

## **A New Framework for Hegemonic Analysis of Monetary Policy: The Case of Iran**

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### **Abstract**

Monetary policy rule might be helpful to avoid the problem of time inconsistency provided there is a commitment to the rule. The commitment is the ability of a government to bind future policies. However, it doesn't include intrinsic motivations. Therefore, hegemony, which includes both intrinsic and extrinsic motivations, better solves the problem of time inconsistency. In this paper, we explain the nature of hegemony and discuss why hegemony is preferred to commitment. We have used an index of hegemony to evaluate monetary policy and estimate the hegemony of Supervisory Packages on Monetary Policy (SPMP) of Islamic Republic of Iran for the period 2008-2011 by using fuzzy logic. The results show that an optimal hegemonic policy is better than the optimal commitment policy if and only if adjusted total effect of intrinsic motivation on an agreed-upon social objective function is positive. The results show that the hegemony index of central bank which consists of a combination of three sub-indexes such as "regional equity", "commitment ordering" and "diversity of economic activities" is relatively low and needs to be increased to ensure economic stability.

**Keywords:** Iran, Hegemony, Commitment, Monetary Policy, Fuzzy Logic.

**Jel Classification:**E52, E61,C51,C61.

### **1. Introduction**

"Time inconsistency affects economy's transition through time and shows how it influences policymakers' ability to stabilize inflation" (Dennis 2003, p. 3).

The idea of time inconsistency of a policy was first introduced by Kydland and Prescott (1977), the 2004 noble laureates of economics. They developed the idea of Lucas' rational expectations in a framework of dynamic games between policy maker (planner) and public and showed that a policy that at the beginning of time  $t$  is optimal, may not be optimal at the end of time  $t$ .

On the other hand, the problem of time inconsistency "arises when a decision maker, especially a policy maker, prefers one policy in advance but a different one when the time to implement arrives." The reason for the existence of time inconsistency is the conflict of interest between planner (or government) and private economic agents. In a dynamic economy, private behavior depends on the expectations of future economic policy. So, if a planner acts without the rule and acts discretionary policy, there is no specific form for formation of agents' expectations about future policy and economic equilibrium is incomplete. Therefore, private agents cannot decide now because of the uncertainty of the future policy. But if a planner sets a rule, private agents can now decide, because the future is not uncertain (Tabellini, 2005, p. 204).

Although a rule may avoid the problem of time inconsistency, a rule must be binding. Indeed, the problem is, therefore, the condition in which there is non-commitment or non-binding.

"Commitment means that the government abandons control over certain policy options in order to credibly communicate to its subjects that policy is not going to be changed in the future" (Mersch, 2006, p.1). Indeed, commitment is the ability of a government to bind future policy choices (Golosov and Tsyvinski, 2006, p. 1). Commitment depends on the predominance of a benevolent planner over the public. The main reason for the predominance of a benevolent planner is the assumption of domination. But domination at last may be a necessary condition for commitment and definitely is not sufficient. Why is commitment not sufficient? Because it only relays on extrinsic motivations. In a framework of motivational theories, motivation comes from two sources: oneself, and other people. These two sources would cover all major motivational theories such as self-determination, self-control, incentive,

drive-reduction, cognitive dissonance, etc. In intrinsic motivation the factor for motivation is endogenous but in extrinsic motivation, the factor of motivation is exogenous. Extrinsic motivation has a positive effect on short run utility function of economic agents but intrinsic motivation has a long run effect (Kreps, 1997, pp. 359-60). Power of a benevolent planner would be an extrinsic motivation which may not stand for long time. Therefore we also need intrinsic motivations. There are some studies such as Hertel et al. (2003) and Lakhani and Wolf (2003) that find intrinsic motives are the most important reason for programmer's enthusiastic commitment to OSS (open source software projects). Furthermore, Frey (1997, 2002a, 2002b) shows that monetary incentives (i.e. extrinsic motivation) will crowd out intrinsic motivation. Regardless of which motivation would be preferable to the other, it is important that almost near optimal commitment in economic policy would include the proper share of both intrinsic and extrinsic economic motivations. So, sufficient condition would rely on the intrinsic motivations. Indeed any benevolent planner needs to make a suitable relationship between planner and public while designing and implementing the rules with fair bargaining and negotiation. In this way, not only the planner would be dominant but also would be in a position of leadership, because the planner considers both intrinsic and extrinsic motivation to combine force and consent, which is called hegemony by Antonio Gramsci in the 19th century. Therefore, hegemony of a monetary policy maker would be a measure to see the ability of the planner for applying the rule or discretion policies. High hegemony has the capability to implement the rule but low hegemony may be suitable for implementing discretion policy. Since discretion policies (the selection of that decision which is best, given the current situation and a correct evaluation of the end of-period position) are suitable for a short run, commitment for short run needs low hegemony, but for mid and long run, rule (the selection of that decision which is best, given the current situation and a correct evaluation of the end of-next period positions) high hegemony is needed. Since a rule would avoid the problem of time inconsistency, the degree of a hegemony would be a proxy to see the ability of monetary authority to avoid the problem of time inconsistency.

