

Full Length Research Paper

Evaluation of countries solution against the U.S economics crisis through a multiple attribute decision model (MADM)

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U.S economics crisis have occurred since 2007. It is the important crisis after the great depression of 1930's. The countries in our global village have relationships together. They can become impressive or neutral in case of this crisis. It definitely depends on their policies and decisions. In this paper, we evaluate some chosen solutions in front of U.S economic crisis using a multi attributes decision model named analytic hierarchy process method in accordance to three alternatives as the developed, developing and underdeveloped countries. The results showed the efficiency of this decision making model in these crisis.

Key words: U.S economic crisis, countries solutions, analytic hierarchy process (AHP) method.

INTRODUCTION

Nowadays, crises problem is a pretty important issue for many countries (Naderi, 2003). A crisis is any event that is, or expected to lead to, an unstable and dangerous situation affecting an individual, group, community or whole society. Crises are deemed to be negative changes in the security, economic, political, societal or environmental affairs, especially when they occur abruptly, with little or no warning. More loosely, it is a term meaning 'a testing time' or an 'emergency event'. An economic crisis is a sharp transition to a recession like 1994 economic crisis in Mexico, Argentine economic crisis (1999-2002), South American economic crisis of 2002, Economic crisis of Cameroon and so on. When this kind of crisis takes place in countries, they find and do some applicable and reactive (respond to the crises properly) (Ameriyoun 2009) solutions in separate or mixed modes (Malekshahi and Mardani, 2009). Other unimpressionable countries make proactive solutions in front of economic crisis. In other words, they used this approach to defeat the possibility of incoming crisis; for instance, they can use an Early Warning model (Kaminsky and Reinhart, 1996; Kaminsky et al., 1999; Berg and Pattillo, 1999a; Edison, 2000; Bussiere and Fratzschere, 2002, Abou, 2006). Despite the diversity of their nature, all crises have a few features in common such as the paucity of time for decision-making and the

too much pressure they exert in that limited period of time (Rahpeik, 2009). Selection of these solutions needs a significant decision making model (DMM). One of the most well known models of DMM is analytic hierarchy process (AHP). The aim of this paper is evaluation of countries solutions in front of the global economic crisis through AHP method. The framework of this paper is as follows: first we define economic crisis and AHP method, after that we present our methodology and eventually we investigate the achieved results.

EMPIRICAL RESEARCHES

There are many studies and researches about crises in the whole world. We present some of the new ones here. Erfani (2007) used the Markov-Switching method with quarterly 2004 data, an Early Warning System for Iran. His estimates showed that if the Iranian economy is in tranquil state at time t , it will be in tranquil state at time $t+1$ with a probability of 0.73. And if it is in crisis at time t , it will return to tranquil state at time $t+1$ with a probability of 0.87. Abu nouri and Erfani (2008) estimated an early warning model for OPEC countries with monthly data for 1989 to 2004 using the Markov-Switching methods. The results have indicated that probability of liquidity crisis

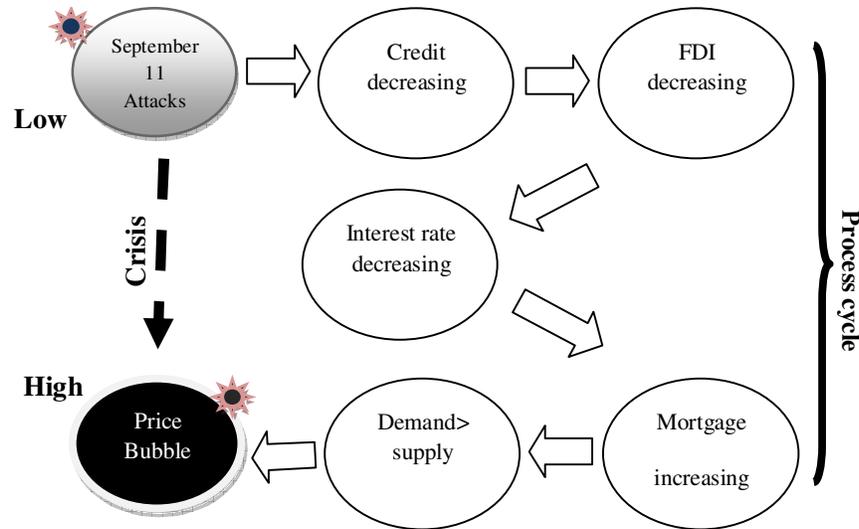


Figure 1. The U.S. ECC.

