FINANCIAL CRISIS AND CENTRAL BANK INDEPENDENCE AND GOVERNANCE (CBIG) IN THE ASIA PACIFIC

Amirul Ahsan, PhD*

Abstract

This paper examines the impact of financial crisis on central bank independence and governance in 36 Asia Pacific countries. It constructs a unique CBIG index for fifteen years (1991-2005); which has an overall index and six sub-indices covering all the necessary aspects of central banking operations. These indices are ranked first to measure the relative positions of the central banks and then statistically tested their relationship with inflation, economic growth and financial crisis of 1997. It applies a panel data pooled regression model and finds a robust negative relation of CBIG with inflation; moderate positive relation with economic growth; and CBIG in post crisis period is significantly different from the pre crisis period.

* Lecturer in Finance
School of Accounting, Economics and Finance
Faculty of Business and Law, Deakin University, Burwood Campus
Vic 3125.
Tel: +613 92446571
Email: amirul@deakin.edu.au

1.   Introduction

A financial crisis may originate from many factors, but ultimately it becomes the responsibility of the government and the central bank to manage and recover from the crisis. A poor performance by the central bank may often increase the length and severity of any crisis. An independent operation of central bank is mostly hindered by the political interference by the government. A government which does not allow higher central bank independence and governance (CBIG) interferes more in central banking activities. So, the central bank would perform poorly in any crisis situation as a political government would always try to follow its political agenda first. As a result, a government mostly fails to recover from the crisis and the need for an independent monetary authority intensifies. The primary objective of this paper is to identify whether the governments of the Asia Pacific countries allowed higher CBIG after experiencing the financial crisis in 1997, where poor CBIG was partly blamed for severity of the crisis. The secondary objective is to measure the impact of such CBIG changes on the macroeconomic indicators of the countries, such as inflation and economic growth.

The paper's main contributions include constructing CBIG index for 36 Asia Pacific countries. Asia Pacific was mostly overlooked in previous CBIG studies. This paper is an attempt to fill out that gap in the literature. Other contribution of this paper is that it has established a statistically robust relationship between Asian financial crisis and CBIG by confirming that CBIG has improved in the post crisis period. Such improvement has contributed to reduce inflation and increase economic growth. These outcomes should have significant policy implications and suggests possible directions for future improvements in CBIG. The remainder of this paper is organized as follows: CBIG, macroeconomic performance and financial crisis in Section 2; while data and methodology is described in Section 3. Empirical results are presented in Section 4, and Section 5 concludes the paper.

2.   CBIG,   Macroeconomic Performance and Financial Crisis

The main objective of any central bank is to maintain price stability as initially identified by Barro and Gordon (1983) in one of the seminal articles on CBIG literature; they argued that a central bank should have full control over inflation. It was further stressed by Bade and Parkin (1988)

and linked to CBIG that a central bank can only delivers low inflation when it is free from government influences. A central bank also plays an important role in maintaining financial stability by applying its various policy instruments. This role becomes even crucial when any financial crisis hits the economy. The level of CBIG attained by a central bank plays a key role both during its normal operations and any financial crisis. The following paragraphs explain the association of CBIG with price stability, economic growth and financial crisis, with specific reference to Asian financial crisis of 1997.

It is very well established in the literature that CBIG and inflation has robust negative relationship. This view is supported by many studies (Grilli *et al.*, 1991, Cukierman *et al.*, 1992, Berger *et al.*, 2001, Panagiotidis and Triampella, 2006). This means that when CBIG increases, inflation decreases. Only a few studies however, questioned whether their outcomes were dependent upon the indicators selected for those studies (Posen, 1995, Fujiki, 1996, Eijffinger *et al.*, 1997), or were genuine statistically valid results or was there a two-way causality between them (Cukierman *et al.*, 1992). In case of two-way causality, less independence contributes to higher inflation. High inflation encourages the government to influence monetary policy. Governments may take advantage of such high inflation situation even if the central bank's act does not allow them to do so. As most central banks are not completely independent, there is always some room for the executive branch to intervene, especially during high inflation periods. This in turn may induce a problem of two-way causality.

The economic development is not one of the central bank objectives; however policies implemented by central bank may have remarkable impact on the economic growth of a country. Naturally, there is no clear cut relationship between CBIG and economic growth, nevertheless few studies have found a positive relationship (Fujiki, 1996); some found a negative relationship (Fuhrer, 1997); and others did not find any measurable impact on real economic performance (Grilli *et al.*, 1991, Alesina and Summers, 1993, Akhand, 1998, de Haan and Kooi, 2000). Few studies argued that even if there is a relationship, CBIG does not affect output growth (Jordan, 1998). The mixed results in the literature mean that there is no widely accepted standard relationship between CBIG and growth. CBIG may be helpful in explaining income inequalities among countries (Dolmas *et al.*, 2000), but it can also reduce the scope for productivity enhancing public investment and so harm the future growth (Ismihan and Ozkan, 2004).

The responsibility of a central bank increases when any economy faces financial crisis. It has to bring financial stability in addition to its primary objective of maintaining price stability. If a central bank has less CBIG then it is always difficult for it to take effective and impartial measures to guide the economy to a recovery. The Asian financial crisis in 1997 started as a currency crisis in a few countries; however, turned into a regional financial crisis. Few specific factors hindered the normal operations of central banks include: excessive interference by the government, the inability of the central bank to manage exchange rate system, connected lending in the banking system, poor regulation and supervision[11] of financial institutions and the central bank's inability to manage the overall situation.

In an ideal situation, the exchange rates should be determined by the market forces not by the government or the central banks. In many countries in Asia, their central bank used to do this job. The pegged exchange rate systems in Thailand, Indonesia and Korea Republic had encouraged large external borrowing (Sugisaki, 1997). When crisis hit the economy, the central banks made additional foreign currency borrowing in an attempt to protect the domestic financial institutions and also the domestic currency (Krugman, 1998, 2000). The unsuccessful bid to protect the Thai Baht and domestic financial institutions costed the economy billions of dollars (Swan, 1998). It was very doubtful in Thailand that whether the Bank of Thailand had much control over its losses when its decisions were essentially subject to persuasion from the government and the finance ministers (Swan, 1998). The President of Indonesia showed a continuing involvement in the loan decisions of both state-owned and private banks. Any financial regulators who attempted to enforce prudential rules on connected lending were removed including the head of the central bank in 1992 and the minister of finance in 1996 (Cole and Slade 1998). The central banks and the banking sectors in Asia were very much influenced not just by their government but also by the political parties (Nanto, 1997). In Indonesia, for example the politically connected groups could and did escape supervision frequently in the 1990s (Ariff and Khalid, 2000).

Higher CBIG should help a central bank to manage similar crisis situations better (Swan 1998). Managing inflation better would indicate the improvement of CBIG, as the former is considered a proxy of the latter (Cukierman *et al.*, 1992). After this financial crisis many countries had amended their central bank acts in the Asia Pacific to make their central banks and other related agencies independent and unbiased; and to practice good governance and improved discipline in the financial

---

[11] In Asia, most of the central banks were responsible for supervision of financial institutions.

system. This study investigates the macroeconomic performance of the Asia Pacific countries in the pre and post financial crisis period; and the association of improved CBIG with such performances. The methodology to conduct such study is explained in the next section.

3. Data and Methodology
3.1 Data

This study constructs the CBIG index for fifteen years (1991-2005) to cover the pre and post financial crisis periods for 36 countries from five regions of the Asia Pacific (see Table 1). The sample consists of eight South Asian; seven South East Asian; seven East Asian; six Central Asian; and eight Pacific countries. The macroeconomic data, such as inflation and economic growth are sourced from the *World Development Indicators* of the World Bank and *World Economic Outlook* of the International Monetary Fund (IMF).

3.2 Research Design

The main components of research design include: the CBIG index construction; CBIG ranking; the statistical relationship between CBIG and macroeconomic performances; impact of financial crisis on CBIG and finally, the diagnostic, specification and robustness checks of the techniques applied.

The CBIG index is constructed following the model designed by Ahsan *et al.* (2008). This index is very unique, as it addresses many of the problems present in previous indices. It has larger number of variables[12] covering all aspects of CBIG; these variables are divided into sub groups to construct six sub-indices; the governance[13] aspect is added to this index to make it more comprehensive and robust. The total 26 variables in the model together form the overall index (See Appendix 1). The CBIG overall and sub-indices are utilised to rank 36 sample countries in five categories: CBIG (overall), CBIG (sub-indices), CBIG (year 2005), CBIG (year 1991-1992), and CBIG (overall)'s growth (See Table 2 to 5). While ranking are not a prerequisite to test the CBIG and macroeconomic performance relationship, they are nevertheless highly useful in understanding and justifying the results. Inflation and economic growth are applied to measure macroeconomic performance. A dummy is utilized to measure the impact of financial crisis on CBIG.

---

[12] The highest number of variables in any previous study was 16 (Cukierman, Webb and Neyapti 1992).

[13] It refers to the absence of governance indicators in the previous indices as they focused on central bank independence (CBI) only.

