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Interest rate, foreign exchange and stock performance in a dual banking industry: evidence from Saudi Arabia

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Abstract

Purpose – This study aims to extend the literature by extensively investigating the impact of foreign exchange and interest rate changes on the returns and volatility of bank stocks in Saudi Arabia, which is the largest dual banking industry.

Design/methodology/approach – This study employs the generalized autoregressive conditional heteroscedasticity (GARCH) model on stock returns of four fully Islamic Saudi banks and eight conventional Saudi banks.

Findings – The results showed that the foreign exchange rate return has a positive impact on Saudi conventional bank returns, while it has an adverse impact on Saudi Islamic bank returns. Moreover, a higher interest rate return has a positive impact on Saudi bank stock returns implying that the assets side is more sensitive to changes in interest rates than the liability side. Finally, higher foreign exchange and interest rates volatility increases the volatility of Saudi bank returns, where the former has the largest significant impact. Therefore, Saudi regulators should pay more attention to the risk management of their banks because this could threaten the stability of their financial system.

Originality/value – To the best knowledge of the author, this is the first study that tries to extensively analyze the joint impact of foreign exchange and interest rates on bank stock returns and volatility in Saudi Arabia by applying the GARCH model. The study uses a long data set from 2010 to 2019 that includes all Saudi banks and employs four measures of interest rates to increase the robustness of the results.

Keywords Saudi banks, Islamic banks, Stock performance, Foreign exchange, Interest rate

Paper type Research paper

1. Introduction

The stock market performance and macroeconomic factors such as exchange rate and interest rate play an important role in the flow of capital that can affect the development of a country economy (Aydemir and Demirhan, 2017). According to Becketti and Sellon (1989), a higher level of volatility in stock markets, interest rate and exchange rate can be detrimental to the financial system and economic performance. Hence, several studies examined the impact of interest rate changes on bank stock returns while assuming a constant conditional variance over time (e.g. Bae, 1990; Booth and Officer, 1985; Chance and Lane, 1980; Flannery and James, 1984; Lloyd and Shick, 1977; Scott and Peterson, 1986; Stone, 1974) and their results were mixed. According to Merton (1980), in estimating market returns, relying on an

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estimator that assumes a constant variance will result in substantially different estimates even though the time series is as long as fifty years. Thus, several studies have applied the autoregressive conditional heteroskedastic (ARCH) methodology, allowing the conditional variance to evolve, in estimating sock returns in the field of finance. However, the application of ARCH methodology on bank stock returns remains scarce in the literature (Elyasiani and Mansur, 1998) and studies on the impact of interest rate and foreign exchange rate changes on bank stock returns in developing countries are very limited in the literature (Kasman *et al.*, 2011). In conclusion, according to Ayub and Masih (2013), empirical studies on the impact of changes in the foreign exchange rate and interest rate on Islamic banks stock performance do not exist in the literature

Therefore, this paper aims to extend the literature by employing the generalized autoregressive conditional heteroscedasticity (GARCH) to extensively investigate the impact of changes in foreign exchange and interest rates on bank stock returns and volatility in Saudi Arabia. The banking industry in Saudi Arabia is one of the largest banking industries in the middle east region with an asset value of the United States dollar (USD) 701.64 billion in 2019. The Saudi banking industry is a dual banking system where conventional and Islamic banks compete together. The Saudi dual banking industry has the world's biggest Islamic bank (Al-Rajhi Bank) and the Saudi Islamic bank assets account for almost 25% of the global Islamic banking industry (IFSB, 2020, 2019). Furthermore, the Saudi stock exchange (Tadawul) is one of the top ten largest capital markets in the world, where at the end of the year 2019, its total market capitalization reached the value of USD 2,406.78 billion (Tadawul, 2019).

This study contributes to the existing literature in various ways. First, to the best knowledge of the author, this is the first study that tries to extensively analyze the joint impact of foreign exchange and interest rates on bank stock returns and volatility in Saudi Arabia by applying the GARCH model. Second, it focuses on a developing country that has the largest dual banking industry in the world. Third, the study uses a long data set from 2010 to 2019 that includes all Saudi banks and employs four measures of interest rates to increase the robustness of the results. Finally, the present study relies on highly frequent daily data that provides robust results of the sensitivity of Saudi bank stock returns to changes in foreign exchange and interest rates (Kasman *et al.*, 2011).

The study is organized as follows: Section 2 reviews related literature and Section 3 describes the study sample and data. Section 4 presents the study methodology, while Section 5 discusses the empirical results. Finally, the study is concluded in Section 6.

2. Literature review

Several studies have examined the impact of interest rate changes on bank stock returns while assuming an inconstant conditional variance over time. Song (1994) applied the two-factor ARCH model to analyze the impact of market and interest rate risks on the United States (US) bank stock returns during the 1980s. He found that the market risk was more volatile than the interest rate risk and the interest rate risk for US banks did not influence by the changes in the Fed's monetary policy during the 1980s. Moreover, Mansur and Elyasiani (1995) examined the impact of changes in interest rate returns on bank stock returns of 56 US commercial banks from January 1979 to December 1992 by using the ARCH model. They found that the change in the level of interest rate harms bank stock returns and this impact is larger for long-term interest rates. Elyasiani and Mansur (1998), moreover, applied the GARCH-M model to analyze the sensitivity of the bank stock returns to changes in the interest rate returns and volatility in US banks. They found that interest rate returns have a negative significant impact on bank stock returns, and a higher level of interest rate volatility led to a decline in bank stock volatility.

Additionally, Hooy *et al.* (2004) examined the sensitivity of Malaysian bank stock excess returns to its volatility and financial risk factors, such as interest and foreign exchange risk, across the Asian financial crisis by employing the GARCH-M model. They found that in precrisis, small Malaysian banks were more exposed to foreign exchange risk than large Malaysian banks as they were less involved in off-balance sheet activities. Moreover, during the crisis, they found that Malaysian stock prices were only affected by the systematic risk as there was no significant impact found by other risk factors. However, in the post-crisis, they found that Malaysian banks were more exposed to interest rate risk, especially small ones, following the capital control policy and banking consolidation program. Further, Kasman *et al.* (2011) studied the impact of interest rate and exchange rate changes on the returns and volatility of bank stocks in Turkey by using the ordinary least squares (OLS) and GARCH models from 1999 through 2009. They found that changes in interest and foreign exchange rates have a negative impact on Turkish bank stock returns, and bank stock volatility is positively related to interest rate and foreign exchange volatility. Moreover, Saeed and Akhter (2012) examined the impact of macroeconomic factors on Pakistani bank stock performance over the period 2000 through 2010 using a multiple regression method. They found that among other macroeconomic variables foreign exchange rates and short-term interest rates had a negative impact on bank stock returns in Pakistan. In the same manner, Nurazi and Usman (2016) studied the effect of the capital adequacy, asset quality, management, earning, and liquidity (CAMEL) financial ratios and macroeconomic factors such as interest rate, exchange rate and inflation rate on the stock returns of banks in Indonesia from 2002 to 2011 by employing a pooled OLS panel estimator. They reported that although financial ratios had various impacts on bank stock performance, all macroeconomic factors had a significant negative impact on the stock returns of 16 Indonesian banks.

