Central Bank Independence and its Role in Disciplining Deficit Spending
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Price stability or low and stable inflation is a primary objective of most central banks, and central bank independence is found to be an extremely important factor in achieving that goal. There have been a long list of studies and research in the economic literature that have found that central bank independence contributes to lower inflation, and a large number of countries around the globe have in general all moved towards having greater central bank independence (Alesina and Summers 1993; Carlstrom and Fuerst 2009; Dincer and Eichengreen 2014). As discussed quite extensively in previous studies, one of the most important reasons behind this relationship is that central banks that are more independent are able to combat the issue of the time-inconsistency problem coming from monetary policy. The time-consistency problem stems from the fact that politicians have the incentives to exploit the short-run tradeoff between inflation and unemployment to benefit themselves in elections, even at the price of higher inflation. Therefore, if central bank authorities can be insulated from that political pressure, they would be able to make better policy decisions based on longer run objectives that can ultimately lead to lower inflation.

Even though central bank independence is a topic that is frequently studied in the literature, it really is a complex concept that is not straight forward to understand or easy to measure. Thus, many economists have created different indices that serve as a proxy for measuring central bank independence. Central bank independence generally consists of two components, political independence and economic independence (Grilli et al. 1991). The two components of independence are the ability to decide on policy objectives and the ability to use monetary policy instruments without government interference, respectively. The many different indices created by researchers also use different measure of central bank independence. Some indices focus on *de facto* independence, which measures how much independence central banks have in actual practice; some focus on *de jure* independence that only look at how much independence is written in the law. With these different measures of central bank independence, economists are then able to examine the effects central bank independence has on inflation, as well as many other economic outcomes and conditions.

The main question that this paper will be attempting to address is, can central bank independence help constrain government budget deficits? Within the definition of central bank independence and specifically economic independence, as defined by Grilli, Masciandaro, and Tabellini (1991). Central banks that can exercise economic freedom are able to use their monetary policy tools without government restrictions, and one feature of this type of independence is that central banks are not obliged to finance government deficits. Independent central banks do not have to take in all of the newly issued government bonds, and can also deny the government's access to the printing press when the government wants to resort to seigniorage revenues (Burdekin and Laney 2016). This means that governments will have a much harder time financing their deficits, and will have to think twice before conducting excessive deficit spendings. Therefore in theory, independent central banks should be able to promote better fiscal discipline and this constraint can be very crucial because the electoral system gives politicians incentives to overspend in order to appeal to voters (Bodea 2013).

Bodea (2013) makes the case that central banks that are more independent will prefer budget discipline because of the connection between deficits and inflation in the long run. This is supported by the findings of Sikken and de Haan (1998), that fiscal deficits result in higher rates of money growth in a sample of 30 developing countries. Central banks should then, have incentives to constrain deficit spending because it can potentially undermine their efforts to control inflation. Furthermore, regarding the goal of price stability, government deficits could also be made less inflationary when there is higher central bank independence (CBI) because greater CBI can help anchor the public's expectations (Burdekin and Wohar 1990). The public will generally have the expectation of lower and more stable inflation because independent central banks tend to be more dedicated to their price-stability objective. This paper contributes to the literature by re-examining the relationship between CBI and government budget deficits, building on the findings of previous studies that use different CBI indices and look at different sets of countries. My hypothesis is that higher CBI will be correlated with lower levels of government budget deficits.

In this paper, I will use the panel data of 15 OECD countries to assess whether greater CBI is in fact correlated with lower government budget deficits. In Section I, I will briefly discuss the findings of some previous papers in the literature that also look at this topic. I will describe the data, the CBI index, as well the empirical methods of this paper in more detail in Section II. The results of my empirical analysis and how those results can be interpreted to answer the research question will be discussed in Section III. Lastly in Section IV, I will conclude on the findings of this paper, discuss how the results compare to those of the Burdekin and Laney study in 2016 (my reference for the regression equation used in this study), and present the limitations of this paper. Contrary to my hypothesis, my results in general show a positive but not statistically significant correlation between CBI and the level of government budget deficits.

II. Literature Review

There has been a number of studies in the literature examining the relationship between central bank independence and the level of government budget deficits, using various different CBI indices and datasets containing different sets of countries. Some studies have found that higher central bank independence seems to be correlated with lower budget deficits and better fiscal discipline (Burdekin and Laney 2016 and Bodea 2013). There are also other studies that were not able to find a statistically significant relationship between CBI and budget deficits (Sikken and de Haan 1998 and Grilli et al. 1991). The differences may be explained by the characteristics of the countries in their dataset, and how researchers can interpret CBI differently if they use different measures of CBI.

