Macro-prudential policies and financial cycle in Iran

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Abstract:
Financial markets are channels for attracting surplus financial resources and allocating them to investment. Macro-prudential policy needs to consider financial cycle in order to assess the state of the financial sector, predict its developments and justify the need for specific policy tools. we examined the effect of macro-prudential policies on financial cycle of Iran's economy Over the period 2008-2018 using Unobserved Components Structural Time Series Model. We explored the effect of macro-prudential policy index and other variables on the financial cycle. The findings of this study, using the Generalized method of moments (GMM) for the time series data, suggested that the macro-prudential policy index has a negative and significant effect on the financial cycle in the Iranian economy. Also, the probability(likelihood) of a banking crisis, the interbank market loan rate and the economic growth index have positive and significant effect on the financial cycle.

1. Introduction

The financial system including financial institutions has been regulated because of the key role in the economy. Developments in the early decades of the twentieth century and the financial crisis of the 1930s led to a systemic approach to financial regulation. Therefore, the role of the central bank and other regulatory institutions in financial markets have got more dimensions and new regulations were proposed for the financial markets.

The global financial crisis of 2007-2009 revealed that imbalances has formed in the previous periods, while inflation and national production seemed to be stable. These imbalances resulted from financial institutions with excessive leverage, high household debt and maturity mismatch in the banking system. The recession in the aftermath of the global financial crisis indicated the negative and significant impact of financial instability on the economy. (Blanchard et al., 2014).

Freixas et al. (2015) consider the global financial crisis as a systemic risk that has been formed endogenously over time. In their view, the main features of systemic risk are its internal formation in the financial system, its threat to the financial system, and its potentially large negative effects on the real sector of the economy. Accordingly, in the global financial crisis, the banking system involved in a high level of risk that the time financial regulations could not control it. In fact, the regulatory approach of the financial sector before the global financial crisis was largely a micro-prudential approach and related to the risk of financial institution level.

The main indicators of systemic risk include: asset price bubble, excessive risk taking and credit boom. Recent empirical literature has identified credit growth and asset price growth as a predictor of financial crises. (Akinci and Rumsey, 2015).

While the financial crisis indicated that there is a strong interaction between financial market developments and the real sector, academics and policymakers begun to identify shortcomings in the financial sector. (Claessens, 2014)

Micro-prudential measures take financial institutions into account separately to ensure that each financial institution is solvent individually. The micro-oriented approach resulted in moral hazard. Because expecting the government to do "financial bail out" motivates lenders and credit institutions to engage in more risky activities. However, if we deal with the moral hazard at the individual level and consider only the financial institution that does not suffer, this does not mean that the financial system as a whole is stable. This is because the interconnection of banks and other financial institutions through the spread of "financial externalities" and through fluctuations in asset prices or strategic engagement can put everyone at risk. (De Nicolò et al., 2012)

The interconnection is why the policies in the financial system were not enough to counter the formation of systemic risk[1] and macro-prudential policies were needed. As a result, macro-prudential policies have been increasingly used since the global financial crisis of 2007-2009.

 However, the basic logic for using macro-prudential policies is not only to prevent systemic risk, but also a response to market failures such as externalities that constitute systemic risk (Claessens, 2014). In fact, different types of externalities justify macro-prudential policies.

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[1] Freixas, Laeven and peydro, 2015, Claessens, 2014, Blanchard, Dell' Ariccia and Mauro, De Nicolo, Favara and Ratnovski, 2012.

Accordingly, the main question of the paper is how macro-prudential policy affects the financial cycle in the Iranian economy? Thus, the article is organized as follows. Following the introduction, the second section is devoted to the theoretical background. In the third section, literature review is presented. The fourth section is dedicated to model estimation, testing, and interpretation of the results. Finally, the paper concludes with some remarks.

2. Theoretical Background

Macro-prudential policy is defined as the use of prudential tools to limit systemic risk. (IMF, 2011).

The key element in the definition of macro-prudential policy is the concept of systemic risk, ie the risk of widespread disruption in the provision of financial services emerged in all or parts of the financial system and may have serious negative consequences for the real sector (IMF, 2013b). A key in this definition is the concept of negative externalities resulting from a disruption or failure in a financial institution, financial market, or financial instrument.

Systemic risk is generally identified by two dimensions: first, the vulnerabilities associated with risk formation over time (time dimension). Second, the vulnerabilities caused by interconnection and risk contagion within the financial system at any time. (Structural dimension) In addressing these vulnerabilities, the direction of macro-prudential policy is complementary to prudential focus on the soundness of individual financial institutions (CGFS, 2010).

The objective of macro-prudential policies is to reduce systemic risks and ultimately reducing the recurrence and severity of financial crises. Macro-prudential policy pursues the following intermediate objectives: (IMF, 2013b)

1- Increasing the resilience of the financial system against shocks by creating and releasing reserves that help maintain and enable the financial system to function effectively - even in the unfavorable conditions.

