The Statistical Association between Central Bank Independence and Inflation [*]

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I. Introduction

Interest in the relationship between central banking institutions and inflation performance has increased during the past decade. While the institutional structure of central banks has always been an important topic, the recent interest is heighten by several factors. Monetary policy is now recognized as the primary instrument of policy and in this regard, many economists and central bankers accept the premise that central banks are capable of setting the long run inflation rate but incapable of achieving meaningful improvements in real performance. The real and financial disruptions of the inflation of the 1970s and early 1980s followed by high costs of required disinflation policies underlined the importance of long run price stability for economic growth. And finally, the financial liberalization process now offers a unique opportunity to restructure central banking institutions in a large number of countries.

As a result, economists have re-opened the agenda of how to structure a central bank to ensure price stability. Many believe central banks that are independent of other government institutions are more likely to generate lower average inflation rates than less independent central banks. There is a growing body of statistical studies attempting to document this view. Most of the studies build off of a methodology developed by Bade and Parkin (1982) in an unpub-

lished, but frequently cited paper. The approach consists of investigating the relationship between the selected measure of central bank independence and inflation performance by either scatter diagrams or more formal regression models.

Important contributors to this literature include Alesina 1988; Burdekin and Willett 1991; Cukierman 1991; Cukierman, Webb and Neyapti 1993; Eijffinger and Schaling 1993 and 1995; and Grilli, Masciandaro and Tabellini 1991. Cukierman, Webb and Neyapti (CWN) offer the most ambitious indexation effort in terms of the number of central banks (72 developed and developing countries) and length of the time period considered (1950-1989).

These studies report a significant and negative statistical association between the constructed indexes and inflation performance when the index values are positively related to the degree of the central bank's formal independence from government. The confidence in these results is high among researchers; for example, Alesina and Summers (1993, p. 154) write that their own work "[...] verifies what previous work has highlighted – a near perfect. negative correlation between inflation and central independence".

This literature is unusual in at least two regards. First, the most frequently cited paper on the subject remains unpublished; second, despite the obvious methodological, econometric and data problems the studies continue to emphasise the importance and general applicability of the results for central bank structure.

The claimed statistical association has influenced policy debate in at least three areas. First, proposals for a formally independent European Central Bank (Burdekin, Wihlborg and Willett 1992) reflect confidence in the statistical results. Second, the results were used in the debate over efforts by the House Banking Committee and the Clinton administration to reduce Federal Reserve formal independence (Berry 1993). Third, the statistical association is often mentioned as an argument for formally separating the central bank from government in developing countries that are in the process of restructuring their financial institutions and markets.

This influence is unfortunate for at least two reasons. First, focusing on formal rules defining the degree of central bank independence is not a productive approach to ensuring long run price stability. The inflation record of the Federal Reserve should be reason enough to reject the notion that formally independent central banks are less likely to be influenced by political institutions and more likely

to generate better inflation performance (Mayer 1990). A more productive approach (Walsh 1992) lies along optimal contracts between the central bank and government to reward central banks for price stability and penalize them for inflation or deflation.

Second, the statistical association is not nearly as robust as alleged by the studies. In addition, the studies fail to account with a major contradiction offered by the inflation records of the Bank of Japan and the Federal Reserve, two of the most important central banks in the world.

This paper focuses on the second issue. The paper summarizes the comparative research on the Bank of Japan and the Federal Reserve contradicting the statistical association between formal independence and inflation performance as well as to point out a difficulty to rationalize ranking of the Bank of Japan and the Federal Reserve presented in the Bade and Parkin study. Second, simple regression estimates are used to illustrate the sensitivity of the statistical association to reasonable changes in specification and time periods. The negative correlation between inflation performance and measures of central bank independence weakens or disappears with changes in model specification and countries included in the regression.

A review of the comparative inflation records of the Bank of Japan and the Federal Reserve combined with the sensitivity of the statistical association to reasonable changes in specification suggests more caution is required than has been exhibited in the literature regarding the relationship between formal central bank independence and policy outcomes.