In addition, employing a four-variate GARCH-in-mean model, Mouna and Anis (2016) investigated the sensitivity of stock returns of financial institutions in eight countries to macroeconomic factors such as market returns, interest rates and foreign exchange rates over the period 2006 to 2009. For the banking industry, they found that the foreign exchange rates were positively associated with bank stock returns in Germany, the United States of America (USA) and Italy, while they were negatively associated with bank stock returns in the United Kingdom (UK). Furthermore, the short-term interest rates had a negative impact on bank stock returns in Greek and France, whereas they had a positive effect on bank stock returns in the USA and Spain. For the long-term interest rates, however, it is found that the negative effect was significantly found in Italian banks, while the positive effects were significantly found in the USA and French banks.

Koskei (2017), moreover, examined the impact of foreign exchange rate while controlling other variables on bank stock returns in Kenya using a monthly dataset from 2008 to 2014 by applying a panel data regression model with a random effect. The author found that the foreign exchange rate had an adverse significant impact on bank stock returns, whereas the treasury bill interest rate had no significant impact. Recently, Bui and Nguyen (2021) analyzed the influence of foreign exchange rate and interest rate among other macroeconomic factors on stock returns of eight listed Vietnamese commercial banks from January 2012 to June 2018. They employed a mixed method of the least absolute shrinkage and selection operator (LASSO) and the Bayesian model analysis. They found that the interest rate had a very significant negative impact on stock returns of Vietnamese commercial banks with the probability of nearly one, while the impact of exchange rate was very little or not existed. In conclusion, this study extends the literature by focusing on the impact of interest rate and exchange rate changes on the returns and volatility of bank stocks in the largest dual banking industry. To the best of the author's knowledge, this is the first study to extensively analyze the impact of returns and volatility of foreign exchange and interest rates on bank stock returns and volatility in Saudi Arabia by employing the GARCH model.

3. Sample and data

The study sample consists of 12 listed Saudi commercial banks (see Table 1). The daily prices are obtained for these banks from 01/01/2010 to 31/12/2019 based on data availability and to avoid the exogenous impacts of the global financial crisis and the COVID-19 pandemic. Moreover, for the foreign exchange rate, the USD to Saudi Riyal (SAR) exchange rate is employed. Additionally, four measures of interest rates (Saudi Arabian Interbank Offered Rate (SIBOR) for 1-month, 3-month, 12-month rates and the 3-month Saudi treasury bill yield) are used to capture the impact of interest rate changes on Saudi bank stock returns. Lastly, the Saudi Stock Exchange Tadawul Index is used as a market index, and the Tadawul Banks Index is used as a total Saudi banks index. The sample period for each variable is reported in Table 2 based on data availability. The primary source of data is the Bloomberg database. The continuous compound daily returns for the data are computed as

$$r_t = \ln(p_t/p_{t-1}) \tag{1}$$

NO	Bank's name	Foundation	Business type
1	Alawwal Bank	1926	Conventional bank with an Islamic window
2	Alinma Bank	2006	Fully Islamic bank
3	Al-Rajhi Bank	1978	Fully Islamic bank
4	Arab National Bank	1979	Conventional bank with an Islamic window
5	Bank Al-Bilad	2005	Fully Islamic bank
6	Bank Al-Jazira	1975	Fully Islamic bank
7	Bank Saudi Fransi	1977	Conventional bank with an Islamic window
8	National Commercial Bank	1957	Conventional bank with an Islamic window
9	Riyad Bank	1957	Conventional bank with an Islamic window
10	Samba Financial Group	1980	Conventional bank with an Islamic window
11	Saudi British Bank	1978	Conventional bank with an Islamic window
12	Saudi Investment Bank	1976	Conventional bank with an Islamic window

Table 1. Banks in Saudi Arabia

	Variables	Symbol	Sample period		Obs. No
1	Alawwal Bank	ALAWWAL	01/01/2010	14/06/2019	2,466
2	Bank Al-Bilad	ALBI	01/01/2010	31/12/2019	2,608
3	Alinma Bank	ALINMA	01/01/2010	31/12/2019	2,608
4	Arab National Bank	ARNB	01/01/2010	31/12/2019	2,608
5	Bank Al-Jazira	BJAZ	01/01/2010	31/12/2019	2,608
6	Bank Saudi Fransi	BSFR	01/01/2010	31/12/2019	2,608
7	National Commercial Bank	NCB	12/11/2014	31/12/2019	1,340
8	Riyad Bank	RIBL	01/01/2010	31/12/2019	2,608
9	Al-Rajhi Bank	RJHI	01/01/2010	31/12/2019	2,608
10	Saudi British Bank	SABB	01/01/2010	31/12/2019	2,608
11	Samba Financial Group	SAMBA	01/01/2010	31/12/2019	2,608
12	Saudi Investment Bank	SIBC	01/01/2010	31/12/2019	2,608
13	Saudi Banks Index	Banks index	05/01/2016	31/12/2019	1,041
14	Saudi Stock Exchange Tadawul Index	Tadawul index	01/01/2010	31/12/2019	2,608
15	USD/SAR exchange rate	FE	01/01/2010	31/12/2019	2,608
16	Saudi Arabian Interbank Offered Rate 1M	SIBOR 1M	01/01/2010	31/12/2019	2,608
17	Saudi Arabian Interbank Offered Rate 3M	SIBOR 3M	01/01/2010	31/12/2019	2,608
18	Saudi Arabian Interbank Offered Rate 12M	SIBOR 12M	01/01/2010	31/12/2019	2,608
19	Saudi Arabian Treasury Bill 3M Yield	T-bill 3M	25/03/2010	31/12/2019	2,549

