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# The Impact of Asset-Liability Management on Profitability: Evidence from Commercial Banks in Zimbabwe

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**Abstract:** This study employs the Statistical Cost Accounting (SCA) econometric framework to evaluate the impact of asset-liability management (ALM) on the profitability of Zimbabwean commercial banks. It explores how efficient ALM strategies can optimize asset allocation, mitigate bank failures, and enhance performance in volatile economic environments. Building on prior research and practical experience in bank treasury management, the paper extends the SCA model to the unique context of evolving regulatory conditions and macroeconomic volatility, addressing gaps in understanding the interplay between ALM strategies, strategic leadership, and profitability. A panel dataset of 15 Zimbabwean banks spanning 2010-2023 was analyzed using R. Quantitative methods included variance inflation factor (VIF) tests, heteroskedasticity tests, Lagrange Multiplier (LM) tests, and pooled Ordinary Least Squares (OLS) regression with robust standard errors to examine the relationships among ALM variables, macroeconomic factors (GDP growth), and return on assets (ROA) as a measure of profitability. The findings confirm ALM's significant influence on profitability, with an adjusted R-squared of 46.51% and model significance (F-statistic, $p = 0.0084$). Asset management variables positively impact ROA (supporting Hypothesis 1), while liability management variables negatively affect profitability due to funding cost implications (supporting Hypothesis 2). The combined composition of assets and liabilities validates Hypothesis 3, and overall model significance supports Hypothesis 4, confirming a statistically significant relationship between ALM and profitability of Zimbabwean commercial banks. The study provides actionable insights for bank treasurers, policymakers, and regulators, emphasizing the importance of optimizing ALM practices to sustain performance and enhance balance sheet resilience. Asset-Liability Management Committees (ALCOs) can leverage these findings to identify high-return assets, refine allocation strategies, and optimize funding costs. By applying the SCA econometric model to Zimbabwe, this research addresses a critical gap in banking literature, offering a comprehensive analysis of ALM's role in profitability. It contributes to the broader discourse on banks' financial performance and resilience under economic uncertainty, advancing the application of the SCA framework in frontier markets.

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## 1. Introduction

Asset-Liability Management (ALM) is a strategic framework employed by financial institutions to manage their assets (uses of funds) and liabilities (sources of funds) while addressing risks arising from balance sheet mismatches (Choudhry, 2007; Brom, 2009; Peykani et al., 2023). In this context, ALM enables banks to pursue multiple objectives, including optimizing profitability, maintaining regulatory compliance, and mitigating risks such as liquidity risk, credit risk, interest rate volatility, and currency risks (Kallur, 2016; Lysiak et al., 2022). Effective ALM practices not only enhance banks' operational resilience but also reinforce financial sector stability, instilling confidence in the individual banking institutions and the broader financial system (Shrestha, 2015; Abebe, 2022; Trang et al., 2024).

Commercial banks play a pivotal role in economic development through financial intermediation, mobilizing and allocating financial resources across sectors (Shrestha, 2015; Uzoamaka & Nebo, 2016; Gil-Jardón et al., 2024). In Zimbabwe, where alternative credit instruments are limited, banks are the primary providers of credit and liquidity, underpinning economic activity (Tsaurai, 2018; Chishamba & Dzingirai, 2024). However, the financial intermediation role of banks in Zimbabwe is complicated by persistent macroeconomic challenges, including hyperinflation, currency volatility, de-dollarization, and structural constraints such as the country's significant debt overhang, which limits access to long-term financing from multilateral institutions. Additionally, the erosion of confidence in the local currency, the Zimbabwean dollar in its various multiple forms, culminating in its displacement by more stable foreign currencies, exemplifies Gresham's Law - where "bad money drives out good" by pushing more stable currencies out of active circulation through increased informalization. In this challenging environment, robust ALM practices are essential for maintaining financial stability, navigating market complexities, and ensuring profitability in the banking sector.

Globally, the banking industry faces transformative pressures, including intensified competition, geopolitical risks, the rise of shadow banking, technological innovations, and evolving regulatory landscape (McKinsey, 2024). These global trends intersect with Zimbabwe's distinct challenges, such as elevated non-performing loans (NPLs), underperformance in the productive sectors of the economy, foreign currency shortages, local currency instability, liquidity constraints, and eroded depositor confidence. For example, the persistent foreign currency challenges undermine banks' ability to facilitate international trade and stabilize their funding structures, while NPLs constrain credit extension to productive sectors.

As these global and local competitive forces converge, Zimbabwean banks must integrate robust ALM practices into their strategic leadership practices to balance risk management, regulatory compliance and profitability goals (Chishamba, 2024). ALM's role in mitigating market uncertainties, addressing deteriorating credit quality, and navigating regulatory requirements is increasingly essential (Huang et al., 2023). This strategic approach enables banks to optimize asset allocation, maintain liquidity, and enhance resilience against external shocks (Trang et al., 2024).

Zimbabwe's adoption of a multicurrency system in 2008, predominantly centered on the US dollar, introduced significant ALM challenges, including currency mismatches, liquidity constraints, and heightened monetary policy uncertainty. These issues, compounded by the absence of an effective lender of last resort, underscore the necessity for robust, adaptive, and context-specific ALM practices. Despite ALM's pivotal role, panel data analysis and empirical research on its optimization within Zimbabwe's unique economic context remains limited. With over 20 bank failures recorded since 1990, it is imperative for banks to adopt integrated ALM strategies that enhance profitability and sustain competitiveness (Chishamba & Dzingirai, 2024). Notably, traditional deterministic ALM models, typically designed for stable economies, often fall short in addressing the complex realities of developing markets, such as hyperinflation, currency mismatches, managed exchange rates, and interest rate volatility (Gessesow & Venkateswarlu, 2023). To ensure financial stability and long-term profitability, Zimbabwean banks must adapt to global banking transformations while addressing localized economic and structural vulnerabilities. This paper contributes to the broader understanding of ALM by identifying credible drivers of profitability and providing actionable insights for navigating the structural constraints and macroeconomic challenges prevalent in Zimbabwe and other similar contexts.

## 2. Problem Statement

The role of ALM in influencing bank profitability has become increasingly critical amid intensifying competition, systemic risks, and evolving regulatory landscapes (Sayeed & Hoque, 2008; Kallur, 2016; Huang et al., 2023). Empirical evidence identifies poor ALM practices as the root cause of major bank failures (Daumont et al., 2004; Owusu & Alhassan, 2020; Lysiak et al., 2022). Globally, the collapse of Silicon Valley Bank and Signature Bank in 2023 underscores the essential role of effective ALM in mitigating risks such as liquidity mismatches, liability mismanagement, and interest rate volatility (Rossi, 2023; Nefrou et al., 2023). These failures, exacerbated by over-concentration in volatile sectors, flawed asset allocation strategies, and insufficient risk oversight, highlight the devastating consequences of weak ALM practices (Vo & Le, 2023). While these global events

offer critical insights into the repercussions of ineffective ALM, Zimbabwe's unique economic and regulatory environment demands context-specific solutions.

Zimbabwe's banking sector faces structural and systemic challenges, including currency instability, frequent regulatory shifts, and the absence of a functional lender of last resort. The adoption of a multi-currency system dominated by the US dollar has compounded these challenges by introducing currency mismatches, liquidity constraints, and heightened monetary policy uncertainty. For instance, the International Monetary Fund (IMF, 2024) has flagged Zimbabwean banks' US-dollar exposures as material liquidity risks, necessitating enhanced currency-specific monitoring. Moreover, intermittent policy adjustments aimed at managing transitions between dollarization, de-dollarization, and mono-currency frameworks have fostered short-termism among banks. Consequently, banks face significant ALM mismatches as they attempt to finance long-term assets with predominantly short-term deposits.

Banks remain central to financing economic activity and supporting diverse market segments through financial intermediation (Athanasoglou et al., 2008). However, the increasing informalization of Zimbabwe's economy, with over USD 1 billion in cash transactions circulating outside the formal banking system, exacerbates deposit volatility, limits banks' ability to secure stable funding sources, drives speculative borrowing, and complicates liability modeling. This disintermediation, coupled with the rise of shadow banking facilitated by fintech innovations and informal credit markets, erodes traditional deposit bases. Moreover, the growing distrust among formal depositors in Zimbabwe, emanating from over 20 bank failures since 1990 and recurring currency devaluations, further drives transitory deposit behaviours, undermining long-term stability. These structural inefficiencies collectively complicate ALM practices in Zimbabwe, constraining banks' ability to achieve optimal risk-return trade-offs and threatening both sustainable profitability and systemic stability.

Despite ALM's pivotal role in addressing these challenges, there remains a critical gap in empirical research on recalibrating ALM strategies to fit Zimbabwe's constrained financial environment. ALM econometric models tailored to Zimbabwe's unique multi-currency system and structural disintermediation dynamics are underexplored. This paper addresses this gap by employing a statistical cost-accounting framework to analyze the relationship between profitability, balance sheet composition, and macroeconomic factors within Zimbabwe's banking sector. By examining the structural drivers of ALM performance, the paper provides context-specific strategies that enhance balance sheet alignment, strengthen financial resilience, and improve sustainable competitiveness.