2- It leads to preventing and controlling the formation of systemic vulnerabilities over time by reducing pro-cyclical feedback between asset prices and credit and controlling the unstable increase in leverage, debt shocks and unsustainable financing.

3. Controlling the structural vulnerabilities within the financial system that result from interconnections, being exposed to the common shock, and the vital role of each financial intermediary in key markets that can make each institution too big to fail.

To control the risks in the financial system, since the banks provide loan and credit, macro-prudential policy typically contain the banking system. However, with the expansion of capital market activity and market-based financing, policymakers must be able to monitor the systemic risks of activities outside the

banking system, as well as develop policy responses to control those risks. (IMF, 2013b).

In fact, macro-prudential policy is the interaction of a range of policies that affect systemic risk. These include prudential micro-regulations and regulatory measures, crisis management and resolution, as well as fiscal and monetary policies. Macro-prudential policies strengthen the defense of the financial system against financial and economic shocks and contribute to stable supply of credit and other financial services in unfavorable economic conditions. By creating and releasing buffers when needed, macro-prudential policies can help reduce the recurrence of financial crises or moderate the sharp contraction in production associated with them. Macro-prudential policy instruments include:

1. Capital-base instruments, such as: statutory reserve, counter-cyclical capital reserve and cap on variable leverage ratio over time.

2. Asset side instruments/limiting loan provision, such as LTV, DSTI and LTI.

3. Liquidity-related instruments.

Of course, macro-prudential policy tools can be classified in a variety of ways. One classification divides macro-prudential policies into five categories. First, quantitative restrictions on borrowers, tools, or activities. Second, the capital or reserve requirement. Third, other quantitative restrictions on the balance sheet of financial institutions. Fourth, levy taxes or duties on activities or the composition of the balance sheet. Fifth, other accounting measures, changes in compensation, and so on. The first four categories are for controlling changes over time, institutions, or situations, while the fifth category includes structural measures.

Apart from the first category of policies in which the purpose is to control the demand for financing, the rest affects the supply of financing. The central bank implements macro-prudential policy. At the heart of this policy is prudential regulations and regulatory arrangements. Countries usually consider two intermediate goals: first, to increase the resilience of the financial system. Second, limit the financial prosperity. The intermediate objectives of macro-prudential policies are to achieve the ultimate goal of financial stability.

The global financial crisis indicated that the economic policies implemented are not enough to maintain financial stability. Macro-prudential policy filled this gap for economic policy instruments. Financial stability ensures to achieve sustainable growth and to avoid growth instability.

In economic theory, there are two shortcomings that create a realm for macro-prudential policy intervention. First, theoretical literature on "pecuniary externalities" justifies macro-prudential intervention. Second, aggregate demand externalities provides another reason for macro-prudential policies. Borrowers who have not been able to internalize the adverse macroeconomic consequences of over-borrowing on aggregate demand. This kind of "aggregate demand" externalities creates the need for macro-prudential policy intervention. As noted, macro-prudential policy seeks to prevent and reduce systemic risk, which

includes strengthening the resilience of the financial system and smoothing out the financial cycle in order to provide financial services to the real sector effectively.

For the implementation of macro-prudential policy, there are typically four aspects:

First, macro-prudential policy need to be proactive and strongly counter-cyclical. Risk identification is the early step, driven by early warning indicators and forecasting models for potential resources of systemic risk. Then macro-prudential policy requires smoothing the financial cycle.

Second, Macro-prudential policy is based on the concept of financial cycle in order to assess the state of the economy, anticipate its developments, and calibrate the application of macro-prudential tools. Thus, the concept of the financial cycle is crucial for the logic of macro-prudential policy and justifies the need for specific policy tools such as counter-cyclical capital.

Third, Macro-prudential policy is complementary to monetary policy. Both policies are managed by the central bank. Macro-prudential policy, need to be designed specifically for each country's economic conditions.

Fourth, Macro-prudential policy needs to go beyond the banking industry and includes market-based institutions and financing products. With the expansion of institutions and products, lending to the real sector and the role of non-banking financial institutions become more systematically important. In this case, if the restrictions only apply to banks, non-bank financial institutions can neutralize it. Therefore, the coverage of macro-prudential policies should be expanded to include "shadow banking".

Macro-prudential policies are now part of the policy tools in emerging markets and developed countries. The logic behind these policies stems from externalities and market failures of financial intermediaries and markets which give rise to successive pro-cyclical and systemic risk, and lead to financial crises. cyclical movement and systemic risk may stem from many factors, including the shock of economic fundamentals (such as commodity price shocks) and the flaws in monetary policy and micro-prudential regulations. Even if we can alleviate the business and financial cycles or discipline large financial institutions, externalities and other market failures justify macro-prudential policies.

