

Central Bank Independence and Inflation: Empirical Analysis

Chioma Sylvia Nwambe

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the Degree of

Master of Science
in
Economics

Eastern Mediterranean University
February 2015
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Serhan Ciftcioglu
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Economics.

Prof. Dr. Mehmet Balcilar
Chair, Department of Economics

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Economics.

Asst. Prof. Dr. Cagay Coskuner
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Fatima Guven Lisaniler

2. Assoc. Prof. Dr. Servin Ugural

3. Asst. Prof. Dr. Cagay Coskuner

ABSTRACT

Many countries have implemented reforms on their Central Banks granting them more independence from political influences. This can be attributed to the recent research in this area which showed that making the Central Banks more independent is a very good means of achieving lower inflation/price stability in a country.

Empirical work supporting this theory shows that there is a significant relationship between inflation and Central Bank Independence but not necessary enough to really bring down inflationary problems. Using data for 6 countries over the period of 1997-2011, result supports this theory but it also shows that other control variable needs to be added for better explanation, and also CBI should be part of policies and strategies to help fight and control inflation in these countries and not necessary the only solution as other policies need to be adopted by their Government and Central Banks.

Keywords: Central Bank Independence, Inflation, Budget Surplus

ÖZ

Birçok ülkede, Merkez Bankalarını politik baskılardan daha bağımsız hale getirme yolunda reformlar yapılmıştır. Bu reformların sebebi, bu alanda yapılan çalışmaların merkez bankalarının bağımsız hale getirilmelerinin enflasyon/ fiyat istikrarında olumlu katkısının olduğunu göstermesidir. Bu alandaki empirik çalışmalar enflasyon ile Merkez Bankası bağımsızlığı arasında istatistiksel olarak önemli bir ilişki olduğunu göstermektedir. Yine de bu ilişki enflasyon sorununu tamamen çözecek büyüklükte olmayabilir. Bu çalışmada da 6 ülkededen 1997 ile 2011 yılları arasındaki veriler kullanılmış, ve panel veri çalışması sonucunda enflasyon ile Merkez Bankası bağımsızlığı arasında ters bir ilişki olduğu gözlemlenmiştir.

Anahtar Kelimeler: Merkez Bankası Bağımsızlığı, Enflasyon, Bütçe Açığı/ Fazlalığı, Para Arzı

To My Dearest Family,

Dr & DR MRS S.N. NWAMBE

Dr Ejike, Chidi, Engr. Nonso & My Dearest Baby Sister Onyii

“Education is Everything”

ACKNOWLEDGMENT

I give all the glory to Almighty God for being faithful to His words in my life.

My sincere gratitude goes to my able supervisor Asst. Prof. Cagay Coskuner, for his encouragement, support, constructive criticism and suggestions for improvement towards the finishing of this work and for always having time to answer our calls and emails at odd times; and a special thanks to Assoc. Prof. Dr Sevin Ugural for her priceless and extreme support, for being a wonderful course adviser and for her esteemed support and encouragement during my program.

I will also like to extend my gratitude to Prof. Dr. Glen Jenkins, Assoc Prof. Dr. Fatima Guven Lisaniler, Asst. Pegman, Asst. Ijeoma and May God reward and bless the work of your hands. (Amen).

Finally, my deepest gratitude goes to my family and friends who shared my joyous and few sad moments during my Masters Program, and made the boring Island Bearable, May God in His infinite mercies, bless you all.

TABLE OF CONTENTS

ABSTRACT.....	iii
ÖZ.....	iv
DEDICATION.....	v
ACKNOWLEDGMENT.....	vi
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
LIST OF CHARTS.....	xi
1 INTRODUCTION.....	1
1.1 Background to the Study.....	1
1.2 Central Bank Independence.....	1
1.3 Inflation and Monetary Policy.....	3
2 LITERATUREREVIEW.....	5
3 THEORITICAL BACKGROUND.....	11
3.1 Costs of Inflation.....	23
3.1.1 Menu Cost.....	24
3.1.2 Shoe Leather Cost.....	11
3.1.2 Redistribution of Income.....	12
3.1.4 Reduced International Competitiveness.....	12
3.1.5 Uncertainty.....	12
3.2 Theories of Inflation.....	12
3.2.1 Demand Pull Effect.....	12
3.2.2 Cost-PushInflation.....	12
3.2.3 Structural Inflation.....	13

3.2.4 Philips Curve.....	15
3.2.5 Supply Side policies.....	16
3.3.6 Keynesian Theory of Money.....	16.
3.37 Neo-Classical Theory (Economy).....	17
4 EMPIRICAL SPECIFICATION.....	20
4.1 Proxy for Central Bank Independence.....	21
4.2 Empirical Specification.....	22.
4.3 Variables Included.....	25
4.4 Control Variables included.....	25
5 DATA AND SOURCES.....	27
5.1 Data Description and Sources.....	27
5.2 Graphical Descriptive Analysis.....	29
5.3 Descriptive Analysis.....	34
6 EMPIRICAL RESULT.....	37
6.1 Heteroscedasticity Test.....	37
6.2 Multi-collinearity Test.....	39
6.2.1 Correlation Matrix.....	39
6.3 Fixed Effect Regression Result.....	39
6.4 Random Effect Regression Result.....	41
6.5 Model Selection, Hausman Test.....	42
7 CONCLUSION.....	44
7.1 Conclusion.....	44
7.2 Problems.....	46
7.3 Recommendation and Further Research.....	46
8 REFERENCES.....	47

LIST OF TABLES

Table 1: Apriori Expectation of the Variables.....	29
Table 2: Correlation Matrix.....	39
Table 3: Fixed Effect Estimated Regression Result.....	40
Table 4: Fixed effect Diagnostic Result.....	40
Table 5: Random Effect Estimated Regression Result.....	41
Table 6: Fixed Effect Diagnostic Result 42.....	42
Table 7: Correlated Random Effects - Hausman Test.....	43

LIST OF FIGURES

Figure 1: Demand Pull Effect.....	13
Figure 2: Cost-Push Inflation.....	14
Figure 3: Exploiting the Philips Curve.....	15
Figure 4: Supply-Side Inflation.....	16

LISTS OF CHARTS

Chart 1: Annual Inflation Levels Across countries.....	28
Chart 2: Annual Budget Deficit/Surplus.....	29
Chart 3: Individual Budget Deficit/Surplus.....	30
Chart 4: Time Series Plot of Money Supply.....	32
Chart 5: Global Oil Price Volatility.....	33

Chapter 1

INTRODUCTION

1.1 Background of the Study

Generally, Economists recognize that inflation, especially unpredicted inflation is harmful to the welfare and economic growth of any country. This realization has made such an impact on economies subject that scholars and policymakers should make effort to fully understand the inflationary process, their causes and remedies increasing government spending by coercing the Central Banks to print more money.

As inflation has been a major macroeconomic problem for several countries, there have been also intensified efforts to stabilize the inflation rates. Exchange rate controls, tight monetary policies and interest rate targeting are among some of the efforts. However, none of these efforts would be effective, unless they are accompanied with effective Central Bank discipline, because sometimes, instead of Government to increase tax revenues, they increase their budget deficit in order to finance their never ending expenditure. This increases the money flow in the economy, causing more inflation.

1.2 Central Bank Independence

Central Banks are state institutions with the main objective of setting up the monetary policies with respect to legislated goals which may include targeting inflation rate, targeting interest rate or boosting economic growth. The monetary policy is conducted through controlling money supply which in turn, is achieved

through printing money, engaging in open market operations and setting bank reserve requirements.

While the goals and tools for achieving these goals are very similar for most Central Banks, Central Banks can vary extensively in terms of degree of independence they may have. Central Bank's Independence simply means the extent with which a Central Bank can set the monetary policy without Government interference.

However, a more detailed definition of CB independence also includes the degree of freedom from political pressure. In other words, how Central Bankers are appointed, reassigned or fined and how the policies and regulations are formulated.

With these definitions in mind, they are two major variables in mind which are used for CBI. These are Central Bank Governors Turnover rate and the Budget deficit/surplus of a government. This study takes the latter approach and uses the budget deficit/surplus as a proxy and measure for Central Bank Independence. As explained earlier, this is a valid and used proxy because the less is the CBI, the more likely the Central Bank are to finance the Government budget deficits.

To this end, many economist and policy makers advocate the CBI as it is well known that the independence of Central Banks is the main driving force in creating a disciplined and reputable Central Banks. The increased interest in this central bank independence is largely due to the recent reform that has increased over the years especially since the 1970s. This were done to partly help solve the huge problems of inflation and to improve the social structure and standard of living of these countries.

As a result, several authors have been investigating the role of CBI on stabilizing inflation. For example, one pioneering work, Cukierman (1992) used Central Bank Independence as a measure (a *defacto* method based on qualitative measure) for reducing inflation. Since then, other researchers have taken up the torch to use and improve on this measure because the result found by Cukierman (1992) was very significant. Nevertheless, while some recent and past studies found a higher central bank independence level affects the economy positively, and stabilizes inflation, some other papers found no significant evidence for it. With this study, we attempt to increase the awareness on how Government influences on Central Banks are detriment to their economic growth. In other words, the purpose of this paper is to investigate the role of CBI in controlling the inflation rate.

