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Banks' Reaction to the COVID-19 Pandemic and Currency Crises: Empirical Evidence from Iran

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Abstract

Since 2019, the global economy has been suffering from a crisis caused by a novel virus called COVID-19, which creates an uncertain condition for investors by simultaneously affecting both the supply and demand sides of the economy. Investors are expected to be more cautious in investing under uncertain conditions created by COVID-19, but this issue has been neglected in the literature. Therefore, the researchers addressed it by examining the banks' behavior in constructing their portfolios based on empirical evidence from the Islamic Republic of Iran (Iran). The researchers focused on the banking system as it is a major investor in the economy that is more sensitive to surprises due to its business model structure. By categorizing the Iranian banks' assets into fixed, variable, and no-interest rates, the researchers examined the weight change of the three contracts in the banks' portfolios during the COVID-19 and a regular currency crisis. The researchers then applied ARDL regression analysis for the Iranian Central Bank's monthly data (January 2010 to June 2021). The results revealed that the weight of the fixed rate contracts in the banks' portfolio, on average, was higher during the crisis than in normal periods and was even higher facing COVID-19 or uncertainty conditions. Thus, this study adds to the literature on the COVID-19 crisis, and its findings help policymakers to provide a prompt reply to such a crisis through the banking system.

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I. Introduction

Since 2019, the world has been suffering from a novel virus called COVID-19. This fatal virus with a very high mortality rate (Baud *et al.*, 2020) is, in fact, a strain of coronavirus with no specific treatment and high transmission rates. For this reason, governments worldwide unanimously persist in social distancing policy and closing borders to prevent its spread. The implemented policies have then negatively affected both supply and demand sides of the economy. In this case, lockdowns and business closures affect the supply side, while loss of income due to voluntary or optional layoffs from work and a steep drop in investments (Guterres, 2020) negatively influence the demand side. In addition, because of investment reduction due to a surge in uncertainties in the economies, the implemented policies have hurt not only the current economic growth but also the future economic growth. It is estimated that the COVID-19 pandemic has imposed an enormous cost on the global economy so that it is expected to fall 6.4% to 9.7% of world GDP (Park *et al.*, 2020) and a 13% to 32% drop in the global trade (Weiss *et al.*, 2020).

Needless to say, it is not the first time the world has faced an economic crisis. The global economy, in fact, has experienced a variety of economic crises over the past centuries. Currency crisis (rapid rise in the value of foreign currencies), credit crunch (the lack of money for financial institutions), banking crisis (the widespread bank run), financial crisis, debt or fiscal crisis, and housing crashes are the popular economic crises in the global economy. All these crises have occurred repeatedly in the economy and have imposed great costs. For instance, the average output costs of currency crises were about 4% of GDP and around 6-7% for banking crises (Nakatani, 2019). It means recurrent and COVID-19 crises are the same in imposing negative impacts on economies. However, it is believed that the economic crisis raised by the COVID-19 pandemic is both deeper and wider than the conventional one in the recent century (Maliszewska et al., 2020; Ludvigson et al., 2020).

Despite the similarities in the economic effects and consequences of the regular and COVID-19 crises, there is a fundamental difference between them. The most important difference between COVID-19 and the regular economic crisis is that the latter is predictable[3], while the former has been unprecedented. By the logic that the economic agents are expected to behave differently in the face of predicted and unprecedented crises, the result of their decisions will not necessarily be the same (Sharma et al., 2020). Alternatively, agents are already preparing and planning to reduce known risks in facing a predictable crisis. However, when they face an unpredictable crisis, they enter an uncertain condition with unknown risks. Therefore, the rational agents facing an unprecedented crisis must plan and make decisions

[3] There are a vast literature in generating early warning indexes for a currency crisis (Krznar, 2004).

when the crisis is underway. It means their behavior would differ in dealing with each of these crises.

Given the key difference between a predictable and an unprecedented crisis, the question is, will the outcome of economic agents' decisions be the same facing these two cases? The researchers addressed this question by focusing on the banking system's reactions to COVID-19 and a regular economic crisis. The researchers focused on the banks for some reasons; first, banking systems are the spring of liquidity insurance and play a strategic role in economies (Barattieri et al., 2020). Second, as the spread of COVID-19 has triggered withdrawal rates due to depositors' precautionary reactions, the banking sector has been the first group to feel the consequences of the unexpected crisis stemming from COVID-19 (Prior, 2020; Barua and Barua, 2021; Greenwald et al., 2021). Moreover, the banks felt the crisis earlier because many debtors did not pay their obligations to the banks due to the loss of their jobs. These factors increased the banking system's stress even more than they experienced during the global financial crisis (GFC) (Aldasoro et al., 2020; Demirgüç-Kunt et al., 2020). Third, despite the problems on their debt side, banks still had control over their assets and could control the risk and uncertainties by managing their asset.

In addressing the issue, the researchers concentrated on two specific crises, i.e., currency and the COVID-19 crises. The researchers emphasized currency crisis instead of another form of regular economic crisis because it is the most frequent crisis (Laeven and Valencia, 2020). A currency crisis is, in fact, the result of a lack of enough money, liquidity, or foreign currency in the domestic market. The shortage of foreign currency in the domestic economy causes exchange rate depreciation. This crisis affects bank behavior, which finally leads to the currency crisis. Additionally, the researchers focused on the Islamic Republic of Iran's banking system to provide an empirical study for two reasons. (1) The financial system structure in Iran is bank-based (Ebrahimi, 2014), and the banking system plays a remarkable role in financing businesses or essential Iranian needs. (2) Iran has experienced both currency and COVID-19 crises in less than a decade, and it can be claimed that the Iranian banking system structure has not experienced significant changes during this period. Then, Iran could be the right laboratory environment for discussing the effects of those two naturally different crises.

