

**AN EXAMINATION OF THE RELATIONSHIP BETWEEN INFLATION AND MONEY
GROWTH:
ALBANIAN APPLICATION**

By

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Thesis Submitted to the Faculty of Economics and Administrative Sciences of Epoka University
in Fulfillment of the Requirement for the Master of Science in Banking and Finance

Abstract of Thesis Presented to the Faculty of Economics and Administrative Sciences of Epoka University in Fulfillment of the Requirement for the Degree of Master of Science in Banking and Finance

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ABSTRACT

This master thesis overviews the relationship between money growth and inflation as monetary policy framework of the BoA, concentrating on the later part on its current set-up, for attaining inflation stabilization in such a strong competitive environment. In this master thesis are explained inflation factors and the main types of inflation related to the money growth because inflation is always a monetary phenomenon. The aim of this thesis is to overview the monetary policy issues under different lights within the basic inflation expectations and targets in Albania over years, is it normal, or Albania is a problematic country and how it has changed over-time. As a methodology it was decided to use simple regression analysis for its simplicity, as the basis for measurement the relationship between money growth and inflation and of BoA performance in attaining inflation stabilization. This master thesis analyzes empirically the co-integrating relationship between inflation and money growth in the Albanian economy in 1993-2012. Since the variables in this thesis are non-stationary and present a unit root, Johansen's co-integration technique has been applied. This methodology has allowed for obtaining of a co-integrating relationship among these variables. The co-integration results provide evidence of a unique co-integrating vector. In other words, a long-run stable relationship between inflation and money growth exist. This indicates that inflation and money growth move together in the long run in Albania.

Key Words: inflation, money growth, quantity theory of money, Johansen's co-integration test, Albania.

Abstrakti i Diplomës Paraqitur Fakultetit të Ekonimiksit dhe Shkencave Administrative të Universitetit Epoka në Përmbajtje të Kërkesës për Marrjen e Diplomës së Masterit Shkencor në Degen Bankë- Financë

**SHQYRTIMI I MARRËDHËNIES MIDIS INFLACIONIT DHE RITJES SE PARASE:
RASTI I SHQIPERISE**

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ABSTRAKT

Kjo tezë masteri pasqyron marrëdhëniet mes rritjes së parasë dhe inflacionit si kuadër të politikës monetare të Bankës së Shqipërisë, të përqëndruar në të kaluarën e saj mbi këtë set-up aktual, në arritjen e stabilizimit të inflacionit në një mjedis të tillë të fortë konkurrues. Në këtë tezë masteri janë shpjeguar faktorët e inflacionit dhe llojet kryesore të inflacionit në lidhje me rritjen e parasë sepse inflacioni është gjithmonë një fenomen monetar. Qëllimi i kësaj teze është vështrimi i përgjithshëm i çështjeve të politikës monetare nën dritë të ndryshme brenda pritshmërive të inflacionit bazë dhe objektivat në Shqipëri ndër vite, është ajo normale, ose Shqipëria është një vend problematik dhe se si ka ndryshuar ai me kalimin e kohës. Si metodologji është vendosur të përdoret analiza e regresionit për thjeshtësinë e saj, si bazë për matjen e marrëdhënieve midis rritjes së parasë dhe inflacionit dhe të performancës së Bankës së Shqipërisë në arritjen e stabilizimit të inflacionit. Kjo tezë masteri analizon empirikisht bashkë-integrimitin e marrëdhënieve mes inflacionit dhe rritjes së parasë në ekonominë shqiptare në 1993-2012. Meqë ndryshoret në këtë tezë janë jo-stacionare dhe paraqesin një rrënjë njësi, është zbatuar teknika Johansen e bashkë-integrimit. Kjo metodologji ka lejuar marrjen e një lidhjeje bashkëpunimi të integruar midis këtyre ndryshoreve. Me fjalë të tjera, një marrëdhënie afatgjate e qëndrueshme mes inflacionit dhe rritjes së parasë ekziston. Kjo tregon se inflacioni dhe rritja e parasë lëvizin së bashku në periudhë afatgjatë të Shqipëri.

Fjalë kyçe: inflacioni, rritja e parasë, teoria e sasisë së parave, testi Johansen i bashkë-integrimit, Shqipëria.

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Furthermore, I am very grateful to my family and I thank them very much for supporting me all the time for the completion of this thesis in the best possible way.

APPROVAL

I certify that an Examination Committee has met on _____to conduct the final examination of Ervin SULIKA on his Master of Science in Banking and Finance Program thesis entitled “An Examination of the Relationship between Inflation and Money Growth: Albanian Application” in accordance with Epoka University (Higher Degree) Regulation “*On second cycle study programs*”. The Committee recommends that the candidate be awarded the relevant degree.

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Epoka University or other institutions.

Ervin Sulika

January 2014

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LIST OF ABBREVIATIONS

ALL	Albanian Lek
BoA	Bank of Albania
EU	European Union
GDP	Gross Domestic Product
INSTAT	Institute of Statistics of Republic of Albania
IMF	International Monetary Fund
M2	Money Growth
UD	United States Dollar

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INTRODUCTION

The basic goal for all central banks to maintain price stability, there exist plenty of literature explaining the basic factors effecting the inflation. The control of inflation is central to good monetary policy. Inflation injects noise into the price system, makes long-term financial planning more complex, and interacts in perverse ways with imperfectly indexed tax and accounting rules. In the long term, low inflation promotes growth, efficiency, and stability, all else being equal. Measuring the long-term relationship between growth or productivity and inflation is difficult. It could be the case that low inflation has accompanied good economic performance in part because countries that maintain low inflation tend to pursue other sound economic policies as well (Mishkin, 2007)¹.

Albania is one of the transition economies that has performed very well at fighting the inflation. Since it was a post communist country, the price levels increased sharply after the fall of communist system in 1990 and during the birth of private enterprise system 1992-ongoing. The economical, political and social developments undertaken during the last two decades have enriched the functions carried out by the BoA² aiming to achieve and maintain the price stability. In addition, people were given for the first time the right to have a private property and the freedom to choose. Above all, thanks to many serious reforms regarding economic developments, the output level increased enjoyably for each year.

Contrary to other years, 1997 was the black year for Albanian people; it was the year of pyramid scheme bankruptcy. Many people deposited the money at banks hoping to double or triple them in a very quick time. Unfortunately, most of them lost their money deposited in the so-called pyramid schemes (Christopher, 2000)³. However, after the collapse of pyramid schemes the flare of prices did not last any longer. In 1999 the inflation changed directions from higher to lower and stable rates. Experiencing such dynamics of inflation rates means a good performance of monetary policy as well.

This master thesis is divided into three chapters. The first chapter is in the form of overviews of the theoretical approach explaining the relationship between money growth and inflation as monetary policy framework of the BoA, concentrating on the later part on its current set-up, for attaining

¹ Mishkin. F. S, (2007), "The economy of money, banking and financial markets", *pp. (613-640)*.

