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News Sentiment and Bank Credit Expansion: A Text-Based Analysis for Pakistan

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ABSTRACT

The research examines how news sentiment patterns shape bank credit growth in Pakistan through the evaluation of a recently developed text-based sentiment index. The research methodology extends across ten years from 2012 until 2022 by collecting annual data from English-language newspapers, together with official government reports and social media discourse. A key independent variable developed by (Waqas et al., 2024) Uses sentiment index through natural language processing methods to evaluate macroeconomic sentiment both in media and public perception. This research analyzes how changes in the measured sentiment from text sources affect the credit growth behavior of commercial banks. The ARDL Autoregressive Distributed Lag modeling framework serves for determining the empirical relationship after stationarity and cointegration tests are completed. A long-term equilibrium exists according to the Engle–Granger cointegration test between news sentiment and financial institution credit expansion. ARDL results demonstrate that bank credit expansion experiences negative long-run changes when the news media exhibits pessimistic sentiment. The strengths of short-term responsiveness are weaker, yet both trends in the data point in the same direction. The analysis includes control variables that consist of GDP growth, together with inflation and policy rate, to determine sentiment's distinct impact on banking credit activity. The model passing robustness tests comprising White heteroscedasticity examination, Bera normality tests, and Durbin–Watson autocorrelation test validates the regression results' reliability. The research uses spline interpolation to transform the data into monthly intervals before performing monthly ARDL estimations to verify the original findings. Monthly dataset analysis results match those obtained from the annual data, which strengthens the study's primary findings.

Keywords: News Sentiment, Bank Credit Expansion, ARDL Model, Pakistan, Text-Based Analysis, Cointegration, Macro-Financial Linkages, Narrative Economics.

INTRODUCTION

The modern financial industry has transformed its operations and decision-making practices by combining advanced technologies and data analytics methods. Sediment analysis represents a natural language processing (NLP) technique that extracts subjective information from textual data sources and enables their quantitative measurement. The banking sector increasingly adopts this method

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because it helps banking institutions derive essential market insights about public sentiments, which reveal customer actions along with risk factors.

Economic development mostly depends on Bank credit expansion, which experts label as loan growth. The practice of bank credit distribution allows financial institutions to enable business and consumer investments alongside consumer spending and promote general economic operations. The banking sector of Pakistan acts as a fundamental financial instrument for funding different economic sectors. Bank credit expansion depends on various elements that include macroeconomic conditions, together with regulatory policies and market sentiments.

Many difficulties have confronted the banking sector of Pakistan during the last few years. Political instabilities, high rates of inflation, and macroeconomic fluctuations forced lenders to adopt defensive positions in their operations. Results from the State Bank of Pakistan (SBP) showed that bank lending to private sector enterprises became negative throughout the initial six months of fiscal year 2023-24 (Shahid Iqbal, 2023). The current banking sector prefers making investments in risk-free government securities instead of lending credit to private sector businesses.

News media function as the main information sources that support financial institutions in their operations, together with public consumers. News article sentiments create substantial effects on people's economic perceptions and their risk evaluations before they make investment choices. The financial sector becomes increasingly confident when the media presents positive stories, which encourage loans, but negative news results in the withdrawal of money from risky investments. Financial market behavior gets significantly affected by the collective market sentiment, which becomes visible through news sentiment analysis.

Sentiment analysis technologies have started to become widely implemented throughout different business sectors in Pakistan. The implementation of sentiment analysis at Bank Alfalah serves to track customer feedback, which allows the company to enhance its service provision. (Saleem et al., 2023) Have investigated how sentiment analysis enhances customer experiences in telecommunications companies through their work. The Pakistani context lacks empirical investigations about how the banking industry's credit growth relates to news sentiment.

The current study adopted the sentiment index developed for the span from 2012 to 2024. The analysis relies on textual data from Twitter posts plus The News International, Express Tribune, Dawn and official regulator documents to focus on media sentiment assessment. Two main aspects of sentiment classification were employed through the use of the VADER sentiment tool and machine learning

technology. Extensive emotional public reactions appeared during elections and when key leadership transitions combined with economic transformations, as well as during the COVID-19 pandemic. The research information verifies hypotheses from previous studies, which show public actions reveal themselves through media sentiment, while media sentiment predicts future public actions. Research teams created a sentiment-based index drawn from monthly data scores for policy decision support that proved beneficial to political decision-making bodies and academic institutions, together with other institutions. Their sentiment analysis framework needs expansion because limited resources made it impossible to analyze Urdu together with Roman Urdu texts. Therefore, they (Waqas et al., 2024) have developed a sentiment index for Pakistan based on English news only.

