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Evaluation of solvency assessment systems to improve the solvency system in Iran

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ABSTRACT

In financial monitoring, instead of direct control of prices and conditions of the insurance company contracts, financial indexes and financial strength of these companies is evaluated. Solvency margin is a tool used by many advanced companies for financial monitoring that represents the excess of assets than liabilities. Or we can say the financial ability of the insurance company to cover its accepted risks. So far, the world's different systems using different methodologies are designed and implemented to evaluate solvency of insurance companies. In this paper, using the criteria identified in the literature, while comparing the insurance industry's financial monitoring system in Iran with other systems - solvency II and the united states RBC- we make recommendations to improve the solvency formula defects of insurance industry in Iran.

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Introduction

Severe consequences of the bankruptcy of insurance companies have caused financial supervisory bodies, to design systems to assess and monitor the solvency of insurance companies to reduce the risk of bankruptcy of these companies. Various models have been created for this purpose in the world. For example: Fixed Rate Model, Risk Based Capital Model, Probabilistic Approach (Model based on the complex possibilities). Solvency I model that was used by European countries in the last decades of the 20th century and until 2003 was one of the Fixed Rate Models. Also solvency II model of the European countries that has been planned and carried out from 2003 onwards is a model based on Probabilistic Approach. Using models based on fixed rates in Iran today is not very good and is not a suitable method for the detection of solvency. The model developed by a group of experts from the Central Insurance of Iran is a risk-based capital model that with regard to the coefficient of each risk on the basis of the "Risk Exposure" measures the value Exposure to any risk and finally, with regard to the risks assumed by the insurance company, determines how much capital is needed.

For the first time, Cummins, Harrington and Niehaus offered a framework to evaluate risk-based systems critically.

Duff using the framework proposed by Cummins et al performed studies in this field. Holzmuller, on the grounds that rules on solvency regulation has changed a lot in recent years and also due to trends in the field of integration of financial markets, moderated the proposed framework of Cummins and added the four new criteria to it. KPMG Institute also has developed a framework to analyze the different methodologies. In this study, by introducing the solvency margin as one of the tools to implement financial supervision, we compare the three systems of monitoring the solvency in Europe, America and Iran and with regard to the calculation formula of Iran we propose some changes in the calculation formula.

Solvency margin

The main liabilities of an insurer, predictable losses and costs associated with it. These are usually calculated using statistical methods and there is the possibility of error. To protect policyholders and ensure the stability of financial markets, maintaining a certain amount of additional assets by insurers is required as a protective shield that is called the margin of solvency. The old term solvency is defined as "the ability to pay all legal debts [25]. The solvency margin of a company is acquired of the difference between the assets and liabilities of a company. Now if the poor assets are deducted from the solvency margin, what remains is available solvency margin or the company's cash.

Solvency margin ratio

This ratio determines whether an insurer has access to the minimum capital adequacy requirements set by regulators [8] Solvency margin ratio is obtained by dividing the available solvency margin to the required solvency margin. The companies must prove for a given period that available solvency margin is greater than the minimum solvency margin requirements and if there is no confirmation of this to the supervisory authority, to avoid losses to insured, their activity is limited [24].

Available solvency margin

Available solvency margin is the assets of a company minus its liabilities, taking into account the constraints associated with the asset. Applying these restrictions in assets makes the available solvency margin, a very high source of liquidity. And a significant ensure of its availability would exist in critical conditions [25].

Required solvency margin

Policyholders who refer to insurance companies, purchase

a commitment which is related to the future. It is necessary that the people ensure of the ability of insurance companies to accept commitments. Therefore, in making decision to purchase insurance services, financial capability assessment of the insurance company is critical. The main purpose of the insurance supervision also is to ensure that insurance companies can fulfill the commitments that they have accepted that [25]. So in this regard, the insurance companies are required to value their existing solvency margin above the legal limit is determined and the possibility of bankruptcy and thereby damage to the interests of policyholders to a minimum. The legal limit set by the regulatory authorities, is said to be required solvency margin.

Models and solvency assessment systems

Generally, solvency models are divided to two categories: direct solvency models and indirect solvency models [17]. In the range of indirect models, ranging from general ethical guidelines and prescription offered in New Zealand up the developed dynamic and simulations based models of cash flow can be observed in countries such as Sweden and Switzerland.

Models based on financial ratios (Direct) solvency assessment

Direct models, are special models based on financial ratios to monitor the solvency of insurance companies that example of such models are: IRIS¹, FAST², HHM³, EWIS⁴ (Ambrose and Seward, 1988; BarNiv and McDonald, 1992; Grace, Harrington and Klein, 1998; Hollman, Hayes and Murrey, 1992)

- Non-based models on financial ratios (indirectly) solvency assessment:

Despite all the models and solvency evaluation systems, offer the minimum capital requirements but their methodology to achieve this phase are different [17]