Considering the above discussions, this empirical study's main objective was to evaluate and compare the banks' reactions to first-time and regular crises. More specifically, the researchers aimed to see how Iranian banks reacted to an unprecedented shock in changing portfolios and whether the banks' reaction has been different in facing an unprecedented and an ordinary crisis. To do this, the researchers applied regression analysis to data collected from different Iranian databases. Worth noting that the banking system in Iran is a totally Sharia-compliant banking system that operates based on Islamic contracts. In fact, the Iranian banking system became a full fledge Islamic

banking system after the approval of Iranian Law for Usury Free Banking (ILUFB) in 1983 (a few years after the Iranian Great Revolution in 1979). Other banks worldwide are almost entirely interest-based or dual banking systems in some countries (in which both Islamic and conventional banks work side by side). In addition, the Iranian banking system allocates its resources through 14 different Islamic permissible contracts (*Uquds*), which can be classified into three primary categories: Fixed Rate of Return (FRR) or low-risk contracts, Rate of Return (VRR) or risky contracts, and *Qard al-Hasan* (no-interest rate) contracts. In this study, the researchers collected monthly data for these *Uquds* from 31 private and state-owned banks in Iran from 2010 to 2021, covering both crises. Then, the researchers defined two specific periods for currency crises based on the deviation of the market exchange rate from its path.

Moreover, this study is novel in the topic, data, and the Iranian case. The existing literature mostly focused on the economic impact of COVID-19, such as its impact on economic growth, supply shock, imposed costs, or deposit withdrawal rate across countries or sectors (Ludvigson et al., 2020, Baqaee and Farhi, 2020, McKibbin and Fernando, 2020). Only a few studies highlighted the impact of COVID-19 on investment decisions. Singh (2020), focusing on the outperformance of the ESG (Environmental, Social, and Governance) portfolio during COVID-19, stressed that this result could have come from the investors' tendency for safer investment strategies and corporate fundamentals. In focusing on the corporate-bond funds' major outflows during COVID-19, Falato et al. (2020) found outflows were more severe during COVID-19 than during GFC. However, this decision was more severe during COVID-19. Besides, in comparing investing in real estate investment trust and gold in Turkey during various crises, Sumer and Ozorhon (2020) revealed that the Turkish real estate investment trust (riskier) index performed better than gold prices in the 2018 Turkish currency crisis and 2020 COVID-19 crisis, but not in the 2008 GFC period. Against this background, the recent research about COVID-19 have neglected crisis impact on banks portfolios.

The study result indicates that predicted and unpredicted crises positively impact fixed-rate contracts. However, in facing a first-time crisis (Covid), investors are three times more interested in a less risky asset than in a recurrent crisis (currency crisis).

Then, the remainder of this paper is as follows. Section 2 presents a brief review of the literature from two aspects: the first is reviewing the existing literature about COVID-19 and the currency crisis to note their differences, and the second discusses Iran's banking system structures to see how they supplied their funds or finance the businesses. The applied methodology and data collection are in section 3. Then, section 4 describes the results, and the final section provides concluding remarks.

II. Literature Review

The literature section contains a brief review of two topics. At first, the researchers discussed the main differences between the currency and the COVID-19 crises and then briefly introduced the Iranian banking system and its applied contracts in practice.

2.1. Currency Crisis Vs. COVID-19 Crisis

The world economy has seen many crises over recent centuries. In recent decades, the global economy has experienced big crises, such as the currency crisis of Latin America (the 1980s), European (in 1992), Asian financial twin crises (both banking and currency crisis), GFC (in 2007-2008), and recently a deep economic crisis stemmed from COVID-19 epidemic (2019). However, the currency crisis is the most frequent in the global economy. A regular currency crisis is often associated with banking crises, known as twin crises (Glick and Hutchison, 2011; Eijffinger and Karataş, 2020). Laeven and Valencia (2020) reported 151 systemic banking crisis episodes around the globe during 1970-2017.

A currency or balance-of-payments crisis results from sharp currency depreciation, a large decline in international reserves, or a combination of the two, as stated by Kaminsky (1998). It may happen by a sudden and dramatic reversal in private capital flows. Hence, the conventional models of currency crises are often based on the capital outflows resulting from the difference between domestic and foreign interest rates under fixed exchange rate regimes (Krugman, 1979; Flood and Garber, 1984). The capital outflow may be ignited by war or sanctions when the country suffers from a long-term trade deficit. Capital outflow will also stimulate the shortage of foreign currency in the domestic market, specifically when the central banks' reserve of foreign currency is not enough to manage the domestic market. This condition incentivizes speculators to attack on foreign exchange markets. Currency depreciations then threatens the viability of domestic banks when their liabilities are in foreign currencies, increasing the probability of failing to meet their obligations at a promised exchange rate.

Unlike currency, the COVID-19 crisis differs to some extent (Krugman, 2020). COVID-19 crisis is alarming because it rapidly spreads inside the population, with a mortality rate as high as 5.7% of infected people (Baud et al., 2020), and there is still unknown treatment for it. In this regard, governments worldwide unanimously persist in policies to prevent its transmission. Social distancing, business closure, compulsory and voluntary leaves from work (with or without pay) and staying at home are common government policies to break the chain. However, limiting businesses and economic activities led to a sharp rise in the unemployment rate and a reduction in economic output through a drop in consumption and investment activities.