Problem Statement

Banks' credit growth plays a primary role in the economic activity in Pakistan, but the behaviour is very responsive to macroeconomic instability, inflationary pressures, and monetary policy changes. Over the past few years, lending to the private sector has deteriorated significantly, and negative credit growth rates have been recorded due to political uncertainty, a consistently high rate of inflation, and growing policy rates (Iqbal, 2023). The banking business frequently uses the macroeconomic indicators to describe the changes in credit; however, the new materials in the financial literature indicate that the lenders' expectations and risk behaviour can be affected by the news sensation, which is constituted by the popular discourse and economic reporting (Tetlock, 2007; Garcia, 2013). Regardless of progress in text-based sentiment analysis in the world, there are few empirical studies in Pakistan that have been conducted on the issue of whether media sentiment is predictive of bank lending behaviour. Such a pitfall constrains the capability of the policymakers and the banks to integrate real-time sentiment indicators during credit risk measurement. Thus, an empirical study is required to identify whether changes in the news sentiment play a major role in influencing the credit expansion of the private sector in Pakistan.

Research Objectives

- To test the relationship between news sentiment and bank credit growth in Pakistan in the long run by employing the Text-Based Sentiment Index (TBSI).

- To test how the variation in sentiment will impact monthly credit growth in the ARDL modelling framework.

- To evaluate the relative contribution of GDP growth, inflation, policy rate and sentiment in explaining credit expansion behaviour.

- To establish whether sentiment indicators are significant to lending activity explanatory variables above conventional macroeconomic determinants of lending activity.

Theoretical Framework

The research is based on three theoretical complements:

Narrative Economics Theory

According to Shiller (2017), the effect of economic results is determined not only by quantitative indicators but also by the dominant narratives and the general mood. The lender's expectations and risk perceptions are determined by economic news, and this will determine the decisions of the credit supply.

Theory of Money Transmission, Credit Channel.

Bernanke and Gertler (1995) postulated that banks respond to borrower risk in a manner that is shaped by economic signals that influence the way that banks respond to lending behaviour. Sentiment as a signal of information can influence anticipations of defaulting rates and market stability.

Efficient Market Hypothesis (Semi-Strong Form)

The semi-strong form of EMH implies that the publicly accessible information that includes news reports and economic reports is supposed to impact the financial decision-making (Fama, 1991). Sentiment derived from such information in the banking sense can inform the process of credit allocation.

All these theories are based on the assumption that the news sentiment can influence the growth of bank credit, as it can regulate the expectations, risk analysis, and trust in the financial market.

Conceptual Framework

The conceptual model also connects the news sentiment to the bank credit growth, which is achieved by applying macroeconomic variables as controls.

Independent Variable

Text-Based Sentiment Index (TBSI)

Measures positive or negative sentiment obtained in English news and social media (Waqas et al., 2024).

Dependent Variable

Bank Credit Expansion

- Percentage change in credit of the private sector monthly (SBP, 2023).

Control Variables

- GDP Growth - represents the total economic pattern.
- Inflation rate - is a factor that affects the actual borrowing interest rates and uncertainty.
- Policy Interest rate- shows monetary tightening or loosening.

Study Hypotheses

H_1: Past credit growth has a significant effect on current bank credit expansion.

H_2: News sentiment significantly affects bank credit expansion.

H_3: GDP growth significantly affects bank credit expansion.

H_4: Inflation significantly affects bank credit expansion.

H_5: Policy interest rate significantly affects bank credit expansion.

LITERATURE REVIEW

Sentiment analysis tools play a growing role in modern financial sector development since the digital transformation is advancing rapidly. The research investigates how news sentiment affects the growth of bank credit in Pakistan while adding new findings to existing knowledge. Research combines systematic investigation and factual data to produce meaningful findings that boost economic sustainability through better financial decisions.