1.3 Inflation and Monetary Policy

Inflation is defined as a percentage increase in the average price level. For measuring this average price level, quite often consumer price index is used. While this is the most emphasized one, the average price level may also be measured by producer price index or by GDP-deflator. There may be several reasons for inflation: oil price increase, exchange rate fluctuations as well as a consistent budget deficits and expansionary monetary policies are among the well known ones.

This study focuses on the latter factors. It links budget deficit and money supply to CBI, and attempts to look at the impact of CBI on inflation. As such, we think this is quite an important topic to explore because we know that inflation is among the top macroeconomic problems leading to lower growth rate and lower living standards.

Chapter 2

LITERATURE REVIEW

Most economists believe that inflation to some extent can be controlled by making the Central Bank more independent. As Cukierman, 1992 and Lohmann, 1992 put it, the more independent a Government grant the Central Bank, it shows that the more committed the Governments are to fight inflation. This in turn, creates more reputable and reliable policies.

Nevertheless, there is a scarcity of literature linking CBI to inflation fighting. Below, we present some past papers on the subject.

According to Cukierman and Cukierman et al (1992), this showed a unique and vast method of measuring Central Bank independence by ranking their banks based on the degree of independence. The data went back as far back as 1950; he observed a set of 72 random countries (with 21 industrialized and 51 developing countries). This was to check whether they are systematic differences between the levels of developments in different countries. Actual turnover rate of the Central Governors and questionnaire answered by specialists in 23 out of the 73 countries observed was used. The results showed that legal independence (which was difficult to measure and subjective to judgment), is more important in the industrialized countries, meanwhile Turnover rate is more important to developing countries (see for example Bodart 1990 and Leonee 1991). Results showed that legal independence is not

necessary or sufficient in reducing inflation but it shows that some legally independent countries have lower inflation. Also the paper produced four rankings of independence; legal independence of Central Banks, Turnover rate, Questionnaire and the aggregation of the first two rankings.

Harshana et al (2011) in their work also examined the link between inflation and central bank independence. The data was collected for 20 countries and used over the period of 1988-2007. This paper examines whether or not central bank independence can be a tool for achieving price stability in some parts of Africa countries where inflation is always known to pose a serious threat; this is because the tendency for major spending in these developing countries are higher compared to the developed countries and are also more liable to inflation (see also Dutton, 1971; Aghevli, 1997; Khan, 1978). The results of this study using turnover rate and changes in budget deficit as a proxy for central bank independence was that inflation was reduced to some extent but not a sufficient measure; variables affecting inflation include unemployment rate, Gross Domestic product and trade openness. They employed a panel data set across time, OLS (Ordinary Least Square) method, FE (fixed effect) and RE (Random Effect). Not surprisingly, unemployment regression results had a positive coefficient and highly significant at 1%, the only problem reported on this research was lack of complete data. The paper recommended among other measures, commitment for Government to hold an executive balance budget is paramount.

Using Ordinary Least Squared (OLS) econometric regression, Ayhan and Durmus (2009) in their work titled “the effect of central bank’s independence on Growth Volatility”, analyses the impact of enhancing independence of central banks in curbing and fighting inflation. They investigated the relationship that exists between

growth volatility and the central bank's independence in Chile, Turkey, United Kingdom, Israel and Brazil using panel data, for a period of 1968-2007. From their findings, it was discovered that the performances of several countries revealed that when they enhance the independence capacity of the central banks of these countries, there is reduction in the pace of economic growth, that is, it influences economic growth inversely. In conclusion, they recommended that central banks should be granted autonomy, despite the fact that it encourages macro economics aggregates like price instability and unemployment, but it's a basis for sound economic growth performance.

Marco and Davide (2012) argued that nations that encourages and allowed Central Bank Independence would experience a decline in their inflationary rate. Their article portrays that the link between the central bank independence and inflation is a sensitive one. This study sampled 10 OECD countries between 1972 and 2010, using a panel data analysis. The objective of this study was to stress the importance of central bank independence in any economy. It was discovered from their findings that legislative reforms that put together the degree and extent of which central bank independence, expresses a sound and strong effect on the dynamics of inflation rate. Moreover, a negative relationship was found between central bank independence and inflationary level in the sampled countries.

Fernando Martin(Revised 2014) in his article "Debt, Inflation and Central Bank Independence", viewed Central Bank Independence basically as a way to limit inflation prejudice that may come up under unrestricted policy, he showed that the role played by the fiscal authority in restricting and reforms of this institution has been ignored. Notably, he argued that although central bank independence increases

the social welfare at the beginning, it does not however reduce inflation permanently as anticipated. For example, for any given any given level of debt, central banks might lower taxation to decrease distortions in inflation at the cost of future disturbances. As long as the central bank is accommodating, debt increases, so would inflation, this at the end will reverse the effect of the efforts they achieved at the beginning. Whereas strict monetary rule no matter the level of the debt will achieve lower inflation permanently because there is no temporal debt choice trade off in the monetary policies that will cause long run distortions. In order to allow for a clear interpretation of his work from PRE (pre reform) and ICB (independent central bank), the economy was calibrated to the postwar US (of which the results showed that there was an increase in debt observed in the 1980s from PRE to ICB). He argued that central bank independence is a reform that makes them resistant to political frictions which implies reduced inflation and taxes for any debt level given, therefore as deficit accumulates, there will be increases in debts and inflation. Finally, his results showed that central bank independence reduces inflation consistently but the effect disappears in the long run due to increased debt accumulated; but the result does not support the theory that *ceteris paribus*, a country with more independent central bank will have lower inflation.

Michael Parkin (2013) examines directly the “effects of central bank independence and inflation targeting on macro economic performance by natural experiments” which includes defining framework for assessing the effects of central bank independence and inflation targeting. He separated the economies into more dependent, inflation targeters , more independent inflation targeters and others (controls). His measures includes the short run Philips curves trade off, the long run

Taylor curve trade off, Annual data on CPI (consumer price index) , inflation, real growth rate, output gap and unemployment rate from (1980-2011) was used in 26 advanced economies. The result showed that when a central bank is more independent, it reduces inflation and lowers the growth rate of future inflation but there is not a real change or adverse effect on real GDP and unemployment. Also if a central bank becomes an inflation targeter, it can also lower future real GDP growth and output gap. From his reports, it showed that institutional arrangements are even more effective than central bank independence. Major concern should be directed towards flexible inflation targeting, executed transparently and credibly, can be an important tool in curbing inflation rate (these monetary policies has been used in countries like Australia, Canada, Sweden, etc).

Athanasios Anastasiou (2009) reviews the influences that several factors may have on the link between legal central bank independence on one hand, inflation with real GDP on the other hand. Using multivariate OLS regression on 39 OECD countries during the periods of 1991-1998 and 1999-2006, the study showed that central bank independence is related to 3 key issues; personnel independence, financial independence and independence in the formulation and implementation of monetary policies. This research also extended the indices used by Cukierman (1992), this is made possible due to the new central bank laws enacted in this past few years in several countries. The sample comprises of 28 countries both developed and developing. The results showed that even when the control variables were included, central bank independence coefficients remaining statistically and negative, it showed that the countries with higher central bank independence tend to experience lower inflation and that only the Government quality, openness and political stability

(control variables) influences inflation negatively and significantly, meanwhile it also revealed no relationship between real GDP and inflation over the both period of time observed. Recommendation included assigning to central bank an inflation target, imposing penalties on the monetary authorities for when their monetary policies are used for unemployment purposes which creates more inflation instead of curtailing it.

Chapter 3

THEORITICAL BACKGROUND

Inflation is known to be a sustained increase in the general level of prices of goods and services in an economy. This is usually measured by price index or consumer index. After awhile, an economy experiencing constant inflation will be faced with devaluation of their currency because their currency is not able to buy as much goods as before (this is measured in annual percentage increase). In this Chapter, first I present the cost of inflation in order to highlight why inflation is such an important macroeconomic variable. Then I present some of the theories which explain the causes of inflation.

3.1 Costs of Inflation

3.1.1 Menu Cost

These are costs to the firm related to the changes in the prices of goods and services; this is also costs of changing nominal prices in general. In a lay man's term, it's a cost due to efforts and money spent on goods and services caused by price fluctuations.

3.1.2 Shoe Leather Cost

This is the cost of effort, time and money spent on trying to divert or counter-react the effects of inflation such as keeping less cash (having to and withdraw money frequently than usual) and investing in other currencies with lower level of inflation.

This literally means the extra time and physical work that you require to reduce the effects of inflation.

3.1.3 Redistribution of Income

Inflation will make borrowers better off and the lenders worse off, it also reduces the value of savings generally (depending on the interest rate). This is to say that the effect is not equally distributed in the economy, plus decrease in the purchasing power of money; also there will be increases in assets, so those who want to acquire them will have to pay more to do so.

3.1.4 Reduced International Competitiveness

Because a higher inflation will make a country's good and services cheaper in the international market, this leads to decreased competitiveness of that country.

3.1.5 Uncertainty

Inflation causes people to be uncertain about what to spend their income on and where it will profit them more in the future or they will incur losses; this confusion leads to a low economic growth in the long run.

3.2 Theories of Inflation

3.2.1 Demand Pull Effect:

As wages increase in a country (that has low employment mostly), people will have more money to spend on goods, this will increase the supply of liquid money for expenditure in an economy and in turn increase the demand for products, suppliers will in turn raise the prices of these goods and services to balance the effect. This usually occurs in growing economies.

