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SAMA Working Paper:

An Empirical Analysis of the U.S Monetary Policy Impact on the Saudi Stock Market

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Abstract

There are two intents of this paper; *first*, to examine the effect of monetary policy in the United States of America – represented by the change in the Fed’s fund target rate over the period 1998-2019 on the Saudi stock market. *Second*, to assess the effect of quantitative easing program on the Saudi stock market, I have realized the program to analyze its effect on selected listed Saudi companies. The empirical analysis shows that the effect of monetary Policy in the United States on the Saudi stock market is statistically significant when it comes to the effect of the unanticipated change in the target interest rate; however, no effect is found for the quantitative easing program on the Saudi Stock market.

Keywords: Monetary Policy, Stock Market, Quantitative Easing.

JEL: G100, G280, E520

1. Introduction

The monetary policy objective is to control the foremost economic indicators such as inflation, unemployment rate, and GDP growth. Yet, there is a time lag between the monetary policy adjustments and its effect on such indicators. The previous literature showed that the stock market response to monetary policy changes immediately after the policymakers' decision i.e. announcement effect. Goodhart and Hofmann (2000) indicate that monetary policy adjustments affect equity prices, which are related to the real economy through their influence on households' spending (wealth effect channel) and investment spending (balance sheet channel). It is important to assess the magnitude of the interest rate effect on stock markets, since stock prices are highly sensitive to economic conditions and reflect the investors' risk sentiment.

In the United States of America, some published papers have examined the response of the stock markets to the Fed's monetary policy decisions over many years. Bernanke and Kuttner (2005) show that monetary policy is effective as the market showed some responses to the changes in the Fed's fund target rate, especially the unanticipated change in the Federal Reserve policy rate.

Saudi Arabian Monetary Authority remains committed to the fixed exchange rate for Saudi Riyal versus US dollar, at its official rate of 3.75 SAR. SAMA maintains a premium on its interest rate above the Fed's target rate to keep a reasonable spread over the time. The peg has been serving the Saudi economy well for more than three decades, given that the main driver of the economy is the government expenditure, which is mostly financed by oil revenues. Accordingly, the monetary policy in Saudi Arabia aims to

preserve the fixed exchange rate and monetary stability through influencing short-term interest rate, liquidity management, and the use of macro-prudential tools.

This paper has two particular objectives. *First*, it examines the effect of the monetary policy in the United States of America –represented by the change in the Fed's fund target rate- on the Saudi stock market –represented by the main market index (TASI). I used the Fed's fund target rate since in Saudi Arabia; policy rates adjustments are highly influenced by the Fed's monetary policy decisions given the Saudi riyal peg to the US dollar. Using the Fed's Fund target rate will allow us to distinguish between anticipated and unanticipated changes in the monetary policy as the U.S. has a developed futures market that helps in doing so. *Secondly*, to assess the effect of the American quantitative easing program on the Saudi stock market over three periods –focusing the analysis on a selected number of publicly listed companies to distinguish the companies, which are more likely affected by the monetary policy.

2. Monetary Policy and the Stock Market: Theoretical Background

The Capital Asset Pricing Model (CAPM) expresses the correlation between the stock market and monetary policy measures. Investors normally use Capital Assets Pricing Model formula to find the investment risk and what return they should expect.

$$R_i = R_f + \beta_i(R_m - R_f) \quad (1)$$

Where:

R_i : Equity Required Rate of Return

R_f : Risk-Free Rate

β_1 : *Volatility of the equity's return relative to the market*

R_m : *Expected Market Return*

$(R_m - R_f)$: *Market Risk Premium*

A broad set of monetary policy instruments can influence real economic variables as well as the financial system through various transmission channels, one of which is through asset prices. Clearly, when policymakers increase policy rate and influence the risk-free rate (R_f), the attractiveness of newly issued debt securities, from an investor point of view, would rise compared to equities. Furthermore, increasing interest rates would increase the cost of borrowing, forcing firms to cut back on their investments and this would affect their future cash flows and profitability negatively causing the stock prices to drop.