A CBI index that is commonly used in the literature to proxy for central bank independence is the Cukierman index (Cukierman et al. 1992). This index examines and measures central bank independence both by law and by its application in practice. These two measures can vary drastically as each indicator captures different aspects of CBI, and researchers may prefer different approaches depending on their country samples. Most of the studies reviewed in this section use the Cukierman index that measure legal independence. When creating the index that focuses solely on legal independence, the authors intentionally left out information on how the law is applied in actual practice to focus on the legal aspect. The legal characteristics were grouped into 4 components: i) the appointment, dismissal, and term of office of the CEO; ii) the

resolution of conflicts between the executive branch and the CB over monetary policy, as well as the participation of the CB in the budget process; iii) the objectives of the CB; iv) limitations on the ability of the CB to lend to the public sector. Each component is weighted slightly differently, and the aggregated legal index is scaled from 0-1(1 being highest level of independence). To measure the *de facto* level of independence, the authors used responses to questionnaires sent to specialists on monetary policy and turnover rates of central bank governors, with more rapid turnover rates indicating lower levels of independence (scaled the same as legal index).

Burdekin and Laney (2016) found that greater central bank autonomy helped keep fiscal excesses in check and controlled inflationary deficit expansion, using data from 14 Latin American countries that have previously struggled with excessive deficits. They proxied central bank independence using three CBI indices in their study. The study used a Cukierman based index (Cukierman et al. 1992, with an updated version from Carstens and Jácome 2005) that looks at institutional features including 17 different legal attributes, and a constitutional index from Gutiérrez (2004) that measures how explicitly the central bank's authority is protected by constitutional provisions, which will make it more likely that *de jure* independence actually reflects *de facto* independence. Lastly, they also included the Dincer-Eichengreen index (2014) that builds on the Cukierman index by also considering reappointment limits for the central bank's head and members of the policy board, restrictions on government representation, as well as its intervention in exchange rate policy. Their findings suggest that higher central bank independence could potentially restrain overly expansionary and inflationary policies, similar to the findings of their previous 1988 paper looking at industrialized countries, that also showed a negative correlation between CBI and deficits (Burdekin and Laney 1988).

Bodea (2013) used the Cukierman index (Cukierman et al. 1992, Cukierman et al. 2002, with an updated version from Carstens and Jácome 2005) and coded their own data for more recent years where the index was not available, and looked at 23 post-communist countries. Bodea concludes that independent central banks can only be expected to deliver lower budget deficits in democratic countries where they are able to exercise *de facto* power. Because they need to be capable of imposing a retaliatory tight monetary policy and limiting lending to the government in order to enforce fiscal discipline. The results in Bodea and Higashijima (2017) are similar and suggest that legal CBI is an important deterrent of fiscal deficits, but this effect is only true in democracies and countries with rule of law. Their research shows that CBI is unlikely to affect the fiscal balance of autocratic countries.

In the study by Sikken and de Haan (1998) looking at 30 developing countries, the authors used the Cukierman index (1992) and the political vulnerability index (Cukierman and Webb 1995) that measures the turnover rate of central banks governors (a higher turnover indicates a lower level of actual independence). They found that monetary accommodation of deficits is negatively related to central bank independence, but only when CBI is proxied by the turnover rate of central bank governors or the political vulnerability index. No relationship was found between central bank independence and the level of budget deficit.

Grilli, Masciandaro, and Tabellini (1991) looked at 18 OECD countries and used measures of political independence and economic independence. The paper defined political independence as the ability of the monetary authorities to decide the final goal of monetary policies, and

economic independence as the independence to choose the tools to achieve those goals. The degree of political independence is evaluated based on whether the appointment of the governor and the board of the central bank is under the control of the government, whether there is mandatory participation of a government representative in the board or requirement of prior government approval of monetary policy, and whether the CB's responsibility in preserving monetary stability is explicitly stated in the constitution. A country's economic independence was rated based on whether the government has easy access to central bank credit, whether the CB has control over the discount rate, and whether the CB is responsible for supervising private banks. This paper also looked at whether higher CBI is correlated with lower levels of budget deficits and does not find evidence that supports this relationship.

