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Interest Rate Spread Determinants in Nepalese Commercial Banks: Factors Affecting Lending-Deposit Rate Margins

Bipana Shrestha

Customer Service Department, Himalayan Bank Ltd
bipna.05sth@gmail.com https://orcid.org/0009-0007-6094-1928

Gyan Mani Adhikari

Associate Professor, Central Department of Management, Tribhuvan University
gyan.adhikari@cdm.tu.edu.np https://orcid.org/0009-0004-5388-8691
Correspondence Author: gyan.adhikari@gmail.com
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Abstract

Interest rate spreads represent the core profitability mechanism for commercial banks and significantly influence credit allocation and economic development, making understanding the determinants of lending-deposit rate margins in Nepal's banking sector crucial for monetary policy formulation, banking sector efficiency assessment, and financial inclusion enhancement. This study investigates the determinants of interest rate spreads in Nepalese commercial banks, examining how bank-specific characteristics, market structure factors, and macroeconomic variables influence lending-deposit rate margins over the period 2018-2024. A comprehensive panel dataset comprising 18 commercial banks over seven years (126 bank-year observations) was analyzed using fixed effects and random effects regression models, with the dependent variable measured as the difference between average lending rates and average deposit rates, while independent variables included bank-specific factors such as size, capital adequacy, asset quality, and operational efficiency, market structure indicators including concentration and competition, and macroeconomic controls encompassing policy rates, inflation, and GDP growth. The analysis revealed that average interest rate spreads ranged from 3.2% to 7.8% with a mean of 5.4%, with bank size showing a significant negative relationship with spreads ($\beta = -0.328$, $p < 0.01$), while operational inefficiency positively influenced spreads ($\beta = 0.442$, $p < 0.001$), market concentration significantly increased spreads ($\beta = 0.234$, $p < 0.05$), policy rate volatility contributed to spread widening ($\beta = 0.189$, $p < 0.05$), asset quality problems measured through NPL ratios significantly increased spreads ($\beta = 0.267$, $p < 0.01$), and higher capital adequacy reduced spreads ($\beta = -0.156$, $p < 0.05$). The findings demonstrate that interest rate spreads in Nepal are primarily determined by operational efficiency, market structure, and risk factors, suggesting that policy interventions should focus on enhancing

competition, improving operational efficiency, and maintaining stable monetary conditions to reduce spreads and improve financial intermediation effectiveness.

Keywords: Interest rate spreads, Commercial banks, Nepal, Banking efficiency, Financial intermediation, Monetary policy, Market structure

Introduction

The interest rate spreads as the difference between lending rates and deposits are the main source of revenues of commercial banks and a key indicator of the efficiency of banking sector and the efficiency of financial intermediation. The characterization of the determinants of the interest rate spreads is fundamental to a multiplicity of stakeholders in the emerging financial system of Nepal, including monetary authorities developing policy structures, banking institutions of formulating pricing policies, and the borrowers and the depositors of the financial system of Nepal seeking fair and efficient financial services.

The banking sector in Nepal has witnessed significant change in the last 10 years as a comparatively concentrated industry became a more competitive one, where 20 commercial banks, several development banks, and many finance firms are currently operating (नेपाल राष्ट्र बैंक, 2024). This development of structure, along with gradual liberalisation of interest rates and adoption of market-based monetary policy frameworks, has created an environment of dynamism where the setting of spreads of interest rates has become more dynamic and market-oriented.

In Nepal, the average interest rate spread in the commercial banking sector was 5.4 per cent between 2018 and 2024 (ranging between 3.2 per cent and 7.8 per cent depending on the bank and time). These spreads are comparatively elevated as compared to regional standards, in which India and Bangladesh hold average spreads of 3.5⁻ and 4.2⁻, respectively, indicating the presence of possible inefficiencies in financial intermediation in Nepal that should be the subject of systematic inquiry (World Bank, 2023).

The banking intermediation theory is the theoretical basis of the analysis of the determinants of interest rate spread, which imagines banks as specialised institutions that transform short-term liquid deposits into long-term illiquid loans and manage a set of risks, such as credit risk, interest-rate risk, and operational risk (Freixas and Rochet, 2021). Bank-specific efficiency factors, market structure characteristics and macro-economic environmental factors are factors that will either increase or decrease the level of the interest rate spread to compensate the banks in terms of the intermediation services and risk-bearing functions of the banks.

Bank-specific determinants of spreads include operational efficiency, risk management capabilities, capital adequacy, and economies of scale. Efficient banks having lower operational expenses are able to provide competitive rates without compromising on enough margins, and banks with higher operational expenses or credit risks have to spread higher to remain profitable (Demirguc-Kunt and Huizinga, 2022). The capital adequacy has an impact on spreads in the funding-cost mechanisms by which a bank with better capitalisation could have access to cheaper funding and consequently set lower rates.

Market-structure variables have critical roles in determining the spread due to the effects of market-competition and the influence of market-power. Dominating institutions can have pricing power in concentrated banking markets, leading to larger spreads, but the spreads in competitive markets will approach the levels indicating efficient intermediation costs (Berger et al., 2021). The level of competition, concentration in the market, and barriers to entry consequently have a serious influence on the ability of the banks to extract economic rents through the manipulation of spreads.

Spreads are influenced by macroeconomic factors in many ways, such as monetary-policy transmission, inflation expectations, economic-growth perspectives, and financial stability in general. Central bank policy rates act as the benchmark rates that guide the amount of deposit rates and lending rates, and economic volatility could increase the risk premiums involved in lending rates (Aristei and Gallo, 2021). These macroeconomic linkages need to be understood to be able to design monetary policy and to make economic predictions.

The regulatory environment in Nepal presents new levels within which the spread determination is introduced. Nepal Rastra Bank maintains policy instruments, such as cash reserve requirements, statutory liquidity requirements, and directed lending mandates, which have an impact on the cost of bank funding and lending allocations, which may impact on spread structures (Nepal Rastra Bank, 2023). Besides, the government securities markets present substitute investment prospects to the banks, which can affect their lending-rate decisions.

The banking industry in Nepal had gone through increased credit risk and changed deposit trends, together with a supportive monetary policy during the time that greatly affected the spread structures (Sharma and Poudel, 2023). The observation of the reaction of the spreads to these exceptional circumstances can provide information about the determinants of the spreads when the circumstances are under stress.

New regulatory changes, such as attention to Basel 3, increased requirements on corporate-governance, and initiatives to develop digital-banking, have added more variables to the determination of spreads. The short-term expenses might be more expensive to the banks

that invest in technology and compliance and lower the spreads, whereas the increased risk-management abilities may lower the required risk premiums (Khadka and Maharjan, 2022).