² The BoA is the monetary authority of the Republic of Albania or the so called Central Bank of Albania. It has the exclusive right to design, approve and implement the monetary policy in Albania.

³ Christopher J, (2000), <http://www.imf.org/external/pubs/ft/fandd/2000/03/jarvis.htm>, (accessed in July 20, 2012).

inflation stabilization in such a strong competitive environment. Then it continues with explaining the inflation factors, the main types of inflation related to the money growth because inflation is always a monetary phenomenon and the effect of inflation on GDP. It ends by measurement of the relationship between money growth and inflation in attaining inflation stabilization where the regression analysis has been used and the evolution of the monetary policy framework of the BoA performance. The second chapter shows some literature review studying the link between money growth and inflation in the euro area arguing and describing fluctuations in inflation in the different periods. The third chapter shows the empirical analysis part explaining the model and the specifications of the model used in this thesis. It has been explained the co-integrating relationship between inflation and money growth in the Albanian economy. It also presents the analysis and results giving answers to the questions above.

CHAPTER I: THEORETICAL APPROACH

1.1 The quantity theory of money

The quantity theory of money says that: If velocity is fixed, then changes in nominal money will lead to equivalent changes in the price level. The quantity theory of money is expressed (Mishkin, 2007)⁴, as follow:

$$M*V=P*Y$$

Where: M = money supply

V = velocity of money

P = price level

Y = real GDP

The velocity is the nominal income P*Y derived by nominal money M. If real output is kept at potential output when prices adjust, then M and P should move together, on the condition that V is fixed. Furthermore, the quantity equation states that changes in total of spending, M*V, must equal the total of receipts, P*Y. In addition to that, the quantity theory assumes that velocity is fixed by the central bank and it remains stable over time. Since, velocity is stable over time, shifts in money supply affects only nominal GDP, P*Y. Namely, 1% increase in money supply will cause equivalently 1% increase in nominal GDP. As a result, left hand and right hand side of equation will move proportionally at the same direction (Fischer and Dornbuch, 2003)⁵.

1.2 Inflation and influencing factors

Inflation is the continuous rise in price levels in a country, whereas deflation is the contrary of it. Inflation is not seen as positive characteristic for a country, instead is a negative indicator which it should be kept within boundaries (Mankiw, 2002)⁶.

There are three types of inflation (Mishkin, 2007):

⁴ Mishkin, F. S, (2007), "The economy of money, banking and financial markets", pp. (613-640).

⁵ Fischer, B., Dornbuch, (2003), Economics seventh edition, pp.367-368.

⁶ Mankiw, N.G, (2002), "Macroeconomics fifth edition", pp. 144-218.

- a. Demand-pull inflation: this inflation persistent increase in prices is caused by the situation where aggregate demand is much higher than aggregate supply. This aggregate demand is usually towards resources made by households, entrepreneurs, or government causing an excess in demand and shortage in supply, resulting in increasing pressure in price levels⁷.
- b. Cost-push inflation: inflation can exist even if there is no increases in the aggregate demand. The reason of this increase in prices can come as a result of costs rising, especially wage costs.
- c. Structural inflation: this is another way how inflation can occur. Due to changes that an economy can have in its structure from an agriculture country to an industrial one.
- d. Inflation: f (AD, AS, MS), AD = aggregate demand, AS= aggregate supply, MS= money supply, inflation is depended on three determinants, and managing these three can make possible the control of inflation levels within a certain country.

By ensuring price stability, the BoA provides a direct contribution to sustaining macroeconomic balances in the country, promoting economic growth and improving the standard of living, as well as safeguarding the financial stability of the system⁸. Central bankers have come to realize that price stability should be the primary, long run goal of monetary policy. However, because the output fluctuation should also be a concern of the monetary policy, in short way we can say that the goal of price stability should be seen as the primary goal only in the long run. Attempt to keep inflation at the same level in the short run no matter what would likely lead to excessive output fluctuations (Mishkin, 2007)⁹. ALL is allowed to float so freely and the BoA has followed a policy of targeting inflation but it is in informal way.

The identification of the causes of inflation is a difficult but politically relevant question, in Albania as well as in many other countries. The difficulties are due to the fact that inflation is a product of many interrelated factors acting and not a consequence of one specific factor. Looking at inflation from a wider point of view, a classification into two large categories can be conducted (Mishkin, 2000):

- Economic causes

⁸ BoA, <http://www.bankofalbania.org>, (accessed in September 10, 2012)

⁹ Mishkin. F. S, (2007), "The economy of money, banking and financial markets", *pp. (613-640)*.

- Political causes

In this thesis it is mainly considered the economic causes of inflation and not the political ones; however we are aware of the fact that these two categories have reciprocal relationships and influences between them.

Inside the category of economical causes one may discern two groups (Mishkin, 2000):

- ✓ Classical causes of inflation like the increase of the money supply and fiscal policy problems,
- ✓ Specific causes, which are related to transition processes from a planned to a market economy, structural transformation of the main branches of the economy, etc.

In this thesis we will mostly consider the classical causes of inflation in order to analyze the form and extent of influence of the money supply increase (monetary aggregate- M2) on the determination of the inflation rate.

1.3 Monetary policy of the BoA

The BoA was legally mandated to design and implement the monetary policy in Albania. It has targeted its liquidity policies towards archiving its inflation objective. Monetary targeting was complemented with quantitative targets on the foreign reserves of the BoA on the domestic assets of the BoA and the overall domestic financing of the budget deficit¹⁰. Changes in net domestic assets come mainly from transactions between the BoA with government and commercial banks. The liquidity generated by these transactions accounts for most of the liquidity in the whole economy and thus, has an impact on inflation performance. In Albanian experience one of the most appreciated achievements during last eleven years has been the control that the monetary authority has exerted on inflation¹¹. The process has been a long and a continuous one, with ups and downs, but in general it can be assessed as a successful attempt. BoA`s ability to forecast inflation and predict how inflation will respond to policy actions depends very much on the BoA capacity to measure and to understand what determines the public`s expectations of inflation. In making very near term price forecasts, the BoA uses diverse information from a variety of sources, such as surveys of prices of gasoline and

¹⁰ BoA, <http://www.bankofalbania.org/>, (accessed in September 10, 2012).

¹¹ BoA, http://www.bankofalbania.org/web/Monetary_Policy_Report_5794_2.php, (accessed in September 10, 2012).

other important items, news reports about price change announcements, and information from business contacts¹². Another reason for the reliance on judgment in the forecasting process is the practical requirement that the forecast for inflation be consistent with the BoA staff's overall view of the economy. Measurement is one aspect of inflation expectation. BoA also needs a better understanding of how inflation expectation affects inflation and of the factors that determine inflation expectations⁶¹³. Both the BoA staff and the decision making body are aware of limitations, short modeling experience and difficulties in assessing future developments in exogenous variables.

