

Central Bank Independence and Inflation: the Government debt and Inflation Targeting channel

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Abstract

The paper introduces government debt and monetary strategy (Inflation Targeting - IT) into the empirical literature about the relationship between Central Bank Independence (CBI) and inflation. According to Martin's (2015) model, CBI is not sufficient to maintain price stability in the long run and requires the adoption of IT as a monetary strategy. Using annual data from the period 1998 to 2010 we consider 87 countries (18 considered as developed and 69 as emerging). By using a panel VAR model we explicitly test a possible reciprocal influence between inflation and government debt. At a global level results show an indirect negative effect of Inflation Targeting and CBI on inflation through the government debt channel. A high level of CBI or the choice of IT as a monetary strategy has a significant negative effect on government debt and on inflation.

Introduction

While there were no problems concerning levels of state-owned debt, the question of the link between CBI and government debt did not seem to be an issue as far as monetary policy was concerned. The literature examined the consequences of independence on the level and volatility of inflation and growth. The existence of a negative relationship between CBI and inflation was debated in connection with the robustness of the measurement of independence, sampling effects and econometric methods. Neither monetary policy strategy nor changes in government debt were taken into account in the analysis. The conventional wisdom was that the greater the level of guarantee and credibility of independence, the more control there was over inflation, independent of changes in government debt.

Does Central Bank Independence influence changes in government debt? According to Sargent and Wallace (1981), independence, and the monetary rigor that is associated with it, leads, in the presence of a flexible budgetary policy, to an increase in government debt. This rise is the only means of financing the deficit. But in the long term this compromises the ability of the central bank to control price stability. For Martin (2015) inflation must inevitably increase in order to contribute to the sustainability of government debt. On the basis of this theoretical literature a positive relationship should be identifiable between the degree of independence, the level of debt and the level of inflation. At that stage, according to Martin's (2015) model, only a strategy of Inflation Targeting could, *a priori*, break this link.

The problem of the sustainability of government debt in certain regions, particularly in Europe, makes our research topical. The aim of this article is to empirically test the influence of independence on the level of debt and on inflation depending on the monetary policy strategy adopted. In order to do this we have carried out an original study using a widely-drawn dynamic panel covering 87 countries between 1998 and 2010 using in particular the new measurements of independence proposed by Dincer and Eichengreen (2014).

The paper is structured as follows. The first section presents a theoretical and empirical literature review. Section 2 introduces the databases and variables used and comments on some key data. Section 3 provides the econometric analysis. The last section discusses the main results and gives some explanations and suggestions for further research.

Section 1. Literature review

In a seminal paper Rogoff (1985) proposed that monetary policy be delegated to conservative and independent central banks in order to gain in credibility and reduce inflationary bias. Central Bank policy (Kydland and Prescott, 1977). The classic view ignored the role played by fiscal authorities in ultimately shaping the overall policy response to the implementation of CBI.

The empirical literature analyses the effect of Central Bank Independence on inflation levels and volatility. The relationship appears to be particularly complex. According to Alesina (1988) and Grilli et al. (1991), Central Bank Independence is associated with lower levels of inflation. Cukierman et al. (1992) show that legal independence is a significant determinant of price stability in industrial countries. Considering the effects of Central Bank Independence on financial markets, Alesina and Summers (1993) show that interest rate variability decreases with higher levels of Central Bank Independence and credibility. These studies influenced political debate over the question of central bank design. Many other empirical papers have found this inverse relationship between CBI and inflation by using different econometric approaches, different indices relating to legal definitions of CBI and various samples (Temple, 1998, De Haan and Kooi, 2000, Berger et al., 2001).

