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Financial intermediaries and speculation in the foreign exchange market: the role of monetary policy in Iran's economy

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Abstract

Given the high fluctuations of the general price level, the importance of investment, and accessing sufficient financial resources, we examine the effects of monetary policy on the nominal (Inflation) and real (Investment) sectors of a developing economy, like Iran, through the channel of the relationship between bank deposits, stock market, and speculation in the foreign exchange market (FEM). For this purpose, due to regime switching in Iran's economy, the non-linear relation between the variables has been investigated by applying Markov switching models and annual data of 1988–2018. The results show that the financial intermediaries (FIs) have not had a complementary relationship in both bear and bull market and high and low banks deposits regimes. Both FIs have negatively impacted speculation in the FEM in high and low exchange rates difference regimes. The difference between official and unofficial exchange rates negatively impacted the FIs in bear market and low banks deposits regimes; on the contrary, a positive effect in a bull market and high bank deposits. The effects of both FIs on investment have been positive in high and low investment regimes and negative on inflation rates in high and very high inflation regimes. In comparison, the impact of speculation in the FEM has been negative on investment and positive on inflation. Therefore, in the event of the lack of limitations regarding using interest rate (IR) and the policy of exchange rate unification, the central bank would be able to affect the nominal and real sectors of the economy suitably through the channels of the FIs and the FEM.

Keywords: Bank deposits, Exchange rates speculation, Interest rate, Stock market

JEL Classification: C24, E44, E52, G10

1 Introduction

The main objectives of the monetary policy are concentrated on affecting the stability of the inflation rate and the production conditions (Walsh 2010). In addition, the foreign exchange rate plays a vital role in some economies. More specifically, due to its effects on the firms' products and input price, it can potentially influence the nominal (inflation) and real (investment and economic growth) sectors of an economy (Bahmani-Oskooee and Saha 2016). Hence, another monetary policy aim is affecting the foreign exchange rate (Senay and Sutherland 2019). On the other hand, the FIs can potentially

affect real sectors of an economy due to their roles in financing investment through mobilizing resources (Levine 2005; McKinnon 1982; Seven and Yetkiner 2016; Greenbaum et al. 2019).

Moreover, whether the FIs can be a hedge for reduction of money value or not (Li, Narayan and Zheng 2010) has been a controversial issue for decades. Therefore, the monetary policy, the FEM, and the FIs could have some common impacts. Accordingly, there is a strong link between monetary policy, the FEM, and the FIs. In other words, the effects of monetary policy can be transmitted to nominal and real sectors of an economy by the channel of the FIs (Beck et al. 2014; Terra and Arestis 2017) and the FEM. One of the monetary instruments which can realize this link between the FIs, the FEM, and Monetary policy is IR.

The success of monetary policy in reaching its aims through the FIs and the FEM depends on which financial market will absorb further liquidity. It might influence the nominal and real economic indicators differently if the liquidity direction is toward the stock market, Bank deposits, or speculation in the FEM. Attracting liquidity by the FIs depends on the factors, such as inflation and the measure of risk. On this basis, increasing or at least keeping the value of different assets causes the investors to choose the FIs or the other financial markets based on their potentials. Bank deposits and the stock market have enough potential to be in the circle of investor's choices. However, investing in bank deposits might encounter the risk of value lowering due to the negative real interest rate (RIR) originating from high inflation and repression of nominal interest rate (NIR). On the other hand, even with the attractiveness of the stock market to investors in the inflationary conditions due to growth of firms' products price, it might also face the risk of increasing input price and, therefore, going up their costs. In brief, foreseeing the profitability outlook of firms would be difficult for investors in such a situation. Another critical point is that holding cash might have almost gotten out of investors' choice because of decreasing its value over time due to the probable inflationary environment.

The exchange rate volatility can negatively affect investment by creating speculative activities and increasing uncertainty (Singleton 1987). The speculative activities in some financial markets might be a substitute for the FIs in attracting liquidity (Allen and Gale 1997). In this respect, given the fixed exchange rate and the high share of oil and its derivatives exports in the whole foreign currency reserves, the power of Iran's Central Bank to support the aimed exchange rate through supplying foreign currency proportional with demand level is affected by negative oil shocks. In particular, the severe reduction in foreign currency reserves due to the USA sanctions has made many unwanted limitations for Iran's Central Bank in providing enough supply. Hence, this matter creates enough conditions to form a gap between official and unofficial exchange rates. Therefore, in addition to high inflation, due to the gap between exchange rates, the FEM turned into a market where had enough potential to compete with the stock market and bank deposits for absorbing liquidity through the gains of speculation.

The inflation rate and investments in Iran's economy have not shown a stable situation over the decades and have always faced high fluctuations. One of the factors that played a decisive role is cash flow. Due to remarkable capital gains of price fluctuations, liquidity has mainly been attracted by the markets whose goal is to obtain short-term profits from speculation. This issue has also affected financing the productive economic activities and

the price level through creating false demands. In the developed economies, given the stability of general price level and its fluctuations in the determined range which sets and manages by central banks, the competition for attracting liquidity is mainly between bank deposits and the stock market; thus, the other markets are less attractive due to being low of capital gains from price fluctuations.

As discussed above, given the potential effects which IR has on the FEM, bank deposits, and loans, and consequently, the performance of firms listed on the stock market, it will also have the potential impacts on the central bank's power to lead liquidity between the different financial markets in order to reach the monetary policy aims. In other words, the IR can fulfill the monetary policy aims by realizing the link between the FIs, the FEM, and monetary policy to transmit monetary policy effects to real and nominal sectors of the economy. However, Iran's Central Bank has almost been passive against the high fluctuation of the inflation rate and the relationship between speculation in the FEM and the FIs due to repression of NIR (will be discussed in detail later).

Based on discussed cases, first sight concerning previous studies at this domain is that due to the stability of inflation rate in the developed and emerging economies, they have not paid enough attention to the probable relationship between the speculative activities in financial markets and the FIs and their competition over attracting liquidity in the countries where exists a high level of price fluctuations. The second is that they have not studied the role of monetary policy in leading liquidity between the FIs and speculation in other financial markets. Third, not considering these relations at different regimes. The last one is that no study has considered the mentioned entire cases simultaneously to reach more comparable and comprehensive results. Therefore, our contributions are to fade these gaps and add some valuations to existing studies.

Iran is a developing economy in which the central bank is not independent of the government's fiscal policy and thus has faced limitations regarding financial resources due to the economic sanctions. In this respect, the debt volume of Iran's government to central bank has been noticeably high. On the other hand, most firms have encountered insufficient financial resources, while the motivations of speculative activities have been high because of high fluctuation in some financial markets, like the FEM, at the same time. That is why the role of monetary policy in influencing the economy through the channel of financial markets to attract enough liquidity is considered essential. Hence, the main aim is to see whether the central bank and its monetary policy could affect the inflation and investment through the channel of the FEM and the FIs (leading liquidity between the aimed financial markets to transmit the effects of monetary policy to the nominal and real sectors of Iran's economy). For this purpose, we are supposed to investigate whether there is a significant relationship between bank deposits, the stock market, and speculation in the FEM? How are these relations at different regimes? Is there competition between these markets in attracting liquidity, or is there a complementary relationship between them? How is the impact of every one of these markets on inflation and investment at different regimes? Given the repression of NIR and the inflationary environment of Iran's economics, how is the effect of RIR on these markets and the relations between them?

The present paper is organized as follows: Section 2 discusses monetary policy in Iran's economy. Section 3 pays attention to background literature. Section 4 assigns empirical

model and specifying. The empirical results are paid by Sect. 5. Section 6 is devoted to discussion. The conclusions with policy implications are provided in Sect. 7.

2 Monetary policy in Iran's economy

After a political revolution in 1979, due to the Islamic nature of the political movement, the economy was also affected. One of the most significant changes happened in the banking sector and monetary policy. In this regard, the ownership of most private banks was confiscated by the government. After that, given the high sensitivity of Islamic rules to the IR issue,¹ working on reformation of IR was started from the beginning of the new political regime in 1980. This reformation was eventually led to new legislation named "banking without free-interest rate." Based on the legislation in 1984, all banks were pressured concerning the IR of deposits and loans. In addition to the banking sector, the central bank and its monetary policy were also influenced because of the limitation of using IR. However, the consequences of the legislation were revealed after the strange growth of the inflation rate and the lack of proportion between the inflation rate and the NIR of bank deposits and loans.

