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MOST GRACIOUS, MOST MERCIFUL

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***** Saudi Economic Association (SEA)- King Saud University.***

Journal of Economic Studies

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- *The list of the Arabic references must be translated into English and added after the list of the Arabic references and before the English references (titled: (Arabic References).*

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Explore the Effect of Strategy Contents on Firm's Innovation Performance: Modeling Using PLS-SEM Approach

Anas Hakeem[(1)] Emran Hakeem[(2)] Mohammed Hakeem[(2)]

(Received: November 08, 2023 – Accepted for publication: February 21,2024)

Abstract: This study explores the impact of strategic performance measures on the connection between organizational content types and innovation performance. Utilizing survey responses from 216 Saudi Arabian companies, structural equation modeling was applied. Findings reveal that a proactive strategy negatively affects process innovation but positively influences product innovation, while a defensive strategy shows a similar pattern. Conversely, a reactive strategy positively impacts both process and product innovation. Embracing proactive, defensive, or reactive approaches positively influences efficiency and effectiveness. However, efficiency negatively impacts innovation, while effectiveness has a positive effect. The study suggests that adopting diverse strategy content types provides a competitive edge, reflected in strategic performance measures. It acknowledges potential benefits and challenges, contributing empirical evidence to the understanding of the relationships between strategy content, performance metrics, and innovation in Saudi Arabian companies.
Keywords: strategy content, innovation performance, strategic performance measure, efficiency, effectiveness.

استكشاف تأثير محتويات الإستراتيجية على الأداء الابتكاري للشركة: باستخدام نمذجة PLS-SEM

أنس حكيم[(1)] عمران حكيم[(2)] محمد حكيم[(2)]

(قُدِّم للنشر 1445/04/24هـ – وقُبِل 1445/08/11هـ)

المستخلص: تستكشف هذه الدراسة تأثير مقاييس الأداء الإستراتيجية على العلاقة بين أنواع المحتوى التنظيمي والأداء الابتكاري. ووفقا لبيانات الاستطلاع والتي جمعها من خلال 216 شركة سعودية، والتي تم تحليلها باستخدام نمذجة المعادلات الهيكلية. تؤكد نتائج هذه الدراسة أن الإستراتيجية الاستباقية للشركات تؤثر سلبًا على ابتكار العمليات، ولكنها تؤثر بشكل إيجابي على ابتكار المنتج، بينما تظهر الإستراتيجية الدفاعية نمطًا مشابهًا. وعلى العكس من ذلك، تؤثر الإستراتيجية التفاعلية بشكل إيجابي على كل من العملية وابتكار المنتج. إن تبني الأساليب الاستباقية أو الدفاعية أو التفاعلية يؤثر بشكل إيجابي على الكفاءة والفعالية. ومع ذلك، فإن الكفاءة تؤثر سلباً على الابتكار، في حين أن الفعالية لها تأثير إيجابي. وتشير هذه الدراسة إلى أن اعتماد محتوى استراتيجية متنوع في الشركات يكسبها ميزة تنافسية، تنعكس في مقاييس أدائها الاستراتيجية. في الختام تساهم هذه الدراسة بالأدلة التجريبية لفهم العلاقات بين محتوى الاستراتيجية، ومقاييس الأداء، والابتكار في الشركات السعودية.

الكلمات المفتاحية: محتوى الإستراتيجية، أداء الابتكار، قياس الأداء الاستراتيجي، الكفاءة، فعالية.

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INTRODUCTION

The literature on strategic decision-making indicates a research gap in the relationship between strategy contents and innovation performance in organisations, and the role of strategic performance measures in mediating this relationship (Yang et al., 2021). Some empirical studies have suggested that strategy contents can positively affect innovation performance (Wang et al., 2020), but this relationship may be complex and contingent on various factors (Leone et al., 2018). However, the existing studies have not provided conclusive results on this topic. Therefore, this study aims to explore the link between strategy contents and innovation performance in organisations, and to examine how strategic performance measures of efficiency and effectiveness influence this link. This study also investigates the impact of strategic performance measures on strategic decision-making. Previous research has emphasised the importance of strategic performance measures in translating strategy into measurable objectives, which can facilitate strategy implementation and improve organisational performance (Fuertes et al., 2020). Although some studies have analysed the role of strategic performance measures in strategic decision-making and their effect on organisational performance (Stoelhorst et al., 2018; Xu et al., 2019), there is limited empirical and theoretical evidence on the joint relationship between strategic performance measures and innovation performance (Perego & Marx, 2019). Therefore, this study aims to investigate how strategic performance measures of efficiency and effectiveness mediate the relationship between strategy contents and innovation performance.

Strategic performance measure is a multidimensional concept that involves measuring both the efficiency and effectiveness of an organisation (Huang, 2018). Efficiency refers to achieving short-term results with minimal resources, while effectiveness refers to attaining long-term organisational objectives (Ojha et al., 2020). Some examples of efficiency measures are cost reduction, productivity, and profitability, while some examples of effectiveness measures are customer satisfaction, market share, and growth rate. These measures can help organisations evaluate their performance and identify areas for improvement.

Strategy content refers to the type of strategy that an organisation adopts to compete in the market. Miles and Snow (1978) proposed a typology of four strategy content types: prospector, defender, analyzer, and reactor. Prospectors are organisations that seek to innovate and pursue new opportunities in the market. They have a high innovation orientation, risk-taking propensity, and strategic adaptation capability. Defenders are organisations that focus on improving the efficiency of their existing operations instead of competing on new products or markets. They have a low innovation orientation, risk-taking propensity, and strategic adaptation capability. Analyzers are organisations that combine elements of both prospectors and defenders. They have a moderate innovation orientation, risk-taking propensity, and strategic adaptation capability. Reactors are organisations that lack a consistent and stable strategy and only adjust when forced to do so by environmental pressures. They have a poor innovation orientation, risk-taking propensity, and strategic adaptation capability. The Miles and Snow typology has been widely adopted as a framework for classifying organisational strategy content (Yanes-Estévez et al., 2018; Liu et al., 2020). It can help managers understand their organisation's strengths and weaknesses and tailor their strategies accordingly.

Innovation performance is the evaluation of an organisation's knowledge application and technological innovation activities, including both product innovation and process innovation (Naveed et al., 2022).

Product innovation entails the development of new or improved goods or services that address new customer needs, manage product quality, and establish effective marketing strategies (Gupta et al., 2018). Process innovation refers to the adoption of new or improved methods to produce goods and services (Lee and Shin, 2018). Innovation performance can be measured using various indicators, such as the number of patents, new products, or process improvements; the percentage of sales from new products or services; the degree of novelty or originality of innovations; or the impact of innovations on customer satisfaction, market share, or profitability (Chen et al., 2019). Innovation performance is a key factor for organisational success, especially in highly competitive business environments (Liu et al., 2018; Singh et al., 2019; Zouaghi and Nouira, 2019; Lu and Wang, 2020). It can help organisations gain a competitive advantage, enhance their reputation, and achieve their strategic goals. Therefore, this study addresses the following research question: How do strategy content, strategic performance measures, and innovation performance interact and influence each other in the context of Saudi Arabia? By answering this question, this study contributes to the literature on strategy content, strategic performance measures, and innovation performance by examining how different types of strategy content affect the quality and uniqueness of services offered by companies in Saudi Arabia, and how strategic performance measures of efficiency and effectiveness mediate this relationship. This study is organised as follows: Introduction, Literature Review and Hypotheses, Research Methodology, Data Analysis and Results, Discussion and Implications, Conclusion and References.

Literature Review and Hypothesis

This research proposes that strategic performance measures mediate the relationship between an organisation's strategy contents and innovation performance. Strategy contents refer to the different ways that organisations respond to environmental changes and opportunities, such as being proactive, defensive, or reactive (Miles & Snow, 1978). Innovation performance refers to the extent to which organisations achieve successful outcomes from their innovation activities, such as developing new products or processes (Damanpour & Aravind, 2012). Previous studies have suggested that the strategic content of an organisation, or the type of strategy stance that it adopts, has a positive influence on its innovation performance, as it reflects its ability to adapt to the market and customer needs (Matsuo et al., 2018; Zhang et al., 2021). However, the strategic content of an organisation is not sufficient to ensure its innovation success, as it also depends on how well the organisation implements its strategy and measures its performance (Cronqvist et al., 2018; Jiang et al., 2019). Supporting this notion, AlTaweel and Al-Hawary's 2021 study, conducted in Saudi Arabia, highlighted that the transformations in the business environment and heightened competition have driven organizations to concentrate extensively on enhancing the implementation of their strategies. This endeavor aims to secure sustainable competitive advantages and foster innovation capabilities that resonate with the evolving desires of their customers. Therefore, this research examines the role of strategic performance measures, or the indicators that organisations use to evaluate their performance and guide their actions, as potential mediators between strategy contents and innovation performance.

Organisations that adopt a proactive strategy stance are characterised by their innovativeness and risk-taking in developing their products and services. They aim to create new markets and opportunities by offering novel and differentiated solutions to customer needs. This strategy stance is reflected in their strategic performance measures, which can assist them in implementing their strategy and enhancing their

innovation performance, if they are aligned with their strategic objectives and capabilities. Previous studies have emphasised the importance of strategic performance measures in fostering innovation performance, especially for organisations with a proactive strategy stance (Albesher, 2014; De Massis et al., 2018; Park & Jang, 2018; Wang et al., 2019). For example, Apple, Starbucks, Netflix, and Patagonia are a well-known example of a proactive organisations.

Apple is a renowned example of a proactive organisation that uses strategic performance measures such as customer satisfaction, market share, and revenue growth to evaluate its performance and guide its actions. Apple is also known for its product innovation, such as the iPhone, the iPad, and the Apple Watch, which have created new markets and customer segments (Lashinsky, 2012). Starbucks is another example of a proactive organisation that has taken a proactive stance on social and environmental issues, such as supporting fair trade, reducing waste, promoting diversity and inclusion, and providing health care and education benefits to its employees (Starbucks Corporation, 2020). Starbucks is also known for its service innovation, such as offering mobile ordering, delivery, and loyalty programs to its customers (Starbucks Corporation, 2020). Netflix is a third example of a proactive organisation that has taken a proactive stance on innovation and customer satisfaction, such as creating original and exclusive content, offering personalised recommendations, expanding its global reach, and adapting to changing consumer preferences (Netflix Inc., 2020). Netflix is also known for its business model innovation, such as using subscription-based streaming services instead of traditional DVD rentals or cable TV (Netflix Inc., 2020). Patagonia is a fourth example of a proactive organisation that has taken a proactive stance on sustainability and activism, such as using organic and recycled materials, donating to environmental causes, encouraging customers to repair and reuse their products, and supporting social movements (Patagonia Inc., 2020). Patagonia is also known for its social innovation, such as creating a benefit corporation that balances profit with purpose (Patagonia Inc., 2020).

Thus, these examples illustrate how organisations with a proactive strategy stance can achieve higher levels of innovation performance by using strategic performance measures that are aligned with their strategic objectives and capabilities. However, these organisations also face some challenges and opportunities in terms of innovation performance. For instance, these organisations need to balance their innovativeness and risk-taking with their financial viability and customer loyalty. They also need to cope with the uncertainty and complexity of the external environment and the changing customer needs. Moreover, these organisations need to maintain their competitive advantage by constantly innovating their products and services and creating new markets and opportunities. Therefore, these organisations need to design strategic performance measures that can help them monitor their performance and guide their actions in a dynamic and uncertain environment (Anning-Dorson et al., 2018). Some of the common obstacles to innovation that these organisations may encounter include lack of a shared vision, short-term focus, lack of resources, lack of time, lack of innovation culture, lack of senior leadership support, and unrealistic expectations (Salamzadeh & Rezai, 2016). These obstacles can be overcome by creating a clear and compelling innovation vision, setting long-term goals, allocating sufficient resources and time, fostering a culture of innovation, engaging senior leaders in innovation initiatives, and managing expectations and risks (Anning-Dorson et al., 2018).

Organisations that adopt a defender approach in their strategy are characterised

by their conservatism and efficiency in developing their products and services. They focus on improving the efficiency of their existing products and services rather than exploring new products or markets. This approach is reflected in their strategic performance measures, which can assist them in implementing their strategy and enhancing their innovation performance, if they are aligned with their strategic objectives and capabilities. Previous studies have shown the positive impact of strategic performance measures on innovation performance, especially for organisations with a defender strategy (Lee et al., 2018; Wu & Wu, 2020). For example, Toyota, Walmart, Coca-Cola, and McDonald's are a well-known example of a proactive organisations.

Toyota is a well-known example of a defender organisation that uses strategic performance measures such as cost reduction, quality improvement, and operational excellence to evaluate its performance and guide its actions. Toyota is also known for its process innovation, such as the Toyota Production System, which has enabled it to achieve high levels of efficiency and quality in its manufacturing operations (Liker & Hoseus, 2008). Walmart is another example of a defender organisation that uses strategic performance measures such as sales growth, market share, and customer satisfaction to evaluate its performance and guide its actions. Walmart is also known for its operational innovation, such as its supply chain management system, which has enabled it to reduce costs and increase customer convenience (Fishman, 2006). Coca-Cola is a third example of a defender organisation that uses strategic performance measures such as brand awareness, customer loyalty, and profitability to evaluate its performance and guide its actions. Coca-Cola is also known for its product innovation, such as introducing new flavors, packaging, and marketing campaigns to maintain its market leadership (Kotler & Keller, 2016). McDonald's is a fourth example of a defender organisation that uses strategic performance measures such as revenue growth, customer satisfaction, and employee engagement to evaluate its performance and guide its actions. McDonald's is also known for its service innovation, such as offering online ordering, delivery, and customization options to its customers (McDonald's Corporation, 2020).

Thus, these examples illustrate how organisations with a defender approach can achieve moderate levels of innovation performance by using strategic performance measures that are aligned with their strategic objectives and capabilities. However, these organisations also face some challenges and opportunities in terms of innovation performance. For instance, these organisations need to balance their efficiency and conservatism with their adaptability and responsiveness. They also need to cope with the changing customer needs and preferences, as well as the competitive threats from new entrants or substitutes. Moreover, these organisations need to sustain their competitive advantage by constantly improving their products and services and retaining their customers' loyalty. Therefore, these organisations need to design strategic performance measures that can help them monitor their performance and guide their actions in a stable but dynamic environment (Miles & Snow, 1978).

Organisations that adopt a reactor approach in their strategy are characterised by their passiveness and unpredictability in developing their products and services. They lack a clear and consistent direction and only respond to environmental changes when forced to do so. This approach is evident in their strategic performance measures, which fail to assist them in implementing their strategy and enhancing their innovation performance, if they are not aligned with their strategic objectives and capabilities. Previous studies have shown the negative impact of strategic per-

formance measures on innovation performance, especially for organisations with a reactor strategy (Mol & Birkinshaw, 2019). For example, Kodak, Blockbuster, Nokia, and Sears are well-known examples of reactor organisations that did not use strategic performance measures effectively to evaluate their performance and guide their actions. They also failed to innovate their products and services, such as digital cameras, online streaming, smartphones, and online shopping, which led to their decline and bankruptcy.

Kodak did not use strategic performance measures effectively to evaluate its performance and guide its actions. Kodak also failed to innovate its products and services, such as digital cameras and online photo sharing, which led to its decline and bankruptcy (Lucas & Goh, 2009). Blockbuster is another example of a reactor organisation that failed to adapt to the changing market conditions and customer preferences. Blockbuster did not use strategic performance measures effectively to evaluate its performance and guide its actions. Blockbuster also failed to innovate its products and services, such as online streaming and subscription services, which led to its decline and bankruptcy (Groysberg et al., 2018). Nokia is a third example of a reactor organisation that failed to adapt to the changing market conditions and customer preferences. Nokia did not use strategic performance measures effectively to evaluate its performance and guide its actions. Nokia also failed to innovate its products and services, such as smartphones and applications, which led to its decline and loss of market share (Jia, & Yin, 2015). Sears is a fourth example of a reactor organisation that failed to adapt to the changing market conditions and customer preferences. Sears did not use strategic performance measures effectively to evaluate its performance and guide its actions. Sears also failed to innovate its products and services, such as online shopping and customer loyalty programs, which led to its decline and bankruptcy (O'Reilly & Tushman, 2021).

Thus, these examples illustrate how organisations with a reactor approach tend to have lower levels of innovation performance by failing to use strategic performance measures that are aligned with their strategic objectives and capabilities. However, these organisations also have some opportunities to improve their innovation performance by learning from their mistakes and adopting more proactive or adaptive strategies in response to environmental changes (Mol & Birkinshaw, 2019). For instance, these organisations can use strategic performance measures that can help them monitor their performance and guide their actions in an uncertain and complex environment (Anning-Dorson et al., 2018). Some of the common opportunities for innovation that these organisations may encounter include identifying new customer needs, exploring new technologies, collaborating with partners, or creating new business models (Rick, 2014); (Innovation Asset Group, 2019) . These opportunities can be exploited by creating a clear and compelling innovation vision, setting long-term goals, allocating sufficient resources and time, fostering a culture of innovation, engaging senior leaders in innovation initiatives, and managing expectations and risks (Anning-Dorson et al., 2018).

Therefore, understanding the unique needs and characteristics of each strategy stance can help organisations design strategic performance measures that better align with their goals, resulting in improved innovation performance. The main focus of this research is to examine the correlation between the contents of strategies in organisations and their innovation performance. Additionally, this study aims to explore the impact of strategic performance measures such as efficiency and effectiveness as me-

diators between strategy contents and innovation performance. Based on this, the following hypotheses have been formulated:

H1: The different strategy contents (prospector, defender, and reactor) have a direct effect on strategic performance measures (efficiency and effectiveness).

H2: Strategic performance measures (efficiency and effectiveness) have a direct effect on innovation performance.

H3: The different strategy contents (prospector, defender, and reactor) have a direct effect on innovation performance.

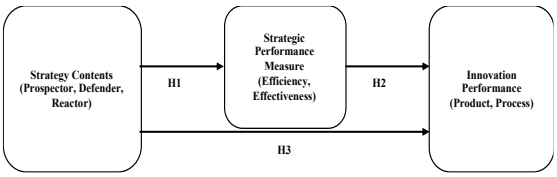

Figure 1: Conceptual Model and Research Hypotheses

Methods

Sample and Procedures

This study focused on companies in Saudi Arabia's service or industrial sector. The study targeted the top managers of these companies, who also served as board members and made strategic decisions for their companies (Rosenbusch et al., 2018). Previous studies have indicated that the participation of top managers in research surveys can enhance the validity of the results (Vroom & Jago, 2018; Berrone et al., 2019). Therefore, this study adopted an electronic survey as the data collection method, as it was convenient and efficient for the respondents. The survey was conducted from April to August 2022, and a total of 3500 questionnaires were sent to 1050 firms. The study received 629 responses from 219 firms, with a minimum of two responses per firm to ensure the representativeness and reliability of the data. The response rate was satisfactory, compared to other studies that have reported lower response rates from top managers (Grewal et al., 2018; Jaskiewicz et al., 2021). The study used Structural Equation Modeling (SEM) as the data analysis technique, as it was suitable for testing the causal relationships among multiple variables in the research framework. The data was analyzed using two software packages: SPSS (Version 28) for descriptive statistics and SmartPLS 4.0 for partial least squares path modeling. This study chose the PLS path modeling over the CBSEM approach that previous studies have used for several reasons. First, PLS path modeling can handle formative constructs more easily than CBSEM. Although CBSEM tools (such as AMOS) can deal with formative constructs in a study model, few studies actually use such a model, suggesting that it is difficult to apply (Hair Jr et al., 2016). Second, PLS path modeling is more suitable for exploratory research (like this one), while CBSEM is better for testing theory (Fornell & Bookstein, 1982). Third, PLS path modeling does not impose restrictive assumptions on the data. For example, PLS path modeling can accommodate reflective and formative constructs, samples smaller than 100, single-item constructs, metric and non-metric data types, datasets with multicollinearity and missing values (Hair & Alamer, 2022). Therefore, PLS path modeling is considered a 'soft-modelling' method.

Measures

To measure the constructs, the previously tested scales were used.

Table 1: Reliability and Validity Test

Construct	No. of Questions	Cronbach's alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	DV/IV/ Mod*
Prospector (SCP)	4	0.955	0.967	0.880	IV
Defender (SCD)	3	0.920	0.950	0.863	IV
Reactor (SCR)	5	0.974	0.979	0.905	IV

Construct	No. of Questions	Cronbach's alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	DV/IV/ Mod*
Strategic Performance Measure of Efficiency (SPEy)	12	0.983	0.985	0.845	Mod
Strategic Performance Measure of Effectiveness (SPEs)	11	0.975	0.979	0.853	Mod
Product Innovation (PODI)	5	0.925	0.944	0.771	DV
Process Innovation (POCI)	3	0.858	0.913	0.777	DV

*DV=dependent variable, IV= independent variable, Mod= moderator variable

Independent variable: strategy contents (prospector, defender, and reactor). In this study, strategy contents (prospector, defender, reactor) were measured by 12 items scale, taken from Snow and Hrebiniak (1980) and Stevens and McGowan (1983), and scaled on Likert scale (1= Not at all; 7 = Completely). A prospecting strategy was measured by a 4-item scale. The 4 items were: (1) we continually redefine our service priorities; (2) we seek to be first to identify new modes of delivery; (3) searching for new opportunities is a major part of our overall strategy; (4) we often change our focus to new areas of service provision. This 4-item measure displays acceptable levels of reliability (α=0.955; CR=0.967) and validity (AVE=0.880), as shown in supplement Table (1). A defending strategy was measured by a 3-item scale. The 3 items were: (1) we seek to maintain stable service priorities; (2) the service emphasizes efficiency of provision; (3) we focus on our core activities. This 3-item measure displays acceptable levels of reliability (α=0.920; CR=0.950) and validity (AVE=0.863), as shown in supplement Table (1). A reacting strategy was measured by a 5-item scale. The 5 items were: (1) we have no definite service priorities; (2) we change provision only when under pressure from external agencies; (3) we give little attention to new opportunities for service delivery; (4) the service explores new opportunities only when under pressure from external agencies; (5) we have no consistent response to external pressure. This 4-item measure displays acceptable levels of reliability (α=0.983; CR=0.985) and validity (AVE=0.845), as shown in supplement Table (1).