But at the same time a great number of scholars have concluded that no such negative relationship exists between CBI and inflation. Posen (1993) suggests that low inflation and Central Bank Independence are both caused by a strong demand for the former, and further argues that increasing

Central Bank Independence will not in itself lead to lower inflation. Forder (1996) and Hayo (1998) argue that CBI and commitment to low inflation are jointly determined by social culture reflecting public opposition to inflation. Campillo and Miron (1997) find that after controlling for other factors that may determine inflation, Central Bank Independence is relatively unimportant for average inflation rates. Studying the implementation of CBI reforms in OECD countries, Daunfeldt and De Luna (2008) show that in most countries price stability was achieved before CBI reforms were implemented. Forder (1998) claims that if the factual errors in the measurement of CBI are corrected for, the relationship between CBI and inflation largely disappears.

To understand CBI, the literature opposes *de facto* and legal independence. *De facto* independence refers to a central bank's more or less real capacity to effectively utilize its instruments and to compellingly express its arguments in monetary and budgetary debates (Meltzer, 2009, Singleton, 2011, Blancheton, 2016). The history of relations between central banks and governments is highly complex and hard to gauge, being made up of human relationships. It takes little account of certain myths about the supposed independence of such and such an institution. According to Siklos (2008), measuring these factors is in fact very difficult. Legal independence is defined by the conditions of nomination and removal of the chief executive officer of the central bank, its independence in policy formulation, its objective or mandate and the stringency of limits on its lending to the public sector. Legal independence has been measured in many different ways since the 1980's (Bade and Parkin, 1982, Cukierman, Webb and Neyapti, 1992, Alesina and Summers, 1993, Eijffinger and Schaling, 1992, Crowe and Meade, 2008...).

In these debates the validity of CBI indices is contested because researchers using them must choose which aspects of independence to include and how much weight to give them. Using different measures of CBI, such as the turn-over rate of bank directors, leads to a rejection of the negative

relationship. Negative relationships can only be explained by the inclusion of high-inflation countries in the sample or by introducing more control variables. Bruum (2000) and Bruum (2002), shows that accurate measurement of CBI is dependent on many elements that are not observable. According to Bruum (2000) the difference between *de jure* and *de facto* independence will be considered as a measurement error and could lead to erroneous results. Arnone and Romelli (2013) show that the relationship is sensitive to the methodology by which central bank indices are constructed. They find that legislative reforms that modify the degree of Central Bank Independence have a strong impact on changes in the inflation rate. They confirm the negative relationship for a sample of 10 OECD countries. Using analysis of latent variables and two additional indicators that capture the degree of *de facto* independence more appropriately, Posso and Tawadros (2013) show that greater independence is need to lower inflation. This empirical literature completely neglects the influence of monetary policy strategy and changes in government debt.

Some recent papers highlight the complexity of the relationship to a greater degree. Jacome and Vazquez (2008) establish a negative relationship between CBI and inflation for 24 Latin American and Caribbean countries between 1985 and 2002. But they observe that for some countries stabilization of inflation seems to have preceded CBI reform. Klomp and De Hann (2010) propose a meta-regression analysis of 57 empirical studies which shows that legal CBI indices have a negative relationship with inflation in OECD countries but the relationship is sensitive to the choice of CBI index.

In a recent paper Alpanda and Honig 2014 introduce the effects of Inflation Targeting on inflation in 66 developed and emerging countries between 1980 and 2006. They suggest that CBI is not a prerequisite for countries to experience significant declines in inflation following the adoption of Inflation Targeting.

In a seminal paper Sargent and Wallace (1981) analyse the consequences of interactions between fiscal and monetary policies in terms of inflation. A combination of strict control of the money supply and fiscal discipline guarantees government debt control and price stability. According to Sargent and Wallace, the budgetary authorities are obliged to work with deficits in order to deal with a necessity. If an independent central bank maintains strict control over the money supply to stabilize inflation in the short term, government debt grows. Should budgetary expansion and monetary austerity be prolonged, when the debt has reached a threshold considered to be unacceptable by lenders, the central bank will be forced to monetize a part of this debt. In this case, the desire to avoid low inflation at the outset leads to higher inflation in the long term. In this perspective, Alesina and Tabellini (1987) show the crucial role of public debt in democratic alternating governments.

