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AN FINANCIAL STRESS INDEX (FSI) FOR IRAN

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ABSTRACT

Recent financial crisis, according to many experts, that is one of the most crises in the world after the 1929 crisis, has affected not only America's economy but also has affected the economy of many countries. Due to this crisis, economy witnessed the bankruptcy announcement of financial institutions and buying them by rival or government companies. Price index in large and small stocks of the world faced with a significant reduction. The Power of loans and liquidity of financial institutions fell sharply. By crisis contagion to the real part of economy, economic growth was reduced and unemployment in the world was increased. According to distributing effects of the crisis, there is the fear that Iran is susceptible to damage caused by crisis. Accordingly, in this study, the characteristics of financial stress and presentation of a model for measuring it in capital market of Iran are investigated. Research methods are descriptive and creational. Multiple variable regression statistical method is used to examine the relationship between the independent and dependent variables. To further test the research hypotheses, 71 companies were selected (in form of 4260 observations of company- months) as end samples using information of companies listed on Tehran Stock Exchange. Finally, the present study results confirming all hypotheses indicate less financial stress in Iran's capital market.

Keywords: Financial Stress, Uncertainty, Asymmetry of Information, Risky Assets, Decreased Illiquidity

INTRODUCTION

The financial crisis of 2008 and 2009 and Europe's debt crisis show that increasing stresses in financial markets have great importance in analyzing and forecasting economic activities (Roye, 2011, 2012).

Financial stress is a condition that leads to disability of financial institutions in meeting their obligations and loss of ability to allocate funds (Cardarelli *et al.*, 2009). Financial stress also leads to the development of financial instability and damages economic growth and social welfare by disturbance in the function of financial system (Duca and Peltonen, 2011). Due to the fact that expansion of financial stresses, typically through increasing fiscal imbalances is resulted from disruption in economic conditions (Borio and Lowe, 2002), so if it takes too long, the economy and financial markets return to normal will face with the problem (Illing and Liu, 2006).

In general, though financial stress is not directly visible, but it is perhaps reflected in most of financial market variables and it is able to manifest itself in different ways in the financial system and brings the problem from one market to another (Illing and Liu, 2006).

By stability of the financial system, markets will work correctly, key institutions will continue to their operations without specific problems and asset prices are not far from their fundamental values. Such circumstances are crucial for an economy that wants to reach a sustainable growth and low inflation targets. So the stable system is flexible and is able to tolerate normal fluctuations in asset prices that are caused by the dynamic conditions of supply and demand and increasing uncertainty (Nelson and Perli, 2005).

When the financial stress is low, the financial market acts uniformly, so the low stress can facilitate economic growth like lubricating economic transaction wheels through efficient aspects from savers to borrowers. While in markets with descending trend and stressful financial situation, absorbing and preparing funds from lenders become more and more difficult and due to the increase in the expected return of lenders to investment in firms, more costs are imposed on companies (Davig and Hakkio, 2010).

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On the other hand, poor economic conditions may reduce earnings and weaken the balance sheets of firms and besides limiting firm's access to foreign funds, reducing capital expenditure of companies, result in decreased economic actions. Also, in such circumstances, as banks expect more firms to become insolvent, budgets will be increased, and this can intensify negative effects of financial stress (Davig and Hakkio, 2010).

In such circumstances, multiple shocks in the economy lead to more volatility in financing costs and investment. While negative shocks take place like bursting of assets price bubble or financial and exchange crisis in economy, it is possible that some stresses to be observed in other markets. Big shocks will be lead to more reactions among various economic variables (Duca and Peltonen, 2011). Shocks with an impact on credit rating of agencies lead to changes in their collateral value and effect on their credit rate and the expected interest given to firm (Bernanke *et al.*, 1999).

Also, shocks with impact on the balance sheet of lenders get the economy moving downward, for example with reduced banks' capital, they become reluctant to provide capital to the real sector of economy and even intensify the downward trend of the economy by strict policies (Bernanke *et al.*, 1999). This crisis not only will lead to a sharp increase in poverty, but also will have the political instability (Mishkin, 2000).

