

Could the ECB Governing Council avoid the formation of coalition?

BUF Audrey*

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Abstract:

The framework of the ECB Governing Council, as a result of the enlargement process, raises some doubt about the monetary decision-making process. Indeed, the strong heterogeneity among European members leads to the fear of “nationalization” of the common monetary policy. This fear would be heightened because the ECB Governing Council remains secret on its decision-making process. The ECB doesn’t reveal the way decisions are taken. In this way the assumption of consensus in the Council is not obvious. Thus, this lack of transparency, associated with the risk of regional bias could be harmful to the credibility of the ECB. Will national governors decide systematically with European perspectives? Are there potential alliances arising in the Governing Council? In that case, is still the Executive Board the dominant player? In this study we focus on the possible coalition formation in the Governing Council. We apply a cluster analysis to the desired interest rate derived from the Taylor rule for each national governor in order to determine coalitions in the Council. The cluster analysis identifies, for every month on the period January 1999 to August 2011, four groups of countries. In this situation it could be difficult for the Executive Board to impose European perspectives. Indeed, the analysis of voting power emphasizes that the Executive board will lose its strategic position when national governors form coalitions.

Keywords: European monetary union, cluster analysis, voting power, decision-making process, Taylor rule

JEL classification: D72, D78, E52

* Ph.D Student, CERGAM CAE, Paul Cezanne University, Faculty of Applied Economics, France, e-mail: audrey-buf@orange.fr, audrey.buf@univ-cezanne.fr

1. Introduction

Since the beginning of the 1990s, the common practice among modern central banks is to delegate monetary policy decision to a committee. As Blinder (2004) mentioned, monetary policy committee (MPC) became the quiet revolution in almost all countries¹. This world tendency is confirmed by the survey of Fry *et al.* (2000) and Pollard (2004) showing that in a sample of 88 central banks, 79 made monetary policy by committee. Thus, the European Central Bank (ECB), like other modern central banks delegates its monetary decisions to a committee. There is a broad consensus in the literature that having a monetary committee decision-making rather than an individual central bankers leads to a better stabilization of the economy². There is however less agreement about the size of the MPC. The theoretical literature mentions that the optimal size is between 5 and 9 members³.

In practice, the size of MPCs varies across countries. Fry *et al.* (2000) find that 8 central banks out 82 have a MPC with more than 10 members. The largest MPC is the European Central Bank with 23 members. It is actually composed of six members of the Executive Board and seventeen national central banks. Eventually the euro area will gather together 27 members, if the three countries benefiting from an opting-out clause decide to join the monetary union⁴. In such a context, the size of the Governing Council would continue to increase and would affect efficiency of the decision-making process⁵. Faced with these difficulties European members have agreed on a reform about the modalities of vote in order to limit the size of the Governing Council⁶. However, in spite of the ECB reform, the Governing Council will still remain the largest MPC with 21 voters. Moreover, the implementation of the rotation system has been postponed until the number of national governors in the Council exceeds eighteen⁷. Consequently, the MPC regroups more than 21 members and the status quo with the “one member, one vote” is still effective. In both situations many uncertainties and worries as regards to the European monetary decision-making appeared.

¹ Only few central banks still delegate monetary decision to a single Governor. It concerns the bank of New Zealand, the Bank of Canada and the Bank of Israel. See Vandebussche (2006) for a complete analysis.

² In a group the quality of decision-making is improved thanks to the collective process of information concerning the state of the economy, the pooling of knowledge and forecasts between members. Moreover with committee, extreme decisions can be avoided leading to more stability in monetary policy. Experimental researches conducted by Blinder and Morgan (2005) and Lombardelli *et al.* (2005) confirm the performance of a decision made by a group over an individual.

³ See Gerling *et al.* (2005), Fujiki (2005), Sibert (2006), Vandebussche (2006) and Berger (2006).

⁴ They are the United Kingdom, Denmark and Sweden. Newcomers in the European Union will not have the opting-out clause. This means that they should adopt the common currency in the long run.

⁵ For a complete analysis of the consequences of the enlargement process on an unreformed decision-making process see Baldwin *et al.* (2001), Berger (2002), Fitoussi and Creel (2002).

⁶ The reform grants 15 rotating voting rights to national governors and 6 permanent voting rights to Executive Board members. See monthly Bulletin of the ECB in May 2003 and July 2009 for a complete description of the rotation system.

⁷ Decision ECB/2008/29. This decision postpones the introduction of a rotation system in the ECB.

On the one side efficiency is questioned because of the size of the council. Theory suggests that benefits from large committees tend to decrease while the number of members increases. Sibert (2006) argues that in large committees, members are tempted to free-ride when they have to reveal information. Maier (2007) explains that monetary decisions are more inertial in large committee. Berger (2006) emphasizes that large group are associated with an increase in the decision-making costs⁸. Specially, more members require more time to exchange visions and information concerning the state of the economy. Equally, more information may be associated with coordination costs. These decision-making costs can affect the quickness and the efficiency of decision-making.

On the other side, effectiveness is questioned because of the heterogeneity among members. In large committees, the probability of having potentially conflicting interest between members is higher than in small committee. Committee members could have different belief regarding the state of the economy resulting in different positions concerning the path of monetary policy. In the ECB, like in other federal system, committee members have different nationalities because they are representatives of European countries. Thus, national governors can be influenced by the economic situation of their home countries and can be attempt to adopt national behavior⁹. According to the statutes of the ECB, national governors should not act as national representatives when they decide on the monetary policy¹⁰. However, the ECB doesn't reveal the way monetary decisions are taken. The minutes of meetings and the voting records are not published compared to other central banks like the Fed or the Bank of England. This lack of transparency raised some doubt about the decision rules applied in the Council and about the behavior of national governors. Will national governors decide systematically with European perspectives? Are there potential alliances arising in the Council?

In the European context this is a burning issue because the ECB is particularly affected by the heterogeneity problem. The enlargement process increases discrepancies between European members. Newcomers are in economic transition characterized by high level of inflation and growth rates. They could have different monetary preferences compared to old members. Nowadays, the diversity among European members is equally present among current member states. The case of

⁸ See Berger (2002, 2006) and Vandebussche (2006).

⁹ A broad theoretical and empirical literature provides evidence about the fact that economic developments may affect the voting behaviors of policy decision-makers in a monetary union. For the theoretical literature see for example Alesina and Grilli (1991), De Grauwe et al. (1998). For the United States Gildea (1992), Meade and Sheets (2002, 2005) and Chappell *et al.* (2008) emphasize that regional economic developments may influence the voting behavior of Reserve Bank Presidents in the FOMC. In the same way studies of Berger and De Haan (2002), Heinemann and Huefner (2004) and Arnold (2006) have reported evidence about the assumption of regional bias in Europe.

¹⁰ ECB (1999), Article 108 of the Maastricht Treaty.

Greece or Spain could aggravate tensions in the Governing Council. Finally it could be very difficult for the Executive Board members to obtain the majority of votes and then safeguard European prospects at the time of the decision-making. Recent studies have already analyzed the possible emergence of coalition in the ECB. Sousa (2009) discovers possible voting coalition in the Governing Council on the period 1999-2003. However he notes that coalition cannot affect the efficiency of monetary policy decision because of the strong position of Executive Board member. Nevertheless Kosior *et al.* (2008) argue that the Board's power will decrease when coalitions between members are taken into account. Mangano (1999) studies voting coalition through voting power indices. He claims that Executive Board members can in certain circumstances have a low policy impact in spite of its voting power. Thus, the position of the Executive Board is not obvious. Which power will Executive Board members have if potential alliances between national governors arise?

