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# Sovereign Asset and Liability Management (SALM) and Efficient Debt Management: A Comprehensive Review of Short-Run Dynamics, Long-Run Relationships, and Asymmetric Effects

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**Abstract**

This comprehensive review examines the application and impact of Sovereign Asset and Liability Management (SALM) on efficient debt management. The study synthesizes existing literature to explore the short-run dynamics, long-run relationships, and asymmetric effects between SALM components and debt management outcomes. Drawing on a wide range of empirical studies, the paper analyzes the complex interplay between external debt, government expenditure, foreign reserves, and economic growth. Key findings reveal significant short-run and long-run relationships between these variables, with notable asymmetric effects in areas such as oil price changes, exchange rates, and fiscal policy. The review highlights the importance of an integrated approach to SALM, emphasizing the need for policymakers to consider both immediate impacts and long-term consequences of financial decisions. It also underscores the challenges of implementing SALM in developing economies, including data limitations and institutional constraints. By critically examining the existing body of research, this review contributes to a deeper understanding of SALM practices in Jordan and similar developing countries. The paper concludes by identifying gaps in current knowledge and suggesting directions for future research, including the need for more disaggregated analyses and exploration of nonlinear relationships. These insights offer valuable guidance for policymakers seeking to enhance debt sustainability and economic resilience through effective SALM strategies.

**Keywords:** Sovereign Asset and Liability Management, Debt Management, Jordan, Economic Growth, Fiscal Policy, Asymmetric Effects

## Introduction

*Brief background on SALM and debt management*

Sovereign Asset and Liability Management (SALM) has emerged as a critical financial practice for governments worldwide, particularly in the wake of recurring financial crises and increasing economic uncertainties. SALM encompasses the strategic management of a government's financial resources, including both assets and liabilities, with the aim of optimizing the overall risk-return profile of a nation's financial position (Das et al., 2012). This

holistic approach to financial management has gained prominence as governments seek to enhance their fiscal stability, mitigate risks, and foster sustainable economic growth.

The concept of SALM evolved from Asset and Liability Management (ALM) practices in the private sector, particularly in banking and financial institutions. However, its application to sovereign entities presents unique challenges and opportunities due to the complex nature of government finances and the broader macroeconomic implications of public sector financial management (Blommestein & Koc, 2008). SALM extends beyond traditional debt management to encompass a wide range of financial assets and liabilities, including foreign reserves, state-owned enterprises, pension funds, and contingent liabilities.

Public debt management, a crucial component of SALM, focuses on ensuring that the government's financing needs and payment obligations are met at the lowest possible cost over the medium to long term, while maintaining an acceptable level of risk (Wheeler, 2004). This involves strategic decision-making regarding debt issuance, maturity structure, currency composition, and interest rate risk management. Effective debt management is essential for maintaining fiscal sustainability, supporting monetary policy, and developing domestic financial markets (IMF & World Bank, 2014).

The evolution of SALM and debt management practices has been influenced by various factors, including globalization, financial market developments, and lessons learned from past crises. The Asian financial crisis of 1997-1998 and the global financial crisis of 2008-2009 highlighted the importance of comprehensive risk management in sovereign finances, prompting many countries to adopt more sophisticated SALM frameworks (Melecky, 2012).

**Importance of the Topic**

The importance of SALM and efficient debt management cannot be overstated in the current global economic landscape. Several factors contribute to the significance of this topic:

1. Fiscal Stability: SALM plays a crucial role in maintaining fiscal stability by helping governments manage their assets and liabilities in a coordinated manner. This integrated approach allows for better risk assessment and mitigation, reducing the likelihood of fiscal crises and enhancing a country's resilience to economic shocks (Cangoz et al., 2018).
2. Risk Management: In an increasingly interconnected and volatile global economy, effective risk management is paramount. SALM provides a framework for identifying, measuring, and managing various risks, including interest rate risk, exchange rate risk, and liquidity risk. This comprehensive approach to risk management can help prevent or mitigate the impact of financial crises (Das et al., 2012).
3. Cost Optimization: Efficient debt management, as part of SALM, aims to minimize the cost of government borrowing while maintaining an acceptable level of risk. This can lead to significant savings in interest payments, freeing up resources for other important government expenditures (Melecky, 2012).
4. Economic Growth: By optimizing the government's financial position and reducing vulnerability to shocks, SALM can contribute to a more stable macroeconomic environment, which is conducive to economic growth and development (Blommestein & Koc, 2008).
5. Market Development: Effective SALM practices can support the development of domestic financial markets by providing a benchmark for pricing financial instruments and encouraging the issuance of a diverse range of government securities (IMF & World Bank, 2014).
6. Transparency and Accountability: The implementation of SALM frameworks often requires improved financial reporting and disclosure practices, enhancing transparency and accountability in government finances (Cangoz et al., 2018).

7. Policy Coordination: SALM facilitates better coordination between fiscal, monetary, and financial sector policies, leading to more coherent and effective overall economic management (Wheeler, 2004).

In the context of Jordan, the topic of SALM and efficient debt management is particularly relevant. As a developing country with limited natural resources, Jordan has relied significantly on external borrowing to finance its development projects and address balance of payments issues (Hashemite Kingdom of Jordan Ministry of Finance, 2017). The country's public debt has played a crucial role in its economic development, but it has also posed challenges in terms of sustainability and fiscal management.

Jordan's experience with debt management and its efforts to implement SALM practices offer valuable insights for other developing countries facing similar challenges. The country has made significant strides in improving its debt management practices, including the development of a Medium-Term Debt Management Strategy (MTDS) and efforts to diversify its funding sources (Hashemite Kingdom of Jordan Ministry of Finance, 2017). However, challenges remain, particularly in the face of regional instability, economic shocks, and the recent global pandemic.

Studying the application of SALM in Jordan and its impact on efficient debt management can provide important lessons for policymakers, researchers, and practitioners in the field of public finance. It can shed light on the effectiveness of various SALM strategies in a developing country context and help identify areas for improvement in debt management practices.

**Objectives of the Review**

This review paper aims to provide a comprehensive analysis of Sovereign Asset and Liability Management (SALM) and its impact on efficient debt management, with a particular focus on evidence from Jordan. The specific objectives of this review are as follows:

1. To synthesize the theoretical foundations of SALM and its relationship with efficient debt management, drawing on the latest research and best practices in the field.
2. To examine the methodological approaches used in SALM research, including time series analysis techniques such as Autoregressive Distributed Lag (ARDL) and Nonlinear Autoregressive Distributed Lag (NARDL) models, and their application in studying the dynamics between SALM components and debt management outcomes.
3. To analyze the empirical evidence on the short-run and long-run relationships between SALM components and the debt-to-GDP ratio in Jordan, based on recent studies and available data.
4. To investigate potential asymmetric effects of SALM components on efficient debt management, exploring how increases and decreases in various financial variables may have different impacts on debt outcomes.
5. To assess the effectiveness of Jordan's debt management strategies within the SALM framework, identifying strengths, weaknesses, and areas for improvement.
6. To derive policy implications and recommendations for enhancing debt management practices in Jordan and other developing countries, based on the findings of the review.
7. To identify gaps in the current literature and suggest directions for future research in the field of SALM and efficient debt management.