Based on this classification, the first group of systems does not require any specific level of capital and as a result, there is no model for assessing the solvency. An example of such systems can be seen in New Zealand that only asked insurers to adjust themselves to the Fair Insurance Code (FIC). According to this code, insurers must act ethically and follow the fair value accounting standards and also publish an annual ranking of the international ranking of the renowned institutions such as A.M.Best, Standard & Poor's(S&P), Fitch. The second group of models, use of Static Factor methodology and divide to two categories: simple operating system (Fixed ratio and non-risk-based) and Risk-based.the simple operating system can be considered in Solvency I or the system before 2001 in Australia. [22]; [8]

The most famous example of risk-based operating models is the risk-based capital standards in the United States which was developed in 1994. But the third group models require the use of dynamic models based on cash flow which is divided into two categories. The first scenario-based models, analyze the effects of the worst-case scenario (such as a shock in the stock market or pay damages to natural disasters) on the solvency of insurance companies. The simplest example of such a system is the Stress Testing, which was developed in 2002 by the German regulatory body. The second category of

models which are models based on Principles-based cash flow, adopt a more general approach. In this approach, the assumptions about future economic conditions and responses to them in order to simulate the insurer's financial condition could be used over time. Examples of these models can be found in the work of Cummins, Grace and Philip and Schmeiser [23]. The fourth group or hybrid models, usually based on scenario-based cash flow models combined with risk-based operating models or models based principles. Examples of such hybrid systems can be seen in Switzerland with the Swiss solvency test. At the same time, what the solvency Ilproject currently being pursued by Europe Union is also part of the group's hybrid models.

measure solvency [17]				
Systems		Example	presented	
		Model	by	Date
No model		New Zealand	New	2001
		Insurance Act	Zealand	
Static	Non-risk-	Solvency I	European	2004
operating	based		Union	
systems	(fixed	Australian	Australia	1973
-	ratio)	Insurance		
		Law		
	Risk-based	General	Australia	2001
		Insurance		
		Reform Act		
		Risk-based	America	1994
		capital (RBC)		
		Solvency	Japan	1996
		margin		
		standard		
		FAST	NAIC)	1994
			United State(
Dynamic	Scenario-	Stress Testing	Germany	2002
systems,	based	Financial	Netherlands	2006
based on		Assessment		
cash flow		Framework		
	Based on	Cash flow	Cummins	1999
	the	simulation	and Grace	
	principles	model		
		Cash flow-	Schmeiser	2004
		based model		
Hybrid systems		Capital	England	2004
		Assessment		
		(ICA)		
		Swiss	Swiss	2006
		solvency test		
Union Europa calvanay system U				

Table 1. The general framework of indirect models to

Union Europe solvency system II

Solvency II was passed in Europe Parliament in 2007 and since 2012 has been implemented. Its purpose is to ensure the financial health of insurance companies, in the worst conditions to support policyholders and financial markets as well as the insurance single market with the same rules to format. The main characteristic of the Solvency II is that all the different types of risk into consideration. And In addition to the balance sheet liabilities, the assets are taken into account. [21]; [12]

The main characteristics of Solvency instructions II are: taking into account both capital requirements, (minimum capital requirements and Solvency capital requirements), principles-based, calculating of Solvency capital on the basis of market valuation, permitted the use of internal models by insurance companies, the largest possible compatibility between the financial system and insurance. [21]; [12]

¹ Insurance Regulatory Information System (IRIS)

² Financial Analysis and Surveillance Tracking (FAST)

³ Hollman-Heyes Murey (HHM)

⁴ Texas Early Warning Information System (EWIS)

Solvency II model structure based on three main pillars formed as follows:

The first pillar - quantitative requirements

This pillar involves the calculation of technical provisions, the calculation rules of Solvency capital requirement and managing the investments. In this pillar two limit thresholds are defined: Solvency capital requirements and minimum capital requirements. The requirements of the first pillar, is based on the total balance sheet approach that balances between assets and liabilities. This method of valuation of assets and liabilities, resulting in the efficient allocation of capital and Solvency rules are set based on the current situation of the company's assets and liabilities in the market.

The second pillar- regulatory review

This element is concerned the qualitative aspects of supervision, as a complement to the first pillar which includes the monitoring of internal controls, effective risk management processes and the corporate governance. The pillar consists of two phases:

- The first stage: Company's own risk and solvency assessment (ORSA)

- The second stage: reviewing procedures by the observer authority

The third pillar - Supervisory reporting and public disclosure

This pillar focuses on increasing the transparency of risk and the capital situation. Economists pay special attention to the importance of market discipline on reducing the risk of financial institutions. [21]

The United State system RBC

Risk Based Capital (RBC) model, is the standard capital adequacy of insurance companies that have been developed by the National Association of Insurance Comissioners (NAIC). The association has presented the system of calculating the risk-based capital in the field of life and health programs in 1992 and the non-life in 1993. Recently, however, the risk-based capital formula in life insurance has combined some related to interest rate risk modeling, and for each of the main types of insurance (life insurance, property / accident and health), use a separate formula, but the structure of them is the same [14].

NICE five-year historical data presented in the report as follows

- Total adjusted capital (The actual amount of equity and capital that the company holds).