II. The Bank of Japan and the Federal Reserve

The Bank of Japan and the Federal Reserve are among the most important central banks in the world. Their differing institutional structure and differing policy outcomes suggests they deserve close comparative study for implications about the institutional structure of a central bank and policy outcomes.

First, comparison of inflation rates during the past twenty years shows the Bank of Japan with a better inflation record than the

Federal Reserve despite being a more formally dependent central bank. Average GDP Deflator inflation rates (International Monetary Fund 1992) for Japan and the United States are as follows:

Periods	Japan	United States
1962-75	7.2%	4.6%
1976-91	2.8%	5.6%

Considering that the average Japanese inflation rate in the first period is influenced by high inflation in the early 1970s and the fact that Japan grew in real terms at annual rates close to 10% in the 1960s suggests inflation performance in Japan in this subperiod is not nearly as negative as the averages indicate. In any event, the inflation rate during the past two decades in Japan has clearly been lower than in the United States.

The differing inflation performance cannot be explained by technical considerations but is more broadly the outcome of structural, political, and social characteristics of the Japanese economy (Cargill and Hutchison 1990). Japan's superior inflation record is often noted in the above studies, but is dismissed in one of three ways: the contradiction is not discussed in any detail in the majority of studies; a short but difficult to accept rationalization is offered;[1] or Japan is regarded as a special case (Parry 1992).

Second, the evolution of central banking in Japan and the United States during the past three decades illustrates the crudeness of the indexes. Consider the CWN ranking for the Federal Reserve and the Bank of Japan, though the same point can be made for many of the constructed indexes. CWN calculate the Bank of Japan and the Federal Reserve index at 0.18 and 0.48, respectively over the period from 1950 to 1989. The Federal Reserve index ignores the impact of the 1975 Concurrent Resolution 133 and the Humphrey-Hawkins Act of 1978 on the formal independence of the Federal Reserve as

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[1] Cukierman, Webb and Neyapti (1993, p. 372) attribute the anti-inflation attitude and performance of the Bank of Japan to the Ministry of Finance. In this way Japan's inflation performance in the past two decades is no longer a contradiction to the maintained hypothesis that independent central banks generate superior price stabilization records. This argument, however, renders the maintained hypothesis difficult to test, but more important, the formal relationship between the Bank of Japan and the Ministry of Finance is only one of many factors that account for Japan's price stability and it is incorrect to argue that the Bank of Japan is a mere extension of the Ministry of Finance. These issues have been discussed in Cargill and Hutchison (1990), Henning (1994) and Suzuki (1987).

well as ignoring efforts of Governor Burns in 1976 and 1977 to ingratiate himself to the Carter administration and the fact President Reagan had the unprecedented opportunity to appoint all members to the Board of Governors by the time he left office in 1988. A time invariant index for the Bank of Japan is equally less defensible. The Bank of Japan has become more "independent" since the early 1970s (Cargill 1989; Henning 1994). After the inflation rate reached 30% in 1973, the Bank of Japan embarked on a long-range program of price stability from which they have not deviated. In fact the Bank of Japan is often regarded as a model central bank in terms of price stability (Hutchison and Judd 1989).[2]

The basic problem with indexes is they ultimately rely on a researcher's interpretation of central bank laws and as such, immediately expose the ranking to two problems. First, reliance on laws can be misleading even if all researchers agree on the same transfer function from laws to numerical index. The relative indexes assigned to the Bank of Japan and the Federal Reserve, being based on formal rules of organization and operation, fail to reflect the substantive differences in independence actually reflected in policy outcomes. Second, reliance on laws to construct indexes for many countries almost insures important historical, institutional, and structural changes occurring in a given country will be overlooked in the effort to construct a simple ranking. This leads one to regard the index as constant during periods of time for which events suggest the degree of central bank independence is changing.