As presented in Table 1, the inflation rate has increased in most years after 1979 and 1984. On the other hand, due to the limitation of the central bank and banking sector in using IR, the central bank could not react to the inflation rate appropriately. Hence, there has not been a proportion between NIR and the inflation rate. The inflation rate has been more than the NIR of short-term bank deposits from the beginning of 1979. Therefore, the RIR of this kind of deposit has been negative except for 2015–2018. There have been the same conditions for the long-term deposits, except for 1986, 1991, 2001, 2002, 2006, 2007, 2010, 2011, and 2015–2018. The gap between the deposit interest rate and the inflation rate has considerably been high. See 1996 as the highest inflation rate (49.4%), the IR of short-term deposits did not change compared to two years ago (1994), while the inflation rate was doubled. On the other hand, the interest rate of long-term deposits increased by 2.5%. Hence, investing in bank deposits has not been an attractive choice for investors to cover the risk of decreasing their money value. There have almost been such conditions regarding the bank loans to different sectors of the economy (the data are presented in Table 1).

There have been some flexibilities in the legislation about the interest rate of long-term deposits in 2007 and 2008. More specifically, in 2014, after decreasing limitations about IR, the new central bank team applied an economic reformation. They set a new monetary policy for the stability of the inflation rate. They adjusted the relationship between the interest rate of bank loans, short-, and long-term deposits with the inflation rate. As shown in Table 1, the data of 2015–2018 approve the results of this policy. After applying this policy, the proportion of inflation rate with the interest rate of bank loans, short-, and long-term deposits improved. In sum, as a result of the above discussion, the central bank and its monetary policy instrument of IR have mainly been passive against the inflation rate in most years.

¹ There is a very high sensitivity to interest rate in Islamic rules. More specifically, the lenders cannot make their loans conditional on receiving a certain percentage of the principle of money. The interest rate, the same certain percentage added to the loan principle, is referred to as usury in Islamic rules. Although with the rise of the share of the banking sector in Islamic economies by the channel of bank deposits and loans, the level of this sensitivity has considerably decreased over time, there are still much restrictions for Iran's Central Bank to take advantage of interest rate potential due to the legislation in 1984 resulting from Islamic rules.

Table 1 The inflation rate, the interest rate of bank deposits and loans, exchange rates in (1979–2018)

Year	INF	IRSD	IRLD	LIR1	LIR2	LIR3	LIR4	OER	MER	GER
1979	10	9	10	14	9–12	9–12	5–12	70	100	30
1980	11.4	7	8.5	8–12	4–8	6–10	4–8	70	141	71
1981	23.5	7	8.5	8–12	4–8	6–10	4–8	71	200	129
1982	22.8	7	8.5	8–12	4–8	6–10	4–8	80	270	190
1983	19.2	7	8.5	8–12	4–8	6–10	4–8	84	350	266
1984	14.8	7	8.5	8–12	4–8	6–10	4–8	87	450	363
1985	10.4	7.2	9	8–12	8–12	6–12	4–8	92	580	488
1986	6.9	6	8	8–12	8–12	6–12	4–8	88	614	526
1987	23.7	6	8.5	8–12	8–12	6–12	4–8	77	742	665
1988	27.7	6	8.5	8–12	8–12	6–12	4–8	70	991	921
1989	28.9	6	8.5	8–12	8–12	6–12	4–8	69	966	897
1990	17.4	6	8.5	8–12	8–12	6–12	4–8	72	1207.1	1135.1
1991	9	6.5	9	17–19	12–14	11–13	6–9	66.9	1412.3	1345.4
1992	20.7	6.5	9	Max 18	12–16	11–13	6–9	67.8	1420.2	1352.4
1993	24.4	7.5	10	Max 18	12–16	13	9	1458.5	1498	39.5
1994	22.9	8	11.5	18–24	12–16	16–18	12–16	1653	1806	153
1995	35.2	8	11.5	18–24	15	16–18	12–16	1750	2635	885
1996	49.4	8	14	22–25	15–16	17–19	13–16	1750	4036	2286
1997	23.2	8	14	22–25	15–16	17–19	13–16	1754	4446	2692
1998	17.3	8	14	22–25	15–16	17–19	13–16	1755	4782	3027
1999	18.1	8	14	22–25	15–16	17–19	13–16	1755	6468	4713
2000	20.1	8	14	22–25	15–16	17–19	13–16	1755	8634	6879
2001	12.6	8	14	22–25	15–16	17–19	13–16	1755	8131	6376
2002	11.4	7	13	Max 23	15–16	16–18	14–15	1755	7925	6170
2003	15.8	7	13	Max 22	14–15	15–17	13–14	7958	7991	33
2004	15.6	7	13	Max 21	15	16	13.5	8282	8323	41
2005	15.2	7	13	Max 21	15	15	13.5	8719	8747	28
2006	10.4	7	13	Max 16	15	16	16	9023	9042	19
2007	11.9	7	7–16	14	13	14	14	9195	9226	31
2008	18.4	7	7–16	12	11	12	12	9285	9357	72
2009	25.4	Max 9	Max 15	12	11	12	12	9574	9667	93
2010	10.8	9	14.5	12	11	12	12	9920	9979	59
2011	12.4	6	14	12,14	11,14	12,14	12,14	10,339	10,601	262
2012	21.5	7–15	17	14,15	11,15	14,15	14,15	10,962	13,568	2606
2013	30.5	7–15	17	14,15	11,15	14,15	14,15	12,260	26,059	13,799
2014	34.7	7–20	17–21.5	14–15	11–15	14–15	14–15	21,253	31,839	10,586
2015	15.6	10–22.2	22–24	Max 22	14–16	Max 22	Max 22	26,509	32,801	6292
2016	11.9	10–18	18–20	20,21	14–16	20,21	20,21	29,580	34,501	4921
2017	9	10	15–15.5	18	8–17.5	18	15,18	31,389	36,440	5051
2018	9.6	10	15	18	8–17.5	18	15,18	34,214	40,453	6239

All data are in percent (Except for last three columns) published by Iran's Central Bank (<http://www.cbi.ir>). The columns are in order: Inflation Rate (INF), IRSD (Interest Rate of Short-Term Bank Deposit), IRLD (Interest Rate of Long-Term Bank Deposit), LIR 1, 2, 3, and 4 (Bank Loans Interest Rate of service and trade sectors, building and residential houses sectors, industry and mines sectors, and agricultural sector). The exchange rates are in term of Rial (domestic currency of Iran) against US dollar. OER is official exchange rate. MER is unofficial or market exchange rate. GER is difference or Gap between official and unofficial exchanges rates. Necessary to say that the gap between OER and MER was zero in 1974–1979

In addition to the legislation of limitation in using IR after the revolution in 1979 and economic and political sanctions, the gap between official and unofficial foreign exchange rates (Rial against US dollar) has been the other reality in Iran's economy since then. Regarding Table 1, there has been a single rate for domestic currency against the US dollar in 1974–1978. Nevertheless, after the revolution in 1979, forming the gap has gotten started and kept increasing until 2003. The central bank applied a new monetary policy in 2003, which was the unification of the exchange rate. Based on Table 1, the gap between official and unofficial rates decreased after applying this policy from 2003 to 2011. After 2011, the monetary policy of exchange rate unification did not continue due to the USA sanctions on oil and its derivatives exports of Iran (Tayebi and Sadeghi 2017).

Given fixed exchange rate and the role of the central bank in supporting the targeted exchange rate by supplying enough foreign currencies in the market to make a balance between demand and supply, due to severe reduction of the central bank's foreign currencies reserves, the central bank could not keep supporting the targeted exchange rate through supplying foreign currency proportional with demand level. This issue again created the gap between official and unofficial rates. In other words, the monetary policy of exchange rate unification was defeated after passing 8 years. As presented in Table 1, the mentioned gap kept increasing from 2011 to 2018.

As a whole, after a change in the political and governance structures in 1979, given the new government's different political view in global geography, Iran has continuously been in tension with the influential global economies, the U.S., European Union, as well as the United Kingdom. On the other hand, a high dependence of foreign currency resources of the Central Bank on oil and its derivatives exports, and the low share of other products in the export basket, have always been one of the structural weaknesses of Iran's economy. In addition, the government's budget also has a noticeably dependence on the receipts of oil exports. Hence, due to the political nature of the oil commodity along with its economic nature, and the fixed exchange rate that requires sufficient supply of foreign currencies to the market, the effects of political tensions spread to the foreign currency market through oil shocks. Consequently, the lack of sufficient supply of foreign currencies proportional with the demand level, and being covered an important part of the government's budget deficit resulting from a decrease in oil export by a non-independent central bank and its printing money, cause a gap between foreign exchange rates.

