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ANALYZING THE BEHAVIOUR OF 91-DAY T-BILLS DURING MARKET STRESS PERIOD

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ABSTRACT

This study analyses the performance of 91-day Treasury Bills (T-Bills) in Nepal during times of market stress, including the COVID-19 pandemic and the 2017 liquidity crisis. Trends in T-Bill yields, liquidity indicators, and the NEPSE Index from 2016 to 2024 are examined in this study using quantitative techniques such as time-series analysis (HP Filter) and Pearson correlation. The results show that during times of crisis, T-Bill yields fell, indicating a "flight to safety" as demand for low-risk assets increased. Liquidity and T-Bill yields showed a limited link with the NEPSE Index, but a moderately favorable correlation. According to the study's findings, T-Bills are an essential instrument for maintaining financial stability since they provide a refuge during times of market stress and supporting in monetary policy actions.

Keywords: Treasury Bills, Behaviour, NEPSE Index, Liquidity, Stress Period

1. INTRODUCTION

1.1 Background of the Study

Treasury Bills (T-Bills) are short term (less than one year) debt securities which is issued by Central Bank of nation. Under the Public Debt Act 1960, Nepal issued its first T-Bill in 1962 A.D. (2019 B.S.) through the Nepal Rastra Bank (NRB). It was a 90-day bill valued NPR 7 million. As the government's agent for domestic debt, NRB oversaw the issuance and auction of T-Bills for many years. On June 20, 2018, the Government of Nepal created the Public Debt Management Office (PDMO) to improve monitoring of public debt. The Public Debt Management Act, which went into effect on November 8, 2022, formalized the PDMO's function. As formally declared by the NRB, the PDMO assumed complete authority for managing and issuing all domestic debt instruments, including government bonds and T-Bills, from April 1, 2024. However, NRB acts as the agent of the government in conducting the auctions and managing the operational aspects. T-bill is always issues on discount basis, auction basis or tender basis. Instead of paying interest on a regular basis, T-Bills offer returns by redeeming at face value when they mature. T-Bills are a key player in financial markets as a crucial part of government borrowing and liquidity management plans. The maturity period of T-Bills includes 28 days, 61 days, 91 days, 182 days, 364 days in a year. Among

them 91-days T-Bill is one of the most important of these since it sets the standard for short-term interest rates and is frequently thought of as a trustworthy safe-haven investment in times of market turbulence (Cecchetti & Schoenholtz, 2021). Using the money raised by T-Bills to pay down maturing government debt is another significant usage. The International Monetary Fund (IMF), Asian Development Bank (ADB), and other foreign nations are among the numerous lenders and debtors that the Nepalese government accepts. When these debts are due, the government borrows money from the general public and issues T-bills to pay them back.

T-Bills can be purchase through competitive bidding and non-competitive bidding. Small investors, individuals, and smaller financial institutions purchase through non-competitive bidding, while banks, major corporations, institutional investors, and other financial entities purchase through competitive bidding. The remaining 15% of the total issue is divided among non-competitive bidders, and the remaining 85% is divided among competitive bidders. The bidding process (Highest Price, Higher Probability) determines the competitive bidder's price, whereas the weighted average price of all successful competitive bidders determines the non-competitive bidder's price. Here is an example how T-bills purchaser can earn profit:

If T-Bills is of face value Rs.1000, Central Bank issues on discount rate let us assume in 5% discount i.e. Rs.950. But upon the maturity of T-bills, the buyer gets the returns in amount of face value i.e. Rs.1000.

So, the buyer earns Rs.50 (i.e. Ending Price - Beginning Price) and the profit yield = $\frac{\text{Profit}}{\text{Purchase Price}}$ *100%

$= \frac{50}{950}$ *100% = 5.26%

T-Bills are crucial tools used by central banks to manage market liquidity and achieve monetary policy objectives. Central banks may utilize open market operations (OMO) to influence market liquidity by either buying T-Bills to add liquidity or selling them to absorb excess liquidity in order to control inflation and restrict the supply of credit. Because of their low risk profile, robust liquidity, and government guarantees (especially during periods of market stress) T-Bills are essential for preserving the stability of financial institutions. T-Bills become a safe-haven asset when investors shift from riskier assets to government-backed securities during market stress period, such as the 2008 Global Financial Crisis, the 2017 Liquidity crises or the COVID-19 pandemic. Market stress period causes T-Bill prices to rise and rates to fall. This "flight to safety" emphasizes their importance in preserving market stability (World Bank, 2021).