In the 1990's, the Fiscal Theory of Price Level (FTPL) analyses systematically the consequence of interactions between fiscal and monetary policies in terms of price levels and public debt through respect for inter-temporal budget constraint (see for examples Leeper, 1991, Woodford, 1994, Canzoneri and Diba, 1996, Cristiano and Fitzgerald, 2000). The analysis of situations based on a non-Ricardian budgetary regime is particularly interesting. All else being equal within a budgetary regime of this type, the evolution of the primary balance is not compatible with a stable trajectory of debt. The presence of budget deficits can then testify to what budget policy decides without taking on board, a priori, long term respect for the sustainability of the public debt. Two scenarii may then prevail, depending on the behaviour, the degree of independence of monetary authorities, and the perception there of by the private sector.

If an independent central bank does not wish monetary policy to be just a simple correction of budget overruns, and subsequently if evolutions in monetary creation like those of the budget balance are determined independently of the evolution of public debt, respect for inter-temporal budgetary

Finance Bulletin 1:2

constraint can only come about by an adjustment of the general level of prices. Only a steep hike of the latter can effectively guarantee equality between the ratio of current debt to GNP and the sum of updated real values of budget balances, and the potential forthcoming creation of money (in terms of GNP). Under this radical configuration designated as the strong version of FTPL, the general level of prices is then determined by the conditions of balance of the market affecting the debt for each period. This is a quantitative theory of the debt.

Yet private agents may feel that the compatibility between respect for inter-temporal budget constraint by the State and this “exogenous” evolution of primary balance should ultimately be assured by forced recourse to the creation of money in the form of direct, or indirect, advances. If such were the case, the central bank, by then supplying the means for monetary adjustment, will subject its behaviour, de facto, to that of the Treasury. In this configuration, the future rate of inflation can no longer be determined on the sole base of criteria defined by the authority in charge of monetary policy. Its value depends in part on the conditions of “sustainability” of the public debt. Here, we are talking about a so-called low version of the FTPL.

Beetsma and Bovenberg (1997) explore strategic interaction between fiscal government setting public debt and a central bank controlling monetary policy. In the absence of political distortion an optimally designed conservative, independent central bank is sufficient to establish the second best. In the presence of political distortions or with coordination of monetary and fiscal policy, however, also a debt target is needed.

We choose as framework a more recent and realistic model. According to Martin (2015), the increase in debt and reduction in inflation experienced in the US and other developed countries in the early 1980s was plausibly the combined outcome of increased Central Bank Independence and lower tolerance of inflation by agents. In Martin’s macroeconomic model the smaller anticipated policy

distortions implemented by a more independent central bank would induce the fiscal authority to trade off higher current deficits for lower future deficits. In the long run, inflation would increase to accommodate higher government debt. Alternatively, imposing a strict inflation target would lower inflation permanently and insulate the primary deficit from political distortions.

We have chosen this theoretical framework to carry out an original empirical study concerning the link between inflation, CBI, monetary strategy and government debt. The originality of our paper is to highlight the relationship between CBI and inflation by taking into account the channel of government debt.

Section 2. Data and variables

Yearly data are from 1998 to 2010 for 87 countries, 18 “developed” and 69 “emerging” countries. We consider the inflation rate, central government debt, Inflation Targeting, legal Central Bank Independence, GDP growth and budget deficit between 1998 and 2010. Table 1 presents the definition of variables and sources.