Third, Bade and Parkin rank the Bank of Japan and the Federal Reserve as equally independent,[3] that is, both central banks are independent. This ranking is difficult to accept in light of the formal

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[2] Even if these types of changes could be consistently incorporated into the independence index, they would result in only marginal index changes and in no event would alter the overall ranking of the Federal Reserve and the Bank of Japan. While the Federal Reserve has lost some formal independence in the past two decades and the Bank of Japan has gained some informal independence, the two central banks would remain at opposite ends of the spectrum of independence. Thus even with a more finely defined index that was lowered and raised slightly for the Federal Reserve and the Bank of Japan, respectively, the contradiction to the traditional view would remain. In addition, on close examination the Federal Reserve resorted to inflationary monetary policy in the second half of the 1960s before the 1975 Concurrent Resolution and the Bank of Japan initiated restrictive monetary policy in 1973 well before it gained some informal independence in the second half of the 1970s.

[3] The Bade and Parkin rankings are reproduced in Alesina and Summers (1993) and Eijffinger and Schaling (1993).

relationship each central bank has with its respective government and in light of the many studies that assign a significantly lower independence ranking to the Bank of Japan.[4] In fact, the Bank of Japan is generally regarded as one of the more formally dependent central banks. Formal dependence is a common feature of central banks in the Pacific Basin. The equal ranking is maintained without comment in two recent studies using the Bade and Parkin rankings (Alesina and Summers 1993; Havrilesky and Granato 1993). Those who persist using the Bade and Parkin rankings, at a minimum, need to rationalize the equal ranking or change the ranking.

III. Statistical association is less than robust

The CWN index is the most impressive effort to rank central bank independence in terms of the degree of differentiation between countries (21 industrial and 51 developing countries), extent of information used to calculate each country's index value, and period of time covered. Thus the CWN data are employed to illustrate that the statistical association is not robust as alleged in the published literature.

Annual inflation rates and the CWN indexes for 20 industrialized countries[5] from the period starting 1962 and ending 1991 are averaged over four time partitions:

(a)   1962-66, 1967-71, 1972-76, 1977-81,
       1982-86 and 1987-91

(b)   1962-71, 1972-81 and 1982-91

(c)   1962-66, 1967-71, 1972-75, 1976-79, 1980-83, 1984-87
       and 1988-91

(d)   1962-71, 1972-79 and 1980-91.

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[4] Burdekin and Willett (1991), Cargill (1989), Cukierman, Webb and Neyapti (1991), Eijffinger and Schaling (1993), Henning (1994), and Grilli, Masciandaro and Tabellini (1991) all rank the Bank of Japan as having significantly less independence than the Federal Reserve.

[5] The CWN index for Luxembourg covers only the period from 1980 to 1989 and is thus removed from the sample in order to have a continuous set of data for all industrialized countries over the 1962-1991 period.

The analysis is confined to the industrialized countries ranked by CWN for three reasons: CWN find no statistical association between central bank independence and low inflation for the developing countries; other studies of central bank independence focus on only the industrialized countries; and reliability of any independence index is likely to be greater for developed than for developing countries.

The four time partitions are used to determine the sensitivity of the results to changes in time periods. The first and second time partitions represent five- and ten-year periods, respectively. The third and fourth time partitions incorporate the same end and start years of the periods employed by CWN and vary in length from four- to seven-year periods.

The relationship between inflation and central bank independence is estimated for four specifications:

(a)   Inflation = f(Time Dummies, Index) with no adjustment to error term.

(b)   Inflation = f(Time Dummies, Country Dummies, Index) with no adjustment to error term.

(c)   Inflation = f(Time Dummies, Lagged Inflation, Index) with no adjustment to error term.

(d)   Inflation = f(Index) with error term adjustment for heteroskedasticity and serial correlation via a method outlined in Kmenta (1986, pp. 622-625).

Table 1 reports the results for specification (a). This specification regresses the inflation rate on the appropriate time dummies and the index of independence for each country. Regression estimates are reported for all 20 countries and two-country partitions: (1) the 10 most independent central bank countries (Germany, Switzerland, Austria, Denmark, and the United States, Canada, Ireland, Netherlands, Australia, and Iceland); and (2), the 10 least independent central bank countries (Sweden, Finland, United Kingdom, Italy, and New Zealand, France, Spain, Japan and Norway).