3. Literature Review

Studies on the relationship between macro-prudential policy and the financial cycle are divided into two categories. The first category includes country studies that examine the relationship between macro-prudential policy and credit growth and other financial indicators. Lim et al. (2011) examined the relationship between macro-prudential policy and the developments in the credit cycle and leverage. They found evidence that policies such as limiting Loan to value (LTV)

and debt to income (DTI), the ceiling on credit growth and reserve requirement (RR), and dynamic provisioning rules are associated with lowering credit pro-cyclicality and leverage. IMF (2013) in a country study examined how policy changes effect on financial vulnerability (credit growth, portfolio capital flows and housing prices) and the real sector (product growth and credit allocation between economic sectors). The study concluded that the requirements for capital increase and reserve requirement have a significant negative relationship with credit growth. LTV restrictions and capital requirement are also strongly correlated with containing housing value increases. In addition, reserve requirement is correlated with declining portfolio inflows in the emerging markets that have floating exchange rates.

The second category focuses on the relationship between macro-prudential policies and crisis risk in the financial cycle. Dell'Ariccia et al. (2012) found that macro-prudential policies can reduce the likelihood of a credit boom and that the boom ends inappropriately (and create a financial crisis). They also concluded that macro-prudential policies reduce the risk of recession and at the same time reduce the risk of being affected by the financial sector.

Goudard et al. (2015) provided an institutionalized reading of macro-prudential policy. They argue that a consequence of the global financial crisis is the demand for new policy tool to be added to monetary, fiscal, and exchange rate instruments. In particular, more effective ways are needed to monitor the financial system and prevent imbalances that affect the real sector. A prudential policy can help maintain financial stability.

Agur and Demertzis (2015) examined whether macro-prudential policy counteract monetary policy effects on financial stability? They modeled the effect of policy tools such as leverage ratio on granting credit and a change in the monetary policy rate by the central bank. They indicated that even if there are macro-prudential regulations, monetary policy affects financial stability.

Gadanecz and Jayaram (2016) evaluated the framework, tools, and indicators of macro-prudential Policy. They concluded that evaluating the effectiveness of policies implemented in the global financial crisis has three key lessons. First, there is a clear need to adopt macro-prudential policies. Second, measuring financial instability requires a better understanding of the dynamics of the financial cycle. To model the empirical features of the financial cycle, it is necessary to consider the interaction between systemic risk, market dynamics, selected policies and its transmission. Third, macro-prudential tools are mostly focused on banks, while due to the evolution of the financial intermediation, more attention is needed to the non-bank financial institutions.

Hossain et al. (2016) examined macro-prudential policy as a tool for promoting financial stability and resilience in the Developing Economics. They indicated that the strength of the financial system depends on the links between the financial system and the economy. In addition, it depends on the links between

financial institutions and the strategic interactions and the externalities that these links create. There is now a great deal of coordination among policymakers that the intensification of macro-prudential regulations and oversight cannot be ignored. They examined the effectiveness of macro-prudential tools in controlling systemic risk over time and among institutions and markets. The results of the study showed that many macro-prudential policy instruments have been effective in reducing the pro-cyclical movement and in responding to the shocks. Macro-prudential policy in conjunction with monetary and micro-prudential-policy can enhance policy coordination.

Ayyagari et al. (2017) examined credit growth in 59 countries that implemented macro-prudential regulations using data from 1.3 million firms over 2002 to 2011. They found evidence that the implementation of these policies have led to low credit growth, especially for small enterprises with non-bank financing. They also found that macro-prudential policies affected new firms in emerging markets and there was a trade-off between financial stability and financial deepening.

Richter et al. (2018) indicated in their study that central banks rely on macro-prudential policies to manage the financial cycle. These policies affect the main objectives of monetary policy, namely production and inflation stability. They quantified the effect of changes in the maximum loan-to-value ratio on production and inflation. They found that on the four-year horizon, a reduction in the maximum LTV ratio led to a 1.1 percent decrease in production. The impact of 10% tightening in LTV is actually equivalent to 25 basis points increase in the policy rate. Moreover, lowering LTV limit has greater economic implications than facilitating them. Also, a change in the maximum LTV ratio has a significant effect on credit growth and housing prices.

Rossini and Quispe (2017) examined the implementation of macro-prudential policy in Peru to address the boom-bust of credit cycle and to reduce the risks associated with the dollarization. They found that the policies are successful in reducing the vulnerability of the Peruvian financial system.

Svensson (2018) discussed how monetary Policy and macro-prudential policy can be distinguished from macro-prudential and how appropriate objective can be set for both policies. How can these two policies be coordinated? To this end, the institutional framework in Canada, Sweden and the United Kingdom is compared.

