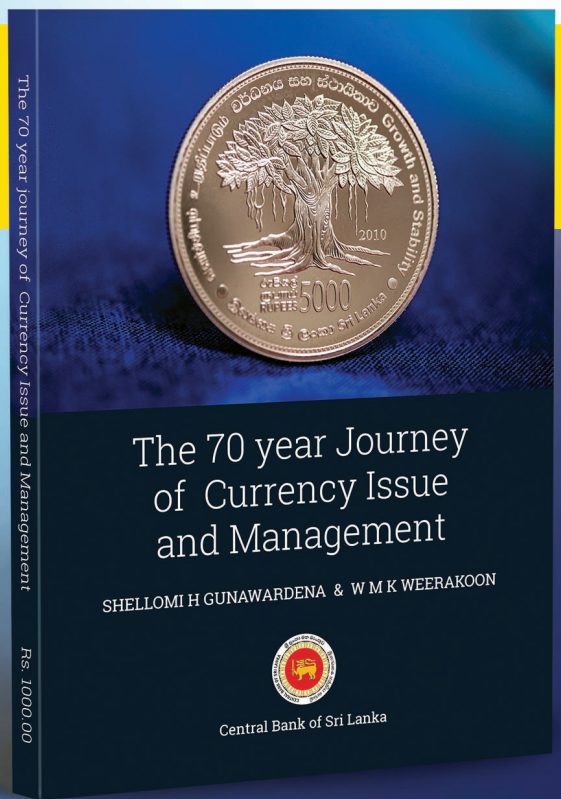

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