

# 1 Introduction

Nowadays deflation is explained as a vast and powerful decline in the prices. It commonly drives to a worse economic activity; the decisions about future investment and consumption are also delayed due to the fact that the majority of companies and households are expecting that future prices will significantly decrease. At the same time, we can observe that the number of borrowers default increases considerably. The major effects of deflation can be destructive, the Great Deflation from 1870s in UK and the Great Recession of 1930s in US proved it.

Ben S. Bernanke said: "The sources of deflation are not a mystery. Deflation is in almost all cases a side effect of a collapse of aggregate demand - a drop in spending so severe that producers must cut prices on an ongoing basis in order to find buyers. Likewise, the economic effects of a deflationary episode, for the most part, are similar to those of any other sharp decline in aggregate spending - namely, recession, rising unemployment, and financial stress." (Deflation: Making Sure "It" Doesn't Happen Here; November 1, 2002)

In 2014 deflation became a very hot topic of discussion. If in the past 20 years people were associating deflation exclusively with Japan, today this phenomenon affects a large number of countries, mentioning here China - one of the biggest Asian countries - dealing with the lowest consumer price inflation since 2010.

Another case is Sweden. On the end of October 2014, Sweden's central bank cut its target interest rate to zero level after several attempts of increasing it as high as 2% in 2011. Moreover, Spain and Italy are suffering of a steep decline in incomes and asset values. All in all, the last economic happenings demonstrate that deflation is already here and concrete measures must be taken to reduce it before it gets out of control.

The main European banks do not observe it, or at least they pretend that deflation is taking hold in the whole euro zone. But this risk, indeed, is always becoming more and more obvious in the last two years.

For three consecutive years inflation in Euro zone has been falling, changing this way bankers and economist's expectations day by day. In September 2014, inflation in euro zone achieved the level of just 0,3%, at the same time when 6 European countries were already confronting deflation, 3 of which facing a fall in Consumer Price Index (CPI) for 3 months in a row.

Deflation is not something totally new for euro zone. I could mention at least 5 countries - such as Greece, Spain, Portugal, Ireland and Switzerland - which experienced this phenomenon in the last 3 years. Falling CPI in 5 countries can easily push the inflation below 0 in the whole euro zone, and not only within the geographic borders of their countries.

The situation becomes even more alarming since the previous researches done on this topic are very partial and brief. Therefore, this paper aims to cover a wider span of time and countries, engaging as well econometric models that seek to further develop the knowledge we have about the relationship between deflation and macroeconomic stability.

The main scope of my work is to determine whether deflation is linked with recession - as it is often indicated in the long-run empirical evidences. The text is structured as following.

In Section 2, I present a concise summary of the current available knowledge and information about deflation, from both frameworks, the empirical and theoretical ones. In Section 3, I show the dataset employed in this paper and I as well provide some basic characteristics of inflation and output change data.

Then in Section 4, using the fixed effects, random effects and generalized method of moments econometric models, I check if the changes in prices have or have not a direct impact on changes that happen in output and also if deflation is a strong indicator of unsteady and weak economic activity and performance. In Section 5, I conclude by pointing out the results and the main findings as a conclusion of my work. In the last Section 6, I stress my contribution on the topic and I highlight the possibilities for further research.

## 2 Short Summary of Available Knowledge and Information

### 2.1 Introduction to the topic

John Maynard Keynes – a famous British economist said: “Thus inflation is unjust and deflation is inexpedient. Of the two perhaps deflation is, if we rule out exaggerated inflations such as that of Germany, the worse; because it is worse, in an impoverished world, to provoke unemployment than to disappoint the rentier. But it is necessary that we should weigh one evil against the other. It is easier to agree that both are evils to be shunned.”

Deflation, actually, is not any new phenomena of modern economy since the first reported episodes of it date the early 1800 in US. If to mention each of the cases on turn, I would of course start with US. Deflation episodes there were firstly caused by the too fast technological progress. To go on, the continual financial crises had its own contribution to the phenomena, such as the one in 1837 caused by a rapid increase of unemployment rate simultaneously accompanied by decreasing profits of firms and wages of employees. Further, in 1873, the American Civil War deficit led to a financial crisis that lasted for more than 5 years.

Another episode of deflation happened due to stock market crash of 1929. There were approximately 9000 bank failures in 1930, a reduction in purchasing across the board and a noticeable weakness of the cooperation between American economic policy and Europe, which caused one of the deepest and most dangerous crises in US history, known as Great Depression.

But everyone got to know better this phenomenon in early 1990s, when Japan loudly entered in so called "deflationary trap". The Bank of Japan and the government attempted in different manners to imply diverse monetary policy instruments to get

rid of deflation. For example they tried to reduce interest rates and 'quantitative easing' as much as it is possible, but it did not work and did not generate significant growth in broad money, so deflation remained to be one of the harshest problems of the country. In July 2006, Central Bank of Japan, ended era of the zero-rate policy, but again this strategy failed, and as result the Wall Street Journal. Bloomberg L.P. reported in November 2009 that the country came back to deflation.

If in the beginning of 2000s everybody was speaking about deflation in context of Japan, nowadays it became a hot topic of discussion and debate when we as well analyze the economic situation of European countries. Paul Krugman predicted this situation much before in 1998, when he said: "The clear and present danger is, instead, that Europe will turn Japanese: that it will slip inexorably into deflation, that by the time the central bankers finally decide to loosen up it will be too late." (Krugman,1998).

The prediction became reality, and now Europe is having a problem with "creating" the inflation. From one side, you can think that it is a really a hard job to create the so called "optimal level" of inflation, but if to go deeper in analyzing the past episodes of deflation, then you will find out that some poor countries such as Argentina, Belarus, Chad, Egypt, Iran, Laos, Sudan, Syria, Ukraine, Vietnam and Zimbabwe, managed to solve the problem of deflation and never had it again. So, why is it so difficult for Europe? What goes wrong?