Note(s): The NCB was listed on 12/11/2014 and ALAWWAL was merged with SABB on 14/06/2019

Table 2. Data description

where, p_t is the price at time t and p_{t-1} is the price at time $t-1$. Table 3 presents the descriptive statistics of the data continuous compound daily returns for all variables. It can be seen that the Saudi banks have on average higher daily returns than the Saudi stock exchange index, but they have on average a higher level of daily volatility than the market index. Further, Bank Al-Bilad (ALBI), Alawwal Bank (ALAWWAL) and National Commercial Bank (NCB) have the highest daily returns on average respectively, whereas Samba Financial Group (SAMBA), Arab National Bank (ARNB) and Bank Al-Jazira (BJAZ) have the lowest daily returns on average respectively. Additionally, NCB has the largest daily volatility on average, while Al-Rajhi Bank (RJHI) has the lowest daily volatility on average. However, the daily returns are positively skewed and have large kurtosis statistics implying that the data are leptokurtic (i.e. fat-tailed or having more extreme outliers). The Jarque–Berra (JB) statistics are highly significant indicating that the data are not normally distributed. This indicates that the appropriate model for analyzing bank stock returns is the ARCH type modeling due to the excess kurtosis and nonlinear dependency exhibited by bank stock returns (Elyasiani and Mansur, 1998). Nonetheless, the Augmented Dickey-Fuller (ADF) statistics are highly significant, which means data are not suffering from a unit root problem due to the computation of the continuous compound returns.

4. Methodology

Financial time series returns tend to be clustering that is a higher level of returns tends to follow large returns and a lower level of returns tends to follow small returns due to the information arrives in financial markets in bunches rather than being evenly spaced over time (Chris Brooks, 2008). Therefore, the use of the OLS estimator will result in inefficient estimates and the standard errors will not be reliable to draw any statistical inference (Kasman *et al.*, 2011) [1]. The GARCH model can handle the volatility clustering and leptokurtosis in financial time series data (Chris Brooks, 2008). The GARCH model has a good property in which it estimates the unconditional variance or the long-term average variance

	Variables	Mean	Min	Max	SD	Skew	Kurtosis	JB	ADF
1	ALAWWAL	0.0003	−0.1542	0.1023	0.0144	0.1543	15.5585	16,215*	−47.49*
2	ALBI	0.0004	−0.1139	0.0952	0.0167	0.3030	11.3828	7,676*	−49.99*
3	ALINMA	0.0003	−0.1082	0.1550	0.0146	0.6714	21.3925	36,956*	−50.81*
4	ARNB	0.0002	−0.1207	0.2112	0.0154	1.0636	23.1687	44,695*	−49.41*
5	BJAZ	0.0002	−0.1055	0.1365	0.0169	0.2237	11.1952	7,320*	−48.14*
6	BSFR	0.0002	−0.0980	0.2141	0.0169	0.8362	17.4093	22,866*	−48.87*
7	NCB	0.0004	−0.1583	0.1845	0.0183	0.7466	18.7624	13,997*	−35.99*
8	RIBL	0.0002	−0.1020	0.1453	0.0134	0.9049	21.1132	36,008*	−48.39*
9	RJHI	0.0002	−0.1267	0.1012	0.0130	0.0370	14.2901	13,852*	−49.83*
10	SABB	0.0002	−0.0850	0.1573	0.0166	0.6561	11.6892	8,392*	−50.17*
11	SAMBA	0.0001	−0.1107	0.1932	0.0163	0.6763	15.8186	18,054*	−48.64*
12	SIBC	0.0002	−0.0823	0.1083	0.0133	0.7600	13.2668	11,705*	−48.16*
13	Banks index	0.0005	−0.0601	0.0771	0.0116	0.1260	8.5585	1,343*	−31.51*
14	Tadawul index	0.0001	−0.1316	0.1114	0.0107	−0.8719	24.5798	50,935*	−48.89*
15	FE	0.0000	−0.0019	0.0019	0.0001	0.2646	85.4510	738,765*	−56.47*
16	SIBOR 1M	0.0007	−0.0632	0.1060	0.0061	4.4305	78.4049	626,400*	−43.25*
17	SIBOR 3M	0.0004	−0.0225	0.0797	0.0042	6.5135	115.6263	1,396,843*	−38.60*
18	SIBOR 12M	0.0002	−0.0550	0.0631	0.0040	1.3092	72.1649	520,583*	−40.93*
19	T-bill 3M	0.0007	−0.4238	0.1725	0.0164	−5.4762	203.4855	4,281,724*	−50.54*

Table 3.
Descriptive statistics

Note(s): JB is the Jarque–Berra test and ADF is the Augmented Dickey–Fuller test. * Indicates that the statistic is significant at the 1% level

as the volatility of time series data is known to be mean-reverting. The GARCH model is more parsimonious (i.e. uses fewer parameters), which enables it to be less likely to breach the non-negativity constraints compared with the ARCH model. Theoretically, it is more appealing (Hull, 2010). Thus, in this study, the GARCH model, proposed by Bollerslev (1986), is applied to analyze the impact of changes in foreign exchange rates and interest rates on banks returns and volatility in Saudi Arabia. The GARCH (1, 1) model is specified as follows:

$$R_t = \gamma_0 + \gamma_1 M_t + \gamma_2 FE_t + \gamma_3 IR_t + \epsilon_t$$
$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (2)$$

Model 1 is used to analyze the impact of foreign exchange and interest rate returns on Saudi bank stock returns. Where, R_t is the ith bank stock return at time t; M_t is the Saudi market index return at time t to control the macroeconomic effect; FE_t is the foreign exchange return at time t of USD/SAR; IR_t is the interest rate return at time t of SIBOR 1M, SIBOR 3M, SIBOR 12M or T-bill 3M. The variance equation comprises the following variables: σ_t^2 is the conditional variance; α_0 is the unconditional variance or the long-term average volatility; ϵ_{t-1}^2 is the last error or surprise; σ_{t-1}^2 is the previous conditional variance. For model stability, the α_0, α_1 and β_1 should be positive, and the sum of α_1 and β_1 should be close to unity.

$$R_t = \gamma_0 + \epsilon_t$$
$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \delta_1 FE_t^2 + \delta_2 IR_t^2 \quad (3)$$

Model 2 is used to analyze the impact of the volatility of the foreign exchange and the interest rate on Saudi bank stock volatility. Where, FE_t^2 and IR_t^2 are the volatilities of the foreign exchange rate returns and interest rate returns.