## 3. Literature Review

### 3.1. Why Profitability of Banks is Important

Banks' profitability is widely recognized as a cornerstone of financial sector stability and economic growth (Yuanita, 2019; Owusu & Alhassan, 2020; Lamothe et al., 2024). Profit generation enables banks to cover operational expenses, build buffers against risks, drive organic growth, absorb financial shocks, and deliver value to shareholders (Richter & Zimmermann, 2019; Kuvshinov et al., 2022; Buch, 2024). As custodians of depositors' funds, banks bear a fiduciary duty to safeguard these deposits, making sustainable profitability essential for maintaining public trust. In Zimbabwe, where currency instability, frequent policy changes, and depositor distrust persist due to past bank failures, resilient profitability strategies are critical for restoring confidence in the banking sector and ensuring long-term stability. However, challenges such as economic distortions arising from hyperinflation-adjusted financial reporting, policy inconsistencies in managed exchange rates, and regulatory adjustments can obscure a bank's actual performance.

The profitability of banks is shaped by a complex interplay of internal and external factors (O'Connell, 2023). Internal factors, such as operational efficiency, loan quality, interest margin, and capitalization, are within the bank's control (Lamothe et al., 2024). For example, a global study of 2,091 commercial banks across 110 countries demonstrated the significant influence of these factors on profitability using random-effects regression models (Lamothe et al., 2024). Conversely, external determinants, such as inflation, unemployment, regulatory frameworks, and market competition, reflect broader economic conditions. These external pressures are especially pronounced in Zimbabwe, where policy uncertainty, regulatory inconsistencies, increased country risk premium, and macroeconomic volatility amplify the challenges of managing profitability and aligning the banking book's assets and liabilities.

While profitability is a key indicator of a bank's financial health, its sustainability and quality are equally critical. History shows that even profitable banks can fail due to hidden risks (Reinhart & Rogoff, 2008). The collapse of Silicon Valley Bank (SVB) in 2023 is a striking example. Despite its accolades as one of the best banks and reputation for growth, SVB's profitability masked vulnerabilities, including overconcentration in specific sectors, inadequate risk oversight, and poor ALM practices (Buch, 2024). Similarly, during the global financial crisis, high pre-crisis bank profitability often obscured significant risks, leading to devastating unexpected losses when the crisis unfolded (Lamothe et al., 2024). These examples underscore the importance of deriving profits from sustainable ALM practices rather than speculative or unsound activities. In Zimbabwe, recurring economic shocks and regulatory fluctuations have encouraged short-termism in some banks' ALM

strategies, making sustainable profitability vital for rebuilding depositor confidence and fostering long-term growth (Chishamba, 2024).

From a resource-based view theory, banks' profitability reflects the effectiveness of strategic leadership, efficiency in resource allocation and risk management, making it a focal point for shareholders and regulators (Donnellan & Rutledge, 2018; Chishamba, 2024). This highlights the strategic value of aligning internal resources, such as capital adequacy and operational efficiency, with external challenges to optimize ALM in volatile environments. Effective ALM strategies are fundamental to achieving an optimal risk-return balance and sustaining profitability (Choudhry, 2007; Kallur, 2016; Abebe, 2022). For Zimbabwean banks, effective ALM is particularly critical in navigating the multi-currency environment, depositor volatility, and structural constraints on financial intermediation.

### 3.2. Asset Management from a Bank's Perspective

Asset management is a core pillar of banking operations, aimed at optimizing income generation while effectively managing associated risks. Banks strive to construct balanced asset portfolios that align with their risk tolerance, funding profile, liquidity needs, regulatory requirements and return objectives (Belete, 2013; Tee, 2017; Gessesow & Venkateswarlu, 2023). Strategic asset allocation determines the optimal composition of loans, investments, and other financial instruments to achieve these goals. Loans and advances, alongside investments in marketable securities, are the primary income-generating assets for banks, constituting a significant share of their total asset base. Sustained profitability and long-term stability depend on proactive measures such as optimizing asset composition, managing asset quality, strategic controls and maximizing returns from earning assets (Kohlscheen et al., 2018).

Effectively managing asset allocation decisions is inherently complex due to the multifaceted and interconnected risks involved (Choudhry, 2007; Peykani et al., 2023). Market risk arises from changes in variables such as interest rates, exchange rates, or commodity prices, which can erode asset values. For instance, rising interest rates reduce the value of fixed-rate loans and securities, directly impacting profitability. Credit risk, which stems from potential borrower defaults, can lead to income losses and increased loan loss provisions. To mitigate this risk, banks employ tools such as credit scoring, due diligence, loan covenants, portfolio limits, and collateral requirements (Lysiak et al., 2022). High levels of non-performing loans (NPLs) negatively impact profitability, strain liquidity, and undermine capital adequacy. Furthermore, concentration risk, arising from overexposure to specific sectors, regions, or asset classes, amplifies vulnerabilities during economic downturns. Effective diversification across industries, geographies, and asset classes is essential for mitigating these risks, enhancing returns, and preserving liquidity

(Dzingirai & Dzingirai, 2024). To address these interconnected risks in asset management, banks are increasingly combining traditional analytical methods and innovative, AI-driven analytical technologies that enhance their ability to proactively manage emerging risks and optimize asset portfolios. These technologies improve the precision of borrower risk assessments, streamline operational processes, provides greater transparency and reducing systemic risk.

Regulatory frameworks also significantly influence asset management strategies (Kallur, 2016). Reserve requirements compel banks to maintain a minimum proportion of reserves against liabilities, ensuring liquidity to meet withdrawal demands and support systemic stability (Bordeleau & Graham, 2010). Although this promotes financial soundness, it also constrains the funds available for lending or investment. Similarly, while prescribed asset directives stabilize financial systems by requiring banks to allocate a portion of their assets to government securities, they often limit banks' ability to explore higher yielding but riskier investments, potentially stifling innovation and competitive growth in the banking sector. Interest rate caps, designed to protect consumers from excessive borrowing costs, also constrain banks' potential returns on loans. While these caps safeguard borrowers, they often hinder income generation in high-risk lending environments where market rates exceed regulatory thresholds. Global regulatory initiatives, such as Basel III, further emphasize higher capital adequacy and liquidity standards, compelling banks to adopt more disciplined and resilient asset management strategies (EBA, 2019; Bawa & Singh, 2023). Therefore, effective asset management requires integrating regulatory compliance, risk mitigation, and profitability goals into a comprehensive and adaptive framework (Romanyuk, 2010). By aligning these elements within the ALM framework, banks can effectively build balance sheet resilience, sustain growth, and navigate evolving economic and regulatory landscapes.

### 3.3. Liability Management from a Bank's Perspective

Liability management encompasses strategic decisions regarding the composition, cost, and utilization of a bank's funding sources, directly influencing its funding structure, liquidity position, risk profile, and profitability (Choudhry, 2011; Najimi et al., 2022). Customer deposits remain the primary funding source for most banks, classified into demand deposits, savings deposits, and fixed-term deposits, each with unique cost and liquidity characteristics. Demand deposits provide high liquidity but are typically more volatile, while fixed-term deposits offer greater stability but at higher interest costs. The stability of customer deposits is also influenced by various factors, including economic conditions, market competition, and depositors' risk-return preferences.

Diversifying funding sources is a critical strategy for mitigating concentration risks and managing exposure to market volatility (Kallur, 2016; Vo & Le, 2023). Beyond customer deposits, banks leverage wholesale funding, interbank borrowing, and bond issuance to meet their funding needs. Wholesale funding provides significant capital but often comes with higher costs and refinancing risks during volatile periods. Interbank borrowing offers short-term liquidity but exposes banks to counterparty and interest rate risks. Bond issuance, while securing long-term funding, introduces challenges such as currency and interest rate risks, especially for banks engaged in cross-border operations.

Although equity capital is not strictly a liability, it plays a pivotal role in liability management by absorbing losses and safeguarding depositor funds. Regulatory frameworks such as Basel III mandate minimum capital adequacy ratios to ensure banks maintain sufficient equity buffers to withstand economic shocks (Bawa & Singh, 2023). These capital requirements shape liability management by constraining the extent to which banks can leverage deposits and borrowed funds. While higher equity levels enhance creditworthiness and reduce the cost of wholesale funding, excessive equity may dilute returns on equity, creating a trade-off between financial stability and shareholder value.

Similarly, regulatory mandates also significantly influence banks' liability management strategies. For example, the Dodd-Frank Wall Street Reform and Consumer Protection Act introduced stricter capital and liquidity requirements, along with enhanced risk management practices, to bolster financial stability (Le et al., 2016). Regulatory reserve requirements obligate banks to retain a portion of customer deposits as reserves, limiting the funds available for income-generating activities. While these measures enhance systemic stability, they constrain the resources that banks can deploy for lending and investments, demanding careful optimization of the liability mix. Liquidity coverage ratios (LCRs) and net stable funding ratios (NSFRs), for instance, require banks to maintain sufficient short-term liquidity and stable long-term funding, compelling them to balance low-cost liabilities with liquidity and stability considerations (Bordeleau & Graham, 2010). Effective liability management demands a strategic approach that integrates cost-efficiency, liquidity optimization, regulatory compliance, and risk mitigation. As financial markets become increasingly complex and regulatory frameworks evolve, banks must adopt dynamic liability management strategies that balance short-term operational needs with long-term resilience, ensuring sustained profitability in a rapidly changing financial landscape.