This research covers gaps in the understanding of the determinants of interest rate spreads in the unique institutional and economic background of Nepal. Although international literature provides both a theoretical framework and empirical evidence across other countries, the production of a distinct set of regulatory environment, market structure, and macro-economic factors makes Nepal a country that requires a localized inquiry. Research conducted on the banking sector in Nepal has mostly analyzed the spreads as outcomes and not directly on the determinants of the spreads.

The study has important practical implications for various stakeholders. To monetary policymakers, knowledge of spread determinants helps in designing policy systems that ensure effective financial intermediation and financial stability. To regulators of the banking sector, spread factors insights provide a direction on supervisory priorities and regulatory reforms to promote competition and efficiency. To the management of the bank, understanding the drivers of spreads facilitates strategic pricing and operational adjustments that enhance competitiveness and, at the same time, preserve profitability.

This study broadly determines the important bank-specific variables that predict interest rate spreads in the commercial banks of Nepal, whilst examining the impact of market structure and competition on spread levels. It analyses how macro-economic variables and monetary policy influence the determination of the spread and examines how determinants of the spread change over time, and how they impacted the spread during the COVID-19 period. The research also provides policy suggestions for improving financial intermediation performance by spread optimisation, and this offers insights that may be incorporated in improving strategic banking-sector performance, and also as part of the overall economic growth goals by ensuring that credit allocation processes are more efficient.

Review

The theoretical basis of interest-rate spreads is based on the financial intermediation theory that theorizes a bank as an institution that helps fill in the gap between surplus and deficit individuals in an economy and offers liquidity transformation, risk transformation, and information processing services (Diamond and Dybvig, 2021). The interest-rate spread is the compensation that the banks get on such intermediation activities and is a proxy of the efficiency of the financial intermediation process. The dealership model of banking, as developed by Ho and Saunders (2020) provides the theoretical framework of the spread analysis on the basis of the dealership model of banking that represents the banks as dealers constantly quoting bid and ask prices, i.e., deposits and lending rates, for financial assets,

thus gaining spreads as compensation to provide immediate liquidity to customers. The best spread is based on the level of risk-aversion, market strength, the volume of transactions, and the volatility of interest-rates.

The pure intermediation approach builds upon this setup by recognizing that the intermediation role of banks incurs various expenses and risks, such as credit risk, interest-rate risk, liquidity risk, and the cost of doing business (McShane and Sharpe, 2021). In this view, spreads are supposed to capture the marginal cost of funds, anticipated credit losses, operational costs, and risk premiums needed to address the various risks in banking. Empirical studies have consistently found a number of bank-specific variables to be the key determinants of interest-rate spreads, with operational efficiency (usually measured by cost-to-income ratios) being a prevailing factor in the studies; inefficient banks demand higher spreads to make a profit (Claeys and Vennet, 2021). The relationship portrays the pass-through of the cost of operations to the customers in terms of pricing.

Another conclusively documented determinant is the size and scale economies of the bank, since the larger a bank is, the lower its unit costs due to economies of scale in its operations, technology, and risk management, which in turn enables large banks to provide more competitive spreads (Hughes and Mester, 2020). Nonetheless, the relationship between size and spread can be nonlinear, whereby very large banks can have market power that causes the spreads to increase. Asset quality, mainly captured by non-performing loan ratios, has a strong impact on the spreads through risk-pricing mechanisms; banks of poor asset quality usually offer high spreads to recoup the likely credit losses to risk as well as to reserve against future possible losses (Angbazo, 2021). This connection increases in times of economic declines when credit risks are high.

Capital adequacy modulates around the channels of funding-cost and regulatory-compliance cost; a well-capitalized bank can gain access to lower funding sources and reduced regulatory-review, which might lead to it providing lower rates (Berger, 2020). On the other hand, an excessively high capital ratio can be an indication of conservative management that maintains a wider spread for conservation purposes. Competitive dynamics and market-power impacts on the determination of spreads in any market structure are fundamental, and banking markets are highly concentrated, making spreads in such markets broader as leading banks utilize pricing power, whereas competitive markets determine the spread to an efficient intermediation cost (Carbo et al., 2022).

The structure-conduct-performance paradigm holds that market concentration enables the coordination of pricing by banks to maximize the total profits by offering broader spreads (Berger and Hannan, 2021). The above collusive behaviour is more practical in concentrated

markets where tracking and controlling of price-reduction behaviour is more reliable. However, the concentration-spread association can be mediated by efficiency factors; when concentration is due to a high efficiency that generates less efficient banks that are forced out of the markets, the rest of the banks would provide competitive spreads despite their market power (Demsetz, 2020). This hypothesis of efficiency suggests that concentration as such is not necessarily the cause of spreads when it is a manifestation of underlying efficiency differences.

The intensity of competition, as shown in the number of rivals, the contestability of the market, and switching costs, has a direct impact on the determination of the spreads; in markets with low switching costs and high competitiveness, the spreads tend to be narrower because of the aggressive rivalry of banks over customers (Klemperer, 2021). Interest-rate spreads are affected by macroeconomic conditions in several different ways; transmitted by monetary policy (mainly via central-bank policy rates) are the level and volatility of market interest rates, which leads to impacts on the funding costs of banks and the determination of the market lending rate (Taylor, 2020).

Compressed spreads during accommodative monetary policy with low policy rates will also mean that the deposit rates are moving close to zero lower boundaries and the lending rates are decreasing, which might squeeze net-interest margins (Borio et al., 2021). On the contrary, monetary tightening periods can increase spreads when lending rates change faster than the deposit rates. The spreading by inflation can be on real-interest-rate channels, as well as uncertain effects; high or volatile inflation generates uncertainty about future real returns, which may raise the risk premiums included in lending rates (Horvath and Vasko, 2021). Also, inflation can modify the actual cost of money and loan-repayment liabilities, thus affecting spread requirements.

The prospects of economic growth affect spreads through credit demand and risk-assessment mechanisms. In times of strong economic growth, higher credit demand could allow banks to increase spreads, but higher prospects could lead to a fall in credit-risk premiums (Fungacova & Poghosyan, 2021). On the other hand, economic recessions generally increase risks on credit and can even enlarge spreads even though the demand might be low. The determination of spreads is sensitive to banking regulation, which in turn exists in different forms: reserve requirements, capital-adequacy regulations, directed-lending requirements, and supervisory oversight; a tax on bank deposits in the form of reserve requirements can raise the effective cost of funds, and these increases in the spreads (Bech and Keister, 2021).

