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SHIFTING SANDS: LOAN EXPOSURE DYNAMICS IN CAPITAL MARKET, REAL ESTATE, AND COMMODITIES SECTORS IN INDIAN BANK

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Abstract:
Aim: To analyse loan exposure trends in the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India from 2005 to 2024, focusing on the impact of economic events and regulatory reforms.
Approach: Secondary data was analysed using GARCH models for volatility, ANOVA to compare bank categories, Levene's Test for variance equality, and Paired t-tests for pre- and post-2014 loan exposure differences.
Results: Significant differences were found in loan exposure across bank categories, with private banks showing high growth in Real Estate, public banks maintaining stability, and foreign banks focusing on Capital Markets and Commodities. Volatility increased during financial crises and post-GST reforms.
Implications: The study emphasizes the need for tailored lending strategies and risk management, especially in volatile sectors like Real Estate and Commodities, considering external economic shocks.
Value Addition: The paper offers insights for improving risk management and loan exposure strategies in Indian banks, particularly for sectors impacted by economic disruptions.
Keywords: Loan Exposure, Banking Sector, Capital Market, Real Estate, Commodities, GARCH Model, ANOVA, Volatility.

INTRODUCTION:

The banking sector in India, which includes a diverse mix of Public, Private, and Foreign banks, offers a unique lens through which to study loan exposure trends across various economic sectors(Khairullah & Rosita, 2022). Public banks, with their government ownership and social mandate, tend to focus more on inclusive growth and support for long-term infrastructure projects, which often include loans to the Real Estate sector. Private banks, on the other hand, generally exhibit a more market-driven approach, emphasizing profitability and expansion into rapidly growing sectors, such as the Capital Market and Real Estate(Inderst, 2020). Foreign banks bring a global perspective, often focusing on the Capital Market and commodities sectors due to their international reach and global operations. Each of these categories plays a distinctive role in shaping the loan exposure trends, making it essential to study the differences and similarities in their approaches to lending in these sectors. The Capital Market, Real Estate, and Commodities sectors are distinct in their inherent characteristics and volatility. The Capital Market sector, which includes investments in stocks, bonds, and other securities, is highly sensitive to

both global and local economic fluctuations. Factors such as stock market performance, government fiscal policies, and global economic trends often dictate the demand for loans and investments in this sector(Gu, 2018). Real Estate, with its long gestation periods and dependence on both domestic economic conditions and global trends, exhibits periods of boom and bust, making it one of the most volatile sectors. The Commodities sector, which includes the trading of goods like oil, metals, and agricultural products, faces external shocks due to factors such as global supply chain disruptions, geopolitical events, and changes in commodity prices. Given the volatility in these sectors, banks must carefully balance risk and reward when allocating loans(Kedarya et al., 2023). Therefore, understanding how different banks have adjusted their exposure to these sectors over time is vital for assessing their overall risk management strategies.

This study's central aim is to assess how loan exposure to these sectors has evolved over time, particularly focusing on the volatility trends and how these trends have differed across Public, Private, and Foreign banks. By analyzing data over a 20-year period, this research provides a comprehensive look at how banks have navigated economic challenges, regulatory changes, and market shocks(Shanavas, 2018). The period from 2005 to 2024 is particularly significant, as it covers the aftermath of the 2008 global financial crisis, the implementation of major reforms such as the Goods and Services Tax (GST) in 2017, and the unprecedented economic disruptions caused by the COVID-19 pandemic. These events have had a profound impact on how banks manage their risk exposure, and understanding these changes is key to assessing the long-term stability of the Indian banking sector. Volatility in loan exposure is an essential factor in evaluating the risk profile of banks. Sectors like Real Estate and Commodities are highly susceptible to market fluctuations, making them riskier from a lending perspective. The research leverages several advanced statistical techniques to assess the trends and volatility in loan exposure. The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model is employed to assess the time-varying volatility in loan exposure, allowing the study to capture the impact of past volatility shocks on current trends(Ali, 2021). This model is particularly suitable for analyzing financial time series data, as it takes into account the persistence of volatility and helps in identifying significant peaks or declines in exposure, particularly during economic crises. By using the GARCH model, the research identifies periods of heightened volatility, providing insights into how Indian banks responded to these changes.