### 3.4. Asset and Liability Management Process

ALM process involves strategic planning, scenario analysis, and continuous recalibration of the bank's asset-liability structure to adapt to evolving market conditions (Kallur, 2016; Abebe, 2022). Its primary objectives include liquidity management, financial stability, profitability optimization, sustainable risk-return trade-offs, and effective risk mitigation (Chatterjee & Dutta, 2016; Burucs, 2017). Asset and Liability Management Committee (ALCO), comprising senior executives from finance, treasury, and risk management, plays a critical role in overseeing the bank's balance sheet structure. For example, ALCO sets risk limits, monitors liquidity, manages structural exposures, and evaluates the impact of macroeconomic on bank performance (Choudhry, 2011; Lysiak et al., 2022). ALCO uses various tools such as advanced data analytics, stress testing, counterparty limits, cashflow and market forecasts to remain agile and responsive to emerging risks and opportunities, ensuring the bank's financial health. Although banks' governance structures may vary, board oversight, typically supported by committees such as Board ALCO, Board Risk, or Board Credit Committee, ensure that ALM strategies align with the bank's long-term objectives, regulatory mandates, and risk appetite. Together, these governance layers optimize the asset-liability mix, balancing profitability with financial stability and sustainability.

Some of the key challenges in ALM include managing mismatches in maturities, liability modelling, managing credit quality, interest rates, and currencies (Choudhry, 2007; Peykani et al., 2023). For example, funding long-term loans with short-term borrowing may initially reduce costs but exposes the bank to refinancing risks during periods of liquidity constraints or rising interest rates. The 2008 financial crisis underscored the dangers of such mismatches, as excessive reliance on short-term funding exacerbated systemic instability (Romanyuk, 2010; Lehmann & Hofmann, 2010). Interest rate mismatches occur when the repricing schedules of assets and liabilities differ, exposing banks to rate fluctuations, while currency mismatches create vulnerabilities to exchange rate volatility. In this context, addressing these risks requires integrating dynamic ALM strategies with traditional approaches, such as duration matching (aligning the durations of assets and liabilities to stabilize interest income), currency hedging, and the use of derivatives like interest rate swaps.

The effectiveness of ALM depends on the banks' strategic leadership practices, robust analytical tools, the strategic controls, dynamic capabilities and implementing methodologies that proactively measure and manage risk exposures across the balance sheet (Kallur, 2016; Lysiak et al., 2022; Chishamba & Dzingirai, 2024). For example, gap analysis identifies mismatches in asset-liability maturities or repricing schedules, highlighting potential liquidity or interest rate risks. Duration matching reduces interest rate sensitivity, stabilizing net interest income. Stress testing

simulates extreme scenarios, helping banks assess resilience and develop ALM strategies to enhance financial stability (Tektas et al., 2005). Additionally, metrics like the liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) ensure regulatory compliance while supporting short-term liquidity and long-term funding stability.

Despite its sophistication, ALM faces challenges during periods of extreme market volatility or systemic crises (Novickytė & Petraitytė, 2014). In this context, traditional tools, such as gap analysis, may fall short during unpredictable market disruptions. Similarly, stress-testing models often struggle to account for unprecedented events, such as geopolitical upheavals or climate-induced financial shocks. The integration of environmental, social, and governance (ESG) factors adds complexity, requiring banks to align funding and investment decisions with sustainable practices. For instance, incorporating ESG criteria may limit access to certain high-yield investment allocations but enhances reputational standing and regulatory compliance. Additionally, technological innovations like fintech platforms and blockchain are transforming ALM by improving transparency, reducing costs, and enabling real-time risk monitoring, though they introduce emerging risks such as cybersecurity threats.

In conclusion, the ALM process requires a dynamic framework that integrates strategic planning, leveraging core competences, robust governance, incorporating emerging technologies and advanced analytical tools to manage balance sheet risks effectively. By addressing challenges such as regulatory compliance, market volatility, and risk mismatches, banks can safeguard their balance sheets and seize growth opportunities. Moreover, embracing contemporary trends like ESG considerations, shadow banking dynamics, and disruptive technologies will further refine ALM strategies, ensuring sustained profitability, operational stability, and resilience in an increasingly complex banking landscape.

### 3.5. Exploring ALM's Role in Bank Profitability: Insights from Selected Case Studies

Although research on the relationship between ALM and profitability is significantly limited within Zimbabwean banks, valuable insights can be drawn from other research contexts and adapted to refine local banks' ALM strategies. Kosmidou et al. (2004) examined ALM-profitability relationship in UK-based domestic and foreign banks using the Statistical Cost Accounting (SCA) method. Analyzing data from 36 domestic and 44 foreign banks over the period 1996-2002, they found that high-profit banks benefitted from significantly lower liability costs across most funding sources, enabling them to offset lower returns on assets compared to their less profitable counterparts. Domestic banks' operating profits were primarily driven

by loans within their earning asset portfolios and fixed assets, while foreign banks relied on a broader asset base. Both types of banks faced high costs from customer and short-term funding. These findings underscore the importance of a strategic approach to ALM for Zimbabwean banks in optimizing funding structures and balancing asset returns to enhance profitability.

Trang et al. (2024) assessed the relationship between ALM and profitability in Vietnamese commercial banks using data from 2013 to 2023. Their findings revealed a positive relationship between asset management and profitability (measured by Return on Assets), with lending activities and investments in securities identified as key drivers. However, the limited impact of investment securities diverged from their conventional significance globally. Liability management, by contrast, negatively influenced profitability, with deposits and borrowings introducing high funding costs and liquidity pressures. The dual challenge of optimizing asset returns while mitigating liability risks was highlighted. Interestingly, while GDP growth is generally linked to financial performance, its effect on profitability appeared muted, suggesting that structural and regulatory factors may hold greater influence in Vietnamese banks. For Zimbabwean banks, these findings emphasize the need to refine liability management strategies tailored to local economic and regulatory conditions to achieve sustained profitability.

Gessesow and Venkatswalu (2024) explored the impact of ALM on profitability in Ethiopian private commercial banks using panel data from 14 banks over the period 2013-2022. Employing statistical cost accounting and a random effect model, their results revealed a positive correlation between all asset types (including loans, foreign deposits, investments in securities, and fixed assets) and profitability (measured by ROA). Conversely, all liability types, including savings, demand, and fixed deposits, negatively impacted profitability. Owusu and Alhassan (2018) applied the statistical cost accounting model to analyze the relationship between profitability and ALM structure, using data from 27 Ghanaian banks spanning 2007 to 2015. They observed that domestic banks achieved higher ROA than foreign banks, with high-profit banks exhibiting both higher asset returns and greater liability costs. These insights are particularly relevant to Zimbabwean banks, as they emphasize the importance of identifying asset categories that significantly drive profitability while managing liability costs effectively. Similarly, Abebe (2022) used the SCA model to investigate ALM and financial performance in 106 sub-Saharan African microfinance institutions (MFIs) from 2014 to 2018. The study revealed that net loan portfolios and MFI size were positively associated with ROA, while deposits and borrowings negatively affected financial performance. These findings emphasize the critical need for Zimbabwean banks to navigate the country's unique challenges, focusing on strategic ALM, through optimal asset allocation and cost-effective funding strategies to enhance financial performance.

Madhushani and Perera (2022) investigated the relationship between ALM and financial performance in Sri Lanka, using data from 15 commercial banks over the period 2011-2020. They employed key balance sheet variables, such as Capital Adequacy Ratio (CAR), Non-Performing Loan Ratio (NPLR), Income Diversification Ratio (IDR), Liquidity Ratio (LR), and Operational Efficiency Ratio (OER), while financial performance was measured through Return on Assets (ROA) and Return on Equity (ROE). The study revealed a negative relationship between NPLR and profitability, while income diversification positively correlated with ROA and ROE. Operational efficiency and liquidity constraints negatively impacted profitability, underscoring the need to address inefficiencies and manage liquidity effectively. While capital adequacy showed a significant negative impact on ROE, no significant relationship was found between CAR and ROA. These findings provide Zimbabwean banks with actionable insights on improving asset quality, optimizing capital allocation in ALM decisions, diversifying income sources, enhancing operational efficiency, and managing liquidity effectively.

The reviewed case studies illustrate the pivotal role of ALM in driving bank profitability, highlighting recurring themes with significant implications for Zimbabwean banks. Effective asset utilization, through informed risk-taking and maintaining high asset quality, emerges as a key profitability driver. Conversely, poorly managed liabilities and liquidity mismatches pose substantial threats to financial stability. The studies also demonstrate the variability of ALM's impact across regions, influenced by regulatory frameworks, market structures, and economic conditions. For Zimbabwean banks, tailoring ALM strategies to local challenges is essential. Emphasis should be placed on liability optimization, portfolio diversification, efficient capital allocation and understanding contributions of specific balance sheet components. By adopting tailored ALM strategies and leveraging structured methodologies like statistical cost accounting (SCA) and econometric modeling, Zimbabwean banks can effectively navigate local challenges, align profitability objectives with operational dynamics, and position themselves for long-term resilience and sustainable growth in an evolving financial landscape.