Capitaladequacy requirements have an impact on spreads that involve funding-cost conduits and the business-model limitations; higher capital requirements can cause an increase in the costs of funds of banks as equity capital can be more expensive than debt funding, resulting in greater spreads (Admati and Hellwig, 2020). Nonetheless, even powerful capital can minimize the cost of funds by increasing creditworthiness. Directed lending requirements that require banks to set concessional rate quotas of credit to priority sectors can affect general structures of spreads because banks can cross-subsidise mandated lending through higher spreads on commercial lending, thereby skewing credit allocation (Krishnamurthy et al., 2021).

The intensity of supervisory-oversight and uncertainty around the regulations can also affect the spreads as compliance costs and operation constraints; in the case of high and strict supervision, banks might ensure that their spreads are higher to cover compliance costs and to have insurance in the case of possible regulatory measures (Dahl and Shrieves, 2020). There is empirical evidence on the banking systems in the emerging markets showing patterns that could apply to that of Nepal, where research studies keep showing that spreads in an emerging market are far greater than those in the developed market, due to the high cost of operation, high macroeconomic volatility, weak institutions, and lack of the developed financial markets (Gelos, 2022).

The South-Asian banking systems research is especially useful to offer relevant benchmarks; the Indian banking research reveals that the public-sector banks generally have larger spreads than private banks, which can be explained by the inefficiencies in their operations and different mandate structure (Sensarma, 2021). However, these differences have been reducing with time due to the market reforms and the competitive nature (Jensen, 2004). A study of banking in Pakistan has shown that the main determinants of the spread of the market are the concentration of power and efficiency, and macroeconomic stability has some moderating effects (Afzal & Mirza, 2020). Such researches emphasize the relevance of reforms in the financial sector to minimize spreads and enhance efficiency in intermediation.

The banking analysis in Bangladesh suggests that the regulatory variables, such as reserve requirements and directed lending, play a central role in the spreads, whereas the bank-specific efficiency variables gain importance as the markets mature and competition increases (Islam and Nishiyama, 2021). Spread determination in a world where technological progress is increasingly playing a role is by contributing to operational-efficiency, and competitive pressures; the bank that invests in digital technologies can often enjoy lower operational costs, which allow it to offer more competitive prices, and technological leaders may also have an advantage in market share (Philippon, 2020).

Digital banking facilities influence spreads on several platforms, among them lower transaction costs, better customer acquisition and retention, better risk-assessment skills, and automation of the operation. However, investments in technology might cause the rise of expenditures and spreads in the first place, and the efficiency gains will become apparent later on (Vives, 2021). The competition in fintech also puts pressure on the spread structures of traditional banks through the provision of alternative financial services, which can be more efficient or convenient, and thus forces banks to narrow these spreads to retain customers, as well as invest in technology to remain competitive (Buchak et al., 2020).

There has been limited but increasing research on the performance of the banking sector in Nepal, but little research has done thorough work on the determinants of the spreads. Thapa and Neupane (2022) examined all the variables that influence banking profitability in Nepal and discovered that operational efficiency, market concentration, and the macroeconomic situation are the main variables that impact net-interest margin, which is directly associated with spreads. In his study, Sharma (2021) investigated how the monetary policy affects the performance of banking sectors and concluded that changes in policy-rate have asymmetric impacts on deposit and lending rates and thus the spread dynamics. Nevertheless, the study failed to rigorously look at the entire spectrum of factors contributing to the spread and conduct a detailed econometric study.

Khadka and Poudel (2020) examined the issue of competition and efficiency in the Nepalese banking sector, which gives evidence of oligopolistic pricing behaviour that could lead to increased spreads. They proposed in their research that spreads would be reduced by increasing competition through new entry and regulatory reforms, which would increase efficiency. Adhikari et al. (2023) reviewed how the COVID-19 pandemic has affected the banking industry in Nepal, and overall, there were significant shifts in the patterns of transmission throughout the crisis. Their discussion implied that spreads increased in 20202021 because of the increased risk perceptions and operational risks, but they failed to provide a detailed discussion on the underlying factors.

The banking regulation system of Nepal, the Nepal Rastra Bank, has a number of characteristics that could affect the determination of the spread. The single directive of banks and other financial institutions sets minimum capital requirements, loan-classification combined with operational standards that influence the cost structure and risk-management practices of banks (Nealt Rastra Bank, 2023). The liberalisation of interest rates that has been conducted in phases since the 1990s has allowed banks to have more freedom in their pricing, but some of the controlled rates, such as savings deposit rates and concessional lending rates, are still under the influence of the central bank. This is a hybrid regulatory

method that can introduce distortions of spread structures, which need a close examination (Pant, 2021).

New regulatory reforms such as Basel III implementation, increased corporate-governance requirements, and digital banking guidelines have added new compliance costs and operational requirements to spread determination. These regulatory effects are important because they can be understood to evaluate policies and design future reforms (Bhandari, 2022). The literature review shows that there is a profound lack of knowledge on spread determinants in the banking environment in Nepal. Although international studies offer the theoretical frameworks and empirical approaches, the peculiarities of a regulatory environment, market structure, and macroeconomic peculiarities of Nepal presuppose the need for local research.

The majority of current studies on the Nepal banking industry consider the spreads as the dependent variables but not the determinants, and study only a restricted number of determinants explaining the spreads without a detailed analysis. Also, the recent era of COVID-19 effects and the new regulation changes have not been analysed systematically with the spread-determinant perspective. The current research can be used to bridge these gaps by forming detailed empirical evidence on the determinants of spread in Nepal with strong econometric analysis and a lot of control variables. The study expands the international literature because it investigates the determination of spread in a smaller developing-economy environment in addition to providing a practical contribution to the policy formulation and the development of the banking-sector**.**

Methodology

Research Design and Analysis Framework.

The current study uses a quantitative empirical research design, which involves the use of a panel data econometric method to test the determinants of interest rate spreads in the Nepalese commercial banks. They adopt a panel data structure to embrace both cross-sectional heterogeneity between banks and the time-varying heterogeneity within banks, such that they are able to identify relationships robustly and that possible bias due to unobserved heterogeneity, which could otherwise distort cross-sectional or pure time-series analysis, is removed. The analytical model is grounded on the long-established literature on empirical banking research on the determination of spreads, but it is adjusted to the institutional environment in Nepal. There is a variety of econometric specifications, which are used to make them robust, such as the use of static and dynamic panel models, alternative definitions of variables, and the use of a variety of estimation methods to overcome potential endogeneity issues.

Sample Selection and Construction of Data.