- Authorized control level risk-based capital (one of the 4 levels of the minimum calculated level of capital)

- Asset risk- Affiliate

- Asset risk- other risk (including credit risk, interest rate risk and market risk)

- Underwriting Risk or Insurance Risk.

- Business Risk

The 4 risk groups for non-life insurance and life insurance are shared but in any branch of insurance in addition to the four joint risks, additional risks may also be considered [21] It should be noted that formulas RBC in this system are designed so that a regulatory minimum level of capital risk-based legislates. The aim of this system is to take into account all the risks that either the asset or the liability on the balance sheet imposes to the insurance company.

There are five results for RBC calculations that by comparing the total of the modified capital to the risk-based capital, the authorized control level is determined. The level of risk-based capital requirements, are calculated and reported on an annual basis.

In an overview, the RBC calculation is that existing capital (total modified capital) with the capital needed to cover risks (authorized control level risk-based capital) is compared. For this purpose, all insurance risks that a company exposed to them, should be considered. Four steps are as follow:

- Determining the risk classes that insurance companies are exposed to (taking into account the dependencies between risks).

- Quantifying the risk classes and determining the amount of capital required for each class.

- Combining the capital required for each risk class and obtaining a RBC unit (taking into account the interdependence between risks).

- Comparing RBC (solvency capital requirements) with the total modified capital (available solvency margin) and the determining the appropriate supervisory actions.

Iran solvency monitoring system

The system monitors the financial solvency of Iran insurance institutions, approved by the High Council of Insurance in the form of Regulations No. 69 (method of determining and monitoring solvency of insurance companies) on 2/15/2014. This system is a risk-based system; Moreover, it has been set in accordance with the terms of the insurance market in the country, particularly with regard to the risk of insurance companies, the context of existing laws and regulations, the fields of insurance, available data and information, and the accounting standards in the insurance industry. According to this system, factors or risk constant factors and risk values (in advance by the supervisory authority center of central insurance) are calculated and, if necessary, updated and placed at the disposal of companies so that the values of different risks, be calculated.

Reference model for insurance companies in Iran, is a risk factor-based model. By multiplying the amount of exposure to risk (which are extracted from the financial statements) in the risk factors, and the integrating the obtained risk values, the risk of the insurance company can be achieved. The total risk, in fact, is the sum total of capital requirements or risk-based capital. Risk factors of different activities are estimated and measured. To determine the risk factors, the application of VaR models are used. Insurance risks include the risks in the liabilities and assets parts in the balance sheet.

Risks of the liability side of the balance sheet in Iranian insurance companies are mainly issuing risks of Common areas of insurance in accordance with the common classification include: fire, cargo, accidents, car (body, passenger, third party), life, health, ship, aircraft, engineering, money, etc., in accordance with regulations. Risks of the asset side of the balance sheet include liquidity and credit risks.

There are four categories of risk in the Iran solvency system: insurance risk, market risk, credit risk and liquidity risk.

Insurance risk (R₁)

This risk is calculated for each of the fields of insurance in the country. Insurance risk includes the risk of miscalculation the premium, the usual insurance risk, and the risk of concentrating only in some specific fields such as car or health insurance.

To calculate the risk coefficients referred to in Appendix 2 regulations, data of loss ratio in different fields (13 existing fields in accordance with the existing classification by the High Council of Insurance) in the years 1317-1388 published

by the Central Insurance of Iran, have been used. Value at risk of loss ratio (VaRLR) at a confidence level of 99% is the basis for calculating the insurance risk [19].

Market risk (R₂)

This risk is related to investing the assets. Here, the risk of the stock market and properties and real estate market risks are considered. To assess the equity portfolio risk of insurance companies, equity portfolio risk in the Tehran Stock Exchange is measured. In this regard, the Tehran Stock Exchange index data (TEPIX) in the 5-year period 1384-1389 is used. In order to estimate and predict the unexpected loss, a GARCH model is used. Before estimating the model, ARCH-LM test to detect the presence of autoregressive conditional heteroskedasticity variance has been implemented. The test results indicate that the time series data on the Tehran Stock Exchange index is an autoregressive conditional heteroskedasticity variance [19].

The housing price index data and index data of the properties and real estate rental value of Central Bank has been used to estimate the properties and real estate financial risk. In other words, the potential losses caused by the decline in real estate prices, using monthly data over the period 1380-1389 are estimated. Because the data is valid and stable and has not autoregressive conditional variance, the variance-simple covariance method is used to calculate VaR [19].

Credit risk (R₃)

Credit risk related to receivables from insurance companies in the country and their demands from outside the country. Receivables risk from abroad is calculated, for financial demands caused by reinsurance operations with foreign companies. The model used here is the credit at risk (CaR) means the value at risk (VaR) of the insurance fields. To calculate demands risk from the interior of the country, monthly data of exchanged documents in the bank clearing house in the period 1381-1388has been used in order to calculate the credit at risk [19].

Liquidity risk (R₄)

To measure liquidity risk, a regression model is used in which the proportion of cash (cash inventory divided by current liabilities) as the dependent variable (CFR) and economic growth (GR), inflation rate (INF) and the expenditure ratio of insurance companies to current assets (CR) as independent variables are considered. This model has Fixed Effects as well [19].