In the long term, low inflation promotes growth, efficiency, and stability, all else being equal. Measuring the long-term relationship between growth or productivity and inflation is difficult. It could be a possibility that low inflation has accompanied good economic performance in part because countries that maintain low inflation tend to pursue other sound economic policies as well. Getting monetary policy right is crucial to the health of the economy. Expansionary monetary policy leads to high inflation, which decreases the efficiency of the economy and hampers economic growth. Monetary policy that is too tight can produce serious recessions in which output fall and unemployment rises. It can also lead to deflation, a fall in the price level (Mishkin, 2007)¹.

The economic profession suggests that keeping inflation under control is the best contribution a central bank can offer to the economic development. During the transition period, the BoA objective was for a stable ALL value which was translated into monthly inflation targets because of high inflation in 1992-1993 years. This period was to think in long time horizons for inflation targets⁶. The academic and professional opinions are converging to the point that low inflation means higher economic growth and higher unemployment rate. In the Albania experience, one of the most appreciated achievements during the last 10 years has been the control that the monetary policy has exerted on inflation. The process has been a long and a continuous one, with ups and downs, but in general it can be assessed as a successful attempt. Monetary targeting was complemented with quantitative targets on the foreign reserves of the BoA on the domestic assets of the BoA and the overall domestic financing of the budget deficit. Changes in net domestic assets come mainly from transactions between the BoA with government and commercial banks. The liquidity generated by

¹² BoA, http://www.bankofalbania.org/web/Document_Title_6547_2_6547_2.php, (accessed September 10, 2012).

¹³ Brayton, <http://www.federalreserve.gov/pubs/bulletin/1997/199704lead.pdf>, (accessed in July 15, 2012).

these transactions accounts for most of the liquidity in the whole economy and thus, has an impact on inflation performance¹⁴.

The BoA's ability to forecast inflation and predict how inflation will respond to policy actions depends very much on the BoA capacity to measure and to understand what determines the public's expectations of inflation. In making very near term price forecasts, the BoA uses diverse information from a variety of sources, such as surveys of prices of gasoline and other important items, news reports about price change announcements, and information from business contacts. Another reason for the reliance on judgment in the forecasting process is the practical requirement that the forecast for inflation be consistent with the BoA staff's overall view of the economy. Measurement is one aspect of inflation expectation. BoA also needs a better understanding of how inflation expectation affects inflation and of the factors that determine inflation expectations¹⁵. During last year's there has been a careful monetary policy which shows a good performance of BoA, combined with a controlled budget deficit which has contributed to controlling the aggregate demand and keeping inflation pressures at reasonable levels¹⁶.

1.4 Inflation and central bank independence

The central bank independence is an essential component of the monetary policy framework. The existing empirical studies strongly support the assumption that the central bank independence is an important political tool that allows monetary policy to support long-term macroeconomic stability and also, avoid short-term political interests or political cycles. Cukierman and Maliszewski conclude that delegating monetary policy making to an independent institution committed to fighting high inflation may restrain the sustainable growth of prices above their social optimal level. These studies find evidence that the level of central bank independence and the inflation rate are negatively correlated in both developing and transition countries. The authors believe that the central bank

¹⁴ BoA, http://www.bankofalbania.org/web/pub/cani_haderi_ang_203_1.pdf, (accessed in September 10, 2012).

¹⁵ FED, <http://www.federalreserve.gov/pubs/bulletin/1997/199704lead.pdf>, (accessed in July 15, 2012).

¹⁶ BoA, http://www.bankofalbania.org/web/Bank_of_Albania_Bulletin_6128_2.php, (accessed in September 10, 2012).

independence is more important in maintaining price stability, rather than achieving it (Cukierman and Maliszewski, 2004)¹⁷.

The main conclusion reached through empirical studies is that there is a negative correlation between central bank independence and inflation in developed countries as well as in developing ones. The experience of developed countries, like Germany, is often used as practical example to illustrate conclusion.

Cukierman, Miller and Neyapti (2000)¹⁸ suggest that:

- The lower the central bank independence, the higher is the average level of inflation of a country.
- The lower the central bank independence is, the bigger are the inflation changes in a country.

Cani and Baleta argue that low inflation itself can affect the increase of central bank independence. Although the existence of an independent central bank is neither a sufficient nor a necessary condition to maintain price stability, it should be agreed with the theoretical and empirical studies claiming that, inflation rate will be lower in countries with an independent central bank rather than in those where the politicians formulate central bank policies. Therefore, it should be considered positive the trend to give more independence to central banks noticed in some countries (Bolle and Meyer, 2003)¹⁹.

Accordingly, Cani and Baleta, suggest that various scholars have concluded that there is a strong positive correlation between higher bank independence and lower inflation in developed countries. This correlation exists even in developing countries, but it is not significant. Here, inflation is effected by other factors that have crucial influence in unstable or changing economies. For this reason, central bank independence does not necessarily lead to low inflation. In order to prove this hypothesis, level of central bank independence should be associated with financial sector. Monetary policy should not be considered as a tool for structural adjustments. This instrument serves as a

¹⁷ Cukierman A. and Maliszewski,(2004), <http://www.imf.org/external/np/leg/sem/2004/cdmfl/eng/lybek.pdf>, (accessed in May 5, 2012)

¹⁸ Cukierman A., Miller G. P. and Neyapti B. (2000), (<http://arno.uvt.nl/show.cgi?fid=4157>, accessed in September 12, 2012)

¹⁹ Bolle M. and Meyer T. (2003), http://www.bankofalbania.org/web/pub/BOLLE_MEYER_1310_1.pdf, (accessed in September 22, 2012).

preventing instrument for high inflation rates. Accordingly, Cani and Baleta, Albania is one of the transition countries where the correlation between inflation and central bank independence is not strong. Developments of inflation have been affected by other factors different from one year to another (Sh. Cani and T.Baleta, 1999)²⁰.

1.5 Inflation targeting: an option?

Expectations play an important role in the economic theories that underpin most macroeconomic models. Planning for the future is a central part of economic life. The need to make decisions about the type of car to buy, the amount of education to pursue, and the fraction of income to save forces households to think about which choices make the most sense not just for today but for years into the future. Similarly, business firms, in deciding where to locate factories and offices, what equipment to install, and what products to develop and produce, make decisions with consequences that may last many years. Individuals must make informed guesses about circumstances in the years ahead and then base decisions on these expectations²¹.

In recent years, the central bank has considered moving from announcing an inflation band within which it intends to operate to explicit inflation targeting (Blejer, Ize, Leone and Werlang 2000)²². Such a policy allows flexibility when facing real domestic and external shocks. Inflation targeting uses a forward-looking approach. Being a forward looking policy this is likely to have a stabilizing effect over financial markets. The Czech Republic was the first transition country that started to adopt this alternative to the monetary policy (Jarmuzek, Orlowski, Radziwill, 2012)²³.