Recent global financial crises show numerous weak financial systems. One of the most important lessons of these crises is that supervisors and decision makers of financial systems do not have necessary tools for identifying the process of increasing stress and measuring them timely. Another problem is that even when they are aware of their forming process, they don't have tools that allow them for rapid intervention (Holló, 2012).

The main concern about the financial stress is that how economic activities are affected by it and how policymakers can reduce the economic consequences caused by it and avoid the similar future incidents (Cardarelli *et al.*, 2009).

According to the importance of the issue, this study intends examining the characteristics of financial stress in Iran Capital Market, provides a model for calculating financial stress in the capital market. Results of this study can be a useful tool for policymakers of capital market and is able to make a useful contribution in filling the gap of the literature.

Literature Review

Some crises happen in the stock market (1929 crisis), some in the credit markets (Crisis, 2007), some in the foreign exchange market and some in the commodities market. These crises sometimes effect on a country, sometimes on a group of countries, and sometimes even on the whole world.

Stress or tension in financial markets is defined as an effective force on the behavior of economic agents in the form of uncertainty and changing expectations that its critical values are called the financial crisis. Financial crisis is a situation in the financial markets that financial system shocks interfere in the flow of information, so that these markets are unable from doing their main task that is, allocating savings in more efficient and profitable production positions (Mishkin, 2000).

The presence of stresses in the financial markets in different ways such as reducing willingness to hold risky an non-cash assets and increasing uncertainty about investor behavior, increasing uncertainty about the fundamental value of assets and uncertainty about future economic conditions, affects the behavior of economic agents, and also due to increased information asymmetry has a negative impact on economic growth.

Financial stress characteristics that represent financial stress in a country were divided into several parameters by Hakkio and Keeton (2009). These characteristics, which include the uncertainty of investors to the fundamental values of assets, investors' unwillingness to hold risky assets, the reluctance of investors to hold noncash assets and increasing lack of symmetry in information are characterized more than investors' behavioral reactions which have been stated below.

Uncertainty about Fundamental Value of Assets. A common feature of financial stress is increasing uncertainty among investors about the value of the underlying assets. Fundamental value of an asset is the discounted value of the future cash flows of that asset (Hakkio and Keeton, 2009).

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According to the fact that fundamental value of asset is future cash flows' discounted value (Hakkio and Keeton, 2009), future cash equities, bonds and debt securities all depend on future economic conditions. As a result, the increase in non- confidence on economic conditions could reduce confidence of loan lenders and investors on current value of cash flow. Therefore, increasing non-confidence on basic values usually leads to further volatility in the market price of the assets (Hautsch and Hess, 2007).

The total maximum price that an investor is willing to pay for shares of a company is dependent on his estimate of the firm's long-term profitability. However, if investors receive new information on their estimations, they will review the profitability of the firm and will change more likely their offered price. Accordingly, an increase in uncertainty about the fundamental value of the stock will generally lead to greater volatility.

According to research literature, other type of non-confidence that increases following financial crisis and helps to asset price volatility is uncertainty about the behavior of other investors. On assets that may need to be sold before maturity, the expected return for an investor may be dependent on other measures of investors in long-term or asset value upon maturity. This type of behavior is more common when loan lenders and investors are more uncertain on the fundamental value of the assets. When investors understand that their hypotheses is wrong on the product or new financial practices and they have little historical experience on their new ideas (Hakkio and Keeton, 2009).

Like other non- certainties that were expressed, uncertainty about the behavior of other investors increases asset price fluctuations. When investors invest based on guessing other investors' decisions, the relationship between financial asset price and the value of the underlying assets becomes less. As a result, fluctuations in the price become more. Accordingly, uncertainty about the fundamental value of the stock's share price will generally lead to greater volatility.

Asymmetry of Information. The second most common sign of financial stress is the information asymmetry between the lender and the borrower or the seller and purchaser of a financial asset. Information asymmetry exists when the borrower's knows anything more about financial situation than the lender, or the seller has more knowledge about the actual quality of the assets than the purchaser. This information gap could lead to inverse selection, moral hazard, increased average cost of borrowing for businesses and reduced average property price in the market (Hakkio and Keeton, 2009).