In conclusion, T-Bills are crucial for reducing market turbulence and fostering economic stability, particularly during lean economic times. They enable central banks to effectively step in, ensuring liquidity, stabilizing markets, and winning back investor confidence. Because of their market liquidity and

government support, T-Bills are crucial for maintaining the resilience of the financial system, especially during periods of heightened uncertainty and financial distress. Their use highlights the importance of effective central bank operations and liquidity management in preserving financial stability during crises (IMF, 2020).

1.2 Research Problems and Questions

This research study shows what the 91-day Treasury Bills (T-Bills) do in times of market stress: recessions, pandemics, or banking crises The study aims in particular to provide a framework on how safe-haven T-Bills work. The focus is on how recent stress events have affected T-Bill yields, demand and liquidity dynamics, in conjunction with Nepal's COVID-19 Pandemic and the banking crisis currently underway. By understanding these patterns, the research seeks to provide insights into the effectiveness of T-Bills as a tool for financial stability and risk mitigation during times of uncertainty.

To achieve this objective, the study will address the following key research questions:

1. **How do 91-day Treasury Bill yields respond to market stress periods in Nepal?**
2. **What is the relationship between liquidity, NEPSE Index and 91-day T-Bill yields?**

By answering these questions, the research aims to contribute to a depth understanding of the role of short-term government securities in maintaining financial stability during the market stress.

1.3 Literature Review

Gurung (2020) used data from 2010 to 2019 to investigate the connection between the NEPSE Index and 91-day Treasury Bill rates. The analysis discovered a strong negative association, suggesting that investors switch to T-Bills when the stock market declines, particularly when they are under financial or political strain. Additionally, it emphasized the relationship between tighter banking liquidity and higher short-term yields, highlighting the impact of monetary conditions on T-Bill behavior.

Amstad and Remolona (2020) investigate the response of short-term government securities to financial market stress, specifically 91-day T-Bills. They discover that investors show a "flight to safety" during times of increasing uncertainty (such as COVID-19 or geopolitical concerns), which lowers T-Bill yields because of higher demand. The study emphasizes that both emerging and developed markets exhibit the same negative association between market stress and T-Bill yields.

Choudhry and Gabor (2019) look into how short-term government securities in emerging Asian markets are affected by liquidity circumstances. They discover that T-Bill yields increase when investors want more rewards for keeping less liquid assets when the banking sector's liquidity tightens (for example, as a result of monetary policy changes or financial crises). According to the study, T-Bill demand tends to rise in tandem with equities market downturns (e.g., stock index drops), which lowers yields.

1.4 Methodology

This research study has adopted a quantitative research approach by using the secondary data to analyses the behavior of 91-days T-bills during market stress period. A time-series analysis and correlation are used to examine the trend, volatility and relationship between T-bills yield, market index and liquidity factors.

1.4.1 Data collection and source:

The data used in this study is monthly observation of following components:

- 91-days T-Bills Yield
- Nepal Stock Exchange Index
- Liquidity Indicators
- Other Macroeconomic Indicators

Both Primary and Secondary data were collected and these data were sourced from Nepal Rastra Bank (a Central Bank of Nation), Nepal Stock Exchange, Public Debt Management Office, and other Publicly available financial database. The Time frame covers from 2016 to 2024 (i.e.9 years)

1.5 Data Analysis Techniques

Two main data analysis techniques were applied during this research:

1.5.1 Time series Analysis

This research uses time series trend analysis using HP filter to analysis the behaviour of 91-days T-Bills yield over the time in Nepal. This method is suitable for long term movement and therir responsiveness.