Researchers do not all agree that such a negative correlation exists between CBI and budget deficits, in some studies this relationship is only found in certain countries (Bodea 2013 and Bodea and Higashijima 2017), or only when using the index that measures *de facto* CBI (Sikken and de Haan 1998). It is very likely that there are other factors that may also affect this relationship and the effects of CBI may not be as straightforward as depicted in theory.

III. Data and Empirical Method

In this paper, I used the CBI index created by Garriga (2016), which measures *de jure* central bank independence that is coded based on the Cukierman, Webb and Neyapty (1992) (CWN) criteria, on a country-year basis. This index includes 182 countries between 1970 and 2012, and the weighted CBI index used in my analysis was coded based on 16 dimensions related to four components of CBI. The measures include CEO's characteristics (appointment, dismissal, term of office of the CEO of the bank), policy formulation attributions (who formulates/makes the final decision in monetary policy, and the role of the central bank in the budget process), central bank's objectives, and limitations on lending to the public sector. These 16 components are then combined into a single weighted index, ranging from 0 (lowest) to 1 (highest).

According to its creator, this index has some advantages over other indices that use measures of *de facto* CBI (such as Blinder 2000, Cukierman, et al. 1992, Fry, Goodhart, and Almeida 1996), and turnover rates of central bankers (such as Cukierman and Webb 1995, Cukierman, et al. 1992, de Haan and Siermann 1996). Measures of *de facto* CBI rely on questionnaires and tend to have narrower coverage, problematic cross-sectional comparability, and very little within-country variation; the accuracy of CBI measures that use turnover rates could be undermined because central bankers that are less efficient in controlling inflation are replaced more frequently as well (Garriga 2016). As Garriga stated in the paper, this CBI index contains cross-sectional data across time that allows for the examination of the systematic differences across observations. In addition, statutory measures of CBI can assess the timing and the extent to which governments grant independence to central banks. On the other hand, I do recognize that *de jure* measures like those used in the Garriga index are also not perfect because in many countries there are frequent deviations from legal independence in the actual practice (Cukierman 2008).

This paper will re-examine the relationship between CBI and government budget deficits using the Garriga CBI index and budget deficit data[1] from 15 OECD countries between 1995-2012. I

will base my study on Burdekin and Laney (2016) and their empirical method to estimate the relationship between CBI and budget deficits.

$$(1) \quad DEF_t = \alpha + \beta MONEY_t + \gamma GDP_t + \delta DEF_{t-1} + \theta FREE + \lambda D_i + \varepsilon_t$$

DEF is the budget deficit as a percentage of GDP, the data is from the OECD. *MONEY* is the growth rate of the broad money as an annual percentage, and *GDP* is the growth rate of real GDP in annual percentage at market prices based on constant local currency, data for both variables were from the World Bank. *FREE* is the Economic Freedom of the World index, measuring size of government, legal system and property rights, sound money, freedom to trade internationally, and regulation (weighted equally), from the Fraser Institute[2]. The freedom index ranges from 1-10 with higher values meaning greater freedom. *D* is the CBI index, which will be the weighted Garriga 2016 central bank independence index in models 1-4, and the individual component of the index that represents limitations of lending to the public sector in model 5.