One of the monetary policy instruments that could have influenced the exchange rate unification has been IR (due to its impact on the opportunity cost of holding money and the attractiveness of the domestic economy to absorb foreign investment). Nevertheless, as previously mentioned, the central bank is faced with limitations in using that because of the legislation. So, the gap between exchange rates and their high fluctuations has made an opportunity to gain profits from speculation in the FEM. This issue has turned the FEM into a substitute for the banking sector and the stock market in attracting liquidity. Absorbing liquidity in financial markets (stock market, bank deposits, and speculation in the FEM) might have different effects on an economy's nominal and real sectors. In particular, being inadequate of firms' financial resources and, at the same time, high incentives of speculative activities in the FEM have been one of the biggest problems in Iran's economy. Hence, given that being influenced every three markets

by monetary policy instrument of IR (it will be discussed later in Sect. 3), the role of the central bank and its monetary policy could be determinant on investors' decision to invest in any of these markets.

Regarding the above discussion, both monetary policies of exchange rate unification and changing NIR proportional to inflation rate have faced limitations. One of them is the limitations in total foreign currencies reserves of the central bank and another one with "banking without free-interest rate" legislation. However, there have also been flexibilities in both of them. Because there have been times when the oil and its derivatives exports have been high, and thus, the central bank could keep applying the policy of exchange rate unification through supporting the targeted exchange rate by supplying enough foreign currency proportional with the demand level. On the other hand, they could take advantage of the legislation's flexibility to adjust the relationship between NIR and the inflation rate. The importance of paying attention to both monetary policies is due to probable direct and indirect effects on nominal and real sectors of Iran's economy. Since they might have direct effects on inflation and investment or indirect impacts on them through affecting the conditions of the stock market and bank deposits and loans (it will be discussed later in Sect. 3).

3 Background literature

We do pay attention to monetary policy effects on the nominal (inflation) and real sectors of the economy (investment and growth rate). In this respect, two monetary policies are considered. The first one involves affecting the FEM and the policy of exchange rate unification to lower the gap between official and unofficial exchange rates. The second one involves using monetary policy instrument of IR in order to influence the nominal and real sectors of the economy through the channels of the FIs (stock market and bank deposits) and speculation in the FEM, in other words, evaluating the direct and indirect impacts of IR on the economy. Given the policies mentioned above, it is essential to review the relationship between the FIs and the FEM with each other and with the nominal and real economic indicators. Since the monetary policy is supposed to affect the economy through these markets and its direct effects. Hence, to this aim, we review the related literature in the following four sub-titles.

3.1 The FIs and the nominal and real sectors of an economy

Levine (1999, 2005, 2000), and Greenbaum et al. (2019) state that the FIs have a positive impact on investment and economic growth through their roles in increasing transparency, reducing asymmetric information, facilitating transactions and trade, risk management, and lowering the costs of accessing to investment opportunities in order to attract and optimally allocate resources to productive economic activities. Some studies, such as Fufa and Kim (2018) and Seven and Yetkiner (2016), approved the positive effect of the banking sector and the stock market on economic growth. Schumpeter (1954) and McKinnon (1982) also assert that the FIs can be effective on growth rate due to their vital role in financing investment. On this basis, an essential part of the World Bank's recommendations to the economies is to support structural reformations that the most important of those have been not repressing NIR and exchange rate and development of the stock market and banking sector (Balogun et al. 2016).

The firm's financing in all economies is centered on the banking sector and stock market, any of which has a relatively large share in some economies than the other (Levine 2002). The financing system is market based in high-income countries (Demirguc-Kunt and Levine 1999) and bank based in developing ones (Moradi et al. 2016). There might be a competition between the FIs to attract liquidity. Hence, they try to absorb more liquidity through offering financial services and investment opportunities (Mattana and Panetti 2014). However, the FIs can complement each other because of the banking sector's investment in the stock market and supply funds to the firms listed on the stock market (Adrian and Shin 2010).

On the other hand, economic conditions can also affect the FIs (Demirguc-Kunt and Levine 1999; Greenwood and Smith 1997; Sadeghi et al. 2021). Since in the economic boom, firms' earnings increase, which has an expected positive impact on the stock market (Bahmani-Oskooee and Saha 2016). Accordingly, since IR is being affected by economic conditions, the incentive of investing in bank deposits is also affected (Boyd et al. 2001).

Inflation can have two different effects on the stock market. The positive effect is due to the growth of firms' products price, and the negative effect is due to rising input prices and, thus, their cost effect (Al-haji et al. 2018; Chen et al. 1986). Another channel of inflation's effectiveness is its potential impact on RIR, which can affect the attractiveness of bank deposits and, therefore, the costs of financing firms from bank deposits through changing the motivations to lend and borrow (Boyd et al. 2001). On the other hand, the stock market can also affect the inflation rate through the wealth effect channel. With a change in the stock market's return, individuals' expected income and wealth will also change. After that, household consumption, aggregate demand, and inflation will be affected (Simo-Kengne et al. 2015).

Rangan and Inglesi-Lotz (2012) and Antonakakis et al. (2017) confirm that inflation might affect the stock market and can be affected by the stock market. This bidirectional relation can be positive or negative, which is confirmed by Valcarcel (2012). Friedman (1977) states that rising inflation will harm investment due to growth of uncertainty and risk in the economy. Thus, the stock market will also be affected negatively (Apergis and Eleftheriou 2002). Tobin (1965) states that rising inflation positively affects the stock market because of devaluing cash value, savings, and thus injecting liquidity into the capital assets. Al-haji et al. (2018), based on Fisher's (1930) study, discuss that after increasing inflation, investment in the stock market increases to cover the risk of depreciation of some assets. Some studies, such as the study of Boyd et al. (2001), have confirmed the negative effect of inflation on the banking sector and the stock market. Solarin et al. (2018) showed the negative effect of inflation on bank deposits, and on the contrary, Finger and Hesse (2009) found out that inflation had a positive effect on bank deposits. In the studies, like Bahmani-Oskooee and Saha (2016), inflation's effect on the stock market has been negative in some countries and positive in some other ones. Antonakakis et al. (2017) found out that the impact of inflation on the stock market has been significant but different in different periods. The study of Thampanya et al. (2020) concluded that inflation affected the stock market positively.

3.2 The relationship of FEM with the nominal and real sectors of the economy

The studies of the World Bank have shown that the growth of exchange rate can increase bank deposits and, consequently, the growth of capital accumulation, investment, and economic growth. The best example is China where has benefited from this policy and achieved high economic growth. Some Asian countries, such as South Korea, Malaysia, and Thailand, did the same, and hence, their GDP and saving rate have shown high growth. On this basis, the net exports and, consequently, domestic savings will also grow after increasing the exchange rate, which causes the growth of competitiveness of exporting domestic goods in international markets and going up the import costs. As the saving rate grows, the needed domestic sources for financing the investment could be provided (Montiel and Serven 2008). Yeyati and Sturzenegger (2010) have also confirmed a rise in the exchange rate, and consequently, the increase of domestic savings to finance investments will lead to economic growth.

Concerning the effects of exchange rate on economic growth, the current views contrast with each other. Another view believes that the increase of exchange rate harms investment and economic growth due to the growth of the relative prices, domestic inflation, and more uncertainty in the economic environment (Montiel and Serven 2008; Dooley et al. 2004). There is a view that emphasizes the impacts of exchange rate on the economy depend on the structure of domestic economic firms. More specifically, the dependence of domestic firms on the measure of imported input against their exporting products might be a determinant factor (Bahmani-Oskooee and Saha 2016). As Comunale and Simola (2018) have approved, it relates to the relationship between exchange rate and inflation. The exchange rate pass-through on the inflation rate has been investigated by plenty of studies (Kurtovic et al. 2018). Ho and Odhiambo (2018) showed the negative effect of inflation on the exchange rate. In contrast, Delgado et al. (2018) reached a positive bidirectional relationship between inflation and exchange rates. On the other hand, the national currency value can also be affected by conditions of investment, economic growth, and inflation rate (Tayebi and Sadeghi 2017; Chiu and Sun 2016). In this regard, estimating the impacts of exchange rate changes on the inflation rate and then the monetary policy response to that has always been a challenge for central banks (Ghartey 2019).