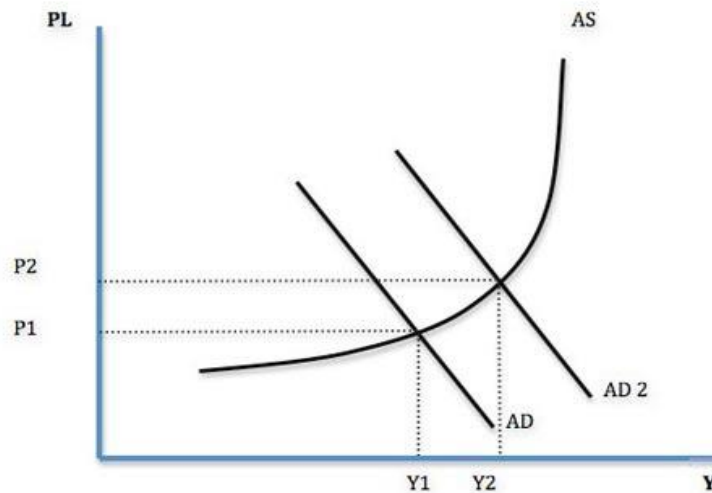


Figure 2: Demand Pull Effect

An increase in AD increases price levels (AD can increase as a result of an increase in either of these components; $C+I+G+X-M$)

3.2.2 Cost-Push Inflation

When industries experience a rise in their cost of production, firms will in turn increase their price of goods and services in the market, this is to protect their profitability by passing off the boost in the cost of production unto the consumer in shape of higher prices, this cost-push can be due to;

- Increase in wages
- Increase in raw-materials
- Higher taxes
- Declining productivity

Cost Push Inflation

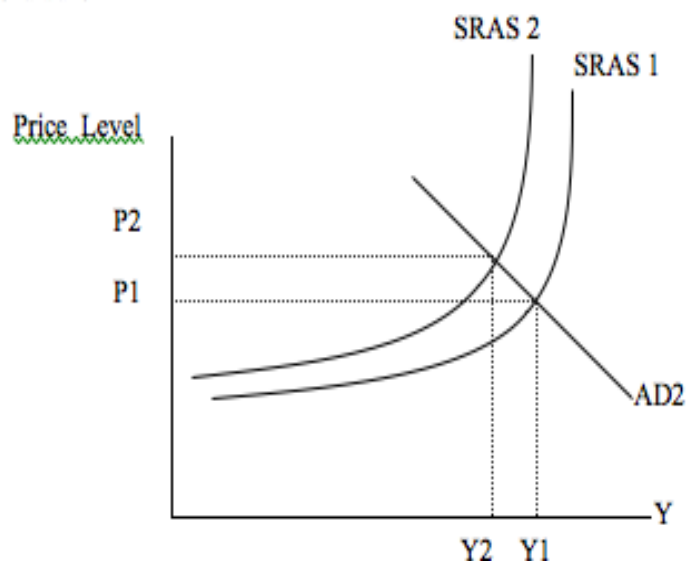


Figure 2: Cost-Push Inflation

3.2.3 Structural Inflation

This is usually caused by Central Bank printing more money which causes excess money in circulation because more money in circulation equals increases in prices of goods and services, that is, more money is chasing after the same level of goods and services as before. The extreme case of this is Hyper-inflation. In some cases like in Recessions and Liquidity Trap, this monetary policy may do more good than harm, that is, increase in money supply will not cause inflation.

3.2.4 Philips Curve

Philips Curves is an economic theory by A.W. Philips, explaining that unemployment and inflation have a stable inverse relation, that is, the lower the rate of unemployment, the more the increase in wages in that economy, so with economic growth follows higher inflation. This policy has been used or exploited rather frequently by policy makers and economists; because this curve explains that changes in the level of unemployment will affect inflation directly. So, increase in AD (Aggregate demand) will:

- Decrease Unemployment.
- Firms will increase Nominal wages in order to compete for laborers.
- Wages will rise
- Firms pass this increase in wages on to the consumers in form of higher prices.

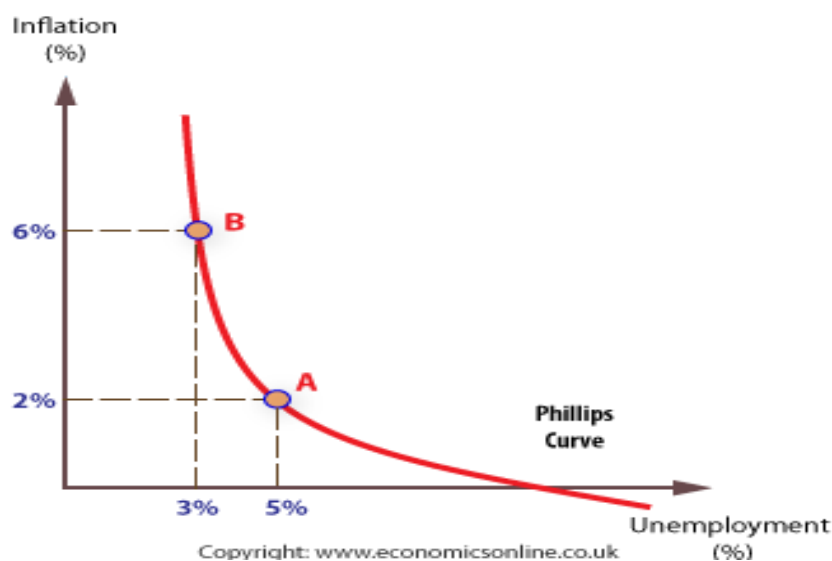


Figure 3: Exploiting the Philips Curves

This policy makers now use the tradeoff between unemployment and inflation, that is, a little more unemployment=less inflation. This was mostly used by Governments in the 1960s and 70s to reduce inflation. After the 1970s, the trade off no longer worked, so Economists (Friedman and Philips) explained that they maybe more than one Philips curve but also series of SR Philips curves and LR Philips curves which exists at the NRU (Natural rate of unemployment) because in the LR, there is indeed no tradeoffs between unemployment and inflation.

3.2.5 Supply Sides Policies

Does the tradeoffs still exists; between 1993 and 2008, unemployment decreased , but inflation did not rise, many economists attributed this to the supply side policies

that has been used over the past 20 years. This was carried out in UK, so the Philips curve still exists but for the UK, it's shifted to the left-side.

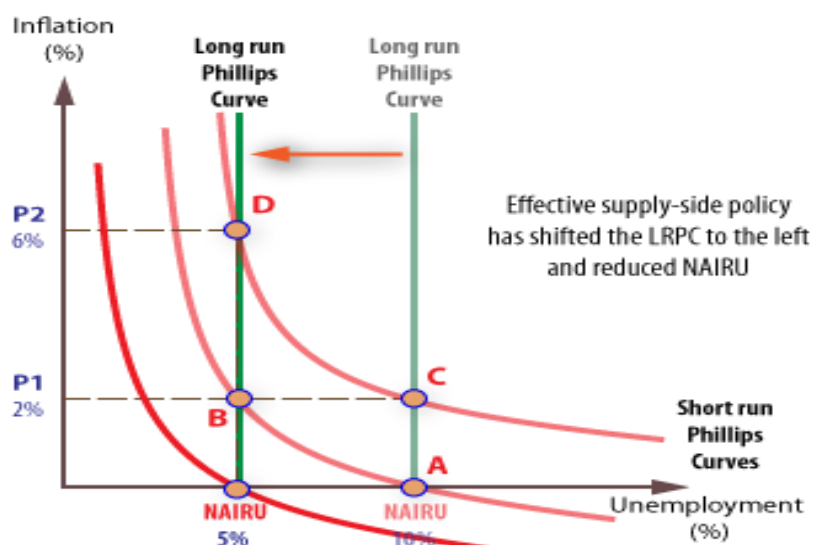


Figure 5: Supply-Side Inflation.

3.2.6 Keynesian Theory of Money

The Keynesians also argued that increase in aggregate demand can be also due to increase in real factors. In his book "How To Pay For War", Keynes explained inflationary gap to be the amount of Government spending of which against it, there is no corresponding manpower or materials realized/provided by the economy. He linked inflationary gap and inflation to full employment output. The Keynesians also instituted that relationship between money and prices are not equal and indirect, they viewed output and employment via interest rate in one hand and the integration of monetary theory in the other hand. They also examined the relationship between quantity of money and prices under full employment and unemployment too; which suggests that as long there is unemployment, output and unemployment will change in the same ratio as the quantity of money.

Neo-Keynesian combined both aggregate demand and supply, it assumes Neo-Classical view in the long-run and Keynesian view in the short-run; they propose that decline in productivity shows diminishing returns to scale and this in turn cause inflationary pressures caused mainly by over-heating of the economy and output gap expansion.