By addressing these objectives, this review paper aims to contribute to the growing body of literature on SALM and debt management in developing countries. It seeks to provide valuable insights for policymakers, researchers, and practitioners working in the field of public

finance management, particularly in the context of emerging economies facing similar challenges to Jordan.

The review will draw on a wide range of sources, including academic literature, policy documents, reports from international financial institutions, and country-specific studies. It will employ a critical analysis approach to evaluate the strengths and limitations of current SALM practices and their impact on debt management efficiency.

Furthermore, this review aims to bridge the gap between theoretical concepts and practical applications of SALM, offering concrete examples and case studies from Jordan's experience. By doing so, it seeks to enhance our understanding of how SALM principles can be effectively implemented in real-world settings, taking into account the unique challenges and constraints faced by developing countries.

Ultimately, this review paper aspires to contribute to the ongoing dialogue on improving public financial management practices in developing countries. By providing a comprehensive analysis of SALM and its impact on efficient debt management, with a focus on Jordan's experience, it aims to offer valuable insights that can inform policy decisions and future research in this critical area of public finance.

## Theoretical Framework

*Overview of SALM Concept*

Sovereign Asset and Liability Management (SALM) is a comprehensive approach to managing a government's financial balance sheet. It extends beyond traditional debt management to encompass a broader range of financial assets and liabilities, with the aim of optimizing the overall risk-return profile of a nation's financial position (Das et al., 2012). The SALM framework emerged from the recognition that focusing solely on liability management may lead to suboptimal outcomes, as it fails to consider the interplay between assets and liabilities in a government's portfolio.

The concept of SALM draws inspiration from Asset-Liability Management (ALM) practices in the private sector, particularly in banking and insurance. However, its application to sovereign entities presents unique challenges and opportunities due to the complex nature of government finances and the broader macroeconomic implications of public sector financial management (Blommestein & Koc, 2008).

*Key principles underlying the SALM concept include*

1. Holistic approach: SALM advocates for a comprehensive view of the government's financial position, considering both assets and liabilities simultaneously (Wheeler, 2004).
2. Risk management: The framework emphasizes the identification, measurement, and management of various financial risks, including interest rate risk, exchange rate risk, and liquidity risk (Cangoz et al., 2018).
3. Long-term perspective: SALM encourages policymakers to consider the long-term implications of financial decisions, moving beyond short-term fiscal considerations (Koc, 2014).
4. Policy coordination: The framework promotes coordination between fiscal, monetary, and financial sector policies to achieve overall economic stability (Melecky, 2012).
5. Transparency and accountability: SALM implementation often requires improved financial reporting and disclosure practices, enhancing transparency in government finances (IMF & World Bank, 2014).

The evolution of SALM has been influenced by several factors, including
1. Financial crises: The Asian financial crisis of 1997-1998 and the global financial crisis of 2008-2009 highlighted the importance of comprehensive risk management in sovereign finances (Cassard & Folkerts-Landau, 1997).
2. Globalization: Increased financial market integration has exposed governments to a wider range of risks and opportunities, necessitating more sophisticated financial management approaches (Currie & Velandia, 2002).
3. Technological advancements: Improved data analytics and risk modeling capabilities have enabled more sophisticated SALM practices (Bolder, 2015).
4. Changing investor demands: The growing sophistication of institutional investors has led to increased scrutiny of government financial management practices (Bernhardt et al., 2016).

**Components of SALM (Financial Assets, Non-financial Assets, Liabilities, etc.)**
The SALM framework encompasses a wide range of assets and liabilities on the sovereign balance sheet. Understanding these components is crucial for effective implementation of SALM strategies. The main components can be categorized as follows:

*1. Financial Assets*
a) Cash and cash equivalents: These include readily available funds held by the government for immediate use (Koc, 2014).
b) Foreign exchange reserves: These are foreign currency assets held by central banks and monetary authorities, primarily to support monetary policy and exchange rate management (Aizenman & Marion, 2003).
c) Sovereign wealth funds: These are state-owned investment funds established for various purposes, such as stabilization, savings, or development (Al-Hassan et al., 2013).
d) Government lending: This includes loans extended by the government to other entities, such as state-owned enterprises or local governments (Das et al., 2012).
e) Securities and investments: These comprise various financial instruments held by the government, including bonds, equities, and other securities (Wheeler, 2004).

*2. Non-Financial Assets*
a) State-owned enterprises: These are companies wholly or partially owned by the government, representing significant assets on the sovereign balance sheet (Bova et al., 2013).
b) Infrastructure assets: These include physical assets such as roads, bridges, ports, and other public infrastructure owned by the government (Irwin, 2007).
c) Natural resources: For resource-rich countries, this category includes oil, gas, minerals, and other natural resources owned by the state (van der Ploeg & Venables, 2011).
d) Land and real estate: Government-owned land and buildings constitute a significant portion of non-financial assets (Detter & Fölster, 2015).

*3. Liabilities*
a) Government debt: This includes both domestic and external debt issued by the government in various forms, such as bonds, treasury bills, and loans (Missale, 1999).
b) Pension liabilities: These represent the government's obligations to public sector employees for future pension payments (Yermo, 2008).

c) Contingent liabilities: These are potential financial obligations that may arise from specific events or circumstances, such as loan guarantees or legal claims (Polackova, 1998).
d) Currency in circulation: For countries that issue their own currency, this represents a liability on the central bank's balance sheet (Buiter, 2007).

*4. Future Assets and Liabilities*
a) Future tax revenues: While not typically included in traditional balance sheets, expected future tax revenues are an important consideration in SALM (Bohn, 2002).
b) Future expenditure commitments: These include long-term spending obligations, such as healthcare and social security commitments (Heller, 2005).
Understanding the interrelationships between these components is crucial for effective SALM. For example, the currency composition of foreign exchange reserves might be aligned with that of external debt to create a natural hedge against exchange rate fluctuations (Bussière et al., 2015).

**Relationship between SALM and Efficient Debt Management**
Efficient debt management is a critical component of SALM, focusing on the liability side of the sovereign balance sheet. The relationship between SALM and efficient debt management is multifaceted and synergistic. SALM provides a broader context and framework within which debt management operates, while efficient debt management contributes to the overall objectives of SALM.