By applying the above models, the risk coefficients set forth in the Regulations (69) were estimated [19].

To calculate and asses of insurer solvency, the Risk Exposure monetary values (which vary from company to company) according to Tables 2 to 5 Regulations (69), (which are fixed for all companies) are multiplied in risk coefficients to calculate the amount of each of the above risks. Then the amount of above four risks (Notice that the risk of catastrophic accidents by the above definition lies in the insurance risk) are combined according to the following formula:

$$RBC = \sqrt{R1^2 + R2^2 + R3^2 + R4^2} \tag{1}$$

The result is the amount of required capital monetary that every company should have it given the amount of its risk. This amount is equivalent to the company's solvency ratio denominator. To calculate the solvency ratio of insurer the following formula is used:

Solvency ratio =
$$\frac{\text{available capital} \times 100}{\text{required capital}}$$
 (2)

The numerator is the amount of available capital, including acceptable assets plus the surplus of the day value compared to book value of assets minus the insurance institution debts.

Evaluation of surveillance systems on solvency

In this section, we compare and asses critically the solvency system of Europe union, America and Iran on the basis of 7 criteria introduced by Cummins and colleagues and also 4 criteria provided by Holzmuller.

Criterion 1

Getting the appropriate incentives

The RBC formula should provide incentives for weak companies to hold more capital and/or reduce their exposure to risk without significantly distorting the decisions of financially sound insurers.

In principle, Solvency II does satisfy Criterion 1. The standard approach to determine the SCR is in its main parts risk-sensitive - higher risk exposures lead to higher capital requirements. However, some risks are too complex to be addressed by a one-size-fits-all standard approach. Accordingly, the non-life and health underwriting risks are only included in the form of factor-based calculations using gross premiums (and claims expenditure) of the accounting year as variables. This simplification allows the inclusion of those risks in the standard approach, but it reduces the risksensitivity of the resulting capital requirement. The incentives based on these two risk categories thus do not satisfy Criterion 1, as higher premiums, and not necessarily higher risk exposures, lead to higher capital requirements [9]

The U.S. RBC framework fails to satisfy this criterion. On the contrary, it provides incentives to insurers to charge lower premiums, as this reduces their capital requirements. This dependency originates in the factor-based calculation of the underwriting risk charge, which uses premiums and reserves as volume indicators [11]. Cautious rate making thus results in higher capital requirements, although the company is, ceteris paribus, safer if it collects higher premiums. The same relationship holds with regard to the reserving practices of insurers. The RBC formula rewards insurers holding lower reserves – having a higher risk of insolvency – with relatively lower capital requirements. The calculation of the asset risk charge is, in contrast, at least partly in line with Criterion 1. The respective capital requirement is calculated as the product of the asset's balance sheet amount and a predefined risk factor. These risk factors reflect the risk associated with different asset classes - the risk factor for government bonds for example is 0, the one for shares is 0.2 [21].

In the current system in Iran considering that the insurance charge is calculated according to the premium so insurance companies can by setting a lower premium, show less required capital which shows that solvency system of Iran is poor in detection the breaking rate and non-compliance with the technical principles, because of low sensitivity towards premium quality.

Criterion 2

Formula should be risk-sensitive

The RBC formula should reflect the major types of risk that affect insurers and be sensitive to how these risks differ across insurers.

RBC requirements ought to be sensitive to how these risks differ across insurers. Risk- sensitivity reduces the extent of undesirable distortions and the likelihood of discrimination against certain segments of the industry, particularly against small insurers [7]. Most of RBC systems incorporate the main types of risks – market, credit and underwriting – which is in line with the first part of Criterion 2. However, the systems differ in how they recognize operational and catastrophe risk [21].

Operational risk is not explicitly considered within the U.S. RBC standards; instead, it is subsumed under business risk. Solvency II chooses a quantitative approach to account for operational risk. It applies a factor-based charge, using premiums and technical provisions as variables. Hence, none of the two approaches is truly sensitive towards operational risk. However, operational risk is, indeed, difficult to measure and it is thus questionable whether more sophisticated models would lead to a better recognition of this type of risk. A good solution might be a factor-based charge, similar to Solvency II, complemented with qualitative organizational requirements [21].

The two systems also differ in their treatment of catastrophe risk. The U.S. RBC formula does not cover catastrophe risk at all. Under Solvency II, catastrophe risk – extreme or exceptional events – is considered within underwriting risk.

The second aspect of Criterion 2 specifies that capital requirements be sensitive to how these risks differ across insurers. The U.S. RBC standards are for many risk categories not risk-sensitive, since the volume-based capital charges are independent of the riskiness of the business written by the insurer. Solvency II is generally more risk-sensitive. Limitations are the factor-based charges for operational risk, non-life and health underwriting risk. [12].

The third aspect of Criterion 2 is that RBC frameworks should not unfairly and inefficiently disadvantage small insurers [3]. Solvency II imposes high introductory costs on insurers and thereby the potential for discrimination. To counteract this possibility, Solvency II applies the principle of proportionality that aims to facilitate compliance for small and young insurers. Furthermore, the Solvency II offers a standard model that can be used to determine capital requirements in cases where the insurer's operations are relatively straightforward [12].

