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Abstract

The Grilli-Masciandaro-Tabellini and Cukierman indices of central bank independence, as well as the turnover of central bank governors, are updated for the late 1990s and early 2000s using the most recently published central banking laws for 90 industrial and developing countries. Included in our indices are most of the Eastern European and South-East Asian countries and a subset of African states. We examine how these CBI indices correlate among themselves and how they compare with previous estimates of CBI indices based on legislation available in the 1980s. We also provide an assessment of how well the new CBI indices correlate with inflation for the periods following any new legislation.

JEL classification: E58, E52

Keywords: Central bank independence; updated indices; inflation

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(*) We are grateful to Jonathan Riley, sadly deceased, for his excellent research assistance.

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1. Introduction

The main purpose of this paper is to present updated indices of central bank independence (CBI) based on the latest legislation available, using the criteria of Grilli, Masciandaro and Tabellini (1991) - henceforth GMT, and of Cukierman (1992) - henceforth CUK. Our study includes all the countries covered by Grilli *et al* (1991) and Cukierman (1992), plus a much larger number of emerging and developing countries from South-East Asia, Eastern Europe[1], Latin America and Africa. In addition we provide values for the turnover of central bank governors (TOR) for all countries.

There are several reasons for writing this paper. The most obvious is that we have a relatively large number of industrial and developing countries (90) whose legislation we have analysed. Secondly, there appears to be no study that has attempted to construct all these indices for such a large set of countries, and especially for developing countries[2]. Thirdly, we have carefully documented how we have scored each of the criteria of the two indices. This is of particular importance given the discrepancy between the interpretation of central banking legislation. As Mangano (1998) has pointed out, in only one out of 17 countries originally analysed in GMT and CUK, and for only one of the criteria, do the scores agree with one another. In addition, Mangano finds that "they disagree in nearly 60% of countries when deciding whether the CB is legally allowed to purchase Government debt in the primary market or not." Although we do not follow the detail of Mangano's analysis, we evaluate the CBI scores of each of the indices using simple correlations. We also compare our updated indices with those reported in previous studies.

Central bank independence has been viewed in the theoretical literature as a means of ensuring low inflation, without harming output or growth. Influential in the support for this view has been the empirical work of Alesina and Summers (1993), Cukierman (1992) and Grilli *et al*; (1991), all of whom have compiled (differing) indices of CBI. All these authors have run regressions demonstrating their results, although a cursory glance at the relevant graphs is convincing. Although Posen (1998) has questioned the conventional view, and has demonstrated that some of the implications, in particular with regard to observations of wages, are not in line with theory, it is not our intention here to grapple with these analytical issues. Our aim is to update and analyse the CBI indices which have been the most influential

[1] A more detailed analysis of the central bank legislation for ten of this group of countries has been conducted by Hochreiter and Kowalski (2000) and for the whole group by Cukierman et al (2002).

[2] To our knowledge, neither Grilli *et al* (1991) nor any other study has calculated the GMT index for developing countries. Our calculation of the GMT index for both industrial and developing countries enables us

in the empirical literature, and to compare them with more recent figures on inflation. A follow-up study will incorporate various control variables and carry out an econometric investigation of the CBI effects on inflation and output growth.

In addition to these two indices, we also calculate the turnover rate of Central Bank governors (TOR). This was introduced in Cukierman (1992, p384) and de Haan and Kooi (2000), and it was shown to be a reasonably good proxy for actual CBI, especially for developing countries. We retain the approach taken in Radzyner and Riesinger (1997) and Dvorsky (2000). Thus acting governors, usually for an interim period, are ignored, and governors reappointed for a second or third term will be counted only once.

The world of the early 21st century is very different from that of 10 years ago, in particular with regard to low inflation, increasing numbers of central banks becoming independent, and lower unemployment in many OECD countries. Despite this, the continuing research work on CBI largely draws on indices from the studies mentioned above. The only exceptions appear to be the work of de Haan et al (1999), which updates Eijffinger and Schaling (1993), but which uses a much smaller set of measures to compile the GMT index, and Cukierman et al (2002), which updates Cukierman's indices for the transition economies of Eastern Europe. Ilieva and Gregoriou (2005) cover 22 of these countries for both GMT and CUK, and in addition suggest a modified index specially tailored for the transition economies, to include measures of changeability of central banking law, tradition, and the existence of conflicting laws. Daunfeldt and de Luna (2003) appear to have updated measures of CBI for 23 OECD countries, although no details are supplied; intriguingly, they show that price stability precedes increased independence[3].

In contrast to the above papers, our study provides a comprehensive cover for all major CBI indices and most countries in the world for which legislation is available. One important innovation of our work is that we have created a record of which articles of the central banking Act for each country are relevant to each of the criteria of the CBI indices. These will be available on the website of the Centre for International Capital Markets at

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to provide a comprehensive comparison of central bank independence across countries.

[3] Polillo and Guillen (2005) have coded the Cukierman index for 71 countries, but have neither recorded the values in their paper, nor any of the details. Their work offers a sociological perspective, with the hypothesis that countries compete to maintain their position and status, with increasing foreign exposure leading to increased competition of this form.

London Metropolitan University, and will enable other researchers to take issue with us on our scoring.[4]

Section 2 discusses the theories behind CBI and motivates the construction of the indices, with a discussion of central bank accountability. Section 3 discusses some of the more detailed issues concerning the creation of the updated indices. Section 4 analyses the relationship between the various measures of CBI, the ranking of countries, and compares the new indices to those reported by previous studies. Section 5 examines how the CBI indices relate to subsequent consumer price inflation. Section 6 concludes.

2. Independence, Accountability and Transparency

The theories behind CBI are grounded in the time inconsistency literature, exemplified by Barro and Gordon (1983). If governments lack credibility, private agents expect temporary boosts in demand from an increase in the money supply. This leads to expectations of higher prices, and thereby higher wage demands. If governments were to shift their preferences away from output stabilisation to inflation stabilisation, this would lead to a lower inflation bias, but a greater volatility of output. Such a shift in government preferences, other than when a new party comes into power, is unlikely to be taken seriously by economic agents. As a consequence, this shift can only be effective if the government appoints an agent, namely an independent central banker, with these preferences. As Rogoff (1985) has shown, it is possible to obtain a second-best outcome by optimally choosing a banker with a particularly desirable set of preferences.

Walsh (1995) and Persson & Tabellini (1993) have demonstrated that it is theoretically possible to arrive at an optimal contract that will force the central banker to behave in a way which is best for society as a whole. The contract creates incentives for the central banker, which force him or her to act as though there were a negative inflation target. These incentives could be in the form of bonuses on the attainment of a particular inflation target, or penalties such as dismissal. However, as pointed out by McCallum (1997), this contract represents a redistribution of the time inconsistency problem, since the government may be unwilling to dismiss the central banker when the time comes. The anticipated reneging of a contract which neither party, government or central banker, really wants, will

[4] Together with our research assistant Jon Riley, sadly deceased, we read through the central bank legislation for each country; if there was a disagreement, it was resolved by discussion and if necessary, majority decision. Riley, in email correspondence with Cukierman, pointed out a number of discrepancies in the indices calculated

alter the expectations of private agents, and lead to a re-emergence of the time-inconsistency problem.

Both of the above approaches to monetary policy involve appointing an independent central bank. In addition the 'Walsh contract', if it is to be effective, requires some kind of accountability, so that Parliament and the electorate can judge whether the contract has been adhered to. The importance of accountability has been pointed out by numerous authors such as Fischer (1994) and Briault *et al* (1996). The latter refer to the 'democratic deficit' incurred by delegating power to an unelected, unaccountable authority, in particular if it is permitted to set the goals of monetary policy as well as to implement them. Persson & Tabellini (1993) show that a reduction in central bank secrecy is important, since an optimal policy must be supported by clear announcements. Nolan & Schaling (1996) develop a theoretical approach to accountability, which is represented by uncertainty in the central bank's stabilisation preferences. The greater the degree of uncertainty, the higher will be inflation expectations. Therefore, using the Rogoff (1985) notion of CBI, the lower is the degree of central bank independence, the higher must be the optimal Nolan-Schaling degree of accountability. Using the Briault et al (1996) indicator of central bank accountability, they find a negative relationship with the Eijffinger & Schaling (1993) measure of CBI, which accords with their theoretical result. However, further comparison by de Haan (1997) using the GMT and the Cukierman indices showed no relationship. This motivated de Haan et al (1999) to propose a more detailed set of indicators for central bank accountability.

The de Haan et al indicator uses 13 aspects of accountability, divided into three main features: ultimate objectives, transparency and final responsibility of monetary policy. The ultimate objectives aspect relates to the democratic deficit referred to earlier, and four features are identified. These refer to whether the objectives are stipulated in central bank law, whether they are clearly defined and prioritised, and if they are anywhere quantified. Transparency, which relates to the Nolan & Schaling (1998) concept of accountability, covers three features of public reporting of minutes and of success in meeting targets. The final responsibility aspect concerns the bank's relationship with Parliament, which covers override mechanisms, dismissal of the governor and ease of changing central bank law.

de Haan et al (1999) go on to discuss why there need not be any correlation between CBI and accountability. Firstly they note that in the Lohmann (1992) and Walsh (1995) solutions, which are both welfare-enhancing, government bears final responsibility for

in Cukierman et al (2002). Cukierman graciously conceded in most cases.

monetary policy; this measure of accountability is therefore negatively correlated with CBI. The same may well be true of transparency, as discussed above. However if the ultimate objective of the bank is price stability, this correlates positively with what is seen as the Rogoff (1985) conservative choice of independent banker. When de Haan et al (1999) compared their indicator with the updated Eijffinger & Schaling (1993) measure of CBI, they found little evidence of any relationship between CBI and accountability, although the correlation between CBI and the final responsibility measure of accountability had a strong negative correlation.