within OPEC, 12 months after the sample period (after September, 2004) includes: Indonesia about 93%, Algeria 81%, Venezuela 71%, Iran 68%, Kuwait 67%, Libya 65%, Nigeria 56%, Saudi Arabia 55% and no crisis in Qatar and United Arab Emirate. Miremadi (2008) in his research attempted to determine the reasons and consequences of the 2008 Financial Crisis in the light of Schumpeter-Freeman-Perez Theory. This analysis showed how the theory of technological successive revolutions and techno-economic theoretical framework could help the technological policy making. Ameryion et al. (2009) accessed the comments made by the managers through using a standard questionnaire whose reliability and validity was approved. The managers' comments indicated that more than half of the managers knew crises very well; however, could not respond to the crises properly. Shirazi (2010) studied the impact of the change in the income of Iran's main trading partners on exports of various groups of commodities. They evaluated the impact of the global financial crisis on exports of various groups of exportable goods using fuzzy logic.

DEFINITIONS

U.S economics crisis

This crisis started in 2007 in U.S and it has dramatically extended globally. The most important factors of this crisis were C-L-T that is capital, liquidity and trust. First of all it was born in home markets in U.S and through the mortgage loans. We can show the U.S Economics crisis cycle (ECC) as shown in Figure 1. As it can be seen that this crisis was generated by September 11 of 2001 in

U.S, it grew and flourished through a process in the mortgage loan system and has appeared obviously since 2011 till now.

Analytic hierarchy process

The analytic hierarchy process (AHP) is a structured technique for dealing with complex decisions that was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then. In many cases of the real world, we should measure to solve the problems, not count to do it. For measuring in this method, the individual tacit and explicit knowledge and experiences are used. This method is subsection of a series as shown in Figure 2.

The first step in the analytic hierarchy process is to model the problem as a hierarchy. In doing this, participants explore the aspects of the problem at levels from general to detailed, then express it in the multileveled way that the AHP requires. As they work to build the hierarchy, they increase their understanding of the problem, of its context, and of each other's thoughts and feelings about both (Saaty, 2008). The framework consists of an overall goal, a group of options or alternatives for reaching the goal, and a group of factors or criteria that relate the alternatives to the goal.

Once the hierarchy is built, the decision makers systematically evaluate its various elements by comparing them to one another two at a time, with respect to their impact on an element above them in the hierarchy. In making the comparisons (in according to Figure 3), the decision makers can use concrete data about the elements, or they can use their judgments about the elements' relative meaning and importance. It

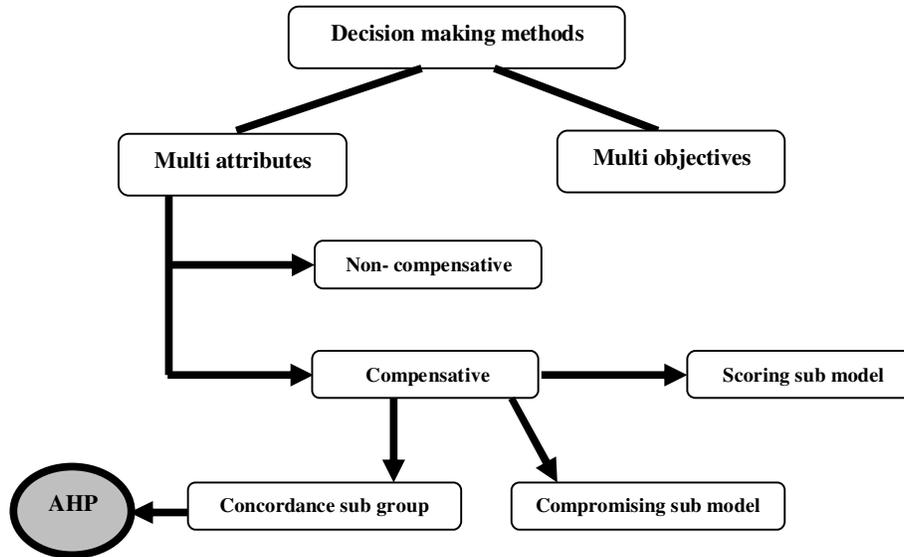


Figure 2. The AHP place in DMM.