IV.   Empirical Results

Fig. 1 CBI and Government Budget Deficits in 1995-2012
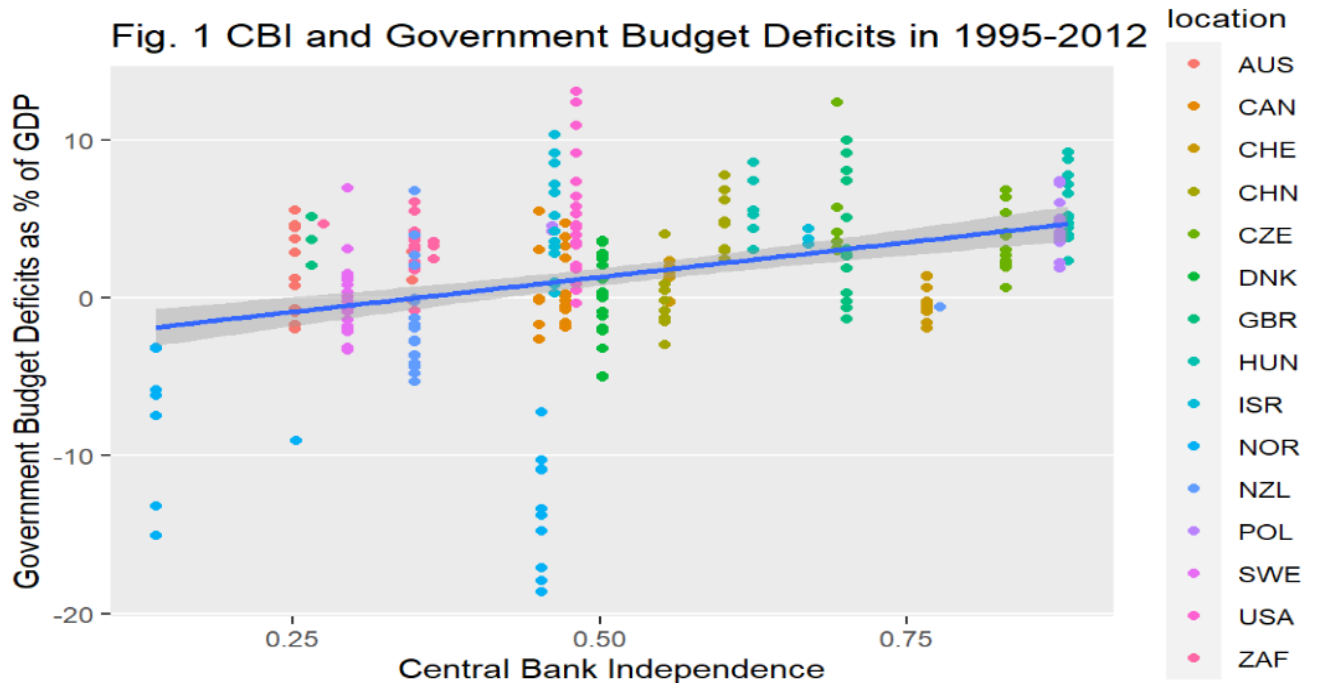
In Figure 1. I first look at the raw correlation between CBI and budget deficits using a scatterplot and a simple OLS regression line, before adding in other controls variables. It shows a scatterplot of 15 OECD countries in the period of 1995-2012. The measure of CBI is the weighted index created by Garriga (2016), and government budget deficits are measured as percentages of GDP.

Each point in the plot represents a country in a year between 1995-2012, and each country is identified by a unique color. From Figure 1 we can see that the regression line is clearly sloped upwards. The slope of the regression line goes against my initial hypothesis that higher CBI is correlated with less budget deficit. From just looking at Fig. 1, it seems like observations with higher CBI actually tend to have higher levels of budget deficit.

Table 1

	(1) OLS	(2) No-IV	(3) IV	(4) IV+FE	(5) IV+Lim-Lending
Weighted CBI	8.801***	0.122	0.184	1.571	
	(1.117)	(0.785)	(0.786)	(2.733)	
GDP		-0.362***	-0.409***	-0.432***	-0.405***
		(0.0589)	(0.0696)	(0.0824)	(0.0707)
MONEY		0.0210**	0.113*	-0.0850	0.116*
		(0.00889)	(0.0585)	(0.0624)	(0.0597)
DEF$_{lagged}$		0.954***	0.976***	0.562***	0.968***
		(0.0448)	(0.0502)	(0.0775)	(0.0496)
FREE		-0.510***	-0.297	-3.083***	-0.275
		(0.192)	(0.270)	(0.881)	(0.271)
Lim-Lending					**0.553**
					(0.509)
_cons	-3.069***	4.932***	2.555		2.124
	(0.740)	(1.706)	(2.615)		(2.585)
N	270	189	189	189	189
r2	0.131	0.875	0.840	0.516	0.839

Robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 1 presents 5 different regression models including pooled OLS regressions and 2SLS regressions that incorporate various control variables. Table 1 Model 1 uses the same estimation equation as the fitted line in Fig. 1. We can see that without the addition of any controls, CBI positively relates to the level of budget deficit and this effect is statistically significant. Model 2 is a simple pooled OLS that estimates equation 1(the baseline equation) without instrumenting for *MONEY*. Model 3 is a 2SLS (Two-Stage Least Squares) regression that also estimates the baseline equation, but I included lagged GDP growth, the second lags of the deficit, second lags of the money growth, and the second lags of inflation rates as instruments for *MONEY* to account for the likely endogeneity problem of the money supply growth variable (Burdekin and Laney

2016). Model 4 is a slight variation of the baseline equation (Model 3) from Burdekin and Laney (2016), in which I added on an entity fixed effect that controls for country level heterogeneity. Finally, in Model 5 I used the component of the Garriga index that focuses on the limitations on lending to the public sector (Lim-Lending) to proxy for CBI instead of the whole weighted average, when estimating the baseline equation (Model 3). By using the component that only measures limitations on lending, the analysis can be focused on the aspect of CBI that directly relates to the research question of this paper.