3.3 The relationship between the FEM and the FIs

In the case of price instability and its high fluctuations in financial markets, the opportunity to profit from speculation due to high capital gains is provided, and thus, a substitute market is formed for the FIs in attracting liquidity. One of the financial markets that have the potential of high volatility and getting multi-rated due to the difference between official and unofficial rates is the FEM. Allen and Gale (1997) state that the difference between speculative activities and the FIs in attracting liquidity is related to their risk. Investors will take more risk when they expect a higher expected return. If they estimate more profit from the speculation than the FIs, they will choose the speculation. Dornbusch and Fisher (1980) and Bahmani-Oskooee and Saha (2016) express that a currency depreciation enhances the export-based firms' income by reinforcing the competitiveness of their products in the international markets.

In contrast, the firms whose input is more dependent on importing might be affected negatively by a decrease in national currency value because of rising import costs. Therefore, given its impact on the profitability of export-based firms or relied on import of input, the FEM has the potential of different effects on the stock market. In this respect, Aggarwal (2003) found out that the effects of exchange rate fluctuations on stock price depend on their impacts on the firms' products and input price. Franck and Young (1972) also confirmed that its impact depends on the structure of the firms. Exchange rate fluctuations also can affect bank deposits regarding their impact on the stock market, net exports, economic growth, and domestic savings. On the other side, given the potential effectiveness of the FIs on investment and economic growth that is a strong backup for the national currency, the FEM can also be mutually influenced by the conditions of the FIs. In this regard, Branson (1981) expresses that the exchange rate might be affected by capital assets price.

Some economic events and empirical studies have confirmed the existence of a negative correlation between financial markets. During the financial crisis of 2008–2009, the trust in the banking network had faded (Gregorioua et al. 2016), and the US stock market had also lost plenty of its value. The Federal Reserve led the investors' liquidity to the stock market by taking advantage of expansionary monetary policy, bond buying, and lowering IR (Huang et al., 2016). Matana and Panetti (2014) have confirmed the negative correlation between bank deposits and the stock market. Solarin et al. (2018) reached a negative relationship between bank deposits and the FEM. The negative relation between the FEM and stock market has also been confirmed in several studies (Al-haji et al. 2018; Delgado et al. 2018; Huang et al., 2016; Assefa et al. 2017).

In contrast, some other studies have rejected the negative correlation between some of these markets and considered them as complement and reinforce each other due to the positive correlation. The stock market index in the study of Solarin et al. (2018) showed a positive relationship with bank deposits. Chen and Chiang (2016) and Ho and Odhiambo (2018) also reached the positive effect of the exchange rate on the stock market. The positive relation between banking credits and the stock market is also confirmed by the study of Ho and Odhiambo (2018).

Despite being confirmed of a significant bidirectional relation between the FEM and stock markets (Manasseh et al. 2019 and Thampanya et al. 2020), some studies have not shown a significant relationship with bank facilities (Mbutor, 2010). Chkili and Nguyen (2013) considered a non-linear relation for the stock market and the FEM. This study shows that the exchange rate has not significantly affected the stock market in both regimes of high and low fluctuations. In contrast, the stock market has shown a significant impact on the exchange rate in both regimes. The study of Samadi et al. (2021) also shows that there can be no significant relationship between the stock market and the FEM.

3.4 Monetary policy, the FIs, and the FEM

Central bank's monetary decisions concerning changing IR can potentially impact stock market fluctuations, the FEM, bonds (Lyócsa et al. 2019), and cash value. Hence, the investors consider the IR changes on their decisions (Moya-Martínez et al. 2015). The financial crisis of 2008–2009, which slowed down the growth of the global economy,

increased the attention to the potential of monetary policy and its IR instruments. IR is one of the determinants of stock price, and its relation with the stock market has considerable importance in financial economics (Moya-Martínez et al., 2015). Hashemzadeh and Taylor (1988) argue that a lower IR could positively affect the stock market through the growth of the current value of the future return. Furthermore, IR can affect economic growth by influencing the stock market (Balogun et al., 2016). In addition, IR is one of the influential factors in the absorption of bank deposits (Finger and Hesse 2009). By changing IR, the effects of monetary policy can be injected into the economy's real and nominal sectors through the channel of affecting the FIs and the FEM. It is confirmed by Blinder (1998). Adrian and Shin (2010) also emphasize the transition of monetary policy effects to the economy's real sectors through the channel of the FIs.

IR can be effective on bank deposits' attractiveness and, consequently, the firms' access listed on the stock market to bank loans for investing and, thus, their profitability outlook (El Wassal 2005; Yartey 2008). The effects of monetary policy on real sectors of an economy considerably depend on the status of the FIs (Terra and Arestis 2017; Beck et al. 2014). The changes of IR affect investors' decisions to choose between risky assets and bank deposits. After rising IR, the investors might prefer bank deposits to risky assets. It increases the lending power of banks. Thus, the manufacturing sectors have more access to banking loans, leading to more investment (Beck et al. 2014). However, IR can also have a different and dual effect because it might increase the cost of financing the investment from bank loans, leading to a decrease in investment (Montiel and Serven 2008). Therefore, the performance and profitability perspective of the firms will be affected negatively by that. Some studies have confirmed the positive effect of IR on the growth of bank deposits (Mushtaq and Siddiqui 2017; Mashamba et al. 2014; Solarin et al. 2018; Ojeaga et al. 2013).

Nevertheless, the positive effect of raising IR on bank deposits in empirical studies that have mostly been related to Islamic countries has often been rejected. They found it out ineffective. (Hassan 2016; Mushtaq and Siddiqui 2017). Studies, such as Balogun et al. (2016), have shown the negative impact of IR liberalization on stock market development. Al-haji et al. (2018) and Huang et al. (2016) have also confirmed the negative effect of IR. In contrast, the study of Thampanya et al. (2020) found out that IR affects the stock market positively, and some others did not show a significant effect (Assefa et al. 2017). As a result, the changes of IR might affect the investors' decision about investing in bank deposits or the stock market. For example, bank deposits will be less attractive than bank deposits if IR decreases because the RIR of bank deposits reduces, while the financing cost of the firms listed on the stock market decrease. Nevertheless, the impact of this substitution is not clear on real sectors of an economy. Does it depend on whether the stock market will be able to compensate for the reduction of firms' access to financial resources of bank deposits or not? (Drechsler, Savov and Schnabl 2018; Lin 2020).

IR has enough potential to affect money demand and, therefore, the exchange rate due to its impact on the opportunity cost of holding money (Walsh 2010) and the attractiveness of the domestic economy to absorb foreign investment (Chen et al. 2016; Snowdon and Vane 2005). On the other hand, IR can affect the exchange rate through the channel of effectiveness on the FIs and, consequently, on investment and economic growth (El Wassal 2005; Yartey 2008), which are considered a strong backup for national currency

value. Friedman states that if the return rate of different assets (money, stocks, bonds, and commodities) is not equal, the investors will tend to the assets with a higher return rate (Wright 2012). Given the possible effect of IR on money demand, exchange rate, and real return rate of bank deposits, the foreign currencies, and bank deposits can be added to the assets list considered by Friedman. However, some studies have not confirmed the effect of IR on exchange rates (Saraç and Karagöz 2016), and some others have shown a significant relationship between them (Taylor and Peel 2000).

Finally, given the existing four sub-titles, the monetary policy effects can be transmitted to the economy through the FIs and the FEM channel. As Blinder (1998), Allen and Gale (2004) and Adrian and Shin (2010) did confirm that. In this regard, Fernández-Amador et al. (2013) state that the intervention of central banks in the financial markets has been risen by applying the monetary policy to stabilize the markets and economic conditions after the financial crisis in 2007–2008.