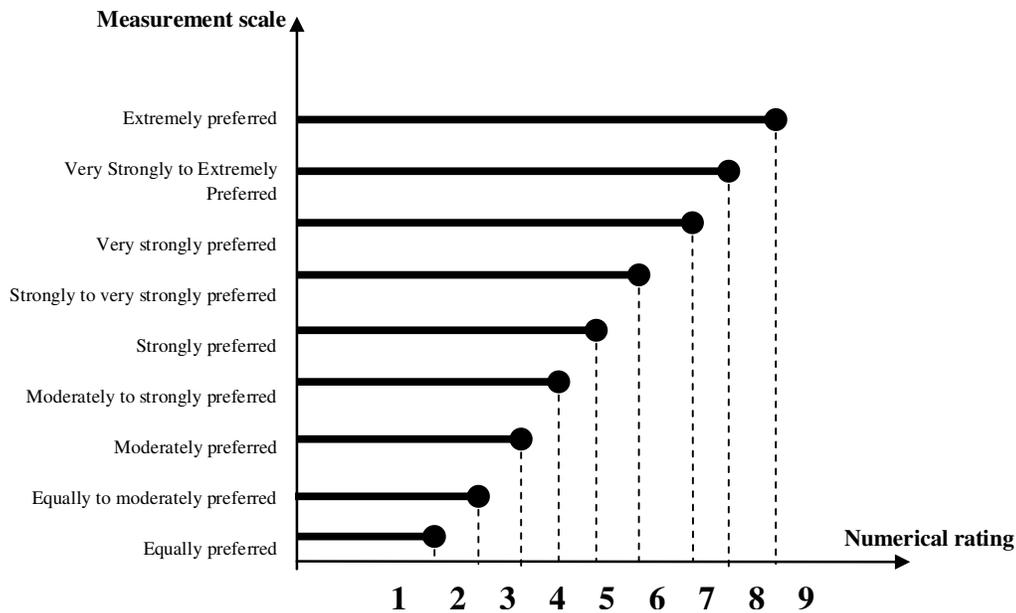


Figure 3. The weight spectrum in relation to AHP method.

is the essence of the AHP that human judgments, and not just the underlying information that can be used in performing the evaluations (Saaty, 2006: 8). Based on pair wise comparison judgments, AHP integrates both criteria importance and alternative preference measures in to a single overall score for ranking decision alternatives. Finally priority synthesis computes a composite weight for each alternative, based on preferences identified weighting changes can affect the changes of ranks of alternatives. The consistency of the result is

measured using a consistency ratio (CR). In summary, we can show the AHP method in six levels, listed as follows (Rasoulinezhad 2009):

- a. Choosing goal
- b. Designing hierarchical structure
- c. Pair wise comparison
- d. Relative weight stimulation through Eigen value
- e. Calculate final weight through relative weight stimulation

Table 1. Clusters and factors of AHP model.

Cluster	Regional solution	Special policies solution	Local solution
Factor	- Regional agreements (RAs)	- Monetary policy	- Job Enrichment
	- Intra regional trade facilities	- Fiscal policy	- Crisis management
	- Improving regional insurance company	- Out and In sourcing	- Precaution alert system (PAS)
	- Establish co-investment fund	- Credit scoring	- Support local industries
	- Unique currency	- Protectionist policies	- Futurology
	- International organizations assistance	- Market Control	- Review current regulations
	- Confrontational index	- Engagement method	- Equity in development growth
	- Diplomatic process	- Integrated Policies	- Balancing model
	- Reforming the financial systems	- Knowledge based polices	- Improving entrepreneurs
	- Regional sharing experiences	- Transparency and supervision increasing	- Islamic finance system
		- Systematic solution	
		- Insuring aggregate risk	
		- Proactive strategies	

f. Consistency and sensitivity test

RESEARCH METHODOLOGY

This paper tries to evaluate countries solutions in front of global economic crisis via a decision making model named AHP. The research methodology in different sections of this paper is as follows.

Achieving the existing data about global economic crisis

We use documentation method which extracts data and information from World Wide Web, Journals, Newspaper and Books.

Choosing evaluation factors of global economic crisis

In our study, 33 factors in three clusters are picked up as shown in Table 1. We choose these factors in accordance to previous studies (Gharavi, 2002; Abu nouri, 2006; Mirdamadi, 2007; Mosalanezhad, 2008; Saei and Khezri, 2009; Vaezi, 2009; Tehrani, 2010; Mousavi, 2010; Ghadimi, 2010), document and counsel with economist and management strategic experts as well.