In the present study we inquire into the possible formation of voting coalition in the actual decision-making process of the ECB. The enlargement of the euro area increased the size of the council and the risk of coalition. The notion of coalition refers to the principle of common preferences in terms of monetary policy between committee members. In this way, we analyze the voting behavior of members through their a priori stance of the monetary policy. More specifically we compute monthly desired interest rate for each country, with a smoothing version of the Taylor rule. In order to find similitudes between members we apply a cluster analysis on the desired interest rate variables. We assume that each national governor takes into account its desired interest rate in the decision and we analyze if national governors can regroup them in order to impose their decisions. According to speeches of the ECB Presidents, decisions are taken by consensus¹¹. However the lack of transparency cannot confirm this evidence. Moreover the reform of the ECB decision-making process heightens doubt on consensus solution. In such a context the assumption of coalition formation in the ECB is still relevant. The cluster analysis reveals the emergence of country group. In that situation we assess the voting power of each coalition in the decision-making. Executive Board members seem to lose their strategic position.

In what follows, the section 2 briefly exposes the heterogeneity level in the EMU. Macroeconomic divergences lead to different monetary preferences. Disparities in terms of output growth and inflation rates are highlighted. Section 3 provides an analysis on the possible emergence of voting coalition. The lack of transparency could attempt national governors to adopt strategic behavior in order to impose their decision. Section 4 assesses the voting power of European members when

¹¹ Duisenberg (2001), Trichet (2003) have mentioned several times in meetings that decision have been taken by consensus.

coalitions are formed. In this section we inquire into the voting power of Executive Board members. Section 5 gives some concluding remarks.

2. National discrepancies between European members

In this section we try to overview disparities between euro members states. The launch of the single currency tends to impose similar macroeconomic policies. However since 1999 there have been persistent macroeconomic divergences between member states. These discrepancies could affect the monetary preferences of countries.

2.1. Different macroeconomic situation

The participation of the European Monetary Union required economic convergence between members. In this way countries have adopted structural policies in order to join the monetary union. However persistent macroeconomic divergences appeared among member states. In a monetary union, not all economies will grow at the same rates. More specifically EMU countries show some discrepancies in terms of economic development, exposure to shocks and adjustment mechanisms. The literature mentions that since 1999 there are some winners like Ireland, Spain and Greece, and losers like Germany, Italy, the Netherlands and Portugal¹². Heterogeneity already existed between old members.

Since 2007, the EMU has experienced a succession of enlargements. Indeed, four new member states have already adopted the common currency. Recently, Estonia joined the monetary union since January 2011. The euro zone then comprises 17 member states. Over the next few years, this enlargement process will continue with the prospective access of new members forecasted in 2014 and 2015. With this enlargement process the divergences between euro member states would continue to increase. Generally we can observe differences between old members and new members. Indeed, the latter are in catch-up process, with higher growth and inflation rates. Likewise, they will have monetary preferences, which may differ from those of current member states. It could be difficult for the ECB to run a common monetary policy.

Table 1 below summarizes disparities among euro area members. We look at average macroeconomic variables in 1999-2006 and 2007-2010. At the first period, we note that only 4 countries out 11 reached an inflation rate below 2%. However, during the second period half of countries outperform the 2% of inflation. Euro members reveal divergences in GDP growth rates.

¹² Mathieu and Sterdyniak (2007)

More specifically new members (Cyprus, Malta, and Slovakia) have higher growth rates than old members during the second period.

Table 1: Disparities among euro area members

Inflation rates (%)		GDP growth rates (%)		Unemployment rates (%)	
1999-2006	2007-2010	1999-2006	2007-2010	1999-2006	2007-2010
> 3	> 2	> 3	> 1	> 9	> 9
Greece, Ireland, Spain	Belgium, Spain, Finland, Greece, Luxemburg, Slovenia, Malta, Estonia, Cyprus	Spain, Luxemburg, Ireland, Greece, Finland	Cyprus, Malta, Slovakia, Portugal	Finland, France, Germany, Greece, Spain	Estonia, Slovakia, Spain, Portugal, Ireland, Greece
< 2	< 2	< 2		< 5	< 5
Austria, Finland, France, Germany	Slovakia, Portugal, Netherlands, Italy, Ireland, France, Austria, Germany,	Germany, Italy, Portugal		Austria, Luxemburg, Netherlands, Cyprus	Austria, Luxemburg, Netherlands, Cyprus

Source : Eurostat, OCDE

These divergences would play a role in the decision-making process because they would have an impact on the monetary preferences. Faced with different macroeconomic situations some countries need high interest rates whereas others need low rates. Finally national governors will have different visions about the optimal path of the monetary policy.

2.2. Different a priori stance of monetary policy

According to the ECB statutes, the Governing Council assesses economic and monetary developments and takes monthly monetary policy decision¹³. Committee members should set the ECB interest rate while asking if the latter should be changed, in what direction and how much. In this way, the general principles of monetary policymaking may be described by a Taylor rule. This rule describes how central banks set interest rate in response to economic shocks. Taylor (1993) proposed a simple reaction function where central banks set interest rate depending on inflation and output gap developments. This rule was firstly applied to describe the monetary policy of the Federal Reserve in the US. Several studies have applied the original rule to other central banks like the ECB¹⁴.

¹³ The Governing Council usually meets twice a month. During the first meeting monetary policy decisions are decided. At its second meeting, the Council deals with issues concerning other responsibilities of the ECB.

¹⁴ There is a growing literature on the application of Taylor rules for the ECB. See for example Taylor (1998), Peersman and Smets (1999), Gerlach and Scnabel (2000), Faust *et al.* (2001), Sauer and Sturm (2003), Fourçans and Vranceanu (2004), Heinemann and Huefner (2004), Gorter *et al.* (2010). In this paper we don't try to add to

In this section we assume that national governors adopt national behavior and have a priori stance about the path of monetary policy. For this we compute the desired interest rate for each national governor by using a simple smoothing version of the Taylor rule as proposed by Sousa (2009). We know that decisions on the policy interest rate are taken monthly, thus we compute the position of each national governor for each month.

In this way the desired interest rate for each country is given by:

$$i_{i,t} = \rho(i_{i,t-1}) + (1 - \rho)i_{i,t}^* \quad (1)$$

where

$$i_{i,t}^* = \bar{r} + \pi^* + \alpha(\pi_{i,t} - \pi^*) + \beta\bar{y}_{i,t} \quad (2)$$

Where $i_{i,t}^*$ represents the short term nominal desired interest rate for country i at time t derived from the Taylor rule, \bar{r} the equilibrium real interest rate, π^* the inflation target, $\pi_{i,t}$ the current inflation rate, $\bar{y}_{i,t}$ the output gap. We assume that Taylor's (1993) original value of $\pi^*=2\%$ (which corresponds to the aim of the ECB) and $\bar{r}=2\%$ should hold for the euro area. Coefficients α and β describe the weights attached respectively to inflation and to the production. Following some empirical studies¹⁵ we set α and $\beta =0,5$. Generally central banks change interest rate in small steps without sudden moves. So we introduce a smoothing parameter, $\rho = 0,9$ in order to smooth interest rate¹⁶. The inflation rate is measured by the annual rate of change of the harmonized index of consumer prices for each European country¹⁷.

The most difficult variable to quantify is the output gap. Given that the potential production is an unobservable variable we should estimate it. In line with other studies we take the industrial production index for the euro area in order to calculate the potential output¹⁸. We apply a standard Hodrick-Prescott filter (with the smoothing parameter set at $\lambda = 14400$) and calculate our measure of the output gap as the deviation of the logarithm of actual industrial production from its trend.

The desired interest rates are computed for the period January 1999 to August 2011 and are in Appendix 1. We have taken into account the successive enlargement process of the euro area since

this literature. We consider that the Taylor rule reflect correctly behaviors of the ECB and national central banks.

¹⁵ Moons and Van Poeck (2008) argue that the original value reflects relatively well the ECB behavior.