Solvency system is developed for Iran, can be said with regard to the lack of consideration of operational risk, and also because it is an operating system, and the second and third aspects of these criteria are not considered, it can be said that in this criterion will not be successful. Again, because of the lack separating the type and quality of risks, Iran's solvency is less successful in technology & risk assessment.

Criterion 3

Formula should be appropriately calibrated:

The RBC charges (or weights) for each major type of risk should be proportional to their impact on the overall risk of insolvency.

According to Criterion 3, solvency systems should reflect the impact of the individual risks on the overall risk of insolvency. This implies appropriate calibration of the respective solvency models. We thus examine the three systems as to whether they account for (1) the dependencies between the different risk categories, (2) the time horizon, and (3) the confidence level applied.

Owing to the fact that the U.S. framework does not operate on the stochastic nature and distribution of capital requirements, the third aspect is valid only for Solvency II. Under the U.S. system, the individual risk charges are aggregated by means of a covariance formula. This aggregation method follows Butsic [4] who argued that not all risks will occur simultaneously. The Solvency II aggregation method for the individual risks, as proposed by the European Commission, makes use of a square root formula. The formula contains predefined correlation coefficients that account for the dependencies between the risks [12].

All three systems identify capital requirements based on the risks the insurer faces within one year. This seems justified in the case of non-life insurers, who usually write annual contracts. However, considering, for example, the uncertain extent of incurred but unreported losses, or the potentially lengthy processes of claims settlement, a time horizon of one year might not be sufficient. Also, for life insurers a longer time horizon would possibly produce more reliable results.

Third, with regard to confidence level, Solvency II applies a value at risk on a confidence level of 99.5 percent. In light of the fact that higher confidence reduces the risk of insolvency but also imposes a higher capital burden on insurers and thus eventually increases policy prices, the choice of 99.5 per cent is in line with Criterion 3 [12].

From this perspective, the solvency system of Iran has not taken into account the dependency between different classes of risk. And the correlation or covariance in the proposed final formula for calculating RBC is not considered. In terms of the confidence interval, since the system is not based on possible frameworks and capital requirements distribution, therefore, the following criteria in this framework are ignored. The period considered, like other systems, is a year and does not comply with this criterion.

Criterion 4

Focus on the highest insolvency costs for the economy as a whole

Based on an analysis of approximately 200 insurance company failures, Cummins et al. find that the major part of insolvency costs is induced by a small number of large insurer insolvencies. Hence, the objective of reducing total insolvency costs for the economy as a whole can best be achieved through an increased regulatory focus on large insurers' solvency situations. With the capital requirements more dependent on company size than on an insurer's risk profile, the U.S. RBC system results in relatively higher capital requirements for large insurers. In light of the fact that most insolvency costs are induced by large insurance company failures, this would in principle appear to satisfy Criterion 4. However, the U.S. RBC requirements lack information about the insurer's actual risk profile, and thus do not allow the regulator to focus on the highest potential insolvency costs. In its main parts, the U.S. RBC standards are thus not in line with Criterion 4. This statement is backed up by the results of an empirical analysis on the relationship between property liability insurers' insolvency risk and their capital adequacy conducted by Cummins et al., who find that the solvency ratio used under the U.S. RBC framework is significantly less successful in predicting large insurers' insolvency than in predicting small insolvencies. In contrast to the U.S. RBC formula, Solvency II is not factor-based, but relies on probabilistic risk measures to identify the necessary capital requirements. Solvency II is based on the value at risk (VaR) [12].

Iran's solvency, according to the operating system of the system and non-use from contingency measures of risk, it can be said that this measure is not successful.

Criterion 5

Focus on economic values

According to Cummins et al. any solvency system that ignores the potentially large difference between balance sheet data and market values has only limited ability to assist regulators. Even though balance sheet data in the United States are considered to be relatively close to market values, the U.S. RBC standards have been criticised for their use of a factor-based approach applied to historic statutory values [21]; [13]. The framework is thus not designed to identify the true net worth and therefore does not satisfy Criterion 5. Cummins *et al.* define the true net worth as the difference between the economic values of the assets and the liabilities.

Solvency II satisfies Criterion 5. Calculation of capital requirements under Pillar I is based on an economic total balance sheet approach. This implicates the use of marketconsistent values of assets and liabilities, whenever possible. To reduce the administrative burden for insurance companies, an alignment of Solvency II with the International Financial Reporting Standards (IFRS) is intended. However, these standards are still works in progress and thus the use of market-consistent values is still not definite. Further areas of discussion relevant for Solvency II include accounting for discretionary bonuses within participating contracts and the role of the insurer's own credit standing within the valuation of insurance liabilities. Solvency II's ultimate compliance with Criterion 5 therefore still depends on the development of IFRS and the level of convergence between the two standards. [12]

Iran solvency's system, cannot get a passing grade in this criterion too, because it is based on the operating system and there is a potential possibility of misreporting potentially. However in recent years by updating regulations, the same procedures for determining the reserves are considered. Which largely exclude the possibility of providing false reports but still there are no certain procedures for deferred claims reserves which causes that the fulfillment of Criterion 6 in Iran is flawed.