Models 2, 3, 4, and 5 all show that CBI is positively correlated with the level of budget deficit, though this effect is not statistically significant. Even though the coefficients on CBI do not support my hypothesis, the coefficients on other variables do make sense intuitively. *GDP* growth has negative coefficients because when the economy is in periods of prosperity, tax revenues will increase, and unemployment rates would decrease, meaning that the need for government-funded programs would also decrease. *MONEY* mostly has positive coefficients because higher money growth rates can allow the government to finance budget deficits easier without resorting to more borrowing (Burdekin and Laney 2016). Lastly, *FREE* has negative coefficients, because greater economic freedom could potentially be correlated with more developed countries and economies that might in turn have better fiscal discipline.

To examine this relationship, I originally intended to look at a total of 32 OECD countries including 17 countries that are members of the European Monetary Union. I eventually decided to leave out those countries because the European Monetary Union could potentially cause problems that would skew the results. This is because EMU countries no longer had independent central banks after 1998, and they now collectively follow the policies of the European Central Bank. Furthermore, in order to join the EMU, those countries needed to meet the convergence criteria of having deficits that are under 3% of GDP, and this restriction continued to hold true even after becoming EMU members[3]. In addition to this potential disturbance, the EMU countries also do not have country level data available for the *MONEY* variable, instead the EMU countries were grouped into a single category called Euro Area and shared a single value. Therefore in the specifications that included the *MONEY* variable, the EMU countries would have been dropped automatically regardless. My results show a positive relationship between central bank independence and government budget deficits that is not statistically significant, even when there is no potential disturbance from the EMU countries.

V.   Conclusion and Discussion

In this paper, I attempted to answer the question of whether central bank independence is able to constrain government budget deficits, using data from 15 OECD countries between 1995-2012 and the Garriga CBI index. As presented in Table 1, my empirical results do not support my initial hypothesis that greater central bank independence is correlated with lower levels of government budget deficits. Almost on the contrary, my findings suggest that CBI might have a weakly positive relationship with the level of budget deficit. It is interesting to see that the results turned out to be different from my baseline paper, even though I used the same regression equation as Burdekin and Laney 2016, where they observed a statistically significant, negative relationship between CBI and budget deficits with all three CBI indices used.

A possible explanation for the differences in the findings of this paper and the baseline paper, could be the type of countries that were used in the data analysis. I looked at OECD countries that, for the most part, did not have severe issues with fiscal excess or fiscal dominance to begin with at the start of the 1995-2012 time period. Central bank independence might have a threshold effect on budget deficits, where it is the most effective for countries that start off with severe issues of inflationary deficit expansion and rely on seigniorage revenues, like the 14 Latin American countries examined in Burdekin and Laney 2016. The aspect of central bank independence that helps promote fiscal discipline is most likely the "economic independence." Central banks with more economic independence are able to deny governments access to the printing press and refuse to monetize their deficits. Thus, higher CBI may only be effective in promoting fiscal discipline in the cases where high levels of budget deficits are mainly caused by reckless expansionary fiscal policies and money printing. In the case of the OECD countries in my dataset, the majority of them did not start off with severe fiscal dominance, therefore the increase in central bank independence may not have been as effective in constraining their deficit spendings.