Constancio et al. (2019) examined how financial stability in the ECB has been pursued by implementing macro-prudential policies. These policies implemented to regulate the ECB's integrated monitoring mechanism. The paper describes the governance framework of the policy in the ECB in the new institutional setting. They discussed systemic risk and prudential policy in the aftermath of the global financial crisis in the Eurozone to achieve financial stability and to avoid formation of systematic risk.

Nymoen et al. (2019) examined the role of macro-prudential policy instruments in managing the financial cycle in the advanced Economies. The results indicated that the short-term effects of the ceiling on Loan-to-Value and Loan-to-Income and risk weights (RW) are significant. Long-term credit growth coefficients are also significant. The findings do not support the fact that Basel Regulations (III) on counter-cyclical buffer have affected credit growth.

4. Data

Financial cycle index derived using cycle components from three separate structural models of Unobserved components structural time series model for money and credit market, capital market and foreign exchange market. It has been obtained by the composite index of Briguglio (1995)[1]. By financial cycle we mean the cycle of boom and bust in the financial markets that can exacerbate economic fluctuations and lead to financial turmoil (Adrian & Shin, 2010; Brunermeier et al., 2009). Figure 1 shows the cycle of financial markets which represents the periods of boom and bust and the successive ups and downs of the financial markets cycle index during 2009-2018. (figure 1)
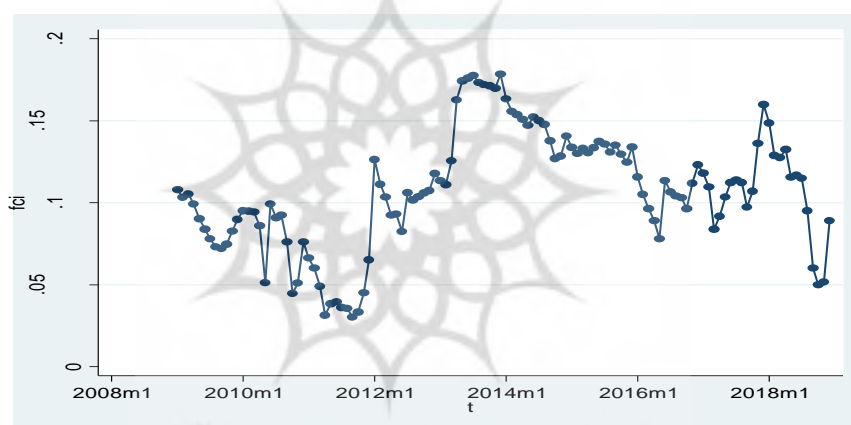

Figure 1: Financial markets cycle index during 2009-2018

Macro-prudential policymaker uses policy tools to achieve its objectives. There are three key points. First, for each intermediate objective, several tools may be available. second, monitoring and controlling systemic risk may require the policymaker's attention to more than one intermediate goal. For example, before the global financial crisis, excessive credit growth and rising maturities mismatch happened. Therefore, since systemic risk occurs in different forms, officials may need to use a combination of these tools to deal with the systemic risk. Third, the

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[1] Keshtgar. N., pahlavani, M. & mirjalili, S. H. (2019). Identification of financial markets' cycle and its relationship to exchange rate fluctuations in Iran. Iranian Economic Journal: Macroeconomics (IEJM). 14(28)

dominant role of the banking system in the financial system of the world's economies, especially in the developing countries, and that in the financial crises, the banking system is severely damaged, in most of policy tools, banks are considered as target financial intermediaries. Macro-prudential instruments in this group are based on capital or liquidity management seeking intermediate objectives, namely increases the resilience or reduces the vulnerabilities.

Capital-base instruments of the bank and financial institutions include Counter-Cyclical Capital buffer (CCB), Leverage Ratio (LEV), and Dynamic Loan Loss Provisioning Requirements (DPRS). These tools enhance the resilience of the banking system to adverse shocks, as well as reduce the pro-cyclical behavior of bank lending. These tools are complement, in a way that the CCB covers the unexpected losses caused by periods of financial stress. Capital adequacy ratio (CAP) is another macro-prudential tool that is calculated as the equity to total assets ratio. Banks are required to hold a portion of bank's capital as a CCB in addition to a fixed capital adequacy ratio. As it turns out, this ratio changes during the financial cycle and is not constant. In other words, the buffer is formed during the credit boom period and is released in the event of a recession to reduce the fluctuations in lending.

 The leverage ratio also limits the bank's ability to increase the overall size of its risk- taking (assets) relative to the capacity to absorb their losses (capital) (Haldane, 2013). While these tools are not available or are ineffective in reducing the sharp growth of credit, some countries have used the ceiling on credit growth (CC). In this paper, financial leverage (LEV) is used as one of the liquidity-based tools in the model that is derived from debt to equity ratio.