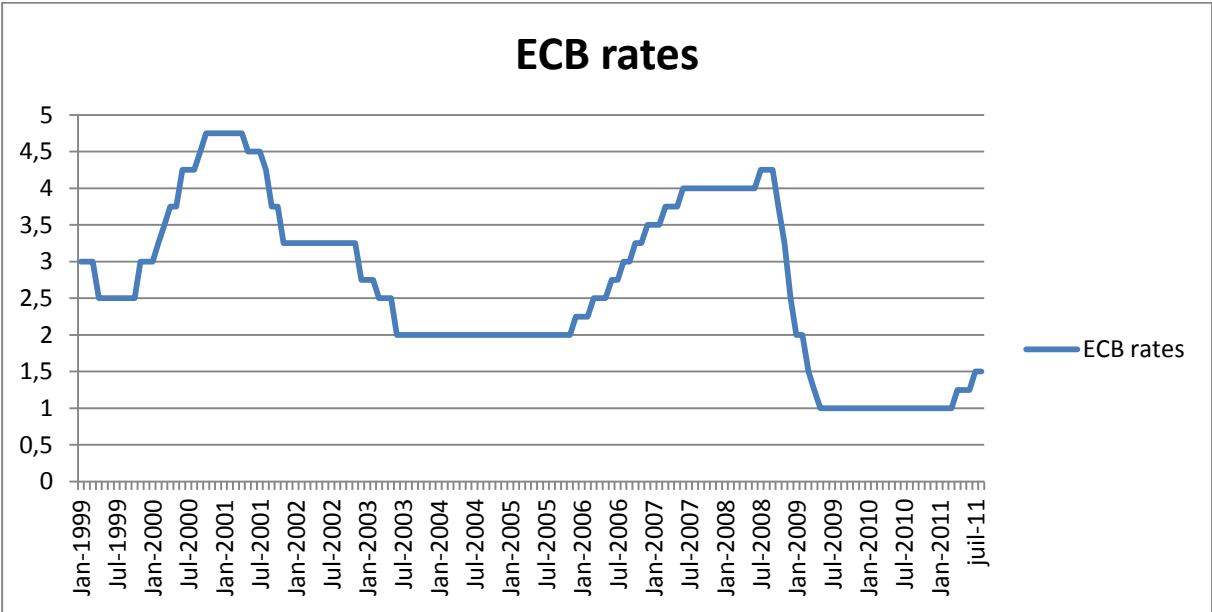
¹⁶ Several empirical studies have estimated this version of the Taylor and have found a smoothing parameter equal to 0,9. See Clarida et al. (1998), Peersman and Smets (1998), Faust et al. (2001).

¹⁷ We use data from the Eurostat database.

¹⁸ We use monthly volume index of production seasonally adjusted. Data are obtained from the Eurostat database.

2001. We compare the national desired interest rates (presented in annex) with the official rates of the ECB¹⁹.

Figure 1: The ECB interest rate



Source: ECB web site

Results show that for some countries like Finland, Germany, France, the a priori stance of monetary policy is close to the ECB positions. Nevertheless some countries, like Spain, Portugal, Greece, Ireland, expose strong divergences.

3. The possible emergence of coalition in the actual decision-making process

Since 1999 the common monetary policy of the European Monetary Union is delegated to the ECB Governing Council. Until today no formal vote has been taken according to ECB Presidents. The practical rule is a consensus solution among committee members. However, the lack of procedural transparency questioned the real decision-making process. The non-publication of voting records and minutes of meetings can lead national governors to adopt strategic behavior.

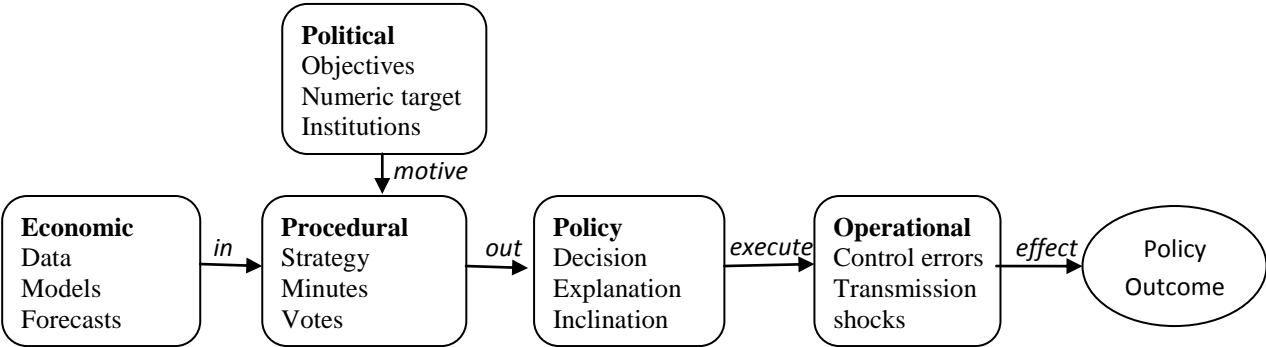
3.1. The lack of transparency

Nowadays transparency is a byword in central banking practice. Central banks are trying to reveal information rather than being secrecy about the path of monetary policy. Transparency is a broadly

¹⁹ We take into account the rate of the main refinancing operations.

concept with several definitions²⁰. It can be defined as the absence of asymmetric information between policymakers and other economic agents. Geraats (2002) identifies five aspects of transparency: political, economic, procedural, policy and operational transparency²¹. Each of these aspects has an impact on the policy outcome (Figure 2).

Figure 2: Dimensions of transparency



Source: Eijffinger and Geraats (2006)

According to several studies, transparency became a real benefit for central banks and their policies. Two main advantages arise from openness. On the one side transparency enhances the efficiency of monetary policy. In order to have stabilization effects monetary policy should be understood by the markets and other economic agents. Thus transparency about objectives and strategies allows central banks to improve their credibility and to anchor inflation expectations. On the other side, transparency is equally a useful tool to improve the democratic accountability of central banks. Central banks became more independent in order to avoid political pressures. The only way to be accountable is to reveal its intentions (decisions) to the public.

However, the way toward greater transparency can affect negatively the effectiveness of monetary policy. Several studies argue that an intermediate level of transparency could be more preferable than a higher level. Notably Jensen (2002) argues that greater transparency could be harmful if

²⁰ See Winkler (2000), Remsperger and Worms (1999) for discussions dealing with the appropriate notion of transparency. In this study we retain the definition given by Geraats (2002) which is close to those given by the ECB.

²¹ *Political transparency* is related to the objectives of policymakers and institutional arrangements associated with these objectives. *Economic transparency* refers to information, models and forecast used for monetary policy. *Procedural transparency* concerns the decision making process. It describes the way monetary policy decisions are taken. This refers to the strategy of the central bank as soon as the publication of voting records, minutes of meetings and deliberations. *Policy transparency* corresponds to the announcement and the explanation of policy decisions. It means equally an indication of the future policy actions. *Operational transparency* focuses on the implementation of monetary policy actions.

central bank already benefice of a strong credibility. Cukierman (2009) emphasizes that transparency can have some limits. He inquires into the desirability and the feasibility of the revelation of relevant information. Policymakers couldn't be entirely transparent because of the limited knowledge and uncertainties about the functioning of the economy. Notably central banks cannot be clear about the measurement of the output gap which is an unobservable variable and about the policy effect on inflation expectations. Mishkin (2004, 2007) stresses that increasing transparency can complicate the communication with the public and can weaken the support for central banks in the conduct of monetary policy. Finally according to the theoretical literature central banks should reach an optimal degree of transparency.

In practice many central banks became much more transparent than they used to be few years ago. The ECB appears to be among the most transparent central banks. According to the study of Dincer and Eichengreen (2009) the ECB obtained the sixth range with an index of 10,5.

Table 2: Transparency index for some countries

Countries with High Transparency	Index	Countries with Low transparency	Index
New Zealand	14	Bermuda	1
Sweden	13	Ethiopia	1
United Kingdom	12	Libya	1
Canada	11	Saudi Arabia	1
Czech Republic	11	Yemen	1
Euro Area	10.5	Aruba	0.5
Hungary	10.5		
United States of America	9.5		
Japan	9.5		

Source: Dincer and Eichengreen (2009)

This table emphasizes that the ECB is more transparent than the Fed or the Bank of Japan. In spite of this ranking, the ECB is still perceived as lacking transparency. Indeed, the ECB doesn't reveal the way decisions are taken compared to the Fed or the Bank of Japan. Should the ECB improve its procedural transparency by the disclosure of minutes and voting records?