It is also important to acknowledge that the relationship between central bank independence and government budget deficits is not always so clear cut. It may be true that central bank independence can help lower the level of budget deficits by not giving governments easy access to central bank credit. But there are also studies that found monetary authorities with greater levels of independence tend to be more averse to inflation and more likely to adopt less aggressive expansionary monetary policies (Elgin et al. 2021). This means that in times of economic downturns or crises, like the Covid-19 Pandemic studied in Elgin et al. 2021, if central bank authorities are hesitant to adopt aggressive monetary policies due to concerns over inflation, fiscal authorities may be pressured to step in instead. They will need to conduct more rigorous fiscal policies which would result in an increase in budget deficits. This may very well counteract any effect CBI has on promoting fiscal discipline, especially in the case of my sample that consists of OECD countries that did not have severe deficits to begin with. Interestingly, a paper written by Adam and Billi in 2013 explores this exact interaction between inflation conservatism and fiscal discipline (in a setting with distortionary taxes, under the assumption of independent authorities). They argue that if fiscal and monetary policy decisions were made simultaneously, inflation conservatism can contribute to fiscal overspending, whereas if fiscal policy is decided before monetary policy, inflation conservatism can promote fiscal discipline.

The insignificant regression results could also be due to the limitations of this study. The Garriga central bank independence index is constructed in a way that does not change very frequently. In this dataset that covers the period of 1995-2012, for nearly all of the countries, the Garriga CBI index only changed once, if at all. To be able to capture the full variation across time, the dataset should ideally include a larger sample that covers a longer time period. The time frame in my dataset is very limited because the dataset was originally unbalanced, and I had to cut out a large number of observations. The OECD data on budget deficits is only consistently available from 2000 to 2020, whereas the Garriga CBI index is available from 1970 to 2012. Countries in the dataset ended up having unequal numbers of observations (US had deficit data available 1970-2020, Austria had data available from 1995-2020, etc). The observations I could use in the regressions were further restricted because of missing values in the control variables, the variable that turned out to be the most problematic was *MONEY*. The countries in the Euro Area did not get individual, country level data. I was also unable to include a measure of CBI that represented

the entire Euro Area to instead look at the Euro area as a whole, because the Garriga index was coded on a country level.

One possibility for future research is to use the same empirical method and the Garriga index to revisit the 14 Latin American countries examined in Burdekin and Laney 2016. It would be very informative to compare those results and see if the negative relationship remains statistically significant when CBI is proxied by the Garriga index instead of the three used in the original paper. If the results for the Latin American countries remain the same, then there will be more consolidated evidence that the positive and insignificant results from the OECD countries are likely due to the threshold effect CBI has on budget deficits, and it would be a valuable addition to our body of knowledge.

VI. Endnotes

1. Deficit as a percentage of GDP, the original value is multiplied by -1 for ease of interpretation (a large, positive percentage value means higher level of deficit; negative values mean there is a surplus)

2. Fraser Institute, https://www.fraserinstitute.org/

3. European Central Bank, www.ecb.europa.eu

VII. Appendix

Descriptive Statistics:

Variable	Obs	Mean	Std. Dev.	Min	Max
year	576	2003.5	5.193	1995	2012
perc deficit	576	-2.23	4.486	-32.124	18.633
cbi rawavg	576	.634	.186	.179	.854
cbi weighted	576	.658	.221	.138	.887
freedom	448	7.659	.614	4.9	8.82
gdp growth perc	568	2.969	3.433	-14.839	14.231
inflation perc	568	3.319	3.687	-9.728	27.938
money growth perc	264	9.827	10.58	-25.551	125.031
def[1]	576	2.23	4.486	-18.633	32.124
lag def	544	2.177	4.498	-18.633	32.124
lag2 def	512	2.076	4.462	-18.633	32.124
lag gdp	536	3.11	3.417	-14.839	14.231
lag m	251	10.071	10.743	-25.551	125.031
lag2 m	238	10.253	10.91	-25.551	125.031
lag inf	536	3.405	3.765	-9.728	27.938
lag2 inf	504	3.456	3.834	-9.728	27.938
cuk limlen	576	.717	.328	.013	1
country1	576	16.5	9.241	1	32
emu	576	.531	.499	0	1

Variables:
● DEF is the budget deficit as a percentage of GDP, data from OECD
● MONEY is the growth rate of the broad money as an annual percentage, data from the World Bank
● GDP is the growth rate of real GDP, in annual percentage growth rate of GDP at market prices based on constant local currency(constant 2015 prices expressed in US Dollars), from the World Bank
● FREE is the Economic Freedom of the World index (an average of size of government, legal system and property rights, sound money, freedom to trade internationally, and regulation), from Fraser Institute
● D_i is the Garriga 2016 central bank independence index(weighted average for M1-M4, component of Limitations to lending for M5)
● Inflation is the GDP deflator as an annual % from the World Bank

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[1] Modified deficit (multiplied by -1)

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