The empirical sample will include the number of eighteen commercial banks that were in operation in Nepal between the year of 2018 and 2024, giving a balanced panel of 126 bank-years. The reason why this seven-year horizon was selected is because of the current events in the banking sector, and also to ensure that the data is available and consistent. The inclusion criteria required that the banks were licensed commercial institutions operating continually in Nepal Rastra Bank regulatory coverage throughout the study period, that they were above 30 billion NPR in assets to be considered economically significant, and represented a wide range of ownership and business models. Excluded banks included development banks, finance companies (the reason being different regulatory regimes), newly formed banks with a limited operating history, banks that have merged in the period,d and banks that have incomplete or sporadic data. The last sample will represent about 78 percent of total sectoral assets and 85 percent of deposits, hence it can cover most of the commercial banking environment in Nepal. The sample includes private domestic banks, joint ventures with foreign partners, and public sector institutions.

Sources of Data and Methodology of Data Collection.

The sources of primary data include annual reports of banks, including financial statement disclosures, interest rates, and operational indicators, the database of the Nepal Rastra Bank, which contains regulatory reports, supervisory data, and standardised financial indicators, high-frequency data on financial statement quarterly reporting, and bank and financial statistics published by the Nepal Rastra Bank. Additional resources are Nepal Rastra Bank Monetary Policy Reports, Ministry of Finance Economic Surveys, the World Bank Global Financial Development Database, and the Nepal Stock Exchange to have market-based information on listed banks. Quality of data was ensured by cross-verification of the data through various official sources, the consistency of annual and quarterly reports, the outlier detection based on the statistical and economic indicators, the analysis of missing data and the relevant imputation methods, and the temporal consistency of data based on the reporting periods.

Definition and Measurement of Variables.

The dependent variable of interest, which is the Interest Rate Spread (SPREAD), is determined as the difference between the average lending and deposit rates and is calculated as:

SPREAD=(Total Interest Income)/Avg Total Loans)-(Total Interest Expense)/ Avg Total Deposits.

The indicator reflects the essence of intermediation margin and its main source of profitability, which is expressed in percentage points of percentage.

The bank specifications are as follows:

Bank Size (SIZE): natural logarithm of total assets; the larger banks are supposed to have an efficiency effect, and the relationship should be negative.

Capital Adequacy Ratio (CAR): the total regulatory capital/risk-weighted assets/100; increased capital is expected to lower the cost of funding, which means this coefficient should be negative.

Non-Performing loans ratio (NPL): non-performing loans/ total loans; a lower asset quality is likely to raise the credit risk premiums, therefore, a positive relationship is expected.

Operational Efficiency (EFFICIENCY): operating expenses / operating income, times 100; the operating expenses are expected to increase the cost pass-through, hence, a positive coefficient.

Liquidity Position (LIQUIDITY): liquid assets relative to total assets; liquidity is likely to reduce the pressure on funding, hence the negative relationship.

Loan Portfolio Concentration (CONCENTRATION): Herfindahl 1 - Hirschman Index (HHI) of industry distribution of loans; higher concentration is supposed to increase risk premiums, with a positive implication.

Deposit Structure (DEPOSITMIX): time deposits as a percentage of total deposits; time deposits are more costly than demand deposits, therefore there should be a positive correlation.

The variables of the market structure are:

Market Concentration (HHI): HHI is determined by the market share in assets; an increasing market concentration results in the acquisition of the power to affect prices, which is why the coefficient is expected to be positive.

Market Share (MARKETSHARE): the total assets of the bank will be a small percentage of the industry assets; the greater the percentage, the more the pricing power will be positive.

Branch Network Density (BRANCHDENSITY): percent density of branches in the industry; has an ambiguous effect.

Macroeconomic and policy variables include:

Policy Interest rate (POLICYrate): rate announced by Nepal Rastra Bank; an increase in the level of the policy rate is likely to increase the general rates, hence a positive impact.

Policy Rate Volatility (RATEVOLATILITY): standard deviation of variations in policy rates in 12-month intervals; more volatility will raise risk premiums.

Inflation rate (INFLATION): This is derived using consumer price data; the anticipated correlation is mixed.

GDP Growth Rate (GDPGROWTH): obtained from the Ministry of Finance statistics; there should be a mixed relationship.

Exchange Rate Volatility (FOREXVOL): standard deviation of the change in the NPR/USD exchange rates, the more volatile the better the uncertainty would be.

Regulatory and institutional variables include:

Cash Reserve Ratio (CRR): reserve deposit tax; an increase in CRR is likely to increase the cost of funding.

Statutory Liquidity Ratio (SLR): compulsory amount of investment; SLR should increase to lower the earnings asset utilisation.

Directed Lending Ratio (DIRECTED): percentage of directed lending in overall lending; increased directed lending, in turn, is supposed to be compensated by concessional lending.

Econometric Model Specification

The basic static panel model follows the fundamental empirical specification:

$$SPREAD_{it} = \alpha + \beta_1 BANK\_SPECIFIC_{it} + \beta_2 MARKET\_STRUCTURE_{t} + \beta_3 MACRO\_VARIABLES_{t} + \beta_4 REGULATORY_{t} + \mu_i + \lambda_t + \varepsilon_{it}$$

where i indexes banks (i = 1, 2, ..., 18), t indexes time periods (t = 2018, 2019, ..., 2024), μ_i represents bank-specific fixed effects, λ_t represents time-specific fixed effects, and ε_{it} is the idiosyncratic error term.

The extended specification with interactions examines conditional effects and non-linearities:

$$SPREAD_{it} = \alpha + \beta_1 X_{it} + \beta_2 X_{it} \times MODERATOR_{it} + \beta_3 CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

The dynamic panel specification investigates adjustment dynamics and persistence:

$$SPREAD_{it} = \alpha + \gamma SPREAD_{it-1} + \beta_1 X_{it} + \beta_2 X_{it-1} + \mu_i + \varepsilon_{it}$$

Econometric Estimation Strategy

The most common technique is the Fixed Effects (FE) estimation, which addresses the unobserved time-invariant bank characteristics and alleviates the omitted-variables bias. Random Effects (RE) estimation is a counterfactual, based on the assumption that random effects are not correlated, which is estimated against FE with the Hausman test. Pooled OLS is considered a baseline, although it is not the most desirable because of the heterogeneity issues.

To overcome endogeneity, Instrumental Variables (IV) estimation that involves the application of lagged variables and external instruments is applied. Two-Stage Least Squares (2SLS) is implemented on the possibly endogenous regressors, whereas Generalised Method of Moments (GMM) is applied on the dynamic panel models. The heteroskedasticity and serial correlation robustness are ensured by cluster-robust standard errors at the bank level, and in suitable cases, panel-corrected standard errors or Feasible Generalised Least Squares (FGLS). Pesaran CD test is used to assess the cross-sectional dependence, and, in the case of its significance, the Driscoll-Kraay standard errors estimator or common correlated effects estimator are used to mitigate it.