The theoretical literature dealing with the procedural transparency does not reach unanimous conclusion. Some authors favor the publication of voting records and minutes. Buitert (1999) criticizes the ECB and stresses the importance of disclosing voting record. Sibert (2003) argues that it is necessary to publish the individual votes in order to build quickly a strong reputation of fighting

inflation. In the same way Gersbach and Hahn (2004) point out that it is desirable to publish voting records. In their model they show that procedural transparency is beneficial when committee members have preferences similar to the public. Nevertheless, some studies have arguments against procedural transparency. Issing (1999) favors secret voting for central banks. The publication of votes is a tool for political pressures and national interest from national governors. Gersbach and Hahn (2009) note that procedural transparency could be not desirable in a monetary union. Heterogeneity among members should not be revealed to the public. The publication of strong discrepancies between committee members could increase worries on financial markets.

However several central banks, like the Fed, the BOJ and the Bank of England publish minutes and voting records. Some empirical studies favor the publication of votes. More specifically, Gerlach-Kristen (2004) inquires into the relevance of the publication of minutes by the MPC of the Bank of England. Its results show that the voting record of the Bank of England is informative about future policy rates changes. Therefore, the publication of minutes and voting records could enhance the predictability of the monetary policy and reduce uncertainties about efficiency of the ECB.

Moreover the enlargement process may require more procedural transparency in order to strengthen the credibility of the ECB. As a result the size of the Governing Council will increase and raises doubt about the way decisions are taken. The hypothesis of consensus seems not to be systemic (obvious) in large and heterogeneous MPC. Additionally because of the strong heterogeneity among European member states there is a fear of “nationalization” of the common monetary policy (Belke and Styczynka, 2006). National central banks could adopt strategic behavior in order to satisfy its own country. This fear would be increased given that the ECB Governing Council is opaque concerning the decision-making process. Furthermore in the previous section we have shown that national governors have different a priori stance on the monetary policy. The lack of procedural transparency could lead policymakers to adopt national behavior.

3.2. Strategic behavior and coalition formation

In this section we inquire into the possible coalition formation during meeting in the ECB Governing Council. Committee members may decide on the path of interest rate in the euro area but the strong heterogeneity between members and the lack of transparency can compel them to adopt strategic behavior. Notably, national governors could be tempted to decide according to the situation of their home countries. Berger and De Haan (2002) argue that there is a risk of regional bias in the ECB monetary policy because of the heterogeneity of preferences among member states. In the same way Heinemann and Huefner (2004) and Arnold (2006) reported evidence about the presence of regional interest in the common monetary decisions.

Therefore we consider that national governors want to form alliance between similar members. Given that they should decide on the policy interest rate we assume that the composition of group depends only on the desired interest rate variable derived from the smoothing Taylor rule. Monetary decisions are taken monthly, thus we try to identify group of countries using a cluster analysis for each month. Among different statistical methods we chose the hierarchical complete linkage method. This method allows us to compute distance between clusters. The analysis covers a large period from January 1999 to August 2011. We have divided the period into two sub-periods: the first, from January 1999 until December 2006, and the second from January 2007 until August 2011. These two sub-periods allow us to take into account enlargement of the monetary union to new members and the financial crisis. The latter affects several old European countries.

Table 3: Cluster analysis

Complete linkage method					
January 1999 to December 2006			January 2007 to August 2011		
Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
Austria (3,33%)	Belgium (3,84%)	Greece (5,84%)	France (3,58%)	Austria (3,93%)	Estonia (8,66%)
Finland (3,25%)	Luxembourg (4,54%)	Ireland (6,11%)	Germany (3,55%)	Belgium (4,38%)	
France (3,48%)	Italy (4,38%)	Netherlands (4,83%)	Ireland (2,69%)	Cyprus (4,52%)	
Germany (3%)		Portugal (5,46%)	Netherlands (3,27%)	Finland (4,17%)	
		Spain (5,45%)	Portugal (3,61%)	Greece (5,92%)	
				Italy (4,11%)	
				Luxembourg (4,90%)	
				Malta (4,54%)	
				Slovakia (4,58%)	
				Slovenia (5,53%)	
				Spain (4,70%)	

Source: own calculations

Results from the cluster analysis show some interesting results. In both sub-periods three possible coalition groups appeared. The first sub-period shows a balanced representation between committee members. The second sub-period, however, points out some changes in the composition

of groups. For some countries, like France and Germany, or Belgium and Luxembourg, the coalition formation remains stable over the entire period. For others countries there are changes during the period. We can note that new members together have similar characteristics in terms of desired interest rates. The latter countries entering in the euro zone in January 2011 will be alone in the first group with highest desired interest rates.

Faced with the formation of coalition groups the Executive Board could have some difficulties to impose European perspectives. As mentioned by Baldwin et al. (2001) Executive Board should convince more national governors to obtain the majority of votes with the enlargement process. In the next section we want to assess the voting power of Executive Board members by taken into account coalition formation.

4. Voting power in the ECB Council

In order to assess the voting power of committee members we use voting power indices. Thanks to these indices we can quantify the a priori influence of each member on the monetary policy decisions. The voting power of a member is measured by the probability to be decisive on a decision. A player i is crucial (decisive) when he makes the coalition winning. This means that the player i is decisive if $v(S) = 1$ and $v(S - \{i\}) = 0$. We will note $d(S)$ the number of decisive players in coalition S , and $D_i(v)$ the set of coalition in which the player i is decisive. The concept of power index allows us to assess the probability of a player i to play a key role in the decision made.

There are a lot of power indices, but two of them are particularly used in the literature. One is the Shapley-Shubik index (henceforth S-S index) and the other is the Banzhaf index (henceforth BZ index)²². The main distinction between these two indices relies on what the qualifier crucial or decisive means.

The S-S index considers all possible permutations of voters in a voting game and takes into account permutations in which the player i is decisive. That is where the player i turns a coalition into a winning one when he joins it. This index is based on the notion of "pivot". The player i is a pivot because the coalition win thanks to his vote²³. This player is decisive in coalition S formed by itself and all prior players. Thus, in order to calculate the S-S index of a player i , we have to divide the sum

²² Historically, the first elaborated index is the Shapley-Shubik index (1954). For twenty years, debates focused essentially on the analysis and the comparison of this index with its rival, the Banzhaf index (1965), which appeared a few years later. Over the following years, the literature on indices grew considerably with extensions and developments. Other indices have been proposed by Deegan and Packel and Johnston both in 1978. Extensions of the theory have been developed by Felsenthal and Machover (1998) and by Holler and Owen (2001).

²³ The player i is considered as the pivot when he makes the coalition a winning one.

of players permutations for which the player i is decisive by all the permutations possible. The S-S index of a player i is given by:

$$SS_i = \sum_{S \subseteq N, S \ni i} \frac{(s-1)!(n-s)!}{n!} [v(S) - v(S - \{i\})]$$

Assuming that all permutations consist in one and only one decisive player, we have: $\sum_i SS_i(v) = 1$. Consequently the S-S index measure the number of times where a given player i is decisive.

The BZ index is slightly different. Banzhaf also considers that the measure of player i voting power depends on the number of times where the player i is decisive. However, in the voting process of Banzhaf coalitions vote in bloc. Therefore, this index is based on the notion of “swing”. A player i has a swing, insofar as when he leaves a winning coalition, he turns it into a losing one. In this way, player i is decisive for the coalition S . Therefore, the BZ index counts the swings of the player i in all possible coalitions. We have two calculations of this index:

The normalized Banzhaf index is given by:

$$\tilde{B}_i(v) = \frac{d_i(v)}{\sum_{j=1}^n d_j(v)}$$

With $d_i(v) = \sum_{S \subseteq N, S \ni i} [v(S) - v(S - \{i\})]$. In other words, $d_i(v)$ represents the number of decisive coalitions containing i . The normalized index has the property that the indices of all players always add up to 1. This formulation is generally used in order to compare it with the SS index²⁴.