The contribution of this paper is constructing both theoretical and empirical models of hegemonic analysis of monetary policy. The

research has used fuzzy method and the hegemony of SPMP for the period 2008-2011 has been computed.

The paper consists of the following sections. After the introduction, in section two, the term of hegemony is defined. In section three, we introduce new hegemony index of monetary policy and compute the hegemony of Monetary and Credit Packages of the central bank for the period 2008-2011. Section four is the conclusion.

## **2. Hegemony Better Than Commitment**

Antonio Gramsci describes hegemony first, as "a relation, not of domination by means of force, but of consent by means of political and ideological leadership". But later on he introduces hegemony as a combination of force and consent. Hegemony is an indirect form of imperial dominance in which hegemony (leader state) rules sub-ordinate states by implementing power rather than direct military force (Beyer, 2008, p. 17).

### **2.1-Hegemony Nature Within Political School of Thought**

Hegemony has become a popular term in the social science. A research of the Social Science Citation Index on this word yielded more than one thousand articles from the last twenty years. Research on hegemony can be divided into two major schools of thought: the realist school and the systemic school. Each school can be further sub-divided. Two dominant theories have emerged from each school. "Theory of hegemonic stability," introduced by Robert Keohane at first (Gilpin, 1987). Long Cycle Theory, espoused by George Modelski, and World Systems Theory, espoused by Immanuel Wallerstein, have emerged as the two dominant approaches to the systemic school of thought. (Boswell and Sweat, 1991, pp. 123-49).

#### **2-1-1-Realist School**

There are two major theories in realist school of thought: Theory of hegemonic stability and Power Transition Theory. Hegemonic Stability Theory (HST) is a theory of international relations. Rooted in research from the fields of political science, economics, and history, HST indicates that the international system is more likely to remain stable when a single nation-state is the dominant world power, or hegemonic (Goldstein, 2005, p. 107). Charles P. Kindleberger is one of

the scholars most closely associated with Hegemony Stability Theory (HST), and is even regarded by some as the father of HST. Kindleberger (1973) argued, in his book, *The World in Depression: 1929-1939*, that the economic chaos between world war I and world war II that led to the Great Depression, can be blamed in part on the lack of a world leader with a dominant economy (Milner, 1998, pp.112-23).

The Power transition theory is a theory about the cyclical nature of war related to the power in international relations. The principal predictive power of the theory is in the likelihood of war and the stability of alliances. An even distribution of political, economic, and military capabilities between contending groups of states is likely to increase the probability of war (Organski 1980, p.19).

### **2-1-2- The Systemic School of Thought**

Systemic school defines hegemony "as a single power's possession of 'simultaneous superior economic efficiency in production, trade and finance.'" Furthermore, a hegemony's superior position is considered the logical consequence of superior geography, technological innovation, ideology, superior resources, and other factors (McCormick, 1990). As it was mentioned there are two major theories: long cycle and World Systems Theory. George Modelski, who presented his ideas in the book, *Long Cycles in World Politics* (1987), is the chief architect of long cycle theory. Long cycle theory describes the connection between war cycles, economic supremacy, and the political aspects of world leadership.

World-system theory traces emerged in the 1970s. Its roots can be found in sociology, but it has developed into a highly interdisciplinary field. Wallerstein predicts that capitalism will be replaced by a socialist economy. He offers several definitions of World-system analysis in 1974 and 1987.

The latest definition is that World-system analysis argues that there have been thus far only two varieties of world-systems: world-economies and world empires. A world-empire (examples, the Roman Empire, Han China) are large bureaucratic structures with a single political center and an axial division of labor, but multiple cultures. A world-economy is a large axial division of labor with multiple political centers and multiple cultures" (Wallerstein, 2004, p.20).

Wallerstein characterizes the world system as a set of mechanisms which redistributes resources from the periphery to the core. In his

terminology, the core is the developed, industrialized part of the world, and the periphery is the "underdeveloped", typically raw materials-exporting, poor part of the world; the market being the means by which the core exploits the periphery. Although discussion on the hegemony is not limited to the above brief survey, we summarize three required for a term of hegemony attributes according to Ferraro (1996) and Modelski (1978). Firstly, it is that a hegemony affects growing economy. This is one reason many scholars, policy makers, and analysts think. Secondly, a dominant economy is not generally enough. Usually, at least one leading economic or technological sector is necessary. Lastly, a hegemony must have political strength, the ability to forge new international laws, rules and regularities (Modelski, 1998).

### **2-2-Hegemony as a Combination of Intrinsic and Extrinsic Motivations**

Akerlof (2007) believes in independence of consumption and current income (given wealth); the independency of investment and finance decisions (the Modigliani-Miller theorem); inflation stability only at the natural rate of unemployment; the ineffectiveness of macro stabilization policy with rational expectations; and Ricardian equivalence. However, each of these surprise results occurs because of missing motivations.

There are two kinds of motivations: extrinsic motivation and intrinsic motivation. Indeed, in order to obtain ultimate goals of macroeconomics such as economic stability, a policy would consider motivations of a society for both planner and public. A hegemonic planner is not only dominant but also has a leading status. This means that a policy should consider extrinsic and intrinsic motivation of each society either for planner or public.