Transparency focuses on whether asymmetric information is a good or bad thing. It is discussed in its own right by Geraats (2002), and five aspects are distinguished: political, economic, procedural, policy and operational. Political transparency is exemplified by Svensson and Woodford (2003) who emphasise inflation targeting, while Walsh (2001) covers contracts and Schaling and Nolan (2001) address preference uncertainty. Economic transparency concerns information on economic data and forecasts; Cukierman (2001) and Gersbach (2003) have shown how information on supply shocks removes the benefit supplied by the Central Bank inflation/output trade-off. Amato et al (2002) and Pearlman (2005) provide contrasting theoretical results on the benefits of full information on money supply targets. Operational transparency has been discussed by Faust and Svensson (2001), and involves the degree to which the imperfectness of control (i.e. the control error) over inflation is revealed. Their additional focus on the indirect observability of central bank's preferences and objectives has its roots in Cukierman and Meltzer (1986). Procedural transparency centres around individual voting records, and minutes of monetary policy committee meetings; recent research on this has been done by Gerlach-Kristen (2002) and Spencer (2005). Associated with this, is an analysis by Ehrmann and Fratzscher (2005) of the differing effects of communication within the central bank committees of the ECB, Bank of England and the Fed, and the response by financial markets. Policy transparency is the disclosure of policy decisions and of likely future policy. Geraats (2002) makes the point that "accountability directly affects the central bank's incentives, whereas incentive effects of transparency only operate indirectly through private sector expectations". Some form of transparency is therefore essential, for as Blinder (1998) argues, with central banks only controlling the overnight rate, there needs to be some other mechanism by which monetary policy can coordinate expectations. Note however that there is some motivation for central banks not being fully transparent. Firstly, there is the potential for market participants to be

unduly influenced by a central bank judgement that may (hopefully no more than occasionally) be misguided (Amato and Shin, 2003). Secondly, there is a trade-off between early publication of data and the discovery of subsequent error, and the consequent loss of reputation due to the latter is likely to be the main factor in deciding not to be fully transparent.

The creation of a measure of transparency, unlike that of CBI, requires considerably more than the assessment of a single piece of legislation, and involves the examination of information published by central banks and other government sources, and feedback from senior officials at those banks. It has been achieved for nine major central banks by Eijffinger and Geraats (2005), who have shown (Eijffinger and Geraats, 2004) that transparency is associated with lower interest rates.

Overall then, the literature indicates that each of independence, accountability and transparency has a role to play in the effectiveness of monetary policy. Our objective is to update the measures of independence only, and in order to be as comprehensive as possible we have chosen to update both of the main CBI indicators. There is a possibility that the GMT indicator of CBI is preferable to both the Cukierman and the Alesina & Summers indicators; a study by Hadri et al (1998) on the relationship between inflation, CBI and the political business cycle showed that the GMT index gave more significant parameter estimates. In addition, both the Alesina & Summers and the Cukierman indicators include measures of accountability in them, namely the provision for dismissal of the governor. Since our discussion has indicated that accountability and CBI represent differing or complementary approaches to stabilisation and control of inflation, it may seem sensible to separate them. However, there is still some overlap between the CBI and accountability indicators, since they all contain features relating to final say over monetary policy and the override mechanism. However, with GMT and Cukierman indices overwhelmingly measuring independence, we have chosen to update these. We also update the turnover rate of central bank governors (TOR) using data for the period 1991-2002, which will allow us to provide a comparison with the TOR indices obtained by Cukierman (1992) and de Haan and Kooi (2000) for the 1980s.

3. The Construction of CBI Indices

All the data that we employ is based on the latest central bank legislation, with the dates of the laws listed in Table 1. We have utilised English translations, which are available

from central bank websites. In certain cases, where the available legislation does not appear to cover some of the criteria, we have examined central bank annual reports and monetary policy statements, which are also available on these websites.

For the GMT index there are 15 criteria of CBI, while for the Cukierman index there are 16. As far as possible, we have listed all the legal articles in each of the central banking laws which are relevant to each of the criteria, and these will be available for every country in our website[5]. The tabulation of the data also appears on the website. Apart from enabling our indices to be more readily checked, we are motivated by Mangano (1998) who has pointed out inconsistencies in the interpretation of banking legislation between GMT and CUK. Part of our later analysis therefore involves establishing the correlation between the indices of CBI. Mangano also discusses the differing criteria and weights of each of the criteria of the indices, but this is not our concern here.

The various indices of CBI have focused on the institutional features, and have ignored any behavioural indicators, in particular that of reputation. The latter is obviously crucial, in that it affects expectations of wage and price setters in the economy, but it is not easily measurable. Furthermore, behaviour is likely to be affected by the institutional framework. Thus, to paraphrase our earlier discussion, the increasing popularity of central bank independence in the industrialised world is due in large part to the view that central bankers will have no incentive to stimulate growth temporarily in the run-up to election by an increase in the money supply. This is notably the case if the term of office of the monetary policy committee is not linked to the government's term of office, but is of course linked to all the CBI criteria.

(a) GMT index

Grilli *et al* (1991) divide their CBI index into political and economic criteria. The political independence of a central bank is associated with how the members of the central bank board are appointed, its relationship with government and its responsibilities. These measures are all about autonomy, with the first four criteria covering the appointment of the governor and the other members of the board and whether their appointments are for longer than the usual duration of the government. Independence is enhanced if they are not appointed by the government (or sovereign), and if they are appointed for a period longer

[5] We are planning to set up a special website later this Summer which will include the central bank legislation for all countries, as well as details on the construction of the LGT and CUK indices.

than five years. The latter period is typical of the maximum length of office of most democratically elected governments, although it fails to take account of the USA and New Zealand where the length of office is only four years. As a consequence, we award New Zealand a lower score than is accorded it by Dowd and Baker (1994), since both governor and board are appointed for five-year terms.

The fifth political independence criterion concerns the presence of a government representative on the board, with a score of zero whether or not that representative has voting rights. There appears to be a possible ambiguity here, since the Bundesbank allows a non-voting government representative. According to Grilli *et al* (1991), this was not the case prior to 1991. It is surprising, given the Bundesbank's record over the years in curbing inflation, to view it as having become less politically independent over time. We have therefore departed from Grilli *et al* (1991), and assigned a positive score if the government representative has no voting rights. In the case of Belgium, the minister only has voting rights on non-ECB issues. Since the only non-ECB issue is banking supervision, over which the Belgian central bank has no say, it too receives a positive score. These criteria of the governor and of the board are summarised in our website.

The sixth criterion measures whether government approval of monetary policy is required; the scoring of this is often a matter of interpretation of somewhat ambiguous legal phrasing. The seventh criterion is whether monetary or price stability is one of the goals of the central bank. This is probably the only contentious criterion, in that it does not differentiate between price stability and control of output. Thus if both are on the agenda, this gets the same score as if price stability were the sole objective. However, if one views the relationship between government and central bank within a principal-agent framework (e.g. Persson & Tabellini, 1993, Walsh, 1995), then the objective of the government is to have the bank pursue an unemployment/inflation trade-off while maintaining credibility. One might therefore argue that price stability as the sole objective is inappropriate for a central bank. The compromise is that any mention of price stability is accorded a positive score. There is a further ambiguity when it comes to less developed countries or countries which have suffered currency crises, so for example in the case of Banco de Mexico we see that 'its primary objective shall be to seek the stability of the purchasing power of [the] currency'.[6] It is difficult not to interpret this as in part a pursuit of price stability, but it is evidently a legal article designed to focus the bank's attention on the exchange rate. Nevertheless, we give

[6]Prior to 1998, the objective of the Dutch Central Bank was to regulate the guilder in a welfare-enhancing way.

Mexico a positive score. The eighth criterion gives a positive score if there is an explicit legal provision strengthening the bank when it is in conflict with the government; once again there are cases where interpretation of the law is difficult, and is part of the reason we have lodged our detailed scoring. One of the reasons for the UK not being constitutionally able to be part of the European system of Central Banks is that under the 1998 legislation, the government is permitted to override monetary policy in emergencies (Cranston, 1998). This provision is in keeping with the analysis of Lohmann (1992), and is not out of step with some other countries' legislation.

The next set of criteria covers economic issues. The first five represent the ease of access of government to central bank credit. The first four cover direct credit facilities, with positive scores for these being non-automatic, at the market interest rate, being temporary, and of limited amount. The fifth refers to the central bank not participating in the primary market for public debt, and is again a little difficult to interpret in some of the legislation.

For the ESCB countries, Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain (Luxembourg being omitted from the tables) all such credit is denied under ECB Article 21.1. All these countries are therefore given positive scores for these five criteria. Although the indices are to a large extent irrelevant for those countries that are now part of the European Central Bank, it may be of use to other researchers, so we include them all for completeness. Clearly there is a common interest rate set by the ECB, but the term structure of individual government debt can be set independently; in some countries there is the equivalent of the UK's Debt Management Office that is separate from the Bank of England, so this aspect of independence may be irrelevant. Furthermore, banking supervision differs in each of the ECB countries, so these two features could affect voting preferences at monetary policy meetings, and also therefore the CBI index of the ECB.

The sixth criterion concerns whether the central bank sets the discount rate, while the final criterion concerns supervision of the banking system. The issue here is about conflict of interest. If banking failures could be triggered by an increase in the interest rate, the central bank might be unwilling to undertake the monetary policy which is required at the macroeconomic level. In addition, if banking failures did occur, the central bank might be regarded as responsible, and this could undermine its reputation. Two stars are given if the bank has no responsibility for banking supervision, and one star if it shares responsibility. Di Noia & di Giorgio (1999) discuss several more arguments both for and against functional separation of banking supervision and monetary policy. In a smaller sample of countries to

ours (notably with the exclusion of Latin American and East European states) they find both higher and more volatile inflation in countries where the central bank has sole responsibility for banking supervision.