European countries are much more developed, richer and they have superior education system. So, theoretically, they should have better educated and prepared specialists. For these high competence economists, deflation may be just a mathematical problem that has a solution. Maybe Clem Chambers was right when he said that: "Economists must be like football stars; you need to import them from developing countries because it is only there that super-skills develop."

Infusing liquidity on the market, as I said above, can eliminate this headache. For this reason, Europe should agree on the issue of printing more money, but Germany will never be in favor of high inflation, that is why the solution should be found in another place, and through another tool of common monetary policy. From 28 European

Central Banks, 16 of them failed in keeping the inflation at the target level. This means that European Union (EU) needs to find another way of making possible the increase of money supply.

However there are some categories of European citizens that can benefit from deflation. For example, as deflation leads to a decrease in prices, everything becomes cheaper and as result more accessible. Further, deflation will encourage citizens to take more credits, since there is not yet such a term as “negative interest rate” charged by the banks. But, for the companies or individuals who interact with other markets abroad, it can still be a problem. As long as at the first stages deflation is not contagious, the decrease in prices will be reflected only in one country, therefore the profits will go down, which in many cases will end with the bankruptcy of small and not that strong firms.

The newest horror scenario for European countries is that now they are staying at the edge of the abyss, another step and they risk falling into the abyss called long-term deflationary unemployment, a situation in which nobody works, because nobody is purchasing or investing in anything.

According to Business Insider, these are the latest deflation figures from Europe, for September 2014:

- Italy: -0.1%. Italy is in its second month of deflation
- Spain: -0.3%. Spain has the most serious deflation of any large euro zone economy; it's in its third consecutive month
- Germany: 0.8%. The fact that Germany has some of the highest inflation in the euro zone tells you a lot.
- France: 0.4%. A five-year low. Core inflation is actually now at zero, the lowest in modern history.
- The United Kingdom (UK): 1.2%. The UK isn't in the euro zone, but inflation is also at a five-year low.

We can observe in the figure below how the inflation turns slowly into deflation starting with the third month of 2013 year.



**Figure 2.1.1: Annual Inflation: Harmonised Consumer Price Index , %**

Source: Eurostat

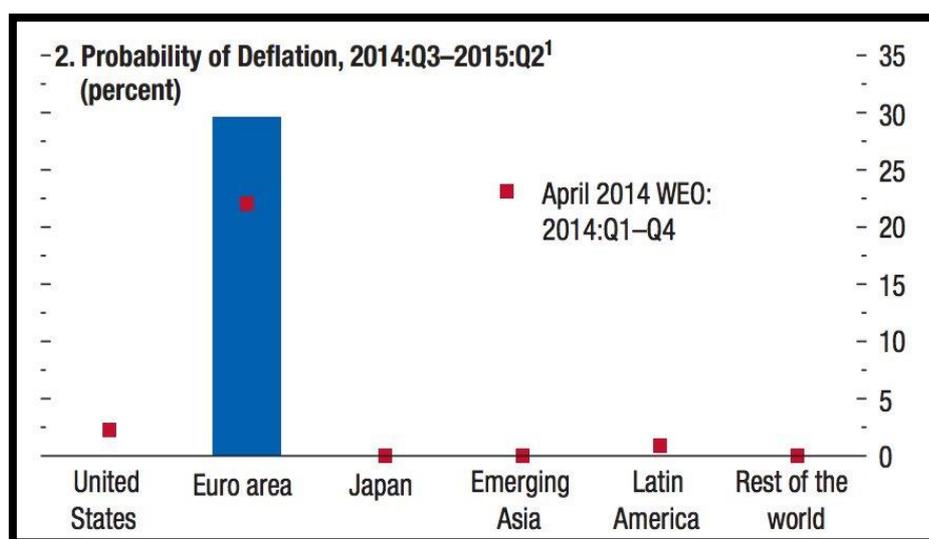
Note: Minimum and maximum is the minimum and the maximum among the euro area countries

The present risk of euro zone deflation suggests a larger economic danger than the earlier transitory episodes after recovery from financial crisis in 2008. In fact, low inflation is having two types of impact, positive impact for some countries such as Spain, Greece and the Netherlands, but also negative influence on Switzerland, Portugal and Poland. Given the well-known fact that countries from euro zone have the same, shared currency – euro, they cannot apply the nominal exchange rate as an instrument to decrease and manipulate external imbalances which could appear between the member countries. This regulation has to be implied through exponential growth in nominal wages and prices.

But in the case when nominal wage raises are very small around the euro zone, a state can only manage to reduce its level of relative wage through decreasing nominal

wages. The tricky thing in this case is that as usual nominal wage level can be reduced only in very severe economic circumstances. It is no fate or an accident that the biggest reductions in wages happen in such weak economies such as Spain and Greece, where we can observe that unemployment has raised to uncommonly high levels. Negative inflation also makes consolidation of financial system more politically difficult, a real example being Greece after election. That's why some countries are cutting their nominal expenditure as a method of targeting real spending reductions through inflation, but such solutions generate only bounded budgetary gains in a deflation environment.

Meanwhile, International Monetary Fund (IMF) calculated the probability of deflation for 2014-2015 in their new world economic outlook. Based on the results of the estimation IMF increased this probability from 20% to 30%. This is shown in the figure below as well:



**Figure 2.1.2: Probability of Deflation, 2014:Q3-2015:Q2, %**

Source: IMF

Deflation can be measured by reduction in the CPI. But this measurement seems to have one important problem, namely the fact that the CPI does not take into account stock prices which pensioners use to finance their acquisitions and entrepreneurs use to subsidize the growth of their businesses. This means that, when the stock prices on

the market fall, the CPI will not react so fast to these changes, so people will firstly feel the deflation change in their pockets, and only after this, the CPI will fall and will finally show the presence of deflation.