Dependent variable: In this study, innovation performance (product and process) was measured by 9 items scale, taken from Prajogo and Sohal (2003), and scaled on Likert scale (1= Not at all; 7 = Completely). A product innovation was measured by a 5-item scale. The 5 items were: (1) the level of newness (novelty) of new products; (2) the use of latest technological innovations in new product development; (3) the speed of new product development; (4) the number of new products introduced to the market; (5) the number of new products that is first-to-market (early market entrants). This 5 items measure displays acceptable levels of reliability (α=0.925; CR=0.944) and validity (AVE=0.771), as shown in supplement Table (1). A process innovation was measured by a 4-item scale. The 4 items were: (1) the technological competitiveness; (2) the updated-ness or novelty of technology used in processes; (3) the speed of adoption of the latest technological innovations in processes; (4) the rate of change in processes, techniques, and technology. This 4 items measure displays acceptable levels of reliability (α=0.858; CR=0.913) and validity (AVE=0.777), as shown in supplement Table (1).

Moderator variable: strategic performance measure (efficiency and effectiveness). In this study, strategic performance measure (efficiency and effectiveness) was measured by 22 items scale, taken from Pollanen et al., (2017), and scaled on Likert

scale (1= Not at all; 7 = Completely). Strategic performance measure of efficiency was measured by a 12 items scale, and also scaled using the same seven-points of Likert scale as above. The items included: (1) to what extent does your organization have performance measures for the Efficient use of allocated budget?; (2) to what extent does your organization have performance measures for the Quantity of products or services provided?; (3) to what extent does your organization have performance measures for the Quality of products or services provided?; (4) to what extent does your organization have performance measures for the Customer satisfaction?; (5) to what extent does your organization have performance measures for the Operating efficiency?; (6) to what extent does your organization have performance measures for the Product/service development or innovation?; (7) how important is Efficient use of allocated budget to the long-term success of your organization?; (8) how important is Quantity of products or services provided to the long-term success of your organization?; (9) how important is Quality of products or services provided to the long-term success of your organization?; (10) how important is Customer satisfaction to the long-term success of your organization?; (11) how important is Operating efficiency to the long-term success of your organization?; (12) how important is Product/service development or innovation to the long-term success of your organization? This 11 items measure displays acceptable levels of reliability (α=0.837; CR=0.891) and validity (AVE=0.671), as shown in supplement Table (1). Strategic performance measure of effectiveness was measured by an 8 items scale, and also scaled using the same seven-points of Likert scale as above. The items included: (1) to what extent does your organization have performance measures for the employee satisfaction?; (2) to what extent does your organization have performance measures for the employee capabilities?; (3) to what extent does your organization have performance measures for the social responsibilities?; (4) to what extent does your organization have performance measures for the environmental performance?; (5) to what extent does your organization have performance measures for the accountability for results to external parties?; (6) how important is employee satisfaction to the long-term success of your organization?; (7) how important is employee capabilities to the long-term success of your organization?; (8) how important is social responsibilities to the long-term success of your organization?; (9) how important is accountability for results to external parties to the long-term success of your organization? This 9 items measure displays acceptable levels of reliability (α=0.975; CR=0.979) and validity (AVE=0.853), as shown in supplement Table (1).

Results

Table 2: Total Effects

No	Relationships	Sample	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Results
1	SCP → SPEy	0.405	0.406	0.058	6.948	0.000	Supported
2	SCP → SPEs	0.538	0.538	0.058	9.307	0.000	Supported
3	SCD → SPEy	0.288	0.287	0.058	4.979	0.000	Supported
4	SCD → SPEs	0.255	0.254	0.054	4.751	0.000	Supported
5	SCR → SPEy	-0.150	-0.151	0.027	5.533	0.000	Supported
6	SCR → SPEs	-0.056	-0.057	0.025	2.270	0.023	Supported
7	SPEy → POCI	0.011	0.009	0.064	0.168	0.866	Not supported
8	SPEy → PODI	0.005	0.005	0.055	0.084	0.933	Not supported

No	Relationships	Sample	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Results
9	SPEs → POCI	0.413	0.414	0.084	4.902	0.000	Supported
10	SPEs → PODI	0.478	0.478	0.067	7.177	0.000	Supported
11	SCP → POCI	0.014	0.014	0.058	0.238	0.812	Not supported
12	SCP → PODI	0.160	0.161	0.049	3.272	0.001	Supported
13	SCD → POCI	0.010	0.008	0.052	0.187	0.851	Not supported
14	SCD → PODI	-0.105	-0.107	0.045	2.351	0.019	Supported
15	SCR → POCI	0.158	0.158	0.038	4.151	0.000	Supported
16	SCR → PODI	0.196	0.195	0.034	5.747	0.000	Supported

* Significant at $p < 0.05$, ** Significant at $p < 0.01$

Table 2 displays the key findings of the survey which indicate a significant relationship between the prospecting strategy and both efficiency and effectiveness measures of strategic performance. Likewise, the study suggests a similar relationship between defending strategy and the same performance measures. Additionally, the results of the survey reveal a strong correlation between reacting strategy and both efficiency and effectiveness measures. Despite these findings, the survey did not show any notable impact of strategic performance measures of efficiency on process innovation, nor was there a significant influence of prospecting or defending strategies on process innovation. In contrast, the study identified a robust relationship between strategic performance measures of effectiveness and both product and process innovation. Furthermore, the survey established a strong association between prospecting strategy and product innovation, as well as between defending strategy and product innovation. Lastly, the survey revealed a strong correlation between reacting strategy and both product and process innovation.

Discussion and Implications

In this comprehensive exploration, the study intricately probes the relationship between organizational contents and innovation performance, with a focal point on the unique intricacies of the Saudi Arabian context. Drawing from the resource-based view of strategic management, the research posits that strategically incorporating organizational contents—prospect, defender, and reactor—into strategies confers a substantial competitive advantage. This advantage, anchored in the adept provision of products and services at competitive prices while upholding quality, aligns seamlessly with Saudi Arabia's transformative Vision 2030 initiatives.

The findings resonate with significance, shedding light on how organizations embracing diverse organizational contents positively influence strategic performance measures, particularly efficiency and effectiveness. Delving into the Saudi Arabian landscape, nuanced dynamics surface: prospect and defender contents exhibit a paradoxical impact on innovation, while a reactor stance showcases a positive influence on both process and product innovation. The dichotomy between the adverse effects of efficiency and the positive impacts of effectiveness on innovation adds layers to the nuanced understanding of these intricate relationships within the Saudi socio-economic fabric.

In the domain of strategic management literature, this empirical contribution holds significant weight. The research posits that organizations embracing a prospecting strategy exhibit increased efficiency and effectiveness, aligning with the idea of gaining a competitive edge through adept utilization of internal resources (Barney, 1991). These findings reinforce earlier studies associating prospecting strategy

with crucial organizational performance indicators, resonating with the changing economic landscape and Vision 2030 objectives. Moreover, they support previous research indicating a positive correlation between a prospecting strategy and organizational performance indicators like profitability, growth, innovation, and customer satisfaction (Miles & Snow, 1978; Venkatraman, 1989; Zahra & Covin, 1995).

However, this discovery challenges some studies reporting mixed or negative effects of a prospecting strategy on performance outcomes such as market share, return on assets, and survival (Hambrick, 1983; Miller & Friesen, 1986; Dess & Davis, 1984). The study addresses this gap by employing a comprehensive measure of strategic performance encompassing both efficiency and effectiveness dimensions. This insight carries practical implications for managers, practitioners, policymakers, and other stakeholders who can leverage the study's results. It implies that organizations can enhance their strategic performance by incorporating a prospecting strategy as part of their overall approach. This entails a continued focus on innovation, the development of new business models, active pursuit of entrepreneurial ideas, prioritization of transforming these ideas into innovative products and services, and swift entry into new markets while remaining adaptable to meet customer needs.

These practical implications extend into the heart of Saudi Arabia's dynamic landscape, offering tailored insights for organizations navigating Vision 2030 initiatives. The strategic adoption of prospecting strategies is highlighted as a pathway to elevate performance, emphasizing continuous innovation, the development of new business models, and agile market entry.

On the flip side, organizations that embrace a defending strategy reap benefits through a positive correlation with efficiency and effectiveness, aligning seamlessly with Saudi Arabia's vision for economic stability, quality enhancement, and customer retention. This customized approach empowers organizations to competently navigate price and quality competition, enhance the efficiency of their current products and services, and yield positive returns in both the short and long term. This discovery aligns with existing literature suggesting that a defending strategy is linked to elevated levels of cost efficiency, quality improvement, customer retention, and profitability (Miles & Snow, 1978; Venkatraman, 1989; Zahra & Covin, 1995).

However, this revelation contradicts certain studies indicating that a defending strategy may correlate with lower levels of innovation, market share, growth, and survival (Hambrick, 1983; Miller & Friesen, 1986; Dess & Davis, 1984). The study resolves this inconsistency by employing a comprehensive measure of strategic performance that encompasses both efficiency and effectiveness dimensions. Additionally, it controls for various contextual factors that may influence the relationship between strategy contents and performance. Consequently, the study findings suggest that integrating a defending strategy into an organization's overall approach can be advantageous for those operating in stable and predictable environments. In such settings, organizations can leverage existing resources and capabilities to maintain or enhance their competitive position. By consistently seeking new ideas to optimize operational efficiency, promptly introducing developed products and services into existing or new markets, and refining existing business models, organizations can attain both efficiency and effectiveness measures of strategic performance, ultimately leading to positive returns on investment.

Another significant revelation from this study with crucial practical implications for organizations lies in the positive correlation between embracing a reacting strategy and measures of strategic performance, specifically efficiency and effectiveness. This implies that responding to external environmental pressures can propel organizations to evolve and enhance their existing products and services, resulting in favorable returns over both the short and long term. This finding holds particular relevance in light of the distinctive challenges posed by unpredictable environments, as seen in Saudi Arabia.

Consistent with existing literature, the study suggests that a reacting strategy stance is linked to elevated levels of adaptability, responsiveness, flexibility, and resilience (Miles & Snow, 1978; Venkatraman, 1989; Zahra & Covin, 1995). However, it also challenges certain studies indicating that a reacting strategy may correlate with lower levels of innovation, differentiation, growth, and survival (Hambrick, 1983; Miller & Friesen, 1986; Dess & Davis, 1984). The study addresses this contradiction by employing a comprehensive measure of strategic performance that encompasses both efficiency and effectiveness dimensions. Moreover, it takes into account various contextual factors that may influence the relationship between strategy contents and performance.

Therefore, the study findings suggest that integrating a reacting strategy into an organization's overall approach can be advantageous, particularly for those operating in turbulent and unpredictable environments. In such settings, organizations can leverage their existing resources and capabilities to effectively cope with changes and challenges. By adeptly responding to external environmental pressures, organizations can enhance the efficiency and effectiveness of their current products and services, ultimately leading to positive returns on investment.

In essence, the affirmative impact of prospecting, defending, and reacting strategies on various performance measures underscores the strategic imperative for organizations to meticulously align strategies with the nature of their business and the unique Saudi Arabian external environment. Continuous improvement and innovation emerge as paramount for maintaining competitiveness.

Looking beyond its theoretical implications, the study emphasizes a positive correlation between the effectiveness of strategic performance measures and innovation performance. In the evolving economic landscape and amidst Saudi Arabia's Vision 2030 initiatives, organizations can enhance their effectiveness by strategically investing in both process and product innovation.

This discovery aligns with previous studies (e.g., Helfat et al., 2020; Osiyevskyy & Dewald, 2020) exploring the connection between innovation performance and strategic performance measures of organizations. Helfat et al. (2020), for instance, found that firms investing in innovation achieved superior long-term performance, with a more pronounced positive effect for those focusing on both product and process innovation. Similarly, Osiyevskyy and Dewald (2020) identified a positive relationship between innovation performance and the financial performance of firms, suggesting that investing in both process and product innovation can enhance effectiveness. These yields benefit such as cost reduction, improved quality, heightened customer satisfaction, differentiation from competitors, market expansion, and the creation of new value propositions.

In contrast to the positive relationship between effectiveness and innovation performance, the study observes a less-documented negative relationship between efficiency and innovation performance. The emphasis on efficiency and cost-cutting may hinder innovation efforts, consistent

with earlier research (Matsuyama, 2018). For instance, Matsuyama (2018) found that firms pursuing cost leadership strategies tended to exhibit lower levels of product innovation compared to those adopting differentiation strategies. Conversely, other studies have identified a positive relationship between efficiency and innovation when firms embrace efficient innovation practices like lean management, open innovation, frugal innovation, and agile development (Kafouros et al., 2018). This suggests that the relationship between efficiency and innovation is complex and context-dependent, necessitating a careful balancing act for optimal performance.

These findings hold significant practical implications for organizations seeking to enhance their strategic performance through investments in both efficiency and innovation. It implies that organizations should adopt a contingency approach, taking into consideration their external environment, internal resources, capabilities, and goals. By doing so, organizations can achieve both efficiency and effectiveness measures of strategic performance, ultimately leading to positive returns on investment. This nuanced analysis serves as a strategic guide, offering a detailed roadmap for organizations navigating the intricacies of Saudi Arabia's economic landscape and contributing significantly to the national vision for economic transformation.

Conclusion

This study explored the relationship between strategy contents (prospecting, defending, and reacting) and strategic performance measures (efficiency and effectiveness), as well as the connection between strategic performance measures and innovation performance. This approach makes the study one of the first to look at these relationships comprehensively. The main research question of the study was to examine how different strategy contents affect strategic performance measures (efficiency and effectiveness), and how strategic performance measures (efficiency and effectiveness) affect innovation performance, which encompasses both process and product innovation. The findings showed that different strategy contents had different impacts on efficiency and effectiveness, and that efficiency had a positive impact on innovation performance, while effectiveness had a negative impact. This may be explained by the fact that there is often divergence between the strategy contents adopted by organisations, which can influence their efficiency, effectiveness, and innovation performance. The study contributes to the literature on strategy contents, strategic performance, and innovation performance by providing new insights and evidence on these relationships. The study also has practical implications for managers, practitioners, policymakers, or other stakeholders who can benefit from or apply the results of this study. The study suggests that organisations should adopt a contingency approach to strategy contents, depending on their external environment, internal resources, capabilities, and goals. By doing so, organisations can balance their efficiency and effectiveness, and enhance their innovation performance. The study also provides some recommendations on how to implement or use the findings of this study in practice. To expand on these findings, future studies should focus on identifying under what circum contents strategy contents such as prospect and defender can have a positive impact on process innovation. Furthermore, it would be beneficial to examine which strategy contents, whether it be prospect, defender, or reactor, have a greater positive impact on product innovation. It is important to note that the main limitation of this study was the narrow sample, which only included or-

ganisations from Saudi Arabia. Thus, caution should be taken in generalizing these findings to other countries in the Middle East or Arab region. Overall, the study's findings highlight the importance of carefully considering the adoption of different strategy contents in order to improve strategic performance measures and innovation performance.

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Revisiting the interest rate, foreign exchange rate, and bank stock return nexus in Saudi Arabia: evidence from the wavelet approach

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Abstract: This study analyzes the relationship between interest rates, exchange rates, and the bank stock return in Saudi Arabia. We use both traditional and novel wavelet analyses to revisit how these macroeconomic variables interact and influence each other in short-, mid-, and long-term periods, and during specific crisis events such as the COVID-19 pandemic and the Ukraine-Russia conflict. The results reveal that all the variables are significantly related in the long and short term, while the interaction among the variables differs over time and frequency domains. In particular, interest rates displayed high volatility during COVID-19, while exchange rates and the banking index showed lower volatility. In addition, interest and exchange rates demonstrated a positive correlation and increased volatility from 2018 to 2020, with the return of the banking index taking a leading position during the COVID-19 pandemic. Overall, this study highlights the risks and opportunities for Saudi Arabia's distinctive dual banking system arising from macroeconomic fluctuations. Policymakers, regulators, and bankers can utilize these insights to make informed strategic and operational decisions regarding their approach to the country's dynamic economic environment and distinct banking landscape.

Keywords: Saudi Arabia, Saudi banks, Interest rate, Foreign exchange, Wavelet analysis.

إعادة النظر في العَلاقة بين سعر الفائدة وسعر صرف العملات الأجنبية وعوائد أسهم البنوك في المملكة العربية السعودية: منهجية تحليل الموجات

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(قُدِّم للنشر 1445/05/23هـ – وقُبِل 1445/09/08هـ)

المستخلص: تحلل هذه الدراسة العَلاقة بين أسعار الفائدة وأسعار الصرف وعائد أسهم البنوك في المملكة العربية السعودية. نحن نستخدم تحليلات الموجات التقليدية والجديدة لإعادة النظر في كيفية تفاعل متغيرات الاقتصاد الكلي هذه وتأثيرها على بعضها البعض، في فترات قصيرة ومتوسطة وطويلة الأجل، وخلال أحداث أزمات محددة مثل جائحة كوفيد-19 والأزمة الأوكرانية الروسية. أظهرت النتائج أن جميع المتغيرات ترتبط ارتباطاً وثيقاً على المدى الطويل والقصير، في حين يختلف التفاعل بين المتغيرات على مدى الزمن والمجالات التكرارية. وعلى وجه الخصوص، أظهرت أسعار الفائدة تقلبات عالية خلال أزمة كوفيد-19، في حين أظهرت أسعار الصرف والمؤشر المصرفي تقلبات أقل. إضافة إلى ذلك، أظهرت أسعار الفائدة وأسعار الصرف ارتباطًا إيجابيًا وزيادة في التقلبات من عام 2018 إلى عام 2020، مع عودة المؤشر المصرفي ليحتل مكانة رائدة خلال جائحة كوفيد-19. عمومًا، تسلط هذه الدراسة الضوء على المخاطر والفرص التي يواجهها النظام المصرفي المزدوج المميز في المملكة العربية السعودية والناجمة عن تقلبات الاقتصاد الكلي. يمكن لواضعي السياسات والمنظمين والمصرفيين الاستفادة من هذه الأفكار لاتخاذ قرارات استراتيجية وتشغيلية مستنيرة فيما يتعلق بنهجهم تجاه البيئة الاقتصادية الديناميكية للبلاد والمشهد المصرفي المتميز.

الكلمات المفتاحية: المملكة العربية السعودية، البنوك السعودية، سعر الفائدة، سعر صرف العملات الأجنبية، تحليل الموجات.

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1. Introduction

Ross (1976) proposed the Arbitrage Pricing Theory (APT), which assumes that several systematic factors, in addition to the market factor, are responsible for the substantial variation in stock returns. Several systematic factors have been shown to be empirically associated with stock returns. These factors include fluctuations in interest rates, exchange rates, inflation rates, the industrial production index, gold prices, oil prices, etc. However, capital flows, which can affect a country's economic growth, are strongly influenced by the performance of the stock market and macroeconomic variables such as foreign exchange and interest rates (Aydemir & Demirhan, 2017). The Saudi Arabian Capital Market Authority (CMA) aims to increase foreign investment in Saudi equity markets. In 2016, the CMA amended the rules governing investments by foreign financial institutions in listed securities. Foreign ownership has increased by 51.33% of the average annual return from USD 26.67 billion in 2019 to USD 92.43 billion in 2022. However, apart from the fact that banks' performance depends on the movements in interest and exchange rates, Saudi banks have the greatest influence on the overall Saudi market index. The Saudi Arabian banking sector operates under a dual banking system in which both conventional and Islamic banks coexist and compete, with assets of USD 965.59 billion in 2022. The Islamic Financial Services Board (2023) reports that Saudi Islamic banks' assets account for 30.6% of the global Islamic banking market, making Saudi Arabia home to the largest Islamic bank in the world (Al-Rajhi Bank). The Saudi Stock Exchange, also known as Tadawul, is a major capital market, ranking among the ten largest in the world. As of the end of 2022, its market capitalization totalled USD 2,634.16 billion.

The relationship between fluctuations in interest rates, foreign exchange, and bank stock returns has been studied in the literature from a time domain perspective, using a variety of time series methods. These methods vary from typical OLS regression analysis to more advanced techniques such as ARCH/GARCH and vector autoregressive (VAR) models. However, although there have been significant improvements in modelling methods, the potential impact of factors such as the investment period on the relationships between interest rates, foreign exchange, and stock market returns has been overlooked. The behaviour of the overall market is determined by the choices made by thousands of diverse agents across a range of time periods (from seconds to years) in financial security markets like the bond and stock markets. According to Moya-Martínez et al. (2015), day traders, who have a short investment horizon, often speculate and make decisions based on transitory events such as earnings surprises, merger announcements, market sentiment, and psychological considerations, while long-term investors such as large institutional investors invest more actively and study macroeconomic factors such as the business cycle, inflation, monetary policy, and so on. In this situation, the wavelet method, which considers both the time and frequency domains simultaneously, appears to be an extremely attractive option. Unlike time-domain methods that combine all time horizons, wavelet analysis is a relatively new and powerful signal processing tool, at least in the context of finance, that offers a unique opportunity to study the interdependence between financial time series in time-frequency space (Ferrer et al., 2016).

In this study, a wavelet coherence analysis and a spectrum-variance wavelet analysis are used to examine the relationship between changes in interest rates, exchange rates, and the Saudi banking index. The main research question of the study is whether and how the investment horizon affects the relationship between interest rates, exchange

rates and the Saudi banking index. According to Alsharif (2023), the analysis of the GARCH model showed that the volatility of interest rates and exchange rates significantly increases the volatility of Saudi banks' returns. However, according to Grinsted et al. (2004), the use of wavelet analysis allows the study of coherence and co-movements across different frequencies and time horizons. Wavelet analysis can detect relationships between financial time series at different time intervals and cyclical components (frequencies), giving regulators and traders insight into how these relationships form and evolve over time, not just whether or not they exist (Almaskati, 2022). The strength and pattern of linkages can change over time, so wavelet analysis provides a more nuanced and time-varying view of interdependencies compared to traditional approaches. This can help regulators with surveillance, managers with hedging and risk management, and traders with exploiting potential opportunities. In short, wavelet analysis provides a valuable tool for revealing timescale-dependent relationships in economic and financial data.