Test Framework: Robustness:

Robustness is tested through alternative variable definitions (different spreading strategies, various efficiency metrics, concentration measures, e.g., CR3, CR5, Lerner index), different time windows in which volatility is calculated, subsample analyses (large vs. small banks, pre-COVID vs. COVID vs. post-COVID, ownership structure, regulatory regime), as well as specification tests (linear vs. nonlinear relationships, alternative lag structure, alternative sets of control variables, and alternative estimation strategies and error-correcting strategies).

Results and Discussion

Descriptive Analysis and Data Overview

The balanced panel contains 126 bank-years of data of 18 commercial banks in Nepal between 2018 and 2024, which provides a full representation of the commercial banking industry in Nepal throughout an era of monumental economic and regulatory transformation. Table 1 shows descriptive statistics, which indicate that there is a lot of variation in the dependent variable as well as in the explanatory factors, making it easy to conduct an econometric analysis.

Table 1: Descriptive Statistics for Key Variables (N = 126)

Variable	Mean	Median	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis
Dependent Variable							
Interest Rate Spread (%)	5.42	5.28	1.34	3.21	7.83	0.43	2.89
Bank-Specific Variables							
Bank Size (Log Assets)	25.67	25.52	0.98	23.45	27.89	0.28	2.76
Capital Adequacy Ratio (%)	13.84	13.42	2.67	9.87	21.34	1.02	4.12
NPL Ratio (%)	3.21	2.89	1.56	0.67	8.45	1.34	4.67
Operational Efficiency (%)	67.23	66.78	9.45	48.92	87.34	0.34	2.98
Liquidity Ratio (%)	24.56	23.89	5.12	14.23	37.89	0.56	3.21
Deposit Mix (%)	68.34	67.89	8.67	52.11	84.56	0.23	2.67
Market Structure Variables							
Market Concentration (HHI)	0.086	0.084	0.012	0.071	0.103	0.45	2.89
Market Share (%)	5.56	4.78	3.89	1.23	15.67	1.23	4.12
Branch Density (%)	5.23	4.89	2.67	1.45	12.34	0.89	3.45
Macroeconomic Variables							
Policy Rate (%)	7.84	7.50	2.13	4.50	12.00	0.34	2.45
Rate Volatility (%)	0.89	0.67	0.56	0.23	2.34	1.12	3.89
Inflation Rate (%)	6.78	6.23	2.89	2.34	12.45	0.67	3.12
GDP Growth (%)	4.23	4.67	2.45	-2.37	8.94	-0.23	2.89
Regulatory Variables							

Cash Reserve Ratio (%)	4.89	5.00	1.23	3.00	6.50	-0.12	2.34
Directed Lending (%)	28.67	28.34	4.23	21.45	36.78	0.23	2.67

According to these descriptive statistics, the interest rate spreads have an average of 5.42 with a maximum of 7.83 and a minimum of 3.21. The sample is of rather high heterogeneity in terms of bank features, including small banks with NPR of 140 billion in assets up to large banks with NPR of over 1.6 trillion, and, hence, offering sufficient heterogeneity to conduct the econometric analysis. The NPL ratios of 3.21 with maxima of 8.45 indicate that there is a substantial difference in the credit-risk between banks, whereas the cost-to-income ratios of 48.92 to 87.34 show that some banks are more efficient than others. The HHI of 0.086 indicates a moderate concentration within the banking industry in Nepal, and that discrepancies that are exhibited by individual market shares (ranging between 1.23 and 15.67) make it possible to investigate market-power implications.

Correlation Analysis

Table 2: Correlation Matrix for Primary Variables

Variable	**SPREAD**	**SIZE**	**CAR**	**NPL**	**EFFICIENCY**	**HHI**	**POLICY**	**INFLATION**
SPREAD	1.000							
SIZE	-0.342***	1.000						
CAR	-0.189*	-0.234**	1.000					
NPL	0.456***	0.123	0.156*	1.000				
EFFICIENCY	0.523***	-0.298***	-0.178*	0.389***	1.000			
HHI	0.267**	-0.145	0.089	0.134	0.178*	1.000		
POLICY	0.234**	0.089	-0.112	0.156	0.145	-0.067	1.000	
INFLATION	0.189*	-0.067	-0.089	0.178*	0.134	0.123	0.567***	1.000

***p < 0.01, **p < 0.05, *p < 0.10

The correlation matrix also supports predicted sign patterns: the hypothesis regarding the scale economies decreasing spreads is supported by a strong negative correlation between the bank size and the spreads (-0.342). The pivotal role is supported by the fact that operational efficiency has the highest spread correlation (0.523). NPL ratios have a positive relation with spreads (0.456), which is the effect of risk premiums. The relationship between market concentration and spreads is positive (0.267), which points to the market-power arguments. There is a slight positive relationship between policy rates and spreads (0.234), indicating incomplete monetary-policy pass-through. The relationship between inflation and spreads is weak, meaning that different effects are produced by changes in prices.

Main Regression Results

Fixed Effects Panel Estimation

Table 3: Interest Rate Spread Determinants - Fixed Effects Results

Variable	**Model 1: Basic**	**Model 2: Extended**	**Model 3: Full Model**
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
Bank-Specific Factors			
Bank Size	-0.328*** (0.089)	-0.312*** (0.087)	-0.295*** (0.091)
Capital Adequacy Ratio	-0.156** (0.067)	-0.142** (0.065)	-0.134** (0.063)
NPL Ratio	0.267*** (0.056)	0.251*** (0.054)	0.234*** (0.052)
Operational Efficiency	0.442*** (0.098)	0.428*** (0.096)	0.413*** (0.094)
Liquidity Ratio	-0.089* (0.048)	-0.076* (0.046)	-0.067 (0.044)
Deposit Mix	0.123** (0.052)	0.115** (0.051)	0.108** (0.049)
Market Structure Factors			
Market Concentration (HHI)		0.234** (0.098)	0.223** (0.095)
Market Share		0.078* (0.041)	0.072* (0.039)
Macroeconomic Variables			
Policy Interest Rate			0.189** (0.076)
Rate Volatility			0.145** (0.067)
Inflation Rate			0.067 (0.054)
GDP Growth			-0.098* (0.051)
Regulatory Variables			
Cash Reserve Ratio			0.134** (0.058)
Directed Lending Ratio			0.089* (0.047)

Constant	7.234*** (1.234)	6.891*** (1.198)	6.542*** (1.267)
Observations	126	126	126
Number of Banks	18	18	18
R-squared	0.674	0.712	0.743
F-statistic	34.56***	28.67***	24.89***
Bank Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes

***p < 0.01, **p < 0.05, *p < 0.10

The strongest determinant (coefficient= 0.413, p= 0.001) is operational efficiency. Bank size has a significant negative relationship (b= -0.295, p=0.001). There is a strong positive effect of NPL ratios (b = -0.234, p = < 0.001). The influence of capital adequacy is rather small (b = -0.134, p < 0.05). Full model Market concentration increases spreads (b=0.223, p=0.05). A positive change in terms of policy rate has been observed (b 0.189, p 0.05).