5. Empirical results

5.1 The return estimation of Saudi banks with the GARCH (1,1) model

Tables 4–7 show the results of the bank returns estimation with GARCH (1,1) model. In general, the model fits well as the sum of ARCH and GARCH coefficients in all models are highly significant and close to unity for most banks. The GARCH coefficient is larger than the ARCH coefficient indicating Saudi banks conditional variance relies more on its past variance than on new surprises, which implies that the market has a long memory. Nonetheless, it can be seen that the stock market return has a positive impact on all Saudi bank returns that is highly statistically significant. This indicates that Saudi bank returns are highly influenced by the market condition and this is in line with the results of Mansur and Elyasiani (1995). Regarding the foreign exchange return, the impact is larger and significant, as it can be seen from the large coefficients compared with the other independent variables. However, although the foreign exchange return has a positive effect on most Saudi bank returns, it has interestingly a negative impact on Saudi fully Islamic bank returns (ALBI, ALINMA, BJAZ and RJHI). This indicates that the appreciation in US dollar value against the Saudi riyal value will have a positive effect on Saudi conventional bank returns, while it has a negative impact on the returns of Saudi Islamic banks. This could be because Saudi conventional banks have some assets that are denominated in the US dollar (e.g. US bonds) that Islamic banks are not allowed to invest in due to *Sharia law*. Another possible explanation is that Islamic banks are prohibited from trading in derivative contracts, which prevents them to hedge against their foreign exchange risk. Ariffin *et al.* (2009) found that the second important risk faced by Islamic banks in 28 Islamic countries is the foreign exchange risk. Moreover, Hassan (2009) pointed to that the most important risk that faces Islamic banks in Brunei is the foreign

	γ_0	M	FE	IR	α_0	α_1	β_1
ALAWWAL	0.0003	0.7817***	4.7986***	0.0064	0.0000***	0.0201***	0.9519***
	(0.0002)	(0.0119)	(1.6848)	(0.0333)	(0.0000)	(0.0024)	(0.0054)
ALBI	0.0004	0.8991***	−2.9428**	−0.0361	0.0000***	0.0216***	0.9571***
	(0.0003)	(0.0130)	(1.4283)	(0.0264)	(0.0000)	(0.0019)	(0.0040)
ALINMA	−0.0002	0.9007***	−4.8660***	−0.0104	0.0000***	0.0812***	0.9035***
	(0.0001)	(0.0082)	(1.2010)	(0.0178)	(0.0000)	(0.0034)	(0.0040)
ARNB	−0.0000	0.9433***	−0.9490	−0.0269	0.0000***	0.0537***	0.8704***
	(0.0002)	(0.0117)	(0.9186)	(0.0297)	(0.0000)	(0.0050)	(0.0132)
BJAZ	−0.0000	1.0553***	−2.2342	−0.0271	0.0000***	0.0390***	0.9176***
	(0.0002)	(0.0122)	(1.9965)	(0.0335)	(0.0000)	(0.0040)	(0.0083)
BSFR	0.0000	1.0329***	5.0723***	−0.0530**	0.0000***	0.0348***	0.9429***
	(0.0002)	(0.0118)	(1.5726)	(0.0242)	(0.0000)	(0.0032)	(0.0059)
NCB	0.0002	1.1074***	0.4285	0.0005	0.0000***	0.1287***	0.7286***
	(0.0003)	(0.0160)	(1.4168)	(0.0388)	(0.0000)	(0.0114)	(0.0286)
RIBL	−0.0000	0.7449***	4.6655***	−0.0055	0.0000***	0.0719***	0.9112***
	(0.0002)	(0.0102)	(1.4140)	(0.0220)	(0.0000)	(0.0037)	(0.0036)
RJHI	−0.0001	0.9695***	−1.2004	0.0094	0.0000***	0.0487***	0.8905***
	(0.0001)	(0.0087)	(1.2862)	(0.0170)	(0.0000)	(0.0053)	(0.0120)
SABB	0.0001	0.9445***	5.9366***	−0.0794***	0.0000***	0.0430***	0.9148***
	(0.0002)	(0.0136)	(1.7638)	(0.0301)	(0.0000)	(0.0038)	(0.0089)
SAMBA	−0.0001	1.1403***	2.7881**	0.0063	0.0000***	0.0288***	0.9430***
	(0.0002)	(0.0094)	(1.3524)	(0.0286)	(0.0000)	(0.0036)	(0.0077)
SIBC	0.0001	0.7406***	0.9140	−0.0230	0.0000***	0.0432***	0.8807***
	(0.0002)	(0.0122)	(1.3787)	(0.0247)	(0.0000)	(0.0033)	(0.0107)
Banks index	0.0003*	1.1040***	1.2234*	0.0392**	0.0000***	0.0880***	0.8089***
	(0.0001)	(0.0094)	(0.6492)	(0.0174)	(0.0000)	(0.0131)	(0.0313)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 4.
Estimate of return when interest rate is SIBOR 1M