This study extends previous research in several ways. First, to the authors' knowledge, this is the first study to analyze the relationship between interest rate, exchange rate, and the banking index in Saudi Arabia using wavelet analysis. Second, the study focuses on an emerging market country with the largest dual banking system in the world. Third, the study includes four measures of interest rates and high-frequency daily data from 2016 through 2022 to strengthen the robustness of the findings. Finally, the study provides new insights into the risks and opportunities arising from the macroeconomic fluctuations that Saudi banks face. The findings could help policymakers, regulators, and banking executives assess vulnerabilities, adjust risk management, and make strategic decisions regarding operations in Saudi Arabia's distinct dual banking system and economy.

The following is the structure of the study: Section 2 discusses the previous literature, while Section 3 explains the research methodology and data. The empirical results are addressed in Section 4. The study's key findings are summarized and outlined in Section 5.

2. Literature review

The Efficient Market Hypothesis (EMH) states that any event that affects a company's cash flow is accurately reflected in its stock prices. According to Reilly and Brown (2011), the rapid spread of information in markets results in stock prices that are expected to comprehensively and precisely reflect all available information, both past and present. Therefore, several studies have examined the relationship between interest rates, exchange rates, and bank stock returns using different methods. The impact of interest rate changes on 56 banks in the United States was studied by Mansur and Elyasiani (1995). The study used the ARCH model and analyzed data from 1979 to 1992. Long-term interest rates were found to have a more significant negative impact on bank stock returns than their shorter-term counterparts. In addition, Elyasiani and Mansur (1998) used the GARCH-M model to evaluate how changes in interest rates and volatility at U.S. banks affect bank stock returns. The study revealed that there is a statistically significant negative relationship between interest rate returns and bank stock returns. Additionally, an increase in interest rate volatility was found to be associated with a decrease in bank stock volatility. Paul and Mallik (2003) conducted a study in Australia for the period 1980 to 1999, performing macroeconomic analysis and examining variables such as inflation, interest rates, and GDP. The study employed

cointegration tests and an error correction model to investigate the long-term association between macroeconomic variables and the return of banking and finance stock prices. The findings of the study indicate that there is a cointegration between banking and finance stock returns and the three macroeconomic factors. The influence of interest rates was negative, while the influence of GDP growth was positive. However, the influence of inflation on stock returns was found to be insignificant. Additionally, Mouna and Anis (2016) used the GARCH extension model to examine the relationship between macroeconomic variables (market yields, interest rates, and exchange rates) and the returns on stock of financial institutions in eight different markets from 2006 to 2009. For German, U.S., and Italian banks, exchange rates were positively related to their stock returns, whereas for U.K. banks, they were adversely related to their stock returns. In addition, bank stock returns were negatively affected by changes in short-term interest rates in Greece and France, but positively in the United States and Spain. However, it was found that for long-term interest rates, Italian banks significantly experienced a negative effect, whereas American and French banks significantly experienced a positive effect.

However, from an emerging market perspective, using the OLS and GARCH estimating models, Kasman et al. (2011) examined the impact of interest rate and exchange rate fluctuations on Turkish banks' stock returns from 1999 to 2009. They concluded that bank stock volatility is highly correlated with interest rate and exchange rate volatility and that changes in interest rates and exchange rates are negatively associated with Turkish bank stock returns. Using a pooled OLS panel estimator, Nurazi and Usman (2016) analyzed the impact of macroeconomic factors like interest rate, exchange rate, and inflation rate, as well as CAMEL financial ratios, on bank stock returns in Indonesia between 2002 and 2011. All macroeconomic variables were found to have a significant negative effect on Indonesian bank stock returns, although financial parameters had different effects on bank performance. Bui and Nguyen (2021) used a hybrid approach involving Bayesian model analysis with the least-absolute shrinkage and selection operator (LASSO) from 2012 to 2018 to examine the effects of exchange rate and interest rate variables on the performance of bank stocks in Vietnam. The study showed that the impact of interest rates was adverse and statistically significant, while the impact of exchange rates was negligible or nonexistent. Recently, Alsharif (2023) used the GARCH model to analyze stock returns and volatility of Saudi Arabian banks from 2010 to 2019 in light of the effects of changes in exchange rates and interest rates. He pointed out that conventional Saudi banks benefited from higher exchange rate returns, while Islamic Saudi banks suffered. The author also found that Saudi banks' stock returns were positively related to interest rate returns, suggesting that Saudi banks' assets are more sensitive to interest rate fluctuations than their liabilities. Finally, the study found that higher volatility in exchange rates and interest rates led to higher volatility in Saudi banks' returns. Thus, the preceding literature shows that there should be a relationship between interest rates, exchange rates, and bank share prices. The present research, therefore, contributes to the literature by analyzing the relationship between interest rates, exchange rates, and the banking index in Saudi Arabia using wavelet analysis.

3. Methodology

3.1 Data

In this study, we use daily data to explore the dynamic time- and frequency-based short-term, medium-term, and long-term relationships between variables. We also examine the lead-lag or causality relationship between the interest rate, exchange rate, and stock index of the banking sector in Saudi Arabia. In this study, we use a time series of daily data covering the period from January 2016 to December 2022. To the best of our knowledge, the dynamic relationship between the interest rate, exchange rate, and banking sector stock index in Saudi Arabia using the wavelet approach has not been investigated in the existing literature.

3.2 Theoricial underpining

In this study, we investigate the relationship between the interest rate, exchange rate, and stock price return of the banking sector in Saudi Arabia using a dynamic wavelet approach, which is in line with wavelet theory. Wavelet theory provides a mathematical framework that is widely applied in finance literature. Moreover, it provides signals and images based on both physics and economics, in terms of border aspects. It contracts different functions and operates with small waves that are localized in both the time and frequency domains. Unlike the Fourier approach, wavelet has a large

3.3.1 Wavelet variance analysis

The other name for the wavelet power spectrum is wavelet variance analysis. It represents the distribution of the power of a signal across both time and frequency family, commonly known as Daubechies wavelets, Haar wavelets, and Morlet wavelets. However, wavelet transformation contains mainly two forms of continuous wavelet transform, which are shortly called CWT and DWT (e.g. discrete wavelet transform). Wavelet theory contributes in numerous ways to financial literature on time-frequency analysis, decomposing or recomposing with image compression, and signal processing of datasets. Finally, wavelet theory captures a powerful framework for analyzing signals and images at diverse scales and resolutions, making it a valuable tool not only in economics but also in scientific and engineering disciplines (Ali et al., 2021).

3.3 Model specification

In this study, we used wavelet variance and coherence analyses. The advantage of this approach is that it is essentially based on the dynamic properties of the time and frequency domains (Sahabuddin, Hassan, et al., 2022). It is also popular because of its non-parametric nature (Sahabuddin, Islam, et al., 2022). It can overcome the disadvantages of stationarity and non-stationarity of time-series data. Similarly, we can apply this approach to time series raw or non-stationary data, as well as natural log-based stationary data (Mutascu et al., 2022). However, to determine the lead-lag or causal relationship between variables, this approach is often used (Ali et al., 2021; HUNG, 2020; Umar & Gubareva, 2020). In this section, the wavelet approach is briefly discussed.

domains. It computes both the CWT and DWT; however, the wavelet variance formula for the continuous wavelet transform is as follows:

$$Var\ (a) = \int_{-\infty}^{\infty} [w(a,\tau)]^{2}\, d\tau \qquad (1)$$

where, $Var\ (a)$ denotes the wavelet variance, $w(a,\tau)$ exhibits the wavelet transform coefficient for scale a and localization τ. This formula defines the squared magnitude of the wavelet coefficients over all positions. This provides valuable insights into how the power of a signal is distributed across different scales and frequencies. Higher values in the wavelet power spectrum detect regions of the signal that have more power at certain scales and frequencies.

3.3.2 Wavelet coherence analysis

Wavelet coherence analysis is a widespread and popular statistical measure used to quantify the degree of dynamic association between two time series as a function of both time and frequency. It is predominantly useful for analyzing time-varying relationships between non-stationary and stationary data or signals, allowing scholars to identify periods of significant correlation between signals across different frequencies. The formula for the wavelet coherence transform is as follows:

$$WCT_{xy\,(\alpha,\,\tau)} \frac{\left[\, W_x\,(\alpha,\tau)\overline{W_{y\,(\alpha,\tau)}}\,\right]}{\sqrt{P_{x\,(\alpha,\tau)}.P_{y(\alpha,\tau)}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, WCT xy (a,τ) represent the wavelet coherence between signals x(t) and y(t) at scale α and position τ, $W_x\ (\alpha,\tau)$ and $W_{y\,(\alpha,\tau)}$ denotes the wavelet transform coefficient of signals x(t) and y(t) at scale α and position τ respectively. Moreover, $\overline{W_{y\,(\alpha,\tau)}}$ express the complex conjugate of $W_{y\,(\alpha,\tau)}$.

Wavelet coherence also provides a multi-dimensional casual direction between two variables or series. It can be visualized as a two-dimensional plot, where one axis denotes time, while the other axis exhibits frequency or scale. The coherence value ranges from 0 to 1, with higher (lower) values. Higher values indicate a stronger correlation between the signals at the corresponding frequency and time, and a lower value indicates a lower correlation (e.g., better portfolio diversification avenues) between the signals at the corresponding scale and time.

4. Results and discussion

4.1 Preliminary analysis

Data for this study were obtained from the Argaam database. For the interest rate, we used the Saudi Arabia interbank interest rate for 1 month, 3 months, 6 months, and 12 months. We also used data from the Saudi Arabian Banking Index and the Saudi Riyal-to-USD exchange rate. However, our study shows performance movement in response to time horizons. Our study covers two crises (e.g., COVID-19 and the ongoing Ukraine-Russia conflict), which express variation among the variables over the period. Figure 1 shows the time patterns of the interbank rate, banking index, and exchange rate of the riyal to the USD in Saudi Arabia. The results show that COVID-19 and the Ukraine-Russia conflict have significant effects on all variables (Shaik et al., 2023). However, we found that the COVID-19 period has higher volatility than the Russia-Ukraine conflict period (Gaio et al., 2022).

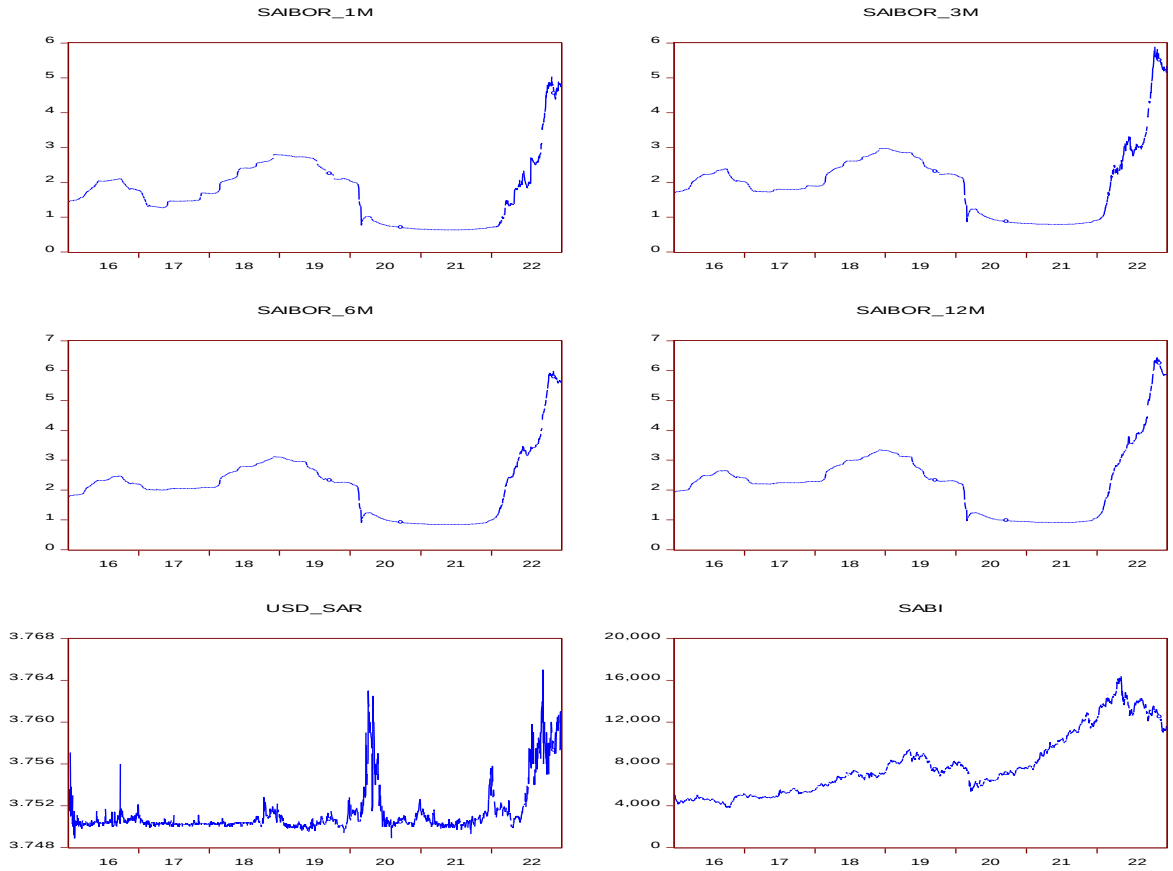


Fig. 1: Time patterns of the varisbles

Note: SAIBOR_1M = Saudi Arabia Interbank interest rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank return.

4.2 Properties of descriptive Statistics

Table 1 presents the descriptive statistics. The results show that the bank index return provides a better mean return, while the 1-month interbank rate has the highest volatility. All the return series reject the properties of a normal distribution at a significance level of 1%. Moreover, all variables rejected leptokurtic properties due to positive skewness, except for the riyal exchange rate. Our study applies the augmented Dickey–Fuller test to determine the stationary and non-stationary properties of all series, and the results show that all variables fulfilled the criteria of stionarity at the 1% significance level. Table 2 presents the results of the correlation matrix of the observed variables. The findings indicate that the exchange rate and bank returns are negatively correlated with interest rates, while the 6-month interbank offered interest rate is strongly correlated with the 12-month interbank offered interest rate.

Table 1: Descriptive statistics

	SAIBOR_1M	SAIBOR_3M	SAIBOR_6M	SAIBOR_12M	USD_SAR	SABI
Mean	-0.0297	-0.0286	-0.0286	-0.0277	0.0000	-0.0206
Std. Dev.	0.8726	0.6715	0.5285	0.4797	0.0081	0.5514

	SAIBOR_1M	SAIBOR_3M	SAIBOR_6M	SAIBOR_12M	USD_SAR	SABI
Skewness	6.7131	12.1880	16.7594	14.5740	-1.7803	0.7319
Kurtosis	311.4127	344.7329	520.6264	426.5408	54.3374	9.8871
Jarque-Bera	6936948.0000	8543963.0000	19585366.0000	13119712.0000	192767.9000	3608.6630
Obs.	1747	1747	1747	1747	1747	1747
ADF	-10.51(-2.86)***	-8.35(-2.86)***	-7.56(-2.86)***	-8.19(-2.86)***	-22.92(-2.86)***	-37.57(-2.86)***

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

Table 2: Correlation matrix

	SAIBOR_1M	SAIBOR_3M	SAIBOR_6M	SAIBOR_12M	USD_SAR	SABI
SAIBOR_1M	-					
SAIBOR_3M	0.6766	-				
SAIBOR_6M	0.7249	0.8149	-			
SAIBOR_12M	0.7201	0.7867	0.9172	-		
USD_SAR	-0.0185	-0.0258	-0.0290	-0.0291	-	
SABI	-0.0564	-0.0418	-0.0337	-0.0576	0.0085	-

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

4.2 Unit root test analysis

The ADF technique is an econometric estimation process that determines whether the dataset is stationary or non-stationary. In particular, it is applied in conjunction with econometric models for time-series investigations. The null hypothesis describes unit root presence or nonstationarity among the variables, and the alternative hypothesis confirms stationarity among the variables. If the p-value is less than the 5% significance level, it rejects the null hypothesis and indicates that the variables are stationary. Table 3 shows the unit root test results, which show that all variables are stationary at the first difference because they meet the criteria of p-value less than the 5% significance leve.

Table 3: Unit root test

Variables	Level		First difference	
	t-value	p-value	t-value	p-value
SAIBOR_1M	0.3579	0.9811	-10.4297	0.0000
SAIBOR_3M	0.1922	0.9721	-7.4773	0.0000
SAIBOR_6M	0.0767	0.9639	-7.3151	0.0000
SAIBOR_12M	-0.0242	0.9552	-6.9306	0.0000
USD_SAR	-2.2852	0.1770	-22.8840	0.0000
SABI	-0.6776	0.8503	-38.0725	0.0000

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

4.3 Long term estimation

Given that not all variables are integrated of order I(0) at level; however, all variables are integrated at I(1) at the first difference, we use a co-integration approach for the long-term estimation. Table 4 presents the results of the long-term estimation. The trace and maximum eigenvalue estimations provide the long-term relationship among the variables over the periods since the p-value captures a positive and significant value at the 5% significance level.

Table 4: Long term estimation (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.031455	154.6691	95.75366	0.0000
At most 1 *	0.024924	99.12240	69.81889	0.0000
At most 2 *	0.015542	55.25492	47.85613	0.0086
At most 3	0.008487	28.03123	29.79707	0.0788
At most 4	0.006006	13.21863	15.49471	0.1070
At most 5	0.001581	2.749215	3.841466	0.0973

** denotes rejection of the hypothesis at the 0.05 level,*
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

Long term estimation (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.031455	55.54675	40.07757	0.0004
At most 1 *	0.024924	43.86748	33.87687	0.0023
At most 2	0.015542	27.22369	27.58434	0.0555
At most 3	0.008487	14.81260	21.13162	0.3022
At most 4	0.006006	10.46941	14.26460	0.1829
At most 5	0.001581	2.749215	3.841466	0.0973

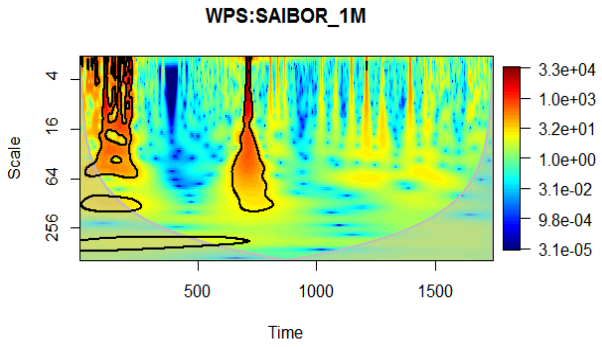
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

Moreover, the short-term estimation from the ECM model provides a negative coefficient value, which indicates a short-term relationship among the variables (see appendix-1). However, the relationship varies over the long run among variables. For example, the 3 months, 12 months interest rate and foreign exchange rates have a positive impact, while 6 month interest rate and bank stock returns suggest a negative impact on 1 month interest rate variables (see Appendix-1).

4.4 Wavelet power spectrum (WPS)

We also used the WPS approach, which is popular for measuring the variance of a single variable. It provides image-based results by considering the characteristics of time and frequency domains. Figure 2 presents the results of the wavelet-based variance, where the vertical axis represents time and the horizontal axis represents the frequency domain features. The WPS results are represented by different color codes. For example, the red region represents high variance, the yellow region represents medium variance, and the blue region represents low variance. The results show that the interbank offered rate exhibits high variance during the pandemic and comparatively low variance during the Ukraine-Russia conflict. These findings are consistent with those of previous studies (Batten et al., 2023; Karamti & Jeribi, 2023;

Taera et al., 2023; Tetteh & Ntsiful, 2023). However, the Riyal exchange rate in USD and the return on the bank index showed low variance during the COVID-19 pandemic. During the pandemic, the supply chain was restricted, and normal business operations were suspended (Samadi et al., 2021). Therefore, exchange rate fluctuations were stable during the pandemic. On the other hand, banks' interest rates fluctuated due to the adjustment of the government's monetary policy (Gholami & Abdul-Rahman, 2022).



