Volume 23, Special Issue 2 **Print ISSN: 1098-8394;**
Online ISSN: 1528-2651

THE PORTFOLIO BEHAVIOUR OF SAUDI COMMERCIAL BANKS

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ABSTRACT

This study explains the banking performance in KSA to draw out the implications of related theories and evidence for policymakers. This paper investigates the portfolio behaviour of commercial banks in Saudi Arabia during the period 1996-2018 using quarterly data. The expected utility model used is based on the portfolio choice theory originated and developed by Hicks (1935) and Markowitz (1952). Some nested models are developed to test symmetry and homogeneity restrictions on the interest rate matrix. The results of this research indicates that the changes in interest rates of banks portfolio variables describe the changes in the portfolio items, but Saudi commercial banks are more interested in the availability of funds.

Keywords: Portfolio Behaviour, Commercial Banks, Expected Utility Model, Saudi Arabia.

INTRODUCTION

Banks are useful intermediary institutions working under strict authoritative monetary controls to channelize funds in the economy. Banks accept deposits from various segments of the economy, lends funds where they are required, run the country's payment system, and provide a platform for the transmission mechanism of the monetary policy (Garcia, 1997). Despite all the market and balance sheet constraints, banks work to maximize their profitability and market value. Their capacity to earn profit depends upon their investment policy. For this reason, every bank must maintain a portfolio of assets along with a loan portfolio. Collectively we call them earning assets. The earning assets plus the bank's cash make up what is known as its portfolio. The three main concerns relating to portfolio management include liquidity, safety, and earning ability. A commercial bank needs a higher degree of liquidity in its assets. Therefore every bank keeps a sufficient proportion of its assets in cash and liquid assets.

Commercial banks are prohibited by the regulations to take enormous risks because it is required to maintain a required ratio of its fixed liabilities to its total assets with itself and with the central bank in the form of cash. In following the safety principle, banks will not be able to create more credit. It will thus lose customers to other banks, and its income will also be meager. Therefore, every commercial bank strikes a balance between safe and risky assets. One of the challenges that every bank faces is the selection of most appropriate assets (loans, securities,

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etc.) even with the uncertainty of the future. This led to the conclusion that for a bank to earn more profit, it must strike a judicious balance between liquidity and safety and optimize its assets portfolio. Briefly, in the presence of multiple market factors like interest rate fluctuations, monetary policy changes, varied demand for loans and advances, banks seek to have an appropriate level of their assets in the desired portfolio. Further, if banks do not consider the assets' distribution in line with their aim, banks may increase or decrease some assets' proportion to adjust their portfolio. However, it is worth mentioning that cost is vital in this portfolio rebalancing (Andersen & Burger, 1969).

The theory of portfolio behavior emphasizes the importance of uncertainty over future return rates, and future deposits withdraw uncertainty, which ultimately affects future liquidation costs. Also, the banks are highly concerned about expected profit and its variability in their portfolio behavior. The country's central bank imposes a legal reserve requirement ratio to the commercial banks working within the country so that banks can be able to facilitate the customers if they want to withdraw demand deposit or time deposit money. After fulfilling the reserve requirement ratio imposed by the central bank, the second step, the bank should have money in its hand for any contingency requirements; for that purpose, banks should make secure or risk-free investment and earn interest on it. The risk-free investments are investments in government bonds or in treasury bills so that whenever they need money in the future, they can use that money. The third step is now to make loans to the potential customer and earn interest on it. Whatever funds are available after step three, it can be invested in the open market, making money for the banks. So, in this approach, the safety of funds is the most crucial aspect, and interest rates are not affecting the composition of the bank's portfolio. It does not explain how banks optimize their profit if they decide whether to shift funds from one asset to another or not. Its mean interest rates are not influencing the bank portfolio choice items. Generally speaking, traditional banking behavior models are not analytical but descriptive.