1.5.2 Correlation Analysis

A Pearson Correlation test was conducted to analysis the relationship between:

- 91-days T-Bills Yield and Liquidity Indicator.
- 91-days T-Bills Yield and NEPSE Index

1.6 Identification of Market Stress Periods

Market stress period in this research were identified based on changes on external environment, systemic financial disruption and global health crises. Specifically, the following events were used as market stress period in case of Nepal:

1.6.1 Liquidity crises:

Tight liquidity conditions, such as low surplus reserves, elevated interbank rates, or aggressive cash injections by Nepal Rastra Bank, were noted for particular months in the country's banking sector. These time frames are helpful for examining the connection between short-term yields and monetary tightening since they represent stress on the financial system. The duration of liquidity crises taken in this research is from April 2017 to February 2018.

1.6.2 COVID-19 Pandemic:

Stock market volatility and extreme economic uncertainty were caused by the worldwide health crisis and the lockdowns that followed. As economic activity slowed in Nepal, the liquidity situation tightened and the NEPSE Index saw significant swings. This time frame was chosen in order to evaluate how T-Bill yields responded to investor risk aversion and general financial hardship. The duration of Covid-19 Pandemic taken in this research is from March 2020 to October 2021.

2. DESCRIPTIVE ANALYSIS

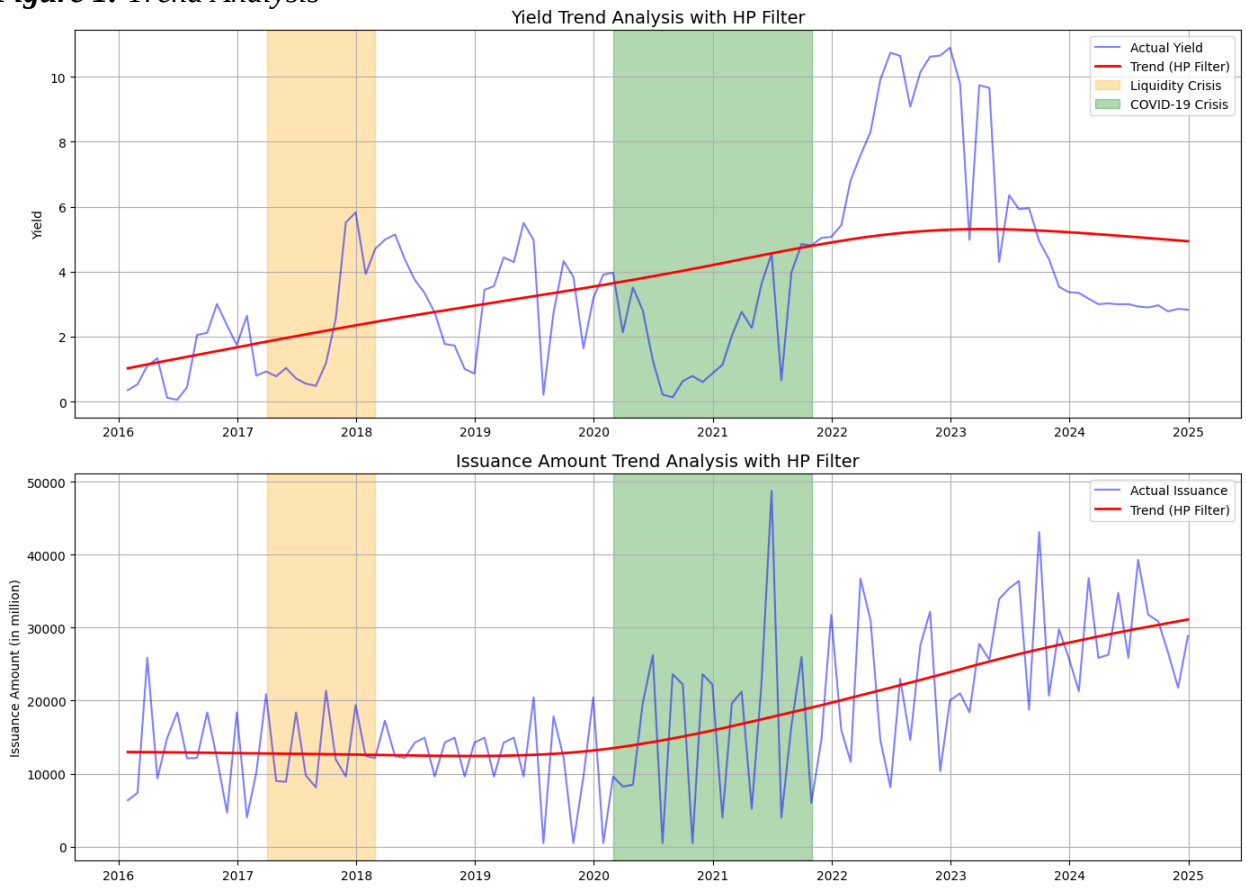
2.1 Analytical Tools Used

To study the behavior of 91-day Treasury Bill yields during different market conditions, the following time series analysis method was used:

2.1.1 Trend Analysis (HP Filter)

It is used to identify long-term trends by separating short-term fluctuations (noise) from the main direction of the T-Bill yield. This helps in understanding the overall movement of interest rates over time (*Hodrick & Prescott, 1997)*

Figure 1: *Trend Analysis*



Source: Authors Calculation using Python