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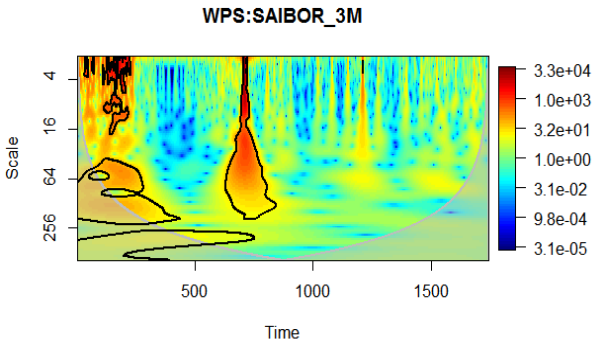

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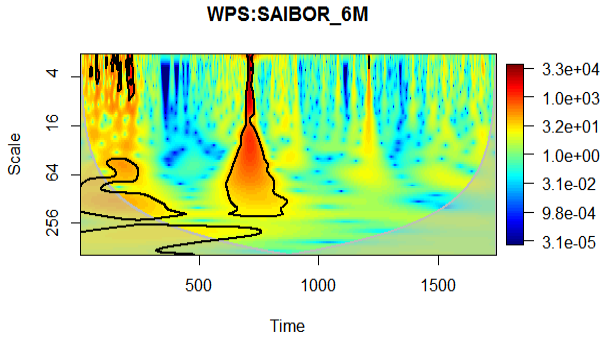

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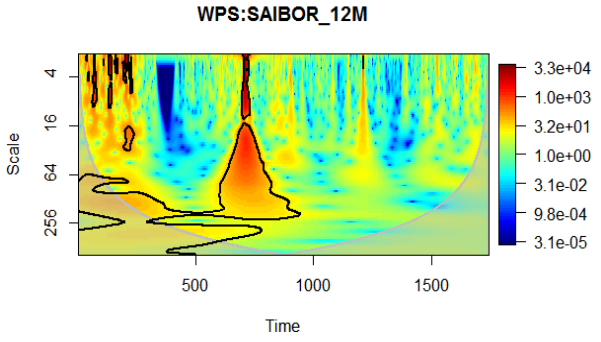

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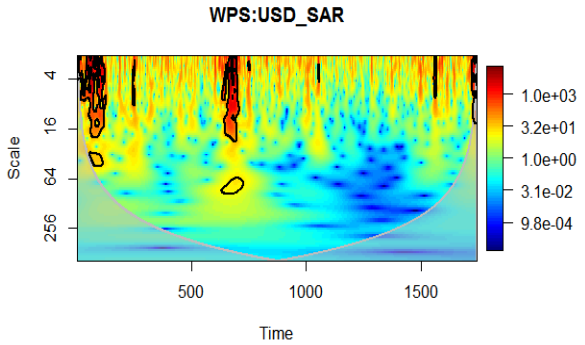

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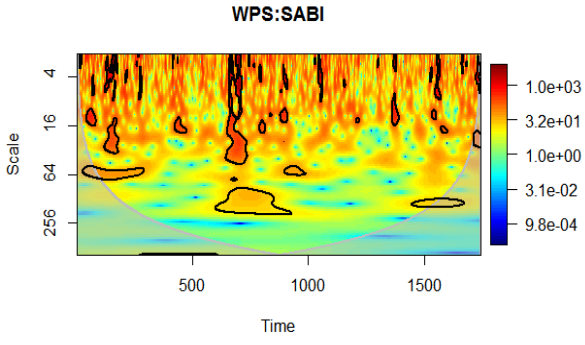

2018/500 2020/1000 2022/1500

Fig. 2: Wavelet power spectrum results for the *Saudi Arabia Interbank offred Rate for 1, 3, 6, and 12 months, Saudi Arabia Riyal Exchange rate in USD, and Bank Index return.*

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

4.5 Wavelet coherence transformation (WCT)

We also investigated the dynamic relationship between the interbank interest rate, foreign exchange (USD/Saudi Riyal exchange rate), and bank index returns during the study period. Figure 3 presents the results of the wavelet coherence between the interest rate and the bank index return. The results show that the interest rate and return on the bank index are weakly correlated in the short holding period at the 4–16 band scales or frequencies. However, the interbank interest rate is strongly correlated with the bank index return in the long run at the 64–256 band scale. A positive co-movement was observed in the years 2018–2020. This trend continues until the COVID-19 period for each 1–12M interbank offered rates. However, compared to the other yields, the 1M interbank offered rate has a stronger long-term influence on the yield of the bank index (e.g., 64–256 band spaces). This result could justify the status of Saudi Arabian commercial banks' mortgage loans. The assets, loans, and deposits of Saudi Arabian commercial banks have grown significantly in recent years (Alsharif, 2020, 2021). Therefore, banking index returns and banks' interest rates are positively correlated in the long run. Interestingly, the impact or correlation between the interbank interest rate and the bank index return during the Ukraine-Russia conflict is comparatively lower in the long run, with 16–64 band spaces. Furthermore, Figure 3 shows that a lead-lag relationship exists between the interbank interest rate and the bank index return. The results reveal that the second variable (e.g., the bank index yield) takes a leading position during the holding period 2018–2020, as the left arrow points downwards (↘) and the right arrow points upwards.

Figure 4 exhibits the results of the wavelet coherence between the interbank interest rate and exchange rate of Saudi Arabia. The results reveal that the interest rate and exchange rate are positively correlated and highly volatile during the long holding period (e.g., 2018–2020). This trend also continues until the COVID-19 period for each 1–12M interbank rate. Similarly, the 1M interbank offered rate has a stronger long-term influence on the yield of the bank index (e.g., 64–256 band spaces). Moreover, the lead-lag analysis exhibits that the exchange rate takes a leading position in this context, as the left arrow points downwards. This could be due to the characteristics of fluctuation in the properties of the time-frequency domain, increasing uncertainty and geopolitical risk, and the impact of monetary policy (Raza Rabbani et al., 2023).

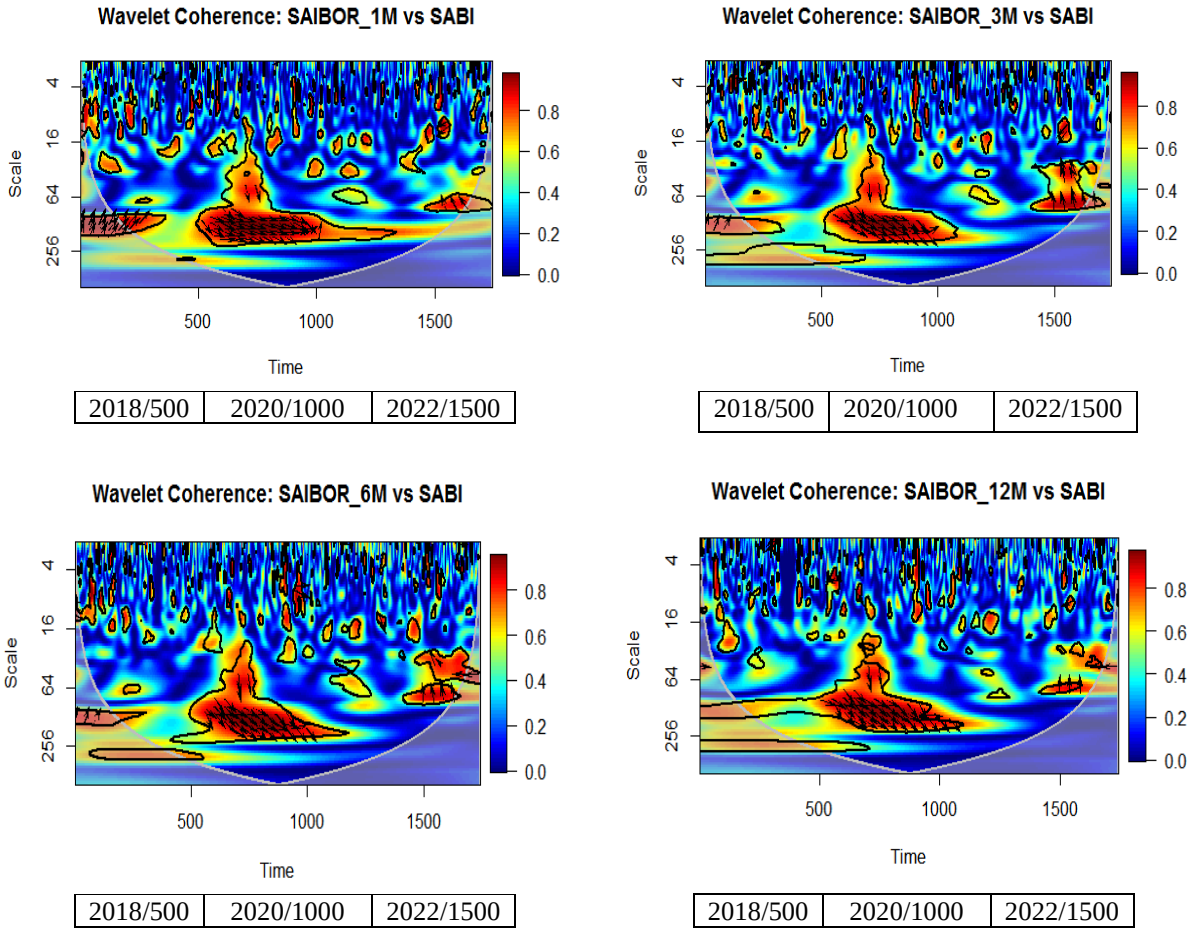

Fig. 3: Wavelet coherence results for one month vs. bank index return, *interbank offered rate for 1 month vs bank index return, interbank offered rate for three months vs. bank index return, interbank offered interest rate for six months vs. bank index return, and interbank offered interest rate for 12 months vs. bank index return.*

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

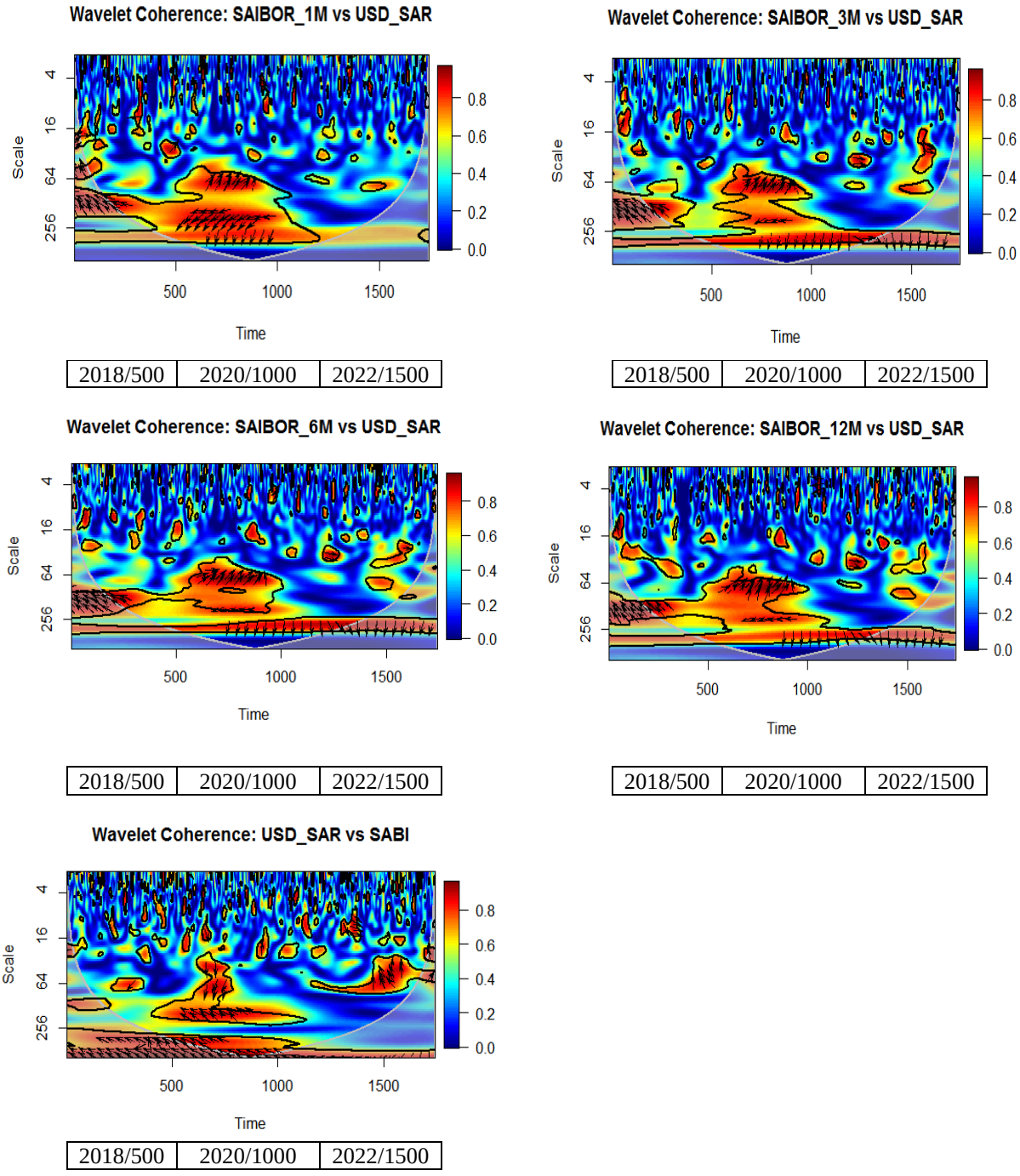

Fig. 4: Wavelet coherence results for the *Saudi Arabia Interbank Offred Rate for 1 month vs. Riyal exchange rate, interbank offered rate for 3 months vs. Riyal exchange rate, interbank offered interest rate for 6 months vs. Riyal exchange rate, interbank offered interest rate for 12 months vs. Riyal exchange rate, and* the *Saudi Arabia Riyal exchange rate vs. bank index return.*

Note: SAIBOR_1M = Saudi Arabia Interbank Offred Rate for 1 month; SAIBOR_3M = Saudi Arabia Interbank Rate for 3 months; SAIBOR_6M = Saudi Arabia Interbank Rate for 6 months; SAIBOR_12M = Saudi Arabia Interbank Rate for 12 months; USA/SAR = Saudi Arabia Exchange rate in USD; SABI = Saudi Arabia Bank Index price.

5. Conclusion

This study analyzes the relationship between interest rates, exchange rates, and bank stock returns in Saudi Arabia by using wavelet analysis. The results show a significant relationship between the variables in the short and long run, considering the characteristics of the time domain. However, the dynamic relationship varies in both time- and frequency-domain properties. In particular, it can be seen that the interbank offered rate has a high variance during the COVID-19 pandemic and a comparatively low variance during the Ukraine-Russia conflict. However, the exchange rate of the riyal against the USD and the return of the bank index showed low variance during the COVID-19 pandemic. Furthermore, the results suggest that the interest and exchange rates are positively correlated and exhibit high volatility in the long holding period (e.g., 2018–2020), in which the bank index return took a leading position during the COVID-19 pandemic.

This study identified certain risks and opportunities associated with macroeconomic fluctuations in Saudi Arabia's banking system. Using these insights, policymakers, regulators, and banking executives can make informed decisions regarding their banking operations in the country, based on the study's analysis of risks and opportunities. The findings of the study may be used for assessing Saudi banks' vulnerability to macroeconomic shocks and adjusting their risk management strategies accordingly. Moreover, the study could also inform strategic decision-making by banking executives regarding their operations in Saudi Arabia's distinct dual banking system and economy. This could include decisions related to expanding their services, entering new markets, or diversifying their portfolios. Stakeholders in the Saudi banking industry can benefit from the insights provided by the study to address the challenges and opportunities presented by the dynamic economic environment of the country.

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Appendix 1: Short term estimation (ECM model)

SAIBOR_1M	SAIBOR_3M	SAIBOR_6M	SAIBOR_12M	USD_SAR	SABI
1.000000	-2.885364	4.403472	-2.435583	-25.82331	8.81E-06
	(0.59561)	(1.27998)	(0.74733)	(18.5760)	(1.3E-05)
Adjustment coefficients (standard error in parentheses)					
D(SAIBOR_1M)	-0.004181				
	(0.00346)				
D(SAIBOR_3M)	0.006696				
	(0.00286)				
D(SAIBOR_6M)	-0.007518				
	(0.00196)				
D(SAIBOR_12M)	-0.003463				
	(0.00210)				
D(USD_SAR)	-2.57E-05				
	(6.3E-05)				
D(SABI)	13.13337				
	(10.6716)				

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Impact of Stock Market Dynamics on Saudi Arabia's Economic Landscape: A 2000-2022 Analysis

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Abstract: This study investigates the nexus between Stock Market Dynamics and economic health in Saudi Arabia from 2000 to 2022, considering its heavy dependence on oil. Employing methods like Enhanced Dickey-Fuller, Engle-Granger, and OLS regression, it aims to elucidate how the stock market influences economic growth in oil-reliant economies. Various factors, including the Market Cap index, liquidity ratio, Human Development Index (HDI), and export volume, were analysed. Unexpectedly, traditional indicators like market size and liquidity showed minimal impact on growth, challenging conventional assumptions about the stock market's role in economic expansion. These findings offer valuable insights into Saudi Arabia's economic dynamics, guiding policy formulation and investment strategies. Furthermore, the study highlights the crucial role of exports, especially from the oil sector, in driving economic growth in both short and long terms. Policy recommendations emphasize initiatives to diversify exports and invest in alternative energy sources to mitigate oil price volatility. Additionally, while the Human Development Index exhibited a significant positive effect in the short term, its long-term impact diminished. This underscores the need for strategies that promote human development alongside economic diversification for sustainable growth. As Saudi Arabia pursues Vision 2030 to reduce oil dependency, strategic policymaking balancing human development with economic diversification becomes imperative for long-term stability and prosperity.
Keywords: Stock Market, Economic Growth, Human Development Index (HDI), Oil Exports, Gross Domestic Production GDP.

تأثير ديناميكيات سوق الأوراق المالية على المشهد الاقتصادي في المملكة العربية السعودية: تحليل 2000-2022

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(قُدِّم للنشر 1445/07/16هـ – وقُبِل 1445/09/01هـ)

المستخلص: تتناول الدراسة العلاقة بين أداء سوق الأسهم والنمو الاقتصادي في المملكة العربية السعودية من عام 2000 إلى عام 2022. لفحص كيفية تأثير سوق أسهم أحد الاقتصاديات المعتمدة على النفط على النمو الاقتصادي. من هنا قامت الدراسة بتحليل عوامل مؤشر رأس المال السوقي، ونسبة السيولة، ومؤشر التنمية البشرية، وحجم الصادرات. وتوصلت الى أن المؤشرات التقليدية ليس لها تأثير معنوي على النمو الاقتصادي. حيث أظهرت النتائج تحديا للافتراضات التقليدية حول تأثير سوق الأسهم على النمو الاقتصادي، توصي الدراسة بأهمية التوجيه بتطوير السياسات وترشيد القرارات الاستثمارية ودور الايرادات النفطية في دفع عجلة النمو الاقتصادي بالإضافة الى التخفيف من تقلب أسعار النفط من خلال استراتيجية تنويع الصادرات، والاستثمار في الطاقة البديلة. تظهر النتائج أن مؤشر التنمية البشرية ذو تأثير معنوي على المدي القصير وهو ما يختلف عن تأثيره في المدي البعيد، الأمر الذي يتطلب توازن الاستراتيجيات الموجهة نحو التنمية البشرية مع تلك الخاصة بتنويع الاقتصاد والتوجه الي الابتكار وتطوير البنية التحتية. لتحقيق التنمية المستدامة على المدي البعيد ضمن إطار رؤية 2030 وضرورة التخطيط الاستراتيجي من قبل صانعي السياسات. ويشكل تكامل هذه المبادرات والاستراتيجيات أساسا للتنمية المستدامة في المملكة، مما يضمن الاستقرار الاقتصادي والازدهار على المدى الطويل.

الكلمات المفتاحية: تطور سوق الأسهم، النمو الاقتصادي، مؤشر التنمية البشرية، الصادرات البترولية، الناتج المحلي الاجمالي.

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1. Introduction

Economic development is a multifaceted topic that has garnered extensive scholarly attention, with researchers exploring various determinants, among which the role of the financial sector stands out prominently. Stock markets, serving as vital platforms for mobilizing savings and channelling investments, have been particularly scrutinized, especially in emerging economies grappling with diversification challenges and striving for integration into the global financial system.

This study delves into the nexus between Stock Market Dynamics and economic trends in Saudi Arabia over the period from 2000 to 2022. Embracing the complexities of an oil-dependent economy.

The objectives of this research are multifaceted. Firstly, it aims to scrutinize the relationship between stock market dynamics and economic progress within the context of Saudi Arabia. Given the nation's heavy reliance on oil exports, the study seeks to evaluate the significance of stock market metrics in such an economic framework. Additionally, it endeavours to delve into the potential limitations associated with solely relying on stock market indicators, proposing a more comprehensive approach that integrates broader economic indicators like the Human Development Index (HDI). Furthermore, this research seeks to grasp the implications of its findings for Saudi Arabia's Vision 2030 plan, which strives to reduce the country's dependence on oil. Lastly, it aims to provide valuable insights that not only inform policy formulation but also foster academic discourse and support efforts to diversify the economy of Saudi Arabia and similar economies.

The primary hypothesis posits a positive correlation between advancements in stock market metrics, such as market capitalization and liquidity, and economic growth within Saudi Arabia. In contrast, the secondary hypothesis suggests that control variables, including exports and the Human Development Index (HDI), exert a notable influence on the interrelation between stock market dynamics and economic advancement within the Saudi Arabian context. These hypotheses provide a framework for examining the intricate relationship between stock market performance and economic growth while considering the broader economic landscape and control variables.

Motivated by the need to move beyond traditional indicators and embrace a holistic approach, the study scrutinizes various factors, including market capitalization, liquidity, exports, and the Human Development Index (HDI). Surprisingly, the findings challenge conventional wisdom, revealing that traditional metrics such as market size and liquidity exhibit minimal impact on economic trends. Instead, the study underscores the pivotal role of exports, particularly from the oil sector, in driving both short-term and long-term economic expansion.

Moreover, the research highlights the significant but time-bound influence of the Human Development Index (HDI) on economic growth, emphasizing the importance of concurrent investments in human capital alongside economic diversification efforts. As Saudi Arabia embarks on its transformative Vision 2030 plan to reduce dependency on oil, these insights assume greater significance, guiding policymakers in crafting strategies that balance economic diversification with human development goals.

In addition to advancing scholarly understanding, the study offers actionable insights for policymakers and investors, advocating for export diversification, investment in human capital, and stable economic policies to foster sustainable growth and resilience against external shocks. By elucidating the intricate interplay between stock market dynamics and economic expansion, this research contributes to the broader discourse on economic development in oil-dependent

economies, offering valuable lessons for Saudi Arabia and similar nations navigating the path to prosperity in an ever-evolving global landscape.

The study sets out to investigate the economic intricacies of Saudi Arabia, particularly focusing on the significance of stock market dynamics in an economy heavily reliant on oil exports. This inquiry stems from the recognition of the need to understand the interplay between stock market performance and economic growth in the context of a nation deeply entrenched in the global oil market. By scrutinizing the relationship between stock market dynamics and economic progress, the research aims to shed light on the efficacy of traditional metrics in capturing the complexities of an oil-dependent economy. Furthermore, the study seeks to address the potential limitations associated with solely relying on stock market indicators and advocates for a more comprehensive approach that integrates broader economic indicators, such as the Human Development Index (HDI), to provide a holistic view of societal progress. Through these endeavours, the research endeavours to offer valuable insights that not only inform policy formulation but also foster academic discourse and support efforts to diversify the economy of Saudi Arabia and similar economies facing analogous challenges in the global economic landscape.

2. Literature Review

The connection between stock market dynamics and economic expansion is a topic of profound interest in the realm of economic literature, showcasing a multifaceted and intricate relationship that varies significantly across diverse geographical regions, different economies, varying market conditions, and specific timeframes.