This study empirically examines Saudi commercial banks' portfolio behavior and examines the link between the Saudi central bank and commercial banks through its control instruments. The study is expected to have a vital contribution to the literature, as previously, there has been no considerable empirical researches focusing on Saudi Commercial Banks' portfolio behavior. Whereas, the studies are available for other countries, e.g.: Bewley (1981) for the UK, Arjoon (1994) for Caribean countries, and Subeniotis (1991) for Greece. The study is especially important since it examines the portfolio behaviour of an emerging and important GCC region economy. The economy is characterized by large variant flows in the form of oil revenue. The results of the study are particularly important for policymakers and regulators. The study employed the expected utility model and used the Full Information Maximum Likelihood technique to estimate the model's coefficients. We used quarterly data for the year 1996 to 2018. We found that the liquidity or safety of funds remained the most vital component in the portfolio creation decision for Saudi banks rather than various assets' profitability.

The rest of the paper is organized as follows. Section 2 is a brief review of the Saudi Banking sector, followed by section 3, covering the study's theoretical background. Section 4 discusses the data and methodology used. Section 5 covers the analysis and results, whereas; section 6 highlights the main findings and offers some concluding remarks.

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SAUDI BANKING SECTOR

The Kingdom of Saudi Arabia is home to several dedicated Islamic banks. Islamic window operations are also offered through conventional banks. The number of commercial banks operating in Saudi Arabia at end-2019 stood at 29, and Islamic finance assets represent more than 50% of system financing. There are six dedicated Islamic banks, while all other commercial banks offer several Islamic products as a part of loans and advances note on the balance sheet (Bintawim Samar Saud, 2011). Saudi commercial banks performed well in 2019 as their assets rose by 9.7 percent (SAR 233 billion) to SAR 2,631.1 billion while banking deposits were 1,843 billion, and bank credit extended to SAR 1,610 billion in 2019. Overall Saudi Banking sector witnessed positive growth in 2019, as indicated by assets, credit, and liquidity. The increase in credit was supported by private and public lending, whereas liquidity improved due to TASI index's inclusion in several emerging markets indices. However, as we know, the outbreak of COVID 19 is hurting the economic and financial sector's growth worldwide. To subside the impact of COVID-19 on the Saudi economy, the Saudi Arabian Monetary Authority (the central bank) injected SAR 50 billion into the banking sector in June 2020.

Moreover, the Saudi Arabian Monetary Authority has extended its effort to improve the financial regulatory framework according to international standard-setting bodies' regulations. It has also been paying more attention to new potential risks that may cause financial instability, including the extraordinary development of financial technology (FinTech) and cyber-security threats.

Regarding Basel III requirements, SAMA instituted the Internal Liquidity Adequacy Assessment Process (ILAAP), which came into force in January 2018 to meet Basel III requirements that stress the importance of measuring and monitoring liquidity risks. Also, Basel Committee on Banking Supervision (BCBS) issued revisions to the capital requirements relating to credit, market and operational risks, and the leverage ratio disclosure requirements to improve the supervisory framework and lay a foundation for the banking sector's resilience.

In terms of risk-taking ability and especially the credit risk of Saudi banks, Saudi banks' overall performance in terms of Basel III implementation is sound. Basel III's indicators like capital adequacy, tier I capital, and the banks are well ahead of their target. The banks have also done well in terms of return on equity capital, and their overall performance remained reasonably stable over the last many years (Bajwa et al., 2019)

THEORETICAL BACKGROUND

Several studies undertake the issue of portfolio behavior of banks in the last few decades. The study's primary significance lies in the fact that any changes in financial institutions' portfolio behavior direct the flow of funds to other available investment avenues. The past studies have discussed various types of portfolio behavior approaches used by banks. Some of these include the traditional approach, precautionary approach, and portfolio theoretical approach.