²⁰ Sh. Cani and T.Baleta, (September 1999), <https://docs.google.com/a/epoka.edu.al/file/d/0B-ScHXnLDXhBd1JPUG9LSVJoN3c/edit>, (accessed in July 20, 2012).

²¹ The Federal Reserve Buletin, (2007) <http://www.federalreserve.gov/pubs/bulletin/1997/199704lead.pdf>, (accessed in August 5, 2012).

²² M. Blejer, A. Ize, A. M. Leone and S. Werlang (eds.), (2000), http://books.google.al/books?id=QfIbOjAaWIIC&pg=PT1&lpg=PT1&dq=M.+Blejer,+%E2%80%9CInflation+targeting+in+practice:+Strategic+and+operational+issues+and+application+to+emerging+market+economies%E2%80%9D,+IMF&source=bl&ots=WUB35_5nvP&sig=9YHBeqR9159TouUcgkmTvGID6vQ&hl=en&sa=X&ei=N5rXUqKEO-OK0AXSv4HQBw&ved=0CDoQ6AEwBQ#v=onepage&q&f=false, (accessed in August 5, 2012).

²³ Jarmuzek M., L. T. Orlowski, A. Radziwill, (2012), http://www.nbp.pl/konferencje/2june/jarmuzek_orlowski_radziwill.pdf, (accessed in August 5, 2012).

First, the existing free float exchange rate regime makes easier the replacement of monetary control with targeting inflation. It may also help strengthen the independence of central bank. Albania is yet a transition country, and therefore the uncertainty about effects of any change in monetary policy is relatively high. Not only is there an informal sector, but also securities markets still need time for monitoring the impacts and effects that they may have on the economy. Indirect instruments of monetary policy are relatively new and not fully tested.

Second, inflation forecasting techniques are not well developed in Albania. The main index used in calculating inflation the CPI has been criticized on the grounds that it does not seem to be relative of consumption patterns. Alternative indexes are not in place yet and statistics on national accounts are not reliable.

For almost 12 years the BoA, has set the annual inflation target as a band of 2-4 per cent. The band has generally been archived and been a good discipline for the Albanian authorities. Nevertheless political instability and elections can hinder the implementation of the target.

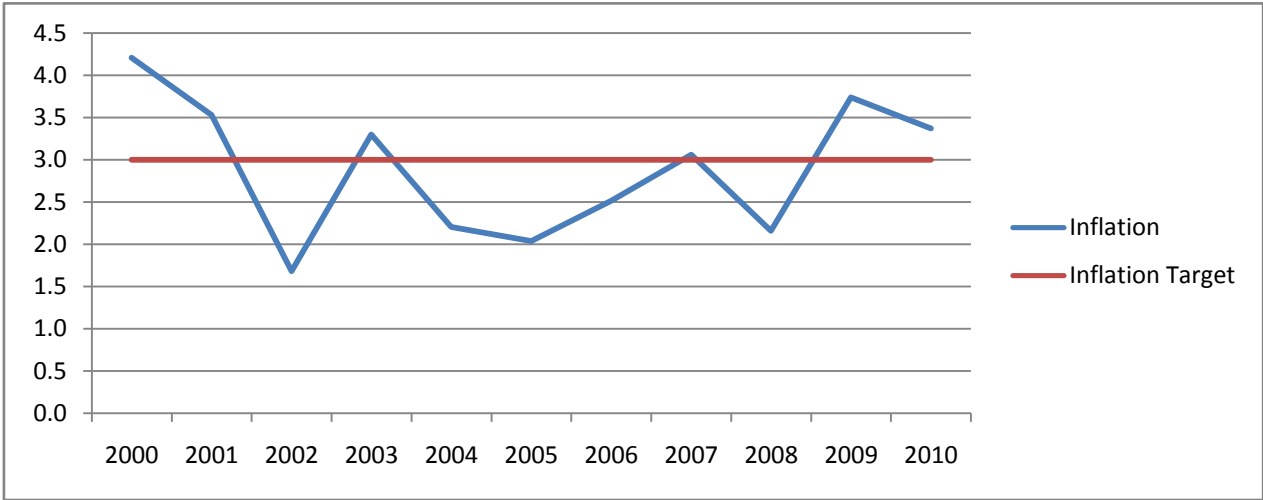
Table 1: Inflation and Inflation Target, Albania

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Inflation	4,2	3,5	1,7	3,3	2,2	2,0	2,5	3,1	2,2	3,7	3,4
Inflation Target	3	3	3	3	3	3	3	3	3	3	3

Source: World Bank and BoA, November 2011.

From the data above with a simple line chart we can observe how the inflation target is approximately matched in the recent years, when also the inflation targeting policy has been implemented.

Figure 1: Inflation and Implemented Inflation Target, Albania



Source: World Bank and Bank of Albania, November 2011.

As can be observed from the chart above it has been showed how the inflation rate flows within the area of 3 +/- 1, mainly in the last 8 years. Therefore according to the data generated by World Bank and BoA this study shows the inflation targeting of the BoA accomplished or reached in a good manner.

CHAPTER II: LITERATURE REVIEW

To carry out the master thesis, it was indispensable to understand the inflation targeting and application of it as a monetary policy instrument at an integrated level. Another important task was to extend it so as to develop the econometric model, helpful to show the impact of money supply quantitatively on inflation rate trends. The link between money growth and inflation in the euro area using money augmented Phillips curve as the underlying model to describe fluctuations in inflation for the period 1986 Q1 to 2003 Q2 and suggests that there exist a positive relationship between monetary growth and inflation over long-run horizons (Bruggeman, 2005)²⁴.

Another important research study that demonstrates short-run consequences of periods of strong monetary growth for inflation dynamics in 15 industrial economies was conducted by the Roffia and Zaghini, who found a positive link between monetary aggregates and prices over a 3-year horizon (Roffia and Zaghini, 2007)²⁵. A similar study concerning money growth and inflation was conducted by Amisano and Fagan, applying Bayesian techniques from 1960s up to 2010. They come to the conclusion that money growth provides timely warning signals of transitions between inflation regimes (Amisano and Fagan, 2010)²⁶. Moreover, Herwartz and Reimers takes the argument a step further testing the relationships between money supply, prices and real output for a wide range panel of 110 economies and find that homogeneity between prices and money cannot be rejected and the main authorities, central banks can achieve and maintain price stability by controlling monetary growth even for high inflation countries (Herwartz and Reimers, 2006)²⁷.

Moreover, Dwyer examine whether money growth helps to predict inflation (Dwyer, 2001)²⁸. Another study was conducted by Qayyum, who tested Money, Inflation, and Growth in Pakistan. Furthermore, they estimated the relationship between the rate of inflation, money growth, growth in real income, and growth in velocity in Pakistan in the 1960–2005 period. The results from the

²⁴ Bruggeman, A.,G. Camba-Méndez, B. Fischer and J. Sousa (2005), <http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp470.pdf>, (accessed in July 11, 2012).

²⁵ B. Roffia & A. Zaghini, (2007), <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-2362.2007.00206.x/full>, (accessed in June 20, 2012).