On the other hand, compulsory and voluntary leaves from work and business closure not only reduced the governments' tax revenues but also increased their direct payment to aid those suffering a sudden loss of income because of the economic lockdown. Then, the governments faced an intensification of the government budget deficits that caused a sharp rise in the debts. Government debt will stimulate the interest rates in the future, a further reduction in future investment, and a longing for the recession. Furthermore, because of lockdowns, business closure, and social distancing policy, the investment during COVID-19 was lower than before; meanwhile, the saving was higher due to a lower level of private consumption.

Some studies have believed that the impact of COVID-19 on the global economy was deeper, and its recovery period was longer than a currency crisis (Kituyi, 2020; Maliszewska et al., 2020). According to them, COVID-19 severely hurt both supply and demand sides of the economy (specifically for durable goods). Therefore, during the COVID-19 crisis, consumption was lower, and saving was higher. Meanwhile, in a currency crisis, money is hot, and demand for durable goods and assets is higher. In addition, the main difference between the COVID-19 pandemic and a regular currency crisis is that the former is an unprecedented crisis, while the latter is a regular one. Their difference in nature, in fact, causes agents' different reactions in facing each of them. While agents' problem in facing a known repeated crisis is managing the mostly known risks, their reaction in facing an unexpected crisis is more complex due to uncertainty. In fact, an uncertainty that is a key feature of a first-time event is not simple to measure its level as it varies by its base and the degree to which it experiences (Alpers, 2019). Oppositely, it is mostly possible to measure or guess risks with different degrees of probability in case of a repeated crisis. It means that a reduction in uncertainty originating from the spread of the virus pandemic involves plummeting the likelihood of unwelcome consequences and their effect on the businesses at different steps of the value chain (Figueira-de-Lemos and Hadjikhani, 2014; Sniazhko, 2019). Nonetheless, a currency crisis creates risks that well-known policies can manage, such as expanding international reserves, raising interest rates at the policymakers' level, or revising portfolios at the firms' level.

Further, the above discussion reveals that agents' decision-making process is expected to be different in facing a first-time crisis such as COVID-19 and a regular crisis such as a currency crisis (Magnani and Zucchella, 2019). Thus, the researchers attempted to address this issue in this study. To do this, the researchers focused on banks to address their reactions to each mentioned crisis on their asset combination. Here, considering the banking system as a representative of the financial system would not be an unreasonable assumption for several reasons. First, it is well known that bank is the most effective player in the economies, so their development would be an important factor for economic prosperity. The bank business model usually works by accepting deposits from economic agents with excess savings to invest them by making loans or directly investing in securities or government

bonds. Due to this role, banks play a leading role in economies and operate as an important player in allocating funds, shaping the economies, and even recovering the economies in all countries over the world (Beck, 2020). The second reason is the structure of the bank's business model. The structure of the bank's business model is such that it has made it sensitive to crisis (Fu et al., 2014; Cecchetti and Schoenholtz, 2020). It means that banks rapidly react to a crisis by changing their portfolio.

For this reason, it is highly expected that the banks play a strategic role in controlling the shock by providing the needed funds (Brei et al., 2020; Acharya and Steffen, 2020). In the case of Brazil, for instance, by predicting the central bank response policy to the currency crisis (rising interest rate), banks rearranged their portfolio from loans (riskier assets) to government bonds (less risky assets) to avoid the probable bankruptcy (Gruben and Welch, 2001). Therefore, by focusing on banks, the researchers addressed how they managed the uncertainty faced by COVID-19 and how their solution differed from the currency crisis.

The discussion, as mentioned earlier, also indicates that banks have both incentive and ability to make faster and deeper changes in their balance sheet in response to different crises. The central bank's policy response to any crisis will strengthen the banks' motivation, for example, considering the case when the central bank implemented an easy money policy to confront the COVID-19 turmoil. In such a case, the banking system will encounter an excess money supply during the pandemic. Hence, its logical response would probably be to reduce the interest rate to lower the risk of defaults, control mismatch problems and reduce the likelihood of insolvency. It means the banks must be more precautions in extending the loan to investment opportunities in this environment. Then, the loans are more probable to extend to lower-risk assets, such as FRR loans, bonds, or commission-based incomes. As a result, the expected weight of FRR assets will exceed the weight of VRR in facing a first-time crisis such as COVID-19 compared to a regular one.

Then, reviewing the existing literature revealed that many studies have focused on the effects of this turmoil on the banks. Some of them concentrated on depositors' withdrawal rates that have greatly increased due to the pandemic and its effect on market funding (Li et al., 2020; Wu and Olson, 2020; Barua and Barua, 2021; Ichsan et al., 2021). They mostly explained how banks managed the huge liquidity demands in the early periods of the COVID-19 crisis. They further discussed that bank liquidity and solvency problems were stronger before this crisis than before the GFC (2007), but both Federal Reserve and depositors' liquidity supply were injected in at the right time.

Many other studies, such as Elnahass et al. (2021), Feyen et al. (2021), Aldasoro et al. (2020), and Demirgüç-Kunt et al. (2020), emphasized comparing the impact of COVID-19 on Islamic and conventional banks and also on banks' performance (how a bank allocated its resources to reach the

goals) in developed and developing economies or during this pandemic and GFC (2007) period. They mostly found that, despite some minor differences in the impact of COVID-19 on various types of banks, this pandemic significantly enhanced all banks' stress and severely hurt their profitability, stock market valuations, and financial stability. Regarding to the bank balance sheet, Acharya and Steffen (2020) argued the potential stress that might be imposed on banks' balance sheet through firms' higher demand for money. Focusing on the 100 largest banks and firms' outstanding credit line and applying some indexes such as capital ratio, they concluded that the current amount of capitalization of the banking sector is enough to deal with liquidity stress.