(b) CUK LVAU and LVAW Indices

The Cukierman CBI index shares the same objective of the GMT index in measuring the legal independence of the central bank, so that it can be compared with those elsewhere and over different periods of time. It also shares similar groupings of questions regarding central bank operations in interpreting the various legal statutes.

However, while the GMT index is a simple binary zero or one answer to a set question, the CUK index lays out a choice of preordained answers for each area of interest. These are weighted, and those statements which are thought of as leading to greater independence, are given a larger weight. Furthermore, the CUK index has a broader set of questions within each sub-group.

Nevertheless, it should be stated at the outset, that this is not an easy task, being dependent on the subjective interpretation of each country's central bank law. As Cukierman (1992, p 371) states:

> "At times the spirit of the law and its application in practice are more important than the letter of the law and its application in practice are more important than the letter of the law. Ranking CB charters by their degree of legal independence is therefore a difficult task involving an inescapable amount of subjective judgement."

The first step in constructing the index of independence is to interpret a number of narrowly defined legal criteria. A corresponding code is given to the statement most appropriate for that particular country. The legal criteria are sub-divided into four groups, Chief Executive Officer, Policy Formulation, Final Objectives and Limitations on lending (to the public sector). The resulting process gives sixteen criteria for each central bank law.

Unfortunately, because the variables are defined very narrowly, there is a problem that some laws do not contain adequate information to answer each question, resulting in missing values. To overcome this problem, Cukierman (1992) scores the CBI index as a proportion of the criteria available.

The legal categories are as follows: Chief Executive Officer (CEO) group, made up of term of office of CEO in years, who appoints the CEO, provisions for dismissal of CEO, and

whether CEO allowed to hold another office; these are aggregated as one variable by applying an unweighted mean.

The Policy formulations group, made up of who formulates monetary policy, government directives and resolution of conflict, and whether the central bank is given an active role in the formulation of government's budget, are aggregated into a second variable using a weighted mean. The weights are 0.25, 0.50 and 0.25 respectively.

The next five criteria are central bank objectives, limitations on advances, limitations on securitized lending, terms of lending, and how wide is the circle of potential borrowers from central bank. These are left unchanged as the next five variables.

The final four criteria: type of limit on loans to government when such a limit exists, maturity of loans, restrictions on interest rates, and prohibition on lending in the primary market, are aggregated into an eighth variable using an unweighted average.

It should be noted that in this paper we deviate slightly from the original coding process. Following Cukierman et al. (2002, p242, Table 1, footnote b), where a government is prohibited from borrowing at a central bank, that is advances to government are prohibited, we also set the remaining lending variables equal to one.

Where there is no entry for a variable in one of the subgroups, the weight(s) of the missing criterion/(a) is/(are) allocated proportionally to the remaining variables in the group which contain a value.

With the eight variables at hand, a second round of aggregation takes place to construct the two Cukierman (1992) indices. First, an unweighted index LVAU is calculated. This is a simple average of the eight variables constructing in the first stage. Second, a weighted index LVAW is computed. Here subjective weights are assigned to each of the eight variables created in the second round of aggregation. These weights are 0.2, 0.15, 0.15, 0.15, 0.1, 0.1, 0.05 and 0.1 respectively.

(c) The Turnover rate of Governors Index (TOR)

The final measure of CBI is the turnover rate of governors (TOR), which is defined as the average term of office of central bank governors[7]. It is calculated by dividing the number of governors within a given period of time by the length of this reference period (expressed in years). This excludes acting governors serving for an interim period without being formally

[7] See Cukierman (1992) and de Haan and Kooi (2000).

appointed to the position of governors. In addition, governors reappointed for a second or third term will be counted only once.

4. Analysis of the CBI Indices

The results for the four measures of CBI are presented in Table 1, together with the latest legislation on which the GMT, LVAU and LVAW indices are based. In the case of the turnover rates of central bank governors (TOR) we construct two measures, one for the 1991-2002 period and the other for the 1996-2002 period.

There are four main issues that need to be addressed for the indices that we have created. The first is how countries are ranked by these CBI indices. The second is how correlated are these indices. The third issue is how the updated indices compare with those reported by previous studies, which could provide us with useful information about the trend in granting central banks independence across countries. The final issue is how well the new indices are correlated with inflation, which will be examined in the following section.

Tables 2-4 show the ranking of countries by the various indices. We divide the countries into industrial and non-industrial in order to compare the experience of developing countries to that of industrial countries. Looking at the GMT index, we notice that the mean value is higher in the industrial than the developing countries, which implies a higher degree of central bank independence in the developed countries. The latter also demonstrate a lower variability for the GMT index. In the case of industrial countries, Sweden has the largest index followed closely by Finland and Germany, while Denmark, Iceland, Japan, New Zealand and Norway have the smallest indices. For the non-industrial countries, we notice that some of the Central and Easter European countries display the largest indices and hence the strongest degree of central bank independence, while India and Maldives come at the bottom of the list.

The Cukierman indices (Table 3) confirm the finding with the GMT index; the average values for both the LVAU and LVAW indices are larger for the industrial than the non-industrial countries, thus supporting our expectation that the degree of central bank independence is much stronger among the industrial than the developing countries. The ranking of countries is similar for both the LVAU and LVAW indices, In the case of the industrial countries, Spain shows the largest index followed by Finland and France, while Norway has the lowest index, as with the GMT index.

The TOR indicator (Table 4), which is supposed to be a better CBI measure for the developing countries (de Haan and Kooi, 2000), provides further support for the proposition that central bank independence is much stronger among the industrial than the developing countries[8] - the average TOR value for the industrial countries is considerably smaller than for the non-industrial countries. The ranking of countries changes quite significantly from the other indicators, with Greece now topping the list and the US coming at the bottom among industrial countries[9]. In the case of non-industrialised countries, Brazil has the highest value followed by Argentina, while seven countries have a zero value (indicating no change in the governor of the central bank).

Tables 5 and 6 report the Pearson and Spearman[10] correlations among our different CBI indicators. Unsurprisingly, there is a very strong correlation between LVAU and LVAW indices. More heartening is the strong correlation between the GMT index and LVAU and LVAW. The correlation is consistently around 0.8 for both industrial and non-industrial countries. On the other hand, for turnover rate, evaluated over various different time periods, there is no significant correlation. Indeed apart from the case of the correlation between GMT and TOR for industrialised countries, the correlation is almost never even negative! The above results remain robust to the use of either linear or rank correlation coefficients.

In Table 7 we compare our GMT index with the GMT index obtained by Grilli *et al* (1991) for those countries common in both studies[11]. It is interesting to note that our mean index is considerably larger than that obtained by Grilli *et al* for the 1980s, which implies greater CBI among industrial countries over the recent years. Greece, Portugal and Spain appear to have experienced the strongest increase in central bank independence. We also note that our indices are significantly less volatile than those of Grilli *et al*. The decomposition of the index suggests that the increasing central bank independence among industrial countries is due to both the political and economic components.

The significant increase in the degree of CBI not only among the industrial countries but also among the developing countries is confirmed by the comparison of the Cukierman indices for the countries common to both studies (Table 8). The average values of our LVAU and LVAW indices (based on the latest legislation) are almost twice the size of those

[8] Note that a higher value for TOR indicates lower level of central bank independence.
[9] The value of zero for the USA reflects the fact that there was no change in the governor of the Federal Reserve during the 1990s.
[10] Pearson is the linear correlation coefficient, and Spearman is the rank correlation coefficient.
[11] The comparison is restricted to industrial countries because neither Grilli *et a*l (1992) nor any other study has calculated the GMT index for developing countries.

obtained by Cukierman (1992) on the basis of legislation available in the 1980s. Poland, Spain, Belgium and Uruguay show the most significant increase in central bank independence since the 1980s.

Table 9 compares our TOR indicator for the 1990s with those reported by Cukierman (1992) and de Haan and Kooi (2000) for the 1980s. The last two studies calculated the TOR measure only for developing countries. The average value of our TOR index is about 35-38% lower than those reported by the previous two studies. For some countries (i.e. Argentina, Botswana, Jamaica, Mexico, Morocco, Poland, Singapore, Venezuela) the TOR index is reduced by over 50%. Our indices are also considerably less volatile than those for the 1980s. These findings confirm those obtained with the Cukierman LVAU and LVAW indices; i.e. CBI among developing countries became considerably stronger during the 1990s.

5. Central Bank Independence and Inflation

Now consider the relationship between the CBI measures and CPI inflation. Here we have been careful to avoid the following potential pitfall: it is a reasonable hypothesis that a period of high inflation might be followed by new central bank legislation which provides for greater CBI. Thus if we use data on inflation prior to the latest legislation, the correlation between inflation and the GMT and CUK measures of CBI could be biased upwards. All the correlations that we provide on a year-by-year basis avoid this. For example, in Table 10, the correlations between CPIM9802 and the GMT and CUK measures involve all countries with no new legislation after 1997, and mean CPI inflation over the years 1998-2002.

In addition to listing in Table 10 the correlations for all the countries, in Tables 11 and 12 we also list the correlations for the industrial and non-industrial countries respectively.

Charts 1-3 give an indication of the correlations listed in the tables. As can be seen from these three charts, there appears to be very little correlation between the GMT and LVAU measures for countries with most recent legislation in 1996 and earlier, and subsequent inflation over the period 1997-2002. The same appears to be the case for TOR compared with inflation.