We applied the Hodrick-Prescott (HP) Filter to analyze trends in 91-day T-Bill yields and issuance amounts from 2016 to 2024. The yield trend showed a steady rise over time, with clear upward deviations during the liquidity crisis (2017–2018) and downward pressure followed by volatility during the COVID-19 crisis (2020–2021). Meanwhile, issuance amounts remained stable during the first crisis but increased sharply during the pandemic, indicating policy intervention. These trends suggest that T-Bills were actively used as a monetary policy tool in response to economic stress and that yields responded dynamically to market uncertainty.

***Table 1**: Mean and Volatility calculation*

Period	Mean of Yield	Mean of Issuance	Volatility/Standard Deviation of Yield	Volatility/ Standard Deviation of Issuance
Full Period	3.700266	17899.350926	2.820460	10010.676739
Liquidity Crisis	2.477466	12823.927273	2.119608	4698.783836
COVID Crisis	2.179910	16453.300000	1.595644	11836.251570
Normal Periods	4.269849	19000.009091	2.969635	9882.049503

The descriptive statistics reveal notable differences in 91-day T-Bill yield and issuance behavior across crisis and normal periods. During the full sample period (Jan 2016–Dec 2024), the average yield was 3.70% with a standard deviation of 2.82, while the average issuance stood at 17,899.25 million NPR, with a standard deviation of 10,010.67million NPR. In the liquidity crisis period (Apr 2017–Feb 2018), the mean yield dropped to 2.47%, and issuance declined to 12,823.92 million NPR, both with reduced volatility (2.119 for yield and 4,698.78 million for issuance). This reflects a period of monetary tightening with reduced market activity and subdued investor participation.

Similarly, during the COVID-19 crisis (Mar 2020–Oct 2021), although the mean yield further declined to 2.1799%, the average issuance increased significantly to 16,453.3 million NPR, with the highest issuance volatility of 11,836.25 million NPR. This suggests aggressive and variable use of T-Bills as a policy tool to inject liquidity and support the economy during the pandemic.The reduced yield volatility (**1.59**) also implies more controlled and stable interest rates through policy interventions.