3. Literature Review

To assist in explaining this paper and to give more of an insight of the impact of the Fed's monetary policy on the United States and global stock markets, this section will present a few papers that have touched on this subject. These include papers written by Bernanke and Kuttner (2005), Abou-Zaid (2013), Ekanayake (2008), Christos Ioannidis and Alexandros Kontonikas (2006). These papers are diverse in the subject material that they addressed. The Bernanke and Ekanayake papers addressed monetary policy's effect on the United States stock market while Abou-Zaid (2013) paper touched on the Fed's monetary policy impact on Egypt, and some MENA countries. Christos Ioannidis and Alexandros Kontonikas (2006) studied the impact of monetary policy shifts on stock returns in thirteen OECD countries.

Bernanke and Kuttner (2005) analyzed the impact of changes in monetary policy on equity prices, with the objectives of both measuring the average reaction of the stock market and understanding the economic sources of that reaction. The findings show that, on average, a hypothetical unanticipated of 25-basis-point cut in the Federal Funds rate target would be associated with roughly a one percent increase in stock indices. Following the methodology on Campbell (1991) and Campbell and Ammer (1993), Bernanke and Kuttner found that the effects of unanticipated monetary policy actions on expected excess returns account for the largest part of the response of stock prices. Although they acknowledge this impact, they qualify it by also mentioning that monetary policy is only responsible for a very small portion of the overall variability in the stock market. Addressing "why stock prices respond as they do to monetary policy?", they found that the response of prices to monetary policy is not directly related to effects on the real interest rate. Rather, the impact of unexpected monetary policy changes on stock prices seems to come through its effects on expected future excess returns or on expected future dividends. Concerning limitations, Bernanke and Kuttner (2005) mentioned how the methodology that they applied to their research made it impossible to determine the impact of anticipated monetary policy on the stock market, only the impact of the unanticipated change in target rate can be estimated. This is due to the assumption that stock prices would be independent of monetary policy in the long-term, and any anticipated monetary policy would have long-term effects. The study includes a wider range of assets that may help to differentiate the results, but that "future exploration" of the impact of monetary policy on equities' excess returns is necessary.

Abou-Zaid (2013) examined whether the U.S. monetary policy decisions influence the stock market returns in Egypt, and some MENA countries. The study used annual data from 1996-2007. The assumption of this research is that efficient markets react to new information immediately and that a greater response would be expected in terms of trading activity if there is an unanticipated element to any information revealed. The author uses a multivariate GARCH technique to capture how the monetary shock in the US influences stock market returns in some MENA markets. The results indicate that the Egyptian stock market had similar results to the United States market in that the stock returns are higher in expansive monetary environments than they are in a more restrictive environment. One interesting finding contrasted Bernanke (2005) is that the stock market in Egypt only responds to the anticipated changes in monetary policy and not to surprise changes, which is the exact opposite of Bernanke's findings in the United States stock market.

Ekanyake (2008) examined the stock price reaction of individual stocks listed under the Dow Jones Industrial Average to announcements of changes in the Federal Funds rate using stock returns from 1996 to 2007. He used an event-study methodology to track the impact of changes in the Federal Funds target rate on individual stock returns using several event windows. The author took 30 individual stocks, reclassified them into eight sectors, and analyzed the reaction of each sector to changes in the target interest rate. The findings suggest that the returns are mostly positive and significant on the days the Federal Funds target rate was reduced and negative when the target rate was increased, but could not identify a pattern of the response as the Federal Funds target rate is changed. This is due to the evidence that the market reacted positively or negatively even if the funds target rate remained unchanged. Like Bernanke, Ekanyake found that there is also an industry factor;

different sectors of stocks reacted differently depending on the industry the stocks represented. In general, Ekanyake feels his findings are in line with previous studies conducted over the same subject.