Chart 1: GMT for 1996 Legislation and earlier vs CPI 97-02

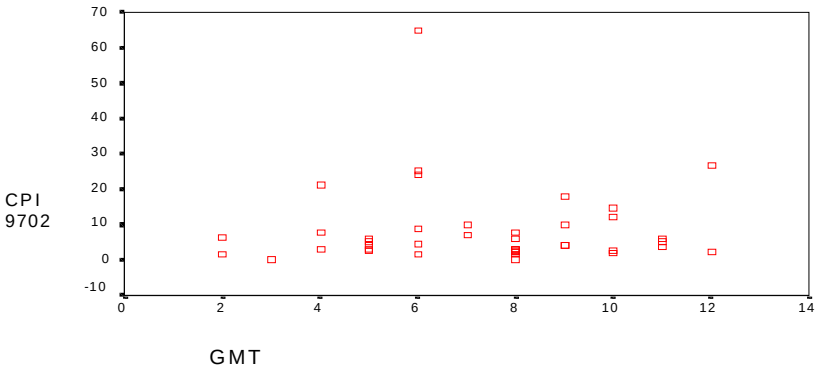


Chart 2: LVAU for 1996 Legislation and earlier vs CPI 97-02

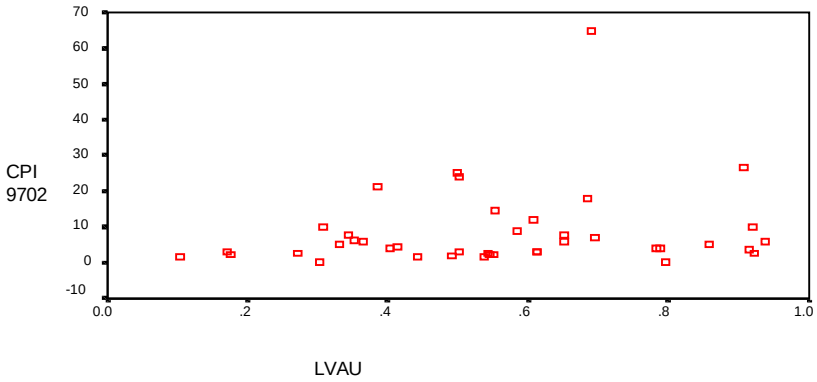
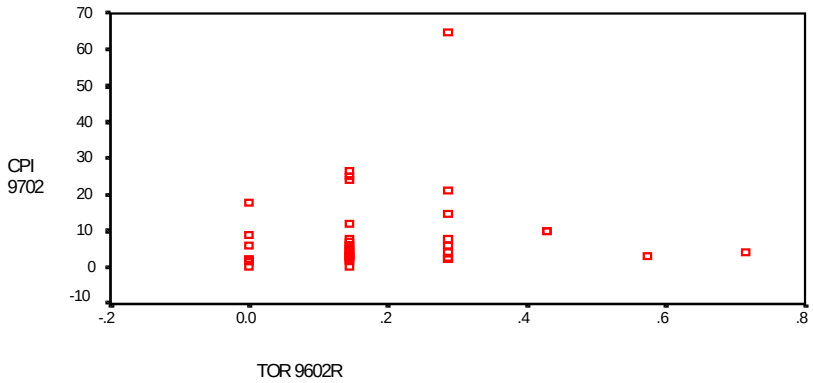


Chart 3: TOR Governors 1996-2002 vs CPI 97-02



In Table 10, the fifth row directly tests the correlation between the data depicted in Charts 1-3. It is evident that there is no significant correlation between CBI legislation and subsequent inflation. Other rows of Table 10 correspond to different time periods and show a similar lack of any significant relationship between CBI and inflation[12]. The reason that the number of countries is lower for earlier periods is that we have only used the most recent CBI legislation in our tests of correlation, so that most countries are therefore excluded from row 1; most of the recent legislation is post-1992. A similar table has been produced for the Spearman rank correlation coefficient, from which similar conclusions were drawn.

What is particularly striking in row 1 is that if anything, high CBI scores are associated with high inflation, completely counter to the accepted theory of ten years ago! This counter-intuitive result is less prevalent among OECD countries, as we see in Table 11, but nevertheless, even among these, there is no significant correlation between CBI measures and inflation of any significance. A similar pattern of insignificant correlations for all sample periods is observed among non-industrial countries.

[12] When the TOR indicator of CBI is used, we notice significant correlations (at the 10% significance level) between CBI and inflation for the short period of 2000-2002. However, when we split the sample between industrial and non-industrial countries, even these correlations become insignificant.

6. Conclusions

We have created a set of indices for 90 countries covering their most recent central banking legislation. This study contains all the details of which legal articles were used to score each criterion. This will enable subsequent researchers to both criticise us more readily than they are able to criticise others who have created CBI indices, and also more easily to update amendments to central banking legislation.

We have established that creating indices simultaneously for both the GMT and CUK indices leads to a fairly high correlation between the two, and alleviates the problems identified by Mangano (1998).

Our estimates of CBI indices show that on average the degree of CBI is much higher among industrial countries than among developing countries.

We have compared the more recent measures of CBI with those of the past, and found that there has been some relative movement among countries. Notably however, the average level of CBI has increased considerably with the new legislation, which implies much stronger and less volatile CBI among both industrial and developing countries. This increase in CBI is particularly pronounced when we look at the Cukierman indices, whose average values are almost twice the size of those obtained on the basis of central bank legislation available in the 1980s.

We have shown that there is no significant correlation between CBI and subsequent inflation either among industrial or among developing countries – if anything, the correlation is in the wrong direction in certain sample periods. These empirical findings contrast sharply with the earlier evidence that was based on the original CBI indices (obtained from the legislation available in the 1980s) and inflation during the 1980s. The main implication of this is that more research needs to be done to take into account other country specific issues such as the labour market, as addressed by Berger et al (2002). The inclusion of country-specific control variables is the subject of future research by the authors. In addition, this preliminary work appears to indicate that further work on creating indices of accountability and transparency is essential; if CBI is relatively unimportant for lowering inflation, then a fuller assessment of the benefits of accountability and transparency is essential.

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Table 1

Scores for the GMT, LVAU and LVAW Indices for Each Country's Most Recent Legislation, and for the TOR Index (1991-2002 and 1996-2002)

Country	Legislation Date	GMT	LVAU	LVAW	TOR 9102R	TOR 9602R
Albania	1997	12	0.7247	0.7943	0.333	0.286
Algeria	1990	8	0.6114	0.5948	0.167	0.143
Argentina	1995	9	0.7822	0.7365	0.500	0.714
Armenia	2002	9	0.7847	0.8213	0.167	0.143
Aruba	1998	6	0.6004	0.5713	0.167	0.143
Australia	1998	9	0.3546	0.4000	0.083	0.143
Austria	1997	12	0.8744	0.8315	0.083	0.000
Azerbaijan	1996	8	0.7957	0.8110	0.083	0.000
Bahamas, The	2000	8	0.4918	0.5553	0.083	0.143
Belarus	2001	5	0.6413	0.5873	0.250	0.286
Belgium	1998	12	0.9166	0.8790	0.083	0.143
Botswana	1996	4	0.3425	0.3525	0.167	0.286
Brazil	2000	8	0.7063	0.6100	0.667	0.286
Bulgaria	1999	10	0.9558	0.9354	0.250	0.286
Canada	1996	10	0.4906	0.4884	0.167	0.143
Chile	2002	11	0.8691	0.8241	0.083	0.143
China - Hong Kong	1997	3	0.3138	0.2998	0.000	0.000
China - Mainland	1979	3	0.3033	0.4130	0.250	0.143
Croatia	2000	12	0.9400	0.9165	0.250	0.286
Czech Republic	1993	11	0.8589	0.8740	0.083	0.143
Denmark	1936	8	0.5450	0.5566	0.083	0.000
Egypt	1993	5	0.5002	0.4683	0.167	0.143
Estonia	1993	11	0.9384	0.9115	0.250	0.000
Finland	1998	14	0.9322	0.9040	0.167	0.143
France	1998	13	0.9322	0.9040	0.083	0.000
Georgia	2001	11	0.5956	0.6353	0.333	0.143
Germany	1997	14	0.9141	0.8750	0.250	0.143
Ghana	1992	4	0.3850	0.3961	0.167	0.286
Greece	1997	11	0.9322	0.9040	0.333	0.143
Hungary	1997	10	0.8736	0.8525	0.250	0.143
Iceland	1998	8	0.3509	0.3204	0.250	0.000
India	1949	2	0.3503	0.3565	0.167	0.143
Indonesia	1999	10	0.9634	0.9415	0.167	0.143
Ireland	1998	11	0.9244	0.8915	0.167	0.143
Israel	1988	6	0.4125	0.3880	0.083	0.143
Italy	1998	11	0.8803	0.8460	0.083	0.000
Jamaica	2001	6	0.5855	0.5467	0.250	0.143
Japan	1997	8	0.3955	0.4415	0.167	0.143
Kazakhstan	1995	7	0.3079	0.3613	0.417	0.429
Kenya	1996	7	0.6942	0.6598	0.167	0.143
Korea	1997	7	0.3182	0.3903	0.417	0.286
Kuwait	2003	5	0.4546	0.4885	0.000	0.000
Kyrgyz Republic	2000	13	0.9463	0.9240	0.167	0.143
Latvia	1992	11	0.9150	0.8865	0.083	0.143
Lithuania	1996	10	0.9228	0.8865	0.333	0.143
Malawi	1989	6	0.4986	0.5395	0.250	0.143
Malaysia	1994	5	0.2704	0.2931	0.250	0.286
Maldives	1981	2	0.1022	0.0978	0.000	0.000
Mauritius	1966	5	0.3636	0.3568	0.167	0.286
Mexico	1993	10	0.6063	0.5850	0.083	0.143
Moldovia	1995	9	0.6858	0.7322	0.000	0.000
Mongolia	1996	10	0.5534	0.6340	0.250	0.286