Table 1. The Sample

No.	Countries	Established	Central bank names	Income groups	Data availability
(1)	(2)	(3)	(4)	(5)	(6)
1	Afghanistan	1939	Da Afghanistan Bank	LI	2003-05
2	Australia	1959	Reserve Bank of Australia	HI	1991-05
3	Azerbaijan	1991	National Bank of the Azerbaijan	MI	1996-05
4	Bangladesh	1971	Bangladesh Bank	LI	1991-05
5	Bhutan‡	1982	Royal Monetary Authority of Bhutan	LI	1991-05
6	Cambodia	1955	National Bank of Cambodia	LI	1992-05
7	China	1948	People's Bank of China	MI	1995-05
8	Fiji Islands	1973	Reserve Bank of Fiji	MI	1991-05
9	Hong Kong -SAR‡	1993	Hong Kong Monetary Authority	HI	1993-05
10	India	1934	Reserve Bank of India	LI	1991-05
11	Indonesia	1953	Bank of Indonesia	MI	1991-05
12	Japan	1882	Bank of Japan	HI	1991-05
13	Kazakhstan	1993	National Bank of the Republic of Kazakhstan	MI	1995-05
14	Korea Rep.	1950	Bank of Korea	HI	1991-05
15	Kyrgyzstan	1992	National Bank of the Republic of Kyrgyzstan	LI	1992-05
16	Laos PDR	1990	Bank of the Laos PDR	LI	1994-05
17	Macao-SAR‡	1989	Monetary Authority of Macao	HI	1999-05
18	Malaysia	1958	Bank Negara Malaysia	MI	1991-05
19	Maldives‡	1981	Maldives Monetary Authority	MI	1991-05
20	Mongolia	1924	Bank of Mongolia	LI	1991-05
21	Nepal	1956	Nepal Rastra Bank	LI	2002-05
22	New Zealand	1934	Reserve Bank of New Zealand	HI	1991-05
23	Pakistan	1956	State Bank of Pakistan	LI	1991-05
24	Papua New Guinea	1973	Bank of Papua New Guinea	LI	1991-05
25	Philippines	1949	Central Bank of Philippines	MI	1992-05
26	Samoa	1974	Central Bank of Samoa	MI	1991-05
27	Solomon Islands	1976	Central Bank of Solomon Islands	LI	1991-05
28	Sri Lanka	1949	Central Bank of Sri Lanka	MI	1991-05
29	Taiwan	1923	Central Bank of China	HI	1991-05
30	Tajikistan	1991	National Bank of the Republic of Tajikistan	LI	1996-05
31	Thailand	1942	Bank of Thailand	MI	1991-05
32	Tonga	1988	National Reserve Bank of Tonga	LI	1991-05
33	Turkmenistan	1993	State Central Bank of Turkmenistan	MI	1993-05
34	Uzbekistan	1995	Central Bank of Uzbekistan	LI	1995-05
35	Vanuatu	1980	Reserve Bank of Vanuatu	LI	1991-05
36	Vietnam	1976	State Bank of Vietnam	LI	1991-05

Notes: LI=Low-income, MI=Middle-income, HI=High-income ‡Monetary Authority (MA).
^Few countries lack full 15 years data, such as the central Asian countries Azerbaijan, Kazakhstan, Turkmenistan, Tajikistan and Uzbekistan as they started operating since mid 1990s. Afghanistan has a new central bank act implemented in 2003 and there is no record of any previous central banking operation. Few other countries replaced or amended their acts (e.g. Nepal in 2002; China in 1995; Macao-SAR in 1999; Hong Kong-SAR in 1993; and Laos PDR in 1994); and previous acts were not available for evaluation.

Source: Authors' compilation

3.3 Index construction

A common and standard procedure followed across all countries to construct this index. The major sources of data are the central bank acts and research publications. Each of the 26 variables in the index has multiple alternative outcomes, which are ranked and coded in descending order as shown in Appendix 1. The variables are equally weighted to construct the sub-indices and the overall index. The value of the each index ranges between 0 and 1. Differing weights might have been used but Factor Analysis failed to identify any meaningful relative weighting. So, they were set as equal to minimize any subjective decision.

3.3.1 Subjectivity

The robustness of the CBIG index is as important as for the statistical techniques. The central

$$CVR = \frac{\left(n_e - \frac{N}{2}\right)}{\frac{N}{2}} \qquad (2)$$

Where, CVR = Content validity ratio, n_e = Number of panellist indicating "essential", N = Total number of panellist.

The reliability tests applied here include test of stability (test-retest) and internal consistency (Cronbach alpha). The test of stability (test-retest) determines the reliability in measuring the same variable repeatedly under the same conditions and then calculating the variability of the resulting

$$Test - retest = \frac{Testscore(2)}{Testscore(1)} \qquad (3)$$

As the six sub-indices have different numbers of variables, the alpha level comparison is not appropriate for such indices (Santos, 1999).

$$\alpha = \frac{N}{(N-1)}\left[\frac{1 - \sum \sigma^2(Y_i)}{\sigma^2 x}\right] \qquad (4)$$

Where, N = The number of items, $\sum \sigma^2(Y_i)$ = The sum of item variance, $\sigma^2 x$ = The variance of the total composite.

3.4 Establishing Statistical Relationship

The estimation-effect test for panel (pooled) data used the Hausman (1978) test to decide between fixed-effect and random-effect of pool estimation. It identified the fixed-effect as the better estimation method, but one of the drawbacks of fixed

difficulty in measuring CBIG is to quantify legal information (Alesina and Summers, 1993). Even a systematic and careful procedure involve many awkward judgments to be made (Cukierman *et al.*, 1992, Forder, 1999). This paper applied content validity and reliability tests to address such subjectivity.

The content validity (also known as logical validity) refers to the extent a measure represents all facets of a given concept. One of the widely used methods of Lawshe (1975) for gauging agreement among experts regarding essentiality of a particular item, calculated by equation (2). Several CBIG expert's opinions (various conference delegates, formal discussants, session chairs and conference judges) were collected to conduct this test (See Table 6).

measures applying equation (3). The Testscore(1) is the first test score of the 26 variables to construct the index in 2008. The same index was constructed again in 2009 to identify any deviations from its previous construction, indicated by Testscore(2). Out of the 26 variables only two variables were slightly deviated from their original scoring. Such deviations were adjusted to correct the index.

The test-retest method was applied to the sub-indices only while Cronbach alpha for the overall index applying equation (4) in SPSS (See Table 7).

estimation method is that it does not produce robust results in a invariable data set (Wooldridge, 2003). So, the fixed effect may not be the appropriate method here as the central bank acts do not change frequently, so as the indices. The Feasible Generalized Least Squares (FGLS) model was therefore applied to test the relationship between

CBIG indices, inflation and economic growth. The FGLS produces better results in a sample of diverse country-specific characteristics, such as the sample of this paper (see column 5 of Table 1); and it also corrects for cross-section hetroskedasticity (Nowak-Lehmann *et al.*, 2007).

Out of the two major macroeconomic performance indicators, inflation is considered as the proxy of actual CBIG (Cukierman *et al.*, 1992). The reason is that when a central bank is independent it can successfully control the price stability and reduce inflation. In contrast, low CBIG indicates to high government intervention, so government would fulfill its political and election winning agenda first even at the cost of economic and price stability.

In addition to testing inflation (See Table 8 and 9) and economic growth (See Table 10) with CBIG, several refined samples were utilized to measure the robustness of the main findings. The overall index and inflation were tested in four other refined samples: countries with central banks only; ones with monetary authorities only; inflation

targeting countries only; and finally replacing Asian financial crisis 1997 dummy with Asian financial crisis 2000 dummy in columns 2, 3, 4 and 5 of Table 9 respectively.

The relationship of financial crisis with inflation and economic growth were tested by equations (5) to (8). In equation (5) the dependent variables is the transformed inflation (Y_{Dtk}); the independent variables include Asian financial crisis dummy ($ASCRIS_{tk}$); CBIG indices ($CBIG_{itk}$), real interest rate ($RInt_{tk}$), low-income countries dummy (LIC_{tk}), where low-income countries = 1 and medium and high = 0; and finally money supply growth ($MoneyG_{tk}$). Two Asian financial crisis dummies were utilised to improve the robustness of the impact of the crisis. The first dummy covered pre-crisis period as 1991-1997 and post-crisis period as 1998-2005. The second dummy identified an alternative post-crisis period of 2000-2005 considering the fact that the crisis was not over immediately after a year rather might have taken few years to settle.

$$Y_{Dtk} = \beta_O + \beta_1 CBIG_{itk} + \beta_2 ASCRIS_{tk} + \beta_3\, LIC_{tk} + \beta_4 MoneyG_{tk} + \beta_5 RInt_{tk} + \varepsilon_{tk} \qquad (5)$$

The relationship between CBIG and inflation may have two-way causality. This is because higher inflation may make it easier for the government to influence monetary policy even

where the central bank charter does not allow this (Cukierman *et al.*, 1992). A simple Granger causality test is therefore applied here as expressed by equations (6-7).

$$(CBIGOALL)_t = \alpha_0 + \alpha_1 CBIGOALL_{t-1} + ... + \alpha_t CBIGOALL_{t-1} + \beta_1 Y_{D\,t-1}$$
$$+ ... + \beta_t Y_{D-t} + \varepsilon_t \qquad (6)$$

$$(Y_D)_t = \alpha_0 + \alpha_1 Y_{D\,t-1} + ... + \alpha_t Y_{D\,t-1} + \beta_1 CBIGOALL_{t-1} + ... + \beta_t CBIGOALL_{-t} + u_t \qquad (7)$$

Where, CBIGOALL = CBIG (Overall) index, Y_D = Transformed inflation, $Y_{D_{t-1}}$ = Lag of Transformed inflation and $\varepsilon_t = u_t$ = error term. The equation (6) shows the relationship that CBIG (overall) Granger cause inflation and equation (7) explains that inflation Granger cause CBIG (overall).

In equation (8), the dependent variable is the annual growth rate of GDP at market rate (EcoG); the independent variables include Asian financial crisis dummy ($ASCRIS_{tk}$) where pre-crisis period is 1991-1997 and post-crisis period is 1998-2005;

CBIG indices ($CBIG_{itk}$), low–income countries dummy (LIC_{tk}), where low-income countries = 1 and medium and high = 0; high–income countries dummy (HIC_{tk}), where high-income countries = 1 and low and medium = 0; terms of trade (TOT_{tk}); initial GDP ($INGDP_{tk}$), initial primary school enrolment ($IPSE_{tk}$), and initial secondary school enrolment ($ISCE_{tk}$).

$$EcoG_{tk} = \beta_O + \beta_1 CBIG_{itk} + \beta_2 ASCRIS_{1997tk} + \beta_3 LIC_{tk} + \beta_4 HIC_{tk}$$
$$+ \beta_5 INGDP_{tk} + \beta_6 TOT_{tk} + \beta_7 IPSE_{tk} + \beta_8 ISCE_{tk} + \varepsilon_{tk} \qquad (8)$$

The diagnostics tests for these analyses

include stationarity[14] check by Augmented Dickey-

Fuller (ADF) test; multi-collinearity was avoided by keeping highly correlated variables in separate regression models. Hetroskedasticity is addressed by applying robust standard error method. So, the covariance matrix was corrected via the White's (1980) correction test. The annual inflation (π) figures were converted to transformed inflation [15] (Y_D) to ameliorate potential hetroskedasticity problem (Cukierman *et al.*, 1992, de Haan and Kooi, 2000, Ja'come and Va'zquez, 2005); finally, autocorrelation among the error terms were examined by the Wooldridge (2002) test.