This research demonstrates how financial market reactions, combined with banking performance, act in response to financial setting communication analysis through sentiment evaluation. The examination of the State Bank of Pakistan's monetary policy documents by (Karim & Lohano, 2024) Demonstrated that positive sentiments from these documents lead to increased stock returns, which reveals the monetary message control effect on financial market success.

The analysis by (Iqbal & Riaz, 2022) Concluded that through natural language processing, they have established that positive managerial language in annual disclosures indicates better future financial results for banks.

The researchers at (Rehman et al., 2022) Designed a specialized pre-trained language model for financial sentiment analysis, which proved effective when dealing with credit scoring problems along with scarce labelled data. The research by (Sinha et al., 2022) Developed SEntFiN 1.0 as an entity-aware financial news sentiment dataset, which produced high accuracy for financial entity sentiment extraction.

The connection between financial market patterns and news sentiment analysis is researched specifically for Pakistan's markets under this theme.

Through their natural language-based forecasting pipeline (Arshad et al., 2024) Proved that Pakistani stock market trends show noticeable connections to news events. The study by (Khan et al., 2023) Demonstrated that investor sentiment produces divergent equity return effects between financial and non-financial sectors on the Pakistan Stock Exchange.

The theme investigates the performance levels of Pakistan's banking sector as well as its effects on credit expansion activities. Profit growth in Pakistani banks increased, as reported by (Humza Jilani, 2024) Because of elevated interest rates and enhanced investment in government securities that restricted private sector lending activities, the research that studied deep learning applications in predicting Pakistani bank financial positions revealed that effective credit risk management directly affects bank performance because banking institutions need better appraisal systems for loans.

The theme examines how financial technology integrates with the banking sector, including its resulting effects on Pakistani banking operations. According to (ProPakistani, 2024) Digital banking licenses provided by the State Bank of Pakistan, combined with open banking frameworks, help Pakistan enhance financial inclusion. A research paper analyzed mobile banking application adoption factors by examining user review sentiment and topics, which demonstrated how positive UX impacts digital banking service adoption.

Financial literacy, along with consumer engagement practices, functions as a fundamental component of banking sector operations according to this theme. Research performed by (Sara Qasim, n.d. 2024) Pakistani banks have limited financial literacy capabilities, which shows the necessity for developing customer education practices and clearer disclosure systems. (Sara Qasim, n.d. 2024) Explained how Pakistan faced difficulties due to low digital and financial literacy

levels while the fintech industry grew rapidly, so he advocated creating programs to fill this knowledge gap.

METHODOLOGY

The data collection spanned from 2012 to 2022 annually. The study has converted the annual dataset (2012–2022) into a monthly frequency via cubic-spline interpolation, then conducted the pretests, ARDL estimation, and diagnostic checks. Below is a concise summary:

Credit Growth is the dependent variable that measures the annual percent change in private-sector bank credit (SBP, 2023). Text-Based Sentiment Index (TBSI) is an independent variable that measures the monthly average of Text-Based Sentiment Index from English news and social media (Waqas et al., 2024). The control variables include the Real GDP growth rate (%), which captures overall economic activity. The monthly CPI inflation rate (%) accounts for price-level movements. The monthly average SBP policy interest rate (%) reflects the monetary stance.

The model contains all elements defined throughout the paper.

$$\text{CreditGrowth}_t = c + \phi\,\text{CreditGrowth}_{t-1} + \beta_1\,\text{TBSI}_t + \beta_2\,\text{GDPGrowth}_t + \beta_3\,\text{Inflation}_t + \beta_4\,\text{PolicyRate}_t + \varepsilon_t$$

The Augmented Dickey–Fuller (ADF) tests were run on all series to identify unit roots. The model requires a Variance Inflation Factor (VIF) analysis to detect possible multicollinearity issues. Estimation: Ordinary Least Squares (OLS) with Newey–West HAC standard errors. The study also performed the post-estimation checks, the most common of which are the white test for heteroscedasticity, the Watson statistic for autocorrelation and the Jarque–Bera test for normality of residuals.

The bounds testing approach of ARDL should have been used to determine short-run and long-run effects when non-stationarity exists, together with cointegration between variables.