The term of hegemony is formed as the monetary hegemony in monetary economics, by Michael Hudson's *Super Imperialism*, which was first published in 1972. Monetary Hegemony describes not only the asymmetrical relationship that the US dollar has to the global economy, but the strictures of this hegemonic edifice that support it, namely the International Monetary Fund and the World Bank. According to conventional Monetary hegemony definition, it is an economic and political phenomenon in which a single state has decisive influence over the functions of the international monetary system. Historical changes in IMF and World Bank from 1970 up to now, show that monetary policy

system and rules need renewable approach to design their rules. An alternative view to hegemony would be a good substitution.

Casario and Dadkhah (1998) provide a general framework for policy evaluation based on fuzzy logic for evaluation of Progress Toward European Monetary Union. They use fuzzy analysis to assess the degree to which each goal is attained, to evaluate the performance of different countries, and to determine the overall progress of the EU in meeting the Maastricht criteria. The European Union (EU) has three choices, to abandon the idea of EMU and opt for independent national monetary policy for each member, to venture the unknown by adopting the EMU regardless of the conditions of its members, or to measure and monitor the fulfillment of EMU preconditions carefully and take the final step when there is a consensus that convergence is reasonably attained. The paper is a contribution to a systematic quantification and measurement of the fulfillment of the EMU preconditions by fuzzy logic.

Vaez Barzani and Bastanifar (2010), analyzed the monetary hegemony of Islamic Republic of Iran by using fuzzy logic during the period 2008 to 2010. The results show that, although the hegemony has been increased yet it is low and would be increased.

Montes and Nicolay (2012) use fuzzy methods for computation of central bank communication in Brazil. This study contributes to the literature in the following aspects: analyzes the influence of central bank communication on inflation expectations, and develops a new index of central bank communication based on the fuzzy set theory. Their findings suggest that the expectations of the agents react according to the content of the information provided by the central: announcements cause deterioration of expectations in times of instability, and reduce inflation expectations when inflation is controlled

Lupu and Rotundu (2012) analyzed the financial implications of monetary redistribution of economic power centers, following the EU enlargement and consolidation, the assertion of strong emerging economies such as those of China, India and Brazil. The evolution of the global economy in the last two decades shows that the American economic hegemony is completely virtual. The events of recent years in the financial world reveal that the classic economic model based on the over-evaluation of the self-regulating capacity of the market is not sufficiently reliable. They show that transformation of emerging powers led to a redistribution of the global decision centers as well as changing

the positions currently held by some powerful countries in the monetary and international financial organizations (IMF, World Bank etc.), U.S. Western European countries currently holding up a privileged status within these organizations.

Night (2013) analyzed the Bretton Woods and Monetary Regimes to see the historical evidences of international monetary cooperation. The study shows that Bretton Woods system depended more upon US hegemonic leadership than the institutional plan designed by its founders.

Kukal and Quang (2014) propose a new rule for inflation targeting monetary policy based on fuzzy control technique. This rule seems to be able to quantify those widely accepted qualitative knowledge on monetary policy. Further, the policy derived by this rule also better captures the common behavior of central banks. They verify this rule on the monetary policy conducted by the Czech National Bank in the period 2000 to 2011. They also compare the result of this rule with the results obtained by implementing monetary policy by some other alternative rules such as Taylor's rule and show that monetary policy is not exactly operational. So, it would help us to see whether the fuzzy control approach is able to improve the outcomes of dynamic stochastic general equilibrium (DSGE) model.

### 2-3- Optimal Hegemonic Conditions of a Plan

As it is mentioned, a hegemonic plan should include both extrinsic and intrinsic motivations. But under which conditions a hegemonic optimal plan would be preferred to an optimal commitment policy?

#### **Proposition, Superiority Condition of an Optimal Hegemonic Policy:**

Optimal hegemonic policy is better than the optimal commitment policy if and only if adjusted total effect of intrinsic motivation upon an agreed-upon social objective function would be positive.

#### **Assumptions:**

A: An agreed-upon social objective function is  $S = S(X_1, \dots, X_T, M_1, \dots, M_T)$ .  $X_T$  is a sequence of policy and  $M_T$  is sequence of public motivations.  $t=1, \dots, T$ .

B:  $X_{ct}^p$  is a sequence of commitment policy.  $X_{ht}^p$  is a sequence of hegemonic policy.  $m_{et}^p$  is a sequence of extrinsic motivation and  $m_{it}^p$  is sequence of intrinsic motivation.

C: Planner's policies are influenced by public motivations.



D: There is an allocation of motivations sequence that solves the optimum problems of an agreed-upon social objective function.

**Proof:** We prove the proposition (1) by two scenarios.

**Scenario (1): Optimal Commitment Policy**

Our goal is maximization of agreed upon, social welfare

$$S_1 = S(X_{ct}^p, m_{et}^p) \tag{1}$$

$$\text{Subject to: } X_{ct}^p = X_{ct}^p(m_{et}^p), \tag{2}$$

$X_{ct}^p$  and  $m_{et}^p$  have positive effect on the S1 and  $m_{et}^p$  has positive effect on  $X_{ct}^p$ .