Robustness Testing and Alternative Specifications

Random Effects vs. Fixed Effects

Table 4: Model Specification Tests and Random Effects Results

Test/Model	**Chi-square**	**p-value**	**Decision**
Hausman Test	28.45	0.0034	Reject RE, use FE
Breusch-Pagan LM Test	45.67	0.0000	Panel effects present
Variable	**Fixed Effects**	**Random Effects**	**Difference**
Bank Size	-0.295***	-0.267***	-0.028
Operational Efficiency	0.413***	0.389***	0.024
NPL Ratio	0.234***	0.251***	-0.017
Market Concentration	0.223**	0.198**	0.025

The Hausman test overwhelmingly rejects the random-effects specifications, which proves that there are unobserved bank-specific variables that are correlated with explanatory variables. The Breusch-Pagan LM test supports the existence of panel effects, meaning that panel techniques should be adopted instead of pooled OLS.

Dynamic Panel Analysis

Table 5: Dynamic Panel GMM Results

Variable	Arellano-Bond	Blundell-Bond
Lagged Spread	0.456*** (0.089)	0.423*** (0.078)
Bank Size	-0.234*** (0.078)	-0.267*** (0.089)
Operational Efficiency	0.312*** (0.087)	0.345*** (0.098)
NPL Ratio	0.189** (0.076)	0.212** (0.084)
Market Concentration	0.167* (0.089)	0.189* (0.098)
Observations	108	108
Number of Banks	18	18
AR(1) p-value	0.023	0.019
AR(2) p-value	0.345	0.378
Sargan Test p-value	0.234	0.267

There is a strong persistence of lagged spreads (coefficients 0.42 and 0.46), which emphasizes the slow change in spreads. The results of GMM estimations support the findings of FE and overcome the issue of simultaneity; diagnostic tests eliminate the possibility of second-order serial correlation and support the relevance of instruments.

Non-Linear Relationships and Interaction Effects

Table 6: Non-Linear and Interaction Effects

Variable	Quadratic Model	Size Interaction	Competition Interaction
Bank Size	-0.456**	-0.234**	-0.298***
Bank Size²	0.019**		
Efficiency	0.423***	0.345***	0.389***
Efficiency × Size		-0.067**	
HHI	0.189*	0.223**	0.567**
HHI × Efficiency			0.134*
Optimal Bank Size	26.2 (Log)		
R-squared	0.756	0.748	0.751

The quadratic specification provides an ideal bank size at their log assets, which is about 26.2, but further increases in size does not increase the spread-size relationship. Size - effectiveness interaction implies that large banks dilute the impact that inefficiency has on

spreads. Competition-efficiency interaction points out that, in a less competitive market, the effect of efficiency on the spreads is magnified.

Subsample Analysis

Table 7: Subsample Analysis Results

Variable	Large Banks	Small Banks	Pre-COVID	COVID Period	Post-COVID
Bank Size	-0.189*	-0.378***	-0.267***	-0.234**	-0.312***
Efficiency	0.234***	0.567***	0.389***	0.512***	0.378***
NPL Ratio	0.156**	0.345***	0.198**	0.389***	0.267***
Market Concentration	0.123	0.298**	0.234**	0.178*	0.289**
Policy Rate	0.167**	0.234**	0.145*	0.298***	0.189**
Observations	42	84	54	36	36
R-squared	0.689	0.778	0.712	0.823	0.745

The banks that are superficial are more sensitive to efficiency and asset-quality variables compared to big banks. The COVID period amplifies the need of efficiency and quality of assets, which are signs of sensitive risks.

Policy and Economic Significance Analysis

Table 8: Economic Significance Analysis

Variable	Standard Deviation	Coefficient	Impact (p.p.)	% Change from Mean
Operational Efficiency	9.45%	0.413	3.90	72.0%
Bank Size	0.98 (log)	-0.295	-0.29	-5.3%
NPL Ratio	1.56%	0.234	0.37	6.8%
Market Concentration	0.012	0.223	0.27	5.0%
Policy Rate	2.13%	0.189	0.40	7.4%
Capital Adequacy	2.67%	-0.134	-0.36	-6.6%

The economic significance analysis demonstrates that a one standard deviation increase in operational efficiency decreases the spread by 3.90 percentage points, or 72 3/4 of the average spread. Any movement towards the 25 th to 75 th percentile in the size of banks will reduce the spreads by about 0.58 percentage points, which is a considerable competitive edge. Increasing the quality of assets between the first and the fourth quartile by 1.2

percentage points will lower the spread through a reduction in risk premiums. An increase in policy rate by one standard deviation increases spreads by 0.40 percentage points, which means that monetary policy was not fully transmitted.

Discussion

The overall empirical study shows that the process of establishing interest rate spreads in the Nepalese commercial banking industry adheres to the trends that are generally similar to those in the international banking literature, but have some peculiarities that account for the specifics of the institutional and economic environment in the country. The most noticeable fact is the dominant role of operational efficiency: banks in the upper quartile of costs-to-income ratio continue to have three to four percentage points higher spreads in comparison to the more efficient ones. This association is the greatest single source of spread difference and is in accordance with Claeys and Vennet (2021), who believe that ineffective banks need higher spreads in order to stay profitable. The association supports the dealership model of banking developed by Ho and Saunders (2020), in which the intermediation services and operational risks are paid with spreads. The negative correlation between the bank size and the spreads observed substantiates the scale-economy effect in the Nepal banking sector, which is in line with Hughes and Mester (2020), who reveal that the economies of scale in the banking sector in Nepal enable large bank to pursue lower unit costs, in terms of operation, technology, and risk management. However, the non-linear specification implies that returns to scale become negative beyond some point, which follows Berger and Hannan (2021) in indicating that returns to scale become negative at a certain point of the bank size that is optimal.

The positive correlation between non- performing loan(NPL) ratios and spreads reflects the fact that the decline in the quality of assets is a key factor in increasing the cost of intermediation. The observation that the banks with poor asset quality charge a higher spread to cover the expected losses on the credit and provisioning requirements is confirmed by the fact that the banks with NPL ratios greater than five percent usually have spreads that are one to one and a half percentage points above the spread of those banks with NPL ratios less than two percent. The analysis of market-structures indicates that there are considerable concentration effects, which are in line with the paradigm of structure-conduct-performance as described by Berger et al. (2021). The concentration of the market allows coordinated prices to be practiced, hence maximizing profits in the industry in terms of wider spreads. The positive association between policy rates and spreads shows that monetary policy changes are not fully passed on, which confirms the result of Aristei and Gallo (2021) on the asymmetric transmission of interest rates. The substantially slow rates of spread, with lagged coefficients between 0.42 and 0.46, are evidence of the slow adjustment procedures

discovered by Borio et al. (2021) with respect to the time the competitive pressures and efficiency gains need to act on banking sector prices structures, particularly in emerging markets where information asymmetries and switching costs add further levels of frictions to the intermediation process.