4. CBIG Index rankings

The CBIG (overall) and CBIG growth rankings are presented by Figure 1 and 2. The overall, growth and sub-indices ranking for year 1991-2005; year 2005; and years 1991-92 are also shown in Table 2 to 5. The numbers in the brackets indicate the ranking of the central banks.

The average CBIG (overall) ranking indicates that the two Pacific countries Australia and New Zealand; and the Central Asian country Kazakhstan are clearly at the top three positions in Figure 1 and column 2 of Table 2. The other Pacific countries Fiji, PNG, Samoa, Solomon Island, Tonga and Vanuatu are well below in the ranking. All Central Asian countries, Kazakhstan, Tajikistan, Kyrgyzstan, Turkmenistan and Uzbekistan have high level of CBIG except for Azerbaijan. These countries are relatively new but allowed a high level of CBIG to their central banks from the beginning of their operations. The South Asian country Afghanistan is the most surprise inclusion in the fourth position. This high ranking is due to its newly formulated central bank act in 2003, which supports higher independence in all its operations. Nepal, Sri Lanka and India are also in prominent positions, higher than many South East, East and Pacific countries, but Pakistan, Bhutan and Bangladesh hold low positions in the ranking. Specially, Maldives is lowest in the South Asia and second lowest among all Asia Pacific countries. Taiwan is at the fifth position and top among the East Asian countries. Korea Republic attained a commendable ninth position; but China, Mongolia, Japan, Macao, and Hong Kong are gradually positioned from the middle to the lower part of the Figure 1 and column 2 of Table 2. The Philippines of South-East Asia has attained sixth position in the Asia Pacific ranking and top in its region. Malaysia is second in the region but tenth in the Asia Pacific, but the ranking gradually declined for Cambodia, Indonesia, Thailand, Laos PDR and Vietnam. The two low ranked countries Laos PDR and Vietnam are also among the bottom three countries in the Asia Pacific (See column 2 of Table 2).

Column 3 of Table 2 reflects the country's CBIG position at the end of the sample period, 2005. The top five positions are taken by countries from different regions. Central Asian country Kazakhstan topped the table improving from second (column 2) to first (column 1); however the two Pacific countries Australia and New Zealand maintained their leading positions. East Asian country Taiwan maintained its fifth position in both categories. Indonesia is a new inclusion here showing remarkable improvement from twenty second position (column 2) to third position (column 3). Afghanistan dropped from its fourth position to sixth place. Other rankings have also changed between columns 2 and 3 in Table 2.

The 1991-92 CBIG ranking in column 4 of Table 2 shows New Zealand, Taiwan, Philippines, Australia and Malaysia in the top five positions. 11 countries, however, are excluded here due to lack of data: the central Asian countries of Azerbaijan, Kazakhstan, Turkmenistan, Tajikistan and Uzbekistan. Except Kyrgyzstan, most of them commenced operation since mid 1990s. The others were countries whose existing central banks acts were amended or introduced a new act (eg. Afghanistan, Nepal, China, Macao-SAR, Hong Kong-SAR and Laos PDR). The data (acts) of these countries were not found prior to those changes. These 11 countries exclusion improved the remaining country's ranking temporarily (See column 4 of Table 2).

Table 2 CBIG (Overall) Ranking, 1991-2005*

| Country	Average CBIG (overall)	Year 2005	Year 1991-92	Average CBIG (overall)'s Growth
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Australia	0.8015 (1)	0.8269 (2)	0.7197 (4)	0.0103(13)
Kazakhstan	0.8003 (2)	0.8377 (1)	-	0.0116(12)
New Zealand	0.7942 (3)	0.7942 (4)	0.7942 (1)	0.0000(30)
Afghanistan	0.7496 (4)	0.7496 (6)	-	0.0000(30)
Taiwan	0.7442 (5)	0.7731 (5)	0.7397 (2)	0.0032(24)
Philippines	0.7354 (6)	0.7453 (7)	0.7314 (3)	0.0015(27)
Turkmenistan	0.7074 (7)	0.7244 (9)	-	0.0069(19)
Nepal	0.6972 (8)	0.6972 (11)	-	0.0000(30)
Korea Rep.	0.6852 (9)	0.7244 (9)	0.6356 (7)	0.0097(17)
Malaysia	0.6841 (10)	0.6878 (13)	0.6878 (5)	0.0005(29)
Tajikistan	0.6817 (11)	0.6873 (14)	-	0.0098(16)
Uzbekistan	0.6789 (12)	0.6789 (15)	-	0.0000(30)
Kyrgyzstan	0.6623 (13)	0.7370 (8)	0.5167 (10)	0.0304(8)
Sri Lanka	0.6510 (14)	0.6714 (16)	0.6436 (6)	0.0031(25)
India	0.6333 (15)	0.6378 (19)	0.6044 (8)	0.0042(23)
China	0.6173 (16)	0.6446 (18)	-	0.0055(21)
Fiji	0.5928 (17)	0.5928 (22)	0.5928 (9)	0.0000(30)
Mongolia	0.5865 (18)	0.6325 (21)	0.4500 (13)	0.0268(10)
Cambodia	0.5692 (19)	0.6369 (20)	0.4000 (19)	0.0456(3)
Azerbaijan	0.5637 (20)	0.6894 (12)	-	0.0328(7)
Japan	0.5483 (21)	0.6645 (17)	0.4156 (16)	0.0428(6)
Indonesia	0.5468 (22)	0.8256 (3)	0.3143 (21)	0.1133(1)
PNG	0.5091 (23)	0.7083 (10)	0.4072 (17)	0.0492(2)
Pakistan	0.4947 (24)	0.5169 (24)	0.4892 (12)	0.0056(20)
Vanuatu	0.4892 (25)	0.4929 (26)	0.4929 (11)	0.001(28)
Solomon Islands	0.4469 (26)	0.4469 (28)	0.4469 (14)	0.0000(30)
Samoa	0.4381 (27)	0.4381 (29)	0.4381 (15)	0.0000(30)
Macao-SAR	0.4289 (28)	0.4289 (30)	-	0.0000(30)
Tonga	0.4164 (29)	0.4497 (27)	0.3942 (20)	0.0101(15)
Bhutan	0.4014 (30)	0.4100 (31)	0.4008 (18)	0.0016(26)
Thailand	0.4009 (31)	0.5261 (23)	0.3128 (22)	0.0435(5)
Hong Kong-SAR	0.3605 (32)	0.3733 (32)	-	0.0102(14)
Bangladesh	0.3589 (33)	0.4958 (25)	0.3125 (23)	0.0440(4)
Laos PDR	0.2687 (34)	0.2733 (33)	-	0.0232(11)
Maldives	0.2593 (35)	0.2667 (34)	0.2389 (24)	0.0083(18)
Vietnam	0.1476 (36)	0.1742 (35)	0.1186 (25)	0.0297(9)