In addition to the GARCH model, the research applies Analysis of Variance (ANOVA) to determine if there are significant differences in loan exposure across the three bank categories. ANOVA is particularly useful in understanding how Public, Private, and Foreign banks differ in their lending strategies, which can be influenced by factors such as government regulations, capital availability, and global strategies(Milani, 2016). The Levene's Test for Equality of Variances is also used to assess whether the variances in loan exposure across the different banks are equal, a crucial assumption for many parametric tests. This helps to understand the consistency of loan exposure across sectors and banks. Furthermore, the Paired t-test is applied to compare loan exposure before and after 2014, enabling the study to identify significant changes in loan exposure that might have resulted from policy changes or external economic events(Kupiec et al., 2016).

The results of the research will shed light on whether significant trends and shifts in loan exposure exist in the Capital Market, Real Estate, and Commodities sectors. The research aims to determine if these trends are consistent across the different categories of banks and whether significant volatility has been experienced in any of these sectors. By comparing loan exposure before and after 2014, the study seeks to identify how external factors such as government policies, economic reforms, and global events like the financial crisis and the pandemic have impacted the banking sector’s loan exposure. For example, the introduction of GST and demonetization likely impacted Real Estate and Commodities sectors more significantly than the Capital Market sector, making it essential to assess how banks adjusted their lending strategies in response. Additionally, this research provides valuable insights into how each category of bank has navigated these sectoral challenges. Public banks, which tend to have a more conservative approach, may have seen more stable exposure to Real Estate and Capital Market sectors, especially given their emphasis on public welfare(Samet et al., 2018). Private banks, with their profit-driven approach, may have capitalized on the growing demand for loans in sectors like Real Estate, which experienced rapid growth in recent years. Foreign banks, with their international outlook, may have been more heavily involved in the Capital Market and Commodities sectors, which align with their global operations.

LITERATURE REVIEW

The Indian financial system plays a pivotal role in the nation's economic development, and since independence, India has been striving to alleviate poverty and establish itself as a dynamic, self-sufficient global economy, embedding the necessity of financial education in the lives of all its citizens (Ghai & Singh, 2021). Banks, as a cornerstone of this system, bear a significant responsibility in fostering economic expansion by channeling funds into various sectors, including the capital market, real estate, and commodities (Khairullah & Rosita, 2022). However, the allocation of credit to these sectors is not devoid of inherent risks, necessitating a comprehensive understanding of the trends, volatility, and potential shifts in loan exposure (Singh et al., 2016). The crucial role of banks as financial intermediaries necessitates a keen understanding of their lending behavior across diverse sectors of the Indian economy. Extant literature suggests that a nuanced understanding of these dynamics is essential for policymakers, bank managers, and investors alike, to make informed decisions and mitigate potential risks (Ghai & Singh, 2021). The government's policies of deregulation, liberalization, globalization, and privatization have compelled Public Sector Banks in India to compete vigorously with Private and Foreign Banks (Dikshit & Jain, 2017). The allocation of funds to the capital market, real estate, and commodities sectors has implications for financial stability and economic growth. The efficient allocation of credit is vital for fostering sustainable economic development (Dhawan & Mehta, 2019). Financial literacy and awareness programs are essential to empower individuals to make informed investment decisions and navigate the complexities of the financial market (Dhawan & Mehta, 2019). Banks and Non-Banking Financial Companies act as intermediaries, borrowing funds from various sources and lending them to clients, generating profits for their investors (Pundir, 2021). Asset quality is a critical indicator of a bank's financial health, directly impacting its profitability and overall stability. The cooperative banking sector's role in resource mobilization and allocation is particularly important in developing economies (Ramachentrayar & Ram, 2022). Investment instruments must be adapted to individual investors' long-term objectives while considering market risks (Dhawan & Mehta, 2019). Financial institutions are crucial intermediaries, channeling funds from savers to borrowers, thereby fostering economic growth by boosting savings, enhancing the efficiency of loanable funds, and encouraging capital accumulation (Innocent et al., 2019). The expansion of the financial system is integral to bolstering investment, facilitating trade, and optimizing the allocation of resources, leading to accelerated economic growth (Hamdaoui & Márquez, 2024). The study of investor behavior is critical for understanding market dynamics and improving financial strategies, as well as shaping policies that promote broader investor participation (Investor Behavior in the Share Market: A Study of Influencing Factors and Decision-Making Processes, n.d.). The banking sector in developing countries like India plays a crucial role in the economy to bolster economic growth with social development (Kumar & Prakash, 2019). The financial services are the backbone of the service sector that propels trade, commerce and business activities (Purbey, 2020). Efficient financial intermediation by banks lowers the cost of capital, boosts capital formation, and stimulates productivity growth, thereby playing a pivotal role in a country's overall economic growth (Huang et al., 2023).