Christos Ioannidis and Alexandros Kontonikas (2006) investigated the impact of monetary policy actions on stock returns in thirteen OECD countries over the period 1972-2002. The results indicate that monetary policy adjustments are significantly affect stock returns, thereby supporting the notion of monetary policy transmission through the stock market. The authors' proxies for shifts in monetary policy are based on interest rate variables including the change in the short-term Treasury bill rate and a dummy variable reflecting discount rate changes. The main contribution of this paper to the existing literature is that when examining the impact of interest rate changes on stock price changes, the non-normal distribution of stock returns is taken into account as well as the co-movement in the international stock markets. The results suggest that in 80 percent of the countries under investigation, periods of tight money are associated with contemporaneous declines in stock market value. These findings can be understood in the context of the present value model, whereas interest rate increases are associated with lower stock prices through higher discount rates and lower future cash flows. Another important result is that following monetary policy changes, not only contemporaneous but also future stock returns, across a variety of returns specifications, are affected. Hence, the authors' interest rate measure of monetary policy contains significant information that can be used to forecast expected stock return. Specifically, they found that in most sample countries a restrictive monetary policy stance decreases expected stock returns. Such changes in required returns do not necessarily contradict market efficiency since central banks often

adopt expansive monetary policy when there is an increased concern of an economic downturn.

4. Monetary Policy in Saudi Arabia

Monetary policy in Saudi Arabia is unique due to the openness of the economy. Since 1986, the Saudi Riyal has been pegged to the U.S Dollar, thus resulting in the interest rates of the two continuously being close. Given this, the exchange rate has a critically important role in the Saudi monetary policy. Intervention policy under the fixed exchange rate regime is influenced by the level of foreign exchange outflow, and the Dollar/Riyal interest rate differential. With perfect asset substitutability, an incremental change in interest rates results in a large change in reserves, reflecting the general point that there cannot be an autonomous monetary policy in a fixed exchange rate system with perfect asset substitutability.¹ SAMA has a handful of tools it uses to influence the condition of the money market. These tools include minimum reserve policy, repos, foreign exchange swaps, and open market operations (OMO). The minimum reserve policy is the same idea as it is in the United States. Banks are required to maintain a percentage of their customers' deposits with SAMA. The required cash reserve ratio is 7 percent and has remained at that mark since 2009.² The statutory liquidity ratio or the amount banks are required to maintain in specified liquid assets is equal to 20 percent of their total deposits. In Saudi Arabia, the bond market is in its early stages compared to international bond markets. A few institutions and banks hold almost all the public debt; however, individual investors would access the market through primary dealers. The market is likely expanding in the near

¹ Muhammad Al-Jasser, and Ahmed Banafe. "Monetary policy instruments and procedures in Saudi Arabia."

² Banafe, Ahmed, and Rory Macleod. "Inflation Mechanisms, Expectations and Monetary Policy in Saudi Arabia"

future due to large-scale debt issuance by the Saudi government. In situations that call for only temporary additions to bank reserves, SAMA engages in short-dated repurchase agreements (predominantly overnight repos) with banks. This arrangement permits a very short-term injection of reserves and their automatic withdrawal when the repos mature. Recently, SAMA launched open market operations to reduce fluctuations and imbalances in the liquidity system. Open market operations (OMO) are complementary tools to achieve SAMA's objectives in maintaining monetary and financial stability in the kingdom. Operations of this kind provide additional short-term liquidity management tool and complement the overnight repo facility.

5. Saudi Stock Market

The Saudi Stock Exchange Market or Tadawul All-Share Index (TASI) was founded on March 19, 2007. Although trading in Saudi Arabia had been going on for years prior, it was not until 2007 that there was a joint-stock company. Tadawul is fully owned by the Public Investment Fund (PIF), with a capital of SAR 1.2 Billion divided into 120 thousand shares. Currently, Tadawul is the sole entity authorized in the Kingdom to act as the securities exchange. With technological advancements, market participants are now able to monitor, analyze, and complete transactions from any place via various tech platforms. They no longer need to visit bank to carry out transactions. By the end of 2019, individual investors performed almost 68 percent of the purchases and 71 percent of the sales, of the total market share.³

Recently, TASI Joined the FTSE Emerging Markets Index over five stages, starting in March 2019 and ending in March 2020. The phased approach was adopted to make it

³ Source: Statistical Bulletin, Capital Market Authority.

easier for index-tracking investors to stay in line with the index, given the large size of Tadawul. The history of these promotions advanced the Saudi stock market to be in a period of increased activities. According to SAMA's Financial Stability Report, at the end of 2019 the value of foreign ownership reached a record amount. In addition, the number of qualified foreign investors (QFIs) has tripled, adding approximately SAR 120 billion of capital inflow to the market.