### 3.6. Hypotheses on the Impact of ALM on Commercial Banks' Profitability in Zimbabwe

This study employs Statistical Cost Accounting (SCA) model to examine the relationship between ALM and the profitability of Zimbabwean commercial banks. SCA model provides a robust econometric framework for estimating marginal rates of return on assets, accounting for the costs associated with portfolio components, and evaluating profitability trends over time (Hester & Zoellner, 1966; Njogo et al., 2014; Chatterjee & Dutta, 2016; Onaolapo & Adegoke, 2020; Ukpong &

Olowokudejo, 2021; Owusu & Alhassan, 2021; Abebe, 2022). The study is guided by the following hypotheses:

- **H1**: Asset management has a positive and significant relationship with the profitability of Zimbabwean commercial banks.
- **H2**: Liability management has a negative and significant relationship with the profitability of Zimbabwean commercial banks.
- **H3**: The composition of assets and liabilities (balance sheet structure) has a significant association with the profitability of Zimbabwean commercial banks.
- **H4**: Asset and liability management jointly exhibit a statistically significant relationship with the profitability of Zimbabwean commercial banks.

By testing these hypotheses, this study aimed to address the research gap in the limited literature exploring the impact of ALM on the profitability of Zimbabwe's banking sector. Furthermore, it highlights the efficacy of the SCA model specification as a valuable analytical tool for optimizing asset-liability structures within the complex and evolving economic landscape of Zimbabwe.

## 4. Methods

### 4.1. Data Collection

This study focused on 15 banks namely, 14 commercial banks and 1 systemically important building society, collectively representing 90% of the banking sector's assets and liabilities during the period 2010-2023. Zimbabwe's banking sector comprises 19 institutions, including 14 commercial banks, 4 building societies, and 1 savings bank (RBZ, 2024). The selection criteria for the banks included their classification, systemic importance and the availability of audited financial statements for the specified period. Data on assets, liabilities, and profitability was sourced from audited annual financial statements and annual reports, accessed through banks' official websites, while GDP growth data was obtained from the Ministry of Finance and World Bank statistics. The study employed a deductive approach, consistent with prior research on ALM and bank profitability (Shrestha, 2015; Najimi et al., 2022; Owusu & Alhassan, 2021). The 14-year study period was selected due to data availability and to capture significant fiscal and monetary reforms that occurred in Zimbabwe during this time. These included changes in bank recapitalization policies, advancements in banking technology, stabilization in the number of failed banks, the adoption of cashless policies and a reduction in brick-and-mortar branches, increased digitization of banking operations and governance reforms driven by shifts in political dispensations. These systemic changes significantly influenced ALM practices, making this period particularly relevant for

assessing their impact on the profitability of Zimbabwean banks. A total of 189 panel observations were derived from the 14-year study period, providing robust data for analysis.

### 4.2. Model Specification

This study adopted the SCA framework to model the role of ALM on the profitability of Zimbabwean commercial banks, consistent with previous studies in other countries (Hester & Zoellner, 1966; Kosmidou et al., 2004; Abede, 2022; Trang et al., 2024). Based on this modeling approach, profitability of bank *b* at time *t*, $Y_{bt}$ is specified as a function of the composition of its assets and liabilities:

$$Y_{bt} = \alpha + \beta_2 A_{ibt} + \beta_3 L_{jbt} + e_{bt} \quad (1)$$

To address potential heteroscedasticity and scale differences, all variables are normalized by Total Assets ($TA_{bt}$) and the model further incorporated macroeconomic growth in line with similar studies (Tee, 2017; Najimi et al., 2022). This resulted in the following model used in this study:

$$Y_{bt}/TA_{bt} = \alpha/TA_{bt} + \beta_2 A_{ibt}/TA_{bt} + \beta_3 L_{jbt}/TA_{bt} + \beta_4 Macro_{i,t} + u_{bt} \quad (2)$$

Where:

- $Y_{bt}/TA_{bt}$: Return on Assets (ROA), profitability of bank *b* at time *t*;
- $A_{ibt}/TA_{bt}$: Proportion of the *i-th* asset of bank *b* at time *t*, relative to total assets;
- $L_{jbt}/TA_{bt}$: Proportion of the *j-th* liability of bank *b* at time *t*, relative to total assets;
- $\alpha/TA_{bt}$: Baseline profitability, independent of the asset-liability composition;
- $\beta_2$: Marginal rate of return on the *i-th* asset, expected to be positive;
- $\beta_3$: Marginal cost of the *j-th* liability, generally expected to be zero or negative;
- $\beta_4$: Effect of GDP growth on bank profitability;
- $Macro\text{-}level_{i,t}$: Annual GDP growth rate (%) for Zimbabwe in year *t*;
- $u_{bt} = e_{bt}/TA_{bt}$: Adjusted stochastic error term normalized by total assets.

Assets are expected to positively impact profitability ($\beta2>0$), as they typically generate income (Athanasoglou et al., 2008). Liabilities, on the other hand, often incur costs that reduce profitability ($\beta3\leq0$). However, in Zimbabwe's banking sector, where banks may derive significant fee income from liabilities, β3, could be positive if income exceeds associated costs. Similarly, the effect of GDP growth, β4, depends on whether economic expansion enhances banking activity or introduces challenges such as inflationary pressures or heightened credit risk. The SCA model provides a

framework for quantifying the contributions of specific balance sheet components, enabling banks to align profitability objectives.

### 4.3. Operationalization of Variables and Measurement

In line with econometric model specification, this study employed defined study variables to ensure robustness and credibility in examining the relationship between ALM and bank profitability in Zimbabwe.

#### 4.3.1. Profitability (Dependent Variable)

Return on Assets (ROA) was used to measure profitability, consistent with established practices in banking literature (Dq & Ngo, 2020; Abebe, 2022). ROA is calculated as Net Income After Tax (NIAT) for a given year, expressed as a percentage of average total assets (Shrestha, 2015; O'Connell, 2023). Using average Total Assets (TA) accounts for variations during the fiscal year, ensuring a more accurate representation of profitability (Gessesow & Venkateswarlu, 2023). ROA is preferred over Return on Equity (ROE) because it evaluates the overall performance of the bank, independent of its capital structure. In contrast, ROE can be influenced by the bank's leverage, as higher leverage increases potential returns to equity holders but also introduces greater risk. By contrast, ROA provides a more holistic assessment of how efficiently a bank utilizes its assets to generate income. Some studies advocate for using pre-tax profits to measure profitability, arguing that this approach better reflects a bank's ability to generate income from its assets before the influence of external factors like taxation (Kosmidou et al., 2004; Kosmidou & Zopounidis, 2008). However, this study employs after-tax profits for a more comprehensive and credible measure of performance, particularly in evaluating balance sheet efficiency. This choice also aligns with the practices of the Central Bank when reporting the soundness of the banking system and ensures consistency in assessing profitability across the banking sector.

#### 4.3.2. Asset and Liability Management (Independent Variables)

Asset management is operationalized as the ratio of rate-sensitive and non-rate-sensitive assets to total assets. Earning assets are expected to generate positive returns, though the magnitude of these returns varies across asset categories. This study examined six categories of assets: loans and advances, investments in securities, trade and other alternative investments, other assets, net fixed assets, cash and cash equivalents (Najimi et al., 2022; Gessesow & Venkateswarlu, 2023; Trang et al., 2024). Similarly, liability management is captured through the ratio of rate-sensitive and non-rate-sensitive liabilities to total assets. This study focuses on three primary liability categories: customer deposits (including demand, savings, and fixed deposits from corporates and individuals), other borrowings (such as lines of

credit, and interbank loans), and other liabilities (Belete, 2013; Abebe, 2022). To ensure comparability across banks of varying sizes, the nominal values of assets and liabilities are normalized by dividing them by the average total assets for the corresponding period, calculated as the mean of opening and closing total assets. This normalization converts variables into ratios, enabling consistent comparisons and mitigating issues related to scale differences. Furthermore, it stabilizes variance within the dataset, reduces heteroscedasticity, and enhances the reliability of regression outcomes.

#### 4.3.3. Macro-Level Variable: GDP Growth (GDPg)

GDP growth (GDPg) serves as a macroeconomic indicator reflecting external economic conditions that influence both ALM strategies and bank profitability (Demirguc-Kunt & Huizinga, 2000; Ghazouani & Moussa, 2013). Fluctuations in GDP growth directly and indirectly affect credit demand and repayment behaviours, requiring dynamic ALM strategies to mitigate risks and capitalize on opportunities. For example, higher GDP growth signals economic expansion, typically resulting in increased credit demand, enhanced repayment capacity, and potentially higher returns on assets, thereby boosting profitability. Conversely, during economic slowdowns, reduced loan demand, rising non-performing loans (NPLs), and narrower interest margins negatively impact profitability. ALCOs respond to fluctuations in GDP growth by adjusting asset composition, liability structures and modelling balance sheet strategies to align with changing economic conditions. Novickytė and Petraitytė (2014) observed a strong relationship between GDP growth and the assets and liabilities of commercial banks in Lithuania, albeit with a moderate cyclical effect. This suggests that while GDP growth significantly influences ALM and profitability, its intensity varies across economic cycles.

Although the relationship is complex and nonlinear, understanding GDP growth's influence provides crucial insights into optimizing ALM practices and enhancing bank profitability. In the context of Zimbabwe, the role of GDP growth in shaping ALM decisions is particularly critical due to the country's economic volatility.