Mixed Findings on the nexus Between stock market dynamics and Economic expansion

A range of studies have explored the relationship between stock market dynamics and economic expansion, with mixed findings. Owolabi (2013) and Masoud (2013) both found a positive relationship, suggesting that stock market advancement can promote economic growth. The foundation of the discourse on this subject was laid by seminal scholars such as Demirguc-Kunt and Levine (1993) and King and Levine (1993), who initially emphasized the positive nexus between SMP and economic expansion. Their arguments centered on the idea that a well-structured equity market could potentially reduce capital costs, thereby fostering increased investment and sustained economic growth. However, this optimistic view was contrasted by the cautionary notes of Bencivenga et al. (1996) and Wang and Ajit (2013), who underscored potential risks associated with stock market performance (SMP), highlighting the propensity for SMP to incite hazardous investment behaviors. In an attempt to challenge the prevailing assumptions, Harris (1997) presented findings that indicated no significant impact of SMP on economic expansion across a varied sample of countries between 1980 and 1991, providing a notable exception to the prevailing consensus. Hassanzadeh and Ahmadian (2010) identified both positive and negative effects of stock market progress on economic expansion, suggesting a weak impact of stock market performance on growth. These studies emphasize the necessity for additional research to gain a better understanding of the intricate relationship between stock market advancement and economic progress. Haque's (2011) study concludes that none of the dynamic models effectively identify the linkage between the stock market and per capita growth rate in the SAARC region. This suggests that stock market advancement do not exert any influence on real economic activity in the region. These results do not support the empirical studies by Levine and Zervos (1996, 1998) and others, which propose a direct association between the stock market

and per capita growth rate. Further enriching the discourse, country-specific studies provided diverse insights into the connection between stock market advancement and economic expansion. (Levine & Zervos, 1996, 1998). Notably, studies conducted in countries like Nigeria and Zimbabwe by Bernard and Austin (2011) and Zivengwa et al. (2011) reported negative correlations, showcasing instances where the conventional relationship between stock market advancement and economic expansion did not hold true. Conversely, research conducted in developed economies highlighted nuances that deviated from the established perspectives. These findings suggest a complex and dynamic interplay between stock market advancement and economic health in Saudi Arabia.

Stock market dynamics and Economic Expansion in Saudi Arabia:

A series of studies have explored the nexus between stock market dynamics and economic expansion in Saudi Arabia. Alghamedi (2012) underscores the heavy reliance of the Saudi stock market on oil revenues, suggesting potential limitations in using stock market metrics as the sole indicator of economic health. Alshammary (2014) highlighted the importance of investment in real economic activities for economic growth, while also cautioning about the potential hindrance of stock market volatility. However, Algaeed (2020) raised questions about the effectiveness of capital market development in fostering per-capita GDP growth, suggesting the need for further exploration of this relationship.

Stock market dynamics and Economic Expansion in Gulf Countries

Hamdi (2014) similarly found that financial sector development contributes significantly to economic growth in Gulf Cooperation Council (GCC) countries. Pradhan (2018) and Naik (2015) both found a positive relationship between stock market advancement and economic growth, with Naik (2015) specifically highlighting the role of a well-functioning stock market in fostering economic growth. These findings suggest that stock market dynamics, particularly in the form of a well-functioning stock market, can potentially contribute to economic growth in Gulf countries.

Exploring Factors Affecting Stock market dynamics and Economic Expansion:

A series of studies have explored the nexus between stock market dynamics and economic growth in Kuwait. Raweh (2023) found a positive long-term association between stock market dynamics, trade openness, and financial development, but a negative short-term impact on sustainable development.

Al-Shami (2013) further highlighted the impact of macroeconomic indicators, such as inflation, interest rate, money supply, and oil prices, on stock returns in the Kuwaiti market. Simultaneously, researchers such as Boubakari and Jin (2010) and Aggarwal and Kyaw (2010) delved into the moderating influences that factors like governance structures and corruption may exert on the nexus between stock market dynamics and economic expansion.

Oil Dependency and Economic Dynamics:

In the context of oil-dependent economies, the intricacies of this relationship become even more pronounced, with limited existing knowledge. The function of the finance industry, including stock markets, is predominantly influenced by the dominant oil industry, thus adding another layer of complexity to the analysis.

This study acknowledges the existing research gap regarding the connection between stock market advancement and economic expansion in oil-dependent economies such as Saudi Arabia. Previous studies, exemplified by the works of Al-Malkawi and Abdullah (2011) and Al-Yousif (2002), have provided only partial insights into this intricate relationship. Thus, this research aims to fill this gap by focusing on Saudi Arabia's economic

landscape from 2000 to 2021, aligning its objectives with Saudi Arabia's Vision 2030 and aspiring to provide insights for policymakers, investors, and the academic community.

Saudi Arabia's Economic Trajectory and Development Strategies:

In the literature, extensive research has been conducted to explore the multifaceted factors that influence a nation's path of economic growth. Particularly, Saudi Arabia's ambitious endeavors in diversification and holistic development have attracted significant attention in scholarly inquiries. For instance, Alkhareif and Alsadoun (2016) conducted a study spanning from 1980 to 2015, which emphasized the nation's determined efforts to shift its focus away from the oil sectors. Their findings shed light on Saudi Arabia's strategic initiatives aimed at economic diversification and comprehensive development. Furthermore, Al-Yousif's (2002) work contributed to understanding the complex relationship between financial development and economic progress across various developing nations. By highlighting the pivotal role of tailored national policies, Al-Yousif's study provided valuable insights into the mechanisms through which financial development can contribute to sustainable economic growth. These prior studies offer valuable context and insights that inform the current research on Saudi Arabia's economic trajectory and the factors shaping its development strategies.

3. Methodology

This research is set out to conduct an in-depth examination of the connection among the progression of the stock market and the economic expansion in Saudi Arabia within the timeframe of 2000 to 2022. The selected timeframe was determined by the constraints tied to data availability. While monthly data is obtainable for metrics like stock market capitalization, liquidity, and export figures, essential economic indicators such as GDP and Human Development Index (HDI) are only available on an annual basis. Consequently, to ensure consistency and meaningful analysis, this research relies on annual data for all variables, recognizing that juxtaposing monthly stock market metrics with annual economic figures could lead to a skewed interpretation due to differing time scales. The study explores two main questions: First, it examines the impact of stock market advancements, such as market capitalization and liquidity, on Saudi Arabia's economic growth. Second, it investigates the influence of control variables like exports and the Human Development Index (HDI) on this relationship, aiming to understand their roles in the broader economic context.

The study utilizes data from reputable sources, including World Bank Open Data and the Tadawul All Share Index (TASI) annual reports, covering the period from 2000 to 2022. These sources provide comprehensive data on stock market capitalization, liquidity, exports, and the Human Development Index (HDI) for Saudi Arabia. Access to this data is available through the World Bank website and the official Saudi Exchange site for TASI reports.

In this study, an examination is conducted to analyze the connection between the progression of stock market and economic expansion in Saudi Arabia within the timeframe of 2000 to 2022. This period was selected due to constraints related to data availability, with annual data chosen to maintain consistency across variables. The primary variables of interest, Stock Market Capitalization (LNSIZE) and the Value of all Traded Shares (LNLIQ), are utilized as indicators of stock market development and liquidity, respectively. These key variables allow for the assessment of the impact of stock market advancements on economic growth. Additionally, control variables such as Exports (LNEXP) and the Human Development Index (HDI) are included to account for external factors that may influence the nexus between stock market

advancement and economic expansion. Exports reflect the significance of Saudi Arabia's oil-centric economy, while the HDI provides insights into broader aspects of development beyond economic output.

Various econometric techniques are employed in the methodology, including the Enhanced Dickey-Fuller test and the Engle-Granger cointegration test, to ensure rigorous analysis of the interplay between stock market advancement and economic progress. Furthermore, Ordinary Least Squares (OLS) regression is utilized to quantify the relationships between the variables under study, allowing for a clear interpretation of the quantitative impact of stock market dynamics on economic growth.

The advantages of applying OLS regression in this study lie in its simplicity, robustness, and suitability for analyzing relationships between variables in economic research contexts (Greene, 2003). By employing OLS regression, the statistical significance of the nexus between stock market advancement and economic growth can be effectively assessed while controlling for potential confounding factors. This approach is aligned with the research objectives and ensures a comprehensive analysis of the factors influencing economic expansion in Saudi Arabia.

The study aims to address two primary research questions that are both specific and testable. Firstly, it seeks to assess the extent to which stock market advancements, including market capitalization and liquidity, impact economic growth in Saudi Arabia. Secondly, it aims to analyze the influence of key control variables such as exports and the Human Development Index (HDI) on this relationship. By utilizing annual data and employing econometric techniques such as the Enhanced Dickey-Fuller test and the Engle-Granger cointegration test, the study ensures rigorous analysis of the interplay between stock market dynamics and economic progress. Additionally, the OLS regression models are utilized to quantify the relationships between the variables under study, providing actionable insights for policymakers and stakeholders.

The hypotheses of the study are as follows:

Primary Hypothesis: There is a positive correlation between enhancements in stock market indicators, such as market capitalization and liquidity, and economic growth in Saudi Arabia.

Secondary Hypothesis: Control variables, such as exports and the Human Development Index (HDI), significantly influence the relationship between stock market dynamics and economic progress within the Saudi Arabian context.

Econometric Techniques and Procedures:

Stationarity and Test for Unit Root

The study follows a procedure to assess data stationarity, which is essential to prevent potentially misleading regression outcomes. This involves conducting a unit root test. Specifically, the Engle and Granger method is employed, tailored for variables that exhibit stationarity at the first difference. This method aids in determining whether the variables under consideration are integrated and stationary, providing a foundation for robust econometric analysis.

Cointegration and Error Correction

The study employs a two-step approach to analyze cointegration and error correction:

Step 1: An OLS regression is conducted using level data, and an error correction term is applied to verify stationarity. This process helps determine long-term cointegration.

Step 2: The study derives the Error Correction Term (ECT) by considering lags of the error term to examine the short-term relationship. If the short-term relationship is found to be insignificant, the Hendry's technique is utilized to incorporate different lags, optimizing the model's fit.

The Model

The association is scrutinized via the ensuing econometric model:

$$\text{LNGDP}_i = \text{a} + \text{ß1 LNSIZE} + \text{ß2 LNLIQ} + \text{ß3 LNEXP} + \text{ß4 HDI} + \text{et} \quad (1)$$

Where:

- LNGDP: the log transformation of GDP per capita (Economic Growth)
- LNSIZE: the log transformation of Capitalization of the market
- LNLIQ: the log transformation of the Value of all Traded Shares
- LNEXP: the log transformation of oil Export
- HDI: Human Development Index
- et: Error term

Introduction to the explanatory variables:

Stock Market Capitalization (LNSIZE): This variable represents the size and development level of the stock market. We selected it because stock market size is often regarded as a proxy for economic development and is expected to positively influence economic growth. Theoretical underpinnings suggest that a larger and more developed stock market can facilitate capital mobilization, investment, and resource allocation, contributing to economic expansion.

Value of All Traded Shares (LNLIQ): This variable reflects market liquidity, indicating the ease with which assets can be bought or sold without causing a significant price change. Market liquidity is essential for efficient capital allocation and market functioning, as it allows investors to enter and exit positions with minimal impact on prices. We included this variable to capture the extent to which the stock market facilitates trading activity, which is crucial for economic growth.

Exports (LNEXP): This variable offers insights into the impact of Saudi Arabia's oil-centric economy on overall growth. Given the nation's heavy reliance on oil exports, this variable serves as a key determinant of economic performance. Theoretical frameworks suggest that export revenues can stimulate economic growth by generating foreign exchange earnings, supporting domestic industries, and driving investment. Considering Saudi Arabia's dependence on oil exports, understanding their influence on economic growth is essential.

Human Development Index (HDI): These variable aggregates life expectancy, education, and income to measure societal progress and quality of life. While not directly tied to economic growth, the HDI reflects broader aspects of development beyond economic output. We included this variable to capture the multidimensional nature of development and its potential influence on economic performance. Empirical evidence suggests that higher levels of human development are associated with greater productivity, innovation, and economic resilience, highlighting the importance of considering human capital in economic analyses.

The methodology employed in this study presents several advantages in comparison to different methods already used in previous literature. By integrating multiple techniques including Enhanced Dickey-Fuller, Engle-Granger, and OLS regression, a more holistic analysis of the nexus between stock market advancement and economic expansion is facilitated. This multi-method approach allows for a thorough examination of the intricate dynamics at play, potentially yielding more nuanced insights compared to studies relying solely on a single methodology.

Moreover, the study analyses a diverse set of variables including the Market Cap index, liquidity ratio, Human Development Index (HDI), and export volume. This comprehensive approach ensures that key factors influencing the nexus between

stock market advancement and economic growth are duly considered, thereby enhancing the accuracy of the study's findings.

Furthermore, the study is tailored specifically to the context of Saudi Arabia, taking into account the nation's heavy reliance on oil and the objectives outlined in Vision 2030. By aligning with the country's development goals and focusing on its unique economic landscape, the methodology ensures that the findings are contextually relevant and actionable for policymakers, investors, and the academic community.

In addition, the methodology addresses limitations identified in previous research, such as the overreliance on traditional indicators and the neglect of oil dependency. By adopting a comprehensive approach that goes beyond conventional measures, the study provides fresh insights into the nexus between stock market advancement and economic expansion, thus contributing to the advancement of knowledge in the field.

The planned methodology for this investigation ensures a comprehensive and rigorous exploration of the stock market advancement and economic expansion nexus within Saudi Arabia. It also perfectly dovetails with the research questions that have been articulated. This study seeks to offer significant insights into the complex mechanisms that steer the economic landscape of Saudi Arabia.

4. Results and Discussion:

The present study conducted an empirical analysis to explore the nexus between stock market dynamics and economic expansion in Saudi Arabia from 2000 to 2021. Through the application of time-series techniques, several significant insights emerged.

The ADF test was employed to assess stationarity across various economic indicators, including GDP Per Capita, Market Size, Exports, HDI, and Liquidity.

Table 1: Augmented Dickey-Fuller (ADF) Test Results

Variables	Order of Integration	ADF Test Statistic (At Level)	P-Value (At Level)	ADF Test Statistic (At First Diff.)	P-Value (At First Diff.)
GDP Per Capita	Not Stationary	-1.488	0.519	-3.828	0.009
Size	Not Stationary	-1.536	0.496	-5.286	0.000
Exports	Not Stationary	-1.781	0.378	-4.280	0.003
HDI	Not Stationary	-1.296	0.611	-4.514	0.002
Liquidity	Not Stationary	-2.480	0.133	-2.815	0.073

Notes:

- ADF Test Statistic: Values less negative than critical values indicate non-stationarity at a significance level.

- P-Value: Values less than the chosen significance level (usually 0.05) indicate rejection of the null hypothesis of non-stationarity.

- "Not Stationary" indicates that the variable is non-stationary, suggesting differencing may be necessary for stationarity.

Table 1's ADF test results indicate non-stationarity at level for all variables, shown by high p-values exceeding the typical significance level of 0.05. However, after first differencing, all variables achieve stationarity as indicated by significantly lower p-values (below 0.05 for all except Liquidity, which is marginally above at 0.073). This shift to stationarity after first differencing is crucial for time-series analysis, ensuring that further analysis, such as cointegration tests and regression models, can proceed without the risk of spurious results.

Table 2: Cointegration Engle-Granger Test Results

	Order of Integration	Residual Std. Error
ADF Test Statistic	At Level	-3.0676
P-Value		0.0456

Based on the results presented in Table 2, the Engle-Granger cointegration test was

conducted to examine the enduring equilibrium relationship among factors within the multiple time series analysis. The table reports the outcomes relevant to the integration order and the residual standard error.

Testing for Cointegration at Level:

1. ADF Test Statistic significance within the framework of the Engle-Granger cointegration analysis is -3.0676. This value serves a vital function in determining whether the residuals of the regression contain a single unit root.

2. The corresponding P-value for the ADF Statistic is 0.0456, which is less than the conventional 0.05 significance level. This provides statistical evidence to refute the null hypothesis positing the presence of a unit root at the level.

Interpretation and Implications:

The findings from the Engle-Granger analysis suggest that the data series is stationary at I(0), as the significance of the test (P-value < 0.05) affirms the existence of a cointegrated relationship among the variables, implying that they move together over time to maintain a long-term equilibrium and suggests a sustained relationship between the variables: the natural log of total exports, natural log of liquidity, natural log of size, and HDI, in the context of their impact on LNGDP.

These outcomes, showcasing statistical significance, permit the use of OLS regression analysis without the need to transform the variables into first differences. The presence of cointegration ascertained by the Engle-Granger test validates the relationships between these variables, ensuring that they are not spurious.

The identification of cointegration underlines both the economic and statistical consistency among the variables, fostering a meaningful interpretation of their long-term relationships. This significant contribution enhances the robustness of the study and lays a solid groundwork for subsequent analyses and their potential implications for policy formulation and investment strategies.

OLS regression:

In this study, Ordinary Least Squares (OLS) regression was employed to analyze the relationship between stock market dynamics and economic growth in Saudi Arabia. OLS regression was chosen for several reasons that align with the objectives of the research. Firstly, OLS regression is a widely used statistical method known for its simplicity and robustness, making it suitable for analyzing relationships between variables in economic research contexts. Secondly, the interpretability of OLS regression results allows for a clear understanding of the quantitative impact of stock market dynamics on economic growth, which is a key focus of the study. Thirdly, OLS regression is well-suited for analyzing time-series data, making it applicable to the research period spanning from 2000 to 2021. Additionally, OLS regression facilitates hypothesis testing, enabling the assessment of the statistical significance of the relationship between stock market dynamics and economic growth. Lastly, OLS regression allows for the inclusion of control variables to account for potential confounding factors, enhancing the robustness of the analysis. Overall, the selection of OLS regression aligns with the research objectives and ensures a rigorous analysis of the relationship between stock market dynamics and economic growth in Saudi Arabia.

Table 3: OLS Regression Results for Long-Run Effects.

Variables	Coeff.	SE	t	Prob.
HDI	0.281	0.242	1.159	0.263
Ln EXP	0.445	0.088	5.065	0.000
Ln LIQ	-0.002	0.004	-0.360	0.723
Ln SIZE	-0.015	0.009	-1.689	0.110
C	7.285	0.309	23.538	0.000

Variables	Coeff.	SE	t	Prob.
R-squared	0.893745			
Adjusted R-squared	0.868744			
S.E. of regression	0.024242			
Sum squared resid	0.009991			
Log likelihood	53.45213			
F-statistic	35.74806			
Prob(F-statistic)	0.000000			
Mean dependent var	9.807543			
S.D. dependent var	0.066913			
Akaike info criterion	-4.404739			
Schwarz criterion	-4.156775			
Hannan-Quinn criter	-4.346326			
Durbin-Watson stat	0.788436			

Table 3: provides the results of the OLS regression analysis conducted to examine the long-term relationship among the log transformations of total exports, liquidity, size, HDI, and GDP per capita in Saudi Arabia.

The regression analysis reveals significant relationships between GDP per capita and certain variables. The coefficient for Ln EXP (natural log of exports) is highly significant ($p = 0.000$), indicating a positive impact on GDP per capita. Conversely, Ln LIQ (natural log of liquidity) and Ln SIZE (natural log of size) have insignificant p-values, suggesting that they do not have a substantial long-term effect on GDP per capita. Although HDI's coefficient is positive, it is not statistically significant at conventional levels ($p = 0.263$). Nonetheless, the model's high adjusted R-squared (0.869) indicates a strong fit, explaining a significant portion of the variation in GDP per capita. Moreover, the significance of the F-statistic ($p = 0.000$) confirms the overall validity of the model.

In evaluating the robustness of our analysis, we employed the Akaike information criterion (AIC) and Schwarz criterion (BIC) to gauge the relative quality of our model compared to alternative models. Lower values of AIC and BIC indicate better-fitting models, signifying a more optimal balance between model complexity and goodness of fit. By utilizing these criteria, we ensured that the regression model selected for our analysis was appropriately chosen, thereby enhancing the reliability of our findings.

Furthermore, we considered the Durbin-Watson statistic (0.788436) to assess the presence of autocorrelation in the residuals. The observed statistic suggests the presence of positive autocorrelation, indicating potential correlations among error terms over time. However, this consideration demonstrates our diligence in addressing potential limitations and ensuring the robustness of our analysis.

The implications of the results from the regression analysis in Table 3:

The significant positive relationship between total exports and GDP per capita underscores the critical role of exports in driving economic growth in Saudi Arabia over the long term. Policymakers should prioritize strategies aimed at promoting export diversification and market expansion to sustain economic development.

The insignificant long-term effects of liquidity and market size on GDP per capita suggest that these factors may not have a substantial direct impact on economic growth. While they may still play supporting roles in the economy, policies focused solely on enhancing liquidity or expanding market size may not

lead to significant improvements in GDP per capita.

Although not statistically significant at conventional levels, the positive coefficient of HDI underscores the importance of human development in driving economic growth. Investments in healthcare, education, and social infrastructure remain crucial for enhancing productivity and improving overall well-being, contributing to long-term economic prosperity.

The high adjusted R-squared and the significant F-statistic indicate that the regression model effectively explains variations in GDP per capita. This suggests that the included variables collectively provide valuable insights into the determinants of economic growth in Saudi Arabia.

Based on the analysis, policymakers should focus on promoting export-oriented policies, investing in human capital development, and ensuring economic stability to sustain long-term economic growth. Additionally, efforts to enhance liquidity and market size should be complemented with broader economic strategies to maximize their impact on GDP per capita.

Table 4 presents the results of the OLS regression examining the short-term effects on GDP per capita in Saudi Arabia from 2000 to 2021. These coefficients offer valuable insights into the factors shaping short-term economic dynamics. Specifically, the analysis highlights the significant impact of changes in oil exports (D(LNEXP)) on GDP per capita, indicating the immediate influence of the oil sector on economic expansion. Additionally, the Human Development Index (D(HDI)) exhibits a positive short-term effect, emphasizing the importance of investments in human capital for short-term economic gains. However, the coefficients

associated with changes in market capitalization (D(LNSIZE)) and liquidity (D(LNLIQ)) do not show significant effects on GDP per capita in the short run. Moreover, the Error Correction Term (ECT) indicates the pace at which the system returns to equilibrium following a shock, although its statistical significance is not observed at conventional levels. Nonetheless, the model's high adjusted R-squared value of 0.825 indicates a strong fit, explaining a substantial portion of the variance in GDP per capita. Furthermore, the significant F-statistic (15.963 with a p-value of 0.000) confirms the overall model's significance, validating the explanatory power of the included variables in predicting short-term changes in GDP per capita. Thus, the model demonstrates robustness and suitability for understanding the dynamics affecting economic outcomes in the short run. A deeper analysis of the coefficients reveals significant insights: D(LNEXP), representing changes in oil exports, exhibits a strong positive effect on GDP per capita, underscoring the pivotal role of oil in the economy. Similarly, D(HDI) suggests that improvements in human development significantly boost GDP in the short term. However, changes in liquidity and market size demonstrate no significant impact, indicating their lesser immediacy in affecting economic outcomes. The non-significant coefficient for the ECT implies a potential gap in understanding the immediate response of Saudi Arabia's economy to shocks, particularly regarding how swiftly it adjusts to its long-term growth path. This suggests the need for policies that acknowledge the economy's gradual adjustment pace, emphasizing stable, progressive economic strategies for sustainable growth.