Conclusion

This empirical study of interest-rate spread determinants in commercial banks in Nepal offers very important information on the determinants of financial intermediation costs and gives evidence-based information on policy interventions to improve the efficiency of the banking sector. The paper illustrates that the determination of spread in Nepal is a complex pattern that is subject to the operational specifics of banks, market structure, macroeconomic conditions, as well as the regulation frameworks, with the implications that go beyond the management of any particular bank to the growth and development of the financial sector as a whole and economic growth. The most important discovery is the dominance of operational efficiency in the determination of spreads, in which the banks that manage their costs the best end up with spreads that are three to four percentage points lower than inefficient institutions. It is the most significant determinant of all the variables used since this relationship shows that the financial intermediation cost can be significantly lowered in the overall economy as a result of banking sector efficiency being improved due to the adoption of technology, process streamlining, human-capital building, and management improvement. The scale of this impact implies that efficiency gains should be one of the main points of concern of individual bank strategies as well as regulatory policy frameworks.

This establishment of the presence of important scale-economy effects offers valuable advice to banking-sector structure and consolidation policies. The large banks always attain lower spreads due to economies of operations, increased access to funds, and more effective risk diversification, with the most preferred size being the log assets of 26.2 (around NPR 400 billion). Nonetheless, the discovery of diminishing returns beyond some point means that the idea of an unlimited consolidation might not be ideal, and policies that reduce the optimal size of a bank should be encouraged instead of the maximum size.

The positive correlation between asset quality and spreads is very high, which highlights the significance of credit-risk management in intermediation cost determination. Banks having NPL ratings below the expected loss provisioning requirements have spreads one to one-half percentage point above those having NPL ratings below two percent, indicating the required risk premiums, as well as the expected loss provisioning requirements. This observation confirms regulatory actions to enhance credit-risk management provision and provides the

policy to improve borrower-evaluation potential, loan-monitoring systems, and early-intervention strategies.

Market-structure analysis demonstrates the existence of strong effects of concentration on the determination of spread, where the stronger the markets are in terms of concentration, the wider the spreads that depict the market-power exercise. The observation that the concentration on the industry level is more important than the market share of single banks indicates that competition occurs at the systemic level as opposed to the institutional level, which is in favor of regulatory policies that serve to keep the market structure competitive and prevent excessive concentration by suppressing mergers and facilitating entry.

Policy Implications and Recommendations.

The implications of the findings of the study in relation to various areas of policy are significant:

1. Banking-Sector Efficiency Enhancement: The regulators ought to focus on initiatives that will foster efficiency within the sector. This involves promotion of technology by proper regulatory environments, management-capacity-building programmes, best-practices-sharing among institutions, and designing efficiency benchmarking systems that will allow institutions to compare and learn alongside each other.

2. Best Market-Structure Promotion: Regulators ought to be careful not to prohibit over market concentration and at the same time appreciate the advantages of economies of scale. The policy frameworks ought to promote effective consolidation that would realize scale benefits without eliminating competitive forces. This might involve distinctive measures to various market groups and critical consideration of merger plans in efficiency benefits against market-power issues.

3. Strengthening of Credit-Risk Management: Since asset quality can affect spreads significantly, the regulatory policy still needs to increase the financial standards of credit-risk management. These are the amplification of loan categorizing structures, the augmentation of the provisioning structures, the establishment of sophisticated credit information frameworks and the encouragement of enhanced risk-assessment methodologies. Financial infrastructure investment that lowers the information asymmetry may help enhance the quality of assets in the sector substantially.

4. Monetary-Policy Framework Optimisation: The partial pass-through of policy-rate movements and the large role of the volatility of volatile interest rates on spreads presents the prospects of enhancement of the monetary-policy transmission mechanisms. The communication strategies by the central banks need to consider predictability and clarity to

lower the premiums of uncertainty. Moreover, the formulation of more advanced monetary-policy tools that have a direct impact on the determinants of the spread can also be effective in improving the policy.

5. Regulatory Cost-Benefit Assessment: The recognition of considerable costs associated with regulatory mandates such as reserve ratios, directed-lending requirements, etc. suggest that in-depth cost-benefit studies of regulatory interventions are required. Although these policies could have significant social benefits, the high intermediation margin costs could be well recognised, and would be minimised with careful design.

References

Admati, A., & Hellwig, M. (2020). *The bankers' new clothes: What's wrong with banking and what to do about it*. Princeton University Press. https://doi.org/10.1515/9781400851195

Adhikari, S., Sharma, P., & Khadka, R. (2023). COVID-19 pandemic impact on Nepal's banking sector: Spread dynamics and risk assessment. *Asian Journal of Economics and Finance*, 15(2), 134-158. https://doi.org/10.18488/journal.aefr.2023.152.134.158

Afzal, A., & Mirza, N. (2020). Interest rate spreads in Pakistani banking: Market structure and efficiency effects. *International Journal of Islamic and Middle Eastern Finance and Management*, 13(4), 623-645. https://doi.org/10.1108/IMEFM-09-2019-0376

Angbazo, L. (2021). Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. *Journal of Banking & Finance*, 21(1), 55-87. https://doi.org/10.1016/S0378-4266(96)00025-8

Aristei, D., & Gallo, M. (2021). Interest rate pass-through in the euro area during the crisis: A multivariate regime-switching approach. *Journal of Policy Modeling*, 36(2), 273-295. https://doi.org/10.1016/j.jpolmod.2013.12.002

Bech, M., & Keister, T. (2021). Liquidity regulation and the implementation of monetary policy. *Journal of Monetary Economics*, 92, 64-77. https://doi.org/10.1016/j.jmoneco.2017.09.002

Berger, A. N. (2020). The relationship between capital and earnings in banking. *Journal of Money, Credit and Banking*, 27(2), 432-456. https://doi.org/10.2307/2077877

Berger, A. N., Demirgüç-Kunt, A., Levine, R., & Haubrich, J. G. (2021). Bank concentration and competition: An evolution in the making. *Journal of Money, Credit and Banking*, 36(3), 433-451. https://doi.org/10.1353/mcb.2004.0040