In order to apply voting power indices we consider each coalition as one separate player. Given that there is a lack of transparency we don't know exactly the way in which decisions relatives to interest rates are taken. Thus we assume that the ECB president proposes a value for the interest rate (that is rising, decreasing, or maintaining the value)²⁵. If no consensus is obtained, a simple majority is required. In the case of a tie the President has a double vote. In the old framework with only 11 members, the majority requires 9 votes. In this case, assuming that Executive Board member vote together, they need to convince only 3 members. In the actual decision-making process, the majority

²⁴ Thereafter, Dubey and Shapley (1979) suggested another weighting of the BZ index. The non normalized index is the most used in the literature. We should note that the latter is often associated with Coleman and the normalized index originated in the studies of Penrose (1946). The formulation of the non normalized BZ index (or the absolute BZ index) takes the following form:

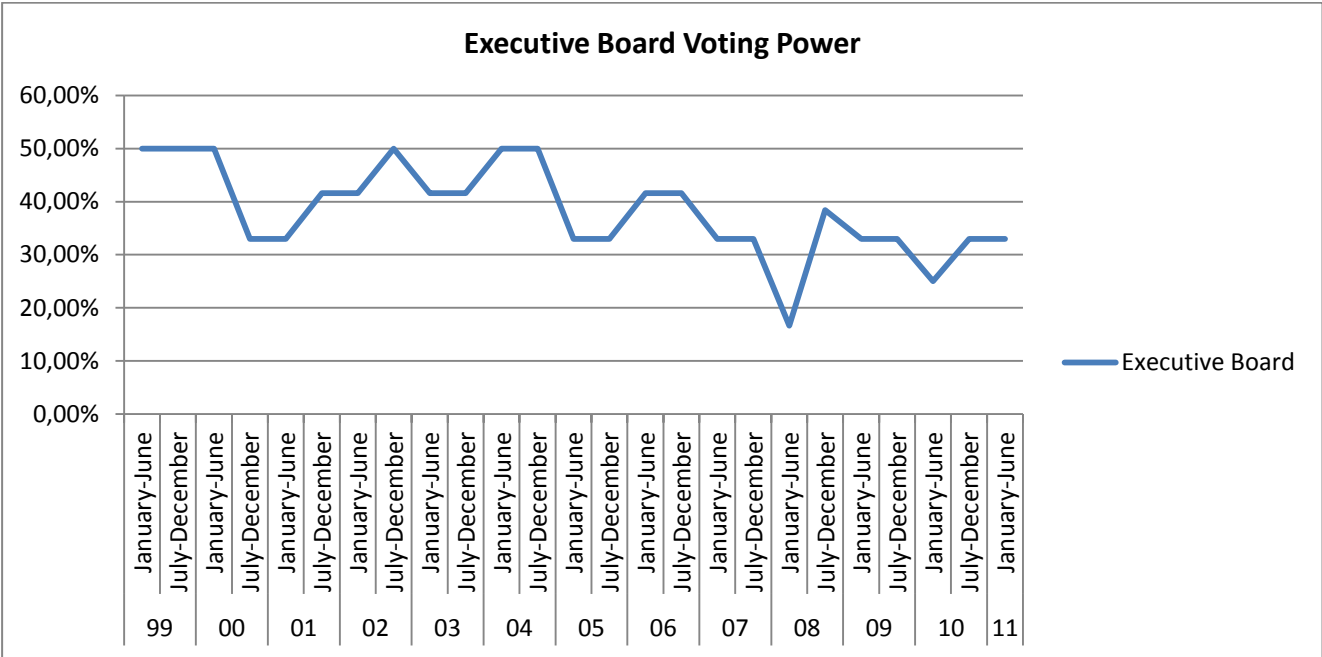
$$B_i(v) = \frac{d_i(v)}{2^{n-1}} = \frac{1}{2^{n-1}} \sum_{S \subseteq N, S \ni i} [v(S) - v(S - \{i\})]$$

In other words, this formulation counts the sum of swings of player i divided by the number of all coalitions including player i , that is (2^{n-1}) .

²⁵ We follow the assumption proposed by Baldwin *et al.* (2001) in their study of an unreformed council.

requires 12 votes. In this case and assuming that Executive Board member vote together, 6 national governors should agree the proposition.

Figure 3: Executive Board voting power



Source: Normalized Banzhaf index, own calculations

The voting power analysis shows that Executive Board members lose influence in the decision-making process when national governors form alliances. The power of the Board decreases to 33%.

5. Concluding remarks

Since 1999, the monetary policy of the euro area is delegated to the ECB Governing Council. The latter is composed by Executive Board members and governor of euro member national central banks. Decisions on monetary policy should be decided by consensus among members taking into account euro aggregates variables. However, this practice seems not obvious. On the one side, the ECB remains secret about the way decisions are taken. Voting records and minutes are not disclosed to the public. In this way policy makers can adopt national behavior in order to respond to economic situation of their own countries. On the other side, there is growing discrepancies between European members. Monetary preferences could differ between committee members. Additionally the size of the Governing Council will continue to increase as a result of the enlargement process.

In such a context we focus on the possible coalition formation in the ECB Governing Council. The cluster analysis reveals four groups of countries for each month on the period January 1999 to August 2011. These results emphasize that it could be difficult for Executive Board member to impose European perspectives. The voting power analysis points out that the Board will lose its influence on the decision-making process. Moreover, the future introduction of an asymmetric rotation system plans to regroup national governors in three groups according to their GDP weight. Each group will have different voting frequencies. If coalitions appeared in the actual system it seems possible to have alliances in the new voting system.

Annexes

Annex 1 : National desired interest rates																	
	GERM	AUST	BELG	SPA	FIN	FRA	IRL	ITA	LUX	NETH	PORT	GRE	SLOV	CYP	MAL	SLQ	EST
Jan-1999	1,30	1,44	2,50	3,10	1,75	1,45	4,17	3,1	2,04	4,15	4,75						
Feb-1999	1,28	1,43	2,50	3,16	1,81	1,45	4,20	3,08	2,05	4,13	4,78						
Mar-1999	1,35	1,41	2,55	3,26	1,86	1,46	4,19	3,09	2,03	4,12	4,82						
Apr-1999	1,43	1,39	2,56	3,38	1,97	1,49	4,17	3,07	2,02	4,09	4,84						
May-1999	1,43	1,41	2,52	3,45	2,08	1,50	4,20	3,09	2,01	4,10	4,77						
Jun-1999	1,45	1,40	2,48	3,52	2,16	1,50	4,18	3,10	2,00	4,10	4,71						
Jul-1999	1,48	1,40	2,43	3,59	2,25	1,51	4,15	3,16	1,97	4,06	4,63						
Aug-1999	1,54	1,44	2,43	3,67	2,32	1,53	4,19	3,19	1,97	4,13	4,53						
Sep-1999	1,60	1,48	2,48	3,78	2,40	1,57	4,28	3,27	1,96	4,12	4,46						
Oct-1999	1,68	1,55	2,54	3,86	2,50	1,63	4,37	3,33	1,97	4,07	4,39						
Nov-1999	1,76	1,65	2,63	3,98	2,63	1,72	4,48	3,39	2,01	4,07	4,33						
Dec-1999	1,88	1,84	2,78	4,10	2,80	1,86	4,72	3,47	2,06	4,05	4,26						
Jan-2000	2,04	1,96	2,65	4,23	2,96	2,03	4,99	3,55	2,16	3,98	4,22						
Feb-2000	2,20	2,17	2,80	4,36	3,17	2,15	5,28	3,64	2,28	3,91	4,13						
Mar-2000	2,29	2,34	2,99	4,47	3,43	2,29	5,62	3,77	2,43	3,86	4,03						
Apr-2000	2,31	2,47	3,14	4,57	3,57	2,37	5,90	3,85	2,58	3,83	4,01						
May-2000	2,31	2,57	3,28	4,70	3,72	2,47	6,18	3,93	2,74	3,85	4,07						
Jun-2000	2,38	2,77	3,50	4,85	3,91	2,61	6,45	4,04	2,92	3,94	4,18						
Jul-2000	2,43	2,89	3,51	5,02	4,05	2,75	6,80	4,14	3,15	4,06	4,36						
Aug-2000	2,44	2,97	3,78	5,16	4,18	2,86	7,07	4,23	3,39	4,13	4,56						
Sep-2000	2,52	3,12	4,10	5,30	4,38	3,02	7,27	4,28	3,63	4,25	4,75						
Oct-2000	2,58	3,24	4,35	5,47	4,55	3,13	7,55	4,38	3,87	4,41	4,93						
Nov-2000	2,63	3,36	4,57	5,64	4,69	3,25	7,78	4,47	4,13	4,50	5,07						
Dec-2000	2,80	3,40	4,66	5,78	4,76	3,28	7,79	4,53	4,38	4,59	5,24						
Jan-2001	2,82	3,49	4,70	5,73	4,82	3,26	7,70	4,54	4,60	4,92	5,47	5,37					