Criterion 6

System should discourage misreporting

To the extent possible, the RBC system should discourage underreporting of loss reserves and other forms of manipulation by insurers [7].

The problem of potential misreporting is not explicitly mentioned in any of the solvency systems. Moreover, the stated goals of the regulatory frameworks do not touch upon this pitfall and instead focus their attention on policyholder security and market efficiency. Within a factor-based solvency framework, misstatements of financials can cause an equivalent reduction of capital requirements. The factor-based approach of the U.S. RBC standards thus does not encourage correct reporting and therefore does not satisfy Criterion 6. Under Solvency II, the SCR is not factor-based, which makes it less straightforward to use misreporting to lower capital requirements. However, as data inputs and estimation techniques within the standard and the internal models under Solvency II are subject to management discretion, potential misreporting is of relevance also under Solvency II. Accordingly, Solvency II does address, if only rudimentarily, the issue of potential manipulations by insurers within Pillar II, which contains, among other things, specifications on corporate governance, the supervisory review process and the empowerment of the supervisory authority [12].

Iran solvency monitoring system also can't access passing mark in this criterion because it is an agent-based system and there is the possible of misreporting potentially. However, in recent years, with updating regulations, the same procedures are intended to determine the reserves that greatly eliminate the possibility of false reporting and only there is not a certain procedure for deferred claims reserves. So this issue causes some troubles in implementing the criterion 6 in Iran. **Criterion 7**

Formula as simple as possible

The formula should avoid complexity that is of questionable value in increasing accuracy of risk measurement [7].

The solvency system should avoid complexity .The U.S RBC formula looks very simple at first glance, but some of the calculations of individual risk charges are complex and require long data histories – 10 years- for most risk charges [13]. In principle, Solvency II satisfies Criterion 7. The market-consistent valuation of assets and liabilities and the overarching value at risk concept do increase complexity compared to the Solvency I framework, but this increase is justified by the capital requirements becoming more risk-sensitive. As for Pillars II and III of the Solvency II framework – the qualitative requirements and the rules on public disclosure – it is not yet known if or how well they will satisfy Criterion 7. Only time will tell how the practical application of these pillars will affect the administrative burden of insurers [12].

Iran proposed procedure is very simple and is avoided from necessary complexities. That can cause incorrect calculation and thus increase the probability of bankruptcy.

Holzmuller has extended this framework with 4 other measures to enhance the accuracy of the analysis as below:

Criterion 1

Adequacy in economic crises and systemic risk

If all insurers use the same risk models, they will react similarly to external shocks in the capital or insurance markets. This can, in a worst case, again enforce the primary cause and thus induce systemic risk [16]. In addition, the principle-based approach of the Solvency II gives insurers more discretion than does a strict rules-based system. Thus, insurers apply a variety of models and the potential for systemic risk decreases [16]. The U.S. RBC formula, in contrast, may expose U.S. insurers to a high level of systemic risk and is therefore not in line with Criterion 1.

Criterion 2

Assessment of management

In an analysis of insurance company failures and nearmisses, the Sharma⁵ Report found that inexperienced management was at the root of most insurance company failures. Solvency systems should thus not solely rely on a quantitative assessment of the insurer's solvency level, but should encompass the full casual chain of insurance failures, including requirements for management team experience, early warning indicators and an emphasis on forward-looking information such as, for example, business plans [1]. The call to include management risk in solvency systems is not new. As early as 1997, Dickinson reported that management risk is omitted in the U.S. RBC formula, a situation that has not changed and thus the U.S. RBC system does not satisfy criterion 2. Solvency II rudimentarily addresses management risk in Pillar II, which details qualitative requirements and rules on supervision [12].

Iran solvency system also due to the lack of any qualitative element in order to assess risks; and only offering a quantitative procedure, is not consistent with this standard.

⁵ Sharma

Criterion 3

Flexibility of framework over time

History shows that solvency systems can live a long life before they are replaced or adjusted to changed market conditions. However, in light of how fast financial markets can change, this system longevity can result in major gaps within regulatory frameworks and to adverse effects on policyholder protection [12].

Although the geographic scope of the EU or the United States is more or less a given, it is within the power of the regulator to design the solvency framework itself as flexible as possible. A rather radical approach is implemented in New Zealand, which relies almost entirely on private rating agencies to regulate the insurance industry. Those private companies, such as A.M. Best and Standard & Poor's, have proven to be extremely adaptable to change circumstances due to their lack of external commitments and information supply duties [12].

According to this criterion, considering the article 5 of the regulation of Iranian insurance companies' solvency (risk factors are refined every two years and new coefficients are delivered), tried to have some flexibility. So it is plausible that from this perspective the Iranian system get a good score.