6. Methodology and Data

A. The response of Saudi stock market to changes in Fed's target rate

Since the surprise component of the change in the Fed's target rate is exogenous, this allows us to use multiple linear regression model to assess the effect of an unanticipated change in the Fed's target rate on the Saudi stock market. As a robustness check, when I add other independent variables like expected change, S&P 500 returns and oil price changes, the effect of surprise element does not change significantly, which means the effect can be considered as a causal effect.

$$TASIindex_t = \alpha + \beta_1 Expected_t + \beta_2 Surprise_t + \gamma Control_t + \epsilon_t \quad (2)$$

Where:

Expected and *Surprise* represent the anticipated & unanticipated parts of the FFR change.

Control is a vector of variables (oil, S&P500 index) to control for endogeneity.

In the analysis, I considered the historical events of the Federal Open Market Committee (FOMC) meetings from 1998 to 2019. Throughout these meetings, the Committee discussed the recent developments in the U.S and global economy with the purpose of supporting the economic activities in the United States by adjusting monetary policy functions. Indeed, some events represent an increase, while others represent a cut in the

Fed's fund target rate. On the way to find the surprise and expected change in Fed's Fund target rate, I have used Bernanke's methodology. The following equation measures the surprise component:

$$\Delta_i^u = \frac{D}{D-d} \left(\phi_{m,d}^0 - \phi_{m,d-1}^0 \right) \quad (3)$$

Where:

Δ_i^u : Surprise target rate change.

D : number of days in the month m .

d : day of the event taking place in month m .

$\phi_{m,d}^0$: Current-month futures rate.

$\phi_{m,d-1}^0$: Previous month future rate.

The expected change is simply the actual change in the Fed's target rate minus the surprise change:

$$\Delta_i^e = \Delta i - \Delta_i^u \quad (4)$$

Together with historical events of the Fed's fund target rate, surprise, and expected changes, I used TASI's daily return for the same period. I also used more variables like oil prices and S&P500 index returns.

B. The effect of quantitative easing on selected listed companies

To assess the impact of the quantitative easing program on the Saudi stock market, I used a difference in difference identification strategy. In my study, I focused the analysis on firms that experience a liquidity constraint, which might be more affected by such policy. Difference in difference methodology allows us to identify the causal effect of

quantitative easing by eliminating the problem of endogeneity. In this methodology, firms with no liquidity constraints will serve as a control group, and I will compare firms that have liquidity constraints to them. Before the quantitative easing, these firms should have parallel returns; however, if there is an effect, we will see a diversion after the quantitative easing on firms that have liquidity constraints. I estimated the following model to find whether quantitative easing had any effect on liquidity constrained firms or not:

$$Return_{it} = \alpha + \beta_0 Return_t^m + \beta_1 QE_t + \beta_2 Cash_{it} + \gamma(QE_t * Cash_{it}) + \epsilon_{it} \quad (5)$$

Where:

Return_{it}: Company's market return.

Return_t^m: The market return on the day of observation.

QE_t: A binary indicator equals 1 if QE is in effect during that date.

Cash_{it}: A binary indicator equal to 1 if the firm is liquidity constrained.

Another data that I have used is the three phases of quantitative easing in the United States between 2008 and 2014. The first phase was from November 2008 to March 2010, the second phase was from November 2010 to June 2011, and the third phase was from September 2012 to October 2014.⁴ Furthermore, I used daily TASI return, liquidity ratios, and the market return of some Saudi listed companies⁵ during the period of the quantitative easing. To avoid biases, I have chosen these companies randomly to cover most of the market's sectors. To find the company's return, I calculated the daily differences between closing prices from 2007 to 2014. Our methodology to distinguish the rich in cash companies is to analyze the following liquidity ratios of our sample:

⁴ Trefis team article, forbes.com "*Quantitative Easing in Focus: The U.S Experience.*"

⁵ Bloomberg Intelligence.