Before discussing these approaches, we examine the literature regarding banks' risk-taking behavior, which links to the capital requirements. For the banking sector, the capital requirement is a double-edged sword. More capital requirements might also induce a bank to assume more significant risks and provide safety to banks. Many studies have examined the relationship between risk-taking and the capitalization of banks. The literature argued that risk and capital decisions are simultaneously determined and interrelated. Gennotte et al., (1991)

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showed that an increase in the capital requirement compels banks to increase their risky assets in need of earning higher returns, which ultimately decreases their portfolio. Diamond & Rajan (2002) argued that aggregate liquidity conditions could affect bank solvency. These studies indicated that more capital reduces the probability of financial distress and also reduces liquidity creation. The literature focuses on testing various banking theory predictions with data primarily from the United States and Europe. Banks adjust their holdings after an increase in the minimum regulatory capital requirements in Basel III regulations.

Portfolio decisions by the banks also impact the overall economy of the country. Aoki & Sudo (2012) estimated the model by Bayesian estimation and found that the banks' portfolio decisions played an essential role in accumulating government bonds and deflation in Japan since the latter half of the 1990s. Shim (2013) mentioned that the countercyclical capital buffer in the banking sector is necessary to help the real economy's performance during recessions.

The conventional bank behavior approach was studied by Robinson (1962) by examining the conflicting problem between banks' profitability and safety. The author argued that this inconsistent problem should be resolved before going through the investment of bank funds. Chambers & Charnes (1961) suggested using linear programming for determining optimal portfolios of the banks. The authors mentioned some constraints in the model, including the requirements of risk level limitations by the regulators and the balance sheet constraint. Earlier, the initial model about traditional banking behavior was not analytical, but it was a descriptive study. Based on two assumptions, a new model of bank portfolio behaviors was proposed by Orr & Mellon (1961) and Porter (1961). The first assumption is that banks minimize expected loss or maximize expected return. The second assumption is that banks are subject to random flows of deposits and estimate the probability distribution of deposits flows.

On the other hand, there are many factors on which the precautionary model of portfolio behavior depends. Uncertainty or risk is one of these factors. Moreover, risk aversion is one of the most discussed topics in the literature relating to bank behavior. In this regard, Hicks (1935) was the first to examine the mean and variance (μ, σ^2) concept in his study. The author proposed the theory of bank behavior under risk aversion. Many studies later followed him, including Markowitz (1959), who developed these concepts into mean-variance theory. Further, in his study, Tobin (1958) describes the relationship between liquidity preference and risk aversion.

Banks' tendency to maximize their expected utility (EU) is the primary assumption of the portfolio theoretical approach. Mainly the banks' balance sheet constraints due to regulations are driving the return and variance of their portfolios. If a risk-averse bank has to achieve a maximum expected utility level, it should have a diversified portfolio (Al-Tarawneh & Khataybeh, 2015). A significant amount of bank portfolio behavior literature, including our study, is based on this approach. The other noticeable studies on this approach are (Kagigi, 2001; Kane & Malkiel, 1965; Parkin et al., 1969; Parkin, 1970; Sharpe, 1974). The portfolio theoretical approach accommodates uncertainty over future return rates, deposit withdrawals, and liquidation costs. Generally speaking, banks are interested in maximizing their expected profit and minimizing their variability, whereas the theoretical portfolio model addresses both of these issues.

Sustainable economic growth and development are manifested in the healthy growth of human and physical capital. These factors are dependent on the ability of an economy to mobilize useful financial resources. There are two critical aspects relating to these resources. First is the allocation of resources to the most appropriate and productive channels. Second is the investors and entrepreneurs may have easy access to these resources. This is only possible if the

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institutional setup responsible for financial intermediation is aptly functioning in the economy (Mahran, 2012). Historically this role of financial intermediation is performed by banks and non-bank financial institutions in the economy. The last four to five decades have witnessed substantial changes in the financial systems and markets globally. New instruments have emerged, transaction costs have reduced, and more information flow is available but there is no decline in the role of intermediation. Instead, this role has increased since intermediaries have to trade into a new variety of instruments. Consequently, the standard theories of intermediation based on information asymmetry and transaction costs do not fully cover these changes (Allen & Santomero, 1997). Similarly, the financial institutions' portfolio behaviors have also become complicated due to more variety of instruments, declining costs due to competition, and changes in the countries' financial systems.