For example, the average investors know the risk of a group of firms that have issued bonds, but they cannot exactly differentiate high quality firms from low quality firms. Therefore, investors take risky action with respect to the average interest rate on the bonds. In such a case, high-quality firms do not tend to borrow and rely on their internal resources, causing a change in the composition of firms by investors as securities.

Accordingly, worsened firms of issued bonds composition, while increasing problem of wrong selection leads to higher rates demanded by investors (Mishkin, 2000).

Asymmetric information may increase the rate of expected return of investors and increase the average costs of borrowing for firm (Mishkin, 1991) and reduce the average price of property in the market according to the changes in quality of investment opportunities on the one hand and low confidence of investors in the accuracy of information regarding the firm on the other hand through imposing wrong investment and increased risk of investment for market participants (Hakkio and Keeton, 2009).

The non- asymmetric information can increase during the financial stress in two forms of change in actual quality of the loan recipients or financial assets (Gorton, 2008; Mishkin, 1991).

For example, when it is expected that the collateral value increases for certain types of loans, loan lenders consider these loans safe regardless of profits or future revenues of loan recipients. But if any one expects that the collateral value to be reduced (because real estate bubble is blasted), loans will have greater risk for borrowers with low incomes than borrowers with high income. Because, if the collateral value falls below the loan amount, low-income borrowers will be less able to repay their loans. So if it is difficult to identify the income of loan recipients for loan lenders, non- asymmetry of information will increase. Because loan borrowers will vary in terms of actual risk and each loan recipient will have better information about risk than loan provider.

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The second form of intensifying information non- asymmetry in the financial crisis is the loss of loan lenders' certainty on the accuracy of their data on loan borrowers. For example, suppose that the issuer of a bond is aware of its real risk but investors must rely on the investment rating that is determined by a third-party for its risk. If the investors doubt on the impartiality of the ratings, their uncertainty to repayment or non-payment of bonds will be greater. Once again, with more information of bond issuer than investors on the actual risk of bonds, information asymmetry will increase.

The information asymmetry with respect to the change in the quality of borrowers or financial assets on the one hand(Gorton, 2008; Mishkin, 1991), and reduced investor certainty in the accuracy of the information about the firms on the other hand, can also create volatility in financial asset prices (stock) and strengthen the financial stress in market.

Decreased Willingness to Hold Risky Assets. The other usual sign of financial stress is a sharp decrease in willing to hold risky assets. Such a change will make investors to demand more return on assets risk and less return on non-risky assets. In such circumstances, most investors go away from risky assets and toward the low risk assets. As a result, the difference between the two asset returns and high risk assets will raise the cost of borrowing (Caballero and Kurlat, 2008).

As some argue, what causes investors tend to low-risk financial assets, is emphasis on the underestimated risk in a boom and overestimated risk in a recession condition. According to this theory, investors are more optimistic during periods of economic stability and forget their past losses, although this optimism may lead to wrong investments and sudden losses. However, when investors consider losses probable, their optimistic switches to a black picture, and leads to adopting a different approach and estimating too much loss. Therefore, reducing the tendency to hold risky assets as one of the indicators of financial stress can justify some financial assets and stock price volatility in the market.

The other reason that lenders and investors' desire is reduced to have risky properties is their reduced tendency to danger. Suppose, for example, when the uncertainty of people is increased to the future economic situation and future earnings, thus, they will have more reasons for concerning on losses in risky investments. Because income and its consumption will be low due to the recession. In such cases, loan lenders and investors will pay more compensation for risky assets. Therefore, they expect more return in these assets than safe assets (Hakkio and Keeton, 2009).

Such changes in preferences, will lead loan lenders and investors to demand higher returns for risky asset and less return for safe assets. These changes in preferences, going away from risky assets and moving toward safe assets is often known as the "flight to quality", that its result is widening the gap between return rate of these two assets, increasing the cost of borrowing loan for moderately high-risk loans borrowers and more volatility of asset prices in the market(Caballero and Kurlat, 2008).

Decreased Willingness to Hold Illiquid Assets. The fourth sign of financial stress is the reduced tendency for holding non-cash assets. Noncash asset is the asset for which the owner is not sure to sell it to price ratio close to its intrinsic value, when he/she suddenly and unexpectedly needs cash. In some cases, an asset becomes noncash for the restrictions on secondary market and due to the high variability of the sales price in the high volume. In other cases, an asset may be non- cash due to its high quality and non-asymmetry of information between buyer and seller, prevents property owner from selling the property to a price close to its fundamental value (for example, the value if asset owner held it until maturity).