The Delphi method is used to determine the coefficients of evaluation criteria

In this paper, we use expert sampling and the questionnaire was given to economist and strategic management experts (that conclude ten economists and ten strategic managers) in January of 2011 to weight these factors and clusters.

Data analysis

All the analyses have been done using Expert Choice (11) software. This software is used for decision making analysis.

EVALUATING SOLUTIONS

In this part, we try to evaluate countries solutions in front of global economic crisis using the AHP method as a good and significant evaluating method. The steps are as follows:

Step 1: The first step to select the best solutions due to the alternatives is to formulate a hierarchy. The first level of the hierarchy is used to define the overall goal, which is to identify the best solution to provide the most action in front of crisis. The second level of the hierarchy is to determine the evaluation criteria (clusters and factors). The third level of the hierarchy is used to identify alternatives. There are 3 alternative in our research (the developed countries, the developing countries and the under developed countries). The hierarchy tree is designed as shown in Figure 4.

Step 2: The second step is to elicit pair wise comparison judgments. After arranging the evaluation criteria in to a matrix, judgments about their relative importance with respect to the overall goal are elicited by asking questions that compare one criterion with another. The pair wise judgments are elicited from the experts' mind. Indeed, it is a principle in the AHP method that the judgments expressed in the form of comparisons are filled out by the experts. The pair wise comparison matrices are constructed for all 3 cluster and 33 criteria.

Step 3: In this step, the pair wise comparisons are ranked. To this purpose, we normalized all achieved matrices in Step 2 through the linear method. The levels in this method are:

- Calculate summation of each column in pair wise comparison matrix
- Divide column elements on summation of that column
- Obtain a vector of priorities showing the relative weight