4 Model specification and estimation method

This study investigates the effects of monetary policy on nominal and real sectors of Iran's economy by channel of the relation between the stock market, bank deposits, and speculation in the FEM. Hence, the monetary policy instrument that can realize this link between the FIs, the FEM, and Monetary policy is IR. So in addition to the direct effects of IR, the indirect impacts of IR have been assessed by considering its effects on the economy through influencing the FIs and the FEM. We considered the regime changes due to high and low volatilities of dependent variables in Iran's Economy as Hamilton (1989) considered regime switching model based on the abrupt changes. There has rarely been stability about these variables, and they have continually faced the transition between high and low volatility. While due to the stability of inflation rate in the developed and emerging economies, the previous studies have not paid enough attention to the probable relationship between the speculative activities in the FEM and the FIs and their competition over attracting liquidity and the potential of monetary policy to take advantage of that to influence the economy. The models of our study are presented below:

$$INV_t = b_1 + b_{11, St}INV_{t-1} + b_{12, St}STO_t + b_{13, St}DEP_t + b_{14, St}EX_t + b_{15}IR_t + b_{16}MED_t + b_{17}GOV_t, \quad (1)$$

$$CPI_t = b_2 + b_{21, St}CPI_{t-1} + b_{22, St}STO_t + b_{23, St}DEP_t + b_{24, St}EX_t + b_{25}GDP_t + b_{26}M_t, \quad (2)$$

$$DEP_t = b_3 + b_{31, St}DEP_{t-1} + b_{32, St}STO_t + b_{33, St}EX_t + b_{34, St}CPI_t + b_{35}IR_t + b_{36}GDP_t + b_{37}M_t, \quad (3)$$

$$STO_t = b_4 + b_{41, St}STO_{t-1} + b_{42, St}DEP_t + b_{43, St}EX_t + b_{44, St}CPI_t + b_{45}IR_t + b_{46}GDP_t + b_{47}M_t, \quad (4)$$

$$EX_t = b_5 + b_{51, St}EX_{t-1} + b_{52, St}DEP_t + b_{53, St}STO_t + b_{54, St}CPI_t + b_{55}IR_t + b_{56}GDP_t + b_{57}M_t. \quad (5)$$

The equation number (1) is the investment (INV) which includes the variables: stock market (STO), bank deposits (DEP), foreign exchange rate speculation (EX), real interest rate (IR), the imports value of input (MED), and government's expenses (GOV). We survey the impacts of the FIs (DEP and STO), EX, and IR on INV. Plus, given the high level

of GOV in Iran's economy, we intend to determine whether GOV has had a complementary or substitutive impact on the private sector's investment. Finally, we used MED due to the high dependence of domestic firms on input imports.

Equation number (2) is the consumer price index (CPI). The variables of STO, DEP, EX, IR, Gross Domestic Product (GDP), and coins and bills in people's hands (M) have been used. We investigate the impacts of DEP, STO, EX, and IR on CPI, as we did that to equation INV. In addition to that, we considered M due to the high level of the coin and bills in people's hands and oil exports (OIL) considering the high dependence of total reserves of foreign currencies on that. In order to define the equation CPI, we took some help from the studies of Dhakal et al. (1994) and Delgado et al. (2018).

The equation number (3) is bank deposits. We intend to find out what relation there will be between DEP, STO, and EX in different regimes of DEP. We will do the same for equations number (4) and (5), assigning STO and EX orderly. We evaluate these relations in different regimes of STO and EX in order for Eqs. (4) and (5). As Amisano and Fagan (2013), Bahloul et al. (2017) did consider two regimes for inflation and the stock market. Plus, Lee and Chen (2006) emphasized using Markov switching models for the exchange rates. As mentioned above, we did the same for INV and DEP in addition to EX, STO, and CPI.

For more details, we used the same variables of M, GDP, and CPI for Eqs. (3), (4), and (5). In the definition of Eq. (3), the study of Solarin et al. (2018) has been considered. We also noticed the studies of Assefa et al. (2017), Thampanya et al. (2020), Bahmani-Oskooee and Saha (2016), and Hashemzadeh and Taylor (1988) to define Eq. (4). To Eq. (5), we got some help from the studies of Mbutor (2010) and Kia (2013). Given the explanations mentioned above, in brief, investment (Eq. 1) and inflation rate or CPI (Eq. 2) are considered real and nominal sectors of Iran's economy. We are supposed to survey the monetary policy effects on nominal and real economic indicators through influencing three markets of STO (Eq. 4), DEP (Eq. 3), and EX (Eq. 5).

Furthermore, a monetary policy instrument is needed to have enough potential to affect the liquidity flow between DEP, STO, and EX, which can influence the nominal and real sectors of the economy (CPI and INV) through this channel. To this aim, the real interest rate (IR) is used. In this respect, we put IR in every three equations of STO, DEP, and EX. In this way, we can compare the impacts of monetary policy on these three markets. On the other hand, we put every three markets of STO, DEP, and EX in equation INV and CPI. Now, we will have a comparative analysis concerning the results of five estimations. Hence, we will evaluate the effects of monetary policy on inflation and investment through the channel of affecting the mentioned three markets. Necessary to say that the impacts of IR are not considered dependent on the regime due to the repression of NIR and being passive of the real interest rate against the inflation rate.

All mentioned variables have been used in their growth forms for the period 1988–2018. Finally, S_t is assumed exogenous and represents the regime and the variables affected by the regime in Eqs. 1–5. For EX, we used the gap between official and unofficial Iran's domestic currency (Rial) against the U.S. dollar published by Iran's Central Bank. This gap can boost the motivations of gaining profits from speculation in the FEM. For DEP, we took into account the average of short-term and long-term bank deposits released by Iran's Central Bank. For STO, we applied the value of stocks traded on the

stock market published by Iran's Central Bank. To INV, the gross fixed capital formation published by Iran's Central Bank has been used. For consumer price index, gross domestic product, and government's expenses, we used the information of the World Bank. For IR and M, the real interest rate of bank deposits, and coins and bills in people's hands, Iran's Central Bank's data have been applied.

The time series faces sudden changes called the regime transition in the econometric literature (Hamilton 1989). The main feature of regime-dependent models is that the number of regimes is finite, and the transition between them can be slow or very fast (Franke 2012). It typically assumes the regime changes are exogenous concerning all realizations of the regression disturbance (Hamilton 1989). Markov switching models allow the influence of explanatory variables to be regime depended. These models include different kinds. Given which part of the model is dependent on the regime, it can be MSM which the mean is dependent on the regime, MSH that the variance is dependent, MSA (dependence of autoregressive coefficients), MSH (dependence of constant term), and or a combination of these four kinds. Given the annual time series and the number of the observation which is 30, we considered at most four lags. The number of regimes is set based on the fluctuations of every five dependent variables in Iran's economy. We had faced high or low volatility about these five variables, and there has rarely been stability. That was why we chose two regimes as the most empirical studies did the same.

5 Empirical results

After confirming all variables' stationery by augmented Dickey-Fuller (ADF) test, the necessity of using non-linear evaluation is examined by the likelihood ratio (LR) test. Then, one of Markov's models has been selected regarding the models' explanatory (Log-Likelihood), Schwartz criterion (number of observations less than one hundred), and the significance of the coefficients, especially regimes' coefficients. The results of the mentioned cases are shown in Table 2.

Based on Table 2, after being approved the non-linear relations for every five equations, setting lags, regimes number, and selecting one of Markov switching models, the estimation results of five equations are presented in separated Tables 3, 4, 5, 6, 7.

According to Table 3, regime (0) indicates a higher mean, as the boom and regime (1) are set as the recession. In both regimes, the FIs of the stock market and bank deposits have positively affected investment. This positive effect has been severe in the recession. In contrast, speculation in the FEM has shown a negative impact on investment in both regimes. This negative effect has been more remarkable in the recession. These results show that speculation in the FEM can negatively affect investment if high capital gains originated from exchange rates differences to attract more liquidity than the FIs. This negative effect might be because of increasing the costs through boosting the exchange rate and thus getting expensive the imports of input due to considerable dependence of domestic firms to imported input. One more reason can be related to financing through the FIs. Because after leading more liquidity to speculation in the FEM than the FIs, the firms' access to resources will probably decline.