Overall, the short-term analysis using Hendry's approach reveals that HDI and exports significantly influence GDP per capita, while market size and liquidity have minimal impact. This finding advises policymakers and stakeholders to prioritize export enhancement and human development to fuel short-term economic

growth. However, the significance of the ECT coefficient suggests a nuanced understanding of economic adjustment processes and their implications for policy, calling for further investigation and refinement in future research.

Table 4: OLS Regression (Short Run Effect)

Variable	Coeff.	SE	t	Prob.
LN GDP (-1)	0.077	0.076	1.017	0.328
D (LNEXP)	0.472	0.056	8.455	0.000
D (LNSIZE (-1))	0.010	0.007	1.376	0.192
D (LNLIQ)	-0.002	0.003	-0.541	0.598
D (HDI)	2.758	0.935	2.950	0.011
ECT (-1)	-0.338	0.193	-1.751	0.103
C	-0.780	0.750	-1.040	0.317
Adj. R^2	0.825			
F-statistic	15.963			0.000

The implications of the results from the regression analysis in Table 4:

The strong positive effect of changes in oil exports (D(LNEXP)) and the Human Development Index (D(HDI)) on GDP per capita underscores the critical importance of prioritizing investments in the oil sector and human capital development. Policymakers should continue to focus on strategies that enhance oil production and export capacity while simultaneously investing in education, healthcare, and social infrastructure to improve human development indicators. The non-significant effects of changes in market capitalization (D(LNSIZE)) and liquidity (D(LNLIQ)) on GDP per capita in the short run suggest that policies aimed solely at bolstering market size or liquidity may not have immediate economic benefits. Instead, efforts should be directed towards initiatives that stimulate economic growth through other channels, such as export promotion and human capital development.

The insignificant coefficient for the Error Correction Term (ECT) implies that the economy adjusts rapidly to equilibrium following short-term shocks. This suggests that stable and consistent economic policies are crucial for maintaining economic stability and promoting sustainable growth. Policymakers should prioritize policies that support gradual adjustments and avoid abrupt changes that could disrupt the equilibrium of the economy.

While the oil sector remains a significant driver of economic growth, the results highlight the importance of diversifying the economy to reduce dependency on oil revenues. Investing in non-oil sectors, promoting export diversification, and developing renewable energy sources are essential strategies to enhance economic resilience and mitigate the impact of oil price fluctuations on national income. In summary, the results underscore the importance of a balanced approach to economic development in Saudi Arabia, emphasizing the need to simultaneously strengthen the oil sector, invest in human capital, pursue economic diversification, and maintain stable economic policies to ensure long-term prosperity and resilience against external shocks.

The findings from the literature review:

The findings from the literature review offer valuable insights into the nexus between stock market advancement and economic expansion. Numerous studies have delved into this connection, yielding varied results. While some, such as those by Owolabi (2013) and Masoud (2013), indicate a positive relationship, others like Vacu (2013) suggest more nuanced or weak effects. Similarly, research specific to Saudi Arabia by Alghamedi (2012),

Alshammary (2014), and Algaeed (2020) provide perspectives on the interplay between stock market dynamics and economic growth in the country.

These studies collectively underscore concerns regarding the potential adverse effects of stock market volatility, challenging conventional notions of the role of stock market capitalization in shaping an economy's growth trajectory (Owolabi, 2013; Masoud, 2013; Vacu, 2013). This perspective resonates with our findings, particularly in the context of oil-dependent economies like Saudi Arabia. Moreover, our research gains significance when compared to similar investigations from other global economies and previous studies focused on Saudi Arabia.

The discussion on the unique economic dynamics of countries heavily reliant on a single commodity, such as oil, reveals significant complexities when juxtaposed against established financial theories. While traditional economic frameworks often assume diversified, multi-sector economies contributing to economic stability and growth, such assumptions may not hold true for oil-dependent economies. In contrast, research on the Russian economy exhibits parallels with the Saudi Arabian context, particularly in terms of heavy reliance on hydrocarbon exports (Fedorova, Musienko, & Afanasy, 2020). However, unlike Saudi Arabia, Russia's stock market exerts a more prominent influence on its economic landscape, indicating a deeper integration of financial mechanisms into the broader economic fabric. Furthermore, our study addresses the existing research gap regarding the nexus between stock market advancement and economic expansion in oil-dependent economies like Saudi Arabia. While prior studies have offered partial insights into this relationship, our research aims to provide a comprehensive analysis by focusing on Saudi Arabia's economic landscape from 2000 to 2021. Aligned with Saudi Arabia's Vision 2030 and aiming to offer insights for policymakers, investors, and the academic community, our study adds to the existing body of economic literature. Our investigation delves into the intricate relationship between stock market dynamics and the trajectory of economic growth in Saudi Arabia, focusing on the period from 2000 to 2022. This research is significant when contrasted with similar investigations from other global economies and previous studies specifically centred on Saudi Arabia. Our investigation delves into the intricate relationship between stock market dynamics and the trajectory of economic growth in Saudi Arabia, focusing on the period from 2000 to 2022. This research is significant when contrasted with similar investigations from other global economies and previous studies specifically centred on Saudi Arabia. In contrast, the case of India, a rising economic power, illustrates a multifaceted growth trajectory influenced by factors like human development and technological advancements, in addition to stock market performance (Choi & Baek, 2017). Unlike Saudi Arabia, India's stock market performance exhibits a clearer correlation with its overall economic progress, owing to the diversity of its economic activities and reduced dependence on a single dominant export. This study aims to unravel the economic intricacies of Saudi Arabia, investigating the significance of stock market dynamics in an economy heavily reliant on oil exports. Acknowledging the potential limitations of relying solely on stock market metrics, we propose a comprehensive approach, incorporating broader economic indicators such as the Human Development Index (HDI), offering a holistic view of societal progress (Malik, 2013). As Saudi Arabia endeavours to realize its Vision 2030, aimed at reducing dependence on oil, our research findings hold significant implications within the nation and across the broader MENA region. By highlighting the interdependent nature of stock market

dynamics and the economic ascent of Saudi Arabia, our study advocates for a shift to a more holistic viewpoint. Through a thorough analysis, encompassing a literature review, methodology discussion, empirical evaluations, and insightful conclusions, we anticipate that our findings will inform policy formulation, stimulate academic discourse, and support efforts to diversify the economy of Saudi Arabia and similar economies.

Research Limitations:

The research acknowledges limitations in its scope and methodology. It's confined to data from 2000 to 2022, which may not reflect future or past conditions due to economic and political changes. The study relies on ADF tests and the Engle-Granger technique for time-series analysis, which assume linear variable relationships, possibly skewing results. OLS regression's effectiveness is contingent on certain assumptions that may not always hold true, potentially affecting the model's accuracy. The choice of variables and the focus on Saudi Arabia might limit the generalizability of the findings to other contexts or variables not included in the study.

The Breusch-Godfrey autocorrelation LM Test identifies the presence of autocorrelation, within the residuals of time series regression. Such autocorrelation infringes upon the core assumptions of classical linear regression, potentially compromising the reliability of standard errors in OLS estimates and possibly skewing hypothesis test results.

The results from Table 5's Breusch-Godfrey autocorrelation LM Test indicate significant autocorrelation within the model, as suggested by the F-statistic value of 7.286639 and a p-value of 0.0062, alongside the Obs*R^2 value of 10.84128 with a p-value of 0.0044. Both p-values being below the standard significance level of 0.05 lead to the rejection of the null hypothesis, confirming autocorrelation at up to 2 lags. This implies that past values of the dependent variable significantly influence its current values, necessitating model adjustments to account for this autocorrelation.

Table 5: Breusch-Godfrey Autocorrelation LM Test

Null Hypothesis: No autocorrelation at up to 2 lags

F-statistic	7.286639
Prob. F(2,15)	0.0062
Obs*R^2	10.84128
Prob. Chi^2(2)	0.0044

The results from Table 6's Breusch-Pagan-Godfrey heteroskedasticity test, with an F-statistic of 0.621333 and a p-value of 0.6535, along with an Obs*R^2 value of 2.806075 and a p-value of 0.5908, indicate no evidence of heteroskedasticity in the model. The high p-values suggest the variance of residuals is constant across the range of values, supporting the null hypothesis of homoskedasticity. This finding implies that the model's error terms have a uniform variance, an assumption critical for the reliability of OLS regression estimates.

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.621333
Prob. F(4,17)	0.6535
Obs*R^2	2.806075
Prob. Chi^2(4)	0.5908
Scaled explained SS	1.390773
Prob. Chi^2(4)	0.8458

The Variance Inflation Factors (VIF) in Table 7 suggest that multicollinearity may not be a significant concern for most variables, as indicated by VIF values below the common threshold of 5, except for the uncentered VIFs which are notably high for HDI and LNEXPORT, suggesting potential issues in model specification. However, the centred VIFs for these variables are within acceptable limits, indicating that, when adjustments are made for the mean, the multicollinearity concern is mitigated, allowing for more reliable interpretation of the coefficients in the regression model.

Table 7: Variance Inflation Factors

Variable	Coeff. Variance	Uncentered VIF	Centred VIF
HDI	0.058755	1471.940	4.426794
LNEXPORT	0.007713	8165.787	4.311485
LNLIQUIDITY	1.74E-05	10.65382	1.369590
LNSIZE	7.84E-05	58.30952	1.253495
C	0.095778	3585.514	NA

The centred VIF values for HDI and LNEXPORT approach but do not exceed the threshold of 5, suggesting manageable multicollinearity within the model. However, the high uncentered VIF values for these variables signal potential concerns in the model's design or the scale of predictors, calling for a closer inspection and possible adjustments to ensure the model's integrity and the reliability of its predictions.

Table 8's correlation analysis reveals strong positive correlations between LNGDPPC and both HDI and LNEXPORT, indicating that as human development and oil exports increase, so does GDP per capita. The relatively lower correlations with LNLIQUIDITY and LNSIZE suggest these factors have a less direct impact on economic output. This pattern highlights the significant influence of exports and human development on economic performance, while liquidity and market size play secondary roles, guiding policy focus towards enhancing human capital and export capabilities for economic growth.

Table 8: Correlation Analysis

	LNGDP	**HDI**	**LNEXP**	**LNLIQ**	**LNSIZE**
LNGDP	1.000	0.819	0.931	0.152	0.221
HDI	0.819	1.000	0.829	-0.040	0.430
LNEXP	0.931	0.829	1.000	0.248	0.350
LNLIQ	0.152	-0.040	0.248	1.000	0.091
LNSIZE	0.221	0.430	0.350	0.091	1.000

The Impact of the COVID-19 Pandemic on Stock Market Dynamics and Economic Expansion in Saudi Arabia:

The COVID-19 pandemic has significantly disrupted global economies, including Saudi Arabia, impacting various economic facets such as stock market performance, investment behaviour, government policies, and overall economic growth. This study acknowledges the potential influence of the pandemic on the nexus between stock market advancement and economic expansion in Saudi Arabia during the period from 2000 to 2021. Factors like market volatility, shifts in investor sentiment, government interventions, changes in consumer behaviour, and supply chain disruptions could have altered the dynamics between stock market advancement and economic growth, potentially affecting the accuracy of our conclusions. Therefore, caution is warranted in interpreting our findings, acknowledging the uncertainties and limitations stemming from the pandemic's influence on economic variables.

To address these limitations, future research could delve into the specific effects of the COVID-19 pandemic on stock market advancement and economic expansion in Saudi Arabia. Methodologies should be adapted to accommodate the unique challenges and dynamics introduced by the crisis. Additionally, conducting sensitivity analyses or scenario-based modelling could enhance the robustness of our findings under different pandemic-related scenarios.

5. Conclusions

In conclusion, this study illuminates several critical factors shaping Saudi Arabia's economic trajectory. Despite significant investments in its stock market infrastructure, the influence of stock market advancement, particularly market

size changes and liquidity, on driving economic growth appears limited over the study period. While a robust stock market offers potential benefits, its anticipated positive impact on growth has yet to materialize in the Saudi context. Therefore, policymakers should prioritize initiatives aimed at bolstering human capital and export capabilities to ensure sustained economic growth. Moreover, the limited immediate impact of liquidity and market size on GDP per capita suggests the need for a nuanced approach that considers various economic factors comprehensively. Policies promoting stability, sustainability, and diversified growth pathways are essential for steering Saudi Arabia towards long-term prosperity amidst evolving global economic dynamics.

Furthermore, the pivotal role of oil exports in shaping Saudi Arabia's economic trajectory across both short and long terms cannot be overlooked. The robust positive relationship observed between oil exports and GDP per capita reaffirms the oil sector's critical position as a primary driver of economic growth. Proactive policies aimed at bolstering stability in oil production and export, coupled with diversification into non-oil sectors and renewable energy sources, are imperative. By embracing export diversification and market expansion strategies and mitigating oil price volatility, Saudi Arabia can stabilize national income and enhance its resilience against global oil market fluctuations.

Additionally, the Human Development Index (HDI) emerges as a crucial determinant of GDP per capita, particularly in the short term. Investments in healthcare, education, and social infrastructure yield immediate economic benefits, underscoring the significance of prioritizing human capital development. However, the long-term impact of the HDI on GDP per capita is subject to complexity, necessitating a balanced and dynamic strategy. Policymakers must prioritize both human capital development and economic diversification to ensure sustainable growth and development, thereby enhancing citizens' quality of life.

The study highlights the pressing need for economic diversification in Saudi Arabia. While the influence of stock market advancement on growth may be currently undervalued, its expansion and deeper economic integration could pave the way for a diversified and robust growth trajectory. Future research should consider leveraging more detailed data and expanding analyses to incorporate additional factors like foreign direct investment (FDI) and capital formation for clearer insights into economic dynamics. Despite limitations, this study unravels crucial insights into Saudi Arabia's economic expansion, emphasizing the role of exports and human development over stock market advancement in influencing growth. Policymakers are encouraged to realign their focus based on these insights for optimal economic growth in the future, fostering sustainable development and stability in the region.

In conclusion, this study sheds light on critical factors influencing Saudi Arabia's economic path, suggesting avenues for fostering diversification and achieving sustainability. While the impact of stock market advancement on economic growth appears limited, policymakers should prioritize initiatives aimed at bolstering human capital and export capabilities. Investment in human capital, including healthcare, education, and social infrastructure, yields immediate economic benefits, highlighting the need to prioritize human development alongside economic diversification efforts. Moreover, proactive policies aimed at stabilizing oil production and export, coupled with diversification into non-oil sectors and renewable energy sources, are imperative to mitigate the volatility of oil prices and stabilize national income. Embracing export diversification and market expansion strategies can enhance resilience against global oil

market fluctuations. Policymakers must adopt a balanced and dynamic strategy that prioritizes both human capital development and economic diversification to ensure sustainable growth and development, thereby improving citizens' quality of life. Future research should delve deeper into factors like foreign direct investment (FDI) and capital formation to provide clearer insights into economic dynamics and guide optimal policy formulation. Despite limitations, this study offers valuable insights into Saudi Arabia's economic expansion, urging policymakers to realign their focus for sustainable development and stability in the region.

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Testing the Triple Deficit Hypothesis: The Case of The Jordanian Economy

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Abstract: Jordan faces a chronic deterioration in its Budget Balance (BB), Current Account Balance (CAB), and Private Saving-Investment Gap (PSGAP). This poses a significant threat to economic stability, growth, employment, and future generations in Jordan. This study assesses the Triple Deficit Hypothesis (TDH) validity in Jordanian economy, an extension of the twin deficit hypothesis incorporating the saving-investment gap. By using annual time series data from 1980 to 2022, Granger Causality has been conducted, indicating that the TDH is not valid for Jordan, as the test results show one-way causality from BB to CAB, another from PSGAP to CAB, and a two-way causality between BB and PSGAP. In addition, the study Employed the Fully Modified Ordinary Least Squares (FMOLS) method, which identifies a statistically significant positive relationship between CAB and BB, supporting the twin deficit hypothesis in Jordan. Furthermore, a statistically positive relationship between CAB and PSGAP is found. Two dummy variables were combined, (DI) for the IMF-supported programs and (D2) for pegging the dinar exchange rate to the US dollar to measure the impact of each on the CAB. Results indicate a positive but statistically insignificant effect of the IMF's programs, contrasting with a positive and statistically significant effect attributed to exchange rate pegging.

Keywords: Triple Deficit Hypothesis, Current Account Balance, Saving-Investment Gap, Budget Balance, FMOLS, Jordan.

اختبار فرضية العجز الثلاثي: حالة الاقتصاد الأردني

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(قُدِّم للنشر 1445/09/02هـ – وقُبِل 1445/11/04هـ)

المستخلص: يعاني الاقتصاد الأردني من تدهور مزمن في رصيد كل من الموازنة العامة، الحساب الجاري، وفجوة الادخار الخاص – الاستثمار، بحيث تشكل هذه الحالة تهديداً كبيراً للاستقرار الاقتصادي والنمو والتوظيف والأجيال القادمة في الأردن. وقد هدفت هذه الدراسة إلى اختبار فرضية العجز الثلاثي في الاقتصاد الأردني، والتي هي امتداد لفرضية العجز الثنائي. وباستخدام بيانات السلاسل الزمنية السنوية للفترة (1980-2022) تم إجراء اختبار السببية (Granger Causality) والذي أشار الى عدم انطباق فرضية العجز الثلاثي على حالة الأردن، لا سيما وأن نتائج هذا الاختبار أشارت إلى وجود علاقة سببية في اتجاه واحد من عجز الموازنة العامة إلى عجز الحساب الجاري، وأخرى من فجوة الادخار الخاص – الاستثمار إلى عجز الحساب الجاري، ووجود علاقة سببية باتجاهين بين عجز الموازنة العامة وفجوة الادخار الخاص – الاستثمار. كما تم استخدام منهجية المربعات الصغرى المعدلة كلياً (FMOLS)، وأشارت النتائج إلى وجود علاقة إيجابية بين عجز الحساب الجاري وعجز الموازنة العامة، مما يدعم فرضية العجز الثنائي (Twin Deficit) في حالة الاقتصاد الأردني، ووجود علاقة إيجابية بين عجز الحساب الجاري وفجوة الادخار الخاص – الاستثمار. وتم دمج متغيرين وهميين، هما: (D1) لقياس أثر برامج صندوق النقد الدولي و(D2) لمعرفة أثر ربط سعر صرف الدينار بالدولار الأمريكي على رصيد الحساب الجاري. وأشارت النتائج إلى وجود أثر إيجابي، ولكن ليست له دلالة إحصائية، لبرامج الصندوق، أما أثر الربط بالدولار فقد كان إيجابياً وذو دلالة إحصائية.

الكلمات المفتاحية: فرضية العجز الثلاثي، رصيد الحساب الجاري، فجوة الادخار الخاص – الاستثمار، رصيد الموازنة، منهجية المربعات الصغرى المعدلة كلياً، الأردن.

The research presented in this study is based on work originally conducted as part of a master thesis. The research methodology and findings from the thesis were adapted and expanded upon to suit the objectives of this study.

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1. Introduction

Nations worldwide are actively pursuing economic equilibrium, both internally and externally, to achieve stability and foster sustainable growth. This shared goal emphasizes the need for a resilient economic framework capable of withstanding internal pressures and external dynamics for long-term prosperity. The twin deficit hypothesis, proposing a positive relationship between current account and budget deficits, has been a persistent concern in academic and policy discussions (Kesgingöz and Ahmed, 2021). The globalization movement, particularly since the 1980s, has led to a rise in current account deficits in many countries, sparking debates on the implications of these imbalances. The development of the triple deficit hypothesis (TDH), considering the relationship between budget, current account, and saving-investment balances, becomes essential (Çoban and Balikçioğlu, 2016). The study focuses on Jordan, a country that has faced chronic imbalances in its saving-investment, budget, and current account balances, raising concerns about external sustainability. The specific motivations for choosing Jordan as the focus of this study stem from its unique economic characteristics and the relevance of the triple deficit hypothesis to its economic challenges. Additionally, Jordan's experience offers valuable insights into the broader discourse on macroeconomic imbalances and policy responses in developing economies. As the study examines the validity of TDH in the Jordanian economy, addressing the relationships among private saving-investment, budget, and current account balances, the study's importance lies in providing insights for policymakers and academics, aiding in the development of effective macroeconomic policies and strategies to promote economic development and mitigate risks. The objectives include testing the applicability of the TDH in Jordan, determining causality directions among key balances, estimating the magnitude and direction of relationships, and conducting a comprehensive temporal analysis of balance dynamics during the period (1980 to 2022). The study utilizes annual time series data, employing descriptive and quantitative analysis approaches and an econometric model based on economic theory and previous studies. The findings aim to contribute to macroeconomic literature and inform future research in developing economies facing similar challenges. Mentioning that the study is organized into seven sections, starting with the introduction. The second section delves into the theoretical background and literature review, followed by a brief overview of the performance of the private saving-investment, budget, and current account balance. Sections four and five focus on the study's problem statement and the econometric analysis of the TDH, respectively. Following this, the main findings are presented in the sixth section. Finally, the seventh section provides the study's key recommendations.

2.Theoretical Background and Literature Review

2.1 Economic Theories Explaining the Triple Deficit Hypothesis (TDH)

The TDH has been studied within the same framework of the twin deficit hypothesis, as the explanation of the TDH can be attributed to two distinct approaches, the Keynesian approach, and the Ricardian Equivalence Hypothesis (REH) approach.

2.1.1 Keynesian Mundell-Fleming Approach

The Keynesian Mundell-Fleming model, or the IS-LM-BP model, is an economic framework that combines elements of John Maynard Keynes' macroeconomic theory with the open economy model of Mundell-Fleming. It is used to evaluate the simultaneous impact of monetary and fiscal policies, as well as exchange rate policies, on a country's output, exchange rates, and interest rates.