Other liquidity tools are also available to enhance sound banking finance and to improve their resilience to shocks over time. These instruments can be divided into two groups: quantitative restrictions on balance sheet ratios (such as loan-to-deposit ratio) or price-based ratios (such as fees, expenses, taxes). (Perotti and Suarez, 2011) Loan-to-Deposit Ratio is another tool which is represented by lending to bank deposits ratio.

Moreover, reserve requirement (RR) ensures that there are sufficient reserves with the central bank. This tool affects the cost of lending and spread between deposit and lending interest rates (Gray, 2011; Tovar et al., 2012). Although this tool is used as monetary policy, countries change this rate to achieve financial stability (Robitaille, 2011). Also, increasing reserve requirement reduced credit growth as well as the pro-cyclicality of credit growth. (Lim et al., 2011)

Moreover, in countries with access to international financial markets, other restrictions can be applied to open foreign exchange position and financing through foreign exchange funding.

Overall, liquidity instruments increase banks' ability to encounter financial tensions by encouraging them to hold liquid assets, restrict financing from

unstable resources, limiting non-cash assets, and reducing the maturity of loans. At the individual level, this improvement in the banks' ability reduces the likelihood of systemic spread of liquidity risks to the real sector and thus reduces the frequency and severity of the crises. (IMF, 2013b)

Macro-prudential policy index is calculated using Briguglio Composite Index (1995). Figure (2) shows the prudential policy instruments over the period 2009-2018 in Iran.
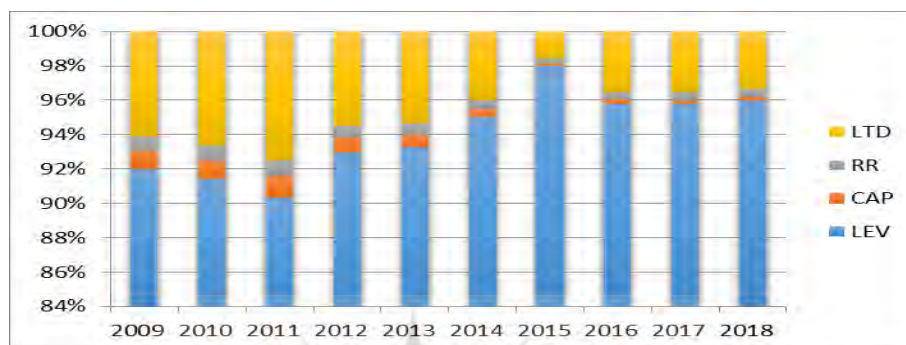

Figure 2. Macro-prudential policy instruments during 2009-2018 in the banking system of Iran

Studies indicated that among the potential variables such as credit growth, GDP growth, asset and real estate prices and bank profit-making, credit gap has been the most effective indicator of banking crises (Drehmann et al., 2011).

As the financial crisis approaches, GDP often begins to decline, while credit is increasing because borrowers using credit lines to continue their business (Giese et al., 2014). These developments will increase the credit gap and will be a signal for increased CCB. In times of financial stress, the CCB should be released so that banks can use their capital to absorb losses and reduce the risk of credit crunch. To ensure that banks use the released capital to attract losses rather than pay to shareholders, the distribution of dividends should be limited as CCB is released. The probability variable of the banking crisis is another variable that we included in the model, which has been calculated with the money market pressure index over the period 2009 to 2018. To this end, Markov's switching model has been used over the period 2009 to 2018 with monthly data. The results indicated that Iran's economy has experienced a banking crisis. To avoid banks weakening and ensuring the health of the financial system in the context of macro-prudential regulations, monetary regulators must constantly monitor the credit quality of banks, as the sharp decline in the quality of loan portfolios can sometimes be detrimental and sometimes even led to banking crisis (Reinhart and Rogoff, 2010).

Governments in the developing and transition economies often utilize their financial systems to direct credit to banks public enterprises or specific economic sector by artificially keeping interest rates low by creating development financial institutions for granting a variety of specific loans or asking existing institutions to finance specific activities. Another variable of our model is the interbank market loan rate as a representative for monetary policy rate.

5. model
The model is specified as follows:

$$Y_t = MacroP'_{t-1}.\beta + GDP'_t.\gamma + Bank\ Crisis'_t.\delta + Policy'_{t-1}.\theta + \varepsilon_t \quad (1)$$

Y_t denotes the dependent variable of the financial cycle index. In addition, the lagged dependent variable, which includes: $Macropru_{t-1}$ denotes a vector of the total MPI index or individual or group macro-prudential tools. GDP_t denotes a vector with real per capita GDP growth, *BankCrisis*$_t$ denotes a vector of the probability of a banking crisis. *Policy*$_{t-1}$ denotes a vector with the central bank's monetary policy rate (a proxy for interbank market loan rate) in the previous period. ε_t denotes the error term. In this model, macro-prudential index (MPI) has one-year lag. Because one cannot expect to see the impact immediately after the implementation of these policies.