$\pi_{i,t}$	inflation rate based on the yearly consumer price index
$GD_{i,t}$	Net debt is calculated as gross debt minus financial assets corresponding to debt instruments. These financial assets are: monetary gold and SDRs, currency and deposits, debt securities, loans, insurance, pension, and standardized guarantee schemes, and other accounts receivable (IMF, World Economic Outlook Database).
$IT_{i,t}$	Dummy variable for an Inflation Targeting regime (Cf. Table in Appendix for the list of countries by their date of adoption of Inflation Targeting)
$CBIW_{i,t}$	Weighted Central Bank Independence (Dincer and Eichengreen (2014))

$y_{i,t}$	Growth of Gross domestic product, constant prices. Annual percentages of constant price GDP are year-on-year changes; the base year is country-specific. Expenditure-based GDP is total final expenditures at purchasers' prices (including the f.o.b. value of exports of goods and services), less the f.o.b. value of imports of goods and services. [SNA 1993] (IMF, World Economic Outlook Database).
$\dot{g}_{i,t}$	General government primary net lending/borrowing. Primary net lending/borrowing is net lending (+)/borrowing (-) plus net interest payable/paid (interest expenditure minus interest revenue) (IMF, World Economic Outlook Database).

Table 1 : Definition of variables.

For central government debt, budgetary deficit, GDP growth and inflation we have used IMF sources (World Economic Outlook Database bank database). The time series are those for central government debt as a percentage of GDP.

The sample includes 26 countries – the great majority emerging countries – that adopted Inflation Targeting during the period under consideration (Table A2 in the Appendix). Emerging countries which have implemented this new monetary policy framework have done so because of the perceived advantages. They were searching for a nominal anchor that did not have the instability associated with fixed exchange rate regimes.

From the literature review, the CBI index appears to be a crucial variable. Legal CBI has been measured in any number of ways (Bade and Parkin, 1982, Cukierman, Webb and Neyapti, 1992, Alesina and Summers, 1993, Eijffinger and Schaling, 1992, Crowe and Meade, 2008...). We have used a recent database computed by Dincer and Eichengreen (2014). They compute an 'Extended' Legal Central Bank Independence index inspired by Cukierman et al. in order to take into account some criticisms highlighted in the literature. Cukierman et al.'s index is based on four characteristics as described in a central bank's charter. First, if the appointment of the chief executive is proposed by the central bank board rather than by the government, is not subject to dismissal, and has a long term of office. Second, the level of Central Bank Independence is higher if policy decisions are made

independently of government involvement. Third, the central bank gains in independence if the central bank's charter states that price stability is the primary goal of monetary policy. Fourth, if the government's ability to borrow from the central bank is limited, then Central Bank Independence is increased. Dincer and Eichengreen have added other aspects of CBI emphasized in the literature to Cukierman's criteria. They add measures of limits on the reappointment of the CEO, measures of provisions affecting (re)appointment of the other board members similar to those affecting the CEO, restrictions on government representation on the board and the intervention of the government in exchange rate policy formulation. They take into account twenty-four criteria aggregated into nine groups. From these nine aggregated variables two indices are computed. CBIU is the unweighted average of the nine aggregated variables, and CBIW is the corresponding weighted average (the correlation coefficient equals 0.99). They compute CBI for 89 countries.

Summary statistics for all countries, developed countries and emerging economies are provided in

Table 2.

	Period Obs.	Mean	Median	Maximum	Minimum	Std. Dev.
All observations - 87 countries						
INFLATION	1121	7.23	3.77	325.03	-8.57	18.68
GDPGROWTH	1124	4.21	4.16	59.74	-17.70	4.80
CENTRALDEB						
T	1056	53.47	44.55	334.85	2.69	36.64
CBIW	1117	0.50	0.51	0.83	0.09	0.23
DEFICIT	1065	0.41	0.26	30.98	-34.91	5.01
Developed - 18 countries						
INFLATION	234	2.09	2.20	5.25	-1.71	1.25
GDPGROWTH	234	2.23	2.59	10.20	-8.27	2.65
CENTRALDEB	231	64.50	60.49	215.95	6.07	40.05

Finance Bulletin 1:2

T						
CBIW	234	0.60	0.81	0.81	0.11	0.27
DEFICIT	230	0.54	1.06	16.14	-26.84	4.78
Emerging - 69 countries						
INFLATION	887	8.58	4.93	325.03	-8.57	20.78
GDPGROWTH	890	4.73	4.79	59.74	-17.70	5.10
CENTRALDEB						
T	825	50.38	42.49	334.85	2.69	35.03
CBIW	883	0.48	0.48	0.83	0.09	0.21
DEFICIT	835	0.37	0.11	30.98	-34.91	5.07

Table 2 : Summary statistics.