3.2.7 Neo-Classical Theory (Economy)

This theory revolves around the role of market in the economy, if the forces of demand and supply worked freely in the market, then it will prosper, so the Government's main role is to make sure that the market is clear and prevent disturbances. The theories used to justify these views and opinions include;

- **FREE MARKET VIEW:** that is if the economy is left on its own, it will lead to full employment, this happens only when the labor market works perfectly.
- **SAY LAW:** according to this early 19th century Economist Jean Baptiste Say, supply creates its own demand, this notion assumes that any increase caused by output of goods and services (supply) will lead to an increase in expenditures of the consumers to buy (demand) that product.
- **QUANTITY THEORY OF MONEY:** this theory gave an equation, Fisher's equation;

$$MV = PT$$

M = is the amount of money in circulation

V = is the velocity

P = average price levels

T = number of transaction occurred

They proposed that V will be stable and T will lead o full employment (increase in money=increase in prices). This equation can also be re-written as in percentage quantities:

$$M+V = P+Y$$

P = percentage rate of inflation

M = percentage rate of rise in money supply

Y = percentage rate increase in real output

V = percentage increase in velocity of money.

The shortcomings of this theory is that it does not explain the process by which when money increases, there will always be an increase in price.

This Neo-Classicalist believes more that increase in demand for money is a major factor in inflation. They also gave this equation:

$$P = MD/KR$$

The equation above depicts that the general prices of goods and services increases in the same rate as the demand for money given K&R, where:

MD = amount of money demanded

R = real output

P = general price level

K = a constant proportion of total income people want to hold in form of cash.

Chapter 4

EMPIRICAL SPECIFICATION

As mentioned before, the purpose of this study is to investigate the role of Central Bank Independence on inflation fighting. Indeed recent works by Cukierman et al (1992), Johnson (1995) and Eijtinger (1998) found that, as countries make their Central banks more independent, there was higher price stability and economic performance.

4.1 Proxy for Central Bank Independence

One of the challenges of this work is to find a good proxy for Central Bank Independence. Previous literatures have used Governors turnover rate and budget deficit/surplus variables commonly as a measure of CBI. Below I present some of the studies:

Economists like Bade and Parkin (1984) and Alesina and Summers (1993), that were the first researchers in this field, suggested that there is no relationship between Central Bank Independence and inflation. Their proxies were based on whether (a) if there are Government members on the board of the Central Bank (b) whether the board members were appointed by the Government (c) whether it's the Government or the Central Bank that controls the monetary policy. Also some authors like Campillo and Miron (1997), argued that Central Bank Independence does not play a significant role on inflation in developing countries once other factors are controlled for.

Cukierman (1992) developed the best measure so far and argues that legal Independence may be a improved measure for Central Bank Independence in industrialized countries rather than developing countries, he explained that sometimes even when the law is specific, the actual practice may not be the same. Therefore Cukierman (1992) and Cukierman et al (1992) built a *defacto* method to measure Central Bank Independence by averaging the number of term in office by the Central Bank Governors. This assumes that a higher turnover rate means that the Central Bank has a lower level of independence. Although Brumm (2000) concludes that even though the Central Bank Independence legal indicator did not have any impact on inflation, using the Turnover rate and political instability index, by Cukierman and Webb (1995), it was significant. He also suggests that this may not be the case at all times as some Governors may last longer simply by obeying the political leaders or the Government. Despite this, many researchers have used this measure with a clear result and conclusion that using Turnover rate to measure Central Bank Independence, it shows a negative relationship with inflation.

4.2 Empirical Specification

Our empirical specification is that as Central Bank becomes more independent, the less inflation there will be, the action o the Central Banks who influence monetary expansions have a profound effect on the Economy, so we expect a negative relationship between inflation and Central Bank Independence, because if they are not, we expect there to be uncontrolled money spending, inappropriate monetary policies and unreasonable budget deficits/surpluses.

The model for this study is formulated using Inflation as a dependent variable on one hand and Money Supply, Oil Prices, Openness and Central Bank Independence as measured by Budget deficit/surplus on the other hand as the independent variables.

Thus, the following mathematical model is used to examine the role of CBI in Stabilizing price level.

$$\text{Infl} = f(\text{bg}, \text{ms}, \text{oilp}, \dots) \dots \dots \dots (\text{eq1})$$

Where;

Infl is inflation proxy by Consumer Price Index (annual %).

Bg being the budget deficit as percentage of GDP.

Ms being the aggregate money supply as percentage of GDP.

Oilp being the oil price in barrels measured in US dollars.

Equation one above can be re-specified as;

$$\text{inf}_{it} = \beta_0 + \beta_1 \text{bg}_{it} + \beta_2 \text{ms}_{it} + \beta_3 \text{oilp}_{it} + U_{it} \dots \dots \dots (\text{eq2})$$

Where $i = 1, 2, 3, \dots, N$ and $t = 1, 2, 3, \dots, N$

The above equation two is the economic model with an error term (U_{it}) which is normally distributed with zero mean and variance = 1.

Table 1: Below illustrates the apriori expectations specified in the model above.

Budget Surplus	Negative
Money Supply	Positive
Oil Prices	Positive

$B1 \leq 0$, $B2 \geq 0$, $B3 \geq 0$. Note that the Equation 2 above contains two trending variables money supply. The two variables are suspected to be non-stationary and running multiply regression using one or more trending variables may result in spurious relationship or a meaningless result.

Furthermore, inflation is a complex variable that cannot be adequately explained by other variables alone without using the previous year(s) in the inflation value. Hence, the below equation includes the lagged value of the dependent variable so as to improve the explanatory value of the model;

$$\text{inf}_{ii} = \beta_0 + \beta_1 \text{bg}_{ii} + \beta_2 \text{ms}_{ii} + \beta_3 \text{oilp}_{ii} + \beta_7 \text{int}_{t-1ii} + U_{ii} \dots\dots\dots \text{equ}(3)$$

4.3 Variables Includes:

a) Budget (Bg);

This is a good measure for both developed and developing economies like African countries, this is because it is easier and quicker for the Government to print more money to finance major capital expenditures rather than increase their tax revenues. This could be due to political or electoral reasons which in turn may cause an increase in cash circulation thereby causing more inflation in the economy. We expect that when there is high Budget Surplus (when revenue exceeds Government Expenditure) meaning the Government is spending less; we assume that the Central Bank is working properly and more independent, inflation will decrease (a negative relationship).

4.4 The control variables used are as follows;

a) Oil Prices (OilP)

The relationship between inflation and oil prices is very evident especially around early 1974; after the oil prices have been increased severally, the prices by then was at four times what it was in 1973. Since then, oil prices have increased ten times more than it was in 1974 and in some cases, less. As inflation moves up and down, oil prices in that country moves in the same pattern, this is because oil is a major input in an economy that is used in every sector including the industries, for transports, in homes, etceteras; so as inputs cost increases so will the end products.

Many countries are faced with ways of countering the inflationary effect of oil prices given also the balance of payment deficit they all seem to face at the same time. Increase in oil prices brings about inflation in the prices of goods and services and so we anticipate a positive relationship between inflation and prices of oil.

b) Money Supply (ms)

It is well known that when money supply grows faster than output in an economy, it will cause inflation, its only when an economy is in recession or depressed that the Central Bank can increase the circulation of money without causing inflation (this occurred in US between 2008-2011). It's also been known that countries with high long-run growth rate are countries that experience high long-run inflation rates and vice versa. The expectation here is that there will be a positive relationship between inflation and Money supply but bearing in mind that all countries do not have the same economic build, this result maybe the opposite which proves my earlier notion about different inflationary effects on different economic structures

Chapter 5

DATA AND SOURCES

As mentioned earlier in the previous section, this study utilizes panel data in analyzing the empirical evidence for Central Bank Independence influence on inflation. The countries selected are the United Kingdom, Sweden, Brazil, India, Denmark and Estonia. The data covers a time period of 1987-2011.

5.1 Data Description and Sources

The model specified in chapter 4 uses annual data collected across the 6 sample countries of the study. The dependent variable is Inflation. For all countries, it is measured by the consumer price index.

The first independent variable Budget Deficit is a proxy for Cash surplus/deficit. It is measured as minus expense, minus net acquisition of nonfinancial assets and is showed in percentage (Weighted Average was used for calculation). In the 1986 GFS manual, nonfinancial assets were included under revenue and expenditure in gross terms. This cash surplus/deficit is closest to the earlier overall budget balance. For most countries central government, finance data have been merged into one account, but for others only budgetary central government accounts are available.

The second independent variable Money Supply which is Money and quasi money (M2) as percentage of GDP. This money supply includes the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central

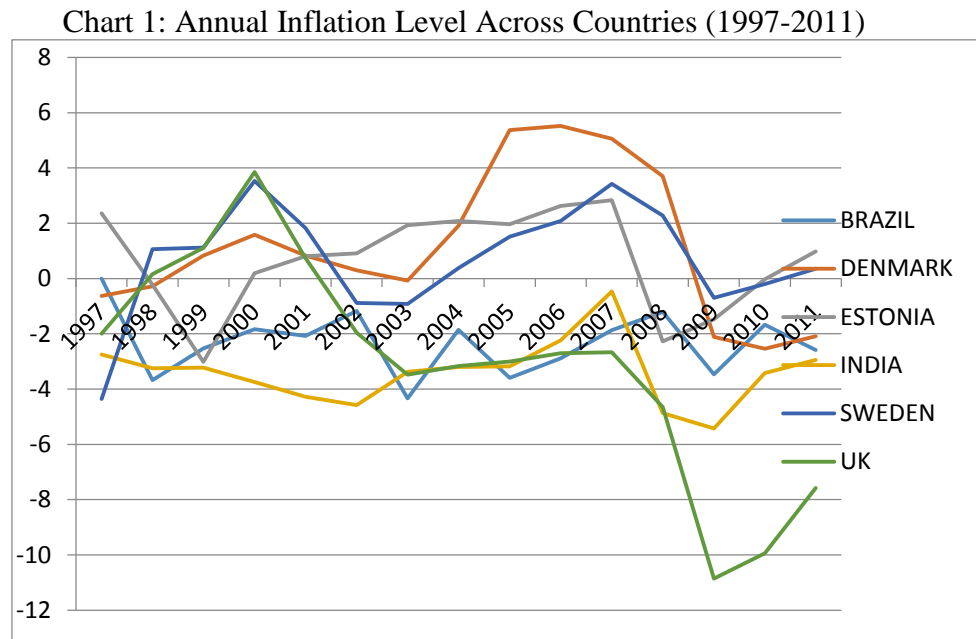
government (Weighted Average was also used). Money supply is frequently called M2 and it corresponds to the definition in International Monetary Fund's (IMF) International Financial Statistics (IFS). The derivation of this indicator was simplified in September 2012 to be current-year M2 divided by current-year GDP multiplied by 100. The source is from International Monetary Fund, International Financial Statistics and data files, and also the World Bank and OECD GDP estimates.