6. Estimation
We estimated the model using monthly data over the period 2008 to 2018. Data were extracted from the website of the Central Bank of Iran, IMF and Tehran Stock Exchange. To find out more about the variables, the descriptive statistics of the variables are indicated in table (1). FCI denotes an index of financial cycles, MPI, denoted an index of macro-prudential policies, BC, denotes probability of banking crisis, GDP, denotes an index of economic growth and PR, denotes interbank loan rate.

Table 1. Descriptive statistics of the variables

Variable	Mean	Max	Min	Standard deviation	skewness	kurtosis
FCI	0.1071	0.1784	0.0302	0.0362	-0.1409	2.5875
MPI	0.0948	0.1695	0.0322	0.0397	-0.2348	1.6391
GDP	-0.0151	4.5124	-3.8404	0.8039	0.0237	15.7595
PR	21.1154	29.3273	17.7	3.0917	1.0671	2.9992
BC	0.175	1	0	0.3815	1.7106	3.9264

Source: Research Findings

We estimated the regression using Generalized Method of Moment. To estimate the model, instrumental variables need to be used based on their ability to estimate and identify conditions. Accordingly, if adding an instrumental variable has a positive effect on the quality of estimation, then the variable will be included in the regression, but if adding it give rise to co-linearity between

instrumental variables, model error, worsening model estimation conditions or corner solution for the parameters, then the instrumental variable will not be included. Table (2) shows the instrumental variables included in the model.

Table 2. Instrumental variables

Variable	Definition	Variable	Definition
Ass	Total assets of Iranian banks	Debt(-1)	Debt with one lag
Equ	Total equity of Iranian banks	DD	Total deposits of Iranian banks
Debt	Total debts of Iranian banks	RR	Central bank lending to the banks
Ass(-1)*	Ass lagged	P⁰	Inflation rate
DD(-1)	DD with one lag	Equ(-1)	Lagged equity
R	Profit rate for one year term deposit	RR(-1)	Lagged DD
GDP(-1)	Lagged Gross Domestic Product at constant price of 2011		

* The numbers in parentheses indicate latency periods.

Although GMM does not require much assumptions about the data, but it is important to investigate the stationary of the variables before estimating the model. In this section, the unit root test for the variables is conducted. As indicated in Table (3), based on the result of Augmented Dickey Fuller and Phillips Perron tests, H_0 hypothesis, namely the existence of a unit root, is rejected. It can be concluded that economic growth and the probability of Banking crises are stationary at the level, but financial cycle index, macro-prudential policy index, and interbank market loan rate are stationary in the first difference.

Table 3. Stationary test results of model variables

Variable	Lag	ADF test	PP test	Result
Fci	.	-2.205 (0.48)	-2.308 (0.42)	Non-stationary
D(Fci)	۱	-9.522 (0.0000)	-9.556 (0.0000)	Stationary
Mpi	.	-2.677 (0.24)	-2.666 (0.25)	Non-stationary
D(Mpi)	۱	-12.81 (0.0000)	-12.808 (0.0000)	Stationary
GDP	.	-3.879 (0.015)	-7.002 (0.0000)	Stationary
Bc	.	-3.532 (0.04)	-4.703 (0.0011)	Stationary
Pr	.	-1.849 (0.67)	-1.47 (0.83)	Non-stationary
D(Pr)	۱	-4.97 (0.0004)	-5.088 (0.0003)	Stationary

Source: Research Findings
* The critical values of McKinnon table at 1%, 5% and 10% level are 4-0.03, 3.44 and 3.14
** The above numbers are the coefficient of the tests statistic related to the variables and the numbers inside the parentheses are their probability.

In order to avoid spurious regression, we conducted the co-integration test of the variables. Co-integration indicates a long-term equilibrium relationship between variables. Johansen co-integration method was applied to determine co-integration vectors or long-term relationships. Table (4) indicates that there is a co-integration between financial cycle and explanatory variables.

Table 4. co-integration test results

Test statistic	Test statistic value	Critical value 1%	Critical value 5%	Critical value 10%	McKinnon probability level
Z(t)	-3.971	-4.034	-3.448	-3.148	0.0097

Source: Research Findings

The results of the estimation using monthly data for the period 2009 to 2018 are indicated in Table (5). GMM estimator consistency depends on the validity of the non-serial correlation assumption of error terms and instrumental variables which can be assessed by J-test provided by Hansen (1982). Hansen's j test is suggested for excessive constraints to measure how close are moment conditions to zero. In other words, the null hypothesis is $E[h(X_t; \Theta_{GMM}, Z_t] = 0$. As the results of the estimate in table (5) shows, the identification conditions in the GMM are met and the results can be trusted.