The index coefficient is negative and significant at least at the .10 level for the 20 countries combined for each of the four time partitions. The statistical association, however, breaks down once the regression is estimated separately for the most and least independent

TABLE 1

Inflation = f(Time Dummies and Index)
Averaged Time Periods: 1962-66, 1967-71, 1972-76, 1977-81, 1982-86 and 1987-91.

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	7.69	4.29*	21.86	4.55*	4.45	2.93*
PD1	−0.06	−0.03	−0.12	−0.38	−0.28	−0.21
PD2	1.26	0.68	1.09	0.34	1.16	0.89
PD3	6.93	3.75*	6.86	2.14*	6.84	5.26*
PD4	6.60	3.57*	6.19	1.93**	6.90	5.31*
PD5	3.37	1.82**	4.12	1.29	2.61	2.01*
Index	−7.79	−2.30*	−34.72	−4.04*	1.92	0.36
R^2	0.20		0.25		0.49	

Averaged Time Periods: 1962-71, 1972-81 and 1982-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	9.38	4.62*	23.90	3.96*	5.93	3.56*
PD1	−1.08	−0.63	−1.58	−0.52	−0.86	−0.80
PD2	5.08	2.94*	4.46	1.48	5.56	5.13*
Index	−7.80	−1.73**	−34.67	−3.03*	1.64	0.26
R^2	0.20		0.27		0.57	

Averaged Time Periods: 1962-66, 1967-71, 1972-75, 1976-79,
1980-83, 1984-87 and 1988-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	7.81	4.24*	22.56	4.67*	4.57	2.89*
PD1	−0.02	−0.01	−0.08	−0.02	−0.26	−0.19
PD2	1.31	0.67	1.13	0.33	1.19	0.87
PD3	6.86	3.50*	7.00	2.04*	6.56	4.80*
PD4	6.19	3.15*	5.41	1.58	6.79	4.98*
PD5	6.96	3.55*	8.02	2.34*	5.90	4.32*
PD6	1.30	0.66	1.29	0.38	1.30	0.95
Index	−8.20	−2.46*	−36.26	−4.28*	1.78	0.33
R^2	0.20		0.26		0.46	

* : Significant at the .05 level.
**: Significant at the .10 level.

TABLE 1 - *(contnd.)*

Constant Averaged Time Periods: 1962-71, 1972-79 and 1980-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	10.53	5.23*	25.16	4.21*	7.38	4.51*
PD1	−2.11	−1.23	−2.57	−0.86	−1.92	−1.77
PD2	3.77	2.20*	3.11	1.04	4.25	3.92*
Index	−8.14	−1.83**	−35.24	− 3.1*	0.01	0
R^2	0.18		0.27		0.52	

* : significant at the .05 level
**: significant at the .10 level

central banks. The index coefficient is negative and significant at the .05 level for all four of the time partitions for the 10 most independent central banks; however, the index coefficient is insignificant and positive for the 10 lesser independent central banks. Thus, for the 10 less independent central banks there is no meaningful correlation between inflation performance and the index of central bank independence.

Table 2 reports the results for specification (b). In this case the inflation rate is regressed against time dummies, country dummies, and the independence index. Table 2 reports the results for only one time partition since the results are the same for other time partitions. The index coefficient is negative but insignificant at conventional levels of statistical confidence.

Table 3 reports the results for specification (c). The inflation rate is regressed on the lagged inflation rate and the independence index. The specification is estimated for the time partition permitting the largest number of time periods within a cross section. This regression models the inflation process as an adaptive process. The index coefficient is negative but not statistically significant at conventional levels of significance. Lagged dependent variable regressions estimated for other time partitions also yield an insignificant index coefficient.

TABLE 2

Inflation = f(Time Dummies, Country Dummies, and Index)
Averaged Time Periods: 1962-71, 1972-79 and 1980-91.