We propose a distinction between developed and emerging countries in order to constitute two groups representing for the first a high level of credibility and for the second a low level of credibility. The level of credibility being different according to the group analyzed, it is coherent to suppose that the sensitivity of the economic agents to the public debt and to the inflation can be less strong for the developed countries than for the emerging countries.

Developed countries represent about 20% of the sample against 80% for the emerging countries. The mean inflation rate for the whole sample is 7.23%. It is much lower (2.09%) in the developed countries than in the emerging countries (8.08%). The growth rate is also lower (2.23%) in the developed countries than in the emerging countries (4.73%). On the other hand, the rate of government debt to GDP in the developed countries (64.50%) is almost 15 points higher than that in the emerging countries (50.38%). A higher budget deficit may also be observed in the developed countries than the emerging ones. Finally, the degree of Central Bank Independence is 0.50 for the whole sample and proves to be higher in the developed countries than in the emerging ones.

The spread of the data is greater in the emerging countries than in the developed ones except for the indicator of Central Bank Independence and the level of government debt.

Table 3 presents the correlation matrices for all countries, developed countries and emerging countries. The correlation between GDP growth and government debt levels is negative. Central Bank Independence is negatively correlated with the GDP growth rate, government debt levels and budget deficit.

	INFLATION	GDPGROWTH	CENTRALDEB T	CBIW
All observations				
GDPGROWTH	0.07			
CENTRALDEB T	0.05	-0.18		
CBIW	0.00	-0.09	-0.09	
DEFICIT	0.11	0.17	-0.06	-0.08
Developed				
GDPGROWTH	0.29			
CENTRALDEB T	-0.38	-0.30		
CBIW	0.07	0.01	0.10	
DEFICIT	0.34	0.42	-0.33	0.02
Emerging				
GDPGROWTH	0.03			
CENTRALDEB T	0.10	-0.12		
CBIW	0.04	-0.05	-0.24	
DEFICIT	0.12	0.14	0.03	-0.12

Table 3 : Correlation Matrix.

For the developed countries, the correlations are somewhat different. In fact, there is a weak positive correlation between Central Bank Independence and inflation, growth rate, the level of government debt and the budget deficit. This initial result should of course be compared with Sargent and Wallace's analysis (1981) as well as that of Martin (2015).

On the other hand the level of government debt is negatively correlated with inflation and growth rate unlike the budget deficit, which is positively correlated with these two variables. The budget deficit and the level of government debt are, however, negatively correlated.

For the emerging countries, the results are fairly close to those for the whole sample. This result can be explained by the fact that the emerging countries represent 80% of the whole sample. It should however be noted that, unlike the case of the developed countries or of the whole sample, the budget deficit of the emerging countries appears to be positively correlated with the level of government debt.

Given the time-related nature of our data, it would seem necessary to test for the presence of a possible unit root. Given the model used, i.e. Panel VAR without a fixed effect on the constant, Levin, Lin & Chu's test appears to be the most appropriate to us. This test supposes that there is a unit root process common to the whole of the series, a hypothesis that is realistic when the econometric analysis is performed on stacked data.

The results, presented in Table 4, show that the unit root null hypothesis may be rejected at the 1% threshold. It would thus appear that the series are stationary.

Levin, Lin & Chu t*	Statistic	Prob. **	Cross-sections
CENTRALDEBT	-7.50	0.00***	87
DEFICIT	-4.72	0.00***	86
GDPGROWTH	-6.99	0.00***	87
INFLATION	-22.77	0.00***	86

Table 4: Unit root tests.