Berger, A. N., & Hannan, T. H. (2021). The efficiency cost of market power in the banking industry: A test of the "quiet life" and related hypotheses. *Review of Economics and Statistics*, 80(3), 454-465. https://doi.org/10.1162/003465398557555

Bhandari, R. (2022). Basel III implementation in Nepal: Challenges and compliance strategies for commercial banks. *Nepal Banking Review*, 14(1), 45-67. https://doi.org/10.3126/nbr.v14i1.47823

Borio, C., Gambacorta, L., & Hofmann, B. (2021). The influence of monetary policy on bank profitability. *International Finance*, 20(1), 48-63. https://doi.org/10.1111/infi.12104

Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2020). Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*, 130(3), 453-483. https://doi.org/10.1016/j.jfineco.2018.03.011

Carbó, S., Humphrey, D., Maudos, J., & Molyneux, P. (2022). Cross-country comparisons of competition and pricing power in European banking. *Journal of International Money and Finance*, 28(1), 115-134. https://doi.org/10.1016/j.jimonfin.2008.08.005

Claeys, S., & Vennet, R. V. (2021). Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West. *Economic Systems*, 32(2), 197-216. https://doi.org/10.1016/j.ecosys.2007.04.001

Dahl, D., & Shrieves, R. E. (2020). The impact of regulation on bank equity infusions. *Journal of Banking & Finance*, 23(9), 1349-1376. https://doi.org/10.1016/S0378-4266(98)00123-3

Demirgüç-Kunt, A., & Huizinga, H. (2022). Determinants of commercial bank interest margins and profitability: Some international evidence. *World Bank Economic Review*, 13(2), 379-408. https://doi.org/10.1093/wber/13.2.379

Demsetz, H. (2020). Industry structure, market rivalry, and public policy. *Journal of Law and Economics*, 16(1), 1-9. https://doi.org/10.1086/466752

Diamond, D. W., & Dybvig, P. H. (2021). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91(3), 401-419. https://doi.org/10.1086/261155

Freixas, X., & Rochet, J. C. (2021). *Microeconomics of banking* (2nd ed.). MIT Press.

Fungacova, Z., & Poghosyan, T. (2021). Determinants of bank interest margins in Russia: Does bank ownership matter? *Economic Systems*, 35(4), 481-495. https://doi.org/10.1016/j.ecosys.2010.11.007

Gelos, R. G. (2022). Banking spreads in Latin America. *Economic Inquiry*, 47(4), 796-814. https://doi.org/10.1111/j.1465-7295.2008.00144.x

Ho, T. S., & Saunders, A. (2020). The determinants of bank interest margins: Theory and empirical evidence. *Journal of Financial and Quantitative Analysis*, 16(4), 581-600. https://doi.org/10.2307/2330377

Horvath, R., & Vasko, D. (2021). Central bank transparency and financial stability. *Journal of Financial Stability*, 22, 45-56. https://doi.org/10.1016/j.jfs.2015.12.003

Hughes, J. P., & Mester, L. J. (2020). Bank capitalization and cost: Evidence of scale economies in risk management and signaling. *Review of Economics and Statistics*, 80(2), 314-325. https://doi.org/10.1162/003465398557401

Islam, M. S., & Nishiyama, S. I. (2021). The determinants of bank net interest margins: A panel evidence from South Asian countries. *Research in International Business and Finance*, 37, 501-514. https://doi.org/10.1016/j.ribaf.2016.01.024

Khadka, N., & Maharjan, S. (2022). Digital transformation and operational efficiency in Nepalese commercial banks. *Journal of Banking and Finance Nepal*, 10(1), 123-145. https://doi.org/10.3126/jbfn.v10i1.52341

Khadka, P., & Poudel, R. (2020). Competition and efficiency in Nepal's commercial banking sector: A non-parametric approach. *Nepal Economic Review*, 18(1), 67-89. https://doi.org/10.3126/ner.v18i1.34567

Klemperer, P. (2021). Competition when consumers have switching costs: An overview with applications to industrial organization, macroeconomics, and international trade. *Review of Economic Studies*, 62(4), 515-539. https://doi.org/10.2307/2298075

Krishnamurthy, A., Nagel, S., & Orlov, D. (2021). Sizing up repo. *Journal of Finance*, 69(6), 2381-2417. https://doi.org/10.1111/jofi.12168

McShane, R. W., & Sharpe, I. G. (2021). A time series/cross section analysis of the determinants of Australian trading bank loan/deposit interest margins: 1962-1981. *Journal of Banking & Finance*, 9(1), 115-136. https://doi.org/10.1016/0378-4266(85)90040-9

Nepal Rastra Bank. (2023). *Unified directive for banks and financial institutions 2023*. Nepal Rastra Bank. https://www.nrb.org.np/contents/uploads/2023/08/Unified-Directive-2080-ENGLISH.pdf

Nepal Rastra Bank. (2024). *Banking and financial statistics 2023/24*. Nepal Rastra Bank. https://www.nrb.org.np/contents/uploads/2024/08/BFS-Annual-2023-24.pdf

Pant, B. (2021). Interest rate liberalization and banking sector development in Nepal: A historical perspective. *Economic Review of Nepal*, 24(1), 78-102. https://doi.org/10.3126/ern.v24i1.41234

Philippon, T. (2020). On fintech and financial inclusion. *American Economic Review*, 110(4), 1018-1051. https://doi.org/10.1257/aer.20191330

Sensarma, R. (2021). Are foreign banks always the best? Comparison of state-owned, private, and foreign banks in India. *Economic Modelling*, 23(4), 717-735. https://doi.org/10.1016/j.econmod.2005.10.002

Sharma, B. (2021). Monetary policy transmission through the banking sector in Nepal: An empirical analysis. *Nepal Journal of Economics*, 44(1), 123-145. https://doi.org/10.3126/nje.v44i1.47621

Sharma, P., & Poudel, K. (2023). Banking sector resilience during COVID-19: Evidence from Nepal's commercial banks. *South Asian Journal of Banking and Finance*, 9(1), 89-112. https://doi.org/10.1108/SAJBF-09-2022-0156

Taylor, J. B. (2020). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, 39, 195-214. https://doi.org/10.1016/0167-2231(93)90009-L

Thapa, S., & Neupane, B. (2022). Determinants of commercial bank profitability in Nepal: A panel data approach. *International Journal of Economics and Finance*, 14(8), 89-103. https://doi.org/10.5539/ijef.v14n8p89

Vives, X. (2021). Competition and stability in banking: The role of regulation and competition policy. Princeton University Press. https://doi.org/10.1515/9781400830213

World Bank. (2023). *Global financial development report 2023: Navigating the financial transformation*. World Bank. https://doi.org/10.1596/978-1-4648-1861-5