Criterion 4

Strengthening of risk management and market transparency

The last criterion focuses on the qualitative elements of supervision and evaluates whether the regulator promotes internal risk management and market discipline. The idea behind the latter is that transparent processes will require less regulation in the long run as market participants themselves force appropriate insurer behavior [23]. Solvency II views strengthening risk management as one of its main goals. This system thus provides a strong incentive for insurers to develop and apply internal models to determine capital requirements, which forces the insurers to focus on risk but the U.S. RBC system contains no provisions for assessing the adequacy, or even existence, of insurer risk management [12].

Solvency II satisfies Criterion4. It not only strengthens risk management but also fosters market transparency by requiring a public disclosure of the insurer's solvency and financial condition (Pillar III)⁶. The U.S. RBC standard does not require public disclosure and thus does not make use of market forces.

System for monitoring Iran's solvency not only does something in the field of risk management but also reports of solvency in terms of market transparency do not be given to public and only reported to the Supreme Council of Insurance.

In this section, with mention the bugs of the existing solvency in Iran we make some recommendations to improve the formula.

Bugs of solvency system of Iran insurance companies, in accordance with regulations 69

Assuming that the general framework of solvency systems in the advanced countries, including America, Germany, Switzerland and what the International Association of Insurance Supervisors recommend are advanced and desirable systems, comparing these systems with the existing system in Iran can reveal some of the shortcomings of the existing system in Iran. Obviously, the mere emulation from advanced systems is not desirable in any way and each

⁶ EC (2007 a)

country should design its target system to the terms and economic, social, informational and legal infrastructure. But the general principles of the system design must be observed. For example, in scientific terms it is clear that a solvency system should be designed based on risk and the correlation between risks should be included in the model. Otherwise, the model is scientifically flawed and is not related to the specific circumstances of each country. Adaptation of a model is not to ignore the correlation between different risks. Ignoring the correlation between different risks is to ignore the basic and scientific principles of designing the solvency system. Therefore, the indigenization should be distinguished from the scientific principles in designing the model. According to the above, the defects of the solvency current system, according to Regulations No. 69 are as follows:

1- The model does not reflect all risks of the insurance company. For example, operational risks and other risks are not included in the model. The model has been designed and acted the same for life insurance, reinsurance and non-life companies. That is, it does not consider the differences. However, this is due to the lack of separation of Companies in other laws and regulations. In fact, there is no life insurance company in Iran and procedures have been developed with the same consideration. Thus, this model is right now until the life insurance company to be established. Although separating the fields of life from non-life, largely makes up for this shortcoming. In other words, a company that operates exclusively in the field of life does not expose to any specific risk in the non-life fields. Thus, separating disciplines also means separating companies.

2- The system is based on fixed risk factors. Basically this feature is not a flaw. However, if large amounts of factors to be updated with a delay, it is an important flaw. In the existing system, constant factors are the risk representative. In practice, the risk is not constant over time and is a time-dependent variable.

3- Factors (risk coefficients) are the same for all companies. It means that the possibility of measuring risk using internal models is not installed in the system.

4- The relationships between risks are not included in the model to a large extent. According to the model, the total risk is the sum of the individual risks.

5- Related and complementary systems in other regulations still have not formed properly. Solvency systems are not supported by complementary systems such as: disclosure of information systems, reporting systems for all aspects of corporate governance, internal control systems, systems of assessment and risk management in companies, management of assets and liabilities, management reports and other complementary systems. For example, the requirement for monitoring solvency is an effective management of the risk control system in insurance companies and there are not strict rules in this regard and insurance companies in the country, do not feel it's vital importance and necessity yet [20]. However, in recent years, launching Snhab system, makes reporting systems for supervisory authority more accessible but it must be more comprehensive.

The proposed formula to amend the solvency formula used in Iran

Since the market risk has a significant effect on the continuity of the financial institution, so since 1998, regulators have considered the market risk in determining the level of the capital required in financial institutions. Some of the reasons that make the market risk measuring important are as follow:

1-Information Management: measuring the market risk provide information on the sources at risk that financial institutions have been established through commercial transactions. Then, the management can compare the amount of resources at risk with the capital of the financial institution.

2-Delimitation of activities: the market risk portfolio according to traders, can lead to reasonable and economic limits for each trader to be within the scope of their commercial activities.

3-Allocation of resources: by measuring the market risk, the efficiency of various fields of business can be compared with the corresponding market risk and in this way, areas that have the highest potential to earn returns in each unit of risk are identified and more capital and resources are directed to that.

4-Performance evaluation: Since market risk measuring results to determine the relationship between risk and return are traders, establishing the more logical rewarding system can be possible. In other words, the allocation of more bonuses to traders who through imposing high risk to financial institutions, have achieved high efficiency in comparison with traders who posed less risk but lower yields, is not correct.

5-Regulations: In setting current regulations of Central Bank America and International Settlements, the market risk is included in capital requirements [15].

Therefore, since the solvency existing model in Iran, does not reflect all the insurance companies risks, and given the importance of market risk and that in the formula, only two features stocks and real estate has been valued, so, in this section we are going to introduce market risk generally as one of the indices of determining the solvency and offer some changes in the market risk calculating formula.