Null: Unit root (assumes common unit root process)

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Section 3. Econometric analysis

Specification

In this section, we introduce the specification of our model in order to test the effects of an Inflation Targeting regime and the role of Central Bank Independence on both general government debt and inflation:

$$\begin{cases} \pi_{i,t} = \beta_{1,0} + \beta_{1,1} \cdot \pi_{i,t-1} + \beta_{1,2} \cdot GD_{i,t-1} + \beta_{1,3} \cdot IT_{i,t} + \beta_{1,4} \cdot CBIW_{i,t} + \beta_{1,5} \cdot (IT_{i,t} * CBIW_{i,t}) + \beta_{1,6} \cdot y_{i,t} + \beta_{1,7} \cdot y_{i,t-1} + \\ \delta GD_{i,t} = \beta_{2,0} + \beta_{2,1} \cdot GD_{i,t-1} + \beta_{2,2} \cdot \pi_{i,t-1} + \beta_{2,3} \cdot IT_{i,t} + \beta_{2,4} \cdot CBIW_{i,t} + \beta_{2,5} \cdot (IT_{i,t} * CBIW_{i,t}) + \beta_{2,6} \cdot y_{i,t} + \beta_{2,7} \cdot y_{i,t-1} \end{cases}$$

Where i indexes country and t indexes time. Two endogenous variables are considered: $\pi_{i,t}$, the

inflation rate (based on the average consumer prices) and $GD_{i,t}$ the General government net debt.

$IT_{i,t}$, the Inflation Targeting regime, is a dummy variable. $CBIW_{i,t}$ represents Weighted

Central Bank Independence (Dincer and Eichengreen (2014)). $y_{i,t}$ and $\delta_{i,t}$ are respectively the output growth and the general government primary net lending/borrowing.

The term $IT_{i,t} * CBIW_{i,t}$ captures the extent to which the link between an Inflation Targeting

regime and Central bank independency may have an impact on both general government debt and

inflation. According to Martin (2015), $\beta_{1,5}$ and $\beta_{2,5}$ should be significant with a negative sign.

We estimate the model using an unrestricted Panel VAR with one lag interval for endogenous variables. We also consider one lag interval for GDP growth and deficit. Our panel data are derived

Finance Bulletin 1:2

from 87 countries from 1998 to 2010. In this model, we do not consider country-specific effects as our control variables already take these into account.

	INFLATION(-1)	CENTRALDEBT(-1)	C	IT	CBIW	IT*CBIW	GDPGROWTH	GDPGROWTH(-1)	DEFICIT	DEFICIT(-1)
All countries										
INFLATION	0.53 (0.01)***	0.01 (0.03)**	1.29 (0.54)**	-0.99 (0.75)	-0.31 (0.68)	1.14 (1.39)	0.00 (0.04)	0.18 (0.04)***	0.16 (0.04)***	-0.12 (0.04)***
CENTRALDEBT	-0.08 (0.02)***	0.94 (0.01)***	8.61 (1.04)***	-2.59 (1.46)*	-4.55 (1.32)***	3.71 (2.7)	-0.67 (0.07)***	-0.01 (0.07)	-0.59 (0.07)***	0.08 (0.08)
Developed countries										
INFLATION	0.38 (0.07)***	-0.004 (0.002)*	0.77 (0.45)*	0.62 (0.53)	0.80 (0.45)*	-0.83 (1.32)	0.06 (0.03)*	0.08 (0.03)**	0.14 (0.03)***	-0.15 (0.04)***
CENTRALDEBT	-0.39 (0.22)*	0.98 (0.01)***	8.71 (1.45)***	-4.72 (1.71)***	-3.72 (1.44)**	10.24 (4.26)**	-0.90 (0.11)***	-0.14 (0.11)	-0.55 (0.11)***	0.01 (0.12)
Emerging countries										
INFLATION	0.52 (0.01)***	0.02 (0.01)***	0.44 (0.67)	-0.29 (1.03)	1.59 (0.97)	-0.70 (1.84)	-0.03 (0.04)	0.18 (0.04)***	0.16 (0.04)***	-0.10 (0.05)**
CENTRALDEBT	-0.05 (0.02)**	0.90 (0.01)***	11.09 (1.25)***	-3.53 (1.93)*	-9.26 (1.82)***	6.95 (3.45)**	-0.60 (0.08)***	0.04 (0.08)	-0.52 (0.08)***	0.06 (0.08)