During financial crisis, investors' tendency to have noncash assets usually is declined and desire to hold cash assets is risen, as a result, the gap between these two assets' return rate is expanded and the cost of borrowing loan is increased for organizations that issue non cash bonds. This behavior in the market is called "flight to liquidity".

Flying toward liquidity may occur due to either an increase in liquidity demand to meet unexpected cash needs or decrease in understood liquidity of some assets. To understand how demand is increased for liquidity, it should be noted that one of the characteristics of financial stress is an increase in the volatility of asset prices. This increased volatility, will increase the strong investor's chance for liquidity of his assets (Brunnermeier and Pederson, 2009). Increase in the volatility of asset prices, will increase the chance of financial intermediaries such as financing funds and investment funds to liquidity of bonds in

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order to redeem bonds. So investors and financial institutions will increase cash assets balance to protect against such incidents.

Another reason of flight towards liquidity is reduced liquidity of understood assets. As it was mentioned before, the financial stress is often related to greater information asymmetry between buyers and sellers of financial assets. In such circumstances, the adverse selection can reduce the market value of some properties to be less than its fundamental value. Investors consider such assets as non-cash because they cannot sell them without significant losses. Thus, changes in the liquidity of assets with an impact on the demand for them will cause changes and fluctuations in market prices.

Financial Stress Index (Fsi) in Capital Market of Iran

A financial stress model is obtained from four above standardized characteristics. In this regard, UCFV refers to investors' uncertainty about the underlying value of the assets. INAS refers to asymmetry of information. Also UHRA and UHUL are the unwillingness of investors to hold risky assets and the unwillingness of investors to hold noncash assets, respectively.

$$FSI = UCFV + INAS + UHRA + UHUL$$

Financial Stress is shown based on positive value of FSI Index and reflects the fact that prices and returns are above their average or flow (Balakrishnan *et al.*, 2009). According to the literature, value of 1 for the index indicates one standard deviation of the conditional mean among four components of the model while value of 1.5 is considered as the financial crisis (Dufrenot *et al.*, 2011; Balakrishnan *et al.*, 2009).

MATERIALS AND METHODS

The present study is retrospective in terms of time, is applicable in terms of target and is Ex-Post Facto in terms of type. Research method is descriptive and correlation and multiple variable regression statistical methods are used to examine the relationship between the independent and dependent variables. The combined data study method is used for analyzing data.

Then, 71 companies were selected as final sample to test the research hypotheses using information on companies listed on the Tehran Stock Exchange, by elimination sampling method (in form of 4260 companies company- month). Finally the tests were performed using SPSS, Eviews and Stata software.

RESULTS AND DISCUSSION

Familiarity with descriptive statistics of the variables is required in order to examine the general features and a detailed analysis of variables.

Table 1: The Summery of the Descriptive Statistics

Variable	Mean	Median	Minimum	Maximum	Std. Deviation
FE	18784	18110	8044	37599	8340.74
UCFV	2877	1738	-433.29	21116.90	3380.72
INAS	0.005	0.002	0	0.45	0.02
UHRA	0.26	0.02	-439.13	388.94	37.08
UHUL	-0.022	-0.022	-0.18	0.12	0.01

FE. Iran's Capital Market Index; *UCFV.* Uncertainty about Fundamental Value of Assets; *INAS.* Information asymmetry; *UHRA.* Decreased Willingness to Hold Risky Assets; *UHUL.* Decreased Willingness to Hold Illiquid Assets.

Table 2: The Summery of the Regression Analysis

Variable	Adjusted squared	R-	Durbin-Watson stat.	t-Statistic	Prob.
UCFV	0.684		1.953	6.485	0.000
INAS _{i,t}	0.715		1.951	1.625	0.000
UHRA _{i,t}	0.635		1.968	-0.712	0.000
UHUL _{i,t}	0.629		1.953	3.509	0.000

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Table 1 shows descriptive statistics of data related to the variables used in the investigation. Table 2 shows regression analysis results of each dependent and independent variable.