Regressor	20 Countries	
	Coef.	T-Value
Constant	5.53	1.87**
PD1	-2.11	-2.22*
PD2	3.81	3.94*
D1	1.61	0.21
D2	1.48	0.24
D3	2.02	0.30
D4	4.06	0.77
D5	1.71	0.34
D6	2.07	0.44
D7	5.48	1.20
D8	1.53	0.35
D9	3.37	0.92
D10	23.02	6.63
D11	2.91	0.96
D12	3.85	1.31
D13	4.36	1.32
D14	5.95	2.17*
D15	4.37	1.63
D16	2.51	0.85
D17	5.96	2.40*
D18	0.14	0.06
D19	2.63	1.07
Index	-5.23	-0.38
R^2	0.75	

Notes: See Table 1.

TABLE 3

Inflation = f(Time Dummies, Lagged Inflation and Index)
Averaged Time Periods: 1962-66, 1967-71, 1972-75, 1976-79,
1980-83, 1984-87 and 1988-91

Regressor	20 Countries	
	Coef.	T-Value
Constant	3.60	2.59*
Inf(t-1)	0.71	10.88*
Index	-3.11	-1.04
R^2	0.52	

Notes: See Table 1.

Table 4 reports the results for specification (d). This specification is the same as (a) without time dummies estimated by a GLS procedure.[6] The index coefficient is consistently negative and significant at the .05 level for all 20 countries; however, the index coefficient is insignificant for both the 10 most independent central bank countries and the 10 least independent countries.

Overall, these results suggest that the statistical association between inflation performance and central bank independence is not nearly so robust as alleged in the literature.

IV. Concluding comments

The claimed statistical association between formal measures of central bank independence and inflation is contradicted by the inflation records of two of the most important central banks in the world. The Bank of Japan, a formally dependent central bank, has generated a superior inflation record to the Federal Reserve, a formally independent central bank. Aside from this problem, the statistical association is not robust and subject to variation depending on countries included in the regression and regression specification. In one specification there is a statistical association for the 10 most independent central banks; however, the association is marginal or disappears when one adds country dummy variables, adjusts the residual process for serial correlation and heteroskedasticity, or models the inflation process as a lagged dependent variable regression. Using different time partitions appears to have little impact on the results.

In summary, the comparative performance of the Bank of Japan and the Federal Reserve and the lack of statistical robustness suggests that the claimed statistical association between low inflation and formal central bank independence should not be given the importance it has been afforded in discussions of how to structure a price stabilizing central bank.

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[6] The estimation technique estimates a value of ρ for all cross sections since there is insufficient information to permit a separate ρ estimate for each central bank. This model is referred to as a Cross-sectionally Heteroskedastic and Time-wise Autoregressive Model and is described in Kmenta (1986). The estimates are obtained from the SHAZAM program (White, Wong, Whistler and Haun 1990).

TABLE 4

Inflation=f(Index), GLS Estimates
Averaged Time Periods: 1962-66, 1967-71, 1972-76, 1977-81, 1982-86 and 1987-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	8.51	5.25*	10.01	2.64*	8.97	3.88
Index	−7.36	−2.48*	−9.72	−1.51	−7.75	−0.86
R^2	0.05		0.04		0.01	

Averaged Time Periods: 1962-71, 1972-81 and 1982-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	9.03	6.45*	10.38	2.96*	8.46	4.12*
Index	−7.77	−3.13*	−9.89	−1.64	−1.83	−0.23
R^2	0.14		0.09		0	

Averaged Time Periods: 1962-66, 1967-71, 1972-75, 1976-79, 1980-83, 1984-87 and 1988-91

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	8.49	−2.36*	8.7	2.39*	9.81	4.34*
Index	−7.29	5.43*	−7.3	−1.17	−11.34	−1.29
R^2	0.04		0.02		0.02	

Averaged Time Periods: 1962-71, 1972-79 and 1980-91.

Regressor	20 Countries		10 Countries		10 Countries	
	Coef.	T-Value	Coef.	T-Value	Coef.	T-Value
Constant	9.08	6.86*	10.33	2.64*	9.05	7.55*
Index	−7.81	−3.38*	−9.64	−1.45	−4.09	−0.54
R^2	0.16		0.07		0.01	

Notes: See Table 1.

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