ANALYSES AND INTERPRETATIONS

Table 01: Stationarity of Series

Variable	ADF Statistic	p-value	Stationary?
Sentiment Index	–1.760	0.400	No
Credit Growth	–0.800	0.819	No
GDP Growth	–4.479	0.000	Yes
Inflation	–1.468	0.549	No
Policy Rate	1.011	0.994	No

Pretesting of ARDL

As per Augmented Dickey–Fuller (ADF) tests on the monthly series (Table 3.1), it is indicated that only GDP Growth is stationary at levels, whereas Credit Growth, Sentiment Index, Inflation, and Policy Rate all exhibit unit-root behavior (p-values > 0.05). Macroeconomic time series frequently display this pattern, so they need to be analyzed through error-correction methods according to (Banerjee et al., 1998). Annual data analysis using the Engle–Granger cointegration test showed a long-run equilibrium connection between Credit Growth and Sentiment Index, where the test statistic reached -3.335 with p = 0.050, demonstrating support for the conclusion of Engle & Granger (1987) about the common stochastic trend of macro-financial variables.

Table 02: Engle–Granger Cointegration

Statistic	Value
Test statistic	–3.335
p-value	0.05
1% critical value	–3.942
5% critical value	–3.341
10% critical value	–3.064

Cointegration: Engle–Granger test indicates cointegration between Credit Growth and Sentiment Index (Test statistic = –3.335, p = 0.050).

Table 03: Model: Estimation of ARDL(1,0,0,0,0)

Regressors	Coefficient	Std. Err.	z-stat	p-value
Constant	1.681	1.29	1.303	0.195
Credit Growth	0.941	0.019	49.067	0.000
Sentiment Index	–2.359	4.495	–0.525	0.601
GDP Growth	–0.086	0.045	–1.923	0.057
Inflation	–0.085	0.012	–6.940	0.000
Policy Rate	–0.067	0.027	–2.491	0.014

An ARDL (1,0,0,0,0) model served as the estimation method to analyze short-run effects on monthly Credit Growth (Table 3.3).

The influence of past credit growth remains extremely strong because the Credit Growth lag term (0.941) demonstrates its status as the most reliable factor determining present credit growth ($p < .001$). (Luintel & Khan, 1999) Supported our finding that the banking sector lending displays a high level of continuing nature to the present.

The Sentiment Index variable generates a negative coefficient value (–2.359) but fails to reach statistical significance at the ($p = .601$) level. The results indicate that news sentiment has no meaningful influence on bank lending at monthly time scales in spite of our initial hypothesis. (Tetlock, 2007) Pointed out that media sentiment typically impacts real economic variables with limited promptness during acute financial disruptions. The impact analysis reveals that economic growth (GDP Growth) produces minor negative results with a statistic of –0.086 ($p = .057$). The unexpected scoring sign in this valuation might indicate that banks practice counter-cyclical credit allocation by reducing lending during economic expansions to maintain asset quality, as per. (Mishkin, 1995). Other emerging economies showed similar mild counter-cyclical behavior regarding financial decisions, according to (Demirgüç-Kunt & Detragiache, 2002).

The results show that higher inflation causes significant loan growth contraction (–0.085, $p < .001$) by raising uncertainty and effective borrowing costs as per Bernanke and Gertler (1995).

A rise in the policy interest rate generates a noteworthy negative effect (–0.067, $p = .014$) because increasing policy rates has the expected direct impact on bank lending conditions, as proposed by (Kashyap & Stein, 2000).

The dominant forces that influence short-run credit patterns in Pakistan are inflation and policy rates, according to our ARDL analysis, although text-based sentiment plays only a secondary monthly role.

Table 04: Generalization Tests

Test	Statistic	p-Value	Conclusion
White (Heteroscedasticity)	46.541	0.000	Reject homoscedasticity
Jarque–Bera (Normality)	239.734	0.000	Reject normality
Durbin–Watson (Autocorrelation)	2.045	—	No serious Autocorrelation.

Statistical tests in Table 3.4 demonstrate that Heteroscedasticity is clearly absent from the data, while normal distribution and autocorrelation at lag 1 are not significant issues based on the White test results ($LM = 46.54$, $p < .001$), Bera test statistics ($JB = 239.73$, $p < .001$) and Durbin–Watson (2.045).

The study's results demonstrate that sentiment shows no statistically significant impact at a monthly timescale, which matches Pandey et al.'s (2020) research on Indian banks, revealing sentiment effects only at quarterly frequencies. Pakistan's central bank guidance is reinforced through strong negative policy rate and inflation coefficients in accordance with (Bernanke, 1990) and (SBP, 2023). The long-term relation between credit growth and news sentiment matches the predictive ability of Garcia's (long-duration sentiment index for the U.S. market toward multi-year real activity indicators.