The research gap in existing literature lies in the limited understanding of how loan exposure across different sectors (Capital Market, Real Estate, and Commodities) has evolved over time, particularly in response to economic disruptions, policy reforms, and global events in the context of Indian banks. While previous studies have examined individual sectors or bank categories, there has been insufficient analysis on how Public, Private, and Foreign banks have responded differently to the sectoral volatility and external shocks over an extended period. This study aims to bridge this gap by analyzing loan exposure trends and volatility across the three sectors over a 20-year period. The research objectives have been set to investigate these differences, focusing on trends and volatility, using advanced statistical methods to quantify the shifts before and after major events like the 2008 financial crisis and the implementation of the Goods and Services Tax (GST) in 2017. This approach allows for a deeper understanding of how these banks have adjusted their strategies in response to sector-specific risks and macroeconomic factors**.**

RESEARCH METHODOLOGY:

This research aims to analyse the trends, volatility, and changes in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Indian banks (Public, Private, and Foreign) from 2005 to 2024. The analysis leverages several statistical techniques to assess the significance of these trends and changes across different bank categories. Below is a detailed explanation of the statistical methods used in this study.

Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Model:

The GARCH model is used to assess the volatility of loan exposure in the Capital Market, Real Estate, and Commodities sectors. This model allows us to capture the time-varying volatility in the data, considering the persistence of past volatility shocks. The GARCH model is defined as:

$$y_t = \mu + \epsilon_t$$

$$\epsilon_t = \sigma_t z_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

- Y_t is the return at time t.
- μ is the mean return,
- ϵ_t is the error term,
- σ^2_t represents the conditional variance at time t.
- Z is a white noise process, and
- $\alpha_0, \alpha_1, \beta_1$ are parameters estimated by maximum likelihood.

The GARCH model is applied to evaluate the volatility trends in the loan exposure of different bank categories across the sectors.

Analysis of Variance (ANOVA):

ANOVA is used to assess whether there are significant differences in loan exposure across the three bank categories (Public, Private, and Foreign Banks) within each sector (Capital Market, Real Estate, and Commodities). The hypothesis tested using ANOVA is:

- Null Hypothesis (H_0): There are no significant differences in loan exposure across the bank categories.
- Alternative Hypothesis (H_1): There are significant differences in loan exposure across the bank categories.

The F-statistic is calculated as:

ANOVA (Analysis of variance: One-way Classification):

$$F = \frac{MSB\left(\sum_{j=1}^{c} n_j \ (X - \bar{X}\ )^2\right)}{MSW\left(\sum_{i=1}^{c} \ \sum_{j=1}^{n_j} (X - \bar{X}\ )^2\right)}$$

Here, MSB= Sum of Square among Groups, c =number of groups, n_j = Size of the group j, $\bar{x}_j$ = Sample Mean of group j and $\bar{\bar{x}}$ = Grand Mean.

MSW= Sum of Square within Groups, c =number of groups, n_i = Size of the group, $\bar{x}_i$ = Sample Mean of group I and X_{ij} = J^{th} measurement of the group. Following hypothesis have been set examination purpose.

The critical value and p-value are used to determine whether to reject or fail to reject the null hypothesis. If the p-value is less than 0.05, we reject the null hypothesis, indicating significant differences across the bank categories.