Another minus of this measurement is that the CPI does not contain current sales prices of houses. Alternatively it determines what is the equivalent price of possessing a house, which is calculated through monthly paid rents. The problem is that this indicator - monthly paid rent – is not trustful, because it is volatile and easily influenced by the current situation on the market as well as by the interest rate.

For example, when interest rate is low, people tend to take more and more credits to buy a house or to rent a house leading to the tendency of an increase of renting houses. In a vice-versa situation, when the cost of borrowing is high, then prices tend to fall because not too many people can afford to take a credit from the bank. As a result, the CPI will not reveal true values when house sales prices are high but rents ones are low.

To solve deflation, in US for example, the Federal Fund Reserve (Fed) triggers the economy recovery using expansionary monetary policy. This policy implies that Fed lowers the Fed funds rate through open market operations, it purchases the Treasury Bills from the extremely volatile and unstable market, but also it runs other monetary instruments to boost liquidity on the market.

Another strategic movement to combat deflation can be implementation of the discretionary fiscal policy. This policy is concerned about decreasing as much as possible taxes paid by the citizens, but in the same time government spending should expand. This type of policy can be implied only in case when the country deficit is not very high.

If these policies are properly and strictly implemented then they will work well, and as result of stimulation of demand, the deflation will turn to inflation. The particular institution that can help to achieve this target is the European Central Bank (ECB). But if this institution adopts a policy of non-market intervention and keeps observing

the situation from the sidelines position doing nothing to solve it, then the problem can get worse and worsen.

## 2.2 Theoretical Approach

Deflation is a general decline in prices, often caused by a reduction in the supply of money or credit, so that inflation rate becomes negative.

In majority of cases, deflation is perceived as an event which brings decline in money supply or in credit availability, also it significantly lower investments spending by both, affecting this way the country government and citizens which fear to invest their money. As result of this, deflation drives to higher unemployment, because of continuously shortcuts of the wages.

Central banks should intervene immediately to stabilize the situation, through for example infusing liquidity on the market. If this is not happening, than simple deflation incident can turn into severe financial crisis or even in a next depression.

In the several previous researches on the topic, the majority of the researchers were focusing on two main events or economic phenomena caused by the deflation, such as liquidity trap and deflationary spiral.

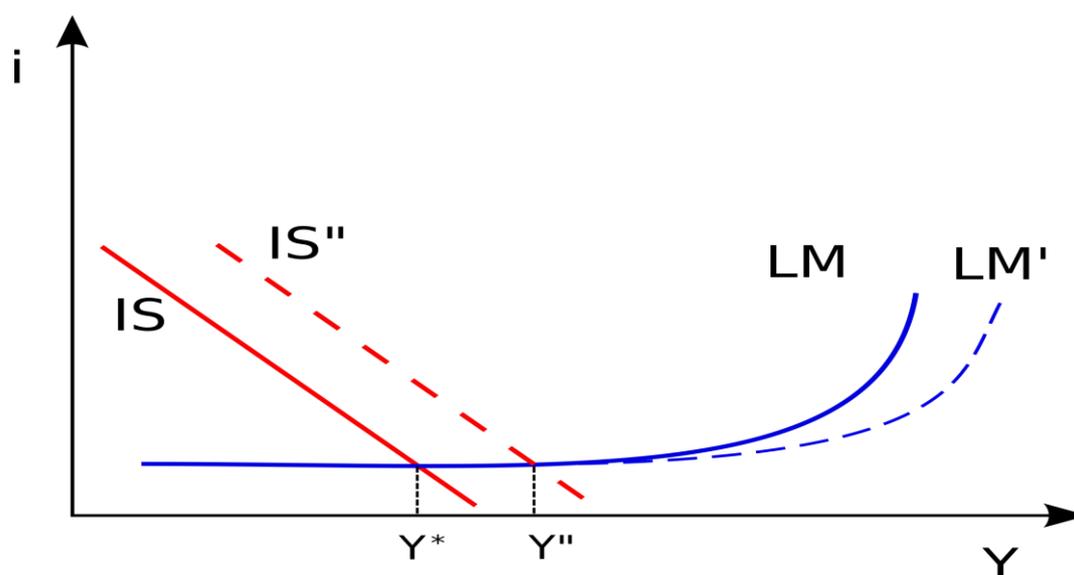
Liquidity trap is an economic situation in which Central Bank injections of liquidity on the market fail to reduce the interest rate, to revive the economy and maybe to generate some growth. As a beginning, this case occurs due to "hoarding money" phenomena, or in other words when people and banks keep the cash because they do not trust each other, and as result the counterparty risk increases very fast. Second, it occurs because they expect that prices in future will fall.

One recent liquidity trap occurred in 2008, when Federal Reserve of US failed to decrease the spread between the over-night interest rate and long-term interest rate on loans.

Some experts believe that liquidity phenomenon never left Japan. "We are in a liquidity trap," Yusuke Ito, a senior fund manager for Mizuho Asset Management in

Tokyo, said in a telephone interview in January of this year (2015). “They’re expecting too much. Even if you provide lots of liquidity to the market, banks do not increase the liquidity to their customers. We are pretty much doubtful about the effect of QE.”