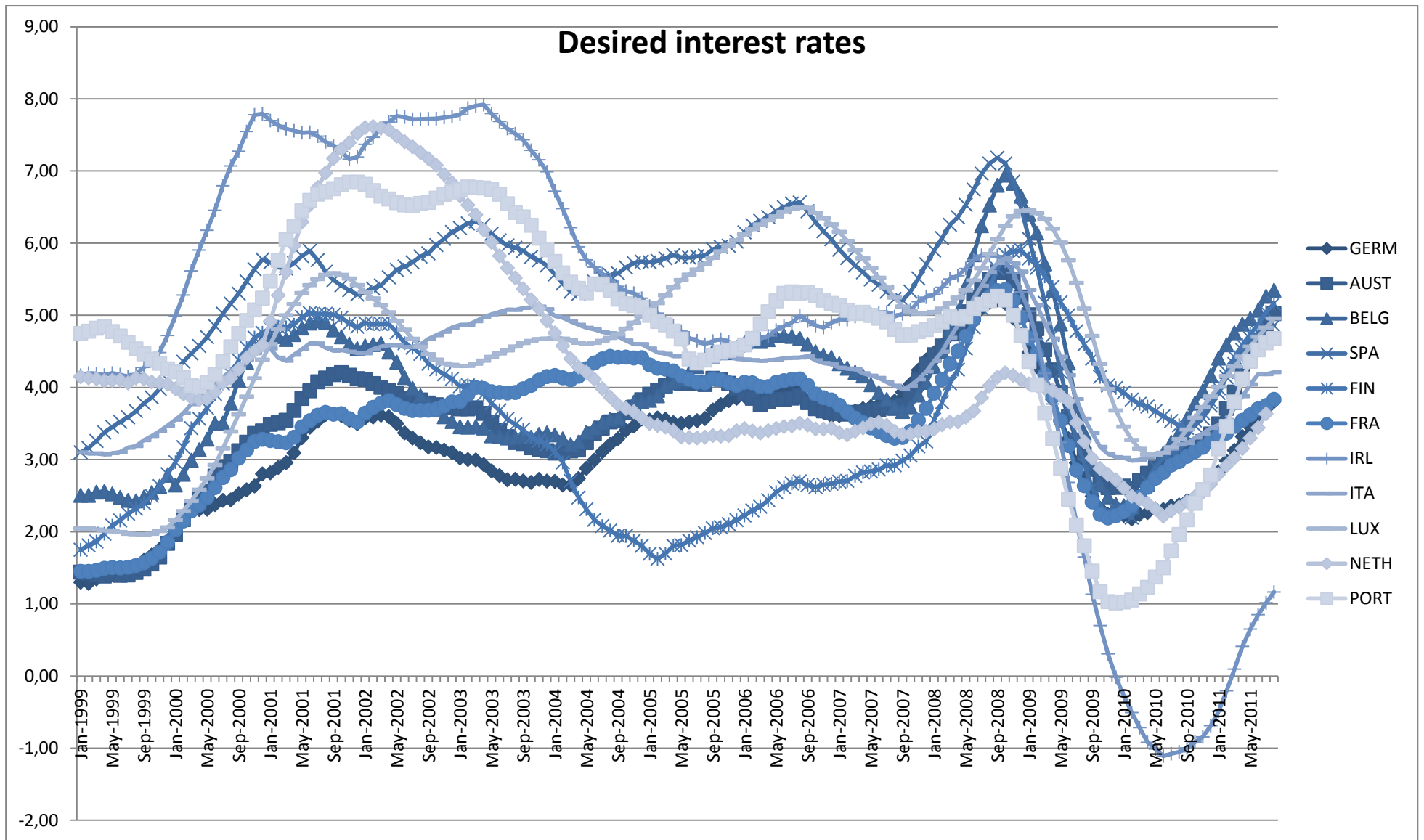
Feb-2001	2,89	3,51	4,71	5,66	4,84	3,25	7,63	4,41	4,81	5,28	5,76	5,46
Mar-2001	2,96	3,54	4,66	5,65	4,83	3,23	7,58	4,37	5,00	5,60	6,05	5,49
Apr-2001	3,09	3,68	4,73	5,72	4,87	3,31	7,56	4,45	5,15	5,96	6,24	5,60
May-2001	3,30	3,85	4,82	5,82	4,98	3,45	7,53	4,53	5,31	6,29	6,45	5,72
Jun-2001	3,45	3,95	4,89	5,89	5,03	3,54	7,54	4,61	5,42	6,53	6,59	5,92
Jul-2001	3,53	4,08	4,92	5,76	5,02	3,61	7,48	4,61	5,50	6,77	6,68	6,06
Aug-2001	3,62	4,13	4,90	5,60	5,02	3,65	7,40	4,55	5,56	6,97	6,71	6,16
Sep-2001	3,63	4,18	4,80	5,49	5,01	3,63	7,35	4,51	5,58	7,17	6,75	6,24
Oct-2001	3,61	4,20	4,70	5,41	4,97	3,64	7,27	4,52	5,56	7,30	6,81	6,20
Nov-2001	3,54	4,17	4,60	5,35	4,88	3,57	7,16	4,50	5,51	7,39	6,84	6,11
Dec-2001	3,50	4,12	4,54	5,29	4,84	3,52	7,19	4,48	5,42	7,52	6,84	6,12
Jan-2002	3,58	4,11	4,58	5,32	4,89	3,64	7,37	4,47	5,32	7,60	6,82	6,33
Feb-2002	3,59	4,05	4,59	5,37	4,88	3,72	7,47	4,53	5,23	7,62	6,73	6,37
Mar-2002	3,62	4,00	4,61	5,41	4,88	3,78	7,59	4,57	5,14	7,60	6,65	6,49
Apr-2002	3,59	3,96	4,49	5,53	4,88	3,82	7,68	4,59	5,04	7,57	6,61	6,56
May-2002	3,50	3,92	4,35	5,63	4,76	3,76	7,76	4,59	4,92	7,48	6,56	6,57
Jun-2002	3,37	3,85	4,14	5,68	4,61	3,71	7,75	4,56	4,80	7,40	6,53	6,55
Jul-2002	3,30	3,79	3,99	5,73	4,55	3,68	7,72	4,56	4,67	7,33	6,52	6,54
Aug-2002	3,23	3,83	3,88	5,81	4,47	3,68	7,72	4,60	4,56	7,26	6,55	6,55
Sep-2002	3,17	3,78	3,78	5,86	4,33	3,68	7,72	4,67	4,46	7,17	6,56	6,57
Oct-2002	3,17	3,76	3,70	5,97	4,25	3,70	7,73	4,72	4,38	7,08	6,62	6,60
Nov-2002	3,13	3,74	3,59	6,06	4,18	3,74	7,74	4,77	4,33	6,95	6,68	6,62
Dec-2002	3,10	3,72	3,53	6,15	4,12	3,80	7,76	4,83	4,31	6,84	6,71	6,58
Jan-2003	3,02	3,70	3,45	6,21	4,02	3,80	7,79	4,87	4,30	6,66	6,74	6,52
Feb-2003	3,00	3,70	3,45	6,27	4,03	3,90	7,87	4,87	4,30	6,53	6,78	6,60
Mar-2003	3,00	3,72	3,46	6,30	4,01	4,00	7,90	4,92	4,33	6,39	6,77	6,62
Apr-2003	2,93	3,64	3,44	6,25	3,91	3,98	7,92	4,98	4,37	6,18	6,76	6,56
May-2003	2,84	3,51	3,33	6,13	3,78	3,94	7,80	5,01	4,42	6,01	6,74	6,53
Jun-2003	2,78	3,41	3,32	6,04	3,68	3,93	7,69	5,05	4,47	5,82	6,68	6,51