#### 4.3.4. Random Error

The random error term accounts for unobserved factors that may influence bank profitability beyond the variables included in this study, thus providing a comprehensive representation of the profitability function. For example, some of the unobserved factors could include bank-specific characteristics, such as ownership structure (e.g., local versus regional banks), strategic leadership practices, and operational scale, as well as external influences like regulatory changes or shifts in market conditions.

## 5. Findings

### 5.1. Descriptive Statistics

Table 1 presents the descriptive statistics of the key variables for 15 Zimbabwean banks over the period 2010 to 2023. The table displays raw data (without adjustments for outliers), highlighting central tendencies and variables including macroeconomic growth (GDP); profitability (ROA) and ALM variables, namely, Loans and Advances (LAD); Investment Securities (ISEC), Total Other Investments (TAOI), Other Assets (OTAS), Net Fixed Assets (NEFA), cash and cash equivalents (CACE), Customer Deposits (CUSTD), other borrowings (OBOR), Other Total Liabilities (OTLI).

**Table 1. Descriptive statistics results**

| Variable | Obs (n) | Mean | Std. Dev. | Median | Min | Max | IQR |
|---|---|---|---|---|---|---|---|
| ROA | 189 | 0.0271 | 0.0923 | 0.0278 | -0.664 | 0.390 | 0.0398 |
| LAD_TA | 189 | 0.3525 | 0.1761 | 0.3462 | 0.0081 | 0.812 | 0.2541 |
| ISEC_TA | 189 | 0.1297 | 0.1259 | 0.0975 | 0.000 | 0.589 | 0.1576 |
| TAOI_TA | 189 | 0.0878 | 0.1282 | 0.0423 | 0.000 | 0.730 | 0.1022 |
| OTAS_TA | 189 | 0.0840 | 0.0929 | 0.0573 | 0.0041 | 0.512 | 0.0757 |
| **NEFA_TA** | 189 | 0.0826 | 0.0690 | 0.0586 | 0.0051 | 0.420 | 0.0688 |
| **CACE_TA** | 189 | 0.2634 | 0.1587 | 0.2314 | 0.0211 | 0.848 | 0.2102 |
| CUSTD_TA | 189 | 0.5737 | 0.2138 | 0.6111 | 0.000 | 0.890 | 0.3480 |
| OBOR_TA | 189 | 0.1037 | 0.1480 | 0.0370 | 0.000 | 0.993 | 0.1557 |
| OTLI_TA | 189 | 0.0703 | 0.0517 | 0.0553 | 0.0055 | 0.256 | 0.0618 |
| GDP | 189 | 0.0466 | 0.0741 | 0.0501 | -0.078 | 0.215 | 0.0698 |

**Return on Assets (ROA)**: The mean ROA of 2.7% and median of 2.8% suggest moderate profitability across banks. However, the wide range (-66% to 39%) and high standard deviation (9.2%) underscore significant variability. These variations are influenced by periods of macroeconomic instability in Zimbabwe, such as currency regime transitions (2010/11; 2018/19; 2022/23), hyperinflation, and bank-specific strategies on government-oriented infrastructure programs (2 banks) or newly established banks (2 banks).

**Loans and Advances to Total Assets (LAD_TA)**: Lending activities remains central for Zimbabwean banks, with loans and advances accounting for 35.2% of total assets on average, mainly corporates and individual loans. The variability (IQR: 19%-60%) reflects differences in credit policies, risk management and other external factors, including impact of hyperinflation and significant regulatory changes relating to currency regimes, dollarization; de-dollarization and mono-currency policies.

**Investment Securities to Total Assets (ISEC_TA)**: On average, 13.0% of total assets are allocated to marketable securities such as treasury bills, negotiable certificates of deposits and bonds. The central bank's regulatory directives relating to prescribed assets and liquidity ratios, heavily influence this allocation, along with the challenges posed by low returns on some securities. The minimum of 0% reflects the impact of newly formed banks during the period, since the descriptive statistics has no adjustments on outliers.

**Trade and Other Investments to Total Assets (TAOI_TA):** Banks allocated 8.8% of their assets to trade, investment property and other investments on average, with significant variability (IQR: 4%-14%). However, regulatory guidelines relating to permissible banking activities shape this asset allocation, with some banks adopting more diversified strategies, depending on funding base stability.

**Customer Deposits to Total Assets (CUSTD_TA)**: Customer deposits (individuals and corporates) remain the primary funding source, averaging 57.4% of total assets. The top 10 banks hold over 80% of the sector's deposits, highlighting concentration risk and their systemic importance, while variability (IQR: 25%-60%) reflects differences in customer deposit bases and alternative funding strategies.

**Other Borrowings to Total Assets (OBOR_TA):** Other borrowings account for an average of 10.4% of total assets, complementing customer deposits as a key funding source. High variability (IQR: 2%-16%) indicates differences in reliance on wholesale funding or external lines of credit, shaped by liquidity needs, credit risks, and macroeconomic conditions.

**GDP Growth (GDPg)**: The average GDP growth rate of 4.7% highlights Zimbabwe's economic volatility. The wide range (-7.8% to 21.5%) reflects periods of contraction and rapid expansion driven by fiscal interventions, political regimes, monetary policy shifts, hyperinflation and impact of Covid-19 pandemic among other factors that impacted GDP from 2010 to 2023 (IMF, 2024).

Overall, the descriptive statistics underscore challenges within banks, reflecting significant variation in ALM strategies and external economic pressures in Zimbabwe. The variability in key indicators aligns with the study's problem statement and establishes a solid foundation for subsequent econometric analysis.

### 5.2. Pairwise Correlation Analysis

Pairwise correlation analysis was conducted using Pearson's correlation matrix to assess the strength and direction of linear relationships between ALM variables and ROA, a measure of profitability (Nguyen et al., 2024). Table 2 presents the pairwise correlations between ROA, ALM variables and GDP, offering insights into their linear relationships and providing a foundation for subsequent analysis.

**Table 2. Pairwise Correlation of ROA with ALM Variables**

| Variables | LAD | ISEC | TAOI | OTAS | NEFA | CACE | CUSTD | OBOR | OTLI | GDP |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 0.16 | 0.09 | 0.382 | 0.011 | -0.02 | -0.07 | -0.312 | -0.047 | 0.109 | 0.043 |

The results reveal that ROA is positively correlated with core income-generating assets such as Loans and Advances (LAD_TA, 0.160) and Total Allocated Other Investments to Total Assets (TAOI_TA, 0.382), suggesting their marginal contribution to profitability. Conversely, liability variables such as Customer Deposits to Total Assets (CUSTD_TA, -0.312) exhibit negative correlations, indicating potential inefficiencies or risks associated with liability management strategies (O'Connell, 2023). This suggests that higher reliance on customer deposits may not directly enhance profitability, possibly due to higher associated costs or inefficiencies (Owusu & Alhassan, 2018). These findings underscore strategic trade-offs in funding resource allocation, such as balancing income-generating assets against liability structures, to optimize profitability under Zimbabwe's unique economic conditions. While Pearson's correlation provides a robust measure of linear relationships, it does not capture non-linear or causal effects hence the need for further diagnostic tests and regression analysis (Dufera et al., 2023).

### 5.3. Multicollinearity Test

Multicollinearity arises when independent variables in a regression model exhibit high correlations, complicating the interpretation of their individual contributions to the dependent variable (Kim, 2019). This results in inflated standard errors of regression coefficients thereby reducing their reliability and statistical significance. Variance Inflation Factor (VIF) was calculated to assess multicollinearity, where values exceeding 10 or tolerance values below 0.10 typically indicate significant multicollinearity (Daoud, 2017). Table 3 presents the results, confirming the robustness of the regression model.

**Table 3. Variance Inflation Factor (VIF) Results**

| Metric | LAD | ISEC | TAOI | OTAS | PCA* | CUSTD | OBOR | OTLI | GDP | Mean VIF |
|---|---|---|---|---|---|---|---|---|---|---|
| VIF | 2.5939 | 1.7216 | 2.2795 | 1.7879 | 1.7096 | 3.9427 | 2.4029 | 1.5018 | 1.2446 | 2.1316 |
| 1/VIF | 0.3855 | 0.5808 | 0.4387 | 0.5593 | 0.5849 | 0.2536 | 0.4162 | 0.6659 | 0.8034 | 0.469 |

**PCA – Principal component representing CACE and NEFA*

The VIF results confirm that all variables fall below the critical threshold of 10, indicating that multicollinearity is not a significant concern. The highest VIF value, 3.9427, associated with (CUSTD_TA), underscores the importance of customer deposits in the operational framework of Zimbabwean commercial banks. Efficiently

managing liabilities such as customer deposits including their cost structure, while maximizing the returns from income-generating assets offers a pathway to improved profitability. The inclusion of PCA (CACE and NEFA), further mitigates collinearity risks by reducing dimensionality. Other balance sheet variables have VIF values close to 2, demonstrating minimal correlation among predictors. These findings are consistent with the assumptions of classical linear regression, ensuring stable and reliable coefficient estimates. The results provide meaningful insights into the drivers of profitability in Zimbabwean commercial banks, emphasizing the importance of effective ALM strategies. This is particularly critical in Zimbabwe's unique economic environment, where resource allocation must account for macroeconomic volatility and operational constraints.