$$\text{Cash ratio} = \frac{\text{cash} + \text{cash equivalent}}{\text{current liabilities}} \quad (6)$$

$$\text{Current ratio} = \frac{\text{current assets}}{\text{current liabilities}} \quad (7)$$

$$\text{Quick ratio} = \frac{\text{current assets} + \text{inventory}}{\text{current liabilities}} \quad (8)$$

Each ratio must equal at least one for a company to be rich in cash, but some companies performed more than one in some ratios and less than one in others. To solve this problem, I assumed that ratios are equally weighted. If the ratio is equal to or greater than one it will get ten points, otherwise the company will get the same face value. Then I summed up all these points together and divided the result by three, if the average of liquidity ratios was equal to or greater than 8 points then this company should be rich in cash.

7. Results and Analysis

A. Examining the effect of monetary policy adjustments on the Saudi stock market

In this section, I will examine the effect of Federal Reserve policy on the Saudi stock market –using the changes in the Fed’s fund target rate as an instrument. One approach to measure this effect is to calculate the market’s response to the Fed’s rate changes on the day of the change. As Bernanke (2005) stated, this approach involves looking at the response to specific events, and it might be described as an event-study style of analysis. To avoid spurious relationships in the time series data, economists have developed various unit root tests. That is, to examine whether our data is stationary or not, I applied Dickey-Fuller unit root test. The table (1) shows that our data is stationary based on the variables’ level.

<i>Table 1: Dickey-Fuller Unit Root Test</i>		
	Test Statistic	p-value
TASI	-9.972	0.000
Surprise	-8.161	0.000
Expected	-5.857	0.000
SP500	-8.072	0.000
Oil	-8.071	0.000

Table (2) shows that approximately 20 percent of the change in the Saudi stock market return on the day of the Federal Fund's target rate changes can be attributed to the surprise (exogenous) component of the change in the Fed's Fund target rate. A hypothetical unanticipated 1 percent increase in the Federal Fund's target rate is associated with roughly a 7 percent increase in TASI return on average.

We might observe an even more significant effect if the stock market was less dominated by individual investors. This is due to the assumption that unlike sophisticated investment companies, individual investors are usually less aware of the effect of monetary policy adjustments on real economic indicators. Given the fixed exchange rate regime in Saudi Arabia, I believe that this result is quite normal. In addition, the increase of marginal lending in the Saudi stock market induced the monetary policy to be more effective. Thus, the monetary policy transmission through the interest rate channel, that affects equity prices, can be applied to the Saudi stock market.

Table 2: TASI Response to Changes in Fed Fund Target Rate				
	TASI	TASI	TASI	TASI
Surprise	6.7032*	6.9687*	6.9975*	6.9799*
	(1.6508)	(1.6795)	(1.7414)	(1.7596)
Expected		-0.7027	-0.7107	-0.7107
		(0.7776)	(0.7928)	(0.8003)
SP500			-0.0092	-0.0204
			(0.1266)	(0.1373)
Oil				0.0221
				(0.2537)
Constant	0.3771	0.3808	0.3837	0.3870
	(0.2448)	(0.2453)	(0.2509)	(0.2537)
Adj-R2	22.29 percent	22.02 percent	20.50 percent	18.99 percent
N	55	55	55	55
* Statistically significant at the 5 percent level. Standard errors in parenthesis.				

B. Analyzing the effect of quantitative easing on the Saudi stock market

At this stage of the analysis, I will assess the effect of increasing the money supply in the United States on some Saudi listed companies. In 2008 post the financial crisis, the U.S economy experienced a high rate of unemployment and a huge decline in the U.S stock markets as well as other economic indicators. To ease this crisis, the Fed started the expansionary monetary policy to support the economy by injecting liquidity into the market. The Fed bought treasuries, mortgages, and securities from the U.S market between 2008 and 2014.

To find whether the quantitative easing has an impact on the Saudi stock market based on the liquidity of the firms, I estimated model (2). This model contains variables, such as quantitative easing events, daily market return, and liquidity indicators for some of the companies listed in the Saudi stock exchange.