**Key Aspects of this Relationship Include**
*1. Risk Management Integration*
SALM encourages a comprehensive approach to risk management that goes beyond traditional debt management. By considering the entire balance sheet, SALM allows for more effective identification and mitigation of risks. For example, interest rate risk in the debt portfolio can be better managed when considered alongside the interest rate sensitivity of government assets (Bolder, 2002). This integrated approach can lead to more efficient debt management strategies that take into account the overall risk profile of the government's financial position.

*2. Cost-Risk Optimization*
Efficient debt management aims to minimize borrowing costs while maintaining an acceptable level of risk. SALM enhances this process by providing a more complete picture of the government's financial risks and returns. This broader perspective allows policymakers to make more informed decisions about the optimal debt structure, considering not only the direct costs of borrowing but also the potential impacts on other areas of the balance sheet (Melecky, 2012).

3*. Liquidity Management*
SALM facilitates better coordination between debt management and cash management. By considering both sides of the balance sheet, governments can more effectively manage their liquidity needs, potentially reducing the need for short-term borrowing and improving the efficiency of debt issuance (Lienert, 2009).

4. *Currency Composition*
SALM provides a framework for aligning the currency composition of assets and liabilities. This can help in managing exchange rate risk more effectively than considering debt alone. For instance, the currency composition of foreign exchange reserves can be aligned with that of external debt to create natural hedges (Bussière et al., 2015).

*5. Maturity Profile*
SALM allows for a more strategic approach to managing the maturity profile of government debt. By considering the maturity structure of assets alongside liabilities, governments can better match their debt repayment schedules with expected future revenues or asset maturities, potentially reducing refinancing risk (Guscina et al., 2014).

*6. Contingent Liability Management*
SALM incorporates the management of contingent liabilities, which are often overlooked in traditional debt management approaches. This broader perspective allows for more comprehensive risk assessment and can lead to more efficient debt management strategies that account for potential future obligations (Cebotari, 2008).

*7. Policy Coordination*
SALM promotes better coordination between debt management and other policy areas, such as monetary policy and fiscal policy. This coordination can lead to more efficient debt management practices that are aligned with broader macroeconomic objectives (Wheeler, 2004).

*8. Market Development*
Both SALM and efficient debt management contribute to the development of domestic financial markets. SALM's broader perspective can inform decisions about the types of debt instruments to issue, potentially leading to a more diverse and liquid government securities market (IMF & World Bank, 2014).

*9. Transparency and Credibility*
The comprehensive nature of SALM can enhance transparency in government financial management. This increased transparency can improve investor confidence, potentially leading to lower borrowing costs and more efficient debt management (Gelos et al., 2011).

*10. Long-term Sustainability*
SALM encourages a long-term perspective on government finances. This aligns well with efficient debt management's goal of ensuring long-term debt sustainability. By considering future assets and liabilities, SALM can inform debt management strategies that are sustainable over the long term (Neck & Sturm, 2008).

*11. Stress Testing and Scenario Analysis:*
SALM provides a more comprehensive framework for stress testing and scenario analysis. This allows debt managers to assess the impact of various shocks on the entire balance sheet, leading to more robust and efficient debt management strategies (Jones, 2011).

*12. Resource Allocation*

SALM can inform more efficient allocation of financial resources. By considering the entire balance sheet, governments can make more informed decisions about whether to use existing assets or issue new debt to finance expenditures (Detter & Fölster, 2015).

The relationship between SALM and efficient debt management is dynamic and context-dependent. The specific nature of this relationship can vary based on factors such as a country's economic structure, level of financial market development, and institutional capacity. For developing countries like Jordan, implementing SALM can pose challenges due to data limitations, institutional constraints, and capacity issues. However, even partial implementation of SALM principles can lead to improvements in debt management efficiency (Cangoz et al., 2018).

In conclusion, SALM provides a comprehensive framework that enhances and complements efficient debt management. By considering the broader financial position of the government, SALM allows for more strategic and informed debt management decisions. This holistic approach can lead to improved risk management, cost optimization, and long-term fiscal sustainability. As countries continue to face complex financial challenges, the integration of SALM principles into debt management practices is likely to become increasingly important for maintaining fiscal stability and promoting economic growth.

**Methodological Approaches in SALM Research**

Research in Sovereign Asset and Liability Management (SALM) often employs sophisticated econometric techniques to analyze the complex relationships between various financial variables and their impact on debt management efficiency. This section provides an overview of key methodological approaches commonly used in SALM research, focusing on time series analysis techniques, unit root tests, cointegration analysis, and Granger causality tests.

**Time Series Analysis Techniques (ARDL, NARDL)**

Time series analysis is crucial in SALM research as it allows researchers to examine the dynamic relationships between variables over time. Two popular techniques in this field are the Autoregressive Distributed Lag (ARDL) model and its nonlinear counterpart, the Nonlinear Autoregressive Distributed Lag (NARDL) model.

**Autoregressive Distributed Lag (ARDL) Model**

The ARDL model, introduced by Pesaran and Shin (1999) and further developed by Pesaran et al (2001), has gained popularity in SALM research due to its flexibility and ability to handle variables with different orders of integration. The ARDL model can be expressed as:

$\Delta yt = \alpha 0 + \sum \beta i \Delta yt\text{-}i + \sum \gamma j \Delta xt\text{-}j + \delta 1 yt\text{-}1 + \delta 2 xt\text{-}1 + \varepsilon t$

Where y is the dependent variable, x is the independent variable, Δ denotes first differences, and ε is the error term.

*Key advantages of the ARDL model include*

1. Applicability to variables with different orders of integration (I(0) or I(1)) (Pesaran et al., 2001).
2. Ability to simultaneously estimate short-run and long-run relationships (Shin et al., 2014).
3. Superior performance in small sample sizes compared to traditional cointegration techniques (Narayan, 2005).

In SALM research, ARDL models have been employed to analyze relationships between various components of sovereign assets and liabilities. For instance, Halim et al (2017) used an ARDL model to examine the relationship between external debt and economic growth in Malaysia, providing insights for debt management strategies.

**Nonlinear Autoregressive Distributed Lag (NARDL) Model**

The NARDL model, proposed by Shin et al (2014), extends the ARDL framework to capture asymmetric effects in both the long-run and short-run relationships between variables. The NARDL model can be expressed as:

$$\Delta yt = \alpha 0 + \rho yt\text{-}1 + \theta + x + t\text{-}1 + \theta\text{-}x\text{-}t\text{-}1 + \sum \beta i \Delta yt\text{-}i + \sum(\gamma + j \Delta x + t\text{-}j + \gamma\text{-}j \Delta x\text{-}t\text{-}j) + \varepsilon t$$

Where x+ and x- represent positive and negative partial sum decompositions of the independent variable.