Clearly, the existing literature has paid less attention to the banks' reaction to the pandemic through their decision on the combination of their assets. Therefore, the researchers addressed these issues in an empirical framework in this paper. The researchers will add to the existing growing body of literature on the COVID-19 pandemic by discussing the banks' response to this pandemic by focusing on the banking asset combination of risky and risk-free assets. Moreover, by emphasizing the Iranian banking system (as a full fledge Islamic banking system) in response to the COVID-19 shock, the researchers contribute to the Islamic banking literature by conducting an empirical study. Finally, considering the COVID-19 crisis as an unprecedented one that generates an uncertain condition for economic agents, the researchers add to the agents' decisions making process in an uncertain condition and how it differs from a risky situation.

2.2. Iran's Banking System

Iranian financial system is dominated by banks and financial and credit institutions; hence, banks and credit institutions have a crucial role in supplying funds and financing the real economy. According to ILUFB, Iran's financial institutions must use Islamic contracts for both the supply of funds (financing) and demanding deposits (borrowing) (Iran, 1983). It means the financial institutions in Iran must operate only based on permissible contracts introduced by ILUFB, and conventional banking or financial services are illegal. According to ILUFB, 12 contracts, including Musharakah[4], Mudarabah[5], Legal Partnership, Forward Transaction (*Salam* or advance payment sale), *Salaf*[6], *Musaqat*[7], *Ijarah*[8], *Jualah*[9], Instalment Sales, Debt Purchase, Direct Investment, and *Qard al-hasan*[10], are permissible in Iran's banking system.

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[4] *Musharakah* is a partnership structure in Islamic finance in which partners share in the profits and losses of a business.
[5] *Mudarabah* is a special kind of *Musharakah* where one partner provides total required money for a business.
[6] *Salaf* is similar to futures, with the difference being that the contract's total price is paid in advance.
[7] Financer in this contract may provide an orchard to a farmer for a period for a share of the profit.
[8] It means leasing or hiring *Ijarah* in Islamic banking.
[9] One party in this contract purchases another party's services for a specified commission.
[10] *Qard al-Hasan* is an interest-free loan or benevolent economic behavior.

Moreover, a look at the set of acceptable contracts reveals that they are three different types: (1) VRR or participation contracts, such as *Musharakah, Mudarabah, Musaqat* and Legal Partnership, whose rate of return depends on market conditions, (2) FRR contracts, such as installment sales, *Ijarah, Jualah,* and *Salam* that their rate of returns are determined exogenously, and (3) NIR or *Qard al-hasan,* a zero-interest rate contract. According to the data published regularly by the Central Bank of Iran (CBI), on average, about 5% of outstanding facilities extended by banks and credit institutions in the Iranian banking system to the non-public sector (supply of funds) are NIR and using *Qard al-hasan* contract. In addition, the most important part of funds in the Iranian banking system (about 65%) is FRR financing/contracts. The higher share of FRR may be due to asymmetric information problems in partnership contracts and banks' preferences for FRR contracts. Lastly, about 30% of the total supply funds of the Iranian banking system are VRR assets, which are based on participation contracts. These shares are, on average, of the long run and may dramatically change in different years.

Furthermore, the Iranian economy has experienced both currency and COVID-19 crises over recent decades. The currency crisis opened with a jump in the market exchange rate and ended with a sharp decline in this rate, while the COVID-19 crisis started with a formal announcement by the Iranian Ministry of Health and Medical Education (MoHME) and still is in the run. On February 19th, 2020, MoHME reported the first confirmed cases of COVID-19 infection in Iran. Iran started the policies such as deploying all points of arrival, including maritime, land, and air, to control all arrival persons, providing the necessary protocol, preparing emergency hospitals and beds, and implementing a social distancing plan. These policies have been implemented in an environment where US sanctions are effective too. To fight the coronavirus over the period of the outbreak, besides allocating 20% of the state budget for the year 2020 (about $10 billion), the government decided to support the businesses by no-interest payment financing and deferred installments for three months, payment into a form of *Qard al-Hasan* to anybody who applies, and others.

All the aforementioned policies affect the banks' behavior on both asset and liability sides. However, to date, no study discussed the reaction of the banking system to COVID-19, except Samadi et al. (2021), who studied the co-movement of the different asset prices, such as gold, oil, exchange rate, and the stock market, from September 2014 to June 2020 covering both sanction and the COVID-19 period. They found that the oil price had a low co-movement with the other markets.

III. Methodology

Generally, a bank must determine its optimal portfolio (according to assets' risk and return) in facing uncertainties that originate from different economic states. Markowitz (1952) showed that diversification of assets (with different risks and returns) in constructing a portfolio improves the expected return of

the portfolio with a certain level of risk or reduces the portfolio's risk for a certain level of return. It means a bank can construct a portfolio of FRR and VRR contracts (diversify its portfolio by different contracts) to take a higher return for a given risk. When the funds are efficiently allocated to selected assets, there will be a positive relationship between the supply of funds and each contract rate of return. Then, if the bank faces with different crisis (shock) that changes the economic risks, it must construct a portfolio of assets that minimizes risks for a given overall return. The bank can then manage risks by changing the weight of FRR and VRR contracts in the constructed portfolio.