²⁶ Amisano and Fagan, (2010), <http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1207.pdf>, accessed in June 22, 2012).

²⁷ H. Herwartz, H. E. Reimers, (2006), <http://onlinelibrary.wiley.com/doi/10.1111/j.14680475.2006.00147.x/abstract>, (accessed in September, 2012).

²⁸ G. P. Dwyer, (2001), <http://www.jerrydwyer.com/pdf/mandp.pdf>, (accessed in June 30, 2012).

correlation analysis indicate that there is strong relationship between the money growth and inflation, suggesting that the important policy implication is that inflation in Pakistan can be cured by sufficiently tight monetary policy. Another study was conducted by Karahan (2012), who tested the relationship between inflation and inflation uncertainty in Turkey in the 2002 to 2011 period using two steps procedure. At first step, ARMA-GARCH model of monthly inflation data where is estimated the conditional variance. Then, the Granger causality tests between primarily inflation and generated inflation certainty series are performed. Empirical results of the study provided strong evidence in favor of the Friedman-Ball hypothesis that inflationary period result in high inflation uncertainty in Turkey. The results indicate that significant implications of the relationship between inflation and inflation uncertainty in developing countries as much as monetary policy adopted inflation targeting in Turkey (Karahan, 2012)²⁹.

Hence, the formulation of monetary policy must consider development in the real and financial sector and treat them as constraints on the policy (Qayyum, 2006)³⁰.

²⁹ O. Karaman, (2012), http://ac.els-cdn.com/S2212567112000263/1-s2.0-S2212567112000263-main.pdf?_tid=bcccdf3a-84e3-11e3-a611-00000aab0f6b&acdnat=1390560121_7e78fef64842aa924f13b000429bcee6, (accessed in January 24, 2014).

³⁰ Qayyum A. (2006), http://mpira.ub.uni-muenchen.de/2055/1/MPRA_paper_2055.pdf, (accessed in June 30, 2012).

CHAPTER III: TESTING THE RELATIONSHIP BETWEEN INFLATION AND MONEY GROWTH IN ALBANIA

3.1 Simple regression analysis

In order to test the theory this master thesis needs to gather data which must be relevant. In this example the data cover the period 1996-2008. The data for Albania include money growth (M2) and inflation rate which is measured using consumer price index. Data for money supply (M2), money-quasi money growth (M2) and inflation rate are provided by BoA and World Bank shown at Table 1. To carry out the study it has been developed an econometric model, through which it has been made a statistical test of the quantity theory of money. The model that has been used resembles that of equation ($\Delta P = \Delta M - \text{CONSTANT}$) (Mankiw, 2002):

Instead of equation ($\Delta P = \Delta M - \text{CONSTANT}$) mentioned above it has been used a regression equation model as (Mankiw, 2002):

$$\text{Inflation} = \alpha + \beta * \text{ms}$$

Where: Inflation: is the percentage change in price level

α : is the intercept and equals the constant in equation,

β : is the value for the slope coefficient,

ms: is the quantity of money supply that change yearly,

Upon this basis, it has been tested the hypothesis that “ α ” or the constant in equation ($\Delta P = \Delta M - \text{CONSTANT}$) is negative and “ β ” or the slope is almost 1. The study is done by taking Albania to test the quantity relationship between change in money supply and inflation rate.

This section deal with estimation of the regression equation model we developed. To conduct regression analysis it has been used Excel 2007. By going first to “data” then “data analysis” after that “regression” it has been selected the money growth as independent variable and inflation rate as dependent variable and at 5% significance level it has been got the results exhibited at Table 2 bellow:

Table 2: Regression Statistics

Multiple R	0.72892016
R Square	0.531324599
Adjusted R Square	0.488717744
Standard Error	6.991598604
Observations	13

Most importantly, this study focuses on empirical results. Such as, dealing with the statistical regression equation:

Where: $\text{Inflation} = b_0 + b_1 \text{ms}$

After removing data input of velocity of money as mentioned above for the regression analyses, this study has the constant of dependent variable (inflation) $b_0 = -3.51676$ and coefficient of independent variable (money supply) $b_1 = 0.6776283$. The regression analyses result presents that the money supply has positive relationship with the inflation. Where, one unit increase in money supply will increase inflation by the 0.677 coefficient. So, if we apply these results into our regression model presented above, the model will be:

$$\text{Inflation} = -3.51676 + 0.6776283 * \text{MS}$$

Again in Appendix 4 it can be seen that the t-statistics for this equation is 3.53 where the critical value of (t) for thirteen observations is 2.2. In order to reject the null hypothesis the t-value must be greater than t-critical value. In addition, similar to the results of t-test the p-value test also confirms that the result of regression model is to reject null hypothesis and accept an alternative one where the p-value must be lower than the p-critical value. Here, the result shows the p-value of 0.0047 where p-critical value is 0.025.

At first, the relationship between money supply and inflation is positive, meaning that as money supply increases also inflation increases. Secondly, the form of the graph seems linear and suitable to model this relationship with a line. Being a numerical summary, the correlation coefficient describe the strength and direction of linear relationship and equal to $r = 0.73$. Since $r = 0.73$, it is positive and near positive 1, as a result, we conclude that this linear relationship is moderately strong and positive. Furthermore, the slope of the line (0.67) indicates that for every increase of 1 unit money supply, we would expect the inflation to increase by 0.67 units. Contrary to other years, during 1999, 2000 and

2003 money supply increases by 20.27, 10.36 and 7.63 units but inflation rises only by 0.4, 0.1 and 0.5 units respectively. Afterwards, the α -intercept of -3.5167 indicates that; in case money supply change by zero units , expected inflation will be -3.5167 units .Finally, the r^2 value of 0.5313 shows that 53.13% of the variation in the dependent variable which is inflation can be explained by the variation in the change in money supply or our independent variable.

3.2 An examination of the relationship between inflation and money growth: non-stationary time-series data and Johansen Co-integration Test