Source: Author's calculation
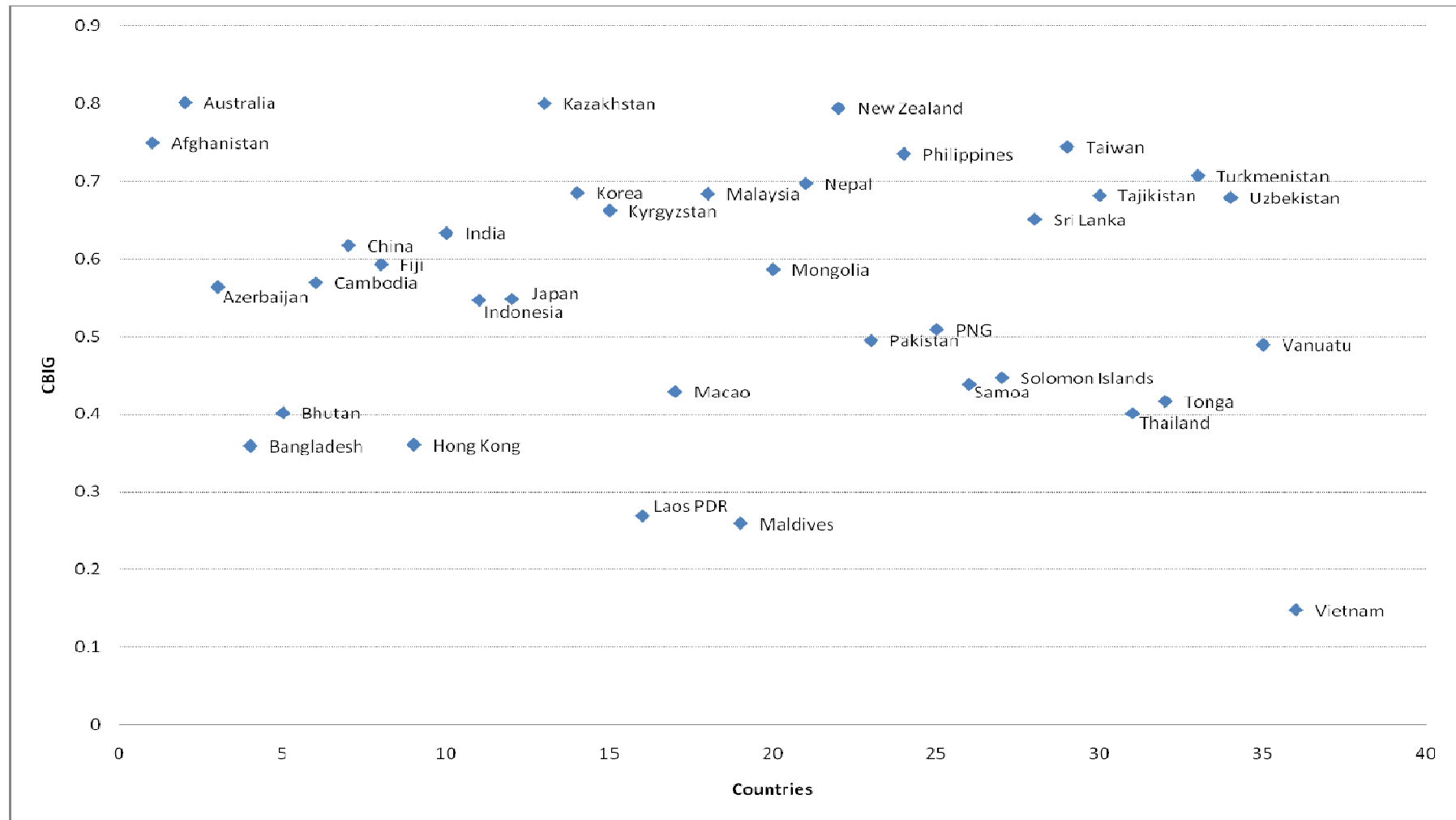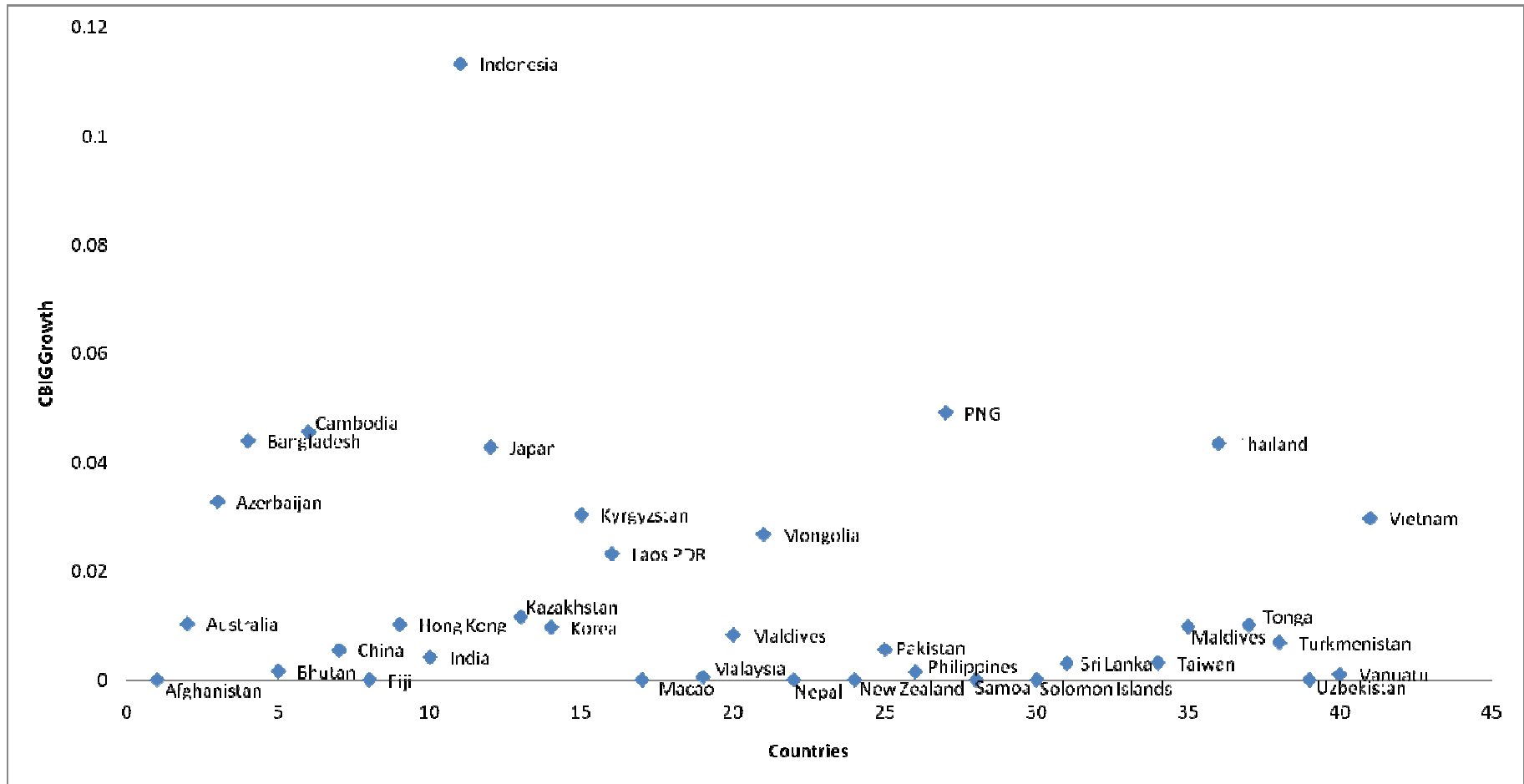
Figure 1. Average CBIG (overall) 1991-2005

Figure 2. CBIG (overall) growth 1991-2005

Finally, column 5 of Table 2 examines each country's overall improvement over the sample period. It compares each country's starting and ending CBIG score and then ranks them. This produces some surprising outcomes as the top five countries (Indonesia, PNG, Cambodia, Bangladesh, and Thailand) are totally different from the previous categories. In contrast, only two countries (Kazakhstan and Australia) among the previously top five countries (based on average CBIG overall) showed moderate CBIG growth (twelfth and thirteenth respectively). It is worth noting that the top five here in column 5 are all low or middle income countries and some were severely affected by the Asian financial crisis in 1997. The latter could be one of the reasons behind such improvements.

The overall index is the compilation of six sub-indices, so any change in the overall position indicates a corresponding change in the sub-indices. The sub-indices ranking for entire sample period (1991-2005); year 2005 and years 1991-92 are explained in Table 3 to 5. These tables help to understand the specific strengths and weaknesses in each overall ranking.

Table 3. CBIG Ranking, 1991-2005*

Countries	CBIG (Overall)	CBIG (Leg)	CBIG (Pol)	CBIG (PStab)	CBIG (Forx)	CBIG (MonPol)	CBIG (AccTrans)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Australia	0.8015 (1)	0.5067(4)	1.0000(1)	0.9410(2)	0.6667(3)	0.8330(4)	0.8620(2)
Kazakhstan	0.8003 (2)	0.3624(12)	1.0000(1)	0.9390(3)	1.0000(1)	1.0000(1)	0.5000(17)
New Zealand	0.7942 (3)	0.3200(16)	1.0000(1)	1.0000(1)	0.6667(3)	0.9170(2)	0.8620(2)
Afghanistan	0.7496 (4)	0.3860(10)	1.0000(1)	0.5570(14)	1.0000(1)	1.0000(1)	0.5550(13)
Taiwan	0.7442 (5)	0.5467(3)	1.0000(1)	0.8900(5)	0.3333(7)	1.0000(1)	0.6950(5)
Philippines	0.7354 (6)	0.3600(13)	1.0000(1)	0.8900(5)	0.6667(3)	0.7220(8)	0.7740(3)
Turkmenistan	0.7074 (7)	0.4000(8)	0.667(10)	0.7870(10)	1.0000(1)	0.8900(3)	0.5000(17)
Nepal	0.6972 (8)	0.3200(16)	1.0000(1)	0.5570(14)	0.8333(2)	0.8900(3)	0.5830(11)
Korea Rep.	0.6852 (9)	0.6000(1)	1.0000(1)	0.8440(9)	0.3333(7)	0.3880(21)	0.9450(1)
Malaysia	0.6841 (10)	0.3200(16)	0.978(2)	0.8900(5)	0.6667(3)	0.5830(12)	0.6670(6)
Tajikistan	0.6817 (11)	0.2320(20)	0.8900(7)	0.8570(8)	1.0000(1)	0.5000(14)	0.6120(7)
Uzbekistan	0.6789 (12)	0.3520(14)	1.0000(1)	1.0000(1)	0.6667(3)	0.4430(18)	0.6120(7)
Kyrgyzstan	0.6623 (13)	0.4563(6)	1.0000(1)	0.8650(7)	0.3333(7)	0.7530(5)	0.5660(12)
Sri Lanka	0.6510 (14)	0.3600(13)	1.0000(1)	0.5570(14)	0.6667(3)	0.7230(7)	0.5990(10)
India	0.6333 (15)	0.4933(5)	1.0000(1)	0.8900(5)	0.3333(7)	0.5000(14)	0.5830(11)
China	0.6173 (16)	0.2024(22)	0.667(10)	0.8900(5)	0.3333(7)	1.0000(1)	0.6120(7)
Fiji	0.5928 (17)	0.2800(18)	1.0000(1)	0.5570(14)	0.6667(3)	0.3320(23)	0.7220(4)
Mongolia	0.5865 (18)	0.4467(7)	0.9630(3)	0.8680(6)	0.3333(7)	0.4070(20)	0.5010(16)
Cambodia	0.5692 (19)	0.3429(15)	0.8100(9)	0.4930(16)	0.4286(5)	0.7310(6)	0.6110(8)
Azerbaijan	0.5637 (20)	0.2200(21)	1.0000(1)	0.9120(4)	0.3333(7)	0.4330(19)	0.4830(18)
Japan	0.5483 (21)	0.5904(2)	0.9220(6)	0.5570(14)	0.0000(13)	0.6110(11)	0.6100(9)
Indonesia	0.5468 (22)	0.3992(9)	0.5340(12)	0.7640(11)	0.3889(6)	0.6440(10)	0.5510(14)
PNG	0.5091 (23)	0.3600(13)	0.9340(5)	0.2450(19)	0.6667(3)	0.4660(17)	0.3830(21)
Pakistan	0.4947 (24)	0.2400(19)	0.9560(4)	0.7230(12)	0.2444(9)	0.4720(16)	0.3330(23)
Vanuatu	0.4892 (25)	0.3740(11)	0.9780(2)	0.7230(12)	0.0000(13)	0.4430(18)	0.4170(19)
Solomon	0.4469 (26)	0.3200(16)	1.0000(1)	0.3900(18)	0.0000(13)	0.5550(13)	0.4170(19)
Samoa Islands	0.4381 (27)	0.2400(19)	1.0000(1)	0.5570(14)	0.0000(13)	0.4430(18)	0.3880(20)
Macao-SAR	0.4289 (28)	0.1000(23)	0.8900(7)	0.5570(14)	0.5000(4)	0.1100(28)	0.4170(19)
Tonga	0.4164 (29)	0.2800(18)	0.8900(7)	0.5570(14)	0.1333(11)	0.2220(27)	0.4170(19)
Bhutan	0.4014 (30)	0.2400(19)	0.6100(11)	0.3900(18)	0.3333(7)	0.4980(15)	0.3370(22)
Thailand	0.4009 (31)	0.1000(23)	0.8680(8)	0.6220(13)	0.2000(10)	0.3430(22)	0.272(026)
Hong Kong-SAR	0.3605 (32)	0.1000(23)	0.6670(10)	0.2230(20)	0.0000(13)	0.6670(9)	0.5060(15)
Bangladesh	0.3589 (33)	0.3147(17)	0.8680(8)	0.4330(17)	0.0667(12)	0.2610(26)	0.2110(27)
Laos PDR	0.2687 (34)	0.3200(16)	0.0000(13)	0.3900(18)	0.3056(8)	0.3050(24)	0.2920(25)
Maldives	0.2593 (35)	0.1000(23)	0.0000(13)	0.5120(15)	0.3333(7)	0.2770(25)	0.3330(23)
Vietnam	0.1476 (36)	0.1000(23)	0.0000(13)	0.3900(18)	0.0000(13)	0.1000(29)	0.2960(24)