Oil price is the Barrel price for gasoline (US\$ per Barrel), prices refer to the pump prices of the most widely sold grade of Oil. Prices are in US local currency (US Dollars), as the US price was used as base for the other countries (calculation was done using Average). The source is from Dow Jones & Company, Wall Street Journal and US Department of Energy, Energy Information.

Openness is measured by trade as percentage of GDP, is the sum of exports and imports of goods and services measured as a share of GDP (Weighted Average was used). Data source is from World Bank national accounts data, and OECD National Accounts data files.

The last variable is a lagged value of the dependent variable. All the other data were obtained from the IMF Data Base (World Economic Outlook) and World Bank Data Base (World Development Indicators).

5.2 Graphical Descriptive Analysis



Source: World Economic Outlook, IMF international financial statistics

The annual inflation chart shows that inflation among these 6 countries are very volatile and hard to predict. Between 1997 and 2003, UK and Sweden were experiencing the highest inflation at 3.8 and 3.5 respectively, with India having -4.58 and Brazil with -4.33 in 2002. But between 2004 and 2011, Denmark was leading at 5.518 in 2006 and UK with -10.85 in 2009.

Chart 2: Annual Budget Deficit/Surplus (As Percentage of GDP), 1987-2011 combined for all countries.

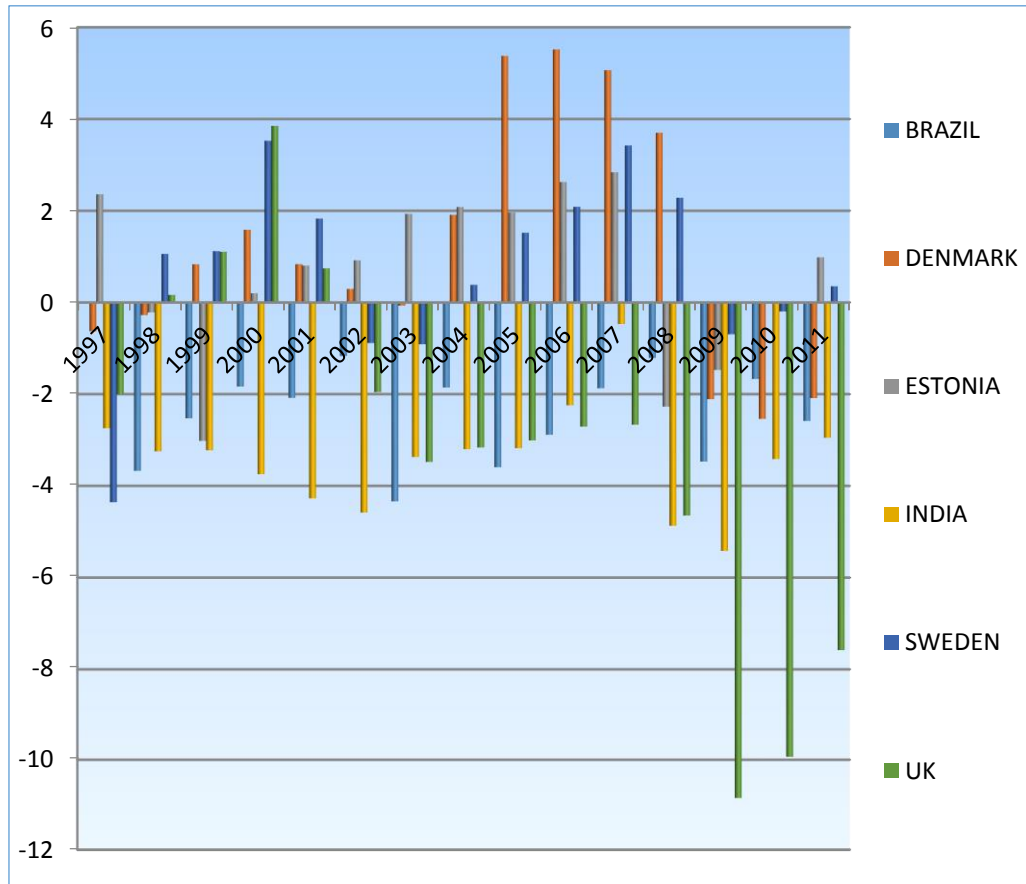
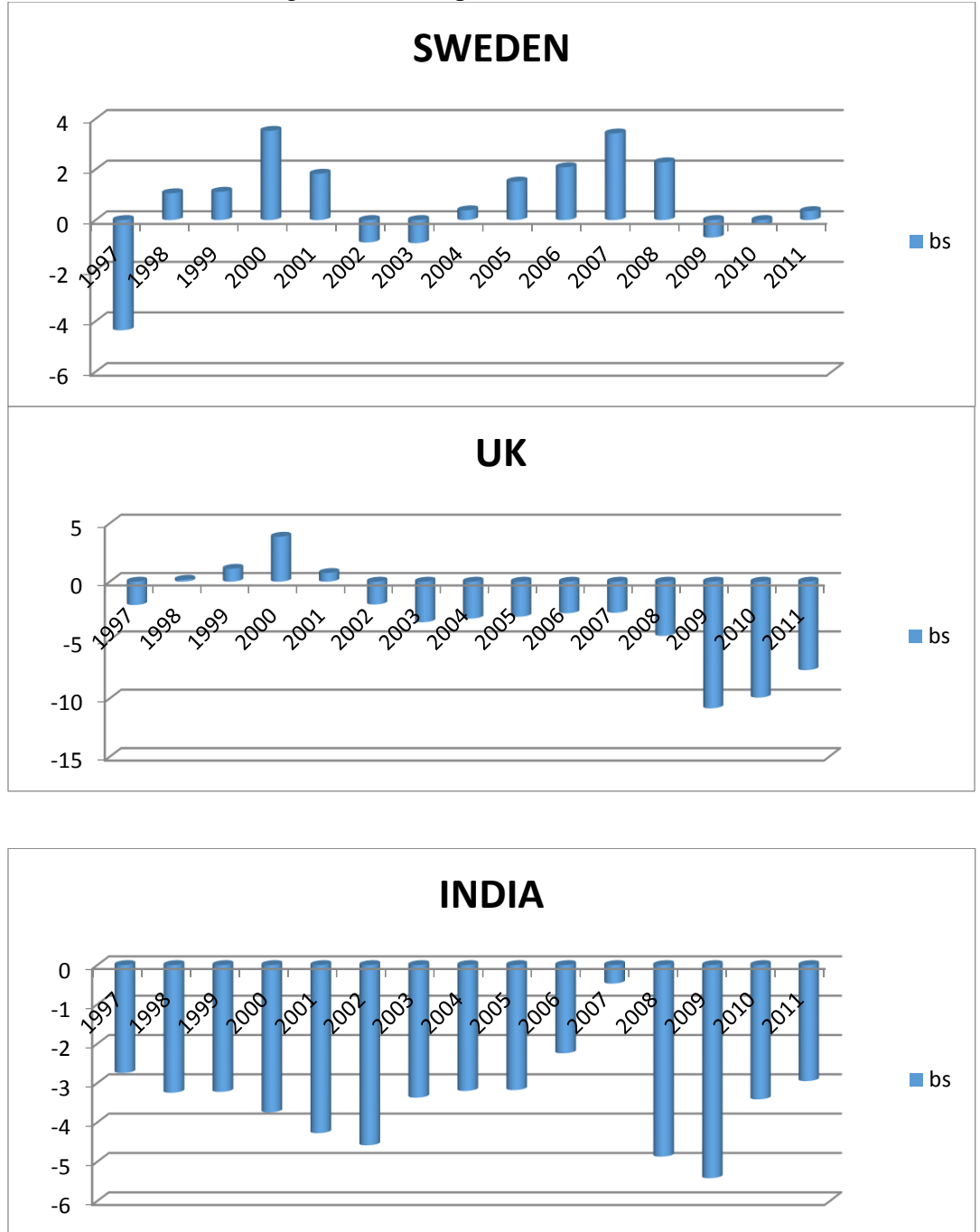
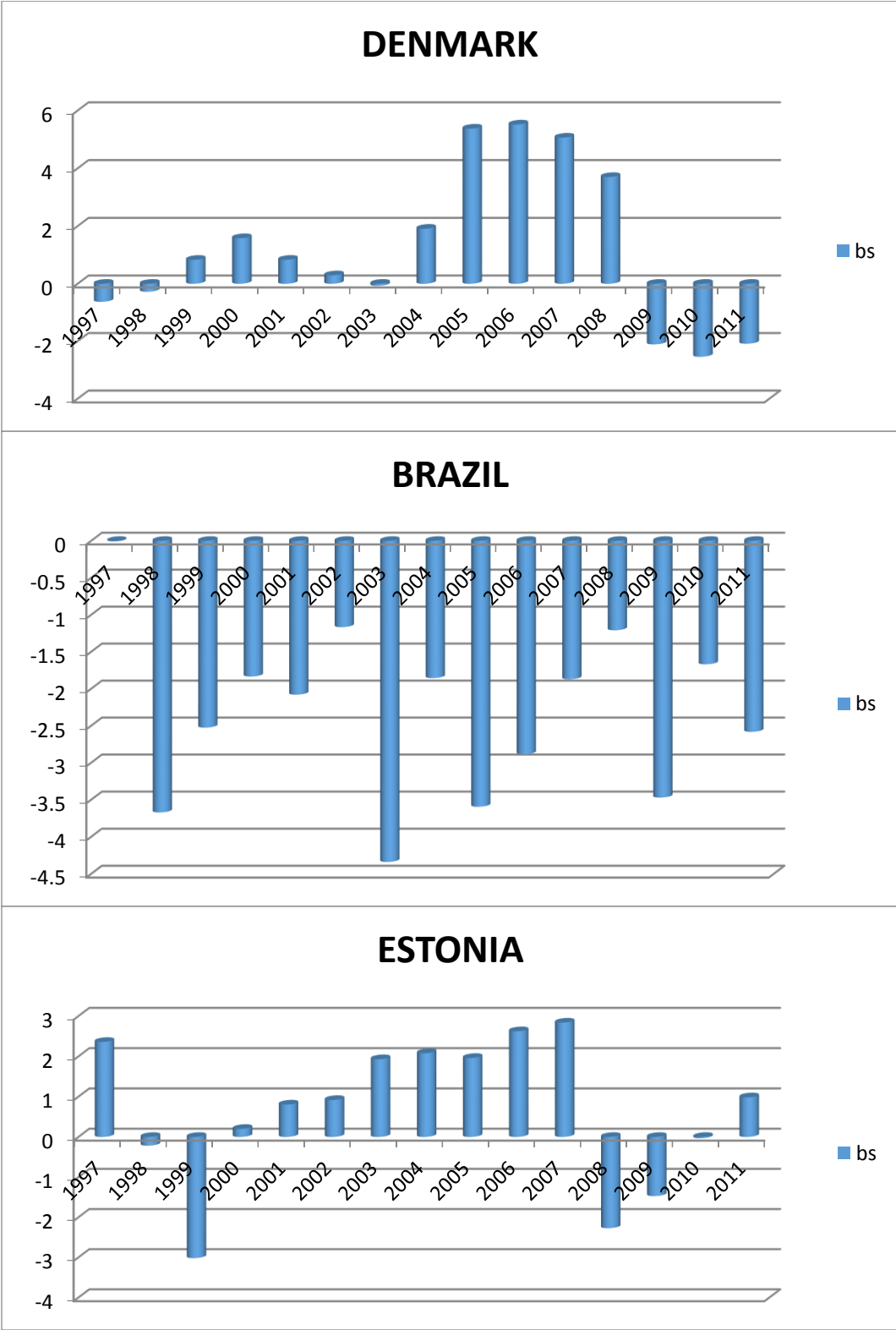