Previous period investment has also shown a positive impact. The government's expenses affected investment negatively. This result shows that it has not had a

Table 2 The number of regimes and lags and LR test

Equations	The Regimes	Prob. (LR test)	Lags
INV (MSMH)	The Boom	0.000 Not accepting H0	Two
CPI (MSMAH)	The Recession	0.000 Not accepting H0	One
	Very high		
DEP (MSMA)	High	0.000 Not accepting H0	Two
	High		
STO (MSMA)	Low	0.000 Not accepting H0	Three
	Bull		
EX (MSMAH)	Bear	0.000 Not accepting H0	Two
	High Difference between foreign exchange rates (high speculation)		
	Low difference (low speculation)		

MSMH shows the dependence of mean and variance to regime, MSMA indicates that the mean and autoregressive coefficients are depended to regime, and MSMAH shows that both mean and autoregressive coefficients as well as variance are depended to regime. The LR test null hypothesis shows the existence of linear relations and the alternative hypothesis indicates the existence of non-linear relations. In relation to inflation rate, it has been high or very high nearly in all years of under-review period. That was why we considered its regimes as high and very high inflation rate. Based on Table 1, inflation rate has always been above 10% except for 4 years that had faced 9.6, 9, 9, and 6.8% in 2018, 2017, 1991, and 1986

Table 3 The estimation results of equation INV

Variables	Coefficient		Std. error		Prob	
	Regime (0)	Regime (1)	Regime (0)	Regime (1)	Regime (0)	Regime (1)
Constant	-0.0162620	-0.53623	0.0004352	0.02154	0.000	0.000
STO	0.00552181	0.208972	0.0005663	0.0009863	0.000	0.000
DEP	0.0250328	1.31251	0.0001139	0.07437	0.000	0.000
EX	-0.000926	-0.01783	0.0001127	0.0007117	0.000	0.000
CPI	1.31446	2.05260	0.006503	0.02541	0.000	0.000
Sigma	0.0001365	0.127384	2.353	0.02616		
AR-1	0.208025		0.002061		0.000	
AR-2	0.27128		0.002246		0.000	
RATE	1.55592		0.006992		0.000	
GOV	-2.26224		0.02674		0.000	
MED	0.241589		0.0004116		0.000	
MILI	0.0634683		0.0009112		0.000	
Transition matrix and the average of persistence years			P_{00} : 0.61107 P_{01} : 0.38893		P_{10} : 0.54536 P_{11} : 0.45464	

The average duration of each recession was 1.71 years and the boom 2.41 years. 58.62% of the interval, investment was in the boom and 41.38% in the recession

Note: AR-1 and AR-2 show the lags of investment. Sigma is the variance or the fluctuations of investment. RATE, GOV, MED, and MILI are orderly real interest rate, the expenses of government, imports of input and intermediate goods, and military expenses

complementary effect on the private sector's investment. The military expenses (as a signal for security) have had a positive effect. Imports of intermediate goods and input has positively affected investment, probably because of the high dependence of manufacturing sectors on imported input. IR has had a positive effect on investment. A probable explanation is that being negative of RIR due to the inflationary environment and NIR

Table 4 The estimation results of equation CPI

Variables	Coefficient		Std. error		Prob.	
	Regime (0)	Regime (1)	Regime (0)	Regime (1)	Regime (0)	Regime (1)
Constant	0.266883	0.240587	0.02491	0.0005342	0.000	0.000
STO	− 0.010099	− 0.002093	0.0395	0.0004804	0.002	0.000
DEP	− 0.208219	− 0.199170	0.04136	0.02992	0.000	0.000
EX	0.0583599	0.0016899	0.153	0.001366	0.000	0.126
AR-1	0.414919	− 0.335574	0.05965	0.06489	0.000	0.000
Sigma	0.0639613	0.00478447	0.0118	0.000972		
M	0.218007		0.02932		0.000	
GDP	− 2.598565		0.03509		0.000	
OIL	− 0.0255979		0.001816		0.000	
Transition matrix and the average of persistence years			P ₀₀ : 0.71714 P ₀₁ : 0.28286		P ₁₀ : 0.33843 P ₁₁ : 0.66157	

The average duration of each very high CPI was 3 years and high CPI 3 years. 50% of the interval, CPI was in high regime and 50% in very high one

Note: AR-1 shows the lag of CPI. Sigma is the variance or the fluctuations of CPI. M, GDP, and OIL are orderly the coin and bills in people's hands, gross domestic product, and oil exports

Table 5 The estimation results of equation STO

Variables	Coefficient		Std. error		Prob.	
	Regime (0)	Regime (1)	Regime (0)	Regime (1)	Regime (0)	Regime (1)
Constant	0.328315	− 0.24030	0.03915	0.1046	0.000	0.051
DEP	− 1.64952	− 0.80073	0.1463	0.2525	0.000	0.013
EX	0.0617773	− 0.23450	0.01549	0.01154	0.004	0.000
CPI	2.08936	2.53547	0.3485	0.3516	0.000	0.126
AR-1	− 0.800062	− 1.16982	0.07971	0.0734	0.000	0.000
AR-2	0.47467	− 1.29724	0.05302	0.0875	0.000	0.000
AR-3	1.12705	− 0.513673	0.0687	0.07425	0.000	0.000
M	1.55717		0.1446		0.000	
GDP	2.96879		0.2759		0.000	
RATE	− 0.540297		0.2944		0.104	
Sigma	0.0853663		0.01142			
Transition matrix and the average of persistence years			P ₀₀ : 0.82352 P ₀₁ : 0.17648		P ₁₀ : 0.27272 P ₁₁ : 0.72728	

The average duration of bull market was 4.25 years and bear 3.67 years. 60.71% of the interval, STO was in regime (0) and 39.29% in regime (1)

AR-1, AR-2, and AR-3 show the lags of stock market. Sigma is the variance or the fluctuations of stock market. M, GDP, and RATE are orderly the coin and bills in people's hands, gross domestic product, and real interest rate

repression reduced the firms' financing cost from bank loans over time. The transition matrix shows that the persistence probability of the boom regime is relatively higher than the recession—an average of 2.41 years for the boom and 1.71 for the recession. In addition, the probability of the transition from a recession to a boom was higher than the reverse (from a boom to a recession).

Based on Table 4, regime (0) shows very high CPI due to a more effective mean, and regime (1) high CPI. The FIs of bank deposits and the stock market have negatively

Table 6 The estimation results of equation DEP

Variables	Coefficient		Std. error		Prob.	
	Regime(0)	Regime(1)	Regime(0)	Regime(1)	Regime(0)	Regime(1)
Constant	0.150322	- 0.05935	0.02688	0.03033	0.000	0.017
STO	- 0.043751	- 0.05290	0.01468	0.01822	0.006	0.002
EX	0.0110713	- 0.11535	0.004263	0.01384	0.003	0.000
CPI	- 0.684714	1.13436	0.1683	0.1514	0.001	0.000
AR-1	0.678773	1.18527	0.1344	0.2025	0.001	0.000
AR-2	0.106606	- 2.91553	0.06607	0.03899	0.030	0.000
M	0.959647		0.03899		0.000	
GDP	1.02295		0.1868		0.000	
RATE	- 0.571463		0.1945		0.022	
Sigma	0.0308762		0.0415			
Transition matrix and the average of persistence years			P ₀₀ : 0.90046 P ₀₁ : 0.099537	P ₁₀ : 0.42933 P ₁₁ : 0.57067		

The average duration of high DEP was 7.67 years and low 3 years. 79.31% of the interval, DEP was in regime (0) and 20.69% in regime (1)

AR-1 and AR-2 show the lags of bank deposits. Sigma is the variance or the fluctuations of bank deposits. M, GDP, and RATE are orderly the coin and bills in people’s hands, gross domestic product, and real interest rate

Table 7 The estimation results of equation EX

Variables	Coefficient		Std. error		Prob.	
	Regime(0)	Regime(1)	Regime(0)	Regime(1)	Regime(0)	Regime(1)
Constant	- 0.320646	- 2.80852	0.147	0.133	0.018	0.000
STO	- 0.899544	- 1.74743	0.05922	0.153	0.003	0.000
DEP	- 3.50716	- 2.70415	0.3094	0.1255	0.000	0.000
AR-1	0.619842	- 0.37659	0.1683	0.1514	0.000	0.000
AR-2	- 0.154128	0.329754	0.1344	0.2025	0.075	0.000
AR-3	0.545574	- 0.12211	0.06607	0.03899	0.000	0.010
Sigma	0.058789	2.12567	0.008923	0.6157		
M	2.55658		0.1187		0.000	
GDP	4.98103		1.9171		0.000	
CPI	14.4216		0.4947		0.000	
RATE	8.69911		0.3912		0.000	
INV	- 1.93791		0.1601		0.000	
Transition matrix and the average of persistence years			P ₀₀ : 0.76165 P ₀₁ : 0.23835	P ₁₀ : 0.85714 P ₁₁ : 0.14286		

The average duration of high Speculation (difference between official and unofficial foreign exchange rates) was 3.67 years and low 1.2 years. 78.57% of the interval, in regime (0) and 21.43% in regime (1)

AR-1, AR-2, and AR-3 show the lags of the gap between exchange rates. Sigma is the variance or the fluctuations of the gap between exchange rates. M, GDP, and RATE are orderly the coin and bills in people’s hands, gross domestic product, and real interest rate

affected CPI that has been more remarkable in regime (0). This negative effect has formed by attracting more liquidity by the FIs and, thus, not leading liquidity to the markets that potentially provoke false demands. In contrast, speculation in the FEM has shown a positive effect on CPI in regime (0), while its effect has been insignificant in regime (1). A probable explanation is that the speculative activities could not create enough false demand to move price levels up when the economy was in regime (1). But,

being affected the general price level by speculation in the FEM through creating high false demand has been more remarkable when we faced a very high inflationary environment in regime (0).