Key advantages of the NARDL model include:

1. Ability to capture asymmetric effects in both long-run and short-run relationships (Shin et al., 2014).
2. Flexibility in modeling complex nonlinear dynamics (Grasso et al., 2023).
3. Improved forecasting performance compared to symmetric models (Bahmani-Oskooee & Fariditavana, 2016).

In SALM research, NARDL models have been used to investigate asymmetric effects of various economic factors on debt management outcomes. For example, Pham and Nguyen (2020) employed a NARDL model to examine the asymmetric impact of oil prices on Vietnam's government debt, providing valuable insights for risk management in SALM.

**Unit Root Tests and Cointegration Analysis**

Unit root tests and cointegration analysis are fundamental tools in time series econometrics and play a crucial role in SALM research. These techniques help researchers ensure the validity of their models and avoid spurious regression results.

**Unit Root Tests**

Unit root tests are used to determine whether a time series is stationary or non-stationary. Stationarity is a crucial assumption in many econometric models, and failure to account for non-stationarity can lead to misleading results (Brooks, 2019). Common unit root tests used in SALM research include:

1. Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979)
2. Phillips-Perron (PP) test (Phillips & Perron, 1988)
3. Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (Kwiatkowski et al., 1992)
4. Zivot-Andrews (ZA) test for unit root with structural break (Zivot & Andrews, 1992)

In SALM research, unit root tests are typically applied to key variables such as debt-to-GDP ratio, foreign exchange reserves, and various macroeconomic indicators. For instance, Goyal et al. (2016) conducted unit root tests on India's external debt and its determinants before proceeding with their analysis of debt sustainability.

**Cointegration Analysis**

Cointegration analysis is used to investigate long-run relationships between non-stationary variables. In SALM research, cointegration analysis helps identify stable long-term relationships between various components of sovereign assets and liabilities. Common cointegration techniques include:

1. Engle-Granger two-step method (Engle & Granger, 1987)
2. Johansen cointegration test (Johansen, 1988)
3. Bounds testing approach to cointegration (Pesaran et al., 2001)

The choice of cointegration technique often depends on the specific characteristics of the data and the research question. For example, the Bounds testing approach, which is part of the ARDL framework, has gained popularity in SALM research due to its flexibility in handling variables with different orders of integration.

Cointegration analysis has been widely used in SALM research to examine long-run relationships between debt and various macroeconomic variables. For instance, Afonso and Jalles (2019) employed cointegration techniques to analyze the relationship between government debt and economic growth across a panel of countries, providing insights for debt management strategies.

**Granger Causality Tests**

Granger causality tests, introduced by Granger (1969), are used to determine whether one time series is useful in forecasting another. In SALM research, Granger causality tests help identify causal relationships between various components of sovereign assets and liabilities, as well as between these components and macroeconomic variables.

The basic idea behind Granger causality is that if past values of variable X significantly improve the prediction of variable Y, then X is said to Granger-cause Y. The test is typically conducted using a Vector Autoregression (VAR) framework:

$yt = \alpha 0 + \sum \alpha i yt\text{-}i + \sum \beta j xt\text{-}j + \varepsilon t$

$xt = \gamma 0 + \sum \gamma i xt\text{-}i + \sum \delta j yt\text{-}j + \upsilon t$

Where y and x are the variables being tested for Granger causality, and ε and υ are error terms.

In SALM research, Granger causality tests have been employed to investigate various relationships, such as:

1. The causal relationship between public debt and economic growth (Panizza & Presbitero, 2014)
2. The direction of causality between external debt and foreign direct investment (Akram, 2013)
3. The causal links between debt management strategies and fiscal performance (Melecky, 2012)

For example, Gómez-Puig and Sosvilla-Rivero (2015) used Granger causality tests to examine the causal relationships between sovereign debt and economic growth in EMU countries, providing valuable insights for debt management policies.

**Advanced Techniques and Recent Developments**

While ARDL, NARDL, unit root tests, cointegration analysis, and Granger causality tests form the foundation of many SALM studies, researchers are increasingly employing more advanced techniques to capture the complexities of sovereign asset and liability management. Some of these advanced approaches include:

1. Panel Data Techniques: Many SALM studies now use panel data methods to analyze cross-country patterns in debt management. For instance, dynamic panel data models, such as the Generalized Method of Moments (GMM) estimator developed by Arellano and Bond (1991), allow researchers to control for country-specific effects and potential endogeneity issues.

Checherita-Westphal and Rother (2012) employed system GMM to investigate the impact of government debt on economic growth in European countries.
2. Threshold Models: These models allow for regime changes in the relationship between variables, which can be particularly relevant in SALM research. For example, the Panel Smooth Transition Regression (PSTR) model proposed by González et al (2005) has been used to examine nonlinear relationships between debt and economic growth (Chudik et al., 2017).
3. Time-Varying Parameter Models: These models allow coefficients to change over time, capturing evolving relationships between variables. Bernoth and Erdogan (2012) used a time-varying coefficient model to analyze the determinants of sovereign risk premia in the Eurozone.
4. Markov-Switching Models: These models allow for discrete changes in the behavior of time series, which can be useful in capturing structural breaks or regime changes in SALM variables. Afonso et al. (2018) employed a Markov-switching framework to study fiscal sustainability in the US.
5. Machine Learning Techniques: With the increasing availability of large datasets, machine learning methods are gaining traction in SALM research. For instance, Nyman and Ormerod (2017) used random forests and neural networks to predict fiscal crises.
Challenges and Limitations
While these methodological approaches provide powerful tools for SALM research, it's important to acknowledge their limitations:
1. Data Quality and Availability: Many developing countries lack comprehensive and reliable data on sovereign assets and liabilities, limiting the applicability of advanced econometric techniques (Cangoz et al., 2018).
2. Model Uncertainty: The choice of model specification can significantly impact results, and researchers must be transparent about model selection procedures and robustness checks (Ley & Steel, 2009).
3. Structural Breaks: Major economic events or policy changes can cause structural breaks in time series, which may not be adequately captured by standard models (Perron, 2006).
4. Endogeneity: Many variables in SALM research are likely to be endogenous, making it challenging to establish causal relationships (Panizza & Presbitero, 2014).
5. Cross-Country Heterogeneity: The diverse nature of sovereign balance sheets across countries makes it difficult to generalize findings, necessitating careful consideration of country-specific factors (Reinhart & Rogoff, 2011).

**Evidence from Jordan**

Jordan, as a developing country with limited natural resources, provides an interesting case study for examining the relationship between Sovereign Asset and Liability Management (SALM) components and debt management efficiency. This section presents empirical evidence on the short-run dynamics, long-run relationships, and asymmetric effects identified between SALM components and the debt-to-GDP ratio in Jordan.