In reality, there are many contracts (bank products) with different risks and returns. Banks use a maximizing return function with a given risk constraint, considering w_i as the weight of contract i={FFR, VRR, QR} in the portfolio (or the supply of fund under the i contract), r_i is the return of the ith contract, and δ_R^2 and $E(r)$ represent the variance of the portfolio and its expected mean, respectively. The objective function is maximizing the portfolio's expected return $E(r)=\sum w_i r_i$, subject to a certain level of risks for the portfolio (σ_i^2). In other words, each product should be allocated so that for a given return, the risk must be minimized. Solving the minimizing problem will give the weight of products in the following Equation (1).

$$w_i=f(\delta_i^2, r_i, \delta_{ij}) \qquad (1)$$

Equation (1) shows that the weight of contracts in the optimal portfolio depends on the contract rate of return, its variance σ_i^2 and its covariance σ_{ij} with another contract (j). It means the weight of contract changes by its associated risks and the systematic risks. Moreover, this weight varies by the magnitude of the risks. In other words, any endogenous or exogenous factor, such as rapid and unpredictable changes in the foreign exchange market or COVID-19-related economic crisis, may change the weight of assets in the investors' optimal portfolio through the change in the assets' risk.

As Iran experienced both crises over the last two decades, it would be a proper case to see how each crisis, with different nature, has impacted the banks' optimal portfolio composition. In this study, for the sake of simplicity, the researchers defined *Musharakah, Mudarabah,* Legal Partnership, and Direct Investment as VRR, Forward Transaction (*Salam, Salaf*), *Ijarah, Ju'alah,* Instalment Sales, and Debt Purchase as FRR, and *Qard al-Hasan* as no interest rate (NIR).

To see the bank's reaction (in their portfolio combination) to facing a different crisis, the researchers considered the following specification.

$$FV_t=f(RFIXEDC_t, REXPEC_t, DUMEXCH_t, DUMCOVID_t, FV_{t-1}) \qquad (2)$$

Equation (4) implies the simple linear functional formulation of the model.

$$FV_t = \beta_0 + \beta_1 RFIXEDC_t + \beta_2 REXPEC_t + \beta_3 DUMEXCH_t + \beta_4 DUMCOVID_t + FV_{t-1} + \varepsilon_{it} \qquad (3)$$

In Equations 3 and 4, FV is a ratio that measures the banks' reaction by changing the value of FRR and VRR contracts ($FV_t = \frac{\text{value of } FRR_t}{\text{value of } VRR_t}$) in their portfolio. The higher the ratio, the higher the weight of FRR in banks' portfolios and banks' tendency to avoid the risks.

Equation 4 states that FV changes by the change in the nominal profit rate of FRR contract (RFIXEDC), the nominal profit rate of VRR contract (REXPEC), and the lagged dependent variables (FV_{t-1}). Including FV_{t-1} as an explanatory variable in the model demonstrates that the current shares of contracts are heavily determined by their past levels. The justification is that the structure of the banks is not so flexible that it completely changes the past behavior in one month. Then, the researchers included a dummy for Covid (DUMCOVID) and another for currency shock (DUMEXCH) to examine their effects on the FV separately. Dummies are 1 when shock happens and 0 otherwise.

3.1. Data

This study used monthly data on funds supplied by contracts (14 contracts) and the exchange rate. The data for money supplied under different contracts were obtained from the CBI database. It covered the period from January 2010 to June 2021.

Regarding the exchange market, due to sharp depreciation since 2011, a multiple-tier exchange rate regime was in place, including the open market rate (SANA), the official exchange rate (or reference rate applied by the government to import essential goods or holding bank accounts), and the NIMA (the integrated forex deals system) rate[11]. The researchers also employed the SANA rate regularly published by the TGJU.ORG website. It is an appropriate rate because it quickly reflects market developments. Then, the researchers used the monthly consumer price index published by Statistical Center for Iran as a proxy for the inflation rate. For the interest rate, the researchers obtained the data from the CBI database. In this case, CBI does not use the benchmark interest rate but sets the bank profit rates for lending/borrowing. In the case of the VRR contract, CBI determines a minimum level of profit rate for bank investment (loans) and a maximum level for accepting deposits. All these rates are often determined one time in a year. It means there is no monthly series for the bank profit rate. Hence, the researchers divided them into 12 (where they needed them) to produce monthly series. Although the monthly rate would be constant throughout a year, it would differ between years.

[11] It is a rate obtained from a market (developed by CBI since 2018), where exporting companies sell their export earnings to fund imports.

IV. Results and Analysis

4.1. Determining the Currency Crisis Periods

A currency crisis often occurs when a domestic currency depreciates through speculative attacks on the foreign exchange market. This pressure on the foreign exchange market could be measured by a conventional index called exchange market pressure indexes (EMPI). The concept of EMPI, originally developed by Girton and Roper (1977), is based on a weighted average of three components: (1) reduction in foreign reserves, (2) depreciation of local currency to capture foreign exchange market pressure, and (3) difference in domestic and foreign interest rate.

$$EMPI = w1\left(\frac{\Delta E_t}{E_t}\right) + w2\left(\frac{\Delta i_t}{i_t}\right) - w3\left(\frac{\Delta F_t}{F_t}\right) \qquad (4)$$

In Equation (2), E_t stands for the real exchange rate, w is the weights, i_t is the nominal interest rate, and F_t is the level of central bank foreign reserves. This index, a predictor for a currency crisis, states that it will probably occur when an economy with lower foreign reserves suffers from higher inflation and lower interest rates. However, this index is not applicable for this study because the Iranian economy is almost closed due to the widespread financial and economic sanctions. As sanctions have severely restricted capital flows, the impact of interest rate differences on the exchange market is nearly zero. Moreover, CBI did not publish the data for its foreign reserves. Consequently, due to the lack of data and ineffectiveness of interest rate in the foreign exchange market, two components of $EMPI$ were removed, and the index summarized the exchange rate variation ($\frac{\Delta Et}{Et}$).