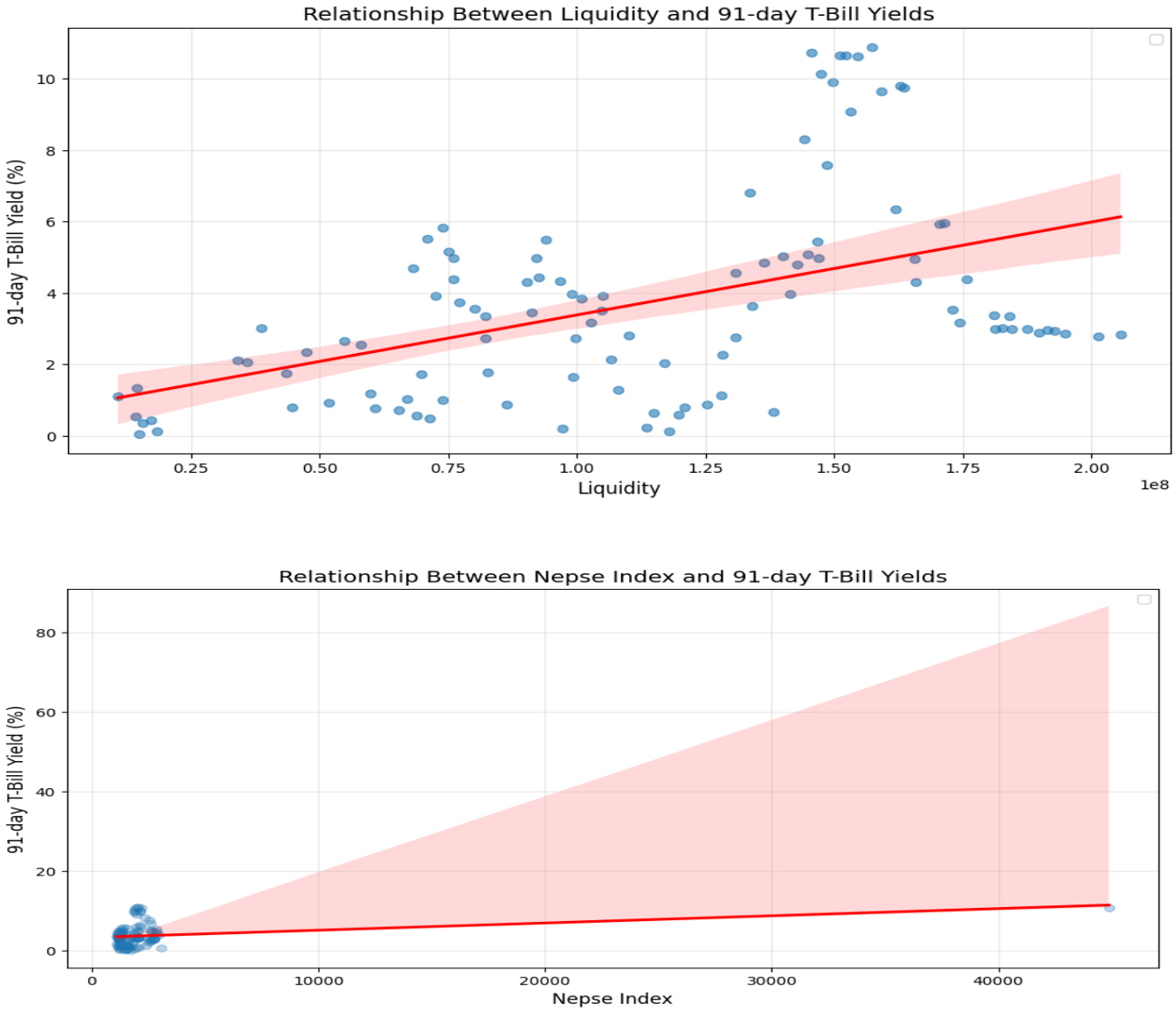
In contrast, **normal periods** (excluding crisis dates) exhibited the **highest average yield** of **4.269%** and issuance of **19,000 million NPR**, along with the highest yield volatility (**2.96**) and moderately high issuance volatility (**9,882.049 million NPR**). This indicates a relatively market-driven environment, with interest rates and borrowing volumes responding more freely to market forces in the absence of extraordinary policy interventions.

Overall, these statistics confirm that both the level and volatility of T-Bill yields and issuance were significantly affected by macroeconomic stress events. The above data supports that **Nepal Rastra Bank actively used T-Bills as a monetary policy tool** during crises, especially during COVID-19, to stabilize financial conditions and manage liquidity.

2.1.2 Correlation

To examine the relationship between 91-day Treasury Bill (T-Bill) yields and key macro-financial indicators, a Pearson correlation analysis was conducted using monthly data from January 2016 to December 2024. The two variables considered were **Liquidity** (representing average deposit from the customer in the banking system) and the **NEPSE Index** (Nepal's stock market benchmark).