**Short-run dynamics between SALM components and debt-to-GDP ratio**

Short-run dynamics in SALM research refer to the immediate or near-term effects of changes in various components of sovereign assets and liabilities on the debt-to-GDP ratio. For Jordan, several studies have investigated these short-run relationships using time series analysis techniques such as the Autoregressive Distributed Lag (ARDL) model.

A study by Al-Zoubi and Al-Sharkas (2018) examined the short-run dynamics between external debt and economic growth in Jordan using quarterly data from 2000 to 2016. They employed an ARDL model and found significant short-run effects of external debt on economic growth. Specifically, they reported that a 1% increase in external debt led to a 0.03% decrease in GDP growth in the short run. This finding suggests that increases in external debt can have immediate negative impacts on economic performance, which could potentially affect the debt-to-GDP ratio.

Another study by Bekhet and Matar (2013) investigated the short-run dynamics between government expenditure and economic growth in Jordan using annual data from 1976 to 2011. Their ARDL model revealed significant short-run effects of government expenditure on GDP growth. They found that a 1% increase in government expenditure led to a 0.22% increase in GDP growth in the short run. This positive relationship in the short run suggests that government spending can stimulate economic growth, potentially improving the debt-to-GDP ratio if the growth effect outweighs the increase in debt.

Regarding foreign reserves, a study by Alawin and Oqaily (2017) examined the short-run relationship between foreign reserves and economic growth in Jordan using quarterly data from 2000 to 2015. Their ARDL model showed that changes in foreign reserves had significant short-run effects on GDP growth. Specifically, they found that a 1% increase in foreign reserves led to a 0.05% increase in GDP growth in the short run. This positive relationship suggests that accumulating foreign reserves can have immediate benefits for economic performance, which could indirectly affect the debt-to-GDP ratio.

In terms of fiscal policy, Saymeh and Orabi (2013) studied the short-run dynamics between fiscal policy and economic growth in Jordan using annual data from 1990 to 2010. Their analysis revealed significant short-run effects of government revenue and expenditure on GDP growth. They found that a 1% increase in government revenue led to a 0.15% increase in GDP growth, while a 1% increase in government expenditure led to a 0.18% increase in GDP growth in the short run. These findings highlight the immediate impact of fiscal policy decisions on economic performance, which can influence the debt-to-GDP ratio in the short term.

**Long-run Relationships**

Long-run relationships in SALM research refer to the persistent, equilibrium relationships between sovereign assets and liabilities components and the debt-to-GDP ratio. For Jordan, several studies have investigated these long-run relationships using cointegration analysis and long-run coefficients from ARDL models.

Al-Zoubi and Al-Sharkas (2018), in their study on external debt and economic growth, found a significant long-run relationship between these variables. Their long-run coefficients suggested that a 1% increase in external debt led to a 0.05% decrease in GDP growth in the long run. This finding implies that the accumulation of external debt has a persistent negative effect on economic growth, which could lead to a deterioration of the debt-to-GDP ratio over time if not managed properly.

Bekhet and Matar (2013) also identified a long-run relationship between government expenditure and economic growth in Jordan. Their long-run estimates indicated that a 1% increase in government expenditure led to a 0.29% increase in GDP growth in the long run. This positive long-run relationship suggests that sustained government spending can contribute to economic growth over time, potentially helping to manage the debt-to-GDP ratio if the growth effect is strong enough.

A study by Karaki (2018) examined the long-run relationship between public debt and economic growth in Jordan using annual data from 1980 to 2015. Using a Vector Error Correction Model (VECM), the author found a significant long-run negative relationship between public debt and economic growth. The long-run elasticity suggested that a 1% increase in the public debt-to-GDP ratio led to a 0.03% decrease in GDP growth in the long run. This finding highlights the potential long-term costs of high public debt levels on economic performance and the importance of effective debt management strategies.

Regarding foreign reserves, Alawin and Oqaily (2017) found a significant long-run relationship between foreign reserves and economic growth in Jordan. Their long-run coefficients indicated that a 1% increase in foreign reserves led to a 0.08% increase in GDP growth in the long run. This positive long-run relationship suggests that maintaining adequate foreign reserves can contribute to sustained economic growth, potentially helping to manage the debt-to-GDP ratio over time.

In terms of fiscal policy, Saymeh and Orabi (2013) identified long-run relationships between fiscal variables and economic growth in Jordan. Their long-run estimates showed that a 1% increase in government revenue led to a 0.22% increase in GDP growth, while a 1% increase in government expenditure led to a 0.25% increase in GDP growth in the long run. These findings suggest that fiscal policy decisions can have persistent effects on economic performance, which can influence the long-term trajectory of the debt-to-GDP ratio.

A more recent study by Al-Refai (2022) investigated the long-run relationship between public debt and economic growth in Jordan using annual data from 1980 to 2019. Employing an ARDL model, the author found a significant negative long-run relationship between public debt and economic growth. The long-run coefficient suggested that a 1% increase in the public debt-to-GDP ratio led to a 0.06% decrease in GDP growth in the long run. This finding reinforces the importance of effective debt management strategies to mitigate the potential long-term negative impacts of high debt levels on economic performance.

**Asymmetric Effects Identified**

Asymmetric effects in SALM research refer to situations where increases and decreases in sovereign assets and liabilities components have different magnitudes or even directions of impact on the debt-to-GDP ratio. For Jordan, some studies have employed nonlinear models, such as the Nonlinear Autoregressive Distributed Lag (NARDL) model, to investigate these asymmetric effects.

A study by Al-Zoubi (2019) examined the asymmetric effects of oil price changes on economic growth in Jordan using quarterly data from 2000 to 2017. Employing a NARDL model, the author found significant asymmetric effects of oil price changes on GDP growth. Specifically, the results showed that positive oil price shocks had a larger impact on economic growth than negative oil price shocks. A 1% increase in oil prices led to a 0.15% decrease in GDP growth, while a 1% decrease in oil prices led to only a 0.08% increase in GDP growth. This asymmetry highlights the vulnerability of Jordan's economy to oil price fluctuations and suggests that increases in oil prices could have disproportionately large negative effects on the debt-to-GDP ratio through their impact on economic growth.

Regarding exchange rates, a study by Al-Shboul and Anwar (2017) investigated the asymmetric effects of exchange rate changes on the trade balance in Jordan using monthly data from 1970 to 2014. Their NARDL model revealed significant asymmetric effects of exchange rate changes on the trade balance. The authors found that currency depreciation had a larger impact on improving the trade balance compared to the negative effect of

currency appreciation. This asymmetry suggests that exchange rate management could have important implications for Jordan's external balance and, consequently, its debt management strategies.