Jul-2003	2,72	3,32	3,30	5,97	3,56	3,92	7,59	5,08	4,51	5,66	6,55	6,49
Aug-2003	2,73	3,24	3,31	5,94	3,49	3,93	7,52	5,07	4,57	5,52	6,43	6,43
Sep-2003	2,70	3,22	3,33	5,89	3,42	3,98	7,43	5,10	4,62	5,37	6,36	6,38
Oct-2003	2,68	3,16	3,31	5,81	3,31	4,03	7,29	5,11	4,64	5,22	6,25	6,33
Nov-2003	2,72	3,14	3,35	5,76	3,26	4,10	7,15	5,12	4,67	5,09	6,07	6,27
Dec-2003	2,70	3,12	3,37	5,69	3,21	4,15	6,99	5,08	4,68	4,92	5,91	6,21
Jan-2004	2,70	3,09	3,34	5,57	3,11	4,16	6,72	4,99	4,68	4,76	5,75	6,15
Feb-2004	2,65	3,11	3,29	5,44	2,96	4,13	6,48	4,97	4,68	4,58	5,59	6,03
Mar-2004	2,65	3,12	3,21	5,33	2,70	4,11	6,22	4,91	4,65	4,40	5,46	5,96
Apr-2004	2,74	3,13	3,24	5,30	2,47	4,15	5,95	4,87	4,62	4,28	5,37	5,93
May-2004	2,88	3,23	3,38	5,38	2,31	4,26	5,77	4,83	4,60	4,21	5,31	5,90
Jun-2004	2,99	3,36	3,44	5,47	2,17	4,34	5,67	4,80	4,62	4,11	5,44	5,86
Jul-2004	3,11	3,44	3,51	5,51	2,08	4,39	5,58	4,77	4,65	3,98	5,43	5,84
Aug-2004	3,21	3,52	3,56	5,56	2,02	4,43	5,49	4,75	4,69	3,87	5,34	5,78
Sep-2004	3,29	3,54	3,57	5,58	1,95	4,42	5,40	4,71	4,74	3,76	5,22	5,74
Oct-2004	3,41	3,65	3,72	5,66	1,94	4,42	5,34	4,65	4,81	3,71	5,16	5,76
Nov-2004	3,46	3,73	3,80	5,72	1,88	4,41	5,31	4,60	4,90	3,66	5,13	5,76
Dec-2004	3,56	3,83	3,80	5,74	1,80	4,41	5,24	4,60	4,99	3,58	5,11	5,75
Jan-2005	3,55	3,91	3,82	5,73	1,69	4,31	5,13	4,54	5,08	3,50	5,00	5,90
Feb-2005	3,58	3,96	3,88	5,76	1,62	4,27	5,03	4,48	5,17	3,47	4,91	5,89
Mar-2005	3,56	4,02	4,02	5,79	1,70	4,25	4,91	4,47	5,28	3,45	4,87	5,84
Apr-2005	3,51	4,07	4,07	5,84	1,81	4,23	4,85	4,43	5,39	3,40	4,78	5,85
May-2005	3,50	4,06	4,11	5,80	1,81	4,16	4,78	4,44	5,49	3,31	4,67	5,84
Jun-2005	3,52	4,05	4,20	5,80	1,88	4,11	4,69	4,41	5,56	3,31	4,39	5,84
Jul-2005	3,54	4,06	4,29	5,82	1,93	4,07	4,65	4,38	5,63	3,30	4,34	5,94
Aug-2005	3,57	4,04	4,39	5,83	1,98	4,06	4,60	4,36	5,71	3,31	4,38	5,99
Sep-2005	3,69	4,13	4,51	5,92	2,05	4,12	4,64	4,35	5,80	3,33	4,45	6,06
Oct-2005	3,76	4,11	4,48	5,95	2,06	4,11	4,67	4,40	5,89	3,32	4,49	6,11
Nov-2005	3,82	4,06	4,48	5,96	2,11	4,07	4,63	4,42	5,97	3,33	4,52	6,11

Dec-2005	3,85	3,99	4,55	6,02	2,16	4,03	4,55	4,40	6,04	3,40	4,54	6,12			
Jan-2006	3,88	3,92	4,62	6,15	2,22	4,07	4,57	4,39	6,12	3,43	4,59	6,06			
Feb-2006	3,91	3,85	4,68	6,25	2,30	4,06	4,62	4,38	6,19	3,40	4,68	6,02			
Mar-2006	3,90	3,76	4,64	6,31	2,35	4,01	4,68	4,37	6,26	3,37	4,88	6,01			
Apr-2006	3,95	3,80	4,66	6,36	2,44	4,01	4,71	4,38	6,32	3,40	5,05	6,03			
May-2006	3,97	3,83	4,72	6,44	2,55	4,07	4,79	4,38	6,37	3,43	5,20	6,03			
Jun-2006	3,98	3,83	4,72	6,50	2,62	4,09	4,85	4,41	6,43	3,46	5,30	6,03			
Jul-2006	3,99	3,85	4,71	6,55	2,67	4,11	4,90	4,41	6,48	3,47	5,32	6,11			
Aug-2006	3,97	3,88	4,68	6,56	2,70	4,12	4,99	4,41	6,50	3,51	5,30	6,11			
Sep-2006	3,82	3,79	4,60	6,44	2,65	4,03	4,92	4,43	6,49	3,48	5,32	6,07			
Oct-2006	3,70	3,71	4,49	6,29	2,62	3,91	4,86	4,38	6,42	3,43	5,28	6,02			
Nov-2006	3,66	3,67	4,44	6,16	2,65	3,86	4,83	4,34	6,34	3,42	5,21	6,00			
Dec-2006	3,60	3,65	4,42	6,05	2,67	3,83	4,90	4,32	6,26	3,44	5,16	5,98			
Jan-2007	3,61	3,64	4,33	5,91	2,69	3,75	4,94	4,27	6,16	3,37	5,14	5,93	5,01		
Feb-2007	3,64	3,63	4,27	5,79	2,70	3,66	4,94	4,26	6,03	3,34	5,07	5,89	4,95		
Mar-2007	3,67	3,65	4,21	5,69	2,77	3,57	4,98	4,25	5,90	3,39	5,02	5,82	4,95		
Apr-2007	3,71	3,66	4,16	5,60	2,82	3,51	5,02	4,20	5,79	3,44	5,04	5,73	4,99		
May-2007	3,74	3,68	4,04	5,50	2,84	3,44	5,02	4,16	5,65	3,49	5,00	5,65	5,06		
Jun-2007	3,76	3,70	3,93	5,42	2,86	3,39	5,04	4,13	5,52	3,52	4,96	5,57	5,22		
Jul-2007	3,79	3,73	3,83	5,33	2,92	3,33	5,04	4,07	5,38	3,47	4,91	5,52	5,40		
Aug-2007	3,81	3,71	3,73	5,23	2,92	3,30	4,98	4,02	5,25	3,39	4,80	5,47	5,47		
Sep-2007	3,93	3,75	3,67	5,21	2,98	3,31	5,02	3,98	5,12	3,35	4,72	5,46	5,56		
Oct-2007	4,05	3,91	3,73	5,33	3,06	3,39	5,07	4,03	5,05	3,35	4,73	5,47	5,87		
Nov-2007	4,24	4,10	3,89	5,51	3,18	3,54	5,19	4,11	5,02	3,39	4,77	5,61	6,24		
Dec-2007	4,38	4,32	4,07	5,71	3,25	3,71	5,25	4,22	5,03	3,39	4,80	5,73	6,57		
Jan-2008	4,48	4,45	4,29	5,90	3,55	3,92	5,29	4,37	5,05	3,42	4,86	5,84	6,98	4,74	3,50
Feb-2008	4,58	4,57	4,50	6,07	3,79	4,11	5,39	4,50	5,09	3,48	4,91	6,03	7,34	5,07	3,85
Mar-2008	4,72	4,74	4,81	6,25	4,06	4,32	5,50	4,69	5,16	3,52	4,98	6,19	7,70	5,32	4,21
Apr-2008	4,74	4,88	5,05	6,36	4,25	4,50	5,55	4,86	5,24	3,52	4,96	6,33	7,96	5,54	4,51