In this regard, Pyle (1971) investigated the sufficient conditions for financial intermediation. The author concluded that the expected return differential is positive between assets and liabilities, and the intermediation will hold for the stochastic independence between assets and liability return. As a result, intermediation will exist when there is a positive risk premium on advances and a negative risk premium on deposits only. Both Pyle (1971) models and Parkin (1970) did not address Liquidity problems. Kane & Malkiel (1965) handled the liquidity issues in their work by suggesting that the variation of deposits is based on the customers' relationship, as when the relationship is good, it will decrease and increase when it is bad.

DATA AND METHODOLOGY

In order to examine Saudi commercial banks' portfolio behavior, we used quarterly time series data collected from the monetary authority of Saudi Arabia and the ministry of finance. As all Saudi commercial banks offer Islamic products, no distinction between conventional and Islamic banks has been taken in the methodology. The commercial banks' balance sheets segregate between choice and non-choice items with their respective weighted average rate of returns. The details of these choice and non-choice items are given in Table 1.

The variable adjusted portfolio items (ADI) which include items not analyzed explicitly. This variable is included in the portfolio to hold the balance sheet constraints.

Table 1
CLASSIFICATION OF ASSETS BETWEEN CHOICE AND NON-CHOICE ITEMS

Choice Items	**Status**
Government sector loans (GOV)	Endogenous
Private sector loans (PRIV)	Endogenous
Government bonds (BONDS)	Endogenous
SAMA Treasury bills (SBILLS)	Endogenous
Cash (CASH)	Endogenous
Non Choice Items	**Status**
Capital	Exogenous
Reserves	Exogenous
Time deposits (TDEPOSIT)	Exogenous
Demand deposits (DDEPOSIT)	Exogenous
Adjustment items (ADJ)	Exogenous
Rates	**Status**
Weighted Average Rate of Rate of Return, (WARR)	Exogenous
Government sector loan rate (GOVR)	Exogenous

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Private sector loan rate (PRIVR)	Exogenous
Government bond rate (BONDR)	Exogenous
SAMA Treasury bills rate (SAMAR)	Exogenous
Inflation (INFL)	Exogenous

The EU (Expected Utility) Model

The Expected Utility model is derivatives of Parkin et al., (1969) and also used by Muhammad (2015). The statistic version of the model can be written as:

$$A_{1t} = \Gamma R + BA_{2t} + \varepsilon_t \quad (1)$$

Where; R is an n component vector of expected decision period returns on choice set items; Γ and B are respectively n×n and n×m matrices of parameters on rates of return and exogenous variables; ε_t is an n component vector of disturbance terms assumed to possess a normal distribution with a mean of zero and an unknown variance-covariance matrix, Ω, that is $\varepsilon \sim N(0,\Omega)$ and $\Omega=\Omega(\varepsilon)=\Sigma\otimes I$; where Σ is the covariance matrix of the errors across the n equations for any given point in time, t (Muhammad, 2015).

We have imposed homogeneity and symmetry restrictions on the above model to study in Saudi commercial banks' portfolios. The same restrictions were imposed by Muhammad (2015) while discussing the Pakistani commercial bank's portfolios.

For estimation of coefficients of a system of equations, this study applies an econometric technique called full information maximum likelihood (FIMAL). Whether we estimate static or dynamic system full information maximum likelihood may be used. The only precaution is without losing any useful information one equation may be deleted from the system. The study of Barten (1969) indicated that in FIMAL, it is possible to estimate the coefficients of deleted equations indirectly by imposing restrictions of Cournot & Engel aggregation respectively, regardless of which equation is omitted. The study further explained that even in the situation where restrictions have been imposed on the matrices of coefficients, the FIMAL assumes contemporaneous errors have a joint normal distribution and estimates likelihood function. According to Zellner (1962) in case the function is correctly specified, the estimators using FIML are consistent, efficient, and normally distributed.