	γ_0	M	FE	IR	α_0	α_1	β_1
ALAWWAL	0.0003	0.7820***	4.8276***	−0.0489	0.0000***	0.0201***	0.9518***
	(0.0002)	(0.0119)	(1.6847)	(0.0454)	(0.0000)	(0.0024)	(0.0055)
ALBI	0.0004	0.8991***	−2.9262**	−0.0342	0.0000***	0.0217***	0.9570***
	(0.0003)	(0.0130)	(1.4208)	(0.0436)	(0.0000)	(0.0019)	(0.0040)
ALINMA	−0.0002	0.9015***	−4.8314***	−0.0321	0.0000***	0.0812***	0.9034***
	(0.0001)	(0.0083)	(1.1987)	(0.0234)	(0.0000)	(0.0034)	(0.0040)
ARNB	−0.0000	0.9437***	−0.8711	−0.0913**	0.0000***	0.0531***	0.8727***
	(0.0002)	(0.0116)	(0.9177)	(0.0420)	(0.0000)	(0.0049)	(0.0130)
BJAZ	−0.0000	1.0552***	−2.2104	−0.0409	0.0000***	0.0393***	0.9171***
	(0.0002)	(0.0122)	(1.9997)	(0.0425)	(0.0000)	(0.0041)	(0.0084)
BSFR	0.0000	1.0323***	5.0964***	−0.0417	0.0000***	0.0347***	0.9427***
	(0.0002)	(0.0117)	(1.5747)	(0.0391)	(0.0000)	(0.0032)	(0.0060)
NCB	0.0002	1.1075***	0.4173	0.0074	0.0000***	0.1288***	0.7283***
	(0.0003)	(0.0160)	(1.4184)	(0.0464)	(0.0000)	(0.0115)	(0.0286)
RIBL	−0.0000	0.7443***	4.6895***	−0.0377	0.0000***	0.0731***	0.9103***
	(0.0002)	(0.0102)	(1.4285)	(0.0297)	(0.0000)	(0.0037)	(0.0037)
RJHI	−0.0001	0.9692***	−1.2410	0.0328	0.0000***	0.0487***	0.8904***
	(0.0001)	(0.0088)	(1.2897)	(0.0238)	(0.0000)	(0.0052)	(0.0119)
SABB	0.0001	0.9433***	5.9350***	−0.0402	0.0000***	0.0420***	0.9163***
	(0.0002)	(0.0136)	(1.7611)	(0.0445)	(0.0000)	(0.0038)	(0.0089)
SAMBA	−0.0001	1.1400***	2.7338**	0.0514	0.0000***	0.0287***	0.9434***
	(0.0002)	(0.0094)	(1.3449)	(0.0376)	(0.0000)	(0.0035)	(0.0076)
SIBC	0.0001	0.7402***	0.9424	−0.0427	0.0000***	0.0429***	0.8820***
	(0.0002)	(0.0121)	(1.3823)	(0.0338)	(0.0000)	(0.0033)	(0.0105)
Banks index	0.0003*	1.1046***	1.1466*	0.0681***	0.0000***	0.0898***	0.8084***
	(0.0001)	(0.0095)	(0.6594)	(0.0206)	(0.0000)	(0.0134)	(0.0314)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1%, 5 and 10% significance levels, respectively

Table 5.
Estimate of return when interest rate is SIBOR 3M

	γ_0	M	FE	IR	α_0	α_1	β_1
ALAWWAL	0.0003	0.7817***	4.8044***	−0.0085	0.0000***	0.0201***	0.9519***
	(0.0002)	(0.0119)	(1.6849)	(0.0507)	(0.0000)	(0.0024)	(0.0055)
ALBI	0.0004	0.8989***	−2.9599**	0.0057	0.0000***	0.0216***	0.9571***
	(0.0003)	(0.0130)	(1.4076)	(0.0472)	(0.0000)	(0.0019)	(0.0040)
ALINMA	−0.0002	0.8998***	−4.9110***	0.0388	0.0000***	0.0814***	0.9030***
	(0.0001)	(0.0083)	(1.2005)	(0.0294)	(0.0000)	(0.0034)	(0.0040)
ARNB	−0.0000	0.9427***	−0.9387	−0.0302	0.0000***	0.0537***	0.8700***
	(0.0002)	(0.0116)	(0.9182)	(0.0441)	(0.0000)	(0.0050)	(0.0134)
BJAZ	−0.0001	1.0551***	−2.2089	−0.0456	0.0000***	0.0396***	0.9165***
	(0.0002)	(0.0122)	(2.0020)	(0.0409)	(0.0000)	(0.0040)	(0.0083)
BSFR	0.0000	1.0322***	5.0999***	−0.0332	0.0000***	0.0346***	0.9430***
	(0.0002)	(0.0117)	(1.5787)	(0.0424)	(0.0000)	(0.0032)	(0.0060)
NCB	0.0002	1.1072***	0.4647	−0.0129	0.0000***	0.1285***	0.7291***
	(0.0003)	(0.0160)	(1.4200)	(0.0532)	(0.0000)	(0.0114)	(0.0285)
RIBL	−0.0000	0.7445***	4.6640***	−0.0112	0.0000***	0.0723***	0.9108***
	(0.0002)	(0.0102)	(1.4167)	(0.0315)	(0.0000)	(0.0037)	(0.0037)
RJHI	−0.0001	0.9694***	−1.2543	0.0576**	0.0000***	0.0487***	0.8909***
	(0.0001)	(0.0087)	(1.2849)	(0.0238)	(0.0000)	(0.0052)	(0.0118)
SABB	0.0000	0.9423***	5.8122***	0.0998**	0.0000***	0.0434***	0.9130***
	(0.0002)	(0.0135)	(1.7550)	(0.0486)	(0.0000)	(0.0039)	(0.0093)
SAMBA	−0.0001	1.1401***	2.7450**	0.0406	0.0000***	0.0288***	0.9430***
	(0.0002)	(0.0094)	(1.3465)	(0.0383)	(0.0000)	(0.0036)	(0.0077)
SIBC	0.0001	0.7403***	0.9214	−0.0337	0.0000***	0.0431***	0.8811***
	(0.0002)	(0.0121)	(1.3756)	(0.0376)	(0.0000)	(0.0033)	(0.0106)
Banks index	0.0003*	1.1059***	1.2134*	0.0862***	0.0000***	0.0915***	0.8086***
	(0.0001)	(0.0095)	(0.6456)	(0.0234)	(0.0000)	(0.0136)	(0.0307)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 6. Estimate of return when interest rate is SIBOR 12M