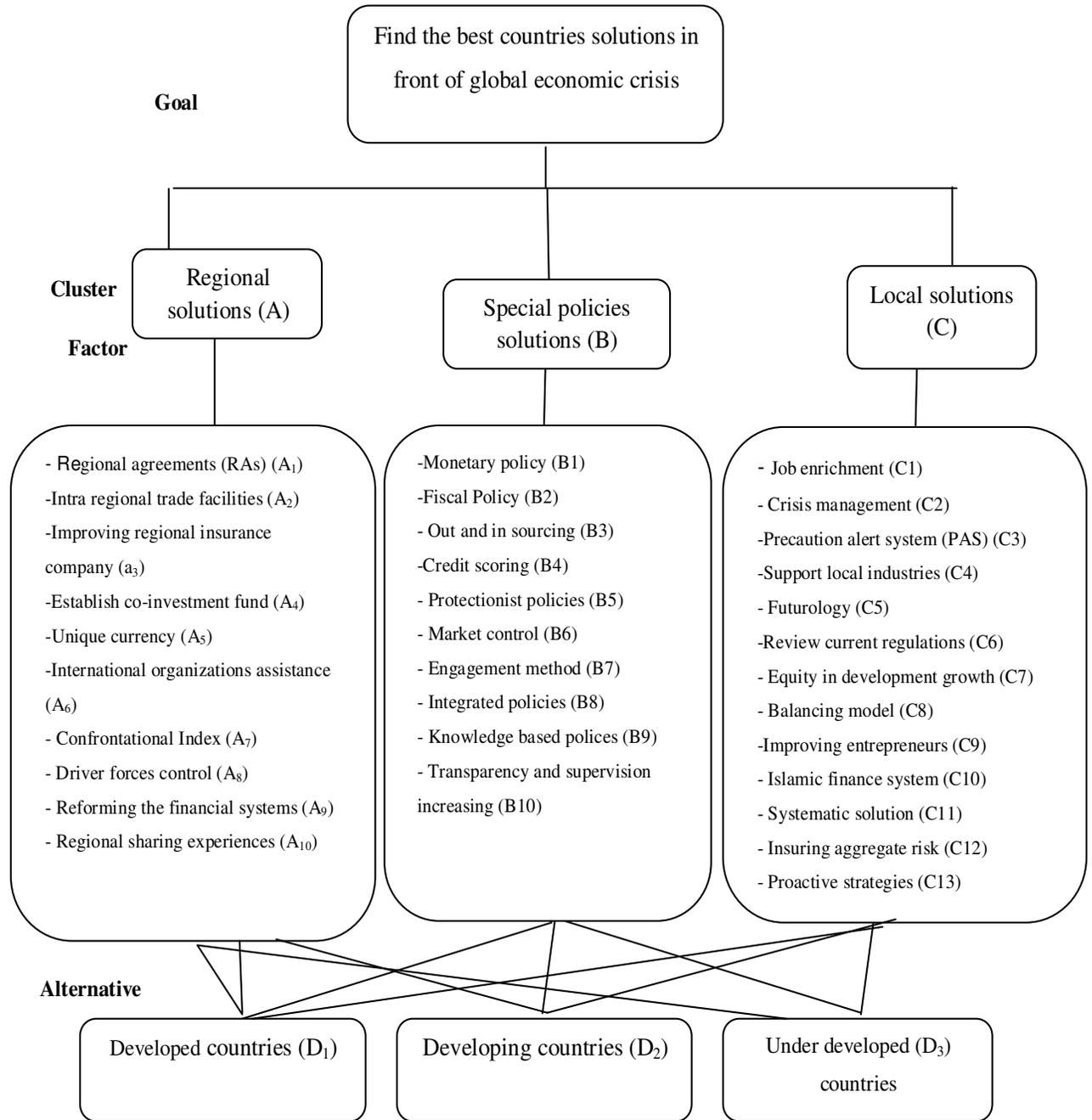


Figure 4. Hierarchy framework.

of criteria.

The calculated weights for each criterion are shown in Table 2.

Step 4: Consistency ratio (CRT) test. Saaty said:

“Consistency is essential in human thinking because it enables us to order the world according to dominance. It is a necessary condition for thinking about the world in a scientific way, but it is not sufficient because a mentally

about a world that does not exist” (Saaty, 2008).

In the AHP method, we gain a Consistency Rate (CR) through the Consistency Index (CI). The consistency index (Table 3) of a matrix of comparisons is given by $CI = (\lambda_{max} - n) / (n - 1)$.

The CR is obtained by comparing the appropriate one of the following set of numbers in Table 4, each of which is an average random consistency index (RI) derived from a sample of randomly generated reciprocal matrices if RI is

Table 2. The calculated weights for each criterion.

Criterion	Weight
A ₁	0.271
A ₂	0.217
A ₃	0.198
A ₄	0.250
A ₅	0.312
A ₆	0.412
A ₇	0.391
A ₈	0.158
A ₉	0.226
A ₁₀	0.104
B ₁	0.270
B ₂	0.447
B ₃	0.165
B ₄	0.411
B ₅	0.263
B ₆	0.314
B ₇	0.198
B ₈	0.336
B ₉	0.131
B ₁₀	0.170
C ₁	0.267
C ₂	0.361
C ₃	0.220
C ₄	0.178
C ₅	0.401
C ₆	0.311
C ₇	0.157
C ₈	0.286
C ₉	0.215
C ₁₀	0.329
C ₁₁	0.202
C ₁₂	0.151
C ₁₃	0.343
A	0.178
B	0.265
C	0.183

Table 3. Average random consistency index.

n	3	4	5	6	7	8	9	10	11	12	13	14
RI	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.19	1.51	1.48	1.56	1.57

$$CR = \frac{CI}{RI}$$

If RI is not less than 0.1, study the problem and revise the judgments. The pair wise comparison matrix procedure

which was done for criteria should be made for the alternatives in the systematic approach. The results of consistency ratio test for pair wise comparison matrices are shown in Table 4. Since the CR is less than 0.1 for

Table 4. The consistency ratio.

Criterion	CR
A ₁	0.00
A ₂	0.02
A ₃	0.07
A ₄	0.05
A ₅	0.01
A ₆	0.00
A ₇	0.08
A ₈	0.06
A ₉	0.09
A ₁₀	0.05
B ₁	0.00
B ₂	0.00
B ₃	0.05
B ₄	0.04
B ₅	0.09
B ₆	0.00
B ₇	0.07
B ₈	0.01
B ₉	0.03
B ₁₀	0.02
C ₁	0.09
C ₂	0.06
C ₃	0.08
C ₄	0.05
C ₅	0.04
C ₆	0.01
C ₇	0.00
C ₈	0.08
C ₉	0.06
C ₁₀	0.01
C ₁₁	0.09
C ₁₂	0.05
C ₁₃	0.02

all alternatives, the truth of the judgments is accepted

CONCLUSIONS AND RECOMMENDATIONS

By applying the AHP method, this paper investigated the rank of best country solutions during the global economic crisis. The criteria for our analysis are classified into three clusters as special policies solutions (B), local solutions (C) and regional solutions (A).