In the figure below, we can see the mechanism of liquidity trap:



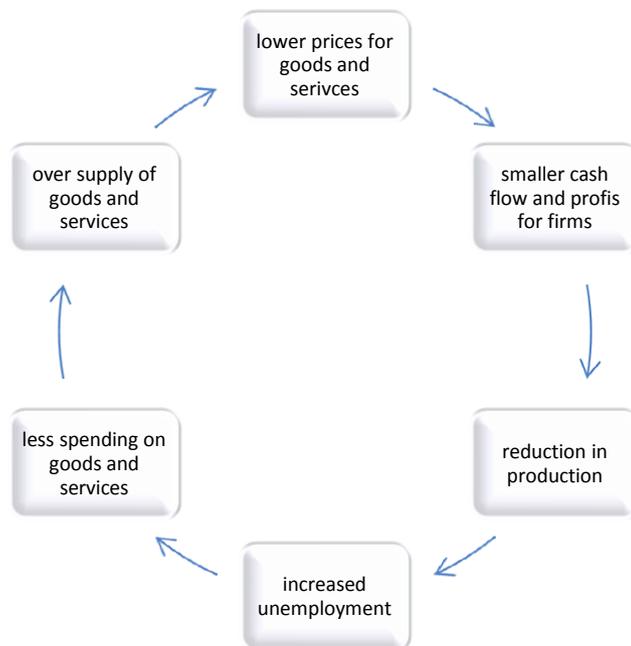
**Figure 2.2.1: The mechanism of liquidity trap**

*Source:* author’s computations.

In this figure, liquidity trap is showed in an IS–LM diagram. A monetary expansion (in graph represented as the shift from LM to LM') has insignificant effect on equilibrium interest rates or output. On the other hand, fiscal expansion (the deviation from IS to IS'') contributes to a higher level of output with no change in interest rates. Since interest rates are stable, there is no crowding out. Even from this graph we can notice that the most typical characteristics of a liquidity trap are interest rates that are equal or close to zero bound and changes in the money supply that fail to translate into variations in price levels

Another economic event is called deflationary spiral. Deflationary spirals occur when there are some consecutive events, such as reduction of prices followed by a decline in production, and as result, wages and demand decrease quickly and significantly.

You can see these consecutive events in the figure bellow:



**Figure 2.2.2: Deflation's Downward Spiral**

*Source:* author's computations.

One well-known real example of deflationary spiral is Japan. The economy of Japan fell in a deflationary spiral 20 years ago and nowadays still works on solving it out. Officially, deflationary spiral in Japan started in 1989, when the Central Bank of the country triggered the asset bubble in the housing market through rapid boosting of the interest rates. As a result of this action, the Japanese economy for the next 10 years grew with less than 2% per year; many companies harshly decreased their spendings because they were afraid to take credits from the banks in these market conditions. Also many of them lost productivity and efficiency due to massive firing of working personal.

In his research, Daniel Okimoto, a professor at Stanford University, specified 5 important drivers of deflation such as following:

1. The political regime did not react in time to the economic problems which arose in the country;
2. In 1997, almost all taxes were increased significantly;
3. Banks failed to diversify their portfolios, and also on their balance sheet they were keeping too many illiquid loans;
4. The Central Bank of Japan lowered interest rates, and as result there appeared the possibility of cheating on yen;
5. Japanese government increased national debt, and it reached the level of 200% of Gross Domestic Product (GDP).

Which of these factors was the most important and determinative one is still unknown; meanwhile it is indeed known that Japan failed to solve this problem, and that deflation is nowadays one of the major fears of China and Europe.

Gauti B. Eggertsson in his work “How to Fight Deflation in a Liquidity Trap: Committing to Being Irresponsible” used micro funded general equilibrium model, making the assumption that nominal interest rate is equal to 0 to model this way deflation in Japan.

The idea of the paper was that deflation could be easily treated implying different monetary policy tools. As solution for liquidity trap, he suggested to buy real assets, also if it is possible to raise inflation expectations through lowering interest rate and stimulating aggregate activity.

Martin Harvey in his paper: “Is Europe heading for Japanese-style deflation? The differences, parallels and implications for markets”, tried to draw a parallel between Japan deflationary spiral and Europe current situation and the possibility of Europe to fall soon in the same spiral. However, he found out that European Banks reacted faster than Japanese ones, which is one big plus for Europe. He also pointed out that ECB is prepared to take some aggressive decisions and steps in order to eliminate deflation, and increase inflation expectations.

This was one perspective of analyzing the available information, papers and researches. Another perspective again splits scientists in two major groups. First group consider that deflation represents more a positive than a negative factor for the economic progress and growth. Meanwhile the second group strongly believes that this phenomenon has a bad influence on macroeconomic stability of the country.

First group includes some researchers such as: John Landon Lane, Angela Redish, Michael Bordo, and Joseph T. Salerno. First three of them are the authors of “Good Versus Bad Deflation: Lessons from the Gold Standard Era” paper of The National Bureau of Economic Research (2004), in which they take a look on the deflationary episodes from 19<sup>th</sup> century. The main finding of this paper was that in US, UK and Germany during 19<sup>th</sup> century, deflation had a positive impact or at the very least neutral, but never negative. Good deflation, according to their report, occurs when aggregate supply of goods rises quicker than aggregate demand, which has as result fall in the price level. Also, not to forget, deflation in this century was caused mainly by three factors: large immigration of population, innovations in the technological sphere and ascending international trade.

Joseph T. Salerno is a professor of economics at the Lubin School of Business at Pace University, also suggests that deflation has a good influence, because he argues that some major economic growth has arisen in periods of deflation.

On the other side of the medal stand P. Anthony Samuelson (1998), J. Bradford DeLong (1999), and Paul R. Krugman (1998) that together agreed that deflation is more related to the recession in the economy.

According to Paul R. Krugman, deflation represents a strong negative phenomenon due to its 3 main unfavorable effects. As a beginning, people will postpone their purchases because they expect in future a fall in prices; this can be offset by lowering the interest rate, but this is a possible solution for a scenario when the country economy is doing well, but if there are some problems, then even if Central Bank of the country will lower the interest rate to 0, it will not help. Secondly, the major impact is on debtors and particularly on their debts, therefore deflation will raise significantly the real burden of their debts. Thirdly, there will be an impact on prices

and wages level as well where both of them will have the tendency to fall rapidly and substantially. This reality will generate high unemployment rate, and as in case of Latvia and Estonia, only hopeless people will be willing to work.