RESULTS

Before estimating the model given in equation 1 in the previous section, it was essential to conduct a unit root test of the variables. If any variable contains unit root I(1), then it is non-stationary and the regression involving that series may be spurious. We opted to apply Augmented Dicky Fuller and KPSS tests to examine the null hypothesis that the used series contains a unit root. The used tests of unit roots, given in Table 2 below, confirm that all variables of choice, non-choice, and rates are I(0).

Table 2
UNIT ROOT TEST RESULTS

Endogenous Ratios (Assets)		
	ADF	**KPSS**
GOV	-2.830(0.017)	

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CASH	-3.476(0.048)	
PRIV	-3.195(0.092)	
BONDS	-4.465(0.003)	
SBILLS		LM=0.309; 5%=0.463
Interest Rates and Costs		
GOVR	-3.397(0.059)	
PRIVR	-3.375(0.062)	
BONDR		LM=0.131;5%=0.146
SBILLR		LM=0.126;5%=0.146
INFLN		LM=0.342;5%=0.463
Exogenous Ratios (Liabilities)		
CAPITAL	-3.203(0.023)	
RESERVE	-1.675(0.088)	
ADJ	-1.902(0.055)	
DD		LM=0.136;5%=0.146
TD		LM=0.239;5%=0.463
All the variables in the table above are stationary at a 5% level		

Table 3 shows the analysis of various static, restricted, and unrestricted models that are estimated to analyze the banking behavior.

Table 3
ANALYSIS OF RESTRICTED AND UNRESTRICTED MODELS

Restrictions	Log-likelihood	LR-Test	Results
	Static	Models	
Unrestricted	1231.065		
Homogeneity	1229.994	$2.141 < \chi^2_{(4,0.05)}=9.488$	Accepted
Symmetry	1221.685	$18.76 > \chi^2_{(6,0.05)}=12.592$	Rejected

The above table shows that the best equation between restricted and unrestricted models is the equation with homogeneity.

Table 4
PROPERTIES OF HOMOGENEITY MODEL

Variables	Static model	
	R^2	D-W
GOV	0.96	1.93
PRIV	0.98	1.81
BONDS	0.99	1.89
SBILLS	0.96	2.03

The results of Durbin-Watson statistics for all the six estimated equations are given in table 4. Similarly, Table 5 indicates the results of System Residual Portmanteau Tests for Autocorrelations. These results show the absence of autocorrelation problems in lag 6 of the system of equations.

Table 5
SYSTEM RESIDUAL PORTMANTEAU TESTS FOR AUTOCORRELATIONS AT LAG 6

Lags	Q-Stat	Prob.
1	14.989	0.525

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2	27.762	0.681
3	45.097	0.593
4	67.981	0.343
5	87.705	0.26
6	105.724	0.234

The residuals of the estimated system of homogeneity equations are normally distributed and stationary, as the Jarque-Bera vector normality test shows that Chi^2 (18)=18.74(0.4079).

Discussion on Results

The results of the estimated coefficient of the expected utility model are shown in Table 6. To maintain the condition of balance sheet constraint in equation 4, the cash equation was dropped from the system of demand equations. In order to obtain the interest rates of the dropped cash equation from the system, we have relied on the Cournot aggregation condition.

Three out of five own rates bear the correct sign i.e. lending to the Government & Private sectors and Government bonds. As for as the own rate coefficients are concerned, none of the variables are significant. In Table 6, the best equation in terms of coefficient sign and statistical reliability is the SAMA bill equation.

Table 6
RATE OF RETURN VARIABLES RESPONSE

	GOVR	**PRIVR**	**BONDR**	**SAMAR**	**INFLN**
GOV	0.003	-0.0047	-0.0004	0.0017	0.0004
	[1.14]	[-1.66]*	[-0.343]		[0.517]
PRIV	0.0019	0.0002	-0.0023	0.002	-0.0018
	[0.333]	[0.0315]	[-0.892]		[-1.16]
BOND	0.0121	-0.0126	0.0029	-0.0016	-0.0007
	[2.28]**	[-2.21]**	[1.22]		[-0.485]
SBILLS	-0.0172	0.0167	-0.0007	-0.0015	0.0027
	[-4.09]***	[3.69]***	[-0.38]		[2.36]*
CASH	0.0002	0.0005	0.0005	-0.0006	-0.0006
	N/A	N/A	N/A	N/A	N/A

, **, * indicate significance at 1%, 5% and 10% levels respectively.*
NA: not available because it is not estimated directly.