Table 5. GMM model estimation results

Variable	Coefficient	Standard Deviation	Z Statistic	Probability Level
Lagged macro-prudential policy index	-0.3501	0.0521	-6.71	0.000
Economic growth index	0.0067	0.00201	3.37	0.001
Probability of banking crisis	0.0391	0.00905	4.32	0.000
Lagged interbank market loan rate	0.0061	0.00022	26.50	0.000
J Test statistic	4.315			
Probability of J test statistic	0.827			

Source: Research Findings

Based on the results of the estimated model in table (5), it can be seen that all the variables of the model are significant at 99% confidence level. In other words, the explanatory variables of the model have a significant effect on the financial cycle. We assessed the validity of the instrumental matrix by J test. In this test, the null hypothesis indicates the non-correlation of instrumental variables with error terms. Therefore, it can be concluded that the instruments utilized to estimate are valid.

Economic growth index has a positive and significant effect on financial cycle index. Historical evidence suggests that during the boom, financial intermediaries tend to expose themselves to the common risks of liquidity and credit, which exacerbates financial cycles and therefore fluctuates in asset prices. These behaviors, which lead to the formation of systemic risk during the boom, occur

for a number of reasons. One reason is strategic complementarities that stem from interactions between rational agents. It means that the return on a given action increases as the number of people who make the same decision increases. Therefore, during the boom, competition between banks increases and effect on the credit standards throughout the economy.

In the face of incomplete information, banks need to assess the credit risk conditions of potential borrowers, but during the boom, due to the increased competition, this need decreases and the criteria for monitoring potential borrowers decrease and lending increases. In this situation, with the fall in asset prices, several banks, in response to this shock, reduce new lending, and so the credit crunch occurs, which in turn reduces the investment and employment, and has contractionary effects on the real sector. In addition, if due to the decreasing asset prices, several institutions are looking to sell securities together to improve their liquidity situation, the supply of securities to the asset market in such circumstances will further reduce their prices and put more pressure on the balance sheet and thus increasing credit costs and will lead to short sale.

It happens when an investor is forced to liquidate his assets in a situation where potential buyers are not in a good financial position. Given the limited buyers, as well as their poor credit record, assets are sold at a price less than the underlying value. In this case, not only these assets be devalued, but other similar assets held by other institutions may be devalued. This reduces the capital value as well as the ability of all financial institutions to provide assets as collateral and forces them to liquidate other assets. This new round of asset sales is the source of further losses and the continuation of the current weakening of the balance sheet, which has negative externalities.

The probability of banking crisis has a positive and significant effect on the financial cycle index. The banking crisis is a situation in which banks' intermediary role is severely impaired. The central bank, as the sole supplier of banking reserves, can respond to the increased demand for banks 'reserves in two ways: First, if banking reserves are pursued as the operational objective of monetary policy, the central bank will then inject additional reserves through open market operations or by granting cheap loan. Therefore, the banking crisis happens by a sharp increase in the short-term interest rates and the central bank's lending to the banks. it exacerbates credit growth and deepening the financial cycle.

The interbank market loan rate has a positive and significant effect on the financial markets cycle. The interbank market in Iran is a components of the money market in which banks and other credit institutions provide short-term financing. This market plays at least two important roles in the financial market.

First, it is a central bank's intervention channel for monetary policy through the management of profit rates. The second role of the interbank market is the

transfer of funds from credit institutions with surpluses to credit institutions with deficits.

Thus, policymakers have a strong incentive to create an efficient interbank market so that they can achieve the desired interest rates, and credit institutions can efficiently exchange funds with each other and manage their liquidity risk. In Iran, the development and deepening of the interbank market will have favorable results. The most important of which are: effective implementation of monetary policy, improving the liquidity management of the banks and reducing the overdraft of banks from the central bank. Given that in Iran, monetary policy is always implemented in a pro-cyclical manner, and as a result, the coefficient of interbank market loan rate as a proxy for monetary policy rate has a positive relationship with the financial cycle. This means that the interbank market loan rate will increase pro-cyclical and accommodative with financial cycles. Thus, macro-prudential policy is needed to smooth financial cycles. In a boom, monetary policy must be contractionary in order to reduce the deepening of the cycles, but in an oil-dependent economy like Iran they act pro-cyclical and monetary policy is expansionary, thus increasing the deepening of the financial cycles and financial instability is a major and permanent problem of the financial system. In such circumstances it is necessary to utilize macro-prudential policies to smooth financial cycles and maintain financial stability.