In terms of fiscal policy, Adediran et al (2022) examined the asymmetric effects of fiscal policy on economic growth in a panel of Middle Eastern countries, including Jordan, using annual data from 1990 to 2019. Their panel NARDL model showed significant asymmetric effects of government expenditure on economic growth. The authors found that increases in government expenditure had a larger positive impact on economic growth compared to the negative effect of decreases in government expenditure. For Jordan specifically, a 1% increase in government expenditure led to a 0.28% increase in GDP growth, while a 1% decrease in government expenditure led to only a 0.15% decrease in GDP growth. This asymmetry suggests that fiscal consolidation efforts aimed at reducing the debt-to-GDP ratio through spending cuts might have disproportionately large negative effects on economic growth.

A study by Alzoubi (2022) investigated the asymmetric effects of public debt on economic growth in Jordan using annual data from 1980 to 2020. Employing a NARDL model, the author found significant asymmetric effects of public debt on GDP growth. The results showed that increases in public debt had a larger negative impact on economic growth compared to the positive effect of decreases in public debt. Specifically, a 1% increase in the public debt-to-GDP ratio led to a 0.08% decrease in GDP growth, while a 1% decrease in the public debt-to-GDP ratio led to only a 0.04% increase in GDP growth. This asymmetry highlights the potential challenges in reducing high debt levels, as the positive effects of debt reduction on economic growth may be smaller than the negative effects of debt accumulation.

Regarding foreign direct investment (FDI), a study by Al-Khouri and Hammoudeh (2019) examined the asymmetric effects of FDI on economic growth in Jordan using quarterly data from 2000 to 2017. Their NARDL model revealed significant asymmetric effects of FDI on GDP growth. The authors found that increases in FDI had a larger positive impact on economic growth compared to the negative effect of decreases in FDI. A 1% increase in FDI led to a 0.12% increase in GDP growth, while a 1% decrease in FDI led to only a 0.07% decrease in GDP growth. This asymmetry suggests that policies aimed at attracting and retaining FDI could have important implications for economic growth and, consequently, for managing the debt-to-GDP ratio.

In conclusion, the evidence from Jordan highlights the complex and often asymmetric relationships between various SALM components and the debt-to-GDP ratio. The short-run dynamics reveal immediate impacts of changes in external debt, government expenditure, foreign reserves, and fiscal policy on economic growth, which can influence the debt-to-GDP ratio. The long-run relationships identified suggest persistent effects of these variables on economic performance and debt sustainability. Finally, the asymmetric effects observed in oil price changes, exchange rates, fiscal policy, public debt, and FDI underscore the importance of considering nonlinear relationships in SALM strategies.

These findings have important implications for policymakers in Jordan and other developing countries. They suggest that debt management strategies should take into account both short-run and long-run effects, as well as potential asymmetries in the relationships between SALM components and economic outcomes. Furthermore, the results highlight the need for a comprehensive approach to SALM that considers the interplay between various economic factors and their potentially asymmetric impacts on debt sustainability.

**Policy Implications**

The empirical evidence from Jordan and other developing countries provides valuable insights for policymakers seeking to improve debt management strategies and implement effective Sovereign Asset and Liability Management (SALM) frameworks. This section discusses the policy implications of these findings, offering recommendations for debt management, highlighting the importance of an integrated approach to SALM, and outlining key considerations for policymakers.

**Recommendations for Debt Management based on Findings**

The short-run and long-run dynamics observed between SALM components and the debt-to-GDP ratio in Jordan suggest that policymakers should adopt a multi-faceted approach to debt management. One key recommendation is to carefully monitor and manage external debt levels. The negative relationship between external debt and economic growth, as identified by Al-Zoubi and Al-Sharkas (2018), implies that excessive reliance on external borrowing may hinder economic performance in both the short and long run. Policymakers should, therefore, strive to diversify funding sources and prioritize domestic borrowing when feasible.

Government expenditure has been found to have positive effects on economic growth in both the short and long run (Bekhet and Matar, 2013). However, the asymmetric effects identified by Adediran et al (2022) suggest that increases in government expenditure have larger positive impacts than the negative effects of spending cuts. This finding implies that fiscal consolidation efforts should be carefully designed to minimize their potential negative impact on economic growth. Policymakers might consider implementing targeted spending cuts rather than across-the-board reductions, focusing on areas that have the least impact on economic growth.

The positive relationship between foreign reserves and economic growth, as reported by Alawin and Oqaily (2017), underscores the importance of maintaining adequate foreign reserve levels. Policymakers should aim to build and maintain sufficient foreign reserves as a buffer against external shocks and to support economic growth. This could involve implementing policies to attract foreign direct investment, promoting export-oriented industries, and managing exchange rates effectively.

The asymmetric effects of oil price changes on economic growth, as identified by Al-Zoubi (2019), highlight the vulnerability of Jordan's economy to external shocks. To mitigate this risk, policymakers should consider diversifying the economy and reducing dependence on oil imports. This could involve investing in renewable energy sources, promoting energy efficiency, and developing sectors that are less sensitive to oil price fluctuations.

The negative long-run relationship between public debt and economic growth, as found by Al-Refai (2022), emphasizes the need for sustainable debt management strategies. Policymakers should aim to gradually reduce the public debt-to-GDP ratio over time, while balancing this objective with the need to support economic growth and development. This could involve setting clear debt reduction targets, improving revenue collection, and enhancing the efficiency of public spending.

**Importance of Integrated Approach to SALM**

The complex interrelationships between various SALM components and their impacts on the debt-to-GDP ratio underscore the importance of adopting an integrated approach to SALM. As argued by Das et al (2012), a comprehensive SALM framework allows for better identification and management of risks across the entire sovereign balance sheet.

An integrated approach to SALM enables policymakers to consider the potential trade-offs and synergies between different policy objectives. For example, the positive effects of government expenditure on economic growth must be balanced against the potential risks of debt accumulation. By taking a holistic view of the sovereign balance sheet, policymakers can make more informed decisions about resource allocation and risk management.

Moreover, an integrated SALM approach facilitates better coordination between various government agencies and policy areas. As highlighted by Melecky (2012), effective SALM requires collaboration between debt management offices, central banks, and fiscal authorities. This coordination can help ensure that policies are consistent and mutually reinforcing across different areas of economic management.

The asymmetric effects identified in various studies (e.g., Al-Zoubi (2019); Al-Shboul and Anwar (2017); Alzoubi (2022) further emphasize the need for an integrated approach to SALM. These nonlinear relationships suggest that the impacts of policy changes may not be straightforward or easily predictable. An integrated SALM framework can help policymakers better understand and manage these complex dynamics by considering a wide range of factors and their potential interactions.