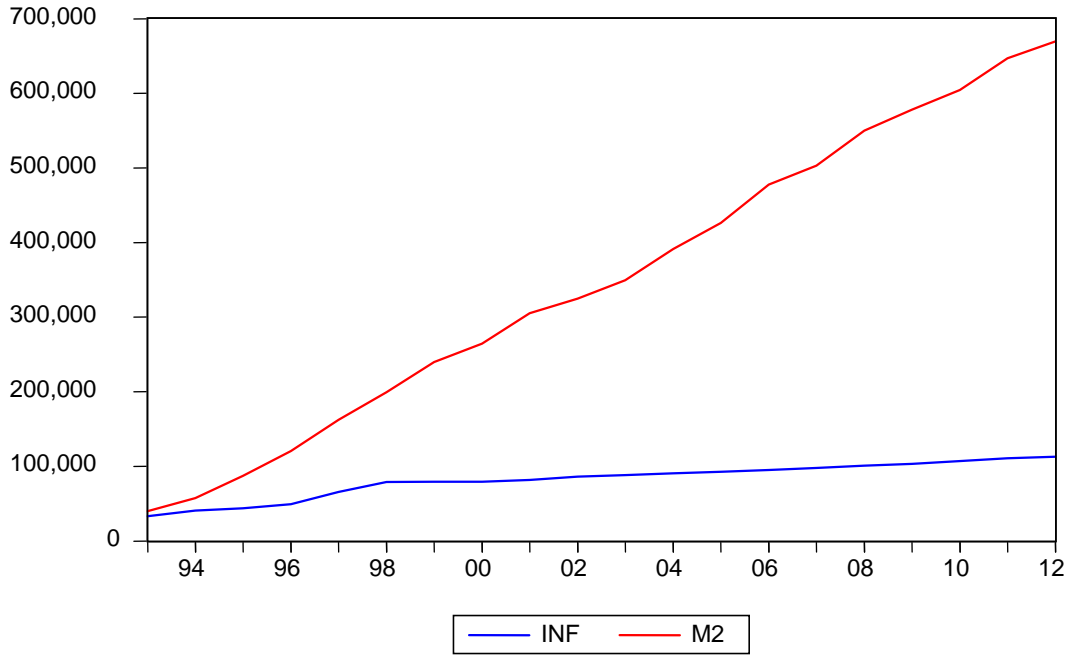
Time series data display a variety of behavior. The main reason why it is important to know whether a time series is stationary or non-stationary before one embarks on a regression analysis is that there is a danger of obtaining apparently significant regression results from unrelated data when non-stationary series are used in regression analysis. Such regressions are said to be spurious (Hill et al., 2008: 221).

The data consist of yearly ALL money growth (M2) obtained from the BoA³¹ and yearly inflation (CPI) from IMF, World Economic Outlook Database, October 2013³² for Albania. The sample period is from 1993 to December 2013. All tests are performed by using E Views statistical program.

³¹ BoA, www.bankofalbania, (accessed in January 19, 2014).

³² IMF, www.imf.org, (accessed in January 18, 2014).

Graph 1: Inflation and money growth series in Albania, 1993-2012



Graph 2: Inflation and money growth in Albania, 1993-2012, scatter diagram

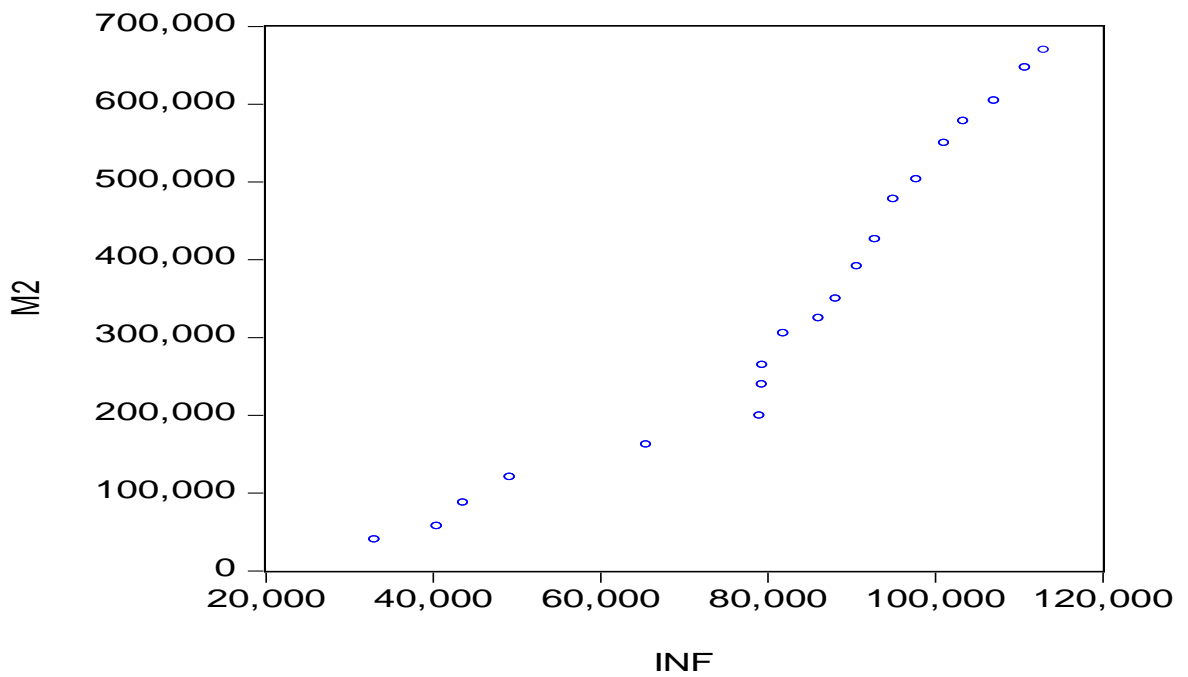
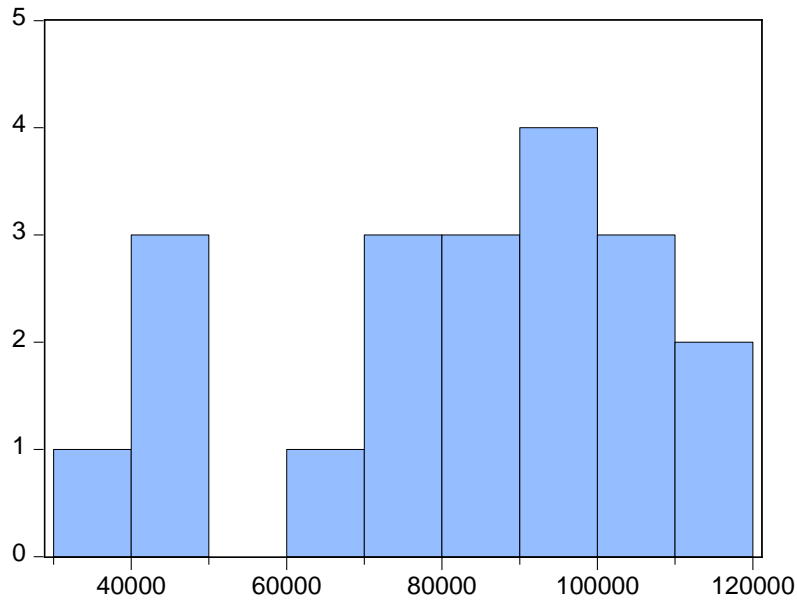
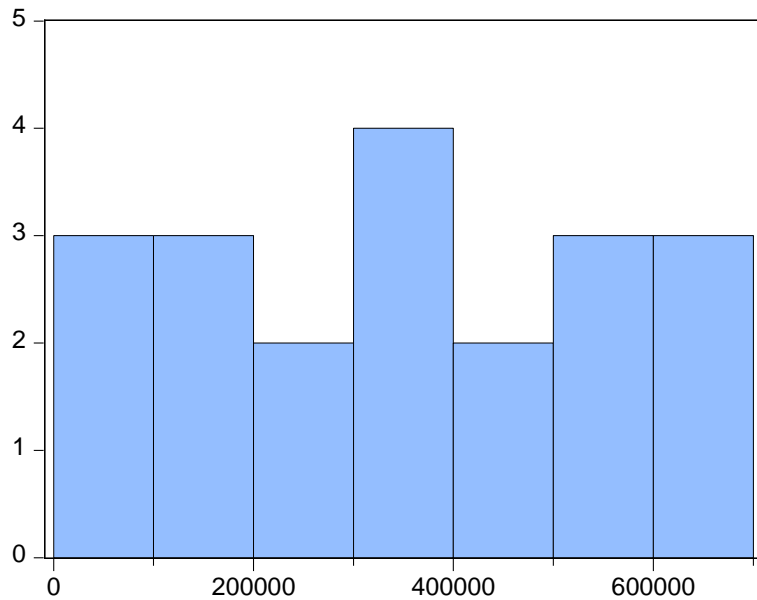