Chart 3: Individual Budget Deficit/Surpluses for all countries.

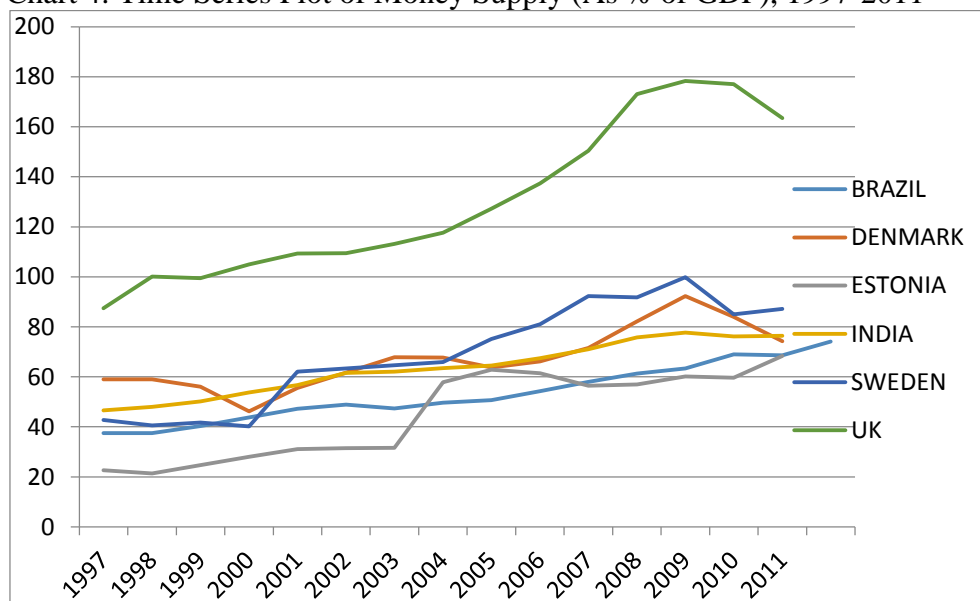




From the chart above, we can see that Denmark has the lowest Budget Deficit from 2005-2008, followed by Estonia whereas United Kingdom has the highest

Budget Deficit especially from 2009-20011 and followed by India. These differences can be accounted due to the fact that for an example, United Kingdom is a large country with equally a large economy while Denmark has is a smaller country with a growing but small economy

Chart 4: Time Series Plot of Money Supply (As % of GDP), 1997-2011



The M2(Money Supply) in UK is the highest in this chart and runs in billions of Dollars, the value was around 178.3778948 in 2009, the other 5 countries experience an entwined and closely related M2 as they all move together between 99.7902427(Sweden) in 2009 and 3.64045263(Estonia) in 2003.

Chart 5: GLOBAL OIL PRICE VOLATILITY (In \$ per Barrel) 1987-2011

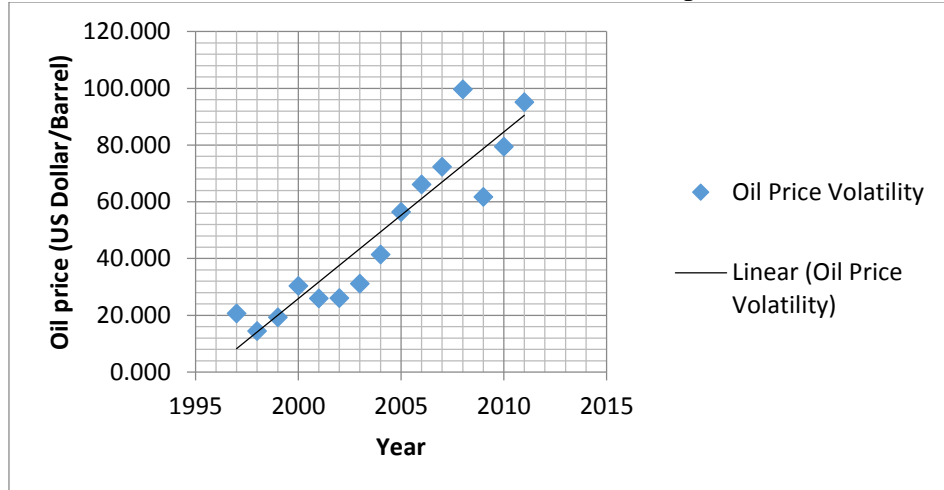


Chart 5.3.1D shows Oil Price volatility, “Random Walk”. It’s trending over time from 1997-2011. The highest point was in 2008 during the Global Financial Crisis, the oil price was close to \$100 per barrel and suddenly dropped to less than \$60 per barrel in 2009, and recovered averagely in 2011 reaching almost \$80 per barrel. Based on this trend, we expect a drop in 2012 and 2013.