J. Bradford DeLong in his article “Should We Fear Deflation?” (1999) argues strongly that we should be more afraid of deflation than of inflation because it will bring more damage to the economy and macro stability of the country due to decreasing nominal interest rate and willingness to invest, causing this way mass unemployment.

Deflation will affect the whole economy and it will cause difficulties to adjust in a proper manner prices and wages, this was the main claim pointed out by P. Anthony Samuelson (1998).

## 2.3 Empirical Approach

Nowadays we can find a huge variety of different empirical studies and researches on the topic of relation between deflation and macroeconomic stability, new studies as well as old ones. In 2004, Atkenson together with Kehoe tried to analyze price and output relation using large panel data for 17 countries. They found out that UK and Japan for example, didn't experience drops in output level, meanwhile US, Argentina and Canada had it.

In the same year, two other scientists Bordo and Redish using auto regression vector investigated deflation in Canada and US, between 1870 and 1913. One of their most important finding was that both countries experienced supply shocks, which influenced the level of the output. Meanwhile, money shocks led to high volatility of prices.

Through Dynamic Stochastic General Equilibrium (DSGE), Cole and Ohanian in 2004 discovered that productivity shocks minimize the role of deflation and of the monetary shocks.

Chen and Flaschel (2005) challenged themselves to find the answer at the question: “Should or should not change the macroeconomic model when the economy achieves

the critical point of zero inflation?”. Further they proposed some tests to assess in which way the changes in monetary policy affect the state of economy, and deflation.

Lucas (2000) using aggregate data for US, for a period of 4 years (1990-1994) checked if decreasing inflation rate generates welfare gains. He used a scatter plot, on the horizontal axis was placed short-term nominal interest rate, and on the vertical axis was showed the ratio of money holding to nominal income. Also implying a model of currency substitution, he confirmed his initial hypothesis of welfare gains that occurs when we have disinflation situation.

Guerrero and Parker (2006) verified the idea that deflation is closely related to depression. Through implying Granger causality test, authors focused their attention only to years in which occurred simultaneously both, recession and deflation. In this way they demonstrate that deflation generates recession. Then they estimated econometric model of fixed effects where they combined deflation and inflation episodes in the same time. In such a way, they concluded that lagged deflation has a negative effect on the growth of the output, highlighting the fact that this effect has a small but still significant economic power.

Despite the fact that there are a lot of available researches on this topic, each of them has some specific boundaries and restrictions as following.

Bordo and Redish (2004) analyze only 2 countries for a period of 43 years, which could affect conclusions and their findings, because of the possibility of the presence of selection bias. Cole and Ohanian (2004) based the whole their work only on one model – DSGE.

Lucas (2000) centered his findings on the conclusions he drew only from one country – US, for a very short period of time (only 4 years). Short period of time may conceal some important changes in data. Atkenson and Kehoe (2004), in their regression independent variables: output and inflation were represented as a 5-years averages which as well, as in previous cases, may hide some relevant data.

Guerrero and Parker (2006) tried to solve this possibility of hidden data, so they included in the regression annually based data, and in the end arrived at the

conclusion that in case when deflation go along with recession, then acute deflation will generate more profound recession. Even though one of their main scopes was to determine whereas economy does better in the period of inflation or in period of deflation, their results didn't say anything about the cases when deflation is accompanied by the output growth.

In comparison to previous papers, the present work analyzes the close relationship that exists between two important economic phenomena such as deflation and macroeconomic stability on the example of only European countries. In order to analyze the potential relationship between change in prices and output in a more complete and extensive way, is used a set of large panel data composed of 18 countries, over approximately a span of time of 34 years.

By analyzing so many countries, I will have a possibility to seize the main differences and similarities in the factors that caused deflation, as well as in the precautions taken by different countries in order to stabilize it.

I will investigate this panel data through fixed effects model. A fixed effects model is an econometric model that shows the measurable quantities of indicators about which we care, in terms of explanatory variables of one regression. In my equation data is interpreted as being non-random - this is indeed the specific of this model in comparison to random effects models or for example mixed models, in which either one, some or even all explanatory variables are interpreted to derive from random reasons. Also I implied random effects model and generalized method of moments.

The analysis will be done implying some empirical evidence, and namely evaluating the past and current economic situation in 11 euro zone countries (Belgium, Cyprus, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Slovakia), plus Bulgaria, Norway, Poland, Romania, Sweden, Switzerland and United Kingdom.

Macroeconomic stability will be assessed through evolution of consumer price index; an indicator that evaluates the weighted average of prices of a basket of consumer goods and services, each good in the basket is examined according to its importance.

The independent variables are planned to be the inflation/deflation rate and foreign direct investment taken as percentage from GDP. The choice of independent variables must be correctly specified in order to keep a low number of regressors and relevant variables. As for the dependent variable I decided it to be GDP growth, because it represents one of the most important characteristic when we speak about macroeconomic stability of a specific entity.

# 3 Data analysis

## 3.1 Data Description

In the end of 2014, inflation (which turned slowly but precisely into deflation) arrived to a critical rate, and it became a serious problem not only for the whole Europe but also for the whole world. Because, as mentioned by Krista Schwarz: “Europe is big enough to effectively ‘export’ its deflationary problem to the rest of the world.”

Being aware of this situation, in my dataset, I gathered large historical dataset with annual observations on output, prices levels, and foreign direct investment of the country. Output is measured as real gross domestic product of the country (GDP) and prices are represented in my regression through the Consumer Price Index (CPI). The dataset consists of 18 European countries such as: 11 euro zone countries (Belgium, Cyprus, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Slovakia), plus Bulgaria, Norway, Poland, Romania, Sweden, Switzerland and United Kingdom. I will analyze data for a period of 34 years, starting with 1980 until the most recent and available data – nowadays.

Almost for all the countries, the observations start in 1980, but there are some exceptions such as Slovakia, for which I have some missing data, due to the fact that this country became independent from Czechoslovakia only at 1 January 1993.