If we substitute constrain (2) into objective function, then by derivation, we have first order condition of the optimality as follows:

$$dS_1 = \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{et}^p} + \frac{\partial S}{\partial m_{et}^p} \right] \cdot dm_{et}^p \Rightarrow \frac{dS_1}{dm_{et}^p} = \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{et}^p} + \frac{\partial S}{\partial m_{et}^p} \right] \tag{3}$$

**Scenario (2): Optimal Hegemonic Policy**

Our goal is maximization of agreed upon, fixed social

$$S_2 = S(X_{ht}^p, m_{et}^p, m_{it}^p) \tag{4}$$

$$\text{Subject to: } X_{ht}^p = X_{ct}^p(m_{et}^p, m_{it}^p) \tag{5}$$

$X_{ht}^p, m_{et}^p, m_{it}^p$  have positive effect on S2 and  $m_{et}^p, m_{it}^p$  have positive effect on  $X_{ct}^p$ . The first order condition (F.O.C) is:

$$dS_2 = \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{et}^p} + \frac{\partial S}{\partial m_{et}^p} \right] dm_{et}^p + \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{it}^p} + \frac{\partial S}{\partial m_{it}^p} \right] \cdot dm_{it}^p \tag{6.a}$$

Or

$$\frac{dS_2}{dm_{et}^p} = \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{et}^p} + \frac{\partial S}{\partial m_{et}^p} \right] + \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{it}^p} + \frac{\partial S}{\partial m_{it}^p} \right] \frac{dm_{it}^p}{dm_{et}^p} \tag{6.b}$$

,

and if we substitute equation (3) into  $\left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{et}^p} + \frac{\partial S}{\partial m_{et}^p} \right]$  in

equation( 6. b) we have:

$$\frac{dS_2}{dm_{et}^p} = \frac{dS_1}{dm_{et}^p} + \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{it}^p} + \frac{\partial S}{\partial m_{it}^p} \right] \cdot \frac{dm_{it}^p}{dm_{et}^p} \tag{7}$$

and

$$\frac{dS_2}{dm_{et}^p} - \frac{dS_1}{dm_{et}^p} = \left[ \frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{it}^p} + \frac{\partial S}{\partial m_{it}^p} \right] \cdot \frac{dm_{it}^p}{dm_{et}^p} \tag{8}$$

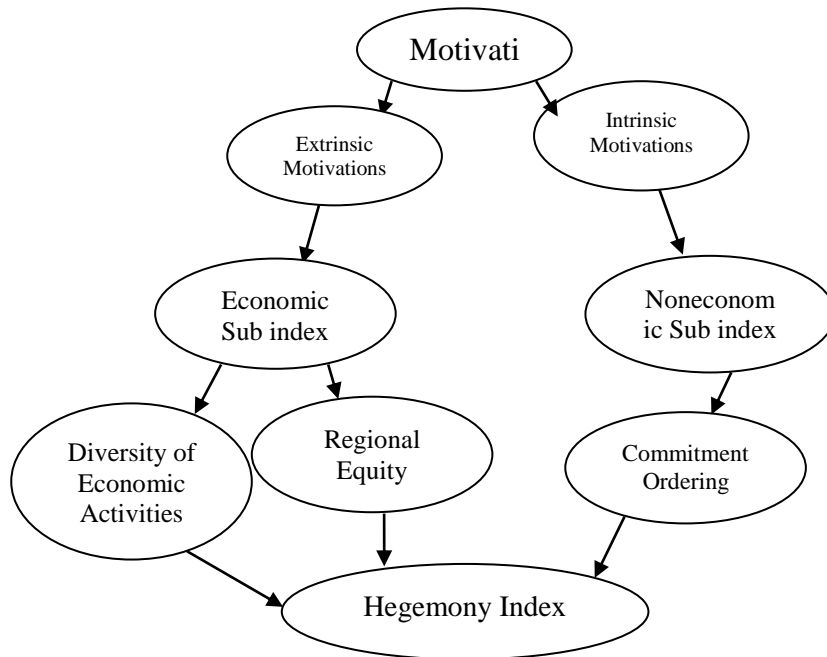
Q.E.D.

We prove the proposition. Let us explain it as follows:

$\frac{dm_{it}^p}{dm_{et}^p}$  is called adjusted factor and  $\frac{\partial S}{\partial X_{ct}^p} \cdot \frac{\partial X_{ct}^p}{\partial m_{it}^p}$  is indirect effect of intrinsic motivation upon an agreed social welfare function.  $\frac{\partial S}{\partial m_{it}^p}$  is indirect effect of intrinsic motivation upon an agreed, fixed social objective function. So if adjusted total effect of intrinsic motivation upon an agreed social welfare function be positive, the right side of equation (8), would be:  $\frac{dS_2}{dm_{et}^p} > \frac{dS_1}{dm_{et}^p}$  and shows that hegemony is better than the commitment.

### 3. Computation of Hegemony (Case Study: Central Bank of Iran)

In figure (1), we show the conceptual framework for formation of hegemony index.