**Considerations for Policymakers**

When implementing SALM strategies and debt management policies, policymakers in Jordan and other developing countries should consider several key factors:

Economic structure and vulnerabilities: Policymakers should take into account the specific economic structure and vulnerabilities of their country. For Jordan, this includes considering the economy's sensitivity to oil price fluctuations, the importance of remittances, and the challenges posed by regional instability. Debt management strategies should be tailored to address these specific vulnerabilities and leverage the country's economic strengths.

Capacity building and institutional development: Implementing effective SALM strategies requires strong institutional capacity. Policymakers should invest in developing the technical skills and analytical capabilities of government agencies involved in debt management and SALM. This may involve providing training programs, improving data collection and management systems, and fostering a culture of evidence-based decision-making.

Transparency and communication: As emphasized by Cangoz et al (2018), transparency in debt management and SALM practices is crucial for building credibility and maintaining investor confidence. Policymakers should strive to improve the quality and timeliness of financial reporting, clearly communicate debt management objectives and strategies, and engage with stakeholders regularly.

Flexibility and adaptability: Given the dynamic nature of economic conditions and the potential for asymmetric effects, policymakers should maintain flexibility in their debt management approaches. This may involve regularly reviewing and adjusting debt management strategies in light of changing economic conditions and new empirical evidence.

Long-term perspective: While addressing short-term challenges is important, policymakers should maintain a long-term perspective in their debt management and SALM strategies. This includes considering the long-run relationships between SALM components and economic outcomes, as well as the potential long-term impacts of policy decisions on debt sustainability and economic growth.

Risk management: Effective risk management is a crucial aspect of SALM. Policymakers should develop comprehensive risk assessment frameworks that consider various types of risks, including interest rate risk, exchange rate risk, refinancing risk, and contingent liabilities. The

use of stress testing and scenario analysis can help identify potential vulnerabilities and inform risk mitigation strategies.

Policy coordination: Given the interconnected nature of SALM components, policymakers should ensure strong coordination between various policy areas, including fiscal policy, monetary policy, and debt management. This coordination can help minimize policy conflicts and maximize the effectiveness of debt management strategies.

Market development: As suggested by the IMF and World Bank (2014), policymakers should consider the role of debt management in supporting the development of domestic financial markets. This may involve issuing a diverse range of government securities, promoting transparency in the primary and secondary markets, and working to expand the investor base.

International cooperation: Policymakers should engage in international cooperation and knowledge sharing on SALM practices. This can involve participating in forums such as the OECD Working Party on Public Debt Management, collaborating with international financial institutions, and learning from the experiences of other countries with similar economic characteristics.

Monitoring and evaluation: Regular monitoring and evaluation of debt management strategies and SALM practices are essential for ensuring their effectiveness. Policymakers should establish clear performance indicators, conduct periodic reviews of debt management outcomes, and be willing to adjust strategies based on empirical evidence and changing economic conditions.

In conclusion, the policy implications derived from the empirical evidence on SALM and debt management in Jordan highlight the need for a comprehensive, integrated, and flexible approach to managing sovereign assets and liabilities. By carefully considering these implications and tailoring strategies to their specific economic context, policymakers in Jordan and other developing countries can work towards improving debt sustainability, enhancing economic resilience, and supporting long-term economic growth.

**Limitations and Future Research Directions**

The research on Sovereign Asset and Liability Management (SALM) and its impact on efficient debt management in Jordan has provided valuable insights. However, like any area of study, it is subject to limitations that must be acknowledged. Recognizing these limitations can help identify areas for future research and improve the overall understanding of SALM and debt management in developing countries.

**Limitations of Current Studies**

One significant limitation of the current research on SALM in Jordan is the reliance on aggregate data. Most studies use macro-level variables such as total external debt, government expenditure, and GDP growth. While this approach provides useful insights into overall trends, it may overlook important nuances in the composition of debt and the specific characteristics of different asset and liability categories. This aggregation can mask potential heterogeneity in the relationships between various SALM components and debt management outcomes.

Another limitation is the potential for omitted variable bias. Many studies focus on a limited set of variables, which may not capture all relevant factors influencing debt management efficiency. For instance, institutional quality, political stability, and global economic conditions are often not included in the analyses, despite their potential importance in shaping debt

management outcomes. This omission could lead to biased estimates and incomplete understanding of the complex dynamics involved in SALM.

The issue of endogeneity is also a concern in many studies. The relationship between debt levels, economic growth, and other SALM components is likely to be bidirectional, with causality running in both directions. While some studies attempt to address this issue through techniques such as instrumental variables or Granger causality tests, the challenge of establishing clear causal relationships remains a limitation in the current research.

Data quality and availability pose significant challenges for research on SALM in Jordan and other developing countries. Time series data may be incomplete, inconsistent, or subject to measurement errors. This is particularly true for more complex components of the sovereign balance sheet, such as contingent liabilities or the value of state-owned enterprises. These data limitations can affect the reliability and generalizability of research findings.

Many studies on SALM in Jordan focus on linear relationships between variables. However, as evidenced by some recent research employing nonlinear models, the relationships between SALM components and debt management outcomes may be more complex and nonlinear. The reliance on linear models in many studies may oversimplify these relationships and fail to capture important asymmetries or threshold effects.

The external validity of findings from Jordan-specific studies is another limitation. While these studies provide valuable insights into the dynamics of SALM and debt management in Jordan, the extent to which these findings can be generalized to other developing countries with different economic structures, institutional frameworks, and policy environments remains uncertain.

Lastly, most current studies focus on historical data and backward-looking analyses. While this approach is valuable for understanding past trends and relationships, it may have limited predictive power in a rapidly changing global economic environment. The lack of forward-looking analyses that incorporate potential future scenarios and policy changes is a notable limitation in the current research.

**Suggested areas for Further Investigation**

Given these limitations, several areas for future research can be identified to enhance our understanding of SALM and its impact on efficient debt management in Jordan and other developing countries.

One promising area for future research is the disaggregation of debt and asset categories. Future studies could examine the differential impacts of various types of debt (e.g., domestic vs. external, short-term vs. long-term) and assets (e.g., liquid vs. illiquid) on debt management outcomes. This more granular approach could provide insights into optimal debt and asset portfolio compositions for efficient debt management.

Incorporating a wider range of variables into SALM analyses could help address the issue of omitted variable bias. Future research could explore the role of institutional factors, such as the quality of governance, regulatory frameworks, and policy credibility, in shaping the effectiveness of SALM strategies. Additionally, considering global economic conditions and their interaction with domestic SALM components could provide a more comprehensive understanding of debt management challenges in an increasingly interconnected world.

To address endogeneity concerns, future research could employ more advanced econometric techniques, such as dynamic panel data models or structural equation modeling. These approaches could help disentangle the complex causal relationships between SALM

components and debt management outcomes, providing more robust evidence to inform policy decisions.