Source: Author's calculation

Table 4. CBIG Ranking, Year 2005

Countries	CBIG (Overall)	CBIG (Leg)	CBIG (Pol)	CBIG (PStab)	CBIG (Forx)	CBIG (MonPol)	CBIG (AccTrans)
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Afghanistan	0.7496 (6)	0.3860 (11)	1.0000 (1)	0.5567 (4)	1.0000 (1)	1.0000 (1)	0.5550 (11)
Australia	0.8269 (2)	0.6000 (4)	1.0000 (1)	1.0000 (1)	0.6667 (3)	0.8333 (5)	0.8617 (2)
Azerbaijan	0.6894 (12)	0.2200 (20)	1.0000 (1)	1.0000 (1)	0.3333 (5)	0.8333 (5)	0.7500 (5)
Bangladesh	0.4958 (25)	0.2800 (17)	1.0000 (1)	0.5567 (4)	0.3333 (5)	0.4167 (16)	0.3883 (15)
Bhutan	0.4100 (31)	0.2400 (18)	0.6100 (4)	0.3900 (5)	0.3333 (5)	0.4983 (13)	0.3883 (15)
Cambodia	0.6369 (20)	0.3200 (16)	1.0000 (1)	0.5567 (4)	0.3333 (5)	0.8900 (3)	0.7217 (6)
China	0.6446 (18)	0.3660 (13)	0.6667 (3)	0.8900 (2)	0.3333 (5)	1.0000 (1)	0.6117 (9)
Fiji	0.5928 (22)	0.2800 (17)	1.0000 (1)	0.5567 (4)	0.6667 (3)	0.3317 (18)	0.7217 (6)
Hong Kong	0.3733 (32)	0.1000 (21)	0.6667 (3)	0.2233 (6)	0.0000 (6)	0.6667 (9)	0.5833 (10)
India	0.6378 (19)	0.5200 (17)	1.0000 (1)	0.8900 (2)	0.3333 (5)	0.5000 (12)	0.5833 (10)
Indonesia	0.8256 (3)	0.4520 (9)	0.8900 (2)	1.0000 (1)	0.8333 (2)	1.0000 (1)	0.7783 (4)
Japan	0.6645 (17)	0.6520 (3)	1.0000 (1)	0.5567 (4)	0.0000 (6)	1.0000 (1)	0.7783 (4)
Kazakhstan	0.8377 (1)	0.5260 (6)	1.0000 (1)	1.0000 (1)	1.0000 (1)	1.0000 (1)	0.5000 (13)
Korea Rep.	0.7244 (9)	0.6800 (2)	1.0000 (1)	1.0000 (1)	0.3333 (5)	0.3883 (17)	0.9450 (1)
Kyrgyzstan	0.7370 (8)	0.5320 (5)	1.0000 (1)	1.0000 (1)	0.3333 (5)	0.8617 (4)	0.6950 (7)
Laos	0.2733 (33)	0.3200 (16)	0.0000 (5)	0.3900 (5)	0.3333 (5)	0.3050 (19)	0.2917 (17)
Macao	0.4289 (30)	0.1000 (21)	0.8900 (2)	0.5567 (4)	0.5000 (4)	0.1100 (23)	0.4167 (14)
Malaysia	0.6878 (13)	0.3200 (16)	1.0000 (1)	0.8900 (2)	0.6667 (3)	0.5833 (10)	0.6667 (8)
Maldives	0.2667 (34)	0.1000 (21)	0.0000 (5)	0.5567 (4)	0.3333 (5)	0.2767 (20)	0.3333 (16)
Mongolia	0.6325 (21)	0.4600 (8)	1.0000 (1)	0.8900 (2)	0.3333 (5)	0.5833 (10)	0.5283 (12)
Nepal	0.6972 (11)	0.3200 (16)	1.0000 (1)	0.5567 (4)	0.8333 (2)	0.8900 (3)	0.5833 (10)
New Zealand	0.7942 (4)	0.3200 (16)	1.0000 (1)	1.0000 (1)	0.6667 (3)	0.9167 (2)	0.8617 (2)
Pakistan	0.5169 (24)	0.2400 (18)	1.0000 (1)	0.7233 (3)	0.3333 (5)	0.4717 (14)	0.3333 (16)
Philippines	0.7453 (7)	0.3600 (14)	1.0000 (1)	0.8900 (2)	0.6667 (3)	0.7217 (8)	0.8333 (3)
PNG	0.7083 (10)	0.3600 (14)	1.0000 (1)	0.8900 (2)	0.6667 (3)	0.7500 (6)	0.5833 (10)
Samoa	0.4381 (29)	0.2400 (18)	1.0000 (1)	0.5567 (4)	0.0000 (6)	0.4433 (15)	0.3883 (15)
Solomon	0.4469 (28)	0.3200 (16)	1.0000 (1)	0.3900 (5)	0.0000 (6)	0.5550 (11)	0.4167 (14)
Sri Lanka	0.6714 (16)	0.3600 (14)	1.0000 (1)	0.5567 (4)	0.6667 (3)	0.7233 (7)	0.7217 (6)
Taiwan	0.7731 (5)	0.7200 (1)	1.0000 (1)	0.8900 (2)	0.3333 (5)	1.0000 (1)	0.6950 (7)
Tajikistan	0.6873 (14)	0.2320 (19)	0.8900 (2)	0.8900 (2)	0.0000 (6)	0.5000 (12)	0.6117 (9)
Thailand	0.5261 (23)	0.1000 (21)	0.8900 (2)	0.8900 (2)	0.3333 (5)	0.4433 (15)	0.5000 (13)
Tonga	0.4497 (27)	0.2800 (17)	0.8900 (2)	0.5567 (4)	0.3333 (5)	0.2217 (21)	0.4167 (14)
Turkmenistan	0.7244 (9)	0.4000 (10)	0.6667 (3)	0.8900 (2)	1.0000 (1)	0.8900 (3)	0.5000 (13)
Uzbekistan	0.6789 (15)	0.3520 (15)	1.0000 (1)	1.0000 (1)	0.6667 (3)	0.4433 (15)	0.6117 (9)
Vanuatu	0.4929 (26)	0.3740 (12)	1.0000 (1)	0.7233 (3)	0.0000 (6)	0.4433 (15)	0.4167 (14)
Vietnam	0.1742 (35)	0.1000 (21)	0.0000 (5)	0.3900 (5)	0.0000 (6)	0.1667 (22)	0.3883 (15)

Source: Author's calculation

Table 5. CBIG Ranking, Year 1991-92

Countries	CBIG (Overall)	CBIG (Leg)	CBIG (Pol)	CBIG (PStab)	CBIG (Forx)	CBIG (MonPol)	CBIG (AccTrans)
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
New Zealand	0.7942 (1)	0.3200 (8)	1.0000 (1)	1.0000 (1)	0.6667 (1)	0.9167 (2)	0.8617 (2)
Taiwan	0.7397 (2)	0.5200 (1)	1.0000 (1)	0.8900 (2)	0.3333 (2)	1.0000 (1)	0.6950 (5)
Philippines	0.7314 (3)	0.3600 (7)	1.0000 (1)	0.8900 (2)	0.6667 (1)	0.7217 (5)	0.7500 (3)
Australia	0.7197 (4)	0.4000 (4)	1.0000 (1)	0.5567 (5)	0.6667 (1)	0.8333 (3)	0.8617 (2)
Malaysia	0.6878 (5)	0.3200 (8)	1.0000 (1)	0.8900 (2)	0.6667 (1)	0.5833 (6)	0.6667 (6)
Sri Lanka	0.6436 (6)	0.3600 (7)	1.0000 (1)	0.5567 (5)	0.6667 (1)	0.7233 (4)	0.5550 (8)
Korea Rep.	0.6356 (7)	0.4800 (2)	1.0000 (1)	0.6667 (4)	0.3333 (2)	0.3883 (13)	0.9450 (1)
India	0.6044 (8)	0.3200 (8)	1.0000 (1)	0.8900 (2)	0.3333 (2)	0.5000 (9)	0.5833 (7)
Fiji	0.5928 (9)	0.2800 (9)	1.0000 (1)	0.5567 (5)	0.6667 (1)	0.3317 (15)	0.7217 (4)
Kyrgyzstan	0.5167 (10)	0.3200 (8)	1.0000 (1)	0.5567 (5)	0.3333 (2)	0.5567 (7)	0.3333 (12)
Vanuatu	0.4929 (11)	0.3740 (6)	1.0000 (1)	0.7233 (3)	0.0000 (4)	0.4433 (12)	0.4167 (10)
Pakistan	0.4892 (12)	0.2400 (10)	1.0000 (1)	0.7233 (3)	0.1667 (3)	0.4717 (11)	0.3333 (12)
Mongolia	0.4500 (13)	0.4200 (3)	0.8900 (2)	0.5567 (5)	0.3333 (2)	0.0550 (19)	0.4450 (9)
Solomon	0.4469 (14)	0.3200 (8)	1.0000 (1)	0.3900 (7)	0.0000 (4)	0.5550 (8)	0.4167 (10)
Samoa	0.4381 (15)	0.2400 (10)	1.0000 (1)	0.5567 (5)	0.0000 (4)	0.4433 (12)	0.3883 (11)
Japan	0.4156 (16)	0.5200 (1)	0.8333 (3)	0.5567 (5)	0.0000 (4)	0.1667 (18)	0.4167 (10)
PNG	0.4072 (17)	0.3600 (7)	0.8900 (2)	0.0000 (10)	0.6667 (1)	0.2767 (16)	0.2500 (13)
Bhutan	0.4008 (18)	0.2400 (10)	0.6100 (4)	0.3900 (7)	0.3333 (2)	0.4983 (10)	0.3333 (12)
Cambodia	0.4000 (19)	0.4000 (4)	0.3333 (5)	0.3333 (8)	0.6667 (1)	0.3333 (14)	0.3333 (12)
Tonga	0.3942 (20)	0.2800 (9)	0.8900 (2)	0.5567 (5)	0.0000 (4)	0.2217 (17)	0.4167 (10)
Indonesia	0.3143 (21)	0.3860 (5)	0.2233 (6)	0.5567 (5)	0.0000 (4)	0.3317 (15)	0.3883 (11)
Thailand	0.3128 (22)	0.1000 (11)	0.8900 (2)	0.4433 (6)	0.0000 (4)	0.2767 (16)	0.1667 (14)
Bangladesh	0.3125 (23)	0.3200 (8)	0.8900 (2)	0.2767 (9)	0.0000 (4)	0.2217 (17)	0.1667 (14)
Maldives	0.2389 (24)	0.1000 (11)	0.0000 (7)	0.3900 (7)	0.3333 (2)	0.2767 (16)	0.3333 (12)
Vietnam	0.1186 (25)	0.1000 (11)	0.0000 (7)	0.3900 (7)	0.0000 (4)	0.0550 (19)	0.1667 (14)
Afghanistan	-	-	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-	-
China	-	-	-	-	-	-	-
Hong Kong	-	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-	-
Laos	-	-	-	-	-	-	-
Macao	-	-	-	-	-	-	-
Nepal	-	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-	-
Turkmenistan	-	-	-	-	-	-	-
Uzbekistan	-	-	-	-	-	-	-