**Figure 1: A Conceptual Framework of Formation for Hegemony Index. Source: Authors**

Now we explain Figure (1) by four steps as below:

**Step1:** Selection of some sub index based on both intrinsic and extrinsic motivations.

In this paper, we introduce three sub-indexes such as: *regional equity, commitment ordering and diversity of economic activities*.

The reason to use *regional equity* refers to the relationship between income inequality and economic growth. The prevalent growth theory since 1950s does not care for distribution effects. The reason refers to the neoclassical assumption that does not care for the dynamics of income distribution (Bertola, 2000). A relatively moderate theory which has prevailed in the mainstream academia for about half a century is attributed to Kuznets (1955), which argues that income inequality would change as economic growth changes or more precisely, income inequality would rise first and then decline with economic growth.

Studies about the relationship between economic inequality and economic growth have increased gradually for the past twenty years. However, the relationship between these two variables, is still ambiguous. For example, Persson and Tabellini (1994) show that there is significantly a negative relationship between inequality and growth in democratic countries. On the contrary, Barro (2000) concludes that there is a negative relationship between inequality and growth for poor countries, but a positive relationship for rich countries. With the finding that inequality in China and India, comes along with their economic growth, Quah (2001) raises that inequality can increase or decrease economic growth. More recent studies also show that the effect of economic inequality on economic growth along with social environment spillovers (Durlauf, 1994); social unrest and conflict (Alesina and Perotti, 1996) and political economy (Chang, 1998).

There are some studies that show the effects of fairness and equity on changing the preferences. According to the studies of Adam (1963), Sheppard, Lewicki, and Minton (1992), there are two dimensions of equity, distributive justice and procedural justice that would change the action of households. Increasing of payment and any economic opportunity in unfair conditions would change the actions and preferences. According to Kahnman, Knetsch and Thaler (1986); Fehr and Schmidt (1999) these situation influence a wide range of economic behavior such as altruism, cooperating and public good provision.

The reason for commitment ordering index is based on the logic of ultimatum game. Ultimatum game is a frequently studied economic

paradox that has also become the subject of much attention in neuroeconomics (Widman, 2009, p. 2). Neuroeconomics seeks to find the brain mechanisms that underlie economic decision making to produce a general theory on human behavior (Glimcher et al., 2004). Through neuroeconomics, researchers hope to tie together methods of thought in economics, psychology, and neuroscience. Much of the neuroeconomic research performed on fairness in the ultimatum game examines the prefrontal cortex (PFC), an immensely complicated area of the brain. Others suggest that it is a highly cognitive, intellectually elegant response. This debate has sparked a flood of new research into the brain and how it manipulates the concept of fairness during decision-making. Experimental studies, such as Sanfey et al. (2003) show when proposers offer responders 20% of the total sum to be divided, responders reject the offer. They suggest that unfair offers induce negative emotions in responders leading to a conflict between emotions (suggesting rejection of unfair offers) and cognition (positive amount of money should be accepted). They also suggested that ACC (anterior cingulate cortex) increased activation during evaluation of unfair versus fair offers may reflect detection of the conflict between sticking to self-interest motive represented by increased activation in right DLPFC (dorso-lateral prefrontal cortex) and emotional response represented by increased activity in anterior insula bilaterally. Indeed, such studies show that, the proposal would not be unfair. For example, when proposers offer responders 20% of the total sum to be divided, responders reject the offer about 50% of the time (Sanfey et al., 2003). Through rejection, individuals seem to be sacrificing their own economic well-being due to their distaste for unfair offers. Accordingly, the game presents a unique neuroeconomic opportunity to study the concept of fairness and how it is manipulated in the brain. Now, what is the relationship between commitment ordering and ultimate game? Commitment ordering in this paper is a literature that monetary authority uses to declare the articles of SPMP by using some words such as "Must", "Have to", "Should to" and "Could to".

The reason for diversity of economic activities index, refers to the concept of diversity.

Throughout the past decade, the social and political implications of social diversity have received widespread attention in economics and the social sciences. While management theorists and sociologists often see

diversity as an asset to a firm or a society (Schneider and Wiesehomeier, 2010, p. 1097), economic diversity has been promoted as a means to achieve the goals of stability and growth. A brief review of diversity measures is used to discuss measuring diversity relative to some standard, as an explanatory variable in examining growth and stability (Siegel and et al., 1995, p. 261). In this paper, we assume that a monetary policy included by more than one of economy sections would increase social welfare.

**Step2: Determination of Criteria**

We set four criteria for each sub-indexes. For regional equity we set city, province and country. Scores of this sub index are sorted by high and low, from city to country, as it is shown in table (1). It means that an ex-ante monetary policy based on micro foundation (City) is better than an ex-ante monetary policy based on macro foundation (Country). For commitment ordering we use four verbs such as “Could”, “Should”, “Have to” and “Must”. It means that an article that uses “Could” is more flexible than the others that use “Should”, “Have to” and “Must”. So, “Could” is preferred to “Must”.