### 5.4. Model Selection: LM Test for Panel Effects

The Lagrange Multiplier (LM) test was conducted to determine whether a Random Effects Model (REM) or a Pooled OLS regression is more appropriate for analyzing the relationship between Return on Assets (ROA) and ALM variables (Nguyen et al., 2024). This step ensures accurate estimation by selecting the model that best aligns with the structure of the dataset on Zimbabwean commercial banks. Based on literature (Torres-Reyna, 2007; Baltagi et al., 2012), LM test hypotheses is given as follows:

- **$H_0$:** No significant panel effects; Pooled OLS is appropriate.
- **$H_1$:** Significant panel effects exist; Random Effects Model is more appropriate.

The LM test produced a chi-squared statistic of 0.52151 with a p-value of 0.4702. Since the p-value exceeds the threshold of 0.05, the null hypothesis of no significant panel effects cannot be rejected (Baltagi et al., 2012). This result indicates that variations in banks' ROA are not substantially influenced by unobserved heterogeneity in the sector or time-specific factors (Shrestha, 2015), Consequently, the Pooled OLS approach is sufficient for this analysis, assuming homogeneity across Zimbabwean banks while providing stable and reliable coefficient estimates. Although some scholars have used REM or Fixed Effect Models in studying ALM (Nguyen et al., 2024; Gessesow &Venkateswarlu, 2023), the selected pooled OLS model is guided by the LM test to ensure interpretable estimates that enable meaningful insights into the drivers of profitability among Zimbabwean commercial banks. While the REM, which accounts for unobserved heterogeneity, may be preferable if panel effects were more pronounced, the LM test results affirm the appropriateness of the Pooled OLS model for this study.

### 5.5. Heteroskedasticity Test

Heteroskedasticity occurs when the variance of residuals in a regression model is not constant across all levels of the independent variables, violating the OLS assumption of homoscedasticity (Raza et al., 2023). This issue can lead to biased standard errors and unreliable statistical inferences, such as invalid p-values or confidence intervals. In this study, heteroskedasticity may arise from factors such as differences in bank size, changing currency regimes during the study period, diversity in the operating environment, or varying performance volatility among Zimbabwean banks. Additionally, it may reflect model specification issues, such as the functional form of statistical cost accounting modelling framework that is used to examine the relationship between ROA and ALM variables.

To detect heteroskedasticity, the Breusch-Pagan (BP) test was employed. The null hypothesis assumes constant variance (homoscedasticity), while the alternative hypothesis suggests the presence of heteroskedasticity (Romeo et al., 2023). The BP test yielded a statistic of 35.285 with a p-value of 0.005307 ($p<0.05$), confirming the presence of heteroskedasticity as the null hypothesis was rejected at the 0.05 significance level. These results also emphasize the importance of methodological rigor, particularly in the banking sector, where heteroskedasticity may reflect diverse operational macro conditions, varying currency regimes and evolving regulatory landscape, as outlined in the study's background and problem statement. To address this, robust standard errors were applied to correct for bias in standard error estimates, ensuring the reliability of the regression coefficients and the validity of statistical inferences (Kaufman, 2013). With these corrections, using robust standard errors supports the appropriateness of the Pooled OLS model for this analysis and enhances the credibility of the findings.

### 5.6. ALM-Profitability Model Specification Test: Hausman Test

The Hausman test is typically employed to determine whether a Fixed Effects or Random Effects Model (REM) is more appropriate for panel data analysis (Baltagi, 2024). However, based on the results of the LM test, which failed to reject the null hypothesis of no significant panel effects, the Pooled OLS model was deemed appropriate for this study. As the LM test confirmed the assumption of homogeneity across entities, conducting the Hausman test was not necessary. This decision aligns with the principle of methodological parsimony, ensuring that the analysis remains streamlined and avoids unnecessary complexity. By relying on the LM test results, the study adheres to its dataset's characteristics, providing credible insights into the relationship between ALM variables and ROA in Zimbabwean banks.

### 5.7. Regression Analysis: Pooled OLS Results and Interpretation

Table 4 presents the results of the pooled OLS regression analysis, identifying the key ALM factors influencing the profitability of Zimbabwean commercial banks. Outliers were excluded to enhance data quality, such as the first year of operation for newly established banks (lacking essential panel data) and development banks with operational characteristics distinct from profit-oriented commercial banks.

**Table 4. Regression Results (Pooled OLS Model with Robust Standard Errors)**

| Variable | Coeff. | Std. Error (Robust) | t-value | p-value | [95% Conf. Interval] | Signf. |
|---|---|---|---|---|---|---|
| **LAD** | 0.093 | 0.0382 | 2.438 | 0.0157 | [0.022, 0.164] | *** |
| **ISEC** | 0.038 | 0.0169 | 2.267 | 0.0100 | [0.010, 0.066] | *** |
| **TAOI** | 0.269 | 0.0724 | 3.712 | 0.0003 | [0.063, 0.474] | *** |
| **OTAS** | 0.014 | 0.0069 | 2.021 | 0.0425 | [0.003, 0.025] | ** |
| **PCA** | 0.015 | 0.0060 | 2.546 | 0.0126 | [0.002, 0.014] | *** |
| **CUSTD** | -0.165 | 0.0516 | -3.198 | 0.0017 | [0.013, 0.100] | *** |
| **OBOR** | -0.119 | 0.0512 | -2.328 | 0.0211 | [-0.028, -0.003] | ** |
| **OTLI** | -0.205 | 0.1832 | -1.121 | 0.2637 | [0.061, 0.458] | * |
| **GDP** | 0.033 | 0.0113 | 2.885 | 0.0036 | [0.026, 0.186] | *** |
| **Intercept** | 0.175 | 0.0573 | 3.063 | 0.0026 | [-0.158, -0.021] | *** |

**** p< 0.01, ** p<0.05, * not significant*
*R-squared: 0.48958; Adjusted R-squared: 0.46511*
*F-statistic: 2.56826, p-value: 0.0083922*

The model's F-statistic (p = 0.0084) confirms the joint significance of the included ALM and GDP variables, highlighting the robustness of the econometric specification. The adjusted R-squared value of 46.51% indicates that the model explains nearly half of the variation in ROA, reflecting the multifaceted determinants of profitability in Zimbabwe's banking sector. While moderate, this is consistent with prior studies in similar financial contexts (Trang et al., 2024). For example, using statistical cost accounting modeling, Gessesow and Venkateswarlu (2023) reported an adjusted R-squared of 40.3% when examining the impact of ALM on Ethiopian commercial banks' profitability (ROA). Similarly, Shrestha (2015) used statistical cost accounting to analyze the impact of ALM on commercial banks in Nepal, based on a sample of the top seven banks, which represented 49% of the sector's net profit, from 2007 to 2013. Using pooled OLS regression, the study found that ALM and macroeconomic variables explained 47.5% of the variation in profitability among Nepalese banks.

In the current study on Zimbabwean banks, asset management variables demonstrated a positive and significant impact on profitability, supporting the first hypothesis (H1). Loans and Advances to Total Assets (LAD_TA) exhibited a significant positive effect on ROA, with a coefficient of 0.093 ($p < 0.05$). This finding aligns with bank's financial intermediation, which emphasizes efficient loan

portfolios as critical drivers of bank profitability. Investment Securities to Total Assets (ISEC_TA) also showed a positive effect (coefficient = 0.038, $p < 0.01$), highlighting the value of strategically allocating assets to high-quality securities that offer stable returns. Total Other Investments to Total Assets (TAOI_TA) had the strongest positive relationship with ROA (coefficient = 0.269, $p < 0.01$), underscoring the profitability derived from diversifying into non-traditional investments such as structured trade finance, property investments, and mortgages to enhance returns. In similar studies, although varying magnitude of contribution, scholars have established a statistically significant relationship between asset management and profitability (Shrestha, 2015; Chatterjee & Dutta, 2016; Owusu & Alhassan, 2018; O'Connell, 2023). While PCA (Cash and Cash Equivalents and Net Fixed Assets) also demonstrated statistical significance (coefficient = 0.015, $p < 0.05$), the relatively smaller magnitude suggests that its contribution to profitability, while positive, is less pronounced compared to other asset categories.

Conversely, liability management variables yielded mixed results, providing partial support for the second hypothesis (H2). Customer Deposits to Total Assets (CUSTD_TA) had a significant negative effect on ROA (coefficient = -0.165, $p < 0.01$), highlighting the cost burden of deposit financing and underscores the need for strategic optimization in liabilities management. Similarly, Other Borrowings to Total Assets (OBOR_TA) negatively influenced profitability (coefficient = -0.119, $p < 0.05$), emphasizing the cost burden of debt financing. Gessesow et al. (2023) contends that the negative coefficients are aligned with statistical cost accounting modeling, which assumes the rates of return on liabilities are generally negative and vary by types of liabilities (Hester & Zoellner, 1966; Shrestha, 2015; Abebe, 2022). However, Other Liabilities to Total Assets (OTLI_TA) was statistically insignificant ($p > 0.05$), suggesting its limited direct influence on profitability which may warrant further research to explore if there are any mediating factors that might explain this result.