Table 3: The amount of financial stress is given based on the positive value of FSI

0.000000149	0.002853555	0.026314432	0.047695703
0.000000284	0.006748723	0.03143827	0.050664783
0.000000317	0.009678426	0.034335161	0.052256085
0.000000327	0.012866948	0.034993395	0.056188624
0.000001710	0.013384572	0.040982773	0.059072505
0.000826551	0.013754105	0.043140947	0.085307372
0.002042326	0.019526065	0.044112772	0.088250932
0.002783500	0.019743546	0.046688290	

Accordance to Table 3, the amount of financial stress is given based on the positive value of FSI. As results show the level of financial stress in the capital markets during the period under review is trivial due to deviation from the conditional mean of model four components that shows small amount of financial stress in the capital market.

Conclusion

In general, the financial stress is a continuous variable with a range of values in which the boundary values are called crisis. Stress increases with expected financial loss, risk (expected loss spreading) and uncertainty (less confidence to the probable loss distribution). Product stress is vulnerable structure and outsourcing shock and financial fragility describes weakness of conditions and structure of the financial system. When financial conditions are weak, the probability that shock will lead to stress (and ultimately, the crisis) will be greater.

The presence of stresses in the financial markets in different ways such as reducing willingness to hold risky an non-cash assets and increasing uncertainty about investor behavior, increasing uncertainty about the fundamental value of assets and uncertainty about future economic conditions, affects the behavior of economic agents, and also due to increased information asymmetry has a negative impact on economic growth (Hakkio and Keeton, 2009).

Fiscal stress is a shock that can have negative effects on the real economy by economy changes (Illing and Liu, 2006), in which the financial system is under pressure and its capacity to do an intermediate function is damaged (Balakrishnan *et al.*, 2009).

The present study examined the characteristics of the Iranian capital market financial stress. Accordingly, consistent with the literature review, fourth variables including lack of investor certainty in the intrinsic value of financial assets, information asymmetry, unwillingness of investors to hold risky assets and the reluctance of investors to hold cash assets were identified and were discussed in four hypotheses. In the following, in order to test the hypothesis using data on firms listed in Tehran Stock Exchange, through the sampling cup, 71 companies were selected as samples.

The first hypothesis examined that the lack of investor certainty the intrinsic value of financial assets in the capital market of Iran is one of the characteristics of financial stress. Accordingly, the analysis of sample data for the period 2009 till 2013 shows lack of investor certainty the intrinsic value of financial assets in the Iran's capital market is one of the characteristics of financial stress. This result is consistent with the research findings by Hakkio and Keeton (2009), Hautsch and Hess (2007) and Nelson and Perli (2005).

Second hypothesis expresses, information asymmetry is one of the characteristics of financial stress. The present results also confirms the hypothesis an suggests there is a significant positive relationship between information asymmetry in Iran's capital market and capital market indicators as variables indicating financial stress, that is the increase (decrease) in Iran capital market information asymmetry by reducing (increasing) equity market indices can lead to financial stress (consistent with Hakkio and Keeton (2009) and Nelson and Perli (2005).

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Third hypothesis expresses unwillingness of investors to hold risky assets is one of the characteristics of financial stress. Based on research findings, the third hypothesis is confirmed and it could be argued unwillingness of investors to hold risky assets is one of the indicators of financial stress. This result is consistent with the research findings by Hakkio and Keeton (2009), Caballero and Kurlat (2008) and Illing and Liu (2003). Fourth hypothesis is expresses unwillingness of investors to hold noncash assets is one of the characteristics of financial stress. Based on the findings, there is a significant positive relationship between unwillingness of investors to hold noncash assets in Iran's capital market and stock market indicators as a variable indicating of financial stress. It means an increase (decrease) in liquidity of stocks in Iran capital market can increase (decrease) equity market indices, and thus lead to financial stress. Therefore, it can be argued that unwillingness of investors to hold noncash assets is considered as one of the indicators of financial stress (consistent with Hakkio and Keeton (2009) and Nelson and Perli (2005). As results show the level of financial stress in the capital markets during the period under review is trivial due to deviation from the conditional mean of model four components that shows small amount of financial stress in the capital market.

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