I excluded observations that have extreme values of price growth, which means that I took out all the observations higher than 20%. The reason behind this decision is that in my research I want to see how economies of the countries work and evolve under the pressure of fairly “normal” inflation rates in comparison to the situation in which we can observe vice-versa - “normal” deflation rates. For the same reason, I also eliminated the hyperinflation and hyper deflation observations, in order to achieve more accurate results, because the main scope of this paper is to analyze and to try to

find a solution for nowadays situation, where inflation/deflation is limited in the range between -5% and 10%.

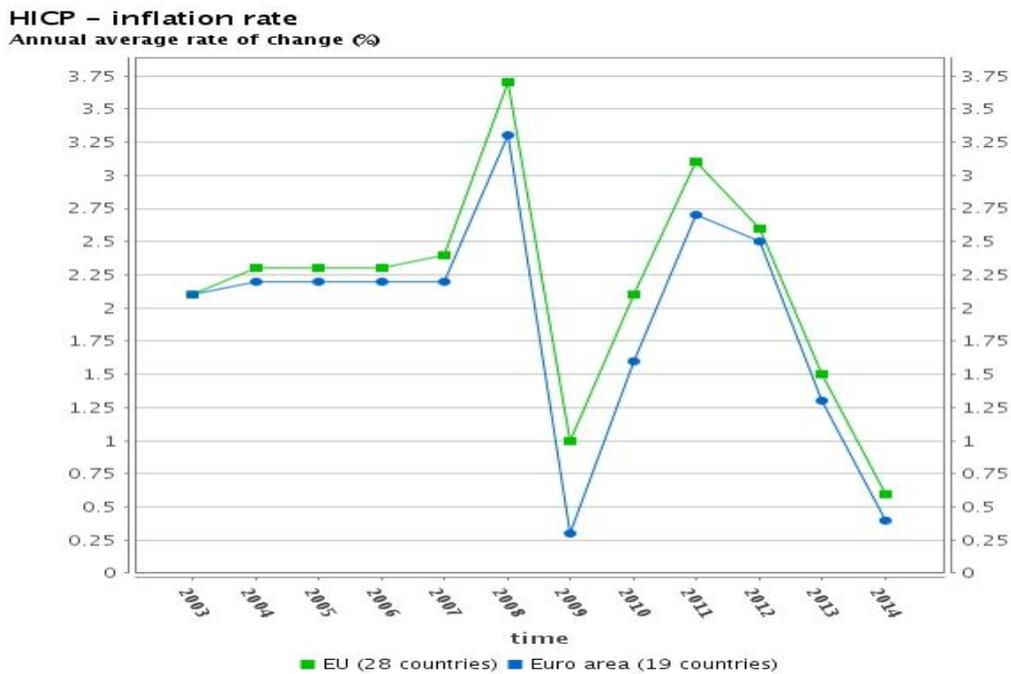
The data for variables under my investigation have been collected from two main sources such as: World Bank Development Indicator (WDI) and International Financial Statistic (IFS). Because I have a long panel data, my regression is examined through fixed effects model. Paul Allison in his book “Fixed Effects Regression Models for Categorical Data” defined fixed effects models as models that control for, or partial out, the effects of time invariant variables with time-invariant effects. This is true whether the variable is explicitly measured or not.

## 3.2 Basic Statistics

If in November 2014, only 4 EU countries were experiencing problems with falling CPI, then in December already 16 countries were facing the same acute problem, where CPI reached the level of just 0,1%. CPI of these EU countries fell so much that achieved the record level as in early 1997. As result of this steep falling EU's statistics agency arrived to the conclusion that Europe in this year – 2015, should be more aware of deflation, which will affect not only EMU countries, but also the rest of EU members.

Meanwhile, ECB Executive Board member – Peter Praet declared his total confidence on 16<sup>th</sup> April 2015, that inflation in EMU will gradually return to the Bank's price stability target and that sustained disinflation in the Eurozone is not probable. Eurosystem staff projections for euro area Harmonized Index of Consumer Prices (HICP), published in March 2015, show inflation rate returning slowly to target by 2017. However, the ECB's quarter Survey of Professional Forecasters, issued a month later – April 2015, shows inflation only increasing 1.6% in 2017 and indicates only moderate upticks in the next year. In the figure below, I projected annual inflation rate (annual average rate of change, %) of EU countries in comparison to EMU countries. Looking closely at this figure, we can easily observe that inflation rate for EMU countries starting from 2003 until 2014 was all the time

smaller than the same rate for EU countries. This graph suggests us the idea that common currency and monetary policy together represent a source of low inflation.