Table3: The Effect of Quantitative Easing	
	Company's Return
TASI	0.9505*
	(0.0157)
QE	-0.0012
	(0.0009)
Liquidity	-0.0011
	(0.0007)
QE*Liquidity	0.0009
	(0.0011)
Constant	0.0014*
	(0.0006)
Adj-R2	46.25 percent
N	4,275
* Statistically significant at the 5 percent level. Standard errors in parenthesis.	

The results show that quantitative easing or the increase of the money supply in the United States has no impact on the Saudi stock market. The restrictions on foreign investors to invest directly in the Saudi stock market and the nature of the Saudi economy can explain this matter. In Saudi Arabia, there were limited investment tools; consequently, the foreign investors found some difficulties to invest in Saudi market during that time. The low degree correlation between the U.S money market and Saudi stock market is a relatively accepted phenomenon. Several explanations have suggested that most of the Saudi listed companies do not sell their products in or raise funds from the U.S markets. Furthermore, it has not observed that Saudi stock market participants borrow money from the U.S market then

invest home due to some difficulties such as cost of money transfer and client's credit history, which is required by U.S banks to fund their customers.

8. Conclusion and Discussion

The results that I found when analyzing all of the data are pretty consistent with what the economic theory suggested and matched up well with the studies that have been done prior. It makes sense that changes in the money supply in the United States did not have a significant impact on Saudi Arabia due to the inability of foreign investors to invest directly in the Saudi Stock Market during the period of quantitative easing program post the 2008 financial crisis. However, the impact felt by the Saudi stock market with regards to monetary policy adjustments is immense due to the fixed exchange rate regime in Saudi Arabia. The results show that Saudi stock market responds to the unanticipated changes in the Fed's Fund target rate on the day of observation. Being tied so close to the Fed's monetary policy means that whenever there are significant changes in monetary policy in the United States, it will be mirrored in Saudi Arabia, as we have seen in the outcomes. These results are also similar to Abou-Zaid (2013) on Egypt; however, the effects found in Egypt were more tied to anticipated changes rather than unanticipated changes, as was the case with Saudi Arabia. Well, additional examination of the link between monetary policy adjustments and the demand on mortgages in Saudi Arabia is a fascinating topic for future research.

9. References

Abou-Zaid, Ahmed, "*International stock markets response to the Federal Reserve policy actions: the case of emerging MENA markets*" (2013), Faculty Research and Creative Activity, 9.

Alkhareif, Riyadh M. and Qualls John H., "*Saudi Arabia's Exchange Rate Policy: Its Impact on Historical Economic Performance*", April 2016.

Annual Statistical Report, Tadawul, Kingdom of Saudi Arabia. (2019)

Board of Governors of the Federal Reserve System, (2019).

Bernanke, Ben S., and Kenneth N. Kuttner, "*What Explains the Stock Market's Reaction to Federal Reserve Policy?*" *Journal of Finance* 60(3): 1221-1257, June 2005.

Banafe, Ahmed, and Rory Macleod "*Inflation Mechanisms, Expectations and Monetary Policy in Saudi Arabia*". Saudi Arabian Monetary Authority, 1952-2016." 2017, doi:10.1007/978-3-319-55218-7, (November 2016), BIS Paper No. 89v.

Bloomberg Intelligence, west campus library, Texas A&M University, College Station.

Capital and Market Value for Saudi companies, Argaam website.

Charles Goodhart and Boris Hofmann, "*Asset Prices and the Conduct of Monetary Policy*", (2000).

Christos Ioannidis and Alexandros Kontonikas, "*Monetary Policy and the Stock Market: Some International evidence*", (2006).

Ekanayake, E & Rance, Robin & Halkides, Mihalis. (2008), "*Effects of Federal Funds Target Rate Changes on Stock Prices*".

Fred Economic Data, Federal Reserve Bank of St. Louis, (2019).

Muhammad Al-Jasser, and Ahmed Banafe. "*Monetary policy instruments and procedures in Saudi Arabia*", BIS Policy Papers, March 1999.

Statistical bulletin, Capital Market Authority. Kingdom of Saudi Arabia, (2019).

Trefis team article, forbes.com "*Quantitative Easing in Focus: The U.S Experience*", May 2015.

Quandl for financial, economic and alternative data, (2019).

Saudi Arabian Monetary Authority, Financial Stability Report, 2020.