Source: Author's calculation

The acceptability of these rankings very much depends on the validity and reliability of the indices. The content validity ratios (CVR) of all indices are much higher than that of required table value. The CVR requirement is inversely related to number of panellists consulted. The required CVR value for 40 [16] panellist is 0.29, whereas the minimum CVR achieved here is 0.73 (column 5 of Table 6) when the number of panellists for CBIG index is much higher (56) than the table value. So, the CVR demonstrates very high content validity for CBIG indices.

Table 6. Content Validity Ratio (CVR)

CBIG indices	Agreed as "essential"(n_e)	Partially agreed	Total (N)	CVR
(1)	*(2)*	*(3)*	*(4)*	*(5)*
CBIG$_{Leg}$	56	9	65	0.73
CBIG$_{Pol}$	56	7	63	0.77
CBIG$_{PStab}$	56	2	58	0.93
CBIG$_{Forx}$	56	3	59	0.90
CBIG$_{MonPol}$	56	2	58	0.93
CBIG$_{AccTrns}$	56	2	58	0.93
CBIG$_{Overall}$	56	9	65	0.73

Notes: *Agreed as "essential" (n_e)* calculates the number of experts fully agree about all 26 variables of the index (column 2). *Partially agreed* means few experts had some suggestions for shifting a particular variable to another sub-indices but not disagreeing its essentiality in the CBIG index (column 3). *Total (N)* defines the total number of experts considered for this analysis (column 4).

Source: Author's calculation

The reliability of CBIG indices is also very high. The two lowest reliability (test re-test) scores is 0.80 and 0.83 for CBIG (legal) and CBIG (accountability and transparency) respectively. CBIG (political), CBIG (price stability objectives), CBIG (exchange rate policy) and CBIG (monetary policy and deficit financing) indices have 100% (1.00) reliability (column 4). The overall reliability of 0.88 also shows a high level of reliability (column 5); normally an *Cronbach alpha* value of 0.60 or 0.70 is considered as acceptable (Santos, 1999). High content validity and reliability suggest that the constructed index has very low level of subjectivity problems.

Table 7. Reliability Ratio

CBIG indices	Testscore(1) (2008)	Testscore(2) (2009)	Reliability	
			(Test-retest)	(Cronbach Alpha)
(1)	*(2)*	*(3)*	*(4)*	*(5)*
CBIG$_{Leg}$	5	4	0.80	-
CBIG$_{Pol}$	3	3	1.00	-
CBIG$_{PStab}$	3	3	1.00	-
CBIG$_{Forx}$	3	3	1.00	-
CBIG$_{MonPol}$	6	6	1.00	-
CBIG$_{AccTrns}$	6	5	0.83	-
CBIG$_{Overall}$	26	24	-	0.88

Source: Author's calculation

4.1 Statistical Relationship between CBIG, macroeconomic performances and Asian financial crisis

The main finding is that the inflation (Y_D) has significantly declined in the post financial crisis period in the Asia Pacific. The Asian financial crisis dummy is highly significant (at 1%) in full sample (column 3 of Table 8); in inflation targeting countries 1991-2005 sample (column 4 of Table 9). This may suggest that central banks played an important role in the post-crisis inflation reduction as price stability is the primary duty of a central bank. This is an important finding as during the Asian financial crisis, the central banks were partially blamed for failing to manage inflation and for poor governance (Cole and Slade, 1998). Several Asian countries addressed this by amending central bank objectives to concentrate more on price stability as well as more independence and governance. These changes may have contributed to such reduction in inflation.

The adjusted R square value shows that 21.62% of the variations in the regressand (inflation) are influenced by the regressor(s) in the full sample (column 3 of Table 8). The strength of the overall test is confirmed by a highly significant F statistics (at 1%). The results of other independent variables in equation (5) are presented in the following few paragraphs. These variables

include CBIG indices (CBIG), low-income country dummy (LIC), money supply growth (MoneyG) and finally, real interest rate (RInt).

The inflation and CBIG (overall) index has showed a significant negative relationship. So, it means that increase in CBIG associates with significant decrease in inflation. This negative relationship was expected as a highly independent central bank controls inflation better (Cukierman *et al.*, 1992). Such robust negative relationship is often attributed to a two-way causality between them (Cukierman *et al.*, 1992). A Granger causality test of CBIG (overall) and inflation, however, finds no two-way causality rather finds CBIG (overall) only Granger cause inflation as reported in Table 11. This view is supported by an earlier finding of Cukierman et al. (1992) where no two-way causality was found. The importance of this finding is that there are many developing countries in this sample which often experience high inflation, however this finding identified that increase in CBIG (overall) has contributed to reduction in inflation even in the developing countries of Asia Pacific; and that drop in inflation in the post financial crisis period is also highly significant.

The income level dummy is positive and highly significant (at 1%). It means that the inflation in the low-income countries was higher than the middle and high-income ones. In general, the central banks in low-income countries with low CBIG appeared less successful in controlling inflation. This may reflect a politically motivated monetary policy where price stability was often sacrificed and lacked inflation targeting program 17. Though, low-income countries had relatively higher inflation than middle- and high-income countries, they did not affect the overall negative relationship between CBIG and inflation.

Money supply growth (MoneyG) also showed a highly significant (at 1%) positive relationship with inflation. Money supply may be not the only determining influence on inflation but it is an important one (Kwon et al., 2006). This positive relationship reflects that the inflation would increase with any increase in the money supply.

The real interest rate (RInt) in the equation has a negative and significant (at 10%) relationship with inflation. This finding is supported by Cukierman et al. (1993). This suggests that the real return to savers in short-term financial assets remains below its competitive equilibrium level due to government regulation and periodic inflation surprises. As the majority of the lower CBIG countries in the Asia Pacific are low or middle income countries, this negative relationship also may be an indicator of financial repression which reduces as the CBIG increases (Cukierman et al., 1993).

The relationship between inflation and CBIG (sub-indices) resembles the same findings with CBIG (overall). All these indices have inherent significant (at 1%) negative relationship with inflation as documented in column 2 of Table 8. The Asian financial crisis dummy is highly significant (at 1%) and negative, manifesting that the increase in CBIG (sub-indices) associates with the decline in inflation in the post crisis period. The negative relationship between inflation and CBIG (sub-indices) are also evident here except for CBIG (exchange rate policy) (column 7 Table 8). Similar significant relationship was found in other refined samples (See Table 9). Inflation has significantly (at 10%) dropped in central banks only sample (column 2); (at 1%) in inflation targeting countries (column 4) and (at 1%); and (at 1%) in full sample with modified Asian financial crisis dummy (column 5 of Table 9). The test for monetary authorities only sample was not valid as shown by the F statistics; however the F statistics for other three samples were highly significant (at 1%). The adjusted R square values are high, indicating the robustness of the tests. The other independent variables in the tests produce similar results to the main findings in Table 8 with slight variations. Finding similar results in the full sample (Table 8) and other refined samples (Table 9) reaffirms that the increase in CBIG is significantly associated with the decline in inflation in the post crisis period.

Table 8. Relationship between CBIG (overall and sub-indices), Inflation and Asian Financial Crisis (Full Sample)

Inflation (Dependent)	Each index separately with no control variable	Overall	Legal	Political	Price stability objectives	Exchange rate Policy	Monetary policy and deficit financing	Accountability and transparency
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Constant		25.37418***	34.49707***	33.73735***	36.41818***	50.35067***	32.58630***	33.23121***
CBIG (Overall) index	-8.307***	-2.339457**						
CBIG (Legal) Index	-5.8699***		-2.494412**					
CBIG (Political) Index	-9.1998***			-2.714846***				
CBIG (Price Stability Objectives) Index	-6.859***				-2.751916***			
CBIG (Exchange Rate Policy) Index	8.901***					3.910446***		
CBIG (Monetary policy and Deficit Financing) Index	-7.428***						-3.118792***	
CBIG (Accountability and Transparency) Index	-10.482***							-3.394781***
Asian Financial Crisis 1997 Dummy		-3.065404***	-2.117949**	-3.337324***	-2.768304***	-3.573754***	-3.865378***	-2.589082***
Low Income Countries (LIC) Dummy		7.329980***	12.08869***	7.903171***	5.908732***	5.512593***	10.88538***	8.561846***
Money Supply Growth (%)		4.256754***	4.691939***	3.652903***	5.820067***	4.816202***	4.706254***	5.033637**
Real Interest Rate (%)		-2.583928**	-2.122368**	-1.447246	-1.587437	-1.380546	-2.562314**	-1.748485*
Adj. R²		0.216231	0.224090	0.178031	0.182160	0.161124	0.289978	0.241913
F- Statistics	0.00000***	0.00000***	0.00000***	0.00000***	0.00000***	0.00000***	0.00000***	0.00000***

Note: Eviews has dropped 6 countries for insufficient data, resulting a sample size of 30.
"***", "**" and "*" denote statistical significance at 1%, 5% and 10% level respectively.