According to the above discussion, the researchers detected the currency crisis episodes in Iran. Based on this study's definition, the researchers determined a period as a currency crisis episode, when the exchange rate has experienced at least one year or, more specifically, a 12-month continuous positive growth. Further explanation is that the researchers focused on the periods as currency crisis episodes when the exchange rate has continuously experienced more than zero growth in the whole period until this trend stopped and the exchange rate recorded zero or negative growth. In addition, worth noting that the researchers could use other methods to detect the windows, such as the exact date of the start of the sanction, the timing of the government's decision to intervene in the foreign exchange market, and others. Yet, the strong point of focusing on exchange rate developments instead of the method is that it is simpler to detect the periods. It is because the exchange rate is the outcome of all events and decisions (either with a positive or negative impact on the exchange rate). In other words, this technique offers more specific windows (a more accurate start and end time of crisis). Then, the researchers came up with the windows through trial and error. Applying this technique led the researchers to three distinct episodes from January 2010 to June 2021. Table 1 presents these periods.

Table 1. Currency Crisis Episodes Over 138 Months Ending in June 2021

Periods	Length/ month	Change in average monthly US$ price (Rial)		Total depreciation (%)
		1st month	Last month	
Jan 2011-March 2012	15	10,800	18,930	75.3
Jul 2017-Oct 2018	16	37,780	151,230	300.3
Oct 2019-Oct 2020	13	114,310	298,870	161.4

Table 1 shows that the exchange rate experienced successive positive growth in three distinct periods (January 2012-March 2012, July 2017-October 2018, and October 2019-October 2020). In all three episodes, imposing new sanctions or tightening the existing sanctions (mostly by the US) stimulated speculative attacks in the foreign exchange market. The first episode started by imposing a sanction on Iran from the first month of 2011 to the third month of 2012. The second window began a few months later (in 2017) when President Trump took office and imposed a rigorous and wide range of sanctions on the Iranian Central Bank, oil sales, metal, businessmen, and trade. These sanctions negatively impacted the Iranian currency. However, after 16 months, the Iranian exchange market experienced a stable condition at a new exchange rate level. Finally, the last episode started in October 2019 due to the rising tensions between Iran and the US. The third wave lasted for 13 months. Then, Table 2 displays the magnitude of the speculative attack on the domestic currency depreciation for each period.

Table 2. Average Growth of Exchange Rate in Currency Crisis Episodes and Non-Crisis Period

Periods	Number of months	Exchange rate average monthly growth (%)
Non-crisis period	132	0.41
Jan 2011-March 2012	15	4.08
Jul 2017-Oct 2018	16	9.50
Oct 2019-Oct 2020	13	7.88

As it is clear from Table 2, the average monthly growth of the exchange rate was 0.41 in the non-crisis period and 4.08, 9.5, and 7.88 for the first, second, and third crisis periods, respectively. It indicates that the average monthly growth of the exchange rate was at least ten times (in comparison with the first crisis) and at most 23 times (in comparison with the second episodes) more than the non-crisis period (0.41).

4.2. Determining the COVID-19 Crisis Episode

The COVID-19 crisis started in October 2019 when the Iranian Ministry of Health and Medical Education reported the first confirmed cases of COVID-19 infection in Iran. Then, it has become a serious problem since February 2020 and still is in effect. Hence, the researchers defined a specific 17-months period for pandemic crisis (February 2020– June 2021), with an eight-month

overlap (February 2020 to October 2020) by the third wave of the currency crisis.

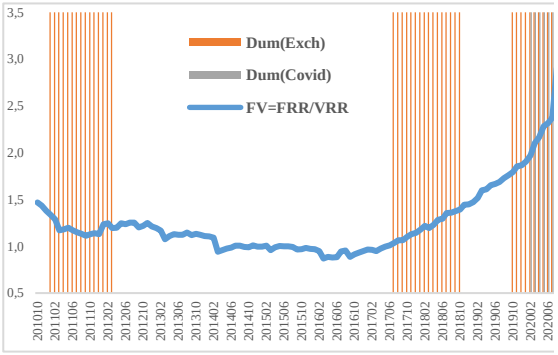
4.3. Evolution of the Iranian Banking System's Assets During the Crisis

After determining the crisis periods, the researchers examined the impact of three currency shocks, apart from COVID-19 shocks, on the weight of FV and NIR contracts in the banks' portfolios. In this regard, the researchers calculated the ratio of total funds supplied by using any of the contracts to the total fund supplied by all banks (weight) during each crisis. Figure 1 depicts the evolution of FV and zero rate assets' share in the portfolio of the Iranian banking system from January 2010 to June 2021.

Figure 1.a illustrates how banks replaced VRR with FRR in crises. In this graph, the left column indicates the values of FV, while the column graph displays the crisis episodes. As the graph shows, FV behaved differently facing a crisis, specifically in 2011 and 2020-2021. By occurring the currency crisis, the value of FV was reduced but raised during the COVID-19 crisis. It means the value of FV tends to increase during a crisis. The important point about the third currency crisis and COVID-19 is that while the Iranian financial market was still suffering from the consequences of the currency crisis (due to the US successive sanctions), the impact of COVID-19 intensified the tendency for most of the period. In addition, overall, banks preferred the FRR contracts during the COVID-19 crisis, while they were less interested in using them during the currency crisis.

As the nature of NIR differs from others, the researchers revealed its changes in Figure 1.b. In this Figure, the weight of NIR was displayed on the right vertical line, while the column graph demonstrated the crisis episodes. As the Figure shows, the contracts' weight experienced a dramatic monthly change over the past 138 months. However, the graph clearly shows that the share of zero rate contracts in the bank's portfolio increased in times of crisis.