In this model, an increase in the budget deficit results in higher interest rates due to the insufficient availability of domestic funds for profitable investment opportunities and government borrowing. As foreign capital inflows are attracted, the domestic currency appreciates which makes domestic goods less competitive against foreign goods and contributes to a trade deficit (Mankiw, 2016).

The theoretical analysis of the TDH commences with the national income identity for an open economy, serving as the baseline of the TDH (Şen and Kaya, 2020).

GDP = C + G + I + X – M ……. (1)

C = Household consumption.

G = Government expenditure.

I = Gross capital formation.

X = Exports.

M = Imports.

That is, the expenditure approach to GDP,

GDP = C + S +T ……. (2)

By definition, nations dispose of their income (GDP) for the period "t" as consumption (C), saving (S), or taxes (T).

The total expenditure in any economy equals total income.

C + G + I + X – M = C + S + T……. (3)

(T– G) + (S – I) = X – M ……..... (4)

Where total saving (S) consists of two parts, the portion of disposable income that is not consumed, but rather saved, is referred to as private saving. Government savings, on the other hand, are calculated by subtracting government expenditures from government revenues.

Sp = GDP– C– T …….…….... (5)

where Sp is Private Sector Saving.

Sg = T– G ……..……..… (6)

where Sg is Government Saving.

Substituting (4) and (5) into (3) reveals,

(T-G) + ((GDP– C– T) –I) = X – M ……. (7)

Rearranging, produce the following;

(T-G) + (Sp –I) = X – M ……..…. (8)

Equation (8) shows that (X-M), which is the current account represented by the trade balance, is the combination of the government budget balance (T-G) and the difference between private savings and investment (Sp-I). Considering that, the private sector savings roughly equals investment (Sp≅I), the budget balance and trade balance will move in the same direction by the same amount. This indicates a direct relationship or "twinning" between the two balances. On the other hand, if the private sector savings do not equal the investment, and the budget balance is negative (T<G), then TDH is held, where the sum of the two internal deficits equals the external deficit expressed by (X-M).

2.1.2 Ricardian Equivalence Hypothesis (REH)

The REH states that, when there is an increase in the budget deficit, resulting from a cut of taxes or higher spending, forward-looking economic agents tend to save more in anticipation of future tax increases to finance the rising deficit and accumulated debt. In this approach, economic agents react to the budget deficit by accumulating more wealth instead of increasing spending. Consequently, the increase in the budget deficit is offset by a corresponding increase in private sector savings, leaving the domestic savings unchanged, leading to no response of the current account deficit to changes in the budget deficit (Barro, 1989).

2.1.3 Current Account Targeting Hypothesis

Summers (1988) introduced the concept of the "maintained external balance hypothesis", which reflects the idea of current account targeting in international economics. According to this hypothesis, governments strategically intervene in their economic policies to ensure that the current account remains relatively stable. The argument is that tax policies, particularly, those aimed at incentivizing investment, may be supported by firms in traded-goods

industries if they anticipate that these incentives will be accompanied by other policies intended to stabilize the current account. These accompanying policies might include measures to increase public savings, implement expansionary monetary policies, or even resort to protectionist measures. In essence, the maintained external balance hypothesis suggests that governments actively work to prevent significant and sustained deficits or surpluses in their current accounts by adjusting various economic levers and recognizing the interconnectedness of fiscal and external economic dynamics.

2.1.4 Feldstein-Horioka Puzzle

Feldstein and Horioka (1980) argued that the level of correlation between investment and savings serves as a measure of international capital mobility. If national capital markets are fully integrated, it implies that foreign savings can finance domestic investment, resulting in a low correlation between them. To investigate this, they conducted a cross-sectional data analysis on 16 countries of Organization for Economic Co-Operation and Development (OECD) during the 1960-1974 period. Their estimated model was as follows:

$$I/Y = \alpha + \beta\,(S/Y) + \varepsilon_t \quad \text{.....(9)}$$

Here, (I / Y) is the investment as a percent of GDP, (S / Y) is the savings as a percent of GDP, β is the savings-retention coefficient. A high value of the savings coefficient suggests no international capital mobility, as domestic investment relies on domestic savings. Conversely, if capital were mobile, the coefficient would equal zero, indicating that foreign savings are financing the domestic investment. Therefore, a non-zero savings-retention coefficient suggests limited capital mobility.

Based on that econometric model, Feldstein and Horioka found that the value of the coefficient (β) was 0.887 in their estimated model. This finding led them to propose a relationship between investments and savings, implying that capital is not highly mobile among OECD countries. In a closed economy, domestic savings must cover investments. However, the presence of foreign savings that can fund some investments allows for investment and savings to vary independently. Thus, despite a strong correlation between investment and savings, Feldstein and Horioka suggest that capital may not be as mobile as expected. However, the prevailing conditions, such as integrated financial markets, minimal capital controls, accessible information, and interest rate differentials among these countries, seem to challenge their findings. This paradox is referred to as the Feldstein-Horioka puzzle. In 1983, they extended their analysis to a larger group of OECD countries and continued to find empirical support for their hypotheses.

This insight prompted Fidrmuc (2003) to investigate the long-run relationship among the current account, represented by the trade balance, the budget deficit, and total investment. Fidrmuc's model, with variables measured as a percentage of GDP, was as follows:

$$X_t - M_t = \beta_1 + \beta_2\,(T_t - G_t) - \beta_3 I_t + \varepsilon_t \quad \text{...(10)}$$

In this model, (X−M) represents the current account deficit, (T−G) represents the government budget deficit, and (I) represents the investment ratio. According to the national account identity, all else being equal, an increase in investment leads to deteriorate the trade balance. Therefore, it is expected that (β_3) will be negative. As discussed earlier, if Ricardian equivalence does not hold, a positive coefficient is anticipated (β_2), resulting in a twin deficit.

Furthermore, if a country is fully integrated into the international economy and both the budget deficit and investment are financed through the world capital market, the coefficients of both variables should be equal to one. However, if the Feldstein–Horioka puzzle is at play, (β_3) will be significantly lower than one. In this context, a negative (β_2) would reject the

twin-deficit hypothesis (Altintas and Taban, 2011).

In a nutshell, drawing upon the aforementioned theoretical background, the causal relationship between the CAB and the BB can be summarized as follows. In the Keynesian perspective, the causal relation is posited to flow from the BB to the CAB. Conversely, the Ricardian viewpoint contends that no such causal relationship exists between these balances. Meanwhile, the Current Account Targeting Hypothesis suggests a causal relationship emerging from the CAB to the BB. Lastly, the Feldstein-Horioka Puzzle suggests a bidirectional causal relationship between these two balances.

2.2 Literature Review

The TDH extends the twin deficits hypothesis by including the saving-investment gap. While there is no specific origin or credited source for this extension, numerous studies and researchers have examined and discussed the TDH. This concept has evolved as scholars and economists expand their understanding of deficits beyond the traditional focus on budget and current account imbalances. Akbaş et al. (2014) stated that studies that aimed to investigate the TDH are mainly theoretical.

Jayasiriwardana et al. (2023), examined the TDH in Sri Lanka, emphasizing bidirectional causality between financial account and budget deficits, and unidirectional causality from budget deficit to current account deficit. Batool et al. (2022) investigated the TDH in South Asian countries, finding co-integration among the variables and identifying a two-way causality between current account and budget deficit, as well as between current account and financial deficits. Al-Zu'bi and Athamneh (2022) examined the technology gap in Jordan's economy and the relationships between the economic resource gap, private saving gap, and government saving gap. Akçayir (2022) discussed the TDH and its relationship to short and long-term macroeconomic stability in Türkiye, highlighting the importance of reducing the budget deficit and increasing savings to address the current account deficit problem. Karahan (2021) examined the presence of the TDH in Türkiye, concluding that policies addressing private sector saving shortages are more effective in closing the current account deficit than policies targeting the budget deficit. Kesgingöz and Ahmed (2021) investigated the TDH in Türkiye, finding causality from the budget deficit and saving-investment gap to the current account deficit.

Raouf (2020) Studied the validity of the TDH in 14 MENA countries, including Jordan, confirming a non-linear relationship between the current account, budget, and saving-investment gap deficits. However El-Khishin and El-Saeed (2021) analyzed fiscal and external balance in MENA, including Jordan, oil and non-oil countries, concluding that, oil-rich nations faced twin deficits, while non-oil countries dealt with structural issues, also, Alshammary et al. (2020) studied 20 MENA countries, including Jordan, by examining the link between fiscal balance, investment, and the current account balance, the results initially supported the twin deficits hypothesis but showed a decreasing effect over time. The study also rejected the Feldstein-Horioka hypothesis in the region. Moreover, Okafor, et al (2022) investigated deficits in the current account, fiscal account, and financial account balances in Sub-Saharan Africa (SSA), exploring their relationship and implications for the African Continental Free Trade Area (AFCFTA). Using panel data analysis with Pooled Mean Group-Autoregressive Distributed Lag (PMG-ARDL) specifications, the researchers tested the Triple Deficit Hypothesis (TDH) in the region. Their findings revealed the presence of TDH in SSA, showing bidirectional causality between current account and budget balances, and between saving gap and current account balance,

with unidirectional causality from budget balance to saving gap.

Magoti et al. (2020) tested the TDH in East African countries, finding that fiscal balance and saving gap had a positive long-run impact on the current account. Şen and Kay (2020) analyzed the twin and triple deficits hypotheses using panel data from six post-communist countries, rejecting these hypotheses for any of the sample countries. Ömer and Yildirim (2019) examined the TDH in Türkiye, emphasizing the significance of the saving gap as an indicator of Türkiye's overall economic balance. Raji (2019) studied the relationship between budget, current account, and financial deficits in Nigeria, supporting the TDH and recommending policies to promote fiscal and monetary discipline. Yeniwati (2018) investigated TDH in Indonesia, revealing one-way causality between budget and current account deficits and recommending appropriate economic policies to reduce deficits. Shastri et al. (2017) explored the TDH by examining the long-run relationship between the budget, current account, and private saving gap balances for five South Asian countries. Çoban and Balikçioğlu (2016) examined the TDH and analyzed the relationship among current account, budget, and saving-investment deficits in 24 transition countries. Akinci and Yilmaz (2012) studied the relationship between current account, saving, and budget deficits in Türkiye, finding a positive effect of both saving and budget deficits on the current account.

By reviewing previous studies, it is evident that the triple deficit hypothesis, which includes the savings-investment gap, adds additional complexity to the analyses. Some of the studies that were reviewed confirmed the validity of this hypothesis to the economies that were studied, such as Sri Lanka, the countries of South Asia, Egypt, and Türkiye, as these studies confirmed the existence of a mutual causality between these three balances, the results of these studies confirmed the existence of a long-term causal relationship between these balances, with a focus on the interrelationship between these variables over time. However, unlike the twin deficits hypothesis, empirical literature investigating the TDH on the case of Jordan as a single country is absent and only analyzed using panel data for general region studies. Among these studies that investigated the twin deficits hypothesis in Jordan, AlShawabkeh and Warrad (2024) analyzed the impact of public debt on the Jordanian twin deficits using a threshold time series model. Their results indicated the existence of five significant thresholds. Their results support the Keynesian view of a strong and positive relationship between the current account deficit، saving, budget deficit, and trade openness. In addition, Daoud et al. (2023) investigated the determinants of Jordan's current account balance the study utilized both analytical-qualitative and econometric methods, along with the Autoregressive Distributed Lag (ARDL) approach. The study concluded that the general budget deficit, private saving, and trade openness negatively affected the current account balance, while the real effective exchange rate, gross investment, and GDP growth rate had a positive impact. The study confirmed that Jordan's current account deficit is primarily due to its trade balance and budget deficit, confirming the validity of twin deficit in Jordan. Al-Sawaei and Al-Azzam (2015) examined Jordan's macroeconomic dynamics, by focusing on the relationships among current account deficit, budget deficit, investment, and trade openness using the ARDL approach. The study found long-term connections among these variables, supporting the Keynesian perspective by showing a positive correlation between budget and trade deficits. The study also affirmed the Feldstein-Horioka hypothesis, indicating Jordan's integration with global capital markets. Trade openness increased current account deficits, while monetary policy had the opposite effect. Real

effective exchange rates helped reduce the current account deficit, whereas real economic growth showed no impact. Also, Tarawneh and Altayeb (2012) investigated the twin deficits hypothesis in the Jordanian economy. The study employed various methodologies including co-integration, Granger causality, variance decomposition analysis, and Impulse Response Functions (IRFs). The empirical findings confirmed the existence of twin deficits in Jordan.

3. Overview of Jordan's Current Account Balance, Budget Balance, and Private Saving-Investment Gap Over (1980-2022)

The overview of CAB, BB, and PSGAP, during (1980-2022) reveals a dynamic trajectory characterized by various challenges and reforms over different periods. In the 1980s, imbalances in the budget structure and external shocks contributed to deficits in both BB and CAB, with PSGAP reflecting the widening gap between private saving and investment. In the 1990s, structural measures, economic reforms, and geopolitical events influenced these variables, leading to fluctuations in deficits and surpluses. The 2000s witnessed a mix of economic shocks, global crises, and regional events impacting CAB, BB, and PSGAP, the years from 2010 to 2019, saw heightened deficits, influenced by regional conflicts, refugee crises, and economic shocks, prompting engagement in IMF-supported programs after the graduation in 2005. The most recent period, from 2020 to 2022, reflects the additional challenges posed by the COVID-19 pandemic and continued commitment to economic reforms. Overall, the consequences of these challenges affected the BB, CAB, and PSGAP are evident in their performance, both BB and CAB showed a deficit, albite there were surpluses recorded in some years, along with fluctuations in the PSGAP, which showed persistent deficit during the whole period, reflecting the complex interplay of domestic and global economic forces that have affected Jordan's economic stability.

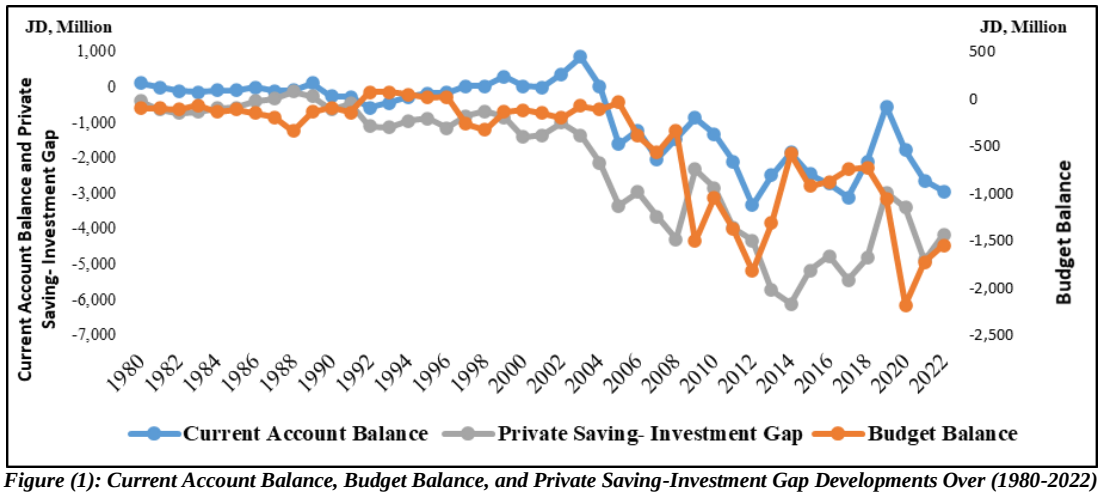

Figure (1): Current Account Balance, Budget Balance, and Private Saving-Investment Gap Developments Over (1980-2022)

Source: - For CAB and BB, The Central Bank of Jordan, annual statistical bulletin, several issues
- For PSGAP, The World Bank, and The IMF databases and researcher calculations.

4.Study's Problem

During the last two decades, Jordan's economy has witnessed a significant deterioration in its budget, current account and saving-investment balances, this raise concerns about the applicability of the TDH in the Jordanian economy, as the performance of these balances indicating a tendency for the TDH to be valid. This issue reflects negatively on the Jordanian economy performance, threaten Jordan's economic stability, internally and externally, economic growth, employment and potentially harming future generations. As a persistent budget deficit lead to

increase government borrowing, impacting interest rates and potentially crowding out private investment. Current account deficit deepening the reliance on external financing and affecting trade dynamics. Meanwhile, insufficient private savings for investment can hinder capital formation and limit economic growth.

To address these challenges, policymakers and academics in Jordan need to understand the relationships among budget, current account, and saving-investment balances, especially in the case of deficit, to mitigate their implications on macroeconomic performance. Therefore, this study came to fill the gap in the literature about the applicability of the TDH in Jordan, as the study try to answer the following questions:

4.1 Main Study Question is:

- Is the TDH valid in the Jordanian economy?

Meanwhile, the Sub-questions are:

- What is the causality direction between Private Saving-Investment Gap (PSGAP) and the current account balances (CAB)? And how do changes in PSGAP affect the CAB?
- What is the causality direction between budget balance (BB) and CAB? And how do changes in BB affect the CAB?
- What is the causality direction between BB and PSGAP?

4.2 Study's Hypotheses

In order to answer the study questions the following hypotheses will be tested:

- There is no statistically significant relationship between PSGAP and CAB.
- There is no statistically significant relationship between BB and CAB.
- There is no statistically significant relationship between PSGAP and BB.

5. Econometric Analysis of the Triple Deficit Hypothesis

5.1 The Study Sample

The study used annual time series data covering the period from 1980 to 2022, consequently, the dependent variable (CAB) is the current account balance, which is defined as the sum of net exports of goods and services, net primary income, and net secondary income. As for (BB) it represents the budget balance, including grants, which is defined as the difference between the total government revenues and total expenditures. (PSGAP) is the private saving-investment gap, which is defined as the difference between the private sector saving and investment. Mentioning that all variables are denominated in million Jordanian dinars. In addition, two dummy variables were used to measure the effect of the IMF-supported program and pegging the exchange rate of the Jordanian Dinar with the US Dollar.

The data for CAB and BB were obtained directly from the Central Bank of Jordan's annual statistical bulletin, several issues. Whereas, since the data related to the PSGAP are not published, the study constructed a time series data for it, mentioning that the process was based on the data published by both the World Bank and the IMF database.

5.2.1 Calculating the Private Saving - Investment Gap

Many studies have calculated the PSGAP due to the unavailability of data for it, of which, Al-Zu'bi and Athamneh (2022) and many others. Mentioning that the domestic saving represents the summation of the saving for both the private sector and the government, Şen et al. (2014) that is shown in equation (11).

Domestic Saving = Private Savings + Government Savings …… (11)

From this standing point and following the definition of domestic saving by the World Bank, which is defined as GDP less final consumption expenditure, while the total consumption is the sum of private consumption and general government expenditure, as shown in equation (12).

Domestic Saving = GDP - Private Consumption - Government expenditure……..… (12)

Based on the equations (11) and (12), private saving can be calculated as:

Private Savings = Domestic Saving - Government Savings…….…….…… (13)

Where, Government saving is defined as total government revenue minus total expenditure (T-G), which is the (BB).

After the data related to the private sector savings have been constructed, and by referring to the IMF database to get the data related to the total investment, private saving-investment gap data have been estimated based on equation (14).

Private saving- investment gap = Domestic Saving - Government Savings - Total Investment..... (14)

5.3 The Study Model

The study developed an econometric model, which is shown in equation (16), based on the economic theory and empirical literature of Khan and Alam (2022), Batool et al. (2022), Ömer and Yildirim (2019), and Akinci and Yilmaz (2012). After making the required adjustments to fit the study aims, which were, replacing the trade balance with the current account balance, excluding the interest rate and exchange rate, which were used by Khan and Alam (2022). Consequently, the general functional form is shown in equation (15), showing that the CAB is a function of both BB and PSGAP.

CAB=*f* (BB, PSGAP, D1, D2) …… (15)

Based on the general functional form (15), the econometric model shown in equation (16) is derived, which shows that the dependent variable is the CAB، representing the external balance. Meanwhile, the two independent variables, which together represent the internal balance, are the BB, and the PSGAP, these two independent variables explain the variation of the dependent variable at time (**t**). Consequently, the coefficients ($\boldsymbol{\beta_1}$) and ($\boldsymbol{\beta_2}$) represent the magnitude of the CAB response to a one-unit change in BB and PSGAP, respectively. Meanwhile ($\boldsymbol{\beta_3}$) and ($\boldsymbol{\beta_4}$) measure the effect of the IMF-supported program and the pegging of the exchange rate of the Jordanian Dinar with the US Dollar on the CAB, taking into account that the dummy variable (D1) takes the value of (1) in the years of implementing an IMF-supported program otherwise take the value of (0), for the dummy variable (D2) takes the value of (1) from 1995 onward, and the value of (0) for the years before 1995 (Table (8) in the Appendix), mentioning that ($\boldsymbol{\mu_t}$) is the random error term.

$$\mathbf{CAB_t = \alpha + \beta_1 BB_t + \beta_2 PSGAP_t + \beta_3 D1 + \beta_4 D2 + \mu_t} \text{ …….. (16)}$$

This equation will be subject to the causality test, and the appropriate econometric techniques to test for the long-term relationships among the variables under study, after conducting the stationarity and co-integration tests.

5.4 Estimation Results

This part represents the results of the econometric analysis of the adopted model, starting with testing the data stationarity, utilizing Augmented Dicky Fuller (ADF) test, passing through testing the causality between the variables, using, Pairwise Granger Causality. As well as testing the co-integration between the variables, ending with estimating the magnitude and direction of the relationship between these variables in the long term using the appropriate econometric model based on the results of the ADF test.

5.4.1 Unit Root Test

Examining the presence of a unit root has become a widespread practice in time series data. This is to avoid both the inconsistent estimated parameters and the associated statistical tests, and the problem of spurious regression. The Augmented Dicky Fuller (ADF) unit root test is used to test the stationarity of time series of variables. The null hypothesis of this test reflects the existence of a unit root, i.e. the non-stationarity of the variables, whereas, the alternative hypothesis reflects the stationarity of the time series data (Wooldridge, 2012). The results of the ADF test are shown in Table (1). The results of the test indicate that all the three balances under study, (CAB, BB, and PSGAP), are stationary after taking the first difference and thus, are integrated into the first degree I (1). This is evident by looking at the probability value (P-value), as it is less than 5%.