Table 3: Histogram and statistics of inflation series



Series: INF	
Sample 1993 2012	
Observations 20	
Mean	81877.50
Median	87148.50
Maximum	112986.0
Minimum	33035.00
Std. Dev.	23916.25
Skewness	-0.736983
Kurtosis	2.451318
Jarque-Bera	2.061359
Probability	0.356765

Table 4: Histogram and statistics of money growth (M2) series



Series: M2	
Sample 1993 2012	
Observations 20	
Mean	349907.5
Median	337120.0
Maximum	669600.0
Minimum	39937.00
Std. Dev.	202329.8
Skewness	0.029062
Kurtosis	1.772853
Jarque-Bera	1.257723
Probability	0.533198

Table 5: Descriptive statistics of inflation and money growth (M2) series

	INF	M2
Mean	81877.50	349907.5
Median	87148.50	337120.0
Maximum	112986.0	669600.0
Minimum	33035.00	39937.00
Std. Dev.	23916.25	202329.8
Skewness	-0.736983	0.029062
Kurtosis	2.451318	1.772853
Jarque-Bera	2.061359	1.257723
Probability	0.356765	0.533198
Sum	1637550.	6998149.
Sum Sq. Dev.	1.09E+10	7.78E+11
Observations	20	20

Table 6: Estimation equation output of regression

Dependent Variable: INF

Method: Least Squares

Date: 01/20/14 Time: 12:10

Sample: 1993 2012

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.204760	0.012559	16.30388	0.0000
R-squared	0.110276	Mean dependent var	81877.50	
Adjusted R-squared	0.110276	S.D. dependent var	23916.25	
S.E. of regression	22559.05	Akaike info criterion	22.93437	
Sum squared resid	9.67E+09	Schwarz criterion	22.98415	
Log likelihood	-228.3437	Hannan-Quinn criter.	22.94409	
Durbin-Watson stat	0.049394			

Before analyzing the co-integrating relationship between inflation and money growth (M2), it is important to carry out a univariate analysis. The economic series like those of inflation and money supply tend to possess unit roots (Hill et al., 2008: 222). The presence of unit roots in the underlying series points towards the non-stationary of the underlying series. If both the independent and the dependent variables show the presence of unit roots, the regression results do not hold much meaning. This is referred to as spurious regression, whereby the results obtained suggest that there are statistically significant relationships between the variables in the regression model, when in fact all that is obtained is the evidence of contemporaneous correlation rather than a meaningful causal relation. The problem of spurious regression is compounded by the fact that the conventional t- and F-statistics do not have standard distributions generated by stationary series; with non-stationary, there is a tendency to reject the null in both cases and this tendency increases with sample size (Gül and Acıkalın, 2008: 3229).

The stationarity of each series was investigated by employing the unit root tests developed by Dickey and Fuller. The test consists of regressing each series on its lagged value and lagged difference terms. The number of lagged differences to be included can be determined by the Akaike information criterion (Hill et al., 2008).

Table 7 reports the Augmented Dickey–Fuller test statistics under the null hypothesis of a unit root. This table also presents the number of lagged difference terms included in the regression. The hypothesis of unit root against the stationary alternative is not rejected at 5% levels for inflation and money growth (M2) with or without deterministic trend. However, the first differences of these variables are stationary under the test. Hence, it has been concluded that these variables are integrated of order 1. The results of these tests are shown in Table 7.

Table 7: Augmented Dickey-Fuller unit root test statistic on inflation

Null Hypothesis: INF has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.715046	0.4074
Test critical values: 1% level	-3.857386	
5% level	-3.040391	
10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INF)

Method: Least Squares

Date: 01/20/14 Time: 13:33

Sample (adjusted): 1995 2012

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.077714	0.045313	-1.715046	0.1069
D(INF(-1))	0.294240	0.224492	1.310692	0.2097
C	9196.793	4283.283	2.147136	0.0485
R-squared	0.321919	Mean dependent var	4027.556	
Adjusted R-squared	0.231508	S.D. dependent var	4189.604	
S.E. of regression	3672.760	Akaike info criterion	19.40629	
Sum squared resid	2.02E+08	Schwarz criterion	19.55468	
Log likelihood	-171.6566	Hannan-Quinn criter.	19.42675	
F-statistic	3.560629	Durbin-Watson stat	1.539887	
Prob(F-statistic)	0.054276			

Table 7 reports the ADF statistics under the null hypothesis of a unit root. The hypothesis of unit root against the stationary alternative is not rejected at 5% levels (critical value) for inflation with or without deterministic trend. Since the calculated ADF t-Statistic (-1.715) is greater than the 5% critical value of (-3.040) do not reject the null of non-stationary. Therefore, inflation series has a unit root.

Table 8: Augmented Dickey-Fuller unit root test statistic on money growth

Null Hypothesis: M2 has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.025686	0.9440
Test critical values: 1% level	-3.857386	
5% level	-3.040391	
10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(M2)

Method: Least Squares

Date: 01/20/14 Time: 13:41

Sample (adjusted): 1995 2012

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2(-1)	-0.000326	0.012676	-0.025686	0.9798
D(M2(-1))	-0.305564	0.240918	-1.268332	0.2240
C	44426.25	8537.696	5.203540	0.0001
R-squared	0.103336	Mean dependent var	34007.11	
Adjusted R-squared	-0.016219	S.D. dependent var	9281.791	
S.E. of regression	9356.758	Akaike info criterion	21.27660	
Sum squared resid	1.31E+09	Schwarz criterion	21.42499	
Log likelihood	-188.4894	Hannan-Quinn criter.	21.29706	
F-statistic	0.864339	Durbin-Watson stat	2.006447	
Prob(F-statistic)	0.441288			

Table 8 reports since the calculated ADF t-Statistic (-0.025) is greater than the 5% critical value of (-3.040) do not reject the null of non-stationary. Therefore, money growth (M2) series has unit root.