***Figure 2**: Correlation*



***Source:** Authors Calculation using Python*

The results show that T-Bill yields have a **moderate positive correlation** with Liquidity (**r = +0.47**). This indicates that increases in liquidity are generally associated with an increase in the yield of short-term government securities. Similarly, T-Bill yields have a **weak positive correlation** with the NEPSE Index (**r = +0.27**), suggesting a limited but positive relationship with stock market performance.

These findings imply that monetary liquidity conditions in the economy may influence short-term interest rates more strongly than stock market movements. The stronger association with Liquidity suggests that policy measures or market behaviors affecting liquidity could directly impact the short-term borrowing cost of the government.

3. SUMMARY AND CONCLUSION

3.1 Findings of the study

i. Yield Fell during the liquidity crisis and during Covid-19 compared to normal stress period. It indicates both policy impact and market preference for safety.

ii. The actual yield deviates below the long term trend during both crisis periods especially during Covid-19 pandemic. It confirms crisis responds to market stress.

iii. Volatility/Standard Deviation of Yield dropped below then in normal period. It indicates it becomes more stable showing they respond in a controlled and calming way.

iv. The research shows that yield reacts differently but always in response to stress.

v. The observed yield behaviour during stress period confirms that 91 days T-Bill yield are highly responsive to policy action.

vi. The relation between T-bill yield and Liquidity indicators is Moderate positive correlation, it shows when liquidity is high, investor may move to riskier to increase as a result T-Bill behave as safe assets during liquidity shortages.

vii. The relationship between T-bill yield and NEPSE Index is weak positive correlation. It shows T-bills are not tightly linked to stock market behaviour as a result T-bill offer safety during stock market uncertainty.

viii. At the end we can say that T-bills are more influenced by liquidity indicators than stock market, that validates the central role of T-bill as safe, low risk assets in Nepali financial market during market stress period.

3.2 Conclusion

The study concludes that 91-day T-Bills in Nepal play a vital role during market stress, with yields declining as investors seek safer assets. The analysis highlights a stronger link between T-Bill yields and liquidity conditions as compared to stock market performance, underscoring their importance in monetary policy.

During crises like the liquidity crises and COVID-19, T-Bills provided stability, reinforcing their reputation as a safe-haven asset. These findings emphasize the need for effective public debt management and policy measures to leverage T-Bills for financial resilience. Future research could explore additional macroeconomic variables to further refine understanding of T-Bill dynamics in emerging markets.

APPENDIX

Amstad, M., & Remolona, E. (2020). *Market stress and the flight to safety: How Treasury bills behave during crises*. March, 1–14. https://www.bis.org/publ/qtrpdf/r_qt2003.htm

Cecchetti, S., & Schoenholtz, K. (2021). Money, Banking, and Financial Markets. McGraw-Hill Education.

Choudhry, M., & Gabor, D. (2019). *"Liquidity Shocks and Short-Term Government Debt: Evidence from Emerging Asia."* Journal of Financial Stability, 42, 45-58.

Gurung, R. (2020). *Relationship between Treasury Bill Rate and NEPSE Index in Nepal*. *Pravaha*, *26*(1), 94–102. https://doi.org/10.3126/pravaha.v26i1.31951

Hodrick, R. J., & Prescott, E. C. (1997). Postwar U.S. business cycles: An empirical investigation. *Journal of Money, Credit and Banking*, 29(1), 1–16.

Hodrick, R. J., & Prescott, E. C. (1997). Postwar U.S. business cycles: An empirical investigation. *Journal of Money, Credit and Banking*, 29(1), 1–16.

https://nepalstock.com.np/indices

https://www.sharesansar.com/index-history-data

International Monetary Fund (IMF). (2020). Monetary Policy Implementation: Tools and Strategies. IMF Publications.

Mishkin, F. S. (2019). The Economics of Money, Banking, and Financial Markets. Pearson Education.

World Bank (2021). Financial Market Stability during the COVID-19 Pandemic. World Bank Publications.