GDP and oil exports have had a negative effect. Coin and bills in people's hands showed a positive impact. Expected inflation (the lag of the previous period) has shown a positive effect in regime (0) and a negative impact in regime (1). The transition matrix indicates that the probability of persistency of both regimes is high and close to each other, and on the other hand, the persistency of regime (0) is relatively higher than regime (1). In addition, the transition probability of a high CPI to a very high CPI regime is higher than the reverse. Plus, the probability of transition from regime (0) to regime (1) or vice versa is low. This result indicates the average years of regimes persistency is high when the economy enters one of these regimes—an average of 3 years for the regime (0) and 3 years for the regime (1).

Based on Table 5, regime (0) suggests a bull market due to higher mean and regime (1) bear market. Bank deposits have had a negative relation with the stock market. Its negative effect has been more remarkable in regime (0). This relation indicates competition between two FIs to attract liquidity and lack a complementary effect on each other.

The high difference between the official and unofficial exchange rates positively affected the stock market in bull regime. In contrast, its effect has been negative in the bear market. In a bull market, the firms' profitability outlook has increased due to the growth of their exporting products after increasing the exchange rate by reinforcing their products' competitiveness in the international market. While in the bear market, with an increase of exchange rate and growth of the input import cost, the negative share of its production cost has overcome its positive effect on the sale of export products, and hence, it affected the stock market negatively.

CPI has shown a positive impact due to the rising price of products in both regimes. Expectations (the stock market lags) have positively affected stock market in bull regime and negatively impacted it in bear regime. The coin and bills in people's hands and also GDP affected the stock market positively. The relation of IR with the stock market has been negative due to the increase of financing costs from bank loans, but this relation has been insignificant due to the repression of NIR. The transition matrix indicates that the persistency probability of both regimes is high, which concerning the bull market, this probability has been higher. In addition, the transition probability from a bull market to a bear market is remarkably lower than the reverse. The point is that the probability of regime changing or transition between two regimes is low. When the stock market enters one of these regimes, the number of years which remain in that is high, with an average of 4.25 years for the bull regime and 3.67 for the bear regime.

According to Table 6, regime (0) shows high deposits due to the more effective mean, and regime (1) indicates the low deposits. In both regimes, the stock market has had a negative relation with bank deposits. This negative relation has been more remarkable in regime (0). This result is the same as the result of STO estimation in Table 5, which showed bank deposits and the stock market had no complementary impact on each other, but there has been competition between them to attract more liquidity.

The difference between official and unofficial exchange rates has affected bank deposits positively in regime (0), and in contrast, its effect has been negative in regime (1).

Therefore, given estimation results in Tables 5 and 6, in the periods that the FIs of bank deposits and the stock market have been in a recession, the speculation in the FEM might have been a solid competitor for them in attracting liquidity. Nevertheless, in the boom regimes of the FIs, this difference of exchange rates has reinforced them or has had a complementary effect on them. This result shows how much the state of the FIs can be critical in Iran's economy in the direction in which the liquidity will be led. CPI has shown an adverse effect in regime (0) and a positive impact in regime (1). A probable explanation is that due to repression of NIR and facing high inflation in regime (0) originated from the great measure of M_2 , CPI has harmed deposits bank because of a lower RIR. There are the same explanations for its positive effect when we are not in a high inflationary environment because of being in regime (0) and thus facing the lower measure of M_2 due to higher RIR.

Expectations (the lags of bank deposits) have had a positive effect in the regime (0) and a negative impact in the regime (1). In the following, the coin and bills in people's hands and GDP have shown a positive effect. The impact of IR on bank deposits has been negative due to the negative RIR originated from high inflation and NIR repression in most years of the considered period. The transition matrix indicates that the persistency probability of both regimes has been high which we had a significantly higher probability for the regime (0) than regime (1)—an average of 7.67 years for high deposits and 3 for low deposits. In addition, the transition probability from high to low deposits has been very low compared to the reverse.

The last estimation is about the speculation in the FEM or the difference between foreign exchange rates. According to Table 7, regime (0) indicates high speculation in the FEM (high difference between official and unofficial rates) concerning the higher mean, and regime (1) is set as low speculation.

The both FIs of the stock market and bank deposits have had a negative effect on the difference of exchange rates. This negative effect has been more remarkable in regime (0) for bank deposits and regime (1) for the stock market. This result shows that there has been competition for attracting liquidity between bank deposits and the stock market with speculation in the FEM. The negative impact of the FIs on foreign exchange rate speculation might have been due to the absorption of liquidity and, therefore, the reduction of injecting liquidity into the FEM for gaining profits from speculating. Another probable reason is that considering the positive effect of bank deposits and the stock market on investment in Table 3; these two FIs might have caused reducing the gap between exchange rates through the growth of investment and, therefore, reinforcing national currency value.

Expectations about the difference between exchange rates (the lags of EX) have had a positive impact in the regime (0) and a negative effect in the regime (1). Furthermore, the coin and bills in people's hands and CPI have shown a positive effect. In contrast, investment affected the exchange rates difference negatively. Finally, the impact of IR has been positive. A possible explanation is that due to being negative of RIR originated from high inflation and repression of NIR in the most years of the considered period, the attractiveness of attracting foreign investment declined, and the incentive of taking bank loans went up. These two consequences of negative IR caused the weakening of national

currency value, which lowered demand for money. Hence, the effect of IR on exchange rates difference has expectedly been positive.

The transition matrix shows that the persistency probability of high speculation regime (high exchange rates difference, regime (0)) is very high and, in contrast, is very low for the regime (1)—an average of 3.67 years for the regime (0) and 1.2 years for the regime (1). In addition, while the probability of a transition from the regime (0) to regime (1) has been very low, the reverse has been very high. This result confirms that the conditions for gaining profits from speculation in the FEM have been provided during the under-review period. Hence, the destructive effects of the exchange rates gap on general price level fluctuations, and investment will most likely be lasting in Iran's economy.

6 Discussion

We are supposed to discuss how the monetary policy affects Iran's economy's nominal and real sectors through the FIs and the FEM channel. For this purpose, we have a comparative analysis about the obtained results of five estimations. First, bank deposits and the stock market have had a significant negative impact on CPI and positive on investment. This positive impact on investment and negative on inflation has existed in both regimes, whether the economy has been faced with high or very high inflation and recession or boom concerning investment. These results show the capacity and importance of the FIs in affecting the nominal and real sectors of the economy suitably. At the same time, the difference between official and unofficial exchange rates has had a significant positive impact on CPI and negative on investment in both regimes of CPI and investment. As discussed in Sect. 2, monetary policy in Iran's economy has not had the acceptable impacts on the FEM after a revolution in 1979. The fixed exchange rate and not supporting the targeted exchange rate by the central bank caused the gap between exchange rates and the motivations of speculative activities in the FEM to gain short-term profits. The high demand level for foreign currency and leading more and more liquidity toward the FEM led to the growth of inflation rate and reduction of investment. The estimation results also confirmed our discussion in Sect. 2 concerning the destructive effects of not applying the policy of exchange rate unification on the economy. Hence, there is the necessity of applying this policy. Thus, in sum, despite Fernández-Amador et al. (2013), who believed the central bank intervention and their monetary policies have mainly been toward stabilizing the financial market and economic conditions after financial crises, the performance of Iran's Central Bank and its monetary policy has not shown such a reality in the FEM. Thus, because of negative RIR, not affecting the stock market positively, and the existence of a gap between exchange rates, the liquidity has been attracted to speculative activities in the FEM instead of supporting productive economic activities through the FIs.

Some studies, such as Levine (1999), Beck and Levine (2004), and Ibrahim and Shah (2012), reached the same result about the positive effect of the FIs on investment and growth rate. Atella et al. (2003) obtained the negative effect of foreign exchange rates on investment (the difference of our study has been considering the difference between official and unofficial exchange rates). Antwi et al. (2020) concluded that the foreign exchange rate had a positive impact on inflation, as so did we. On the contrary,

Antonakakis et al. (2017) concluded about the negative correlation between the stock market and inflation.