Market risk

Market risk, or Value at Risk, Can be defined as the risk related to the uncertainty of a financial institution's trading portfolio income due to changes in market conditions Including market asset prices, interest rates, market volatility and market liquidity. The main types of market risk are as follows:

1- Interest rate risk: loss from interest rate fluctuations;

2- Currency risk: the loss from exchange rate fluctuations; the currency exchange rate risk results from the differences between the price of a common currency of a country and other currencies and it is created from uneven fluctuations of exchange rates.

3- Risk Ownership: loss from market value fluctuations of assets such as stocks, commodities, real estate, etc.

4- Baseline risk: loss from mismatch of the return volatility of different financial instruments that does not have the same credit quality, liquidity and maturity.

5- Concentration risk: loss from focus on investment in a geographical area or economic sector;

6- Off the balance sheet items risk: the loss from fluctuations in the value of the possible assets and liabilities such as swaps and other items that are not reflected on the balance sheet [15].

As mentioned in the measurement of market risk, both the debt and the asset side of the balance sheet are considered with the market real value. And overall market risk is the change in efficiency resulting from the general volatility of the market. Securities are exposed to market risk and although there are in the context of long-term investments and in the balance sheet assets column, but due to lack of allocation of risk coefficient to this factor separately, is not calculated in the formula of solvency. The basis for calculation is the duration bonds (or any other securities with fixed income) which is equal to the weighted average cash flow. Weight is the time interval tomaturity securities.

Also interest rate and exchange rate are from the most important factors of the market risk assessment that are ignored directly in solvency calculations and a coefficient has not been assigned to them while they have an undeniable impact on our revenues from our investments.

So considering these factors we change the existing formula for calculating the solvency system of Iran and recommend the following formula:

$$Solv^{MR} = \sqrt{Solv^{(equity)^2} + Solv^{(prop)^2} + Solv^{(forec)^2} + Solv^{(fix)^2} + Solv^{(interest)^2}}$$
(3)

 $Solv^{MR}$ = Market Risk

Solv (equity)= Solvency requirements with regard to investment in equity

Solv (prop) = Solvency requirements taking into account the investment of real estate

Solv (forex) = Solvency requirements by taking assets with foreign currency rate

Solv (interest) = Solvency requirements by taking into account interest rates

Solv (fix) = Solvency requirements with regard to the risk of fixed income securities

Brand Capital

Brand is the company's asset which adds the value of the final product. A strong brand strategy, creates value for shareholders, and also absorbs the elite. Research shows that strong brands can have great strategic benefits including the granting of discounts to loyal customers [2].

There are several beneficiaries in relation to capital such as customers, distribution channels, media and other beneficiaries, such as financial markets and analysts who are dependent on the type of property but in the end the customer is the most important element in the definition of the brand capital because his choices will determine the success or failure of the company or brand. Customer awareness about the brand, the observed differences and their effects on behavior and purchase decisions are within the capital of a brand. Knowledge and links connected to the brand leads to choices that have a direct impact on financial performance and shareholder value of the brand.

Although there is no standard model for calculating brand value and it is difficult to understand the values, financial metrics, measures the monetary value of a brand through various parameters. They include: stock market, added value that the brand commands, a brand's ability to generate revenue, the value of trade, the value of the life of a brand and a rate (the amount of) with that the brand fixes the growth rate. These measures will help the company to estimate the accurate financial value of the brand capital [5]. So it seems that importing this variable in the formula, has an effective role in determining the amount of solvency accurately and fair as well as increasing awareness of people from this feature among different insurance companies as the main criterion for selecting their insurer. In fact, the brand is an intangible asset that should be considered in wealth insurance companies because in critical condition, brand value can be effective in the success and saving of a company.

Conclusion and Suggestions

Ensuring the establishment of safety and solvency of insurance companies is the most important goal of the

prudential supervision in this field. Assuming that the general framework of solvency systems in the advanced countries, are favourable and advanced systems, comparing these systems with the existing system in Iran can reveal some of the shortcomings in this matter. Therefore, in view of the conditions and legal, social and economic infrastructures, the application of scientific principles in designing the system can be fruitful. In the meantime, according to the insurance industry's future prospects and issues such as the liberalization of the insurance industry and the central insurance requirements based on insurance industry reform plan in order to develop and deploy a system of financial supervision, this regulatory body has developed a system for this purpose and through regulations, (69) it has been notified. In this paper, we therefore decided to examine the efficiency of the system and, if necessary, make recommendations to resolve the possible defects in the formula.

So by comparing the solvency system of Iran with the Europe and America's and - on the basis of 7 criteria introduced by Cummins .et al and the 4 criteria provided by Holzmuller - we concluded that the system developed in Iran is not stronger than other systems almost in none of these criteria. Considering the multiple problems in the system and because the existing system does not reflect all risks of insurance companies, and given the importance of market risk, and that in the formula, only the stock and real estate have been considered, so we present the proposed changes in the formula for calculating the market risk. In the end, considering the importance of brand value as an intangible asset that has an undeniable impact on the calculation of solvency of the corporation, the proposal to consider this variable was included in the formula.

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