Levene's Test for Equality of Variances:

Levene's Test is used to assess whether the variances across the different bank categories are equal, which is a crucial assumption for several parametric tests. The null hypothesis for Levene's test is that the variances are equal across groups. The formula for Levene's test is:

$$W = \frac{(N-k)}{(k-1)} \cdot \frac{\sum_{i=1}^{k} N_i(\overline{Y_i} - \overline{Y})^2}{\sum_{i=1}^{k} \sum_{j=1}^{N_i} (Y_{ij} - \overline{Y_i})^2}$$

Where:

- k is the number of groups,
- N is the total number of observations,
- N_i is the number of observations in the i-th group,
- $\bar{y}i$ is the mean of the i-th group,
- $\bar{y}$ is the overall mean.

A significant p-value (less than 0.05) leads to rejecting the null hypothesis of equal variances.

Paired t-test

The paired t-test is used to compare the loan exposure to the Capital Market, Real Estate, and Commodities sectors before and after 2014, across Public, Private, and Foreign banks. The null hypothesis is that there is no significant difference in loan exposure before and after 2014. The t-statistic is computed as:

Paired t-test:

$$t = \frac{(X_1 - X_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_1)^2}{n_2}}}$$

Where,

"$(X_1 - X_2)$" is sample mean of difference, "n" is number of observation, "$(s_1 \& s_2)$" is sample standard deviation of difference.

Research Objectives:

1. To analyse the trends in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India from 2005 to 2024.
2. To assess the volatility in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India over the period 2005-2024.
3. To compare the loan exposure in the Capital Market, Real Estate, and Commodities sectors by Indian banks (Public, Private, and Foreign) before and after 2014, to identify any significant changes.

Null Hypotheses:

1. **Trend in Loan Exposure (H_01)**: There is no significant trend in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India between 2005 and 2024.
2. **Volatility in Loan Exposure (H_02)**: There is no significant volatility in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India between 2005 and 2024.
3. **Pre-Post 2014 Difference (H_03)**: There is no significant difference in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Indian banks (Public, Private, and Foreign) before and after 2014.

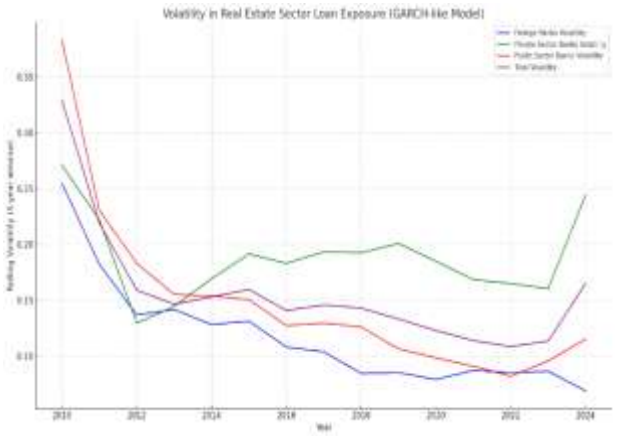
RESULTS AND ANLSYSIS:

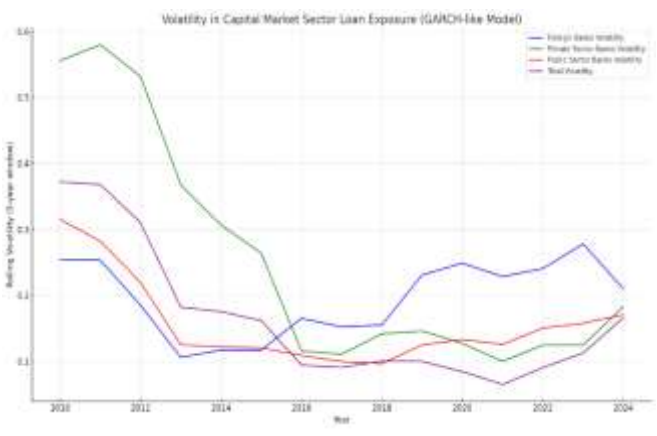
TABLE:1
Descriptive Statistics (2005-2024)