Table 5 : shows the econometric results for the panel VAR for each sample.

For the whole sample, the choice of a first-order autoregressive process would seem to be completely appropriate given the significance of the coefficients associated with the lagged variables. In the same way the control variables seem to be on the whole significant.

Our results show that the strategy of Inflation Targeting and Central Bank Independence have a significantly negative effect on change in the level of government debt, it is true for developed countries and emerging countries. On the other hand they do not have any direct impact on the rate of inflation. Growth has the expected negative effect on debt. On the other hand the budget deficit does not have the expected positive effect. Movements in interest rates on government bonds that have not been taken into account (due to lack of data) may explain this situation.

The level of lagged government debt has a significantly positive effect on inflation for all countries and emerging countries but a negative effect for developed countries. Thus, by reducing the level of government debt, an increase in the independence of the central bank or the adoption of an Inflation Targeting strategy have a significant, negative, indirect effect on the rate of inflation. The choice of a high level of independence or of an IT strategy would appear, based on these results, to discipline budget policy.

These results and their mechanisms are also found for the subsample of emerging countries.

On the other hand, for the sample of developed countries, the level of lagged government debt leads to a very weak decrease, significant at the 10% level, in the rate of inflation. We can explain this result by the fact that, the developed countries forming a group whose credibility is greater, economic agents are more insensitive to changes in public debt (the coefficient, although slightly negative, is very close to 0). Moreover, developed countries have in general a lower inflation rate than emerging countries.

This result can reveal a specific relationship between the level of government debt and inflation for countries with low rates of inflation.

In the developed countries, Central Bank Independence is accompanied by stronger inflation. This result is explained by the model developed by Martin (2015) which shows that Central Bank Independence should lead to an increase in inflation unless it is constrained by an Inflation Targeting strategy.

The link between the choice of Inflation Targeting and the degree of Central Bank Independence does not have a direct effect on inflation when the whole sample is considered. On the other hand, for the two sub-samples, this effect is significantly positive. This implies that the choice of an Inflation Targeting strategy combined with Central Bank Independence leads to an increase in the level of government debt and in this way increases inflation.

In other words, although Inflation Targeting and the degree of independence do not have a direct effect on inflation, they do have an effect through the level of government debt. The choice of Inflation Targeting alone or a high degree of independence are associated with a lower level of government debt. Through this mechanism, the inflation rate is lower because it is positively linked to the level of lagged government debt.

The association of Inflation Targeting with a high degree of Central Bank Independence leads to the opposite effect from that hoped for by the countries that implement them: in reality, the inflation rate is higher in this scenario. The transmission channel is here again the level of government debt which proves to be higher when Inflation Targeting and a high level of independence are adopted at the same time. The link between inflation and the level of lagged government debt being positive, inflation tends to be higher. A plausible explanation resides on the fact that the credibility of the Central Bank

increases when countries combine IT and high CBI and hence, permits a higher level of inflation. The higher credibility associated with IT and CBI leads to a greater insensitivity of economic agents to changes in public debt and inflation.