1.a. Evolution of FV During Currency & COVID-19 Crisis



1.b. Evolution of NIR During Currency & COVID-19 Crisis

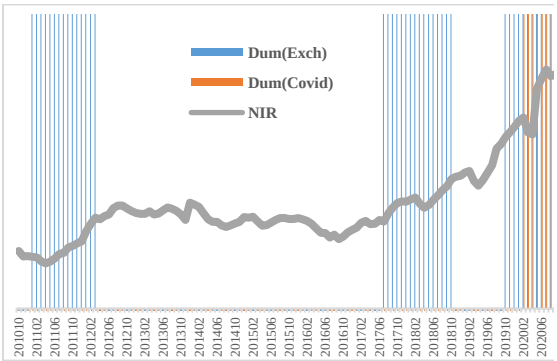


Figure 1. Impact of the Currency and COVID-19 Crisis on FV and NIR Contracts in Iranian Banks' Portfolio

Source: Central Bank of The Islamic Republik of Iran (2021) and TGJU (2021)

In addition to the graph, the researchers compared the weight of the mentioned contract in the portfolio in each period using statistical methods.

4.4. Estimation

In estimating Equation 3, two points should be considered. First, due to the including a dependent lagged variable as an explanatory variable in the mode, Ordinary Least Square (OLS) method would produce a biased and inconsistent estimation (Rois et al., 2012). Second, the ADF unit root test12 results, which is a necessary condition for avoiding spurious estimation, developed by Dickey and Fuller (1979), revealed that only one variable was stationary (Table 3).

Table 3. Unit-root Estimation

Variables	t-Statistic (Prob.)	
	Level	1st difference
FV	-1.18 (0.68)	-4.35 (0.00)***
RFIXEDC	-1.4 (0.58)	-13.15 (0.00)***
INF	-3.46 (0.01)***	
DUMCOVID		-13.15 (0.00)***
DUMEXCH		-13.1 (0.00)***

Figures in parenthesis are p-values.
***indicates significance at a 1% level.

Table 4. Empirical Results of the ARDL Model

Dependent Variable	*FV*	
Independent Variables	*Coefficients*	*Prob.*
Intercept	0.02035	0.7024
FV_{-1}	0.930935***	0.0000
INF_{-3}	0.010397**	0.0418
RFIXEDC	0.020276	0.4076
DUMCOVID	0.132223***	0.0000
DUMEXCH	0.033018***	0.0102
Number of observations = 127		
Breusch-Godfrey Test for FV	F statistic = 1.9 (0.15)	
Normality test Jarque and Bera (JB)	JB = 911 (0.00)***	
Heteroskedasticity Test (ARCH)	F = 0.03 (0.86)	
Ramsey RESET Test	F = 5.8 (0.017)***	

Note *, **, and *** stand for coefficients' significance at 10%, 5%, and 1%, respectively. The numbers in parenthesis are the p-value.

[12] The test includes intercept but not trend.

As Table 3 displays, INF was stationary at the level, but the rest were stationary at 1st difference. It denotes that the model contained stationary I(0) and non-stationary I(1) variables. Along with including lagged variables in the model, this feature made Autoregressive Distributed Lag (ARDL) approach an appropriate technique (Greene, 2008). Then, Table 4 presents the estimation results of the ARDL approach for FV.

Since both RFIXEDC and maximum REXPEC are determined by Iranian policymakers and are almost close to each other, INF has been considered a proxy for REXPEC. It is assumed, by this proxy, that, expecting higher inflation in the future, the bank preferred the VRR contract to get a higher return by sharing in the higher level of oncoming profit or the increase in asset value[13].

Then, as the Durbin Watson test was inconclusive for first-order correlation, the Breusch-Godfrey test was employed to ensure that this study's model did not suffer autocorrelation. The results are presented in the third row of Table 5. As the table shows, the P-value was 0.15 (greater than 5%), and the null hypothesis stating autocorrelation between series was rejected. In the case of normality, the researchers used Jarque and Bera's (1980) statistics. As it appears from the 4th row of the table, P-value was zero. It means the null hypothesis that the data were normally distributed was rejected. However, it is said that autocorrelation is more important than normality assumption. Furthermore, the ARCH statistic rejected the heteroscedasticity of the residuals (5th row of the table), the CUSUM test confirmed no structural problem in the models, and coefficients were stable at a 95% significant level (Figure 2).

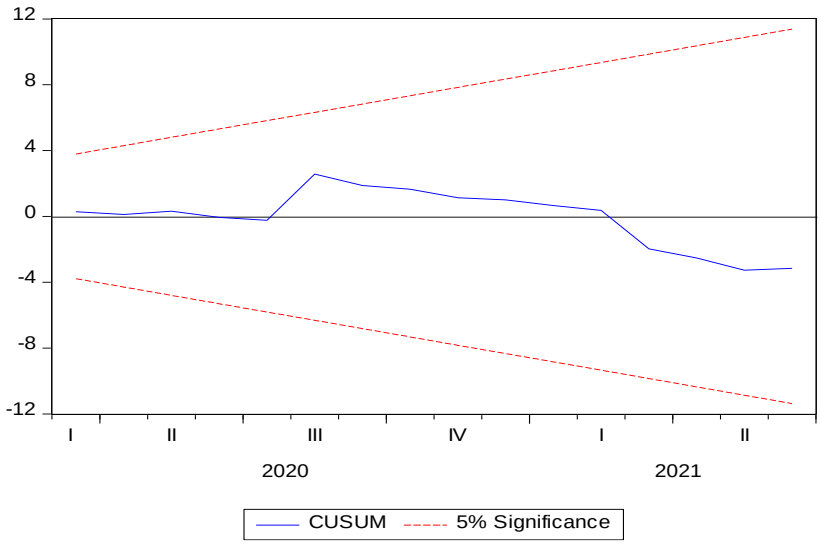


Figure 2. Plots of Cumulative Sum of Recursive Residuals

[13] According to both of HQ and AIC criteria, the appropriate lag order is 3 for INF, for FV and 0 for rest.