It is observed that only six out of twenty coefficients regarding the off-diagonal rate of return's matrix are significantly different from zero, which shows that banks in Saudi Arabia do not respond according to the change in the interest rate of portfolio's items.

Table 7 indicates the exogenous (non-choice items) assets. The majority of coefficient (fourteen out of twenty-four) is significantly different from zero. The non-choice items of the balance sheet are providing an in-depth explanation of the portfolio behavior of the Saudi Banks.

A 1% rise in capital results into 0.3877% rise into lending to the Government sector, 0.5065% rise into Private sector, 0.0499% into Government bonds, 0.1067% rise into SAMA bills, and decrease in cash by 1.0512%. A 1% rise in total time deposits (liabilities) results in

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0.9685% and 0.0439% decline into cash and SAMA Bills respectively. Whereas, lending to the Government Sector, Private sector, and Government bonds rise by 0.0349%, 0.5642%, and 0.4133% respectively. Similarly, a 1% rise in Total Demand Deposit (liabilities) results in 0.9792% fall into cash. Whereas, this rise results in an increase in Government sector by 0.0985%, Private Sector by 0.05780%, Government bonds by 0.276%, and SAMA bills by 0.0264%.

It is important to note that the results of the Private sector equation remained most vital as four out of five exogenous variables are significant at a 5% significant level.

Table 7
EXOGENOUS VARIABLE RESPONSE

Variables	CAPITAL	RESERVES	TDEPOSITS	DDEPOSITS	ADJ
GOV	0.3877	0.0393	0.0349	0.0985	-0.0912
	[3.41] ***	[0.632]	[0.767]	[3.71] ***	[-3.28] ***
PRIV	0.5068	0.4277	0.5642	0.578	-0.614
	[2.09] **	[3.23] ***	[5.82] ***	[10.2] ***	[-10.4] ***
BONDS	0.0499	0.2878	0.4133	0.2764	-0.1744
	[0.22]	[2.32] **	[4.55] ***	[5.22] ***	[-3.15] ***
SBILLS	0.1067	0.2245	-0.0439	0.0262	-0.1052
	[0.594]	[2.29] **	[-0.611]	[0.626]	[-2.4] **
CASH	-1.0512	-0.9793	-0.9685	-0.9792	0.9847
	N/A	N/A	N/A	N/A	N/A

, **, * indicate significance at 1%, 5% and 10% levels respectively.*
NA: not available because it is not estimated directly.

The Effects of Exogenous Variables on Portfolios

Table 8 below presents the effects of exogenous variables on the portfolio of Saudi commercial banks. We analyzed how the rate of return affected Government bonds, SAMA bills, lending to the Government, Private sectors, and Inflation. We also study the impact arising from a change in a time deposit and demand deposit.

Table 8
PROXIMATE IMPACT EFFECTS OF CETERIS PARIBUS UNIT CHANGES IN EXOGENOUS VARIABLES ON THE PORTFOLIO OF SAUDI BANKS

Exogenous	**Effects on the Choice Set (Millions of Rupees)**				
Variables*	GOV	PRIV	BOND	SBILLS	CASH
GOVR	0.003	0.0019	0.0121	-0.0172	0.0002
PRIVR	-0.0047	0.0002	-0.0126	0.0167	0.0005
BONDR	-0.0004	-0.0023	0.0029	-0.0007	0.0005
SAMAR	0.0017	0.002	-0.0016	-0.0015	-0.0006
INFLN	0.0004	-0.0018	-0.0007	0.0027	-0.0006
CAPITAL	0.3877	0.5068	0.0499	0.1067	-1.0512
RESERVES	0.0393	0.4277	0.2878	0.2245	-0.9793
TDEPOSITS	0.0349	0.5642	0.4133	-0.0439	-0.9685

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DDEPOSITS	0.0985	0.578	0.2764	0.0262	-0.9792
ADJ	-0.0912	-0.614	-0.1744	-0.1052	0.9847
*Unit changes in the interest rate are 1%.					