5.3 Descriptive Analysis (for each country)

Brazil

```
. summ code country year inf bs oil
```

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	1	0	1	1
country	0				
year	15	2004	4.472136	1997	2011
inf	15	6.369411	2.730676	3.198592	14.71533
bs	15	-2.317089	1.144048	-4.338351	-.0070809
oil	15	49.32233	28.4507	14.388	99.568

Denmark

. summarize code country year ms oil inf bs

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	2	0	2	2
country	0				
year	15	2004	4.472136	1997	2011
ms	15	67.15882	12.20239	46.22134	92.32162
oil	15	49.32233	28.4507	14.388	99.568
inf	15	2.178175	.5909824	1.160165	3.399475
bs	15	1.160765	2.697202	-2.539586	5.51831

Estonia

. summ code country year inf bs oil

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	3	0	3	3
country	0				
year	15	2004	4.472136	1997	2011
inf	15	4.877363	3.015823	-.0847765	10.58188
bs	15	.6461622	1.795313	-3.017648	2.838936
oil	15	49.32233	28.4507	14.388	99.568

India

. summ code country year inf bs oil

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	4	0	4	4
country	0				
year	15	2004	4.472136	1997	2011
inf	15	6.771045	3.216336	3.684807	13.23084
bs	15	-3.395063	1.171501	-5.418699	-.4706152
oil	15	49.32233	28.4507	14.388	99.568

Sweden

```
. summ code country year inf bs oil
```

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	5	0	5	5
country	0				
year	15	2004	4.472136	1997	2011
inf	15	1.321592	1.158237	-.4944606	3.437049
bs	15	.7020838	1.995003	-4.356814	3.525353
oil	15	49.32233	28.4507	14.388	99.568

United Kingdom

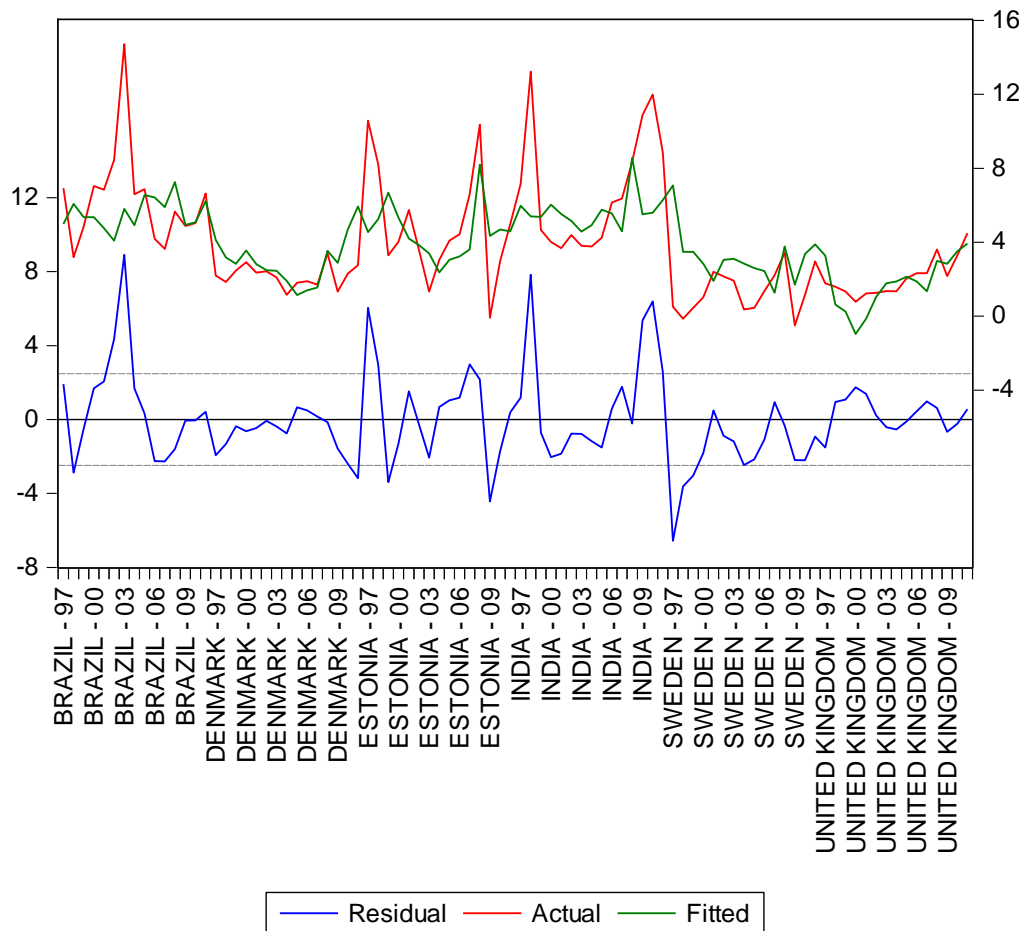
```
. summ code country year inf bs oil
```

Variable	Obs	Mean	Std. Dev.	Min	Max
code	15	6	0	6	6
country	0				
year	15	2004	4.472136	1997	2011
inf	15	2.062738	1.025438	.7852694	4.48424
bs	15	-3.0746	3.997457	-10.85159	3.850522
oil	15	49.32233	28.4507	14.388	99.568

Chapter 6

EMPIRICAL RESULT

6.1 Heteroscedasticity Test



Test for heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of infl
chi2(1) = 18.25
Prob > chi2 = 0.0000

6.2 Multi-Collinearity Test

The table below displays the empirical results of the multi-collinearity test among the variables of interest using correlation matrix. As can be observed there is no any redundant/correlated variable(s) that may invalidates the conventional t/F test. In fact, only OIL and MS has the highest correlation coefficient of 0.444543 which is also relatively small enough to raise any alarm for multi-collinearity problem.

6.2.1 Correlation Matrix

Table 2: Correlation Matrix

Variables	INF	BD	MS	OIL
INF	1.000000	-0.288152	-0.269042	0.114811
BD	-0.288152	1.000000	-0.395665	-0.091235
MS	-0.269042	-0.395665	1.000000	0.444543
OIL	0.114811	-0.091235	0.444543	1.000000

6.3 Fixed Effect Regression Result

The table 3 below shows the fixed effect estimated regression result. All the variables are statistically insignificant including the lagged value of the dependent variable [INF (-1)]. Budget surpluses turned out with the correct sign (coefficient of -0.104316) which implies that a negative relationship between inflation and budget surplus. The money supply turned out with the wrong sign and it contradicts our *a priori* expectation of a positive correlation between money supply and inflation and this is also a contradiction to the Irvin Fisher's theory of money which states that when money supply increases, price level will also increase in the same proportion. The coefficient of money supply is -0.025090 which implies that an increase in money supply by 1%, will lead to a decrease in annual inflation rate by 2.5% all

things being equal. For the coefficient of oil price, it turned out with the correct sign of 0.028989 which is consistent with our theoretical expectations.

Table 3: Fixed Effect Estimated Regression Results

Parameter Estimates						
Variable	DF	Estimated Coefficient	Standard Error	t Value	Prob.	Label
Intercept	1	2.860303	1.364002	2.096993	0.0394	Intercept
BS	1	-0.104316	0.124520	-0.837743	0.4049	Budget Surplus
MS	1	-0.025090	0.025960	-0.966453	0.3370	Money supply
OIL	1	0.028989	0.014959	1.937874	0.0565	Oil prices
INF(-1)	1	0.322007	0.105801	3.043528	0.0032	Lagged value of inflation

The diagnostic test result of fixed effect regression is reported on table 4 below for the six selected countries of the study over the time period of 1997-2011. While the standard error test revealed that all the parameters of the model are statistically insignificant, the fixed effect model is overall statistically significant with 11.72 test statistics. The explanatory power of the model is fairly good accounting for about 59% of the total discrepancy in the dependent variable (inflation). For the auto-correlation, the Durbin Watson statistic is around 1.86 suggesting that there is a relatively low positive auto-correlation.

Table 4: Fixed Effect Diagnostic Result

Model Description: Fixed Effect Model			
Estimation Method		Panel Least Squares	
Number of Cross Sections		6	
Time Series Length		14	
Fit Statistics			
SSE	2.051630	F-Statistics	11.72880
SSR	0.0011	Prob (F-ratio)	0.000000
R-Square	0.587880	D.W statistics	1.858527

6.4 Random Effect Regression Result

The table 5 below shows the estimated regression result of the random effect model. Unlike the fixed effect model, all the estimated coefficients of the random effect model are statistically significant at 5% significant level and also with the correct signs, except for the Money supply which is still negative.

Table 5: Random Effect Estimated Regression Results

Variable	Estimated Coefficients	Standard Error	t Value	Pr > t 	Label
Intercept	2.437717**	0.894469	2.725324	0.0079	Intercept
BS	-0.277118**	0.104396	-2.654493	0.0096	Budget surplus
MS	-0.029109**	0.010331	-2.817481	0.0061	Money supply
OIL	0.029426**	0.009612	3.061436	0.0030	Oil prices
INFL(-1)	0.455944**	0.098658	4.621475	0.0000	Lagged value of inflation

The diagnostic test result of random effect regression is reported on table 6 below for the six selected countries of the study over the time period of 1997-2011. The

Random effect model has a better fit than the fixed effect model. Overall, The RE model is statistically significant with 22.23947 F statistics. For the auto-correlation, the Durbin Watson statistic is almost close to 2 suggesting that there is no auto-correlation in the RE model. However, the explanatory power of the model is a little less than that of FE model, but fairly good enough since it accounted for about 53% of the total variation in the dependent variable (inflation).

Table 6: Fixed Effect Diagnostic Result

Model Description: Radom Effect Model			
Estimation Method		Method: Panel EGLS	
Number of Cross Sections		6	
Time Series Length		14	
Fit Statistics			
SSE	2.121302	F-Statistics	22.23947
SSR	355.4940	Prob (F-ratio)	0.000000
R-Square	0.529644	D.W statistics	1.906136

6.5 Model Selection-Hausman Test

The table 7 below reported a Hausman m statistic which gives information on the suitability of the random-effects specification. The m statistic is based on the idea that, under the null hypothesis of no correlation between the effects variables and the repressors, OLS and GLS are reliable, but OLS is inefficient. Hence, a test can be based on the outcome that the covariance of an efficient estimator with its difference from an inefficient estimator is zero. To reject the null hypothesis shows that the fixed-effects model is more reliable. Hence, based on the test M- statistics we cannot reject the null hypothesis at 5% significance level and hence, conclude that the RE model is more reliable for our analysis of central bank Independence and Inflation among the six selected countries of the study.