Morocco	1993	6	0.5369	0.5205	0.000	0.000
Namibia	1997	7	0.5441	0.5570	0.083	0.143
Netherlands	1998	12	0.9088	0.8665	0.083	0.143
New Zealand	1995	8	0.4422	0.4400	0.083	0.143
Nigeria	1999	6	0.5839	0.6580	0.167	0.143
Norway	1995	8	0.1765	0.2315	0.250	0.286
Pakistan	1956	5	0.3299	0.3482	0.167	0.143
Papua New Guinea	2000	10	0.5911	0.6203	0.417	0.429
Peru	1994	9	0.7891	0.7291	0.167	0.143
Philippines	1993	8	0.6521	0.6458	0.167	0.143
Poland	1997	12	0.9278	0.8988	0.250	0.143
Portugal	2001	10	0.8931	0.8415	0.250	0.143
Qatar	1997	6	0.4963	0.5257	0.000	0.000
Romania	1998	8	0.6400	0.6763	0.167	0.286
Russia	1999	9	0.9556	0.9290	0.250	0.286
Rwanda	1997	8	0.7382	0.7093	0.333	0.286
Serbia	2003	10	0.5961	0.6665	0.333	0.286
Singapore	1999	3	0.3146	0.3670	0.083	0.143
Slovak Republic	1999	12	0.6617	0.6974	0.167	0.143
Slovenia	1991	8	0.6515	0.7093	0.083	0.143
South Africa	2000	5	0.3125	0.3000	0.250	0.143
Spain	1998	12	0.9400	0.9165	0.167	0.143
Sri Lanka	1998	7	0.4958	0.5357	0.167	0.000
Sweden	1998	15	0.8994	0.8740	0.083	0.000
Switzerland	1997	11	0.6650	0.6025	0.167	0.286
Tanzania	1995	6	0.5828	0.5655	0.167	0.000
Thailand	1942	4	0.1696	0.1404	0.333	0.571
Trinidad	1986	5	0.4043	0.4493	0.250	0.286
Tunisia	1958	8	0.5425	0.5444	0.083	0.143
Turkey	1994	6	0.6900	0.7121	0.250	0.286
Uganda	1993	8	0.6129	0.6070	0.083	0.143
Ukraine	2000	10	0.8484	0.7816	0.333	0.286
United Arab Emirates	1980	8	0.6786	0.6568	0.000	0.000
United Kingdom	1998	11	0.8447	0.7990	0.083	0.000
United States	1995	12	0.5516	0.5133	0.000	0.000
Uruguay	1995	9	0.9188	0.9025	0.417	0.429
Venezuela	1992	12	0.9072	0.8740	0.250	0.143
Zambia	1996	6	0.5025	0.4650	0.333	0.143
Mean		8.4444	0.6378	0.6350	0.1870	0.1651
Variance		8.6092	0.0535	0.0459	0.0150	0.0169

Table 2

GMT Index by Descending Order

(a) Industrial Countries

Country	GMT
Sweden	15
Finland	14
Germany	14
France	13
Austria	12
Belgium	12
Netherlands	12
Spain	12
United States	12
Greece	11
Ireland	11
Italy	11
Switzerland	11
United Kingdom	11
Canada	10
Portugal	10
Australia	9
Denmark	8
Iceland	8
Japan	8
New Zealand	8
Norway	8

Mean 10.9090909
Variance 4.46753246

(b) Non-Industrial Countries

Country	GMT
Kyrgyz Republic	13
Albania	12
Croatia	12
Poland	12
Slovak Republic	12
Venezuela	12
Chile	11
Czech Republic	11
Estonia	11
Georgia	11
Latvia	11
Bulgaria	10
Hungary	10
Indonesia	10
Lithuania	10
Mexico	10
Mongolia	10
Papua New Guinea	10
Serbia	10
Ukraine	10
Argentina	9
Armenia	9
Moldovia	9
Peru	9
Russia	9
Uruguay	9
Algeria	8
Azerbaijan	8
Bahamas, The	8
Brazil	8
Philippines	8
Romania	8
Rwanda	8
Slovenia	8
Tunisia	8
Uganda	8
United Arab Emirates	8
Kazakhstan	7
Kenya	7
Korea	7
Namibia	7
Sri Lanka	7
Aruba	6
Israel	6
Jamaica	6
Malawi	6
Morocco	6
Nigeria	6

Qatar	6
Tanzania	6
Turkey	6
Zambia	6
Belarus	5
Egypt	5
Kuwait	5
Malaysia	5
Mauritius	5
Pakistan	5
South Africa	5
Trinidad	5
Botswana	4
Ghana	4
Thailand	4
China - Hong Kong	3
China - Mainland	3
Singapore	3
India	2
Maldives	2

Mean	7.647058824
Variance	7.39596137

Table 3
Cukierman Indices by descending Order

(a) Industrial Countries

Country	LVAU
Spain	0.94
Finland	0.932188
France	0.932188
Greece	0.932188
Ireland	0.924375
Belgium	0.916563
Germany	0.914063
Netherlands	0.90875
Sweden	0.899375
Portugal	0.893125
Italy	0.880313
Austria	0.874375
United Kingdom	0.84469
Switzerland	0.665
United States	0.551563
Denmark	0.545
Canada	0.490625
New Zealand	0.442188
Japan	0.395476
Australia	0.354583
Iceland	0.350938
Norway	0.176458
Mean	0.716546432
Variance	0.06316343

Country	LVAW
Spain	0.9165
Finland	0.904
France	0.904
Greece	0.904
Ireland	0.8915
Belgium	0.879
Germany	0.875
Sweden	0.874
Netherlands	0.8665
Italy	0.846
Portugal	0.8415
Austria	0.8315
United Kingdom	0.79900
Switzerland	0.6025
Denmark	0.556583
United States	0.51325
Canada	0.488375
Japan	0.441458
New Zealand	0.44
Australia	0.400042
Iceland	0.320375
Norway	0.231542
Mean	0.696664773
Variance	0.052141225

(b) Non-Industrial Countries

Country	LVAU
Indonesia	0.963438
Bulgaria	0.955781
Russia	0.955625
Kyrgyz Republic	0.94625
Croatia	0.94
Estonia	0.938438
Poland	0.927813
Lithuania	0.922813
Uruguay	0.91875
Latvia	0.915
Venezuela	0.9071875
Hungary	0.873571
Chile	0.8690625
Czech Republic	0.858928571
Ukraine	0.848438
Azerbaijan	0.795714
Peru	0.789063
Armenia	0.784688
Argentina	0.782188
Rwanda	0.738214

Country	LVAW
Indonesia	0.9415
Bulgaria	0.935438
Russia	0.929
Kyrgyz Republic	0.924
Croatia	0.9165
Estonia	0.9115
Uruguay	0.9025
Poland	0.89875
Latvia	0.8865
Lithuania	0.8865
Czech Republic	0.874
Venezuela	0.874
Hungary	0.8525
Chile	0.824125
Armenia	0.82125
Azerbaijan	0.811
Albania	0.79425
Ukraine	0.781625
Argentina	0.7365
Moldovia	0.732167

Albania	0.724688
Brazil	0.70625
Kenya	0.694167
Turkey	0.69
Moldovia	0.685833
United Arab Emirates	0.678571
Slovak Republic	0.661667
Philippines	0.652143
Slovenia	0.651548
Belarus	0.64125
Romania	0.64
Uganda	0.612857
Algeria	0.611429
Mexico	0.60625
Aruba	0.600357
Serbia	0.596071
Georgia	0.595625
Papua New Guinea	0.591071
Jamaica	0.585476
Nigeria	0.583929
Tanzania	0.582813
Mongolia	0.553438
Namibia	0.544063
Tunisia	0.5425
Morocco	0.536875
Zambia	0.5025
Egypt	0.500238
Malawi	0.498571
Qatar	0.49631
Sri Lanka	0.495833
Bahamas, The	0.491786
Kuwait	0.454643
Israel	0.4125
Trinidad	0.404306
Ghana	0.385
Mauritius	0.363571
India	0.350313
Botswana	0.3425
Pakistan	0.329881
Korea	0.318229
Singapore	0.314583
China - Hong Kong	0.31375
South Africa	0.3125
Kazakhstan	0.307917
China - Mainland	0.303333
Malaysia	0.270357
Thailand	0.169643
Maldives	0.102222

Mean	0.612357641
Variance	0.048560197

Peru	0.729125
Turkey	0.712125
Slovenia	0.709333
Rwanda	0.70925
Slovak Republic	0.697417
Romania	0.67625
Serbia	0.6665
Kenya	0.659833
Nigeria	0.658
United Arab Emirates	0.65675
Philippines	0.64575
Georgia	0.63525
Mongolia	0.634
Papua New Guinea	0.62025
Brazil	0.61
Uganda	0.607
Algeria	0.59475
Belarus	0.58725
Mexico	0.585
Aruba	0.57125
Tanzania	0.5655
Namibia	0.557
Bahamas, The	0.55525
Jamaica	0.546667
Tunisia	0.544375
Malawi	0.5395
Sri Lanka	0.535667
Qatar	0.525667
Morocco	0.5205
Kuwait	0.4885
Egypt	0.468292
Zambia	0.465
Trinidad	0.449333
China - Mainland	0.413
Ghana	0.396125
Korea	0.390333
Israel	0.388
Singapore	0.367
Kazakhstan	0.361333
Mauritius	0.35675
India	0.3565
Botswana	0.3525
Pakistan	0.348167
South Africa	0.3
China - Hong Kong	0.29975
Malaysia	0.293125
Thailand	0.140375
Maldives	0.097833