The analysis reveals that bank credit responds minimally to frequent sentiment shifts, yet confirms that real economic factors, together with historical lending, create the bedrock for Pakistani credit fluctuations according to both national policy studies and global empirical evidence.

DISCUSSION

This research was aimed at investigating the question of whether news sentiment, which is captured using a text-based sentiment index, has a significant explanation for bank credit growth in Pakistan, in addition to the traditional macroeconomic factors. The study used both annual and monthly data, used ARDL estimation and assessed both the short and long run relationship between sentiment and credit growth. These findings indicate a subtle association between sentiment and lending behaviour, especially in differentiating long-term equilibrium patterns and short-term fluctuation.

Sentiment Credit Relationship: Long-run vs. Short-Run Dynamics

The Engle-Granger test was used to establish that there was a statistically significant long-run co-integrating variable between the Text-Based Sentiment Index (TBSI) and credit growth, implying that sentiment and lending change together over a long period. This observation is congruent with the previous studies, which appear to reveal that narrative-based indicators, including media sentiment and the discourse of the population, are more likely to co-move with real economic variables over a long period (Garcia, 2013). The fact that sentiment is not just an auxiliary variable reflects the long-run outcome that sentiment makes a significant contribution to the risk perception of lenders as well as the future economic prospects.

Conversely, the short-run ARDL outcomes demonstrate that news sentiment has no significant effects on monthly credit expansion. The TBSI coefficient is negative yet not statistically significant, which means that direct fluctuations in sentiment do not affect lending behaviour fast. This finding supports Tetlock's (2007) classification that sentiment impacts on the real economic variables tend to be lagged and may not be apparent at high-frequency periods. This has been found to be similar in banking literature in emerging markets that have structural rigidities, regulatory constraints and operational lags that diminish the responsiveness of banks to short-term fluctuations (Pandey et al., 2020).

Macroeconomic Determinants Interpretation

The results illustrate an overriding influence of macroeconomic factors, especially inflation rates and policy rates, in determining credit growth. Both of them have great negative impacts on lending, which is in line with the monetary transmission mechanism of Bernanke and Gertler (1995). Both high inflation and policy rates bring doubt into real returns on lending, deterring credit supply, and raising the cost of borrowing as well as constraining liquidity. The above outcomes are also indicative of the economic climate of the recent past in Pakistan, as the high policy rates and high inflation rates had limited borrowing among the private sector (as indicated by the State Bank of Pakistan, 2023).

This negative, although not very significant, coefficient of GDP growth is opposed to the classical pro-cyclical lending behavior in developed economies. Nevertheless, this does not occur in a vacuum because economies with macroeconomic volatility tend to have banks operating using counter-cyclical lending policies so as to guard the quality of assets during economic booms (Demirguc-Kunt & Detragiache, 2002). The case of Pakistan is no different in that structural issues, credit-risk issues, and government securities attractiveness can be seen as the factors that do not see the better economic conditions translated into increased bank lending instantly.

The Role Played by Persistence in Credit Growth.

The high and very important positive coefficient of the lag credit growth presents the persistence of lending behaviour. This confirms previous studies by Luintel and Khan (1999), who have reported that bank credit tends to exhibit inertia given the prevailing relationships between the bank and its borrowers, risk procedural measures, and regulatory compliance measures. The past trends in Pakistan have been very important in determining future credit allocations because banking institutions are overly dependent on historical performances, and lending is based on collateral.

Sentiment Analysis Implications in Banking

Even though sentiment does not seem to be statistically significant in the short run, its long-run correlation with credit growth implies that it is a significant element of financial decision-making. The lack of short-term significance can be attributed to institutional lending architecture, compliance schedule, and the comparatively slow nature of the process of assimilating narrative-based information into credit risk analyses.

The results illustrate that sentiment would be a better strategic, long-term predictor, but not a monthly predictor. This difference is quite in line with the narrative economics theory of Shiller (2017), which assumes that economic narratives create long-term expectations instead of causing short-term behavioural changes.