**Table1: Hegemony ,Combination of Sub Index of Ex-ante Monetary Policy**

Sub Index	Criteria	Score	computed Score
<b>Regional Equity</b>	<b>City</b>	10	10 or 7.5 or 5 or 2.5
	<b>City province</b>	7.5	
	<b>Province</b>	5	
	<b>Country</b>	2.5	
<b>Commitment Ordering</b>	<b>Could</b>	10	10 or 7.5 or 5 or 2.5
	<b>Should</b>	7.5	
	<b>Have to</b>	5	
	<b>Must</b>	2.5	
<b>Diversity of Economic Activities</b>	<b>One section of economy</b>	10	10 or 7.5 or 5 or 2.5
	<b>Two section of economy</b>	7.5	
	<b>Three section of economy</b>	5	
	<b>Four and more section of economy</b>	2.5	

Source: research results

We use “economy section” a criterion for diversity of economic activities’ sub index. If an article focuses on more aspects of a policy, it would be preferred than the article that only focuses on one part of economy section. For example, imagine two Articles: Article (1) and Article (2). If the content of Article (1) affects the industry and agriculture but content of Article (2) only affects the industry, the Article (1) would be preferred to article (2).

**Step3: Fuzzification**

As it is shown in table (1) each year we have a quantity index for hegemony. But we have to consider the degree of hegemony. Indeed it is important to know whether hegemony is low, medium or high. Therefore, we use fuzzification. Fuzzification is the process of changing a real scalar value into a fuzzy value. Fuzzification of a real-valued variable is done with intuition, experience and analysis of the set of rules and conditions associated with the input data variables (Tsoukalas and Uhrig, 1993). There is no fixed set of procedures for the fuzzification. The important thing for fuzzification is making the Membership functions of the hegemony, as follows:

$$\mu(x)_{triangle} = \begin{cases} 0 & x < L \\ 1 - \frac{|c-x|}{(R-L)/2} & L < x < R \\ 0 & x > R \end{cases}$$

$\mu_{triangle}(x)$  is the triangle Membership function  $L$  and  $R$  are the left and right bounds, respectively, and  $C$  is the center of the symmetric triangle (Average of  $L$  and  $R$ ).  $X$  is the estimated hegemony of SPMP for each year.

**Step4: Estimation of Hegemony Index**

Table (1) shows maximum and minimum scores of all articles of SPMP in the period 2008 -20011. Table (2) and table(3)show estimated Hegemony Index for Central Bank of Iran.

**Table2: Estimation of Hegemony Index for Central Bank of Iran**

Hegemony	2008	2009	2010	2011
<b>Low</b>	$105 \leq H < 210$	$375 \leq H < 750$	$150 \leq H < 300$	$172.5 \leq H < 345$
<b>Medium</b>	$210 \leq H < 315$	$750 \leq H < 1125$	$300 \leq H < 450$	$345 \leq H < 517.5$
<b>High</b>	$315 \leq H < 420$	$1125 \leq H < 1500$	$450 \leq H < 630$	$517.5 \leq H < 690$
<b>Estimated</b>	150	487.5	230	245

Source: The research results

**Table3: Degree of Hegemony and Rate of Planed and Actual Stock of Money**

Year	Hegemony	planed rate of stock of money	actual rate of stock of money
2008	Low	.20	0.16
2009	Low	.20	0.24
2010	Low	.20	0.25
2011	Low	.20	0.20

Source: research results

We first determine the left and right bounds for each year and convert low, medium and high hegemony to a domination of numbers. We then use triangle membership functions for fuzzy estimation and see that estimated hegemony for the period 2008 to 2011 is low<sup>4</sup>. Table (4) to table (7), have shown the computation of the SPMP of the central bank of Islamic Republic of Iran in the period 2008 to 2011.

**Table4: Computation of SPMP of the Central Bank of Islamic Republic of Iran 2008**

Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
2	2.5	5	2.5	10
3	2.5	5	2.5	10
4	2.5	7.5	2.5	12.5
5	2.5	5	2.5	10
6	2.5	5	2.5	10
7	2.5	5	2.5	10
8	2.5	5	2.5	10

Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
9	2.5	5	2.5	10
10	2.5	2.5	2.5	7.5
11	2.5	5	2.5	10
12	2.5	2.5	2.5	7.5
13	2.5	7.5	2.5	12.5
14	2.5	7.5	2.5	12.5
15	2.5	5	2.5	10
16	2.5	5	2.5	10
Total	37.5	75	37.5	150
(Sub index /index) *100	<b>25</b>	<b>50</b>	<b>25</b>	<b>1</b>

Source: research results

**Table5: Computation of SPMP of The Central Bank of Islamic Republic of Iran 2009**

Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
<b>2</b>	2.5	10	2.5	15
<b>3</b>	2.5	5	2.5	10
<b>4</b>	2.5	5	5	12.5
<b>5</b>	2.5	5	2.5	10
<b>6</b>	2.5	10	2.5	15
<b>7</b>	2.5	2.5	2.5	7.5
<b>8</b>	2.5	5	5	12.5
<b>9</b>	2.5	2.5	2.5	7.5
<b>10</b>	2.5	5	2.5	10
<b>11</b>	2.5	2.5	2.5	7.5
<b>12</b>	2.5	5	2.5	10
<b>13</b>	2.5	10	2.5	15
<b>14</b>	2.5	5	2.5	10
<b>15</b>	2.5	10	2.5	15
<b>16</b>	2.5	5	2.5	10
<b>17</b>	2.5	2.5	2.5	7.5



Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
18	2.5	2.5	2.5	7.5
19	2.5	5	2.5	10
20	2.5	10	2.5	15
21	2.5	5	2.5	10
22	2.5	5	2.5	10
23	2.5	2.5	2.5	7.5
24	2.5	7.5	2.5	12.5
25	2.5	5	2.5	10
26	2.5	5	2.5	10
27	2.5	10	2.5	15
28	2.5	2.5	2.5	7.5
29	2.5	2.5	2.5	7.5
30	2.5	10	2.5	15
31	2.5	2.5	2.5	7.5
32	2.5	2.5	2.5	7.5
33	2.5	2.5	2.5	7.5
34	2.5	2.5	2.5	7.5
35	2.5	2.5	2.5	7.5
36	2.5	2.5	2.5	7.5
37	2.5	2.5	2.5	7.5
38	2.5	2.5	2.5	7.5
39	2.5	2.5	2.5	7.5
40	2.5	7.5	2.5	12.5
41	2.5	2.5	2.5	7.5
42	2.5	5	2.5	10
43	2.5	2.5	2.5	7.5
44	2.5	2.5	2.5	7.5
45	2.5	2.5	2.5	7.5
46	2.5	2.5	2.5	7.5
47	2.5	2.5	2.5	7.5
48	2.5	2.5	2.5	7.5
49	2.5	2.5	2.5	7.5
50	2.5	5	5	10
51	2.5	10	2.5	15

Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
<b>Total</b>	125	232.5	130	487.5
<b>(Sub index/index)*100</b>	<b>25.64</b>	<b>47.69</b>	<b>26.76</b>	<b>100</b>

Source: research results

**Table 6: Computation of SPMP of The Central Bank of Islamic Republic of Iran 2010**

Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
2	2.5	5	2.5	15
3	2.5	7.5	2.5	12.5
4	2.5	5	2.5	10
5	2.5	5	7.5	15
6	10	10	5	25
7	2.5	7.5	10	20
8	2.5	10	10	22.5
9	2.5	10	10	22.5
10	2.5	2.5	2.5	7.5
11	2.5	2.5	2.5	7.5
12	2.5	2.5	5	10
13	2.5	7.5	2.5	12.5
14	2.5	2.5	2.5	7.5
15	2.5	2.5	5	10
16	2.5	7.5	2.5	12.5
17	2.5	2.5	2.5	7.5
18	2.5	5	2.5	10
19	2.5	2.5	2.5	7.5
20	2.5	7.5	2.5	12.5
21	2.5	2.5	5	10
<b>Total</b>	55	97.5	77.5	230
<b>(Sub index/index)*100</b>	<b>24</b>	<b>42</b>	<b>34</b>	<b>100</b>

Source: research results

**Table7: Computation of SPMP of The Central Bank of Islamic Republic of Iran 2011**

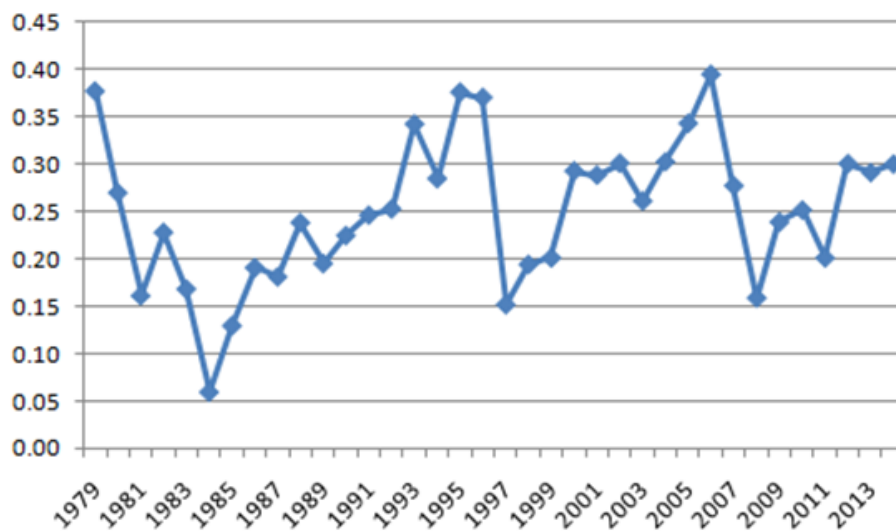
Article	computed Score of sub indexes			Total computed Score of hegemony
	Regional Equity	Commitment Ordering	Diversity of Economic Activities	
2	2.5	2.5	3	8
3	2.5	2.5	2.5	7.5
4	2.5	5	2.5	10
5	2.5	5	2.5	15
6	2.5	5	2.5	10
7	2.5	2.5	10	15
8	2.5	7.5	7.5	17.5
9	2.5	5	2.5	15
10	2.5	10	2.5	15
11	2.5	7.5	5	15
12	2.5	10	2.5	15
13	2.5	5	2.5	10
14	2.5	7.5	2.5	17.5
15	2.5	5	5	12.5
16	2.5	2.5	2.5	7.5
17	2.5	10	2.5	15
18	2.5	2.5	2.5	7.5
19	2.5	2.5	2.5	7.5
20	2.5	5	2.5	10
21	2.5	5	2.5	10
22	2.5	2.5	2.5	7.5
23	2.5	2.5	2.5	7.5
<b>Total</b>	<b>55</b>	<b>117.5</b>	<b>72.5</b>	<b>245</b>
(Sub index/ index)*100	<b>22</b>	<b>48</b>	<b>62</b>	<b>100</b>