Table 9. Relationship between CBIG, Inflation and Asian Financial Crisis (Refined Sample)

CBIG Proxy (Dependent)	Central Banks only	Monetary Authorities only	Inflation Targeting (1991-2005)	Asian Crisis 2000 Dummy
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Constant	43.73136***	-0.171212	22.90940***	42.75564***
CBIG (Overall) index	-2.203861**	3.267626***	-1.890924*	-2.437294**
Asian Financial Crisis Dummy	-1.872647*	0.841723	-5.322290***	-2.780040***
Income Level Dummy	-2.618961***	-2.792801***	0.676403	-2.136269**
Money Supply Growth (%)	-12.81738***	-0.361612	-7.857482***	-12.51945***
Real Interest Rate (%)	4.593763***	-1.730870*	2.075176**	4.408823***
Adj. R²	0.2674	0.078571	0.358021	0.29964
F- Statistics	0.0000***	0.125563	0.0000***	0.0000***
Cross Section	26	4	13	30

"***", "**" and "*" denote statistical significance at 1%, 5% and 10% level respectively.

Source: Author's calculation

Table 10. Relationship between CBIG, Economic Growth and Asian Financial Crisis

Variables	Overall	Legal	Political	Price stability objectives	Exchange rate Policy	Monetary policy and deficit financing	Accountability and transparency
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Per Capita GDP Growth (Dependent)	t-Stat	t-Stat	t-Stat	t-Stat	t-Stat	t-Stat	t-Stat
Constant	-0.434308	0.851520	1.095489	0.158540	0.851616	-0.691449	0.094162
CBIG (Overall) index	1.841839*						
CBIG (Legal) Index		0.080220					
CBIG (Political) Index			-0.385620				
CBIG (Price Stability Objectives) Index				2.352049**			
CBIG (Exchange Rate Policy) Index					2.468920**		
CBIG (Monetary policy and Deficit Financing) Index						4.249247***	
CBIG (Accountability and Transparency) Index							1.743108*
Asian Financial Crisis 1997 Dummy	-1.222868	-0.936974	-0.905319	-1.212794	-1.142972	-1.185361	-1.192682
Low Income Countries (LIC) Dummy	-0.180236	-0.643161	-0.937760	-0.537527	0.260434	0.518448	0.460909
High Income Countries (HIC) Dummy	-1.996422**	-2.481641**	-2.714580*	-1.268270	-0.755328	-2.925591***	-2.704717***
Initial GDP	-0.942481	-0.734343	-0.867638	-0.974546	-0.020842	-0.877941	-0.864889
Terms of Trade	2.613369***	2.398287**	2.300198**	1.790612*	1.253552	2.451923**	2.546452**
Initial Primary School Enrolment	-0.100556	-1.106400	-1.298685	-0.478247	0.015641	-0.051631	-0.596976
Initial Secondary School Enrolment	0.441018	1.648314*	1.834568*	0.586167	0.028624	1.143410	0.927086
Adj. R^2	0.092104	0.072608	0.071589	0.100957	0.090843	0.111636	0.084928
F- Statistics	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***

, and * denote statistical significance at 1%, 5% and 10% level respectively.

Source: Author's calculation

Table 11. Granger Causality Test

Null Hypothesis:	Observations	F-Statistic	Prob.
CBIG (overall) does not Granger Cause Inflation (Y_D)	407	2.95023	0.0125
Inflation (Y_D) does not Granger Cause CBIG (overall)		0.33362	0.8925

The null hypothesis for inflation (Y_D) does not Granger cause CBIG (overall) is not rejected but we do reject that CBIG (overall) does not Granger cause inflation (Y_D). This suggests that CBIG can affect on the inflation (Y_D), but the reverse is not true. So, two-way causality is not found in the Asia Pacific.

The main finding between economic growth and Asian financial crisis dummy is insignificant across all indices (column 2 to 8 in Table 10). So, the economic growth in the post crisis period is not significantly different from that of the pre crisis period. The relationship between CBIG indices and economic growth shows that the overall index has significant (at 10%) positive relationship along with price stability objectives (at 5%); exchange rate policy (at 5%); monetary policy and deficit financing (at 1%); and finally accountability and transparency (at 10%) indices (columns 2, 5, 6, 7 and 8 in Table 10). The high-income countries experience significantly lower economic growth than low- and middle-income countries. The low-income countries did not achieve any significantly different economic growth either. The increase in the terms of trade cause significant increase in economic growth; but initial GDP, initial primary and secondary school enrolment had no significant impact on economic growth. The overall strength of the tests was explained by high F statistics (1%) and acceptable adjusted R square values. So, CBIG has contributed to some economic growth in the Asia pacific but not in the post crisis period.

5. Conclusion

This paper constructed and ranked the CBIG indices for 36 Asia Pacific countries applying a robust index model. The CBIG overall and sub-indices portrayed the actual picture of CBIG of the region. The ranking in several refined samples highlighted the strengths and weaknesses of each central banks providing valuable information for policy makers for further improvements and modifications. The rankings also indicated that relatively low-income countries had improved their

CBIG more than the others. Such evidences support the view that the central banks in the region which suffered from low independence and poor governance before the financial crisis had taken necessary steps to improve their status in the post crisis period. The statistical findings identified that the inflation had significantly declined in the post financial crisis period, however no significant changes found in the economic growth. The key findings also include that inflation and economic growth are negative and positively related to CBIG statuses of the countries respectively.

This study provides several key contributions to the CBIG literature. This would be one of the leading studies to construct CBIG indices for Asia Pacific countries with such a comprehensive model. Such model explains six sub-indices to pinpoint specific areas of CBIG, while the overall index provides the overall picture. It would be also one of the first studies to measure the impact on inflation and economic growth in the post financial crisis period.

This suggests that governments had realised that low CBIG was insufficient to manage the financial crisis and so had enhanced accordingly. Inflation and economic growth are important monetary policy tools and it is very crucial to identify their correct relationship with others, such as CBIG. These findings should help resolve any unclear direction of relationship evident in previous studies.

Finally, the Asia Pacific was mostly overlooked in the previous works. Moreover, there were no works to check whether the CBIG had changed after experiencing such severe financial crisis in 1997. So, this adds to the CBIG literature as it adds the CBIG dataset constructed.

Appendix: 1 CBIG Index Format

		Coding
1.	**LEGAL** (CBIG$_{Leg}$)	Coding
a.	**Term of office of Governor / CEO (TOG)**	
	7 years or more	1.00
	6 years	0.80
	5 years	0.60
	4 years	0.40
	Below 4 years	0.20
	Not Mentioned	0.00
b.	**Legal power to appoint Governor/ CEO (LPA)**	
	Board of the central bank	1.00
	Parliament/Legislature	0.67
	Government but need parliament consent	0.33
	Government/ Executives alone	0.00
c.	**Legal power to Dismiss Governor/ CEO (LPD)**	
	No provision for dismissal	1.00
	Board of the central bank	0.67
	Parliament/Legislature or Government but approved by the parliament	0.33
	Government/ Executives alone	0.00
d.	**Reappointment of Governor/ CEO (RAG)**	
	Yes, there is provision of reappointment	1.00
	Not mentioned	0.50
	No, provision	0.00
e.	**Regulatory and supervisory power of central bank (RSC)**	
	Yes, completely separated	1.00
	Jointly done by central bank and other authorities	0.50
	No, only by central bank	0.00

$$CBIG_{Leg} = w_1 TOG + w_2 LPA + w_3 LPD + w_4 RAG + w_5 RSC$$

Where, $w_1 = w_2 = w_3 = w_4 = w_5$

		Coding
2.	**POLITICAL** (CBIG$_{Pol}$)	Coding
a.	**Turnover of Governor/CEO (TRG)**	
	Governor/CEO changed after 1 year or more of government's change	1.00
	Governor/CEO within 1 year of government's change	0.50
	Governor/CEO within 6 months of government's change	0.00
b.	**Members of the management board of central bank (CMB)**	
	Non-government persons	1.00
	Not mentioned government or non-government persons	0.67
	Government employees	0.33
	Government ministers	0.00
c.	**Governor/CEO holds other office in the government (GOO)**	
	No, Governor/CEO does not	1.00
	Yes, but with prior permission from government	0.50
	Yes, always	0.00

$$CBIG_{Pol} = w_6 TRG + w_7 CMB + w_8 GOO$$

Where, $w_6 = w_7 = w_8$.