May-2008	4,83	5,05	5,41	6,53	4,54	4,71	5,65	5,03	5,35	3,59	4,98	6,53	8,20	5,77	4,77	
Jun-2008	4,96	5,24	5,84	6,74	4,83	4,94	5,77	5,23	5,48	3,67	5,09	6,72	8,50	6,08	5,06	
Jul-2008	5,09	5,39	6,24	6,96	5,09	5,15	5,83	5,41	5,65	3,86	5,15	6,88	8,79	6,37	5,49	
Aug-2008	5,18	5,49	6,53	7,10	5,38	5,26	5,83	5,60	5,85	4,02	5,20	7,01	8,91	6,59	5,85	
Sep-2008	5,21	5,60	6,80	7,18	5,65	5,34	5,83	5,72	6,06	4,14	5,26	7,12	8,96	6,79	6,10	
Oct-2008	5,17	5,59	6,94	7,10	5,84	5,36	5,75	5,79	6,24	4,20	5,21	7,11	8,89	6,93	6,45	
Nov-2008	4,96	5,48	6,83	6,85	5,88	5,21	5,59	5,72	6,37	4,17	5,00	6,94	8,53	6,80	6,64	
Dec-2008	4,73	5,25	6,65	6,49	5,90	4,97	5,32	5,60	6,45	4,10	4,72	6,68	8,05	6,49	6,82	
Jan-2009	4,49	5,01	6,40	6,06	5,79	4,69	5,06	5,35	6,45	4,05	4,36	6,41	7,55	6,08	6,71	6,24
Feb-2009	4,29	4,81	6,14	5,66	5,71	4,47	4,67	5,14	6,41	4,03	4,04	6,14	7,21	5,66	6,66	6,07
Mar-2009	4,02	4,52	5,71	5,17	5,54	4,18	4,19	4,89	6,33	3,99	3,64	5,85	6,83	5,33	6,68	5,83
Apr-2009	3,83	4,24	5,35	4,72	5,40	3,87	3,77	4,68	6,20	3,96	3,29	5,53	6,40	4,98	6,71	5,56
May-2009	3,55	3,93	4,88	4,21	5,18	3,54	3,24	4,43	6,01	3,89	2,88	5,18	5,94	4,66	6,64	5,26
Jun-2009	3,29	3,59	4,34	3,74	5,00	3,19	2,68	4,17	5,76	3,81	2,45	4,87	5,47	4,31	6,50	4,94
Jul-2009	2,95	3,27	3,75	3,27	4,78	2,85	2,12	3,84	5,45	3,51	2,09	4,59	4,93	3,86	6,07	4,63
Aug-2009	2,74	3,07	3,37	2,94	4,59	2,64	1,65	3,57	5,09	3,25	1,80	4,38	4,55	3,44	5,71	4,34
Sep-2009	2,49	2,86	2,98	2,61	4,40	2,41	1,13	3,37	4,71	3,02	1,45	4,14	4,20	3,01	5,35	4,01
Oct-2009	2,32	2,69	2,65	2,36	4,15	2,24	0,70	3,18	4,33	2,88	1,17	4,01	3,90	2,66	4,84	3,69
Nov-2009	2,24	2,61	2,48	2,28	4,03	2,19	0,31	3,08	3,98	2,79	1,03	4,02	3,88	2,64	4,44	3,42
Dec-2009	2,23	2,61	2,38	2,29	3,99	2,22	-0,02	3,03	3,68	2,72	1,01	4,11	3,91	2,72	4,04	3,18
Jan-2010	2,23	2,63	2,36	2,26	3,93	2,28	-0,27	3,02	3,46	2,61	1,03	4,14	3,89	2,92	3,91	2,93
Feb-2010	2,18	2,60	2,34	2,20	3,83	2,36	-0,51	2,99	3,27	2,49	1,05	4,26	3,84	3,15	3,73	2,71
Mar-2010	2,24	2,71	2,49	2,48	3,77	2,48	-0,72	3,00	3,15	2,45	1,14	4,52	3,82	3,28	3,54	2,58
Apr-2010	2,26	2,81	2,66	2,69	3,73	2,62	-0,92	3,04	3,07	2,39	1,23	4,88	3,94	3,43	3,41	2,53
May-2010	2,32	2,88	2,87	2,90	3,67	2,74	-1,01	3,07	3,06	2,32	1,37	5,28	4,01	3,45	3,44	2,48
Jun-2010	2,31	2,96	3,09	3,02	3,60	2,82	-1,11	3,09	3,09	2,21	1,50	5,64	4,02	3,52	3,47	2,44
Jul-2010	2,36	3,02	3,24	3,09	3,53	2,92	-1,08	3,15	3,17	2,29	1,73	6,00	4,07	3,68	3,60	2,44
Aug-2010	2,37	3,06	3,38	3,12	3,48	2,97	-1,05	3,21	3,28	2,34	1,96	6,34	4,12	3,92	3,79	2,46
Sep-2010	2,43	3,11	3,57	3,33	3,44	3,04	-0,99	3,23	3,42	2,41	2,17	6,66	4,12	4,17	3,87	2,48

Oct-2010	2,48	3,20	3,78	3,47	3,54	3,11	-0,92	3,31	3,58	2,48	2,39	6,87	4,13	4,33	3,91	2,49	
Nov-2010	2,57	3,25	3,95	3,57	3,65	3,17	-0,84	3,36	3,73	2,55	2,58	7,00	4,05	4,25	4,13	2,49	
Dec-2010	2,70	3,35	4,17	3,75	3,80	3,25	-0,69	3,44	3,88	2,66	2,79	7,18	4,08	4,21	4,42	2,54	
Jan-2011	2,83	3,49	4,41	3,92	3,99	3,33	-0,49	3,48	4,01	2,80	3,15	7,30	4,12	4,34	4,57	2,86	5,88
Feb-2011	2,98	3,71	4,59	4,14	4,22	3,37	-0,21	3,55	4,16	2,92	3,46	7,30	4,11	4,47	4,62	3,20	6,22
Mar-2011	3,13	3,94	4,76	4,32	4,42	3,46	0,10	3,71	4,29	3,02	3,80	7,32	4,16	4,61	4,68	3,55	6,46
Apr-2011	3,32	4,20	4,88	4,52	4,59	3,54	0,41	3,88	4,43	3,15	4,12	7,24	4,14	4,77	4,67	3,88	6,73
May-2011	3,45	4,43	4,96	4,68	4,74	3,62	0,65	4,04	4,57	3,30	4,36	7,08	4,19	5,01	4,68	4,23	6,98
Jun-2011	3,56	4,65	5,07	4,76	4,88	3,70	0,85	4,19	4,70	3,44	4,52	6,94	4,11	5,28	4,78	4,52	7,12
juil-11	3,70	4,85	5,26	4,83	5,04	3,75	1,01	4,18	4,83	3,63	4,62	6,66	3,96	5,38	4,73	4,74	7,31
Aout-11	3,81	5,02	5,35	4,86	5,16	3,83	1,16	4,21	4,96		4,68	6,30	3,85	5,34	4,70	4,98	7,52



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