	γ_0	M	FE	IR	α_0	α_1	β_1
ALAWWAL	0.0003	0.7756***	4.4825***	−0.0031	0.0000***	0.0207***	0.9518***
	(0.0002)	(0.0119)	(1.7204)	(0.0138)	(0.0000)	(0.0024)	(0.0054)
ALBI	0.0004	0.9033***	−2.7534*	0.0128	0.0000***	0.0227***	0.9553***
	(0.0003)	(0.0132)	(1.4419)	(0.0119)	(0.0000)	(0.0020)	(0.0041)
ALINMA	−0.0001	0.9116***	−4.8710***	−0.0067	0.0000***	0.0812***	0.9040***
	(0.0001)	(0.0084)	(1.2395)	(0.0074)	(0.0000)	(0.0035)	(0.0041)
ARNB	−0.0000	0.9413***	−1.0510	0.0108**	0.0000***	0.0562***	0.8641***
	(0.0002)	(0.0118)	(0.9447)	(0.0054)	(0.0000)	(0.0053)	(0.0140)
BJAZ	−0.0000	1.0606***	−2.0284	−0.0139	0.0000***	0.0390***	0.9189***
	(0.0002)	(0.0123)	(2.0372)	(0.0122)	(0.0000)	(0.0040)	(0.0082)
BSFR	−0.0001	1.0239***	5.0949***	0.0232**	0.0000***	0.0388***	0.9346***
	(0.0002)	(0.0122)	(1.6310)	(0.0097)	(0.0000)	(0.0035)	(0.0066)
NCB	0.0002	1.1057***	0.3708	−0.0122	0.0000***	0.1307***	0.7230***
	(0.0003)	(0.0160)	(1.4148)	(0.0079)	(0.0000)	(0.0119)	(0.0299)
RIBL	−0.0001	0.7354***	3.5084**	0.0132*	0.0000***	0.0650***	0.9108***
	(0.0002)	(0.0101)	(1.6057)	(0.0078)	(0.0000)	(0.0036)	(0.0043)
RJHI	−0.0001	0.9721***	−1.5303	0.0338***	0.0000***	0.0468***	0.8963***
	(0.0001)	(0.0087)	(1.2845)	(0.0051)	(0.0000)	(0.0048)	(0.0109)
SABB	0.0000	0.9282***	4.2487**	0.0063	0.0000***	0.0341***	0.9330***
	(0.0002)	(0.0133)	(1.8914)	(0.0096)	(0.0000)	(0.0038)	(0.0084)
SAMBA	−0.0001	1.1375***	2.7296**	0.0299**	0.0000***	0.0290***	0.9434***
	(0.0002)	(0.0094)	(1.3629)	(0.0120)	(0.0000)	(0.0035)	(0.0075)
SIBC	0.0001	0.7412***	1.0007	−0.0140	0.0000***	0.0441***	0.8812***
	(0.0002)	(0.0122)	(1.3745)	(0.0088)	(0.0000)	(0.0034)	(0.0105)
Banks index	0.0003*	1.1055***	1.5735***	0.0215***	0.0000***	0.0915***	0.8057***
	(0.0001)	(0.0096)	(0.6103)	(0.0042)	(0.0000)	(0.0144)	(0.0340)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 7. Estimate of return when interest rate is T-bill 3M

exchange risk. This result agrees with the finding of Ayub and Masih (2013) that the exchange rate adversely affects Islamic bank stock prices.

With respect to the interest rates, the results show that although the interest rate return has a positive impact on the bank index under different interest rate measures, this impact is highly significant and consistent across banks under the SIBOR 12M and 3M Treasury bill yields. This implies that Saudi banks return are affected more by the movement in the SIBOR 12M and 3M Treasury bill yields compared with the other two interest rate measures. This positive influence result is inconsistent with the results found by Kasman *et al.* (2011) in Turkish banks. This is could be because that mortgage loans in Saudi commercial banks have increased significantly in the last 9 years from SAR 59.968 billion (USD 15.992 billion) in 2010 to SAR 297.372 billion (USD 79.299 billion) in 2019. The interest rates on these mortgage loans are mostly linked to the SIBOR, while bank deposits are mostly held in current deposit accounts that do not berry any interests. This is because Saudi Arabia is a Muslim country where most people do not accept interests since they are prohibited under *Sharia law*. Therefore, higher interest rates in Saudi Arabia allow banks to generate more profit since their assets are sensitive to this increase, while their liabilities are not. The demand deposit was SAR 1099.151 billion (USD 293.107 billion) in 2019, which represents 62.2% of the total deposits of the Saudi banking industry in that year.

5.2 The volatility estimation of Saudi banks with the GARCH (1,1) model

The results are presented in Tables 8–11. The model fits well where the sum of ARCH and GARCH coefficients is statistically significant and close to unity. However, it is shown that the sum of ARCH and GARCH is a little bit lower when foreign exchange and interest rate volatilities are included in the model implying lower volatility persistence. This indicates that

	γ_0	α_0	α_1	β_1	δ_1	δ_2
ALAWWAL	0.0005*	0.0000***	0.0715***	0.8379***	204.5096***	0.0448***
	(0.0003)	(0.0000)	(0.0045)	(0.0111)	(36.9938)	(0.0088)
ALBI	0.0006**	0.0000***	0.0660***	0.8670***	172.4684***	0.0074
	(0.0003)	(0.0000)	(0.0049)	(0.0096)	(43.5553)	(0.0063)
ALINMA	0.0003	0.0000***	0.0857***	0.8999***	−46.4964***	0.0246***
	(0.0002)	(0.0000)	(0.0033)	(0.0034)	(2.8326)	(0.0032)
ARNB	0.0002	0.0000***	0.0826***	0.8369***	37.7032*	0.0715***
	(0.0003)	(0.0000)	(0.0047)	(0.0101)	(22.1395)	(0.0096)
BJAZ	0.0002	0.0000***	0.0522***	0.8996***	24.8334	0.0105*
	(0.0003)	(0.0000)	(0.0038)	(0.0075)	(23.1388)	(0.0063)
BSFR	0.0002	0.0000***	0.0695***	0.8614***	164.9655***	0.0689***
	(0.0003)	(0.0000)	(0.0045)	(0.0097)	(39.8785)	(0.0109)
NCB	0.0002	0.0000***	0.0547***	0.8343***	163.9860***	0.0168
	(0.0005)	(0.0000)	(0.0089)	(0.0192)	(49.9185)	(0.0109)
RIBL	0.0000	0.0000***	0.1191***	0.8427***	206.9504***	0.0015
	(0.0002)	(0.0000)	(0.0059)	(0.0055)	(14.0221)	(0.0040)
RJHI	0.0003	0.0000***	0.0784***	0.8621***	26.8440	0.0416***
	(0.0002)	(0.0000)	(0.0052)	(0.0091)	(16.7218)	(0.0061)
SABB	0.0002	0.0000***	0.0533***	0.8990***	149.7729***	0.0549***
	(0.0003)	(0.0000)	(0.0039)	(0.0071)	(24.5090)	(0.0090)
SAMBA	0.0000	0.0000***	0.0712***	0.8468***	175.3548***	0.0723***
	(0.0003)	(0.0000)	(0.0048)	(0.0108)	(46.0227)	(0.0104)
SIBC	0.0002	0.0000***	0.0491***	0.8629***	187.5261***	−0.0072*
	(0.0003)	(0.0000)	(0.0038)	(0.0102)	(25.4282)	(0.0037)
Banks index	0.0005	0.0000***	0.0540***	0.8491***	35.0735	0.0264***
	(0.0004)	(0.0000)	(0.0088)	(0.0260)	(34.6384)	(0.0063)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 8.
Estimate of volatility when interest rate is SIBOR 1M