Mean	0.615010735
Variance	0.043012263

Table 4

TOR Index by Descending Order

(a) Industrial Countries

Country	TOR 9102R
Greece	0.3333
Germany	0.2500
Iceland	0.2500
Norway	0.2500
Portugal	0.2500
Canada	0.1667
Finland	0.1667
Ireland	0.1667
Japan	0.1667
Spain	0.1667
Switzerland	0.1667
Australia	0.0833
Austria	0.0833
Belgium	0.0833
Denmark	0.0833
France	0.0833
Italy	0.0833
Netherlands	0.0833
New Zealand	0.0833
Sweden	0.0833
United Kingdom	0.0833
United States	0.0000
Mean	0.1439
Variance	0.0067

Country	TOR 9602R
Norway	0.2857
Switzerland	0.2857
Australia	0.1429
Belgium	0.1429
Canada	0.1429
Finland	0.1429
Germany	0.1429
Greece	0.1429
Ireland	0.1429
Japan	0.1429
Netherlands	0.1429
New Zealand	0.1429
Portugal	0.1429
Spain	0.1429
Austria	0.0000
Denmark	0.0000
France	0.0000
Iceland	0.0000
Italy	0.0000
Sweden	0.0000
United Kingdom	0.0000
United States	0.0000
Mean	0.1039
Variance	0.0081

(b) Non-Industrial Countries

Country	TOR 9102R
Brazil	0.6667
Argentina	0.5000
Kazakhstan	0.4167
Korea	0.4167
Papua New Guinea	0.4167
Uruguay	0.4167
Albania	0.3333
Georgia	0.3333
Lithuania	0.3333
Rwanda	0.3333
Serbia	0.3333
Thailand	0.3333
Ukraine	0.3333
Zambia	0.3333
Belarus	0.2500
Bulgaria	0.2500
China - Mainland	0.2500
Croatia	0.2500

Country	TOR 9602R
Argentina	0.7143
Thailand	0.5714
Kazakhstan	0.4286
Papua New Guinea	0.4286
Uruguay	0.4286
Albania	0.2857
Belarus	0.2857
Botswana	0.2857
Brazil	0.2857
Bulgaria	0.2857
Croatia	0.2857
Ghana	0.2857
Korea	0.2857
Malaysia	0.2857
Mauritius	0.2857
Mongolia	0.2857
Romania	0.2857
Russia	0.2857

Estonia	0.2500
Hungary	0.2500
Jamaica	0.2500
Malawi	0.2500
Malaysia	0.2500
Mongolia	0.2500
Poland	0.2500
Russia	0.2500
South Africa	0.2500
Trinidad	0.2500
Turkey	0.2500
Venezuela	0.2500
Algeria	0.1667
Armenia	0.1667
Aruba	0.1667
Botswana	0.1667
Egypt	0.1667
Ghana	0.1667
India	0.1667
Indonesia	0.1667
Kenya	0.1667
Kyrgyz Republic	0.1667
Mauritius	0.1667
Nigeria	0.1667
Pakistan	0.1667
Peru	0.1667
Philippines	0.1667
Romania	0.1667
Slovak Republic	0.1667
Sri Lanka	0.1667
Tanzania	0.1667
Azerbaijan	0.0833
Bahamas, The	0.0833
Chile	0.0833
Czech Republic	0.0833
Israel	0.0833
Latvia	0.0833
Mexico	0.0833
Namibia	0.0833
Singapore	0.0833
Slovenia	0.0833
Tunisia	0.0833
Uganda	0.0833
China - Hong Kong	0.0000
Kuwait	0.0000
Maldives	0.0000
Moldovia	0.0000
Morocco	0.0000
Qatar	0.0000
United Arab Emirates	0.0000
Mean	0.2010
Variance	0.0170

Rwanda	0.2857
Serbia	0.2857
Trinidad	0.2857
Turkey	0.2857
Ukraine	0.2857
Algeria	0.1429
Armenia	0.1429
Aruba	0.1429
Bahamas, The	0.1429
Chile	0.1429
China - Mainland	0.1429
Czech Republic	0.1429
Egypt	0.1429
Georgia	0.1429
Hungary	0.1429
India	0.1429
Indonesia	0.1429
Israel	0.1429
Jamaica	0.1429
Kenya	0.1429
Kyrgyz Republic	0.1429
Latvia	0.1429
Lithuania	0.1429
Malawi	0.1429
Mexico	0.1429
Namibia	0.1429
Nigeria	0.1429
Pakistan	0.1429
Peru	0.1429
Philippines	0.1429
Poland	0.1429
Singapore	0.1429
Slovak Republic	0.1429
Slovenia	0.1429
South Africa	0.1429
Tunisia	0.1429
Uganda	0.1429
Venezuela	0.1429
Zambia	0.1429
Azerbaijan	0.0000
China - Hong Kong	0.0000
Estonia	0.0000
Kuwait	0.0000
Maldives	0.0000
Moldovia	0.0000
Morocco	0.0000
Qatar	0.0000
Sri Lanka	0.0000
Tanzania	0.0000
United Arab Emirates	0.0000
Mean	0.1849
Variance	0.0183

Table 5

Correlations for All Indices: Industrial Countries (Pearson and Spearman Rank)

Correlations

		GMT	LVAU	LVAW	TOR 9102R	TOR 9195R	TOR 9602R	TOR 9902R
GRILLI	Pearson Correlation	1	.789**	.784**	-.173	-.052	-.198	-.092
	Sig. (2-tailed)	.	.000	.000	.442	.820	.377	.682
	N	22	22	22	22	22	22	22
LVAU	Pearson Correlation	.789**	1	.995**	-.039	.116	-.221	.048
	Sig. (2-tailed)	.000	.	.000	.863	.607	.322	.832
	N	22	22	22	22	22	22	22
LVAW	Pearson Correlation	.784**	.995**	1	-.035	.111	-.208	.042
	Sig. (2-tailed)	.000	.000	.	.876	.623	.352	.852
	N	22	22	22	22	22	22	22
TOR 9102R	Pearson Correlation	-.173	-.039	-.035	1	.776**	.488*	.543**
	Sig. (2-tailed)	.442	.863	.876	.	.000	.021	.009
	N	22	22	22	22	22	22	22
TOR 9195R	Pearson Correlation	-.052	.116	.111	.776**	1	-.173	.107
	Sig. (2-tailed)	.820	.607	.623	.000	.	.442	.635
	N	22	22	22	22	22	22	22
TOR 9602R	Pearson Correlation	-.198	-.221	-.208	.488*	-.173	1	.700**
	Sig. (2-tailed)	.377	.322	.352	.021	.442	.	.000
	N	22	22	22	22	22	22	22
TOR 9902R	Pearson Correlation	-.092	.048	.042	.543**	.107	.700**	1
	Sig. (2-tailed)	.682	.832	.852	.009	.635	.000	.
	N	22	22	22	22	22	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

			GMT	LVAU	LVAW	TOR 9102R	TOR 9195R	TOR 9602R	TOR 9902R
Spearman's rho	GRILLI	Correlation Coefficient	1.000	.761**	.757**	-.231	-.047	-.198	-.125
		Sig. (2-tailed)	.	.000	.000	.301	.835	.378	.581
		N	22	22	22	22	22	22	22
	LVAU	Correlation Coefficient	.761**	1.000	.995**	.059	.176	-.014	.173
		Sig. (2-tailed)	.000	.	.000	.794	.433	.951	.442
		N	22	22	22	22	22	22	22
	LVAW	Correlation Coefficient	.757**	.995**	1.000	.060	.201	-.039	.144
		Sig. (2-tailed)	.000	.000	.	.792	.369	.862	.522
		N	22	22	22	22	22	22	22
	TOR 9102R	Correlation Coefficient	-.231	.059	.060	1.000	.700**	.544**	.559**
		Sig. (2-tailed)	.301	.794	.792	.	.000	.009	.007
		N	22	22	22	22	22	22	22
	TOR 9195R	Correlation Coefficient	-.047	.176	.201	.700**	1.000	-.181	.095
		Sig. (2-tailed)	.835	.433	.369	.000	.	.420	.673
		N	22	22	22	22	22	22	22
	TOR 9602R	Correlation Coefficient	-.198	-.014	-.039	.544**	-.181	1.000	.712**
		Sig. (2-tailed)	.378	.951	.862	.009	.420	.	.000
		N	22	22	22	22	22	22	22
	TOR 9902R	Correlation Coefficient	-.125	.173	.144	.559**	.095	.712**	1.000
		Sig. (2-tailed)	.581	.442	.522	.007	.673	.000	.
		N	22	22	22	22	22	22	22

**. Correlation is significant at the .01 level (2-tailed).

Table 6

Correlations for All Indices: Non - Industrial Countries (Pearson and Spearman Rank)

Correlations

		GMT	LVAU	LVAW	TOR 9102R	TOR 9195R	TOR 9602R	TOR 9902R
GRILLI	Pearson Correlation	1	.827**	.850**	.213	.231	.081	.110
	Sig. (2-tailed)	.	.000	.000	.081	.058	.509	.373
	N	68	68	68	68	68	68	68
LVAU	Pearson Correlation	.827**	1	.983**	.148	.208	.001	.088
	Sig. (2-tailed)	.000	.	.000	.227	.089	.991	.474
	N	68	68	68	68	68	68	68
LVAW	Pearson Correlation	.850**	.983**	1	.129	.189	-.009	.069
	Sig. (2-tailed)	.000	.000	.	.294	.122	.941	.573
	N	68	68	68	68	68	68	68
TOR 9102R	Pearson Correlation	.213	.148	.129	1	.802**	.712**	.466**
	Sig. (2-tailed)	.081	.227	.294	.	.000	.000	.000
	N	68	68	68	68	68	68	68
TOR 9195R	Pearson Correlation	.231	.208	.189	.802**	1	.151	.081
	Sig. (2-tailed)	.058	.089	.122	.000	.	.220	.512
	N	68	68	68	68	68	68	68
TOR 9602R	Pearson Correlation	.081	.001	-.009	.712**	.151	1	.676**
	Sig. (2-tailed)	.509	.991	.941	.000	.220	.	.000
	N	68	68	68	68	68	68	68
TOR 9902R	Pearson Correlation	.110	.088	.069	.466**	.081	.676**	1
	Sig. (2-tailed)	.373	.474	.573	.000	.512	.000	.
	N	68	68	68	68	68	68	68