Macro-prudential policy index has a negative and significant relationship with financial cycle index. Therefore, macro-prudential policy objective in the time dimension, by limiting unstable increases in financial leverage and volatile funding, seek to reduce pro-cyclical feedback between credit and asset prices and thus limit systemic risks over time.

Second, prudential policies seek to increase the resilience of the financial system against those shocks through buffers that absorb the effects of major shocks and help maintain the financial system's ability to provide credit to the economy. Third, these policies can be very effective by controlling financial institutions that play an important role in financial markets and their failure is important. Macro-prudential policy help protect the stability of the financial system as a whole, which includes reducing the formation of vulnerabilities and increasing the resilience of the financial system.

7. Conclusion

This article seeks to identify the financial cycle and examine the impact of the macro-prudential policy index on the financial markets cycle by using monthly data over the period 2009-2018. Because the unfavorable situation of the financial cycle index in recent years is a crucial risk that threatens the soundness of the banking system and the financial stability of Iran's economy. Macro-prudential policies are important instruments for systemic risk reduction, which are the risks of distortion in the provision of financial services.

The overall objective of the prudent policy is to maintain the stability of the financial system and to reduce the depth of the financial markets cycle. Therefore, identification of the sources of systemic risk is necessary. Macro-prudential policy is based on the concept of financial cycle in order to assess the financial economy, predict its developments and explore the application of its tools. We derived the financial cycle using three models of UCTSM for different financial market and then examined the impact of prudential policy on the financial cycle in the Iranian economy over the period 2009-2018.

The results of model estimation indicated that:

1-The cycle of financial markets in Iran has been extracted by separating the cycle from its structural trend in three financial markets; money and credit, capital and exchange rate. The cycle indicated several fluctuations over the period.

2. Macro-prudential policy is based on the concept of financial cycle in order to assess the state of the economy, predict its developments and evaluate the application of macro-prudential tools. Therefore, the concept of financial cycle is important for macro-prudential policy logic and justifies the need for specific policy tools to achieve financial stability. Macro-prudent policy must be proactive and strongly counter-cyclical to smooth out the financial cycle. Macro-prudential policy index is calculated by the composite index of Briguglio (1995), which has a negative and significant effect on the financial cycle index.

3- Banking crisis in Iran has been identified using Markov's switching model and the probability of banking crisis index has a positive and significant relationship with the financial cycle index. The banking crisis, which is reflected in the turmoil in the financial markets, is due to the uncontrolled growth of credit in the banking system. As a result, there is a positive relationship between the likelihood of a banking crisis and the financial cycle index.

4- The interbank market loan rate has a positive and significant relationship with the financial market cycle. Given that in Iran, monetary policy is implemented in a pro-cyclical manner, as a result, the coefficient of interbank market loan rate as a proxy for monetary policy rate has a positive relationship with the financial cycle. This means that the interbank market loan rate increases pro-cyclical and accommodative with financial cycles. Therefore, macro-prudential policy is needed to smooth out financial cycles.

5. The Economic Growth Index indicates a positive and significant relationship with the financial cycle in the Iranian economy. Increasing economic growth actually increases banks' ability for lending. Banks typically need to assess the credit risk conditions of a loan applicant, but during a booming business, financial intermediaries tend to expose themselves to common liquidity and credit risks. Thus, monitoring potential borrowers are reduced and lending increases, which exacerbates financial cycles.

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سیاست های کلان احتیاطی و چرخه مالی در ایران

چکیده:

بازارهای مالی، کانال‌های جذب منابع مالی مازاد و تخصیص آنها به سرمایه‌گذاری است. به منظور ارزیابی وضعیت بخش مالی، پیش بینی تحولات آن و توجیه نیاز به ابزارهای سیاستی خاص، سیاست احتیاطی کلان لازم است چرخه مالی را در نظر بگیرد. در این مقاله با استفاده از مدل سری‌های زمانی ساختاری با اجزای مشاهده نشده، تاثیر سیاست‌های احتیاطی کلان بر چرخه مالی اقتصاد ایران طی دوره ۲۰۰۸-۲۰۱۸، بررسی شده است. این امر از طریق بررسی تاثیر شاخص سیاست احتیاطی کلان و سایر متغیرها بر چرخه مالی انجام شده است.

یافته های این مطالعه با استفاده از روش اقتصاد سنجی گشتاورهای تعمیم یافته (GMM) با استفاده از داده‌های سری زمانی، نشان داد که شاخص سیاست احتیاطی کلان اثر منفی و معنی‌داری بر چرخه مالی در اقتصاد ایران دارد. همچنین احتمال بحران بانکی، نرخ وام بازار بین بانکی و شاخص رشد اقتصادی دارای تاثیر مثبت و معنی‌دار بر چرخه بازارهای مالی ایران است.

واژه‌های کلیدی:

سیاست‌های کلان احتیاطی، چرخه مالی، رونق و رکود، GMM.