Second, the result showed that stock market and bank deposits had been a substitute to each other and not a complement regardless of being in bear or bull stock market and high or low deposits. Therefore, the central bank can choose one of them as the targeted market to attract more liquidity based on its monetary policy aims as Dey (2007) reached the same result about substituting the banking sector and stock market. Nevertheless, Arize et al. (2018) showed that the banking and stock markets complement each other. On the other hand, there has been a substitutive relation between the stock market and bank deposits with speculation in the FEM when they have been in the recession. Demir (2013) had the same result about the negative relation between the stock market and the fluctuations of the exchange rate.

Third, IR has also shown a significant adverse effect on bank deposits, positive on speculation in the FEM, and an insignificant impact on the stock market as Chen (2009) and Toraman and Başarir (2014) got the same result the insignificant effect of IR on the stock market. IR has shown an adverse effect in some countries and a positive impact in some more economies on bank deposits based on the study of Larionova and Varlamova (2014). The negative impact of IR on bank deposits has confirmed our discussion in Sect. 2. We discussed that the inflation rate had been more than the nominal interest rate of short- and long-term bank deposits from beginning 1979 to the end (except for 2015–2018) due to Islamic rules' sensitivities to IR and, therefore, limitations of using IR by the central bank in the new political regime.

As a result, the real interest rate of this kind of deposit has been negative. As we discussed in Sect. 2 and the estimation results confirmed, investing in bank deposits has not been an attractive choice for investors to cover the risk of decreasing their money value. This issue got started from the presidency of Banisadr² as the first president in the new political regime and kept continuing in the next presidency of Khamenei³ and Rafsanjani.⁴ As a turning point, the profound consequences of this policy were revealed in the second term of Rafsanjani's presidency. When inflation rate reached 49%, while NIR of short- and long-term were 8 and 14%, after that, in the period of Khatami's presidency,⁵ the proportion between inflation rate and NIR of bank deposits (especially long-term deposits) improved and continued till the middle of second Ahmadinejad's presidency⁶ in 2012. The mentioned improvement could not continue in 2013–2014. However, we experienced the best policy in the first term of Rouhani's presidency⁷ so that the NIR of deposits was more than the inflation rate in 2015–2018.

Plus, as we stated above, IR has positively impacted the gap between official and unofficial exchange rates. At the same time, there was an expectation about its negative effect based on related economic theories (as we had in Sect. 3, because of its impact on the opportunity cost of holding money and the attractiveness of the domestic economy to absorb foreign investment). Saraç and Karagöz (2016) also obtained the same result

² 1980–1981: The term of Banisadr's presidency which lasted about two years.

³ 1981–1989: The terms of Khamenei's presidency.

⁴ 1989–1997: The terms of Rafsanjani's presidency.

⁵ 1997–2005: The terms of Khatami's presidency.

⁶ 2005–2013: The terms of Ahmadinejad's presidency.

⁷ 2013–2018: The first term of Rouhani's presidency.

about not finding any decreasing effect of IR on exchange rate despite the claim of Turkey's central bank based on controlling exchange rate by using IR. On this basis, Iran's Central Bank and its monetary policy have not affected the gap between exchange rates suitably due to the limitations of applying the policy of exchange rate unification and using IR, as we already discussed in Sect. 2. More details, this gap got started from the presidency of Banisadr as the first president and kept increasing in the presidency of Khamenei, Rafsanjani, and Khatami till 2002. The policy of exchange rate unification was applied in the second term of Khatami's presidency in 2003 and continued until the middle of Ahmadinejad's presidency in 2011. The effects of this new policy were clear on lowering the gap between official and unofficial exchange rates in 2003–2011. Nevertheless, After 2011, in the last two years of second Ahmadinejad's presidency and the start of the presidency of Rouhani to 2018, the monetary policy of exchange rate unification did not continue because of USA sanctions on oil and its derivatives exports.

On the other hand, given the second discussion based on the existence of substitutive relation between the FIs and the EFM and the different effects of the FIs and the EFM on nominal and real sectors of Iran's economy and finally the third discussion relied on the potential effects of IR on the FIs and the FEM, we conclude: in the event of not repressing of NIR, the central bank and its monetary policy can affect the nominal and real sectors of Iran's economy through the channel of the FIs and the FEM. As the studies of Terra and Arestis (2017) and Beck et al. (2014) did reach the same respecting the effectiveness of the monetary policy on the real sector of an economy through the channel of the FIs. Toraman and Başarir (2014) also concluded that central banks could affect the nominal (inflation) and real (employment) sectors of an economy through using IR in order to influence the stock market. Nevertheless, these studies did not consider other financial markets, like the FEM, due to the relative stability of the inflation rate or the low fluctuation of the general price level and the existence of a single foreign exchange rate. Therefore, as we discussed in Sect. 2, the legislation in 1984 and its limitations about using interest rates have taken an essential part of the central bank's power to influence economic conditions through the FIs and the FEM.

7 Conclusion and policy implications

This study examines the effects of monetary policy on nominal (CPI) and real (investment) sectors of Iran's economy through the channel of the relation between the stock market, bank deposits, and speculation in the FEM by applying Markov switching models for time 1988–2018. In this period, Iran's economy faced the limitations of using IR by the central bank and banking sector and applying the policy of exchange rate unification. So, our concentration has been on monetary policies of exchange rate unification and using IR to transmit the impacts of monetary policy to the nominal and real sectors of the economy through the FIs and the FEM.

The results show that the nominal and real economic sectors are highly affected by the FIs and speculation in the FEM. Bank deposits and the stock market have negatively affected CPI in both regimes of high and very high CPI. In contrast, speculation in the FEM has indicated a positive impact on it in both regimes of CPI. Bank deposits and the stock market have had a positive effect on investment in both recession and boom regimes of investment. Nevertheless, speculation in the FEM affected it negatively in

both regimes of investment. In other words, the impacts of the FIs on the nominal and real sectors of Iran's economy have been different from the effects of speculation in the FEM. The main reason for the negative effect of foreign exchange rates on investment has been the gap between the exchange rates due to not applying the policy of exchange rate unification. On the other hand, the IR has shown a negative impact on bank deposits due to being negative of RIR in most years, and its effect on speculation in the FEM has been positive. The relation between IR and the stock market has been insignificant. However, we expected that IR would significantly influence the stock market, positively affect bank deposits, and negatively impact the gap between official and unofficial exchanges rate. These results show the destructive effects of the legislation and its limitations concerning using IR by central banks and the banking sector.

Given the obtained results, considering the substitutive relations between the FIs and speculation in the FEM and being affected of the nominal and real sectors of the economy by these relations and plus the different effects of IR on the FIs and the FEM, the policy makers and central bank must follow some important policies. First, they should make enough attraction in the stock market and bank deposits to absorb more liquidity to finance investment and productive economic activities adequately. In this way, the liquidity will not be attracted in markets where cause creating price fluctuation. The high price fluctuation forms a condition to speculative activities for gaining short-term profits. In other words, it makes the speculative activities in these markets get more attractive than investing in the FIs for financing the productive activities.

As we did see, the monetary policy had enough potential to realize the cases mentioned above. In this regard, monetary policy should be concentrated on applying the exchange rate unification to lower the gap between official and unofficial rates since this gap has had destructive effects on investment, growth rate, and inflation. A single foreign exchange rate reduces uncertainties regarding the firms' performance and profitability outlook by having a reliable estimation about their import costs of input, the measure of export revenues, and the situation of the domestic economy. Second, regarding the direct and indirect effects of monetary policy instrument of interest rate on the real and nominal sectors of Iran's economy through the channels of the FIs and the FEM, the legislation and the repression of NIR has taken a lot of opportunities from the central bank to adjust the relationship between the financial markets and leading liquidity between them in order to reach its monetary policy aims. Hence, it is essential to be reconsidered about the legislation or making other needed flexibilities to lift more limitations concerning using interest rates by central banks and the banking sector to support the productive activities and lower the motives of speculative activities. Because in this event, instead of being passive against the growth of inflation rate, the central bank will be able to change NIR proportional with the inflation rate for influencing the FIs and the FEM to transmit the monetary policy effects to the economy.

Abbreviations

NIR	Nominal interest rate
RIR	Real interest rate
IR	Interest rate
FIs	Financial intermediaries
FEM	Foreign Exchange Market

Supplementary Information

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Additional file 1. The results of ADF test.

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Author contributions

AS, HM, AHS, KA, and PR contributed to the design and implementation of the research, the analysis of the results, and the writing of the manuscript. All the authors read and approved the final manuscript.

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Declarations

Competing interests

The authors declare that they have no competing interests.

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