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

			GMT	LVAU	LVAW	TOR 9102R	TOR 9195R	TOR 9602R	TOR 9902R
Spearman's rho	GRILLI	Correlation Coefficient	1.000	.820**	.855**	.210	.259*	.085	.067
		Sig. (2-tailed)	.	.000	.000	.086	.033	.492	.585
		N	68	68	68	68	68	68	68
	LVAU	Correlation Coefficient	.820**	1.000	.975**	.152	.215	.041	.039
		Sig. (2-tailed)	.000	.	.000	.215	.078	.739	.750
		N	68	68	68	68	68	68	68
	LVAW	Correlation Coefficient	.855**	.975**	1.000	.163	.219	.056	.045
		Sig. (2-tailed)	.000	.000	.	.185	.073	.653	.714
		N	68	68	68	68	68	68	68
	TOR 9102R	Correlation Coefficient	.210	.152	.163	1.000	.808**	.711**	.407**
		Sig. (2-tailed)	.086	.215	.185	.	.000	.000	.001
		N	68	68	68	68	68	68	68
	TOR 9195R	Correlation Coefficient	.259*	.215	.219	.808**	1.000	.208	.126
		Sig. (2-tailed)	.033	.078	.073	.000	.	.089	.307
		N	68	68	68	68	68	68	68
	TOR 9602R	Correlation Coefficient	.085	.041	.056	.711**	.208	1.000	.588**
		Sig. (2-tailed)	.492	.739	.653	.000	.089	.	.000
		N	68	68	68	68	68	68	68
	TOR 9902R	Correlation Coefficient	.067	.039	.045	.407**	.126	.588**	1.000
		Sig. (2-tailed)	.585	.750	.714	.001	.307	.000	.
		N	68	68	68	68	68	68	68

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Table 7

Comparison with Grilli *et al's* (1991) GMT Indices

Country	GMT 1991	Current Study	Difference
Australia	9	9	0
Austria	9	12	3
Belgium	7	12	5
Canada	11	10	-1
Denmark	8	8	0
France	7	13	6
Germany	13	14	1
Greece	4	11	7
Ireland	7	11	4
Italy	5	11	6
Japan	6	8	2
Netherlands	10	12	2
New Zealand	3	8	5
Portugal	3	10	7
Spain	5	12	7
Switzerland	12	11	-1
United Kingdom	6	11	5
United States	12	12	0
Mean	7.6111	10.8333	
Variance	9.6634	2.9706	

Political Component

Country	GMT 1991	Current Study	Difference
Australia	3	4	1
Austria	3	4	1
Belgium	1	4	3
Canada	4	4	0
Denmark	3	3	0
France	2	6	4
Germany	6	6	0
Greece	2	5	3
Ireland	3	5	2
Italy	4	6	2
Japan	1	4	3
Netherlands	6	6	0
New Zealand	0	3	3
Portugal	1	4	3
Spain	2	6	4
Switzerland	5	4	-1
United Kingdom	1	3	2
United States	5	5	0
Mean	2.8889	4.5556	
Variance	3.2810	1.2026	

Economic Component

Country	GMT 1991	Current Study	Difference
Australia	6	5	-1
Austria	6	8	2
Belgium	6	8	2
Canada	7	6	-1
Denmark	5	5	0
France	5	7	2
Germany	7	8	1
Greece	2	6	4
Ireland	4	6	2
Italy	1	4	3
Japan	5	4	-1
Netherlands	4	6	2
New Zealand	3	5	2
Portugal	2	6	4
Spain	3	6	3
Switzerland	7	7	0
United Kingdom	5	8	3
United States	7	7	0
Mean	4.7222	6.2222	
Variance	3.6242	1.7124	

Table 8

Comparison with Cukierman's (1992) Indices

(a) LVAU Index

Country	CUK	Current Study	Difference
Argentina	0.43906	0.78219	0.34313
Australia	0.30552	0.35458	0.04906
Austria	0.58063	0.87438	0.29375
Bahamas	0.45094	0.49179	0.04085
Belgium	0.18875	0.91656	0.72781
Botswana	0.36063	0.34250	-0.01812
Brazil	0.25542	0.70625	0.45083
Canada	0.45656	0.49063	0.03406
Chile	0.49229	0.86906	0.37677
China	0.28278	0.30333	0.02056
Denmark	0.46552	0.54500	0.07948
Egypt	0.53125	0.50024	-0.03101
Finland	0.26952	0.93219	0.66266
France	0.27938	0.93219	0.65281
Germany	0.65719	0.91406	0.25688
Ghana	0.28219	0.38500	0.10281
Greece	0.51031	0.93219	0.42188
Hungary	0.23969	0.87357	0.63388
Iceland	0.35948	0.35094	-0.00854
India	0.33063	0.35031	0.01969
Indonesia	0.31719	0.96344	0.64625
Ireland	0.38619	0.92438	0.53818
Israel	0.42469	0.41250	-0.01219
Italy	0.21821	0.88031	0.66210
Japan	0.15726	0.39548	0.23821
Kenya	0.44063	0.69417	0.25354
Korea	0.23240	0.31823	0.08583
Malaysia	0.33500	0.27036	-0.06464
Mexico	0.35594	0.60625	0.25031
Morocco	0.15698	0.53688	0.37990
Netherlands	0.42281	0.90875	0.48594
New Zealand	0.26865	0.44219	0.17354
Nigeria	0.33344	0.58393	0.25049
Norway	0.13656	0.17646	0.03990
Pakistan	0.19458	0.32988	0.13530
Peru	0.43000	0.78906	0.35906
Philippines	0.41813	0.65214	0.23402
Poland	0.09604	0.92781	0.83177
Qatar	0.17698	0.49631	0.31933
Romania	0.28806	0.64000	0.35194
Singapore	0.26944	0.31458	0.04514
South Africa	0.30052	0.31250	0.01198
Spain	0.20688	0.94000	0.73313
Sweden	0.27250	0.89938	0.62688
Switzerland	0.67262	0.66500	-0.00762
Tanzania	0.47875	0.58281	0.10406
Thailand	0.26344	0.16964	-0.09379
Turkey	0.43656	0.69000	0.25344
Uganda	0.37036	0.61286	0.24250

United Kingdom	0.30875	0.84469	0.53594
United States	0.50490	0.55156	0.04667
Uruguay	0.21917	0.91875	0.69958
Venezuela	0.37344	0.90719	0.53375
Zambia	0.30563	0.50250	0.19688
Mean	0.34278	0.62420	
Variance	0.01635	0.05938	

(b) LVAW Index

Country	CUK	Current Study	Difference
Argentina	0.40013	0.73650	0.33638
Australia	0.35454	0.40004	0.04550
Austria	0.61375	0.83150	0.21775
Bahamas	0.41125	0.55525	0.14400
Belgium	0.16450	0.87900	0.71450
Botswana	0.32725	0.35250	0.02525
Brazil	0.20858	0.61000	0.40142
Canada	0.45063	0.48838	0.03775
Chile	0.45946	0.82413	0.36467
China	0.26500	0.41300	0.14800
Denmark	0.49192	0.55658	0.06467
Egypt	0.49263	0.46829	-0.02433
Finland	0.28038	0.90400	0.62363
France	0.24063	0.90400	0.66338
Germany	0.69488	0.87500	0.18013
Ghana	0.30563	0.39613	0.09050
Greece	0.55513	0.90400	0.34888
Hungary	0.24313	0.85250	0.60938
Iceland	0.34371	0.32038	-0.02333
India	0.33650	0.35650	0.02000
Indonesia	0.26838	0.94150	0.67313
Ireland	0.42558	0.89150	0.46592
Israel	0.38963	0.38800	-0.00162
Italy	0.25050	0.84600	0.59550
Japan	0.17458	0.44146	0.26687
Kenya	0.43525	0.65983	0.22458
Korea	0.26992	0.39033	0.12042
Malaysia	0.35925	0.29313	-0.06613
Mexico	0.34246	0.58500	0.24254
Morocco	0.14392	0.52050	0.37658
Netherlands	0.41888	0.86650	0.44763
New Zealand	0.24317	0.44000	0.19683
Nigeria	0.36813	0.65800	0.28988
Norway	0.17038	0.23154	0.06117
Pakistan	0.21117	0.34817	0.13700
Peru	0.43163	0.72913	0.29750
Philippines	0.43288	0.64575	0.21288
Poland	0.10396	0.89875	0.79479
Qatar	0.20121	0.52567	0.32446
Romania	0.30033	0.67625	0.37592
Singapore	0.29617	0.36700	0.07083
South Africa	0.24617	0.30000	0.05383
Spain	0.23088	0.91650	0.68563
Sweden	0.29450	0.87400	0.57950
Switzerland	0.64375	0.60250	-0.04125

Tanzania	0.43938	0.56550	0.12613
Thailand	0.26450	0.14038	-0.12413
Turkey	0.45538	0.71213	0.25675
Uganda	0.37725	0.60700	0.22975
United Kingdom	0.26525	0.79900	0.53375
United States	0.47392	0.51325	0.03933
Uruguay	0.24196	0.90250	0.66054
Venezuela	0.42713	0.87400	0.44688
Zambia	0.32563	0.46500	0.13938