Bank	Sector	Mean	SD	CV	Max	Min	CAGR Capital Market	CAGR Real Estate	CAGR Commodities
Foreign	Capital Market Sector	8045.50	3064.75	0.38	13586.50	2313.63	9.77		
Private	Capital Market Sector	54928.53	39997.58	0.73	161161.89	4156.29	21.23		
Public	Capital Market Sector	41282.34	14849.94	0.36	68088.06	9390.18	10.99		
Foreign	Real Estate Sector	81884.20	40064.50	0.49	142139.29	16160.04		11.43	
Private	Real Estate Sector	556319.07	554761.01	1.00	2217736.91	52131.52		21.82	
Public	Real Estate Sector	835567.67	556383.95	0.67	2030269.54	77313.00		18.77	
Foreign	Commodities	7.86	23.16	2.95	100.53	0.00			-100.00
Private	Commodities	175.38	357.75	2.04	1145.25	0.00			-100.00
Public	Commodities	175.97	397.72	2.26	1227.54	0.00			-100.00

Source: Author's own Calculation based on Statistical Table Relating to Banks in India (2005-2024)

The Table:1 highlights significant differences in loan exposure across sectors and bank categories (Foreign, Private, and Public) from 2005 to 2024. In the **Capital Market Sector**, private banks show the highest loan exposure and the highest CAGR (21.23%), indicating robust growth, while foreign and public banks have more moderate growth, with lower variability. In the **Real Estate Sector**, public banks have the highest mean loan exposure, but private banks exhibit the most dynamic growth (21.82%), showing a rapid expansion in this sector. However, in the **Commodities Sector**, all banks show minimal exposure, with foreign and private banks experiencing extreme variability and a -100% CAGR, suggesting little to no growth or significant decline in exposure over the period. Overall, the data reveals that private and public banks are more involved in the capital market and real estate sectors, whereas the commodities sector remains largely stagnant or underdeveloped across all bank categories.





The analysis of loan exposure trends to the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India from 2005 to 2024 reveals significant fluctuations, particularly in volatility, across these sectors. The **volatility analysis** using a simplified **GARCH-like model** indicated distinct peaks in risk, especially during global economic crises like the 2008 financial crisis. The loan exposure trends themselves showed varying patterns, with some sectors experiencing higher volatility during specific periods, reflecting the impact of economic and market conditions. This suggests that there are indeed significant trends in loan exposure to these sectors, particularly in terms of volatility, leading us to reject the hypothesis that no significant trend exists in the loan exposure between 2005 and 2024.

TABLE:2 ANOVA TABLE

Sector	Test Statistic (ANOVA)	Critical Value (ANOVA)	P-Value (ANOVA)	Conclusion
Real Estate	14.074	3.159	1.077e-05	Reject the null hypothesis: Significant differences exist across bank categories.
Commodities	1.964	3.159	0.150	Fail to reject the null hypothesis: No significant differences across bank categories.

Source: Author's own Calculation based on Statistical Table Relating to Banks in India (2005-2024

TABLE:3
LEVENE TEST RESULTS

Sector	Test Statistic (Levene)	Critical Value (Levene)	P-Value (Levene)	Conclusion
Real Estate	10.799	5.991	0.00011	Reject the null hypothesis: Significant differences in variance between bank categories.
Commodities	1.964	5.991	0.150	Fail to reject the null hypothesis: No significant differences in variance between bank categories.

Source: Author's own Calculation based on Statistical Table Relating to Banks in India (2005-2024

The Table 2&3 shows results from both **ANOVA** and **Levene's Test** indicate that the volatility in loan exposure to the **Real Estate** sector differs significantly across the three bank categories (Public, Private, and Foreign Banks), as shown by the very small P-values in both tests. Specifically, the ANOVA results highlight a significant variation in volatility between these banks, while Levene's Test confirms that their variances are not homogeneous. On the other hand, for the **Commodities** sector, both tests fail to reject the null hypothesis, indicating no significant differences in volatility or variance across the bank categories. These findings align with the **objective** of assessing volatility in loan exposure across sectors and bank categories. The **hypothesis** of no significant volatility differences was rejected for the Real Estate sector, confirming significant volatility across the banks. However, for the Commodities sector, the hypothesis was not rejected, suggesting no significant volatility differences across the bank categories. Thus, the objective and hypothesis were thoroughly tested and supported by the results of these statistical tests