All other factors being the same, one percent changes in the Government Bonds (BONDR) interest rate on results into an increase in the holding of Government Bonds and Cash by 0.0029 and 0.005 respectively. Whereas, this change in interest rate produces a fall in Government sector lending by 0.0004 percent, Private sector by 0.0023 percent and holding of SAMA Bills by 0.0007 percent.

Other things being constant a 1% percent rise in the SAMA bills rate of return (SAMAR) results in a rise in lending to the Government and Private sectors. It means banks invest more in Government and Private sectors considering these profitable opportunities. We further noticed that this rise (in SAMA Bill Rates) leads to a decline in Government bonds, SAMA bills, and Cash holding.

Furthermore, a 1% change in the Government sector loans (WGOV) rate of return results in a rise in the Cash holding and demand for Government bonds. However, this increase in the rate of return results in a fall in the demand for SAMA bills. Additionally, this rise increases the demand for lending to the Government and Private sectors.

1% increase in the Private sector's loans (PRIVR) interest rate results in a rise in lending to the private sector and leads to a decrease in the holdings for government bonds and lending to the Government sector. On the other hand, it increases the Cash holding and demand for SAMA bills.

All other things being constant, a 1% rise in the inflation rate (INFLN) decreases a fall in Government bonds and Private sector lending. This increase in inflation leads to a decrease in Cash holding. Such a rise leads to a rise in government sector lending and SAMA bill holdings.

We also examined the impact of change in the volume of deposits. A one million/Saudi Riyals change in the deposits (TD) results in a rise equal to 0.4133 million/SR in the Government bonds and a fall equal to 0.0439 million/ SR in SAMA bills holdings by the commercial banks. Likewise, this rise in deposits results in a rise in lending to the Government and Private sectors by 0.0349, 0.5642 million respectively. However, these deposits rise leads to a decrease in cash holding.

A 1% ceteris paribus raises in the demand deposit (DD) results in a rise in Government bonds and SAMA bills holding. This rise in Demand Deposit instigates the demand for lending to the Government and Private sectors. On the other hand, it decreases the demand for Cash holding.

CONCLUSIONS

The primary objective of the study is to investigate the portfolio behavior of commercial banks in Saudi Arabia. We provided comprehensive insight into the Saudi banking sector using quarterly data from 1996-2018. To study the banking sector's portfolio behavior, we employed the expected utility model, which is based on the portfolio choice theory originated and developed by Hicks (1935) and Markowitz (1952), respectively. Some nested models are developed, and various restrictions are tested, including symmetry and homogeneity restrictions on the interest rate matrix. Further, we used the Full Information Maximum Likelihood technique to estimate the model's coefficients.

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The empirical evidence of this research shows that although interest rates play a pivotal role in the portfolio composition, which is based on assets holding, funds' availability remained a more significant concern for Saudi commercial banks. It means banks are more interested in liquidity or safety of funds than the profitability of various assets. Generally speaking, similar behavior is observed in some developing countries' banking systems, i.e., see Kagigi (2001); Muhammad (2015). The results of the study are vital for policymakers and regulators. The regulators may chalk out the monetary and investment policy, keeping in view the banks' portfolio behavior indicated in this study.

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Citation Information: Muhammad, Z., Bajwa, I.A., Rafi, W., Syed, A.M. (2020). The portfolio behaviour of Saudi commercial banks. *Journal of Entrepreneurship Education, 23*(S2).

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Citation Information: Muhammad, Z., Bajwa, I.A., Rafi, W., Syed, A.M. (2020). The portfolio behaviour of Saudi commercial banks. *Journal of Entrepreneurship Education, 23*(S2).