The macroeconomic variable, GDP, exhibited a significant positive relationship with ROA (coefficient = 0.033, $p < 0.01$), emphasizing the importance of economic growth in driving bank profitability (Najimi et al., 2022). This finding aligns with prior research on ALM models, indicating that improved economic conditions enhance credit demand, repayment capacity, and interest margins (Kohlscheen et al., 2018; Al-Homaidi, 2018; Trang et al., 2024; O'Connell, 2023). Abbas et al. (2023) explored how economic growth influences the relationship between banks' capital, liquidity, and profitability in Asian economies. Using two-stage least squares (2SLS) regression on annual data of Asian commercial banks ranging from 2011 to 2019, they found that economic growth strengthens the inter-relationship between these variables, further highlighting the pivotal role of economic conditions in commercial banks' performance. However, contrasting evidence from Shrestha (2015), which found a negative relationship between GDP and profitability, suggests that economic

context and temporal factors may influence this variable's impact. In this context, future research could delve deeper into these contrasting findings.

Overall, the third hypothesis (H3), which posits that balance sheet composition significantly impacts profitability, is validated by the pooled OLS regression results. The adjusted R-squared value further supports the notion that the proportions of various asset and liability categories are critical determinants of ROA, consistent with similar studies (Shrestha, 2015; Chatterjee & Dutta, 2016; O'Connell, 2023). Additionally, the overall significance of the model, confirmed by the F-statistic, supports the fourth hypothesis (H4), emphasizing the joint impact of ALM variables on banks' profitability. This aligns with findings from comparable research in other emerging markets (Amira & Otuya, 2019; Owusu & Alhassan, 2020). The study's findings contribute to the growing literature on ALM by providing nuanced insights into the balance sheet management dynamics of Zimbabwe's banking sector, emphasizing the critical importance of optimizing ALM strategies to enhance profitability.

## 6. Discussions and Conclusion

This study examined the impact of ALM on profitability of Zimbabwean commercial banks, using panel data from 2010 to 2023. The findings underscore ALM's pivotal role in influencing profitability through efficient asset utilization and cost-effective liability management. Loans and Advances to Total Assets (LAD_TA) emerged as a key driver of bank performance, reinforcing the financial intermediation role, where banks allocate resources from surplus to deficit sectors. The significance of investment securities (ISEC_TA) and diversified asset categories (TAOI_TA) highlights the value of strategic diversification in mitigating risks and stabilizing returns in volatile macroeconomic environments. These results emphasize the importance of balancing traditional lending activities with alternative asset investments to drive sustainable profitability. Liability management presents notable challenges, as evidenced by the negative impact of customer deposits (CUSTD_TA) and external borrowings (OBOR_TA) on profitability. These findings highlight the need for banks to optimize funding strategies by balancing liquidity needs with cost considerations. The statistical insignificance of other liabilities (OTLI_TA) suggests that their impact may be indirect or context-dependent, warranting further exploration. Additionally, the positive relationship between GDP growth and profitability underscores the interplay between macroeconomic conditions and bank performance. In this context, a stable and growing economy supports banks' ability to extend credit, loan performance and overall country credit ratings.

Overall, the study validates the hypothesis that ALM significantly influences profitability, with balance sheet composition emerging as a critical determinant of

financial performance. These findings align with prior research, demonstrating the interconnected nature of asset allocation, liability management, and external economic conditions (Shrestha, 2015; Owusu & Alhassan, 2021; Madhushani & Perera, 2022). The results offer valuable practical implications for practitioners and policymakers, particularly in frontier markets, where financial systems are often characterized by structural complexities and macroeconomic volatility. In view of the history of bank failures in Zimbabwe, banks must proactively prioritize operational efficiency, improve credit quality, and explore opportunities for diversification to optimize returns and building sustained competitiveness. Policymakers can strengthen financial stability by fostering regulatory frameworks that encourage prudent lending, asset diversification, and developing deeper financial markets for alternative investments. Furthermore, promoting lending to productive sectors could further stimulate economic growth while reducing systemic vulnerabilities.

## 7. Further Research

Future research can consider expanding on these findings by including other financial institutions, such as microfinance banks, development banks and all building societies, to provide a holistic view of the broader financial sector. This approach could capture unique ALM dynamics in institutions serving niche markets or operating under distinct regulatory frameworks. Furthermore, incorporating data from earlier periods, particularly from 2008 when Zimbabwe adopted the multicurrency system, could reveal the long-term effects of monetary policy shifts on ALM practices, especially the impact of hyperinflation and political regime changes between 2000 and 2009. Understanding these historical influences could shed light on how structural changes in the financial ecosystem affect bank profitability and resilience. Additionally, future studies could explore ALM's influence on broader performance dimensions, such as financial stability, operational efficiency, and risk management. Moreover, integrating variables like digital transformation, off-balance-sheet components, inflation rates, banks' branch network density, and evolving regulatory policies could enhance the explanatory power of future models. Qualitative methods, such as interviews with ALCO members or detailed case studies, could complement quantitative approaches, uncovering the strategic and operational considerations behind ALM decisions. Broadly, comparative research across Southern Africa or other emerging markets could provide valuable insights into how diverse economic, institutional, and regulatory environments shape ALM strategies. By pursuing these directions, future research could address existing gaps in the literature while deepening the understanding of ALM's role in banks' financial performance and stability. This would provide further insights for practitioners and policymakers in both emerging

and established markets, contributing to more resilient and adaptive banking systems.

## References

Abbas, F., Ali, S., & Ahmad, M. (2023). Does economic growth affect the relationship between banks' capital, liquidity and profitability: empirical evidence from emerging economies. *Journal of Economic and Administrative Sciences*, 39(2), 366-381.

Abebe, M. G. (2022). The effect of asset and liability management on the financial performance of microfinance institutions: Evidence from the sub-Saharan African region. *Future Business Journal*, 8(1), 1-12.

Al-Homaidi, E. A., Tabash, M. I., Farhan, N. H. S., & Almaqtari, F. A. (2018). Bank-specific and macro-economic determinants of profitability of Indian commercial banks: A panel data approach. *Cogent Economics & Finance*, 6(1), 1-23.

Amira, E. A., & Otuya, W. (2019). Impact of asset liability management and economic capital modelling on the profitability of Kenya commercial banks: a review of existing empirical evidence. *International Journal of Management and Commerce Innovations*, 7(2), 1384-1391.

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121-136.

Baltagi, B. H. (2024). Hausman's Specification Test for Panel Data: Practical Tips. In C.F. Parmeter, M.G. Tsionas, H.-J. Wang, (Eds.), *Essays in Honor of Subal Kumbhakar*, *Advances in Econometrics*, Vol. 46, pp. 13-24. Leeds: Emerald Publishing Limited.

Baltagi, B. H., Feng, Q., & Kao, C. (2012). A Lagrange Multiplier test for cross-sectional dependence in a fixed effects panel data model. *Journal of Econometrics*, 170(1), 164-177.

Bawa, R., & Singh, K. (2023). Implementation of Basel Accords and its impact on Asset-Liability Management in Banks: A Literature Review. *Indian Institute of Finance*, 37(3), 849-880.

Belete**,** T. (2013). Asset liability management and commercial banks profitability in Ethiopia. *Research Journal of Finance and Accounting*, 4(10), 77-91.

Bordeleau, E., & Graham, C. (2010). *The impact of liquidity on bank profitability*. Bank of Canada Working Paper 38, pp. 1-22.

Brom, K. (2009). *Asset and liability management for deposit-taking microfinance institutions*. CGAP Focus Note 55, pp. 1-35.

Buch, C. (2024). *Bank profitability: A mirror of the past, creating a vision for the future*. Chair of the Supervisory Board of the European Central Bank Speech at Bocconi University, Milan, 16 October 2024.

Burucs, J. (2017). *How can a medium-sized Bank develop its own asset or liability risk management system*. World Bank Working paper. Washington, D.C.: World Bank Group.

Chatterjee, C., & Dutta, P. (2016). Exploring the linkage between profits and asset–liability management. *Paradigm*, 20(2), 131-142.

Chishamba, J. (2024). The Impact of Strategic Leadership on Sustainable Competitive Advantage of Commercial Banks in Zimbabwe. *Acta Universitatis Danubius. Œconomica*, 20(6), 245-280.

Chishamba, J., & Dzingirai, C. (2024). An Integrative Approach to Operationalizing Strategic Leadership in Banking Institutions. *Acta Universitatis Danubius. Œconomica*, 20(5), 23-48.

Choudhry, M. (2007). *Bank Asset and Liability Management: Strategy, Trading, Analysis.* Singapore: John Wiley & Sons.

Choudhry, M. (2010). *Impact of the financial crisis on bank ALM and liquidity risk management*. Presented at PRMIA-Thomson Reuters Markets Academy, Singapore, 9 April 2010.

Choudhry, M. (2011). Bank Asset-Liability and Liquidity Risk Management. In G. Mitra, K. Schwaiger (Eds.), *Asset and Liability Management Handbook*. London: Palgrave Macmillan.

Daoud, J. I. (2017). Multicollinearity and regression analysis. *Journal of Physics: Conference Series*, 949(1).

Demirguc-Kunt, A., & Huizinga, H. (1998). Determinants of commercial bank interest margins and profitability: some international evidence. *The World Bank Economic Review*, 13(2), 379-408.

Demirguc-Kunt, A., & Huizinga, H. (2000). *Financial structure and bank profitability*. Policy Research Working Paper Series 2430, pp. 1-25. The World Bank.