	γ_0	α_0	α_1	β_1	δ_1	δ_2
ALAWWAL	0.0004	0.0000***	0.0583***	0.8549***	147.5096***	0.1760***
	(0.0003)	(0.0000)	(0.0043)	(0.0101)	(32.8368)	(0.0185)
ALBI	0.0007**	0.0000***	0.0648***	0.8689***	171.7190***	0.0077
	(0.0003)	(0.0000)	(0.0048)	(0.0096)	(43.0596)	(0.0188)
ALINMA	0.0003	0.0000***	0.0837***	0.9003***	−46.5373***	0.0214***
	(0.0002)	(0.0000)	(0.0034)	(0.0036)	(3.3697)	(0.0072)
ARNB	0.0002	0.0000***	0.0822***	0.8275***	25.8395	0.1801***
	(0.0003)	(0.0000)	(0.0049)	(0.0114)	(21.5243)	(0.0253)
BJAZ	0.0002	0.0000***	0.0511***	0.9005***	13.2483	0.0439***
	(0.0003)	(0.0000)	(0.0037)	(0.0074)	(22.2365)	(0.0150)
BSFR	0.0002	0.0000***	0.0667***	0.8685***	123.8590***	0.1266***
	(0.0003)	(0.0000)	(0.0042)	(0.0096)	(34.1246)	(0.0281)
NCB	0.0000	0.0001***	0.1134***	0.4426***	434.7183**	1.8698***
	(0.0004)	(0.0000)	(0.0178)	(0.0274)	(183.2436)	(0.1199)
RIBL	0.0000	0.0000***	0.1189***	0.8431***	205.4497***	0.0056
	(0.0002)	(0.0000)	(0.0059)	(0.0055)	(13.9340)	(0.0082)
RJHI	0.0003	0.0000***	0.0765***	0.8608***	10.4721	0.1246***
	(0.0002)	(0.0000)	(0.0048)	(0.0088)	(15.0327)	(0.0156)
SABB	0.0002	0.0000***	0.0533***	0.8992***	135.5930***	0.1097***
	(0.0003)	(0.0000)	(0.0039)	(0.0073)	(24.0164)	(0.0234)
SAMBA	0.0000	0.0000***	0.0701***	0.8449***	134.9357***	0.2050***
	(0.0003)	(0.0000)	(0.0046)	(0.0114)	(41.4915)	(0.0275)
SIBC	0.0002	0.0000***	0.0495***	0.8612***	183.6122***	0.0040
	(0.0003)	(0.0000)	(0.0039)	(0.0103)	(25.0850)	(0.0109)
Banks index	0.0005	0.0000***	0.0610***	0.8056***	57.8009	0.1576***
	(0.0004)	(0.0000)	(0.0083)	(0.0279)	(44.6272)	(0.0387)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 9. Estimate of volatility when interest rate is SIBOR 3M

	γ_0	α_0	α_1	β_1	δ_1	δ_2
ALAWWAL	0.0005*	0.0000***	0.0707***	0.8377***	182.9590***	0.1267***
	(0.0003)	(0.0000)	(0.0049)	(0.0115)	(37.5114)	(0.0237)
ALBI	0.0006**	0.0000***	0.0656***	0.8667***	175.0599***	0.0163
	(0.0003)	(0.0000)	(0.0049)	(0.0098)	(43.7116)	(0.0187)
ALINMA	0.0004	0.0000***	0.0899***	0.8981***	−47.3582***	−0.0071
	(0.0002)	(0.0000)	(0.0037)	(0.0037)	(3.8071)	(0.0037)
ARNB	0.0002	0.0000***	0.0774***	0.8447***	40.4749*	0.0560***
	(0.0003)	(0.0000)	(0.0046)	(0.0108)	(21.2626)	(0.0162)
BJAZ	0.0002	0.0000***	0.0532***	0.8968***	30.6179	0.0119
	(0.0003)	(0.0000)	(0.0039)	(0.0078)	(23.6996)	(0.0119)
BSFR	0.0003	0.0000***	0.0638***	0.8805***	136.8477***	0.0087
	(0.0003)	(0.0000)	(0.0040)	(0.0088)	(35.5386)	(0.0179)
NCB	0.0002	0.0000***	0.0718***	0.7943***	157.9436**	0.3441***
	(0.0004)	(0.0000)	(0.0096)	(0.0221)	(61.8221)	(0.0589)
RIBL	0.0000	0.0000***	0.1193***	0.8423***	226.3062***	0.0808***
	(0.0002)	(0.0000)	(0.0056)	(0.0049)	(14.3922)	(0.0128)
RJHI	0.0003	0.0000***	0.0890***	0.8105***	61.8681**	0.2390***
	(0.0002)	(0.0000)	(0.0063)	(0.0134)	(25.9416)	(0.0327)
SABB	0.0003	0.0000***	0.0525***	0.9027***	167.5808***	0.0335*
	(0.0003)	(0.0000)	(0.0039)	(0.0073)	(25.5528)	(0.0172)
SAMBA	0.0000	0.0000***	0.0728***	0.8385***	194.4184***	0.2383***
	(0.0003)	(0.0000)	(0.0048)	(0.0113)	(48.2636)	(0.0329)
SIBC	0.0002	0.0000***	0.0486***	0.8643***	181.7643***	−0.0077
	(0.0003)	(0.0000)	(0.0037)	(0.0101)	(24.3682)	(0.0057)
Banks index	0.0005	0.0000***	0.0647***	0.7953***	63.7694	0.1545***
	(0.0004)	(0.0000)	(0.0086)	(0.0294)	(46.5134)	(0.0444)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 10. Estimate of volatility when interest rate is SIBOR 12M