Both inflation and money supply series have unit root, needed taking differences of both variables.

Table 9 reports, after taking second differences (lags) of variable of inflation series, since the calculated ADF unit root test statistic (-3.834) is less than the 5% critical value of (-1.962) do not reject the null hypothesis of non-stationary. Therefore, inflation series has not a unit root, or it is stationary.

Table 9: Augmented Dickey-Fuller unit root test on D (INF, 2)

Null Hypothesis: D(INF,2) has a unit root
 Exogenous: None
 Lag Length: 0 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.834499	0.0007
Test critical values: 1% level	-2.708094	
5% level	-1.962813	
10% level	-1.606129	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INF,3)

Method: Least Squares

Date: 01/20/14 Time: 13:53

Sample (adjusted): 1996 2012

Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1),2)	-0.933005	0.243319	-3.834499	0.0015
R-squared	0.478477	Mean dependent var	168.8235	
Adjusted R-squared	0.478477	S.D. dependent var	6220.335	
S.E. of regression	4492.111	Akaike info criterion	19.71506	
Sum squared resid	3.23E+08	Schwarz criterion	19.76407	
Log likelihood	-166.5780	Hannan-Quinn criter.	19.71993	
Durbin-Watson stat	1.802195			

Table 10: Augmented Dickey-Fuller unit root test on D (M2, 2)

Null Hypothesis: D(M2,2) has a unit root

Exogenous: None

Lag Length: 0 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.281182	0.0000
Test critical values: 1% level	-2.708094	
5% level	-1.962813	
10% level	-1.606129	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(M2,3)

Method: Least Squares

Date: 01/20/14 Time: 14:01

Sample (adjusted): 1996 2012

Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2(-1),2)	-1.719298	0.185246	-9.281182	0.0000
R-squared	0.842601	Mean dependent var	-1897.824	
Adjusted R-squared	0.842601	S.D. dependent var	28246.80	
S.E. of regression	11206.49	Akaike info criterion	21.54340	
Sum squared resid	2.01E+09	Schwarz criterion	21.59241	
Log likelihood	-182.1189	Hannan-Quinn criter.	21.54827	
Durbin-Watson stat	2.313222			

Table 10 reports, after taking second differences (lags) of variable of money growth (M2) series, since the calculated ADF unit root test statistic (-9.28) is less than the 5% critical value of (-1.962) do not reject the null hypothesis of non-stationary. Therefore, money growth (M2) series has not a unit root, or it is stationary. On the basis of the above-mentioned unit root tests, performed the Johansen's co-integration test to see whether any combinations of the variables are co-integrated. This approach uses a maximum likelihood procedure that tests for the number of co-integration relationships and estimates the parameters of those co-integrating relationships (Hill et al., 2008: 225).

Table 11: Johansen Co-integration Test

Date: 01/20/14 Time: 14:29
 Sample (adjusted): 1996 2012
 Included observations: 17 after adjustments
 Trend assumption: Linear deterministic trend
 Series: INF
 Lags interval (in first differences): 1 to 2

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.533684	12.96917	3.841466	0.0003

Trace test indicates 1 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.533684	12.96917	3.841466	0.0003

Max-Eigen value test indicates 1 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co integrating Coefficients (normalized by $b'S_{11}^{-1}b=I$):

INF	5.89E-05
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Unrestricted Adjustment Coefficients (alpha):

D(INF)	-2412.579
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LR test statistics and critical values are shown in Table 11. The results suggest that there is a co integrating relationship between inflation and money growth (M2) at the 5% significance level. In other words, a long-run stable relationship between inflation and money growth (M2) exists. This indicates that inflation money growth move together in the long run.

CONCLUSION

To sum up, this study investigated the link between inflation and money growth. As a first step, it overviewed the relationship between money growth and inflation as monetary policy framework of the BoA, concentrating on the later part on its current set-up, for attaining inflation stabilization in such a strong competitive environment. It has been developed an econometric model through which it has been made a statistical test of quantity theory of money. After that, it has been applied regression analysis for M2 and CPI where it has been found a moderate strong relationship between these two variables. Moreover, the coefficient of money supply (M2) 0.67 tells us that as long as money supply in Albania increases by 1%, inflation rate increases by 0.67%. Most importantly, t test analysis allows me to conclude that there exist a relation between changes in money supply and inflation rate for Albania.

This master thesis analyzed empirically the co-integrating relationship between inflation and money growth in the Albanian economy. Since the variables in this article are no-stationary and present a unit root, Johansen's co-integration technique has been applied. This methodology has enabled to obtain a co-integrating relationship among these variables. The co-integration results provide evidence of a unique co-integrating vector. In other words, a long-run stable relationship between inflation and money growth exist. This indicates that inflation and money growth move together in the long run.

APPENDIX

Appendix 1: Average Growth Rates

	Year	M2	CPI
Albania	1996-2008	15.61	7.06

Appendix 2: Regression Results

Multiple R	0.72892016
R Square	0.531324599
Adjusted R Square	0.488717744
Standard Error	6.991598604
Observations	13

Appendix 3: Anova

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	1	609.5838078	609.5838	12.4704
Residual	11	537.7069614	48.88245	
Total	12	1147.290769		

Appendix 4: Coefficients

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-3.51676004	3.568398503	-0.98553	0.345546
M2 Growth	0.677628267	0.191889535	3.531346	0.004704

Appendix 5: Inflation and money growth in Albania, 1993-2012

years	M2	inflation
1993	39,937	33,035
1994	57,472	40,490
1995	87,370	43,645
1996	120,646	49,203
1997	162,221	65,522
1998	199,264	79,050
1999	239,662	79,358
2000	264,497	79,389
2001	305,302	81,867
2002	324,727	86,139
2003	349,513	88,158
2004	391,411	90,688
2005	426,150	92,830
2006	477,739	95,031
2007	502,981	97,822
2008	549,957	101,108
2009	578,200	103,407
2010	604,500	107,076
2011	647,000	110,746
2012	669,600	112,986

BIO-DATA OF THE AUTHOR

The author, Ervin Sulika, was born in Diber/ Albania in 1988. He has pursued his Bachelor studies in Banking and Finance department at Epoka University and graduated in 2011. During his university life, the author has attended many conferences, training programs, internships and workshops, where he has gained a very good experience. Currently he is attending the Master of Sciences, second cycle program in Banking and Finance at Epoka University. He is also working as a Coordinator of Faculty of Economics and Administrative Sciences at Epoka University. The author aspires to pursue administrative experience and then an academic career in the field of Banking and Finance.

Scientific Publications and Academic Activities:

E. Sulika, (2011), "*The Dynamics of Inflation Expectation and Targeting: An Albanian Application*", International Conference on "Economic & Social Challenges 2011- Globalization and Sustainable Development" December 9-10, 2011, Conference Proceeding book, Faculty of Economics, University of Tirana/ Albania.

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