Table (1): Unit Root Test Result (Augmented Dicky Fuller Test Results)

	At Level						
	Intercept		Intercept & Trend		None		
Variables	**ADF**	**Prob.**	**ADF**	**Prob.**	**ADF**	**Prob.**	**Result**
CAB	-1.419794	0.5636	-2.861137	0.1850	-0.643479	0.4325	**Nonstationary**
BB	-1.551871	0.4979	-3.115318	0.1161	-0.754843	0.3833	**Nonstationary**
PSGAP	-1.214424	0.6594	-2.827542	0.1966	-0.133727	0.6317	**Nonstationary**
At First Difference							
CAB*	-6.179452	0.0000	-6.142168	0.0000	-6.132479	0.0000	**Stationary**
BB*	-7.826966	0.0000	-7.796113	0.0000	-7.816222	0.0000	**Stationary**
PSGAP*	-6.800898	0.0000	-6.707356	0.0000	-6.681276	0.0000	**Stationary**

**: Reject the Null Hypothesis at 0.05 level of significance.*
Source: Researcher Calculation Using E-views.

5.4.2 Lag Selection

The co-integration test typically follows a preliminary examination of the optimal lag length, which expresses the time during which the CAB responds to changes in other independent variables (BB and PSGAP), as the outcome of the test can be influenced by the number of lags incorporated into the VAR model. To ascertain the ideal lag length for the co-integration test, several criteria are employed of which Akaike information criterion (AIC), Schwarz criterion (SC), and Hannan-Quinn Information Criterion (HQ), as presented in Table (2), all of these criteria converge on one lag length, at a significance level of 5% as the optimal lag, and this lag length will be employed in the context of this study.

Table (2): VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-958.7296	NA	1.4e+17	48.08648	48.21315	48.13228
1	-890.5212	122.7751*	7.97e+15*	45.12606*	45.63272*	45.30925*
2	-885.1013	8.942895	9.62e+15	45.30506	46.19173	45.62656
3	-877.5447	11.33490	1.06e+16	45.37723	46.64389	45.83522

**: Indicating the Optimal Lag.*
Source: Researcher Calculation Using E-views.

5.4.3 Co-integration Test

If the variables are not stationary at the level and were integrated of the first degree, there may be a co-integration relationship and a stable long-run relationship between them, so the co-integration test should be conducted to examine whether there is a long-run relationship between the variables (Wooldridge, 2012). Based on the results of the unit root test, which confirmed the stationarity of all study variables after taking the first difference i.e integrated of order one I(1), and after determining the optimal lag (one lag), the study employed the Johansen and Juselius (1990) test to ascertain the existence of a long-term relationship among CAB, BB, and PSGAP. The Johannes test relies on Maximum Likelihood estimators and serves the purpose of testing and estimating multiple co-integration vectors. This approach entails examining the stationarity of the residuals arising from the long-term relationship. If these residuals exhibit stationarity, it suggests that there is a co-integration between the dependent and independent variables. This, in turn, signifies the existence of a long-run relationship or balance between these variables. Additionally, it aids in testing restricted co-integration vectors and assessing adjustment parameters. The test's foundation lies in the relationship

between the rank of the matrix and its eigenvalues, making use of two specific tests for co-integration, the Trace test and the Maximum Eigenvalue test, the results of these two tests are presented in Table (3) and (4) respectively.

Table (3): Unrestricted Co-integration Rank Test (Trace)

Hypothesized No of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.409070	30.07687	29.79707	0.0464
At most 1	0.182062	8.508515	15.49471	0.4127
At most 2	0.006534	0.268778	3.841465	0.6042

**: Denotes rejection of the hypothesis at the 0.05 level.*
Source: Researcher Calculation Using E-views.

Table (4): Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.409070	21.56835	21.13162	0.0434
At most 1	0.182062	8.239738	14.26460	0.3549
At most 2	0.006534	0.268778	3.841465	0.6042

**: Denotes rejection of the hypothesis at the 0.05 level of significance.*
Source: Researcher Calculation Using E-views.

The results shown in tables (3) and (4) reveal a rejection of the null hypothesis of no co-integration at 5%. Both the trace and maximum eigenvalue statistics point to the existence of a single co-integrating equation at the 5% critical value, with a p-value less than 5%. Consequently, it can be confidently inferred that the variables in the model are indeed co-integrated. This significant finding leads to the important conclusion that there is a shared trend among the variables, signifying the existence of a long-term relationship between the CAB, BB, and PSGAP, this could be noticed in Figure (1).

5.4.4 Granger Causality Test

The presence of a long-run relationship between the variables, by itself, does not indicate the direction of causality. Co-integration suggests a long-term relationship or equilibrium between variables, but it does not reveal which variable is causing changes in the other. Consequently, the Granger causality test was utilized to fulfill the central objective of the study, testing the TDH in Jordan. This test serves the purpose of identifying causal relationships and determining their direction, whether it is one-way (unidirectional), two-way (bidirectional), or if there is simply no causality between the variables (Gujarati, 2004). The results, as shown in Table (5), indicated that there is a one-way causal relationship between BB and CAB, from BB to CAB, which is compatible with the Keynesian approach, as the null hypothesis is rejected at a 5% level of significance, this result suggests that policies aimed at addressing and stabilizing the BB may positively affect the CAB over time, this might be attributed that budget deficit may lead to a corresponding increase in the current account deficit as the government need to borrow from foreign sources to finance its deficit, to avoid crowding out the privet sector, thus putting pressure on the current account.

Regarding the causality between BB and PSGAP, based on the results, it is considered a two-way causal relationship, this result can be explained by the fact that the Jordanian economy is suffering from a persistence deficit, as the revenue base is mainly limited to taxes and grants, and since the private saving is less than investment, meaning that the investment in Jordan is financed from external sources, the incentives and exemptions provided by the government to stimulate investment

lead to an increase in investment at a faster pace than the increase in private saving, and may cause a budget deficit through a decline in revenues and or an increase in government expenditures, also, the policies adopted by the government to mitigate the budget deficit, such as increasing tax rates, or cutting the expenditures may lead to a change in the pattern of saving and investment among economic agents.

Meanwhile, the results indicate that there is no significant causality between PSGAP and CAB. This result might be attributed to several economic factors, including, the composition of private investments, international economic conditions, government policies, behavioral matters, and the degree of capital mobility, as the complex interplay of these factors within the specific economic characteristic of Jordan may introduce complexities that diminish the causal relationship between PSGAP and CAB.

Based on the results of this causality test, the TDH is not valid for the Jordanian economy, as to validate the TDH, deficits must be recorded in all three balances simultaneously. Additionally, there should be a two-way causality between them. In terms of the applicability of the TDH, this result is contradicting the result of Raouf (2020) which indicates that the triple deficit hypothesis is valid in the MENA region, including Jordan, meanwhile, the results supporting the existence of the twin deficit hypothesis in the Jordanian economy which is consistence to the results of AlShawabkeh and Warrad (2024) Daoud et al. (2023), Alshammary et al. (2020), Al-Sawaei and Al-Azzam (2015), and, Tarawneh and Altayeb (2012). Mentioning that, the rejection of the TDH in Jordan has broader implications for economic theory and policy in comparable economies, particularly within the region. Firstly, this suggests that the dynamics driving deficits in each account may vary across different economies, undermining the universality of the TDH as a framework for understanding macroeconomic imbalances.

Moreover, the validation of the twin deficit hypothesis in Jordan, underscores the importance of fiscal policy in influencing external balances. This highlights the need for coordinated fiscal and monetary policy measures to address external imbalances and promote economic stability.

The factors affecting the rejection of the TDH could indeed indicate a larger trend or irregularity in the region. Other economies in the MENA region may also exhibit similar patterns, with fiscal policy playing a significant role in shaping external balances. However, it is essential to consider the unique characteristics and policy contexts of each country within the region.

Furthermore, the findings in Jordan may prompt a reevaluation of economic policy frameworks and strategies in comparable economies. Policymakers may need to reassess the effectiveness of traditional approaches to macroeconomic management and explore alternative policy measures to address external imbalances and promote sustainable economic growth.

Overall, the rejection of the TDH in Jordan and its implications for economic theory and policy suggest the need for a nuanced understanding of macroeconomic dynamics and policy responses tailored to the specific circumstances of each economy within the region.

Table (5): Pairwise Granger Causality Test Result

Null Hypothesis	Obs	F-Statistics	Prob.
BB ↛ CAB	42	9.64464	0.0035*
CAB ↛ BB		0.47767	0.4936
PSGAP ↛ CAB	42	3.22700	0.0802
CAB ↛ PSGAP		1.49001	0.2295
PSGAP ↛ BB	42	4.37230	0.0431*
BB ↛ PSGAP		15.9496	0.0003*

**: Denotes rejection of the null hypothesis at 0.05 level of significance.*
↛ : Implies does not Granger Cause.
Source: Researcher Calculation Using E-views.

5.4.5 Model Estimation

Once the co-integration between the variables exists, and the ADF test shows the stationarity of all variables at the first difference, the utilization of the Fully Modified Least Squares (FMOLS) approach becomes viable to estimate the long-run relationship among the CAB, BB, and PSGAP, as this technique produces reliable estimates for small sample size and provides a check for robustness of the results, this is crucial given the empirical nature of the analysis and the potential impact of data limitations on the validity of the findings. This method, proposed by Phillips and Hansen (1990), offers several advantages that align with the objectives of the study. They introduced an innovative estimator featuring a semi-parametric adjustment designed to mitigate issues stemming from the long-term relationship between the co-integrating equation and innovations in stochastic regressors, addresses concerns arising from the long-term relationship between the co-integrating equation and innovations in stochastic regressors, ensuring the accuracy of our estimates even in the presence of complex dynamics. This innovation resulted in the development of the FMOLS estimator, which, in its asymptotic behavior, demonstrates a notable absence of bias and adheres to a fully efficient mixture normal distribution. Indeed, the FMOLS estimator considers the potential presence of autocorrelation and heteroscedasticity patterns within the residuals. Furthermore, it addresses the issue of endogeneity within the explanatory variables, this distinctive feature allows for the use of standard Wald tests, employing asymptotic Chi-square statistical inference for robust analysis. This feature is particularly advantageous in the study, where the relationships between CAB, BB, and PSGAP may be subject to endogeneity concerns due to potential feedback effects.

While alternative econometric techniques such as Vector Autoregression (VAR) models or ARDL offer valuable insights into the dynamics of the variables under investigation, we opted for FMOLS due to its ability to estimate a single co-integrating relationship and its robustness to issues such as endogeneity and small sample sizes. By leveraging the strengths of FMOLS, the study ensures the reliability and validity of the empirical analysis, ultimately enhancing the credibility of the research findings.

The results are introduced in Table (6), revealing that, there is a statistically significant, at a 5% level of significance, positive relationship between CAB and BB, with a coefficient value of 0.50, indicating that an increase of BB deficit by JD 1.0 million lead to an increase of CAB deficit by about JD 0.5 million. This result supports the existence of the twin deficit hypothesis in the Jordanian economy as many studies did before. On the other hand,

the results indicated a statistically significant, at a 5% level of significance, positive relationship between CAB and PSGAP, with a coefficient value of 0.53, indicating that an increase of PSGAP deficit by JD 1.0 million led to an increase of CAB deficit by about JD 0.53 million.

Regarding the dummy variables, the results indicated that D1, which represents the engagement in an IMF-supported program, is not statistically significant, this was expected as the Tsikata et al. (2005) mentioned that the evaluation of the IMF's role in Jordan suggests moderate success. Meanwhile, the pegging of JD with the USD has a statistically significant positive effect on the CAB, as the pegging contributed to reducing the current account deficit by JD 518.8 million.

Based on the estimated parameters, the elasticity between the CAB, BB, and PSGAP can be estimated. This involves multiplying the estimated value of β_1 by the ratio of the average BB to the average CAB over the period from 1980 to 2022. The calculated elasticity value of 0.29 between the CAB and BB suggests that the CAB is relatively inelastic concerning variations in the BB. In practical terms, this indicates that changes in the government's budgetary position, as reflected by the BB, have a limited impact on CAB. The inelastic response implies that the CAB is less sensitive to alterations in the BB, possibly due to other factors exerting more influence on the current account dynamics.

On the other hand, the significant elasticity value of 1.36 between the CAB and PSGAP, which was calculated by using the same approach, implies that the CAB is highly responsive to changes in the PSGAP. This suggests that shifts in PSGAP have a substantial impact on the CAB. The higher elasticity indicates a more dynamic adjustment of the CAB to fluctuations in the PSGAP.

Table (6): Fully Modified Ordinary Least Square (FMOLS) Result

Variable	Coefficient	STDH.Error	t-Statistic	Prob.
BB	0.505707	0.124466	4.063012	0.002
PSGAP	0.534755	0.046164	11.58369	0.0000
C	165.7510	109.4016	1.515069	0.1383
D1	86.02162	118.8503	0.723781	0.4738
D2	518.7690	156.0534	3.324305	0.0020
R-squared	0.880430	Mean dependent var		-903.0381
Adjusted R-squared	0.867504	S.D dependent var		1132.136
S.E of regression	412.0976	Sum squared resid		6283504
Long-run variance	122060.7			

Source: Researcher Calculation Using E-views.

5.4.6 Diagnostics Tests

5.4.6.1 Normality Test

The Jarque-Bera test is used to test whether the residuals are normally distributed or not. This test depends on the p-value if it is below a chosen significance level (commonly 5%), the null hypothesis is rejected, and it concluded that the residuals are not normally distributed. As shown in Figure (2) the p-value is strongly indicating that the null hypothesis cannot be rejected.

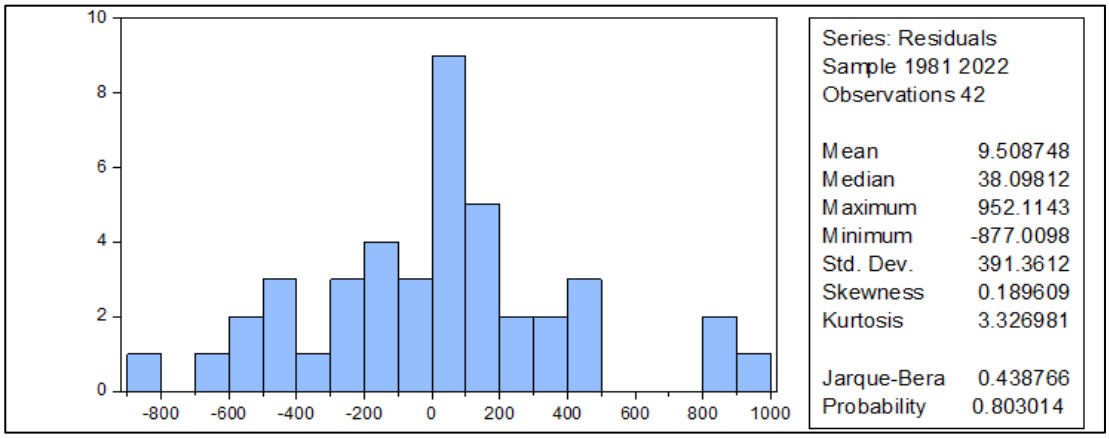

Figure (2): Jarque-Bera Normality Test

Source: Researcher Calculation Using E-views.

5.4.6.2 Multi-collinearity Test

The presence of multi-collinearity between the explanatory variables indicates a negative impact on the reliability and credibility of the regression results. The strong correlation between the explanatory variables leads to an increase in the standard error, and thus a decrease in the value of the t-statistic, and this negatively affects the significance of the estimated parameters (Wooldridge, 2012).

The Variance Inflation Factors (VIFs) were conducted, which serve as a tool for quantifying the extent of collinearity among the independent variables within a regression equation. VIFs provide insights into the degree to which the variance of a coefficient estimated for a particular independent variable has been magnified due to its correlation with other independent variables. Essentially, VIFs help assess the impact of multi-collinearity on the reliability of regression results. Table (7) represents the result of this test, indicating that centered VIF values for the independent variables are less than 2.5 as a low VIF suggests that the variance of a coefficient for a particular independent variable is not significantly inflated due to its correlation with other independent variables, indicating no substantial multicollinearity.

Table (7): Variance Inflation Factors Result

Variable	Coefficient Variance	Centered VIF
BB	0.015492	1.874152
PSGAP	0.002131	2.421320
C	11968.71	NA
D1	14125.40	1.115914
D2	24352.65	1.862118

Source: Researcher Calculation Using E-views.

6. Main Study Results

The empirical findings indicated the invalidity of TDH and as expected to the validity of the twin deficit hypothesis for the Jordanian economy. This is consistent with the results of the causality test which showed a one-way causality from the BB to the CAB, a one-way causality from the PSGAP to the CAB, and a bidirectional causality between the BB and the PSGAP. Meanwhile, the estimation of the coefficients based on (FMOLS) indicates a statistically significant positive relationship between CAB and BB, indicating that an increase in BB deficit leads to an increase in CAB deficit, this result supports the existence of the twin deficit hypothesis in the Jordanian economy, a statistically significant positive relationship between CAB and PSGAP, indicating that an increase of PSGAP leads to an increase of CAB deficit. As for the dummy variables, the results showed that the IMF-supported programs (D1) have a

positive but statistically insignificant effect on the CAB. These results are consistent with previous studies on testing the twin deficit hypothesis in the case of Jordan. On the other hand, the results indicated that pegging the dinar exchange rate to the US dollar has a positive and statistically significant effect on the CAB. Meanwhile, the estimation of the elasticity indicated that the CAB exhibits relative inelasticity (elasticity value of 0.29) to changes in the BB. Conversely, the elasticity (1.36) between CAB and the (PSGAP) indicates a highly responsive CAB to variations in PSGAP.

7. Study recommendations

The study's recommendations aim to guide policymakers and researchers in addressing economic challenges and fostering a more balanced and sustainable economic environment in Jordan, considering the TDH does not hold in the Jordanian economy. Firstly, given the positive relationship between budget balance (BB) and current account balance (CAB), indicating the existence of the Twin Deficit Hypothesis in Jordan, policymakers are advised to address the challenge of energy dependency and the high energy import bill rather than solely focusing on fiscal adjustment. In addition to investing in renewable energy sources, policymakers should consider addressing potential risks and barriers to the implementation of renewable energy projects, such as regulatory hurdles or financing constraints. Furthermore, exploring partnerships with international organizations or neighboring countries to leverage expertise and resources in the renewable energy sector. Secondly, recognizing the bidirectional causality between BB and the private saving-investment gap (PSGAP), the study advocates for diversifying revenue sources and mitigating dependency on foreign aid by promoting key sectors such as tourism, technology, and services. Creating an investment-friendly environment and diversifying into knowledge-based industries can attract foreign investment, fostering economic resilience, However, it's crucial to acknowledge potential risks and barriers to diversification efforts, such as limited human capital or infrastructure constraints. Thirdly, although PSGAP does not show a direct causal relationship with the current account, the positive relationship underscores the importance of policymakers focus on promoting domestic savings and investment. Encouraging savings and facilitating productive domestic investments can contribute to a stable economic environment by developing robust domestic financial markets, Additionally, policymakers should consider conducting further research to explore the relationship between PSGAP and CAB in more detail, perhaps through a sectoral analysis to better understand the dynamics at play. This, in turn, can provide alternative sources of financing, reducing reliance on external borrowing.

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Appendix

Table (8): Study's Data

JD Million / **Year**	**CAB**	**BB**	**PSGAP**	**D1**	**D2**
1980	111.6	-104.0	-397.2	0	0
1981	-13.7	-101.5	-645.0	0	0
1982	-118.3	-113.0	-735.8	0	0
1983	-141.4	-68.7	-704.0	0	0
1984	-104.1	-142.1	-597.9	0	0
1985	-99.9	-112.2	-594.3	0	0
1986	-16.0	-153.1	-398.9	0	0
1987	-118.3	-198.4	-336.4	0	0
1988	-105.5	-341.0	-133.5	0	0
1989	104.9	-137.1	-275.1	1	0
1990	-272.8	-94.5	-634.5	1	0
1991	-288.1	-147.8	-463.2	1	0
1992	-587.7	67.5	-1,106.8	1	0
1993	-446.4	69.5	-1,145.6	1	0
1994	-279.2	44.6	-966.6	1	0
1995	-179.8	15.2	-892.2	1	1
1996	-157.4	16.6	-1,164.5	1	1
1997	20.8	-263.4	-816.8	1	1
1998	15.5	-327.3	-696.0	1	1
1999	287.1	-140.4	-852.4	1	1
2000	19.5	-119.8	-1,414.2	1	1
2001	-17.7	-155.5	-1,360.4	1	1
2002	355.7	-205.1	-1,003.9	1	1
2003	849.8	-79.0	-1,355.9	1	1
2004	27.7	-116.7	-2,146.8	1	1
2005	-1,610.6	-40.5	-3,360.2	0	1
2006	-1,223.8	-391.4	-2,964.7	0	1
2007	-2,038.0	-568.8	-3,657.8	0	1
2008	-1,457.2	-338.2	-4,294.6	0	1
2009	-882.6	-1,509.2	-2,323.7	0	1
2010	-1,336.3	-1,045.2	-2,851.9	0	1
2011	-2,098.8	-1,382.7	-3,983.4	0	1
2012	-3,344.9	-1,824.0	-4,331.0	1	1
2013	-2,487.7	-1,318.0	-5,742.1	1	1
2014	-1,851.7	-583.5	-6,132.3	1	1
2015	-2,463.3	-925.9	-5,175.1	1	1
2016	-2,734.4	-878.6	-4,766.2	1	1
2017	-3,118.6	-747.9	-5,454.5	1	1
2018	-2,103.1	-727.7	-4,826.6	1	1
2019	-548.7	-1,058.4	-2,986.4	1	1
2020	-1,778.5	-2,182.5	-3,399.4	1	1
2021	-2,639.5	-1,730.6	-4,900.2	1	1
2022	-2,944.6	-1,552.6	-4,170.6	1	1
Average (1980-2022)	**-879.4**	**-505.0**	**-2,236.2**		

Source: - For CAB and BB, The Central Bank of Jordan, annual statistical bulletin, several issues.
- For PSGAP, The World Bank, and The IMF databases and researcher calculations.
- D1 for the IMF-supported program, D2 for pegging the exchange rate of Dinar with the US Dollar.