Donnellan, J., & Rutledge, W. L. (2019). A case for resource-based view and competitive advantage in banking. *Managerial and Decision Economics*, 40(6), 728-737.

Dq, T., & Ngo, T. (2020). The determinants of bank profitability: A cross-country analysis. *Central Bank Review*, 20(2), 65-73.

Dufera, A. G., Liu, T., & Xu, J. (2023). Regression models of Pearson correlation coefficient. *Statistical Theory and Related Fields*, 7(2), 97-106.

Dzomira, S. (2014). Analysis of Bank Failures During Financial Tumult in Africa-Zimbabwe: A Historical Review. *Journal of Governance and Regulation*, 3(3), 75-80.

European Banking Authority (EBA) (2019). *Basel III Reforms: Impact study and key recommendations*.

Forbes (2023). *America's best banks*. Retrieved from. https://www.forbes.com/lists/americas-best-banks/?sh=737e931dc0de.

Gessesow, T. A., & Venkateswarlu, P. (2023). Impact of asset-liability management on bank profitability: Evidence from private commercial banks in Ethiopia. *Seybold Report Journal*, 18(05), 106-124.

Ghazouani B. A. I., & Moussa M. S. (2013). Explanatory factors of bank performance in Tunisia: A panel model approach. *Global Journal of Management and Business Research*, 13(C5), 1-12.

Gil-Jardón, J. A., Morganti, P. R., & Atristain-Suárez, C. (2024). The role of development and commercial banking in promoting economic growth in Mexico: A sectoral analysis. *Journal of Risk and Financial Management*, 17(11), 505.

Hester, D. D., & Zoellner J. F. (1966). The Relation between Bank Portfolios and Earnings: An Econometric Analysis. *Review of Economics and Statistics*, 48, 372-386.

Huang, W., Molyneux, P., Ongena, S., & Xie, R. (2023). The new challenges of global banking and finance. *The European Journal of Finance*, 29(7), 693-699.

International Monetary Fund. African Dept. & International Monetary Fund. Monetary and Capital Markets Department (2024). Zimbabwe: Technical Assistance Report - Financial Sector Stability Report follow-up technical assistance on the implementation of the Basel III liquidity framework. *Technical Assistance Reports*, 2024(81), 6-23.

Kallur, V. (2016). Bank's asset and liability management: A chief risk officer's perspective. *Journal of Risk Management in Financial Institutions*, 9(4), 313-326.

Kaufman, R. L. (2013). (Estimated) Generalized Least Squares Regression Model for Heteroskedasticity. In *Heteroskedasticity in Regression: Detection and Correction, Quantitative Applications in the Social Sciences*, pp. 51-70. Thousand Oaks, California: Sage Publications, Inc.

Kaufman, R. L. (2013). Heteroskedasticity-Consistent (Robust) Standard Errors. In *Heteroskedasticity in Regression: Detection and Correction, Quantitative Applications in the Social Sciences*, pp. 43-50. Thousand Oaks, California: Sage Publications, Inc.

Kim, J. H. (2019). Multicollinearity and misleading statistical results. *Korean Journal of Anesthesiology*, 72(6), 558-569.

Kohlscheen, E., Murcia, A., & Contreras, J. (2018). *Determinants of bank profitability in emerging markets*. BIS Working Papers No. 686, Monetary and Economic Department, Bank for International Settlements.

Kosmidou K., & Zopounidis, C. (2008). Measurement of Bank Performance in Greece. *South-Eastern Europe Journal of Economics*, 79-95.

Kosmidou, K., & Pasiouras, F. (2004). Linking profits to asset-liability management of domestic and foreign banks in the UK. *Applied Financial Economics*, 14(18), 319-1324.

Kuvshinov, D., Richter, B., & Zimmermann, K. (2022). The shifts and the shocks: bank risk, leverage, and the macroeconomy. *Working Paper Series*, No 2672, ECB.

Lamothe, P., Delgado, E., Solano, M. A., & Fernández, S. M. (2024). A global analysis of bank profitability factors. *Humanities and Social Sciences Communications*, 11(124), 1-12.

Le, H. T. T., Narayanan, R. P., & Vo, L. V. (2016). Has the Effect of Asset Securitization on Bank Risk Taking Behaviour Changed? *Journal of Financial Services Research*, 49(1), 39-64.

Lehmann, A. P., & Hofmann, D. M. (2010). Lessons Learned from the Financial Crisis for Risk Management: Contrasting Developments in Insurance and Banking. *The Geneva Papers on Risk and Insurance. Issues and Practice*, 35(1), 63-78.

Lysiak, L., Masiuk, I., Chynchyk, A., Yudina, O., Olshanskiy, O., & Shevchenko, V. (2022). Banking Risks in the Asset and Liability Management System. *Journal of Risk and Financial Management*, 15(6), 265.

Madhushani, W. I., & Perera, K. H. (2022). The Impact of Assets Liability Management on the Financial Performance: Evidence from Licensed Commercial Banks in Sri Lanka. *International Journal of Accountancy*, 2(1), 1-17.

Mckinsey (2024). *Global Banking Annual Review 2024: Attaining escape velocity*. Retrieved from https://www.mckinsey.com/industries/financial-services/our-insights/global-banking-annual-review?cid=eml-web.

Najimi, N. A., Wani, N. U. H., & Deshpande, A. (2022). Effect of asset-liability management on bank profitability: Evidence from Afghanistan banking sector. *Kardan Journal of Economics and Management Sciences*, 5(4), 35-49.

Nefrou, M., Wu, Y.-Y., & Duqué, F.-X. (2023). *Why ALM matters: The Silicon Valley Bank (SVB) case. Finalyse*. Retrieved from: https://www.finalyse.com/blog/why-alm-matters-the-silicon-valley-bank-svb-case.

Novickytė, L., & Petraitytė, I. (2014). Assessment of banks' asset and liability management: Problems and perspectives (case of Lithuania). *Procedia - Social and Behavioural Sciences*, 110, 1082-1093.

O'Connell, M. (2023). Bank-specific, industry-specific and macroeconomic determinants of bank profitability: evidence from the UK. *Studies in Economics and Finance*, 40(1), 155-174.

Owusu, F. B., & Alhassan, A. L. (2020). Asset-Liability Management and bank profitability: Statistical cost accounting analysis from an emerging Market. *International Journal of Finance & Economics*, 26(1), 1488-1502.

Peykani, P., Sargolzaei, M., Botshekan, M. H., Oprean-Stan, C., & Takaloo, A. (2023). Optimization of asset and liability management of banks with minimum possible changes, *Mathematics*, 11(12), 1-24.

Raza, M., Ahmed, M., Razzaque, S., & Hina, H. (2023). Testing for heteroskedasticity in the presence of outliers, *Journal of Education and Social Studies*, 4(2), 313-329.

Reddy, K. V., & Sucharitha, D. (2019). An analysis of ALM in selected commercial banks. *Pramana Research Journal*, 9(1), 457-462.

Reinhart, C. M., & Rogoff, K. S. (2008). *This time is different: a panoramic view of eight centuries of financial crises*. NBER Working Paper Series, No 13882. National Bureau of Economic Research.

Richter, B., & Zimmermann, K. (2019). The profit-credit cycle.

Romanyuk, Y. (2010). Asset-liability management: An overview. Bank of Canada Discussion Paper 2010-10, pp. 1-25.

Romeo, G., Buonaccorsi, J. P., & Thoresen, M. (2023). Detecting and correcting for heteroscedasticity in the presence of measurement error. *Communications in Statistics - Simulation and Computation*, 53(11), 5474-5490.

Rossi, C. (2023). *Silicon Valley Bank: A Failure in Risk Management*. Retrieved from https://www.garp.org/risk-intelligence/market/silicon-valley-bank-031423.

Shrestha, S. (2015). Asset liability management and commercial banks' profitability in Nepal. *Academic Voices: A Multidisciplinary Journal*, 5(1), 40-47.

Tee, E. (2017). Asset liability management and the profitability of listed banks in Ghana. *IOSR Journal of Economics and Finance (IOSR-JEF)*, 8(3), 9-14.

Tektas, A., Nur Ozkan-Gunay, E., & Gunay, G. (2005). Asset and liability management in financial crisis. *Journal of Risk Finance*, 6(2), 135-149.

Torres-Reyna, O. (2007). *Panel Data Analysis Fixed and Random Effects using Stata (v. 4.2)*. Princeton University.

Trang, N. T. T., Duong, N. T., & Binh, P. N. (2024). The impact of asset-liability management on the profitability of listed commercial banks in Vietnam. *International Journal of Economics and Financial Issues*, 14(6), 369-378.

Tsaurai, K. (2018). The Dynamics, Challenges and Transition of Banking Sector Development in Zimbabwe. *The Journal of Developing Areas*, 52(3), 85-96.

Uzoamaka, O. E., & Nebo, G. (2016). Role of commercial banks in sustainable economic development in Nigeria. *Journal of Social Development*, 5(4), 211-228.

Vo, L. V., & Le, H. T. T. (2023). From hero to zero - The case of Silicon Valley Bank. *Journal of Economics and Business, Forthcoming*.

Yuanita, N. (2019). Competition and bank profitability. *Economic Structures*, 8, 31.