Mean	0.34375	0.61562
Variance	0.01609	0.04959

Table 9

Comparison of TOR indices with Cukierman (1992) and de Haan and Kooi (2000)

Country	TOR 9102R	TOR 9602R	TOR (CUK)	TOR (H&K)
Algeria	0.167	0.143	na	0.3
Argentina	0.500	0.714	1	1.1
Bahamas, The	0.083	0.143	0.2	0.2
Botswana	0.167	0.286	0.4	0.4
Brazil	0.667	0.286	0.8	0.8
Chile	0.083	0.143	0.8	0.8
China	0.250	0.143	0.3	na
Egypt	0.167	0.143	0.3	0.1
Ghana	0.167	0.286	0.2	0.2
Greece	0.333	0.143	0.2	0.2
Hungary	0.250	0.143	0.1	na
India	0.167	0.143	0.3	0.4
Indonesia	0.167	0.143	0.2	0.2
Israel	0.083	0.143	0.2	na
Jamaica	0.250	0.143	na	0.5
Kenya	0.167	0.143	0.2	0.1
Korea	0.417	0.286	0.5	0.5
Kuwait	0.000	0.000	na	0.2
Malawi	0.250	0.143	na	0.3
Malaysia	0.250	0.286	0.2	0.2
Maldives	0.000	0.000	na	0.1
Mauritius	0.167	0.286	na	0.1
Mexico	0.083	0.143	0.3	0.3
Morocco	0.000	0.000	0.2	0.2
Nigeria	0.167	0.143	0.1	0.1
Pakistan	0.167	0.143	0.3	0.4
Peru	0.167	0.143	0.3	0.3
Philippines	0.167	0.143	0.2	0.2
Poland	0.250	0.143	0.5	na
Portugal	0.250	0.143	0.3	na
Qatar	0.000	0.000	0	0
Romania	0.167	0.286	0.2	na
Singapore	0.083	0.143	0.6	0.6
South Africa	0.250	0.143	na	0.1
Sri Lanka	0.167	0.000	na	0.1
Tanzania	0.167	0.000	0.1	0.1
Thailand	0.333	0.571	0.1	0.1
Trinidad	0.250	0.286	na	0.3
Tunisia	0.083	0.143	na	0.4
Turkey	0.250	0.286	0.4	0.3
Uganda	0.083	0.143	0.2	0.2
Uruguay	0.417	0.429	0.3	0.3
Venezuela	0.250	0.143	0.5	0.5
Zambia	0.333	0.143	0.5	0.4
Mean	0.201	0.182	0.323	0.305
Variance	0.0175	0.0193	0.0485	0.0524

Note: TOR (CUK)and TOR (H&K) indicate the Cukierman and de Haan & Kooi measures respectively. Both these indicators are for the period 1980-1989, while our indicator covers the periods 1991-2002 and 1996-2002 respectively.

Table 10

Correlation Between CBI Indexes and Mean of Price Inflation for Corresponding Sample Period

Legislation	Inflation Variable	Statistical Test	GMT	LVAU	LVAW	TOR9102R	TOR9195R	TOR9602R	TOR9902R
Pre and 1992	CPIM9302	Pearson Sig. (2-tailed) N	0.483 0.058 16	0.583* 0.018 16	0.573* 0.020 16	0.272 0.308 16	0.404 0.121 16	-0.034 0.902 16	0.335 0.204 16
Pre and 1993	CPIM9402	Pearson Sig. (2-tailed) N	0.327 0.127 23	0.357 0.095 23	0.357 0.094 23	0.373 0.80 23	0.408 0.053 23	0.037 0.867 23	0.168 0.443 23
Pre and 1994	CPIM9502	Pearson Sig. (2-tailed) N	0.136 0.506 26	0.292 0148 26	0.313 0.120 26	0.353 0.077 26	0.259 0.201 26	0.180 0.378 26	0.166 0.417 26
Pre and 1995	CPIM9602	Pearson Sig. (2-tailed) N	0.074 0.679 34	0.272 0.120 34	0.302 0.083 34	0.192 0.276 34	0.221 0.208 34	0.083 0.641 34	0.013 0.941 34
Pre and 1996	CPIM9702	Pearson Sig. (2-tailed) N	-0.007 0.996 41	0.166 0.299 41	0.193 0.226 41	0.207 0.194 41	0.187 0.247 41	0.113 0.483 41	0.062 0.702 41
Pre and 1997	CPIM9802	Pearson Sig. (2-tailed) N	-0.060 0.664 54	0.110 0.427 54	0.137 0.323 54	0.171 0.216 54	0.126 0.364 54	0.124 0.370 54	0.114 0.411 54
Pre and 1998	CPIM9902	Pearson Sig. (2-tailed) N	-0.136 0.269 68	0.012 0.924 68	0.046 0.707 68	0.159 0.196 68	0.044 0.721 68	0.179 0.144 68	0.238 0.051 68
Pre and 1999	CPIM0002	Pearson Sig. (2-tailed) N	-0.110 0.352 74	0.068 0.566 74	0.102 0.386 74	0.216 0.064 74	0.069 0.559 74	0.235* 0.044 74	0.276* 0.017 74
Pre and 2000	CPIM0102	Pearson Sig. (2-tailed) N	-0.113 0.320 80	0.073 0.522 80	0.099 0.381 80	0.257* 0.021 80	0.105 0.354 80	0.287** 0.010 80	0.310* 0.05 80

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 11

Correlation for Industrial Countries between CBI Indexes and Mean of Price Inflation for Corresponding Sample Period

Legislation	Inflation Variable	Statistical Test	GMT	LVAU	LVAW	TOR9102R	TOR9195R	TOR9602R	TOR9902R
Pre and 1995	CPIM9602	Pearson Sig. (2-tailed) N	0.492 0.508 4	0.135 0.865 4	0.149 0.851 4	-0.074 0.926 4	0.421 0.579 4	-0.351 0.649 4	-0.715 0.285 4
Pre and 1996	CPIM9702	Pearson Sig. (2-tailed) N	0.111 0.860 5	-0.220 0.723 5	-0.185 0.766 5	0.144 0.818 5	0.443 0.455 5	-0.094 0.880 5	-0.543 0.344 5
Pre and 1997	CPIM9802	Pearson Sig. (2-tailed) N	0.063 0.863 10	0.170 0.638 10	0.173 0.632 10	0.171 0.638 10	0.372 0.290 10	-0.198 0.583 10	0.234 0.516 10
Pre and 1998	CPIM9902	Pearson Sig. (2-tailed) N	-0.179 0.437 21	-0.037 0.873 21	-0.058 0.804 21	0.186 0.421 21	0.300 0.186 21	-0.125 0.591 21	0.059 0.799 21
Pre and 1999	CPIM0002	Pearson Sig. (2-tailed) N	-0.156 0.500 21	-0.014 0.952 21	-0.034 0.885 21	0.152 0.511 21	0.267 0.243 21	-0.130 0.574 21	0.067 0.772 21
Pre and 2000	CPIM0102	Pearson Sig. (2-tailed) N	-0.119 0.608 21	0.026 0.911 21	0.006 0.978 21	0.163 0.481 21	0.306 0.178 21	-0.167 0.470 21	0.046 0.842 21

Table 12

Correlation for Non-Industrial Countries between CBI Indexes and Mean of Price Inflation for Corresponding Sample Period

Legislation	Inflation Variable	Statistical Test	GMT	LVAU	LVAW	TOR9102R	TOR9195R	TOR9602R	TOR9902R
Pre and 1992	CPIM9302	Pearson Sig. (2-tailed) N	0.548* 0.034 15	0.625* 0.013 15	0.615* 0.015 15	0.229 0.411 15	0.443 0.098 15	-0.130 0.644 15	0.255 0.360 15
Pre and 1993	CPIM9402	Pearson Sig. (2-tailed) N	0.350 0.110 22	0.365 0.095 22	0.367 0.093 22	0.355 0.105 22	0.429* 0.046 22	-0.012 0.956 22	0.115 0.611 22
Pre and 1994	CPIM9502	Pearson Sig. (2-tailed) N	0.149 0.476 25	0.295 0.152 25	0.318 0.122 25	0.339 0.097 25	0.270 0.191 25	0.152 0.467 25	0.130 0.534 25
Pre and 1995	CPIM9602	Pearson Sig. (2-tailed) N	0.139 0.463 30	0.248 0.186 30	0.278 0.137 30	0.159 0.402 30	0.203 0.281 30	0.048 0.800 30	-0.026 0.892 30
Pre and 1996	CPIM9702	Pearson Sig. (2-tailed) N	0.056 0.747 36	0.135 0.432 36	0.162 0.345 36	0.177 0.302 36	0.168 0.326 36	0.084 0.628 36	0.039 0.820 36
Pre and 1997	CPIM9802	Pearson Sig. (2-tailed) N	0.047 0.761 44	0.134 0.388 44	0.156 0.312 44	0.156 0.313 44	0.132 0.393 44	0.098 0.528 44	0.087 0.573 44
Pre and 1998	CPIM9902	Pearson Sig. (2-tailed) N	0.044 0.768 47	0.116 0.439 47	0.149 0.317 47	0.108 0.470 47	0.029 0.846 47	0.124 0.405 47	0.190 0.201 47
Pre and 1999	CPIM0002	Pearson Sig. (2-tailed) N	0.069 0.623 53	0.167 0.231 53	0.198 0.156 53	0.175 0.209 53	0.062 0.661 53	0.189 0.176 53	0.241 0.083 53
Pre and 2000	CPIM0102	Pearson Sig. (2-tailed) N	0.046 0.731 59	0.162 0.221 59	0.184 0.162 59	0.214 0.103 59	0.085 0.521 59	0.249 0.057 59	0.279* 0.032 59

*. Correlation is significant at the 0.05 level (2-tailed).