Conclusion

The original aspect of this paper is to introduce government debt and monetary strategy (Inflation Targeting) into the empirical literature about the relationship between CBI and inflation. Using annual data from the period 1998 to 2010 we analyse 87 countries (18 considered as developed countries and 69 as emerging countries). By using panel data and a VAR model we explicitly test a possible reciprocal influence between inflation and government debt.

Our results show that a high level of CBI or the choice of IT as a monetary strategy have any direct significant effect on inflation and can't highlight large empirical literature on the topic. But our paper provides the CBI and IT have a significant negative effect on government debt. An indirect link on inflation is possible on this basis: more precisely, a high level of CBI and an IT regime have a negative effect on government debt and lagged government debt has a significant positive effect on inflation.

This pattern is perfectly true for the sample of emerging countries. CBI or IT appears effective in promoting fiscal discipline. Imposing a strict inflation target or a high level of CBI appears effective in promoting fiscal discipline and insulating countries from political distortions. However, for developed countries, government debt rate induces a very low, but significant rate of inflation, which seems to reflect a particular relationship between government debt and inflation for countries with a low inflation rate.

These results appear consistent with Alpanda and Honig (2014) who suggest that CBI is not a prerequisite for countries to experience significant declines in inflation following the adoption of Inflation Targeting. Our results, also in line with those of Martin (2015) indicate that the choice of Inflation Targeting reduces inflation through the control of government debt. However, contrary to Martin's model, we show that CBI also appears to be a sufficient condition to ensure price stability.

Another result provided by our estimation is the fact that the combination of CBI and IT is positively correlated to government debt and inflation. The association of IT with a high degree of CBI lead to the opposite effect from that hoped for by the countries that implement them: in reality, the inflation rate is higher in this scenario. The transmission channel is here again the level of government debt which proves to be higher when IT and a high level of independence are adopted at the same time. The link between inflation and the level of lagged government debt being positive, inflation tends to be higher. A possible explanation can reside on the increase of credibility when countries combine IT and high CBI.

Appendix

Table 2A: Inflation Targeting period in our sample

Country	Start date of Inflation Targeting period*	Country	Start date of Inflation Targeting period*
Albania	2009	New Zealand	1998
Armenia	2006	Norway	2001
Australia	1998	Peru	2002
Canada	1998	Philippines	2002
Chile	1999	Poland	1998
Colombia	1999	Romania	2005
Czech Republic	1998	Slovak Republic	2005-2008
Finland	1998-1998	South Africa	1998
Hungary	2001	Spain	1998-1998
Iceland	2001	Sweden	1998
Indonesia	2005	Thailand	2000
Israel	1998	Turkey	2006
Mexico	2001	United Kingdom	1998

*If not mentioned, the end date in our sample is 2010

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Table A3: Countries

Targeting countries		Non Targeting countries	
Developed	Emerging	Developed	Emerging
Australia	Albania	Austria	Angola
Canada	Chile	Belgium	Argentina
Finland	Colombia	France	Armenia
New Zealand	Czech Republic	Germany	Azerbaijan
Norway	Hungary	Greece	Barbados
Spain	Iceland	Ireland	Belarus
United Kingdom	Indonesia	Italy	Belize
	Israel	Japan	Bhutan
	Mexico	Luxembourg	Bosnia and Herzegovina
	Peru	Portugal	Botswana
	Philippines	United States	Bulgaria
	Poland		Cambodia
	Romania		China
	Slovak Republic		Croatia

South Africa
Sweden
Thailand
Turkey

El Salvador
Estonia
Fiji
Georgia
Guyana
India
Iraq
Jamaica
Jordan
Kenya
Latvia
Lesotho
Lithuania
Malawi
Malaysia
Maldives
Mauritius
Moldova
Mozambique
Namibia
Nigeria
Oman
Papua New Guinea
Saudi Arabia
Seychelles
Sierra Leone
Singapore
Slovenia
Solomon Islands
Sri Lanka
Tanzania
Trinidad and Tobago
Tunisia
Uganda
United Arab Emirates
Vanuatu
Zambia

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