Source: research results

Now, we discuss our finding.

As we have shown at the subsection "1-3- Optimal Hegemonic Conditions of a Plan", scenario (1) is based on extrinsic motivations and consistent with the character of dominant planner. The dominant planner

needs low hegemony. But as we have shown in scenario (2), optimal hegemonic policy would include both intrinsic and extrinsic motivations, and it needs high hegemony. Revealed facts during the years of the study show that, there is a disparity between the planned rate of money stock (ex- ante) based on forth Iranian developing plan, and the actual rate (ex - post). As we see in table (3), low hegemony of the SPMP, made a disparity between the planned rate of money stock (ex- ante), and the actual rate (ex -post). Therefore, to avoid the problem of time inconsistency by implementation of a rule instead of discretion, we have to increase the hegemony of monetary policy. As we see figure (2), designing SPMP during 2008-2011, has not any significant effect to control the devotion of growth rate of money stock. Therefore, we need high hegemony for designing any monetary policy rule.



**Figure2: Velocity of the Money Stock rate in Iran. Source: Central Bank of Iran, <http://www.cbi.ir>.**

#### 4. Conclusion

Monetary policy rule that would avoid the problem of time inconsistency, would be binding. Binding or commitment optimality is an important problem for any economic policy making. But each commitment technology, needs intrinsic and extrinsic motivations. Hegemony has the

capability to avoid the problem of time inconsistency because it includes both intrinsic and extrinsic motivations and would be better than commitment.

Central bank of Islamic republic of Iran needs a consistent monetary policy rule instead of discretion but before designing the rule, it needs a measure or index to see the capability of the economy to achieve the rule. Therefore, the new hegemony index is recommended. This index is an ex-ante framework of a monetary authority for designing the capability of a rule for achieving macroeconomic goals such as stability. The results show that, the hegemony was low and must be improved.

We recommend that, before adopting any monetary policy rule, the central bank of Islamic republic of Iran, should construct a quantitative ex-ante framework of a monetary policy based on the terms of hegemony and compute the possibility of its implementation by the degree of this hegemony index.

### **Endnotes**

1- For more details about extrinsic intrinsic motivation see the working paper "No More Polarization, Please! Towards a More Nuanced Perspective on Motivation in Organizations" Reinholt (2006).

2- The SPMP is a potential package of public and banking system benefit. Central bank as a player (1) is to be given ex-ante benefit, and will be asked to divide it between itself and public or player (2). The rules stipulate that it must make Player (2) an offer, and then Player (2) can either accept or reject the offer. Indeed central bank as an allocator (that may be responsible for both of banking industries' benefits and public's benefits) recommend its offer in the form of articles of the package. But receiver may accept or reject the offer in practice. If the public find that the recommendation (package) is unfair (for example interest rate is higher than their expected interest rate and banking industries' benefits is preferred to public's benefits), they would not obey it and announcements of central bank which is legally accepted at time (t) would not be as same as in practice at time (t+1). So we lead to time inconsistency problem. Indeed unfair proposal would lead to time inconsistency problem. But how should public understand that the proposal is fair or unfair in the package of credit and money? As central bank is a monopoly, commitment ordering in the content of articles acts as fair or unfair proposal. For example in the articles that use the term Must, it means the benefit behind this article is very important for central bank. If public has no role for formation of these articles, they got fewer scores for public.

3- The result of the computation of hegemony during 2008 to 2010 is similar as the result of Bastanifar and Vaez Barzani (2010).

4- We show with examples how we estimate hegemony of SPMP of Islamic republic of Iran. Consider Article 7 of SPMP 2011:

"Of the credit institutions must provide facilities to the productive sectors and give priority to employment. It is recommended to increase the credit institutions in their facilities in 2011 to comply with the following ratios: Changes in the distribution network of banking facilities in different economic sectors in 2011 Agriculture and water 20%  
Industry 37%  
Housing and building 25%  
Exports and 10 percent of commercial infrastructure  
Commerce, Services and Other 8%"

There are no distinguished points among city and province, city and country. So computed score of *regional equity* is 2.5. The article uses "Must" to commit his announcement. So, computed score of *Commitment Ordering* is 2.5. The content of article shows that monetary authority focuses on more than four sections in economy (Agriculture and water, Industry, Housing and building, Exports and commercial infrastructure, Commerce, Services). So computed score of *Diversity of Economic Activities* is 10.

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