Table 7: Correlated Random Effects - Hausman Test

Test cross-section and period random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	4	1.0000
Period random	0.000000	3	1.0000
Cross-section and period random	4.831085	3	0.1846

Chapter 7

CONCLUSION

7.1 Conclusion

This study examines the link between inflation and central bank independence. Other analytical works have noted that Central Bank independent could lower the expected inflation (Kasseeah et-el, 2011). Using a panel data for 6 randomly selected countries for the period of 1987-2011, I attempt to analyze whether central bank independence lowers price stability among the six selected countries of the study.

In this paper, the main measure of central bank independence is the Budget (surplus/deficit as % of GDP). However, the most popular measure of CBI most especially in LDCs is the turnover rates of central bank governors; see Cukierman et al (1992). The simple reason for not using this measure of CBI is because; it is an informal indicator of independence which is found statistically significant as a proxy for CBI in developing countries. As can be observed, this study involves some of the most developed countries of the World, including UK, Denmark and Brazil. The turnover rate is popular in LDCs because, the government found it easier spending rather than using tax revenues and other less harmful ways. Apart from the Budget Surplus/Deficit measure, other variables were controlled for, these includes Money Supply, Oil Price and Exchange rate as well as trade openness.

The evidence obtained shows that central bank independence contributes to decreasing inflation rate via the reduction in budget deficit or increasing budget surplus which in turn leads to lower price level in the economy. Other variables like exchange rate, oil price, trade openness and the money supply also influence inflation rates and should be included.

Using panel data models, namely FE and RE models, the paper link the aforementioned variables together the proxy of CBI to explain the dependent variable, Inflation. The fixed effects technique, however, doesn't reveal any relationship between the predictor and the outcome variables, as all the endogenous variables in the FE model are statistically insignificant. Base on the RE model, we find a strong statistical support for BS/D, MS, OIL and IFN (-1). Despite the obvious advantage of the RE model over the FE model, the paper employed the Hausman test to decide between the two models. The test supported the rejection of FE model in favor of the RE model. The R2 we acquire under the RE effects is 0.54, therefore our model explains about 54% of variation in inflation.

In general, the outcome indicates that CBI is a good way to fight high price level among the selected six sampled countries of the study. Although important, it is still not enough. From the findings, the R-squared is not enough to explain inflation rate discrepancy; there are other causes of inflation. This is why other supplementary methods will be needed to reduce and target price stability.

7.2 Problems

Problems encountered included insignificant control variables that were later excluded in my model (exchange rate regime, political instability and openness), it can be reasoned that with more variables, the R-square will increase more and the model will account for more variation between inflation and CBI. Furthermore, there was an outdated TOR index for CBI proxy. Also the sample countries were reduced due to incomplete data in the data base.

7.3 Recommendation and Further Research

Because this paper had to exclude TOR due to updated data availability and unclear measurement, I will be continuing this research in my doctoral thesis to build a new TOR index (Tenure of Central Bank Governors since their independence) based on recent findings and test it in the West African Countries to see whether the CBI will have a stronger and more significant effect on Inflation, seeing as the West African Countries are mostly LDC and likely to rely heavily on their Central Banks which also means more political influences, more inflation and unsteady economic growth in these countries. I will be using the original model with the excluded control variables to see whether the same result and effects can be achieved using TOR as CBI proxy instead of Budget (deficit and surplus).

REFERENCES

- Alesina, A. (1988) Macroeconomics and Politics. In BER Macroeconomics Annual, Edited by Stanley Fisher, Cambridge, Mass: MIT Press. 17-52.
- Alesina, A. & Summers, L. (1993) Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence. *Journal of Money, Credit and Banking*. 25, 151-162.
- Amirul, A., Michael S. & Wickramana, Y. J. (2006) Determinants of Central Bank Independence and Governance: Problems and Policy Implications.
- Athanasios, A. (2009) Central Bank Independence and Economic Performance, *Cyprus Policy Review*. 3, 123-156
- Ayhan, O. & Durumus, C.Y. (2009) The Effect of Central Bank Independence on Growth Volatility: A pooled Regression Analysis. *Serbian Journal of Management* 4, 157-167
- Bade, R. & Parkin, M. (1984) Central Bank Laws and Monetary Policy. Department Of Economics, University of Western Ontario, Canada.
- Bend, H. & Steven, V. (2002) Inflation, Central Bank Independence and Legal System.
- Bernd, H. & Carsten, H. (2007) Does Central Bank Independence Cause

Low Inflation: sceptical View.

Cukierman, A. (2008) Central Bank Independence and Monetary Policy

Making Institutions. Past, Present and Future, *European Journal of Political Economy*, 24 (2008) 722-736.

Cukierman, A., Kalaitzidakis, P., Summers, L.H. & Webb, S.B. (1993) Central bank

Independence, Growth, Investment and Real Rates. *Carnegie Rochester Conference Series on Public Policy*, 39, 95-140.

Cukierman, A., Webb, S.B. & Neyapti, B. (1992) Measuring the Independence of

Central Banks and its Effect on Policy Outcomes, *World Bank Economic Review* 6, (1992), 353-398.

Campillo, M. & Miron, J. (1997) Why Does Inflation Differ Across Countries.

Deomer, R. & Romer, D.H. (2001) Reducing Inflation: Motivation and

Strategy. Chicago: University of Chicago Press. 335-357

Carin, V. C. (2008) Economic Impact of Central Bank Transparency.

Carl, E. W. (2005) Central Bank Independence. Prepared for the New

Palgrave Dictionary: University of California, Santa Cruz.

Cheick, K. M. (2012) Assessing Macroeconomic Impact of Central Bank

Transparency in Emerging Countries: New Index and Empirical Evidence.

- Chhibber, A. & Shafik, N. (1990) Exchange reform, parallel markets and inflation in Africa: The case of Ghana. Pre -orking Paper. World Bank Washington, D.C.
- De Haan, Leertouwer, Meijer &Wensbeck, (2001) Measuring Central Bank Independence: A Latent Variable Approach.
- Eijffinger, S., Van Rooji, M. & Schaling, E. (1996) Central bank independence: A Panel Data Approach. *Public Choice* 89, 63-182.
- Eijffinger, S. & Schaling, E. (1993) Central Bank Independence in Twelve Industrial Countries", *Banca Azionale del Lavoro Quarterly Review*. 184, 1-41.
- Fernado, M. (2003) Debt, Inflation and Central Bank Independence. Research Division, Federal Reserve Bank of St. Louis.
- Grilli, V., Masciandaro, D. & Tabellini, G. (1991) Political and Monetary Institutions and Public Financial Policies in the Industrial Countries. *Economic Policy* 13, 341-392.
- Harshana, K., Jean, M. F. W. & Khooshan, P. M. (2001) CBI Trends in Economic and Management Sciences, 2(4):325-332. *Central Bank Independence: Evidence from Africa Journal of Emerging*.
- Helder, F. M. (2005) Central Bank Independence and Its Relationship to Inflation. *CEPAL Review* 87.

- Helder, F. M. & Jose, S. F. (2008) Macroeconomic Effect of Central Bank Transparency. The Case of Brazil, *Cato Journal*, 28
- Helder, F. M. & Karine, S.G. (2013) *Economic System* 37, 69-80.
- Jan, E. S. & Jakob D.H. (2001) *Central Bank and Inflation Developing Countries: The Role of Influenced Observations*. Department of Economics, University of Groningen, Netherlands.
- John, B. T. (2013) *Effectiveness of Central Bank Independence versus Policy Rules*. Stanford University.
- James, S. D., Andrienne, M. & Mark, W. A. (2004) *Central Bank Transparency Anchors Inflation Expectations*. *Economic Letter*, 9.
- Lucotte, Y. (2009) "Central Bank Independence and Budget Deficits in Developing Countries: New Evidence from Panel Data Analysis," *Post-Print Halshs-00447398*.
- Mats, L. (2013) *Determinants and Effects of Central Bank Independence Reforms*. Doctoral Thesis, department of Economics, Umea School of Business and Economics.
- Michael, P. (2003) *The Effects of Central Bank Independence and Inflation Targeting on Macroeconomic Performance: Evidence from Natural Experiments*. University of West Ontario.

- Milton, F. (1962) "Should there be an independent Central Bank" Patricia S. Pollard. Central Bank Independence and Economic Performance. Federal Reserve Bank of St. Louis.
- Petra, G. (2002) Central Bank Transparency. The Economic Journal and University of Cambridge.
- Roman, H. & Dan, V. (2012) Central Bank Transparency on Financial Stability: Measurement, Determinant and Its Effect.
- Sven-Olov, D. & Xavier, (2003) Central Bank Independence and Price Stability: Evidence from 23 OECD Countries. Swedish Research Institute of Trade, (HUI).
- Thomas, O. (1997) Central Bank Independence and Inflation: Corporatism, Partnership and Alternative Indices of Central Bank Independence. Public Choice 98, 399-413 (1999).
- Woolridge, J. (2002) Econometric Analysis of Cross Section and Panel Data, MIT in Press.