		Coding
3.	**PRICE STABILITY OBJECTIVES** (CBIG$_{PStab}$)	Coding
a.	**The major objectives of the central bank (MOB)**	
	Price stability as the only objective of the bank	1.00
	Price stability is one objective with other compatible objectives	0.67
	No objectives stated in the bank charter	0.33
	Stated objectives do not include price stability	0.00
b.	**Inflation targeting (INT)**	
	Independently by central bank	1.00
	Jointly with government	0.50

Not done by the central bank	0.00

c.	**Interest rate controlling (INC)**	
	Independently by central bank	1.00
	Jointly with government	0.50
	Not done by the central bank	0.00

$CBIG_{PStab} = w_9MOB + w_{10}INT + w_{11}INC$

Where, $w_9 = w_{10} = w_{11}$

4.	**EXCHANGE RATE POLICY** ($CBIG_{Forx}$)	Coding
a.	**Foreign exchange market interventions (FIN)**	
	By central Bank alone	1.00
	Jointly with government	0.50
	By government only	0.00
b.	**Foreign exchange market regulations (FMR)**	
	By central bank alone	1.00
	Jointly with government	0.50
	By government only	0.00
c.	**Foreign exchange borrowings (FBR)**	
	Central bank has a prominent role	1.00
	Jointly with government	0.50
	By government alone	0.00

$CBIG_{Forx} = w_{12}FIN + w_{13}FMR + w_{14}FBR$

Where, $w_{12} = w_{13} = w_{14}$

5.	**MONETARY POLICY AND DEFICIT FINANCING** ($CBIG_{MonPol}$)	Coding
a.	**Responsibility of monetary policy formulation (MPF)**	
	Central bank alone	1.00
	Central bank participates, but has little influence	0.67
	Central bank only advice government	0.33
	Central bank has no say	0.00
b.	**The final word in resolution of conflict (FWC)**	
	The central bank, clearly defined in the law	1.00
	A council of the central bank, executive branch, and legislative branch	0.50
	Government and Executive branch	0.00
c.	**Lending to the government (PLN)**	
I.	Provision for lending	
	Not permitted	1.00
	Permitted, but with strict limits (e.g. up to 15% of government revenue)	0.67
	Permitted, and the limits are loose (e.g. over 15% of government revenue)	0.33
	No legal limits on lending	0.00
II.	**Terms of lending (TRL)**	
	Controlled by the central bank	1.00
	Specified by the central bank charter	0.67
	Agreed between the central bank and executive	0.33
	Decided by the executive branch alone	0.00
III.	**Maturity of loans (MLN)**	
	Within 6 months	1.00
	Within 1 year	0.67
	More than 1 year	0.33
	Not mentioned in the law	0.00
IV.	**Interest rates on loan (INL)**	
	At market rates or above minimum rate	1.00
	Below market rate	0.67
	Interest rate is not mentioned	0.33
	No interest on government borrowing	0.00

$CBIG_{MonPol} = w_{15}MPF + w_{16}FWC + w_{17}PLN + w_{18}TRL + w_{19}MLN + w_{20}INL$

Where, $w_{15} = w_{16} = w_{17} = w_{18} = w_{19} = w_{20}$

6.	**ACCOUNTABILITY AND TRANSPARENCY** ($CBIG_{Acctrans}$)	Coding
a.	**Objectives of the central bank (WOB)**	
I.	**Written objectives**	
	Mentioned in the law	1.00
	Not mentioned in the law but evident in other documents	0.50
	Not mentioned	0.00
II.	**Clear priorities in objectives (COB)**	
	Priorities are distinct and easy to understand	1.00
	Priorities are there, but not distinctly presented	0.50
	No priorities	0.00
b.	**Communication strategy**	
I.	**Policy explanations provided for public (PEP)**	
	Regularly communicated to public	1.00
	Occasionally communicated to public	0.50
	Not communicated at all	0.00
II.	**Publication of minutes of Board meeting (PMN)**	
	Minutes are published publicly	1.00
	Minutes are kept but not published	0.50
	Nothing mentioned	0.00
c.	**Accountability of the Governor/ CEO (ACG)**	
	Board of central bank	1.00
	Parliament	0.67
	Parliament and government	0.33
	Government only	0.00
d.	**Audit of central bank (ADC)**	
	External auditor	1.00
	Internal auditor	0.50
	Nothing mentioned	0.00
	$CBIG_{AccTrans} = w_{21}WOB + w_{22}COB + w_{23}PEP + w_{24}PMN + w_{25}ACG + w_{26}ADC$ Where, $w_{21} = w_{22} = w_{23} = w_{24} = w_{25} = w_{26}.$	
	$CBIG_{Overall} = w_1CBIG_{Leg} + w_2CBIG_{Pol} + w_3CBIG_{PStab} + w_4CBIG_{Forx} + w_5CBIG_{MonPol} + w_6CBIG_{AccTrans}$ Where, $w_1 = 5/26$; $w_2 = 3/26$; $w_3 = 3/26$; $w_4 = 3/26$; $w_5 = 6/26$; $w_6 = 6/26.$	

References:

1. Ahsan, A., Skully, M. and Wickramanayake, J. (2008). Central bank independence and governance: Definitions and Modelling. *Central banking governance.* Hyderabad: Institute of Chartered Financial Analysts of India (ICFAI) University Press.
2. Akhand, H. A. (1998). "Central Bank Independence and Growth: A Sensitive Analysis". The Canadian Journal of Economics, Vol. 31 No.2, pp 303-317.
3. Alesina, A. and Summers, L. H. (1993). "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence". Journal of Money, Credit and Banking, Vol. 25 No.2, pp 151-162.
4. Ariff, M. and Khalid, A. M. (2000). *Liberalization, Growth and Asian Financial Crisis: Lessons for Developing and Transitional Economies,* London, Edward Elgar Publishing Co.
5. Bade, R. and Parkin, M. (1988). Central Bank Laws and Monetary Policy. *Department of Economics Working Paper, University of Western Ontario.*
6. Barro, R. J. and Gordon, D. B. (1983). "Rules, Discretion and Reputation in a Model of Monetary Policy". Journal of Monetary Economics, Vol. 17 No.1, pp 101-121.
7. Berger, H., De Haan, J. and Eijffinger, C. W. S. (2001). "Central Bank Independence: An Update of Theory and Evidence". Journal of Economic Surveys, Vol. 15 No.1, pp 3-40.
8. Cole, D. C. and Slade, B. F. (1998). "Why Has Indonesia's Financial Crisis Been So Bad?". Bulletin of Indonesian Economic Studies, Vol. 34 No.2, pp 61-66.
9. Cukierman, A., Kalaitzidakis, P., Summers, L. H. and Webb, S. B. (1993). "Central Bank Independence, Growth, Investment and Real Rates". Carnegie-Rochester Conference Series on Public Policy, Vol. 39 No.1, pp 95-140.
10. Cukierman, A., Webb, S. B. and Neyapti, B. (1992). "Measuring the Independence of Central Bank and Its Effect on Policy Outcomes". World Bank Economic Review, Vol. 6 No.3, pp 353-398.
11. De Haan, J. and Kooi, W. (2000). "Does Central Bank Independence Really Matter? New Evidence for Developing Countries Using a New Indicator". Journal of Banking and Finance, Vol. 24 No.4, pp 643-694.
12. Dolmas, J., Huffman, G. W. and Waynne, M. A. (2000). "Inequality, Inflation, and Central Bank Independence". Canadian Journal of Economics, Vol. 33 No.1, pp 271-287.
13. Eijffinger, S. C. W., Van Rooij, M. and Schaling, E. (1997). "Central Bank Independence: A Panel Data Approach". Public Choice, Vol. 89 No.1, pp 163-182.
14. Forder, J. (1999). "Central Bank Independence: Reassessing the Measurements". Journal of Economic Issues, Vol. 33 No.1, pp 23- 40.
15. Fuhrer, J. C. (1997). "Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the Next Millennium?". New England Economic Review, Vol. 12 No.1, pp 19-36.
16. Fujiki, H. (1996). "Central Bank Independence Indexes in Economic Analyses: A Reappraisal". Bank of Japan Monetary and Economic Studies, Vol. 14 No.2, pp 79-99.
17. Grilli, V., Masciandaro, D. and Tabellini, G. (1991). "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries". Economic Policy, Vol. 6 No.13, pp 341-392.
18. Gujarati, D. N. (2003). *Basic Econometrics,* New York, McGrawHill.
19. Hausman, J. A. (1978). "Specification Tests in Econometrics". Econometrica, Vol. 46 No.6, pp 1251-1271.
20. Ismihan, M. and Ozkan, F. G. (2004). "Does Central Bank Independence Lower Inflation? ". Economics Letters, Vol. 84 No.3, pp 305-309.
21. Ja'come, L. I. and Va'zquez, F. (2005). Any Link Between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean. *International Monetary Fund Working Paper WP/05/75.*
22. Jordan, T. J. (1998). "An Empirical Observation on Central Bank Independence and Real Output". Open Economies Review, Vol. 9 No.3, pp 219-225.
23. Krugman, P. (1998). *What Happened to Asia*, mimeo, MIT Press.
24. Krugman, P. (ed.) 2000. *Currency Crisis,* Chicago: The University of Chicago Press.
25. Kwon, G., Mcfarlane, L. and Robinson, W. (2006). Public Debt, Money Supply, and Inflation: A Cross-Country Study and Its Application to Jamaica. *International Monetary Fund (IMF), Working Paper Series 121.*
26. Lawshe, C. H. (1975). "A Quantitative Approach to Content Validity". Personnel Psychology, Vol. 28 No.4, pp 563-575.
27. Nanto, D. K. (1997). South Korea's Economy and 1997 Financial Crisis. *CRS Report 98-13 E.*
28. Nowak-Lehmann, F., Vollmer, S. and Martínez-Zarzoso, I. (2007). Competitiveness - A Comparison of China and Mexico. *CESifo Working Paper Series No. 2111*
29. Panagiotidis, T. and Triampella, A. (2006). "Central Bank Independence and Inflation: The case of Greece". Revista de Economia del Rosario Bogota (Colombia), Vol. 9 No.1, pp 95-109.
30. Posen, A. S. (1995). Financial Sector Sources of Central Bank Independence. *In:* B Bernanke and Rotemberg, J. (ed.) *N.B.E.R. Macroeconomics Annual 1995.* Cambridge MA: MIT Press.
31. Santos, J. R. A. (1999). "Cronbach's Alpha: A Tool for Assessing the Reliability of Scales". Journal of Extension, Vol. 37 No.2, pp 1-5.

32. Sugisaki, S. (1997). The Global Financial System: Status Report. *11th Conference of the International Federation of Business Economists.* Vancouver, Canada.

33. Swan, P. (1998). "Asia's Financial Crisis: Its Causes and Unlikely Impact on Australia". Policy, Vol. 14 No.1**,** pp 10-16.

34. White, H. (1980). "A Heteroskedasticity-Consistent Covariance Matrix and a Direct Test for Heteroskedasticity". Econometrica, Vol. 48 No.4**,** pp 817-838.

35. Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data,* Cambridge MA, MIT Press.

36. Wooldridge, J. M. (2003). *Introductory Econometrics A Modern Approach,* Ohio, Thomson South-Western.