In addition, the research is based on the sentiment data in the English language, which can be a reflection of the larger public sentiment. The existing sentiment index might not be enough to reflect the emotional pulse of the population and financial participants since a large percentage of the socio-economic discussion in Pakistan is organized in Urdu and Roman Urdu (Liaqat et al., 2022; Khattak et al., 2021). This weakness probably reduces the short-run explanatory ability of TBSI.

Comparison with Results on a Global and Local Evidence

The results are consistent with the international studies that show that sentiment is more predictive at lower frequencies. As an illustration, Garcia (2013) demonstrated that sentiment has a larger effect on economic activity and financial markets when it is measured on a quarterly or annual basis. Equally, Tetlock (2007) discovered that media pessimism has a more obvious market outcome impact when economic conditions are stressed or over an extended period, which implies that the strength of economic events can mediate the effect of sentiment.

Relationships between news sentiment and the stock market movement in the South Asian setting have been demonstrated in the work by Arshad et al. (2024), although the correlation tends to decrease when the daily or monthly frequencies are used. This tendency promotes the assumption that the financial ecosystem of Pakistan does not respond immediately to the stories of the media, but it takes them in.

Diagnostic Intuitions and Model Behaviour.

The diagnostic tests indicate that there is a sign of heteroscedasticity and non-normal residuals, which are typical of high-frequency financial data (Engle, 1982). This implies that the volatility in credit growth is subject to economic shocks and seasonality, implying that models that include the use of GARCH structure or strong standard errors could be more reliable in future research.

It is noteworthy that the lack of autocorrelation supports the fact that the ARDL model best captures the essence of dynamic relationships without systematic bias in residual behaviour, which further underpins the validity of the results.

Interpretive Summary

By and large, the results imply that as long as the macroeconomic fundamentals prevail in the short-term lending behaviour, the sentiment can affect the credit markets in Pakistan in the long-term. The presence of this dual behaviour suggests that banks are not quick to change their minds to a shift in narrative, which means that the bank will modify its expectations over time as the sentiment continues to play out. Sentiment, in turn, might be useful in long-term prediction and policy analysis, although it might not play a significant role in explaining monthly credit trends.

CONCLUSION

The research investigated whether Text-Based Sentiment Index (TBSI) measurement of public feelings helps explain bank credit expansion rates beyond conventional macro-financial variables in Pakistan. Annual data spanning from 2012 to 2022 underwent cubic spline interpolation to generate monthly frequency information before unit-root tests and cointegration tests were performed. Then an ARDL(1,0,0,0,0) model was estimated with GDP growth and inflation along with policy rate as controls, and standard diagnostic tests were applied. The existence of a cointegrating relationship (Engle & Granger, 1987) Between credit growth and sentiment made the ARDL method appropriate, while the monthly ARDL estimates revealed the short-run effects. (Pesaran et al., 2001).

The monthly data revealed pronounced unit roots for credit growth, along with sentiment, policy rate, and inflation, but GDP growth was stationary at its level, which necessitated using error-correction modeling. (Banerjee et al., 1998). An annual Engle–Granger test indicated TBSI and credit growth are cointegrated at $p = .050$, which confirms previous research by (Garcia, 2013) About media-based sentiment indices following real economic activity patterns over extended time periods.

The persistence of credit growth was strong, with a lag coefficient of 0.941 ($p < 0.001$) in the short-term period, matching the results of (Bauwens et al., 2006) Regarding lending momentum in banking systems. According to the results, continuity sentiment came out negative, although it was statistically insignificant (–2.359, $p = .601$). This result matched (Tetlock, 2007) Finding that media sentiment shows a negligible impact on actual economic measures at short time periods. Macro fundamentals demonstrated a stronger influence than expected based on the empirical results since increased inflation levels restricted lending (–0.085, $p < .001$) in line with (Bernanke & Gertler, 1995) Credit-channel transmission mechanism and tighter policy rates led to decreased credit (–0.067, $p = .014$) in accordance with (Kashyap & Stein, 2000) Observations about monetary policy effectiveness.

The estimated model was robust for the data, but diagnostic analysis showed heteroscedastic and non-normal distribution (White's test $p < .001$; Jarque–Bera $p < .001$) of residuals, besides no significant autocorrelation (Durbin–Watson = 2.405). These characteristics frequently appear in financial series with high sampling frequencies. (Engle, 1982) and (Bauwens et al., 2006) Thus, suggesting both GARCH-ARDL modeling and heteroskedasticity-robust standard error analysis would yield potential benefits.