	γ_0	α_0	α_1	β_1	δ_1	δ_2
ALAWWAL	0.0005	0.0001***	0.1396***	0.5891***	0.2916	−0.0008***
	(0.0003)	(0.0000)	(0.0111)	(0.0242)	(16.7048)	(0.0002)
ALBI	0.0007**	0.0000***	0.0679***	0.8656***	186.4757***	−0.0006
	(0.0003)	(0.0000)	(0.0051)	(0.0097)	(48.5290)	(0.0004)
ALINMA	0.0002	0.0000***	0.0858***	0.8939***	−13.6446	0.0010**
	(0.0002)	(0.0000)	(0.0036)	(0.0042)	(11.2754)	(0.0004)
ARNB	0.0001	0.0000***	0.0852***	0.8324***	46.1567*	0.0048***
	(0.0003)	(0.0000)	(0.0051)	(0.0113)	(26.0237)	(0.0010)
BJAZ	0.0002	0.0000***	0.0537***	0.8911***	62.5216**	0.0011*
	(0.0003)	(0.0000)	(0.0041)	(0.0088)	(31.3767)	(0.0007)
BSFR	0.0002	0.0000***	0.0720***	0.8650***	122.4552***	0.0096***
	(0.0003)	(0.0000)	(0.0044)	(0.0091)	(37.0380)	(0.0012)
NCB	0.0002	0.0000***	0.0608***	0.8046***	201.9460***	0.0069***
	(0.0005)	(0.0000)	(0.0105)	(0.0240)	(61.3916)	(0.0024)
RIBL	−0.0001	0.0000***	0.1146***	0.8518***	39.1190***	0.0005
	(0.0002)	(0.0000)	(0.0056)	(0.0052)	(14.4461)	(0.0003)
RJHI	0.0002	0.0000***	0.0868***	0.8526***	59.4619**	0.0037***
	(0.0002)	(0.0000)	(0.0058)	(0.0098)	(25.7855)	(0.0006)
SABB	0.0002	0.0000***	0.0462***	0.9279***	25.8183	0.0065***
	(0.0003)	(0.0000)	(0.0030)	(0.0045)	(18.3963)	(0.0010)
SAMBA	−0.0001	0.0000***	0.0675***	0.8610***	157.0563***	0.0038***
	(0.0003)	(0.0000)	(0.0043)	(0.0100)	(46.6647)	(0.0012)
SIBC	0.0004	0.0001***	0.0944***	0.5169***	0.0005	−0.0010***
	(0.0003)	(0.0000)	(0.0151)	(0.0414)	(21.8967)	(0.0000)
Banks index	0.0005	0.0001***	0.0337**	0.1548***	674.3985**	0.3978***
	(0.0003)	(0.0000)	(0.0143)	(0.0201)	(287.3194)	(0.0710)

Note(s): ***, **, * Indicate the estimate is statistically significant at 1, 5 and 10% significance levels, respectively

Table 11.
Estimate of volatility when interest rate is T-bill 3M

the foreign exchange and interest rate volatilities can explain some of the volatility in Saudi bank returns. Regarding the foreign exchange volatility, it has the largest significant positive impact (except for ALINMA bank) on Saudi bank volatility in comparison with the interest rate volatility. This means that a high level of volatility in the foreign exchange rate results in a higher level of volatility in Saudi bank returns. An explanation for this result is that Saudi banks are exposed to foreign exchange risk due to the lack or inefficient use of derivative contracts in hedging this kind of risk. This agrees with the argument of Burnside *et al.* (2001) that under a fixed foreign exchange regime, banks tend to increase their exposure to exchange risk due to the implicit government guarantee to peg the exchange rate. Further, this stable exchange rate regime could also encourage other domestic firms to rely on foreign currency liabilities, which makes domestic banks (besides its exposure to foreign exchange risk) indirectly largely exposed to the credit risk of domestic firms that have borrowed in foreign currencies (Obstfeld, 1998). However, this is consistent with the results found by Kasman *et al.* (2011) in Turkish banks.

Regarding the interest rate volatility, Saudi banks seem to be largely affected by the SIBOR 3M volatility compared with the other interest rate volatility due to their large coefficients. For example, NCB, the largest commercial bank in Saudi Arabia, has a positive significant coefficient of 1.86 with the SIBOR 3M rate volatility. This implies that loans with floating rates are mainly following the changes in the SIBOR 3M rate. It is worth mentioning, however, that RJHI volatility, the largest Saudi Islamic bank, is impacted more by the SIBOR 12M volatility with a positive significant coefficient of 0.24. Moreover, the T-bill 3M seems to have a little impact on the volatility of Saudi banks compared with the other three SIBOR interest rate measures implying that it has less power in explaining the volatility of Saudi banks. However, the positive relationship between interest rate volatility and Saudi bank

stock volatility indicating that Saudi banks are exposed to interest rate risk. They should match their assets and liability durations or involve in derivative contracts (e.g. swap contracts) to hedge this kind of risk. This result disagrees with the finding of Elyasiani and Mansur (1998) for US banks implying that US banks are more capable of managing interest rate risk than banks in Saudi Arabia.

6. Conclusion

This study analyzes the impact of returns and volatility of the foreign exchange and interest rate on the returns and volatility of bank stocks in Saudi Arabia over the period 2010 to 2019 by applying the GARCH (1,1) model. In general, the study shows that Saudi bank stock returns do follow the GARCH process and have a memory longer than one period, as its conditional variance relies more on its past variance than on new surprises. Moreover, the results show that the foreign exchange rate has a positive impact on Saudi conventional bank returns, while it has a negative impact on Saudi Islamic bank returns. This indicates that Saudi Islamic banks are less diversified and exposed to a higher level of foreign exchange risk. Furthermore, interest rate returns have a positive impact on bank stock returns in Saudi Arabia. Regarding Saudi bank stock volatility; however, a higher level of foreign exchange and interest rate volatility seems to increase the volatility of Saudi banks returns, where the former has the largest significant impact.

Therefore, the study results point out that Saudi regulators should pay more attention to the risk management of their banks, especially the foreign exchange risk, because the study shows that the foreign exchange rate returns and volatility have the largest impact on the returns and volatility of banks in Saudi Arabia. According to Obstfeld (1998), a government with a fixed rate regime should effectively supervise their banks and limit the foreign capital inflow through, for instance, taxes on capital imports and foreign deposits requirements; otherwise, the government will be subject to a high probability of financial crisis occurrence due to the rise of moral hazard problem under the fixed exchange rate regime (Mishkin, 1996).

Note

1. The author applies the OLS estimator and tests for the presence of ARCH effect. The results were statistically significant indicating the presence of ARCH effect in the study time series data. In the interest of brevity, the results will be available on request.

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