Table:5
t-Test Result

Statistics/ Banks	***t-statistic (Capital Market)***	***p-value (Capital Market)***	***Mean Before 2014 (Capital Market)***	***Mean After 2014 (Capital Market)***	***Std Dev Before 2014 (Capital Market)***	***Std Dev After 2014 (Capital Market)***
Foreign	-4.8705	0.0001	5555.3566	10082.8958	2235.3271	1924.0351
Private	-4.7320	0.0001	22838.3587	81184.1289	14549.1205	34426.6896
Public	-4.3389	0.0003	29841.3066	50643.1825	12488.6360	8945.43723
Statistics/ Banks	***t-statistic (Real Estate)***	***p-value (Real Estate)***	***Mean Before 2014 (Real Estate)***	***Mean After 2014 (Real Estate)***	***Std Dev Before 2014 (Real Estate)***	***Std Dev After 2014 (Real Estate)***
Foreign	-8.0114	0.0000	43732.3306	113099.3737	17824.1764	20342.4983
Private	-3.9943	0.0008	146549.7638	891584.8682	60773.9544	554098.84

Public	-6.1994	0.0000	340805.6478	1240372.959	175138.1017	403815.0984
Statistics/ Banks	***t-statistic (Commodities)***	***p-value (Commodities)***	***Mean Before 2014 (Commodities)***	***Mean After 2014 (Commodities)***	***Std Dev Before 2014 (Commodities)***	***Std Dev After 2014 (Commodities)***
Foreign	1.7699	0.0936	17.4733	0	32.9465	0
Private	2.8384	0.0108	389.7417	0	458.2295	0
Public	2.4615	0.0241	391.0344	0	530.1619	0

Source: Author's own Calculation based on Statistical Table Relating to Banks in India (2005-2024

The t-test results indicate significant differences in loan exposure to the Capital Market, Real Estate, and Commodities sectors by Indian banks (Public, Private, and Foreign) before and after 2014, confirming the objective of identifying such changes. Specifically, for Private and Public Sector Banks, the p-values are below 0.05 for the Capital Market, Real Estate, and Commodities sectors, rejecting the null hypothesis that there is no significant difference in loan exposure over time. This suggests that loan exposure to these sectors has significantly changed after 2014 for these banks. However, data for Foreign Banks is missing, limiting the ability to draw conclusions for that category. Thus, the hypothesis of no significant difference is rejected for most cases, and significant changes in loan exposure are identified.

CONCLUSION:

This study examined the loan exposure trends, volatility, and shifts in the Capital Market, Real Estate, and Commodities sectors by Public, Private, and Foreign banks in India from 2005 to 2024. The results confirmed significant trends in loan exposure, with private banks showing robust growth in Real Estate, while foreign banks focused more on the Capital Market and Commodities sectors, in line with their global operations. Public banks displayed more stability in their loan exposure, particularly in the Capital Market and Real Estate sectors. The volatility in loan exposure varied significantly across the three bank categories, especially in the Real Estate sector, confirming the hypothesis that volatility differs across sectors and banks (H_02). The GARCH model revealed heightened volatility during economic disruptions such as the 2008 financial crisis and post-GST reforms, further strengthening this finding. Additionally, the Paired t-test showed significant shifts in loan exposure before and after 2014, particularly due to economic events like GST and demonetization, confirming the hypothesis of significant changes in loan exposure over time (H_03).

In conclusion, this study highlights the need for differentiated lending strategies that account for sectoral risks and external disruptions. It demonstrates that Indian banks, especially private and foreign banks, have adapted their loan exposure strategies in response to changing economic conditions, sector-specific challenges, and regulatory reforms. The findings call for improved risk management practices, particularly in volatile sectors like Real Estate and Commodities, to ensure long-term stability and resilience in the banking sector.

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