After ensuring the goodness of the model, the researchers interpreted the coefficients. As Table 5 shows, the coefficients of the dummies for both shocks were significant at a 99% level[14], and their sign aligned with the researchers' expectations. Furthermore, the profit rate of the FRR contract was as expected, although it was not significant. However, the sign of INF was against the researchers' expectations and statistically significant. In addition, the rest of the coefficients had corrected signs statistically significant. Therefore, according to these findings, in line the researchers expected, both crises significantly and positively impacted FV. The interpretation is that, in the face of crises, Iranian banks invested more resources in less risky contracts.

To ensure that the impact of COVID-19 differs from the currency crisis, the researchers applied the Wald equality test (Table 5).

Table 5. Empirical results of Wald test

$\beta_{Covid} = \beta_{Exch}$	F (1, 129) = 7.746047	(P-value= 0.0062)
$\beta_{Covid} = 4\beta_{Exch}$	F (1, 129) = 5.47E-06	(P-value= 0.9981)

As Table 5 displays, the equality test for two crises in the FV model rejected the equality of two dummies coefficients (COVID-19 and currency shocks). However, the null hypothesis stating the coefficient of COVID-19 (β_{Covid}) is about three times greater than the coefficient of currency shock (β_{Exch}), was not rejected. Then, the researchers may say that, in facing the first-time crisis, investors were more interested in a less risky asset than in facing a recurrent crisis.

Furthermore, *good results* are that the Iranian banks have invested more of their resources on less risky assets facing both predicted and unprecedented crises. However, in facing an unprecedented crisis, they allocated more funds to a less risky asset than when they faced a recurrent crisis.

4.5. Discussion

The differences in the nature of the crisis (either an unprecedented one such as COVID-19 or a regular one such as a currency crisis) have caused a different response from the investors. The different response was due to the complexity of the condition caused by the existence of uncertainty. In other words, investing is riskier in an unknown condition. In these circumstances, the investor must logically manage the risks by outweighing the less risky asset in his portfolio. In line with this logic and with Magnani and Zucchella (2019) and Gruben and Welch (2001), this empirical study verified that the banking system, as the most important investor in an economic system, invested much of its resources in low-risk but fixed return assets.

4.6. Implications

Based on what has been said, banks can respond faster to different crises. Policymakers may use the bank response as a leading index and apply a policy proportionate to the type of crisis. In confronting an unprecedented crisis, for

[14] The researchers also used a dummy variable for slopes, but the results were not significant.

instance, a policy maker must apply an easier monetary policy (compared to other crises) to reduce the interest rate. A reduction in the interest rate will decrease the investment cost and raise the expected return. In other words, an easier monetary policy will reduce the risk for every income unit by increasing the expected return. As a result, investors will be encouraged to invest in a greater range of assets that causes a reduction in the risk of defaults, controls mismatch problems and reduces the likelihood of insolvency.

V. Conclusion and Recommendation

5.1. Conclusion

The COVID-19 pandemic, which affects both the supply and demand side of the economy, has generated the deepest economic slump in nearly a century. It is inherently different from the currency crisis as the most frequent conventional crisis. As it was a first-time shock, it created much uncertainty in the economy. Therefore, the depth and extent of the crises' impact on the banking system as a key player in the global financial market should be very different. However, the research on COVID-19 has not yet addressed these issues. As the banking system normally shows different reactions to different crises for survival, this study addresses the banks' asset side reactions to COVID-19 and currency crises for the Iranian banking system. In this respect, the Iranian banking system has suffered both first-time and predicted crises in the recent decade.

The empirical results have verified that the currency and COVID-19 crises had a statistically significant impact on banks' assets. In both crises, the banks increased their portfolio's share of FRR and NIR. It means the banks avoided risky investment and VRR contracts, specifically when they faced uncertain conditions. This empirical finding also confirms that the FRR share increase during the COVID-19 crisis was greater than the currency crisis. It is consistent with the findings of Barua and Barua (2021) and Falato, Goldstein and Hortaçsu (2020), which found that the investment funds outweighed their less risky asset. It indicates that uncertainty intensified the banks' risk avoidance behavior.

Moreover, the COVID-19 crisis has shown that the global economic structure is so fragile that any small shock, even a virus, could fuel a major global economic crisis. Thus, policymakers must encourage banks and other financial institutions to supply more funds under VRR contracts as this type of contract can be an instrument in preventing the crisis or faster recovering them (Abdul-Rahman and Gholami, 2020). In addition, banks may play an entrepreneurial role (Abdul-Rahman et al. 2014) by offering equity-based financing products (Abdul-Rahman et al. 2019 and Abdul-Rahman et al. 2020) in helping the government and businesses to survive the COVID-19 crisis.

5.2. Recommendation

One of the limitations of this empirical research is that data gathered were constrained to some specific period as the researchers could not gather a longer data set. Moreover, the monthly data for interest or asset profit rates were unavailable, preventing the researchers from exploring the role of risk-adjusted return in the banks' behavior. Hence, future studies may consider the role of this variable in their model.

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