This study had some limitations that should be revisited in future studies. First, the base reason is different from one crisis to another. But we investigated these crises aggregately. Second, this paper did not include any opinion of the people. It is better that in future studies the opinions of people apply for analysis. Third, since the

study is based on the AHP method, measurement instruments for each criterion were not developed. Future studies using different statistical methods, like regression, to develop the instruments are recommended.

Despite the limitations, the analysis showed several interesting results. First of all, the study found that the rank of assorted solutions as special policies solutions (B), local solutions (C) and regional solutions (A). So the most important solution against global economic crisis is doing as special policies and activities. Furthermore, this paper showed the importance of each factor in each kind of country (Table 5). Meanwhile, the results represent that the effects of U.S global crisis have been more in the developed countries, the developing and under developed nations. So we can have a knowledge based results shown in Figure 5.

Table 5. The importance of each factor in each kind of country.

Country	Developed	Developing	Under developed
	B ₈	B ₉	C ₃
	C ₁₃	C ₈	B ₉
	A ₄	B ₄	A ₇
	B ₁₀	B ₇	C ₁₂
	C ₅	C ₃	A ₂
	C ₃	A ₁	C ₈
	A ₁	B ₃	C ₉
	B ₂	C ₅	C ₁₃
	C ₁₁	C ₂	B ₂
	A ₃	A ₃	A ₁
	A ₅	C ₁₃	B ₁₀
	C ₁	B ₁₀	A ₆
	B ₁	C ₆	B ₅
	A ₂	A ₈	C ₅
	A ₆	C ₁₀	C ₇
	B ₉	B ₆	A ₈
	C ₄	A ₇	C ₆
	A ₉	C ₁	B ₆
	C ₂	B ₈	A ₉
	B ₅	A ₉	B ₄
	C ₁₀	C ₁₂	C ₁
	B ₆	B ₁	B ₃
	A ₁₀	A ₄	A ₉
	C ₆	A ₅	A ₄
	C ₇	C ₇	C ₂
	A ₈	B ₂	B ₇
	B ₇	A ₆	C ₁₀
	C ₉	C ₄	A ₁₀
	A ₇	B ₅	C ₄
	B ₄	C ₁₁	B ₁
	C ₁₂	A ₁₀	A ₃
	C ₈	A ₂	C ₁₁
	B ₃	C ₉	A ₁₀

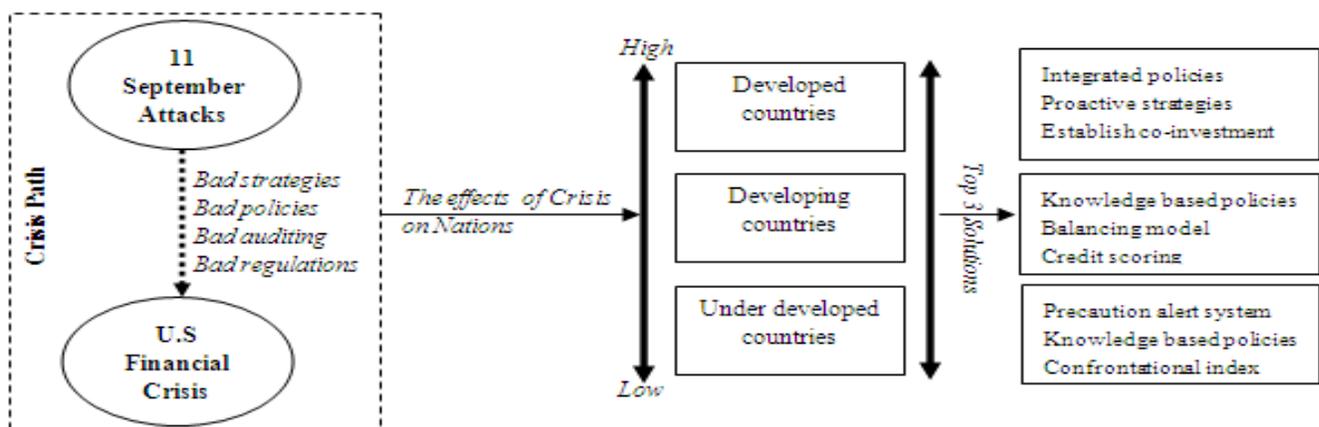


Figure 5. The model of U.S global crisis and nations.

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