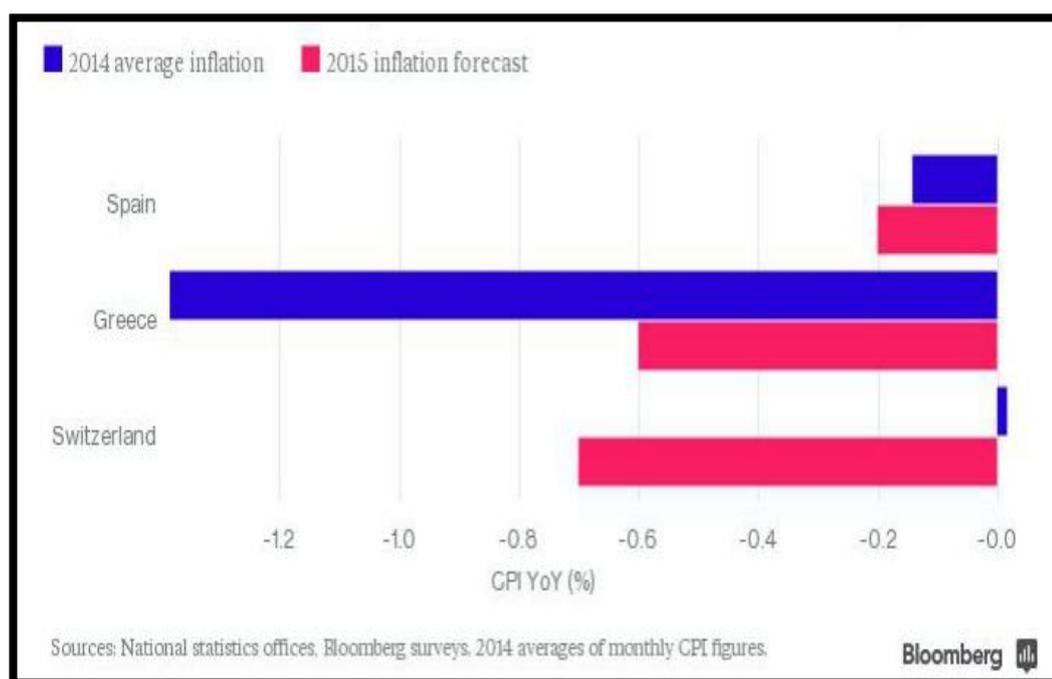
**Figure 3.2.1: Annual rate of inflation in the European Union (HICP, %)**

*Source:* author’s computations.

Although, in the end of 2014, some experts were sure that 2015 would be the first year in which nobody would experience deflation, it is still here. As result of a dramatic collapse of oil prices, which over last couples of months fell from \$107 to just \$56 for a barrel, deflation could not be avoided. Another difficulty was caused by the Syriza’s victory in Greece’s election, which is perceived as boycott of Greek people against austerity from other EU countries.

These 2 reasons taken together, made the experts believe that in 2015 several countries will face deflation. According to Bloomberg, Bulgaria (the most deflationary country in the world), Croatia, Greece, Poland, Spain and Sweden will need to deal with deflation, but Greece, Spain and Switzerland are expected to have the worst annual deflation in this year.

In the figure below we can observe the forecast for 2015 of inflation rate, based on CPI volatility in the last months of 2014.



**Figure 3.2.2: Inflation forecast for 2015**

*Source:* Bloomberg surveys

In 1958, A. W. Phillips showed the trade-off that exists between unemployment rate and inflation rate. According to him, there is an inverse relationship, which means that when inflation increases then unemployment decreases.

In the last 4 years, starting from 2010 until 2014, we could see that unemployment rate for Euro Area increased from 10% to 12,5%, meanwhile inflation decreased from 0,9% in 2010, to 0,1% in December 2014. Therefore Europe now has so called “double trouble”, which makes the process of finding the solution for deflation ever harder and more difficult.

The figure below illustrates this situation.



**Figure 3.2.3: Double Trouble, Core Inflation (% change on year earlier)**

Source: Eurostat

If deflation problem will not be solved, it will cause an increase in real value of debt; real interest rate is also expected to raise therefore; consumers, on the contrary, will be discouraged to purchase goods and willingness to invest will slowly disappear. All these factors can cause Europe to follow the Japanese scenario, for which deflation became a norm and not a problem. That's why is absolutely necessary to find solutions as soon as possible, in order to minimize the possible consequences.

### 3.3 Comparison of Monetary Policies across Countries

In this part of thesis I decided to analyze 3 different monetary policies, of US, Japan and of EU members with the reason of choosing the one that fits the best current

market situation and deflation. Further more I want to determine and find out which implied tools were effective and which ones showed no benefic results.

In the US, the Federal Reserve responds of monetary policy of the country, and puts it into action primarily by executing operations and implementing different tools that manipulate short-term interest rates. The last time the U.S. economy seriously confronted deflation was in March 2009, directly after global financial crisis, when the CPI fell below zero. At that moment the Fed under Chairman Ben Bernanke applied one of the most unusual tool – quantitative easing.

Fed implemented quantitative easing by purchasing specific quantities of financial assets from commercial banks and other private institutions from the market. In such a way, Fed targeted to increase the prices of those financial assets, plus to reduce their yield, while at the same time growing the monetary base of the country. This tool is distinct from other more common policy tools of buying or selling short-term government bonds planned to keep interbank interest rates at a concrete target value, specified by the monetary policy. Unlike a large number of other countries – especially some European nations – the US nowadays is not facing the problem of general price declines. However, the risk of such a scenario has increased substantially.

It will be extremely interesting to observe which actions will be taken by Fed in current situation when the wage growth under disinflationary pressure reduced significantly; also the crash of oil prices as well as other commodity shook the whole energy market, while CPI trend has fallen to 2009 levels.

The Bank of Japan (BOJ), as the central bank of the country, takes the decision and applies monetary policy tools with the main scope of keeping price stability in the country. The BOJ set the "price stability target" at 2% in terms of the year-on-year rate of change CPI in January 2013, and it had taken an obligation to reach this target as soon as possible, maximum time horizon being 2 years.

The BOJ initiated Qualitative and Quantitative Easing (QQE) in April 2013 to accomplish the price stability target that was mentioned above of 2% in terms of the

year-on-year rate of change in the CPI. Implying this method, the Bank keeps seeking a new stage of monetary easing in terms of quantity and quality. The main objectives being to double the monetary base and the volumes outstanding of Japanese Government Bonds (JGB) as well as Exchange-Traded Funds (ETFs) in next 2 years, and also to extend largely remaining maturity of JGB acquisitions. This plan has the following steps:

- The implementation of the "monetary base control" ;
- A raise in JGB acquisitions and increase of their maturity;
- A significant growth in ETF and of Japanese Real Estate Investment Trust (J-REIT) purchases;
- The maintenance of the QQE;

And it seems that Japan finally transformed deflation into inflation, in February this year, their inflation rate was equal with 2,2% and forecasts promised that this rate will keep growing in next months.