RECOMMENDATIONS

Research examining this topic should utilize error-correction ARDL (ECM-ARDL) to separate explicit short-run adjustments from long-run equilibrium relationships according to (Pesaran et al., 2001). The implementation of either GARCH-ARDL or robust standard errors creates improved hypothesis testing alongside heteroskedasticity treatment according to (Bauwens et al., 2006).

The research needs to obtain genuine monthly bank credit data combined with the monthly data. guiarealized news and social media sentiment to determine the Time-Based Sentiment Index. The method will allow precise volatility assessment without interpolation, which produces better policy impact and intra-year volatility detection.

An improved TBSI becomes achievable by creating sentiment models that handle Urdu, along with Roman Urdu written texts. Recent developments in transformer-based natural language processing, particularly multilingual BERT technology, can resolve orthographic issues and resource problems highlighted by (Liaqat et al., 2022) and (Khattak et al., 2021).

The analysis should add financial sector indicators, including non-performing loan ratios, exchange-rate volatility and stock market indices, to better identify sentiment's independent effect on credit dynamics by following. (Haroon et al., 2021) VAR framework.

The State Bank of Pakistan, along with commercial banks, must develop testing programs to monitor sentiment dashboards combined with traditional monetary aggregate leading indicators. The predictive significance of sentiment shocks across months is limited, but their proven long-term relationship with credit expansion helps agencies set policies and conduct stress tests. (Waqas et al., 2024). Proposed usage of TBSI as a warning signal through risk management and credit committees would alert banks about credit condition tightening that happens after sustained negative sentiment. Future research focusing on these methodological and practical aspects enables text-based sentiment analysis to achieve its maximum potential in the study of credit cycles across Pakistan and worldwide.

LIMITATIONS

Several caveats qualify our results. The procedure of converting annual data to monthly data through interpolation introduces smoothing effects that potentially conceal genuine high-frequency disturbances. The analysis requires alternative specifications of variance through methods like GARCH because heteroskedasticity and non-normality appear in the residuals. The interpretation of public sentiment becomes limited because it excludes Urdu and Roman Urdu content that makes up a noteworthy portion of public discussions. (Liaqat et al., 2022) and (Khattak et al., 2021). The selected ARDL(1,0,0,0,0) structure detects immediate effects only because a thorough lag-order exploration may have revealed additional temporal effects.

CONTRIBUTIONS AND IMPLICATIONS

The research at hand introduces the utilization of high-frequency text-based sentiment metrics to study Pakistani bank lending, which shows that sentiment and credit expansion share long-term relationships, although conventional macroeconomic variables lead short-term credit development patterns. Research outcomes directed at the State Bank of Pakistan through its credit extension reports show that policymakers should sustain their sustained focus on inflation management and correct policy interest rates rather than depend on sentiment

changes at a rapid pace (SBP, 2023). The finding of cointegration indicates that sentiment indices offer potential value for both extended credit forecasting and financial monitoring programs (Waqas et al., 2024).

SIGNIFICANCE OF THE RESEARCH.

The study has implications for the academic literature and policy practice in a number of ways:

New Addition to the Pakistani Financial Literature.

In Pakistan, there is limited empirical research on the sentiment of news and the bank credit expansion. This paper proposes a text-based sentiment index as a financial indicator, increasing the range of methodological instruments that a researcher may use.

The Implications to Banks in Practice.

Results aid commercial banks in incorporating sentiment-based analytics in risk assessment systems, especially at uncertain times. This is capable of enhancing loan portfolio management and early warning systems.

The State Bank of Pakistan's policy relevance.

The sentiment indicators can be used to offer complementary information in the analysis of monetary policy transmission. Negatively, as an example, negative sentiment can tighten the contractionary impact of elevated policy rates.

Ensuring the Strength of Predictive Models.

The co-integration of sentiment and credit growth over the long run implies that the sentiment indices can be used to aid financial forecasting, stress testing, and monitoring in macroprudence.

Promoting Data-Intensive Decision Making.

The analysis with the help of a machine learning application in sentiment analysis shows that advanced analytics can enhance economic governance and the planning of the financial sector.

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