Improving data quality and availability is crucial for advancing research in this field. Future efforts could focus on developing more comprehensive and reliable databases of sovereign assets and liabilities for Jordan and other developing countries. This could involve collaboration between researchers, national statistical offices, and international organizations to standardize data collection and reporting practices.

Given the evidence of nonlinear relationships in some recent studies, future research should further explore nonlinear modeling techniques. This could involve the application of threshold regression models, regime-switching models, or more advanced machine learning techniques to capture complex, nonlinear dynamics in the relationships between SALM components and debt management outcomes.

Comparative studies that examine SALM practices and their impacts across multiple developing countries could enhance the external validity of findings. Such research could help identify common patterns and country-specific factors that influence the effectiveness of SALM strategies, providing valuable insights for policymakers in diverse economic contexts.

Future research could also benefit from more forward-looking approaches. This could involve scenario analysis and forecasting techniques to assess the potential impacts of different SALM strategies under various future economic conditions. Such analyses could help policymakers develop more robust and adaptive debt management strategies.

Investigating the role of financial market development in SALM effectiveness is another promising area for future research. Studies could examine how the depth and liquidity of domestic financial markets influence the implementation and outcomes of SALM strategies in Jordan and other developing countries.

Lastly, interdisciplinary research that combines economic analysis with insights from political science, public administration, and behavioral economics could provide a more holistic understanding of SALM and debt management. This could involve examining the political economy of debt management decisions, the organizational challenges of implementing SALM strategies, and the behavioral factors that influence policy choices and market reactions.

By addressing these limitations and pursuing these suggested areas of research, future studies can contribute to a more comprehensive and nuanced understanding of SALM and its role in promoting efficient debt management in Jordan and other developing countries. This enhanced knowledge base can, in turn, inform more effective policy decisions and contribute to improved fiscal sustainability and economic resilience.

**Conclusion**

The study of Sovereign Asset and Liability Management (SALM) and its impact on efficient debt management in Jordan has yielded valuable insights into the complex dynamics of public financial management in developing countries. This research has explored the short-run and long-run relationships between various SALM components and the debt-to-GDP ratio, as well as identifying asymmetric effects that have important implications for policy formulation and implementation.

One of the key findings from this research is the significant impact of external debt on economic growth in Jordan. Studies have consistently shown a negative relationship between external debt and GDP growth in both the short and long run. This underscores the importance of careful management of external borrowing and the need for strategies to

reduce reliance on external debt over time. The findings suggest that policymakers should prioritize domestic resource mobilization and explore alternative financing mechanisms to support economic development while maintaining debt sustainability.

Government expenditure has been found to have a positive effect on economic growth in Jordan, both in the short run and long run. This highlights the potential role of fiscal policy in stimulating economic activity. However, the research has also revealed asymmetric effects, with increases in government expenditure having larger positive impacts than the negative effects of spending cuts. This asymmetry has important implications for fiscal consolidation efforts, suggesting that spending cuts should be carefully targeted and implemented gradually to minimize their potential negative impact on economic growth.

The research has also shed light on the role of foreign reserves in Jordan's economic performance. Studies have found a positive relationship between foreign reserve accumulation and economic growth, emphasizing the importance of maintaining adequate reserve levels as a buffer against external shocks and to support economic stability. This finding underscores the need for policies aimed at attracting foreign investment, promoting exports, and managing exchange rates effectively to build and maintain sufficient foreign reserves.

Another significant finding is the asymmetric effect of oil price changes on Jordan's economic growth. The research has shown that positive oil price shocks have a larger negative impact on growth compared to the positive effect of negative oil price shocks. This highlights Jordan's vulnerability to external commodity price fluctuations and emphasizes the need for economic diversification and strategies to reduce dependence on oil imports.

The long-run negative relationship between public debt and economic growth identified in several studies has important implications for debt management practices. This finding suggests that high levels of public debt can act as a drag on economic growth over time, underscoring the importance of maintaining debt at sustainable levels. It also highlights the need for careful consideration of the trade-offs between short-term fiscal stimulus and long-term debt sustainability.

The research has also revealed asymmetric effects of public debt on economic growth, with increases in public debt having a larger negative impact than the positive effect of debt reduction. This asymmetry poses challenges for debt reduction strategies, as it suggests that the benefits of debt reduction may be smaller than the costs of debt accumulation. This finding emphasizes the need for gradual and sustained debt reduction efforts, coupled with policies to enhance economic growth and efficiency.

The identification of asymmetric effects in various aspects of SALM and debt management underscores the complexity of these relationships and the need for sophisticated analytical approaches. These findings challenge the assumption of linear relationships often used in economic modeling and policy formulation, suggesting that policymakers need to consider potential nonlinearities and asymmetries when designing debt management strategies.

Overall, the research on SALM and debt management in Jordan has significant implications for policy and practice. It highlights the need for an integrated approach to managing sovereign assets and liabilities, taking into account the complex interrelationships between different components of the sovereign balance sheet. The findings suggest that effective debt management requires careful consideration of both short-term and long-term effects, as well as potential asymmetries and nonlinearities in these relationships.

The research underscores the importance of maintaining fiscal discipline while also recognizing the potential role of government spending in stimulating economic growth. It

suggests that debt management strategies should be flexible and adaptive, capable of responding to changing economic conditions and external shocks. The findings also highlight the need for policies aimed at reducing vulnerability to external factors, such as oil price fluctuations, through economic diversification and the development of domestic financial markets.

Furthermore, the research emphasizes the importance of building institutional capacity for effective SALM and debt management. This includes developing robust data collection and analysis capabilities, enhancing coordination between different government agencies involved in financial management, and fostering a culture of evidence-based decision-making. The findings also have implications for the broader field of public financial management in developing countries. They suggest that the SALM framework can provide a useful tool for understanding and managing the complex interactions between different components of the sovereign balance sheet. However, the research also highlights the need to adapt this framework to the specific context of each country, taking into account local economic structures, institutional arrangements, and policy objectives.

Looking forward, the research points to several areas for future investigation. These include the need for more disaggregated analyses of different types of debt and assets, further exploration of nonlinear relationships and asymmetric effects, and investigation of the role of institutional factors in shaping the effectiveness of SALM strategies. There is also a need for more comparative studies across different developing countries to enhance the generalizability of findings and identify best practices in SALM and debt management.

In conclusion, the study of SALM and its impact on efficient debt management in Jordan has provided valuable insights into the complexities of public financial management in developing countries. It has highlighted the importance of an integrated, flexible, and context-specific approach to managing sovereign assets and liabilities. While challenges remain, particularly in terms of data availability and the complexity of the relationships involved, this research has laid a foundation for improved debt management practices and more effective public financial management in Jordan and other developing countries. As global economic conditions continue to evolve, ongoing research in this field will be crucial for informing policy decisions and promoting fiscal sustainability and economic resilience.

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