Taking a look on EU, here the situation is a little bit more different and at the same time more complicated due to the fact that EU's monetary policy is one for the all euro area member countries. It is controlled through the ECB and the national central banks of the euro-area member countries, which jointly create the Euro system. Resolutions and compromises on the euro area monetary policy can only be adopted by the Governing Council of the ECB, which consist of the governors of the national central banks of the euro-area Member States and the representatives of the ECB's Executive Board.

The main objective of ECB, as in case of BOJ, is to keep inflation equal or below 2% in the medium term. The level of 2% is considered as optimal level for encouraging economic growth and full employment. If in the past years ECB was not facing any problem in achieving this target, now the situation has slightly changed not in the positive direction. The well-known set of instruments like open market operations (OMO), standing facilities, and minimum reserve requirements for credit institutions

are not working well anymore. So, naturally there appears the question, which is the solution for current deflation?

One solution that seems to be a little bit weird and uncommon is that a new monetary policy based mainly on “off balance sheet” or “derivative based” can help.

The idea that monetary policy can manage to use derivative contracts markets to achieve its scopes was published in the literature before, for example at Bindseil, Mercier, Papadia and Würtz (2011), but it had found only very rare application in practice. The acute necessity of finding new instruments for the unmanageable problem of drifting inflationary expectations could now give the right impulse to test this idea in real life.

The main idea of this theory is that the ECB is able to propose an option in which it would refund to participants in the contract a specific sum of money if the inflation rate was, over a particular period, smaller than a specified bound, representing the strike price of the option contract. Rather, or it can be counted as a plus, the ECB could enter in the inflation swap market, through introducing a fixed rate of inflation opposite to existing floating inflation.

Buyers of the option or counterparties in the swap contract would earn money in case that the rate of inflation was smaller than for example ECB’s target of 2% over a specific period, equivalent to the “medium term” in the inflation aim. Theoretically, this movement should increase inflation expectations through a large number of different channels.

In the global financial market, the higher inflationary prospects, paired with cash acquisitions of securities under the proposed by ECB program of Extended Asset Purchase Program (EAPP), would be able to reduce the real rate of interest, thus it would be benefic for investments. The entry of an important trader of protection contra deflation can modify the expected value of inflation, and also could change its whole distribution, shifting the undesirable tendency that could be observed nowadays. As a result, this step would reduce the period of deflation, giving to the market participants a general feeling of safety and protection.

On the other hand, on the product market, motivations to delay acquisitions for consumption hoping for further reducing prices would be compensated, since consumers would be able to protect themselves through buying the protection proposed by the ECB against extremely small inflation or even deflation, thus offsetting the probability of smaller prices.

In the market of labor force, companies could propose higher salaries for their employees since in the future they would be reimbursed for it, in case that inflation was lower than a specific threshold, by the safety provided due to the option swaps or the inflation swaps granted by the ECB. Fairly, it is logic to suppose that employees would ask from firms for higher wages: to imagine this, it would be as in case if the Phillips curve had deviated up and to the right side. So, in general there should be a beneficial impact from an instrument that is primarily used to solve the problem of too low inflation.

Implying this method would have benefits not only for economic sector of the country but also it can provide in long run some “political” advantages, because the adoption of this tool would delete the question of a potential disorientation between monetary and fiscal policy of the country, which is surely a controversy, as there would be no viable relation between operations in the derivative market and the financing of government losses. This should be gladly received as a result of the ECB sharks, which could observe the confidence of the ECB on QE being weakened. Further more, if some witnesses anticipate, the ECB would identify it problematic and challenging to buy all what it plans to, so it may be practical to have another back-up instrument to force back inflation approaching the level compatible with price stability on the markets.

Continuing this idea, I can say that for the ECB the risk which appears from creating inflation options or trading protection contra too low inflation in the swap market of the country would look more agreeable, because there will be no exposure to the risk of sovereign default.

Another major risk – counterparty risk - will minimize and become controllable due to implementation of collateralization.

Of course as in any other cases, the coin has two faces; there can appear substantial obstacles in starting a plan of actions in the derivative market. The most complex one is that the ECB would need to act practically blindly, because it will not have any precedent on which to base or on which to calibrate the program.

Also, it is hard to determine the number of how many swap or option contracts should be initiated by the ECB to achieve the wanted effect on inflationary prospects.

However these problems can be efficiently solved out by “experimenting” and creating the program fully open for everybody: institutions, companies, traders, and analysts etc., i.e. maintaining this design of the program until the proposed goals are achieved. Everybody knows that the EAPP is quasi open, while this program which can be called as the Derivative Market Program (DMP), should be totally open.

It is a normal fact that in the implementation of this plan will appear also some technical problems, related to the restricted and sometimes even finite quantity of liquidity on the derivative market for inflation, although the price the ECB should propose on its options or swaps is hard to find out, also it is not even understandable whether it would not be better for the ECB to sell these contracts to the companies for free, similarly to what it does while providing standing facilities such as deposit and marginal lending facility.

As we can see, these 3 analyzed monetary policies are quite different from each other, but is noticeable the trend that European countries as well as American states and Japan are facing or have faced inflation. One of the most popular tools implied for solving this acute problem was quantitative easing. In case of Europe nowadays, there have been proposed a lot of other scenarios and programs, one of which I described above, anyway it is not so important which program will be chosen, but which results will be achieved.

# 4 Empirical Investigation

## 4.1 Introduction to the model

The starting phase in any regression process is to point out the model. The econometric model of this paper is as following:

$$\Delta gdp_{it} = \beta_0 + \beta_1 \Delta gdp_{it-1} + \beta_2 \Delta \pi_{it} + \beta_3 \Delta \pi_{it-1} + \beta_4 \Delta i_{it} + \beta_5 \Delta i_{it-1} + u_i + \epsilon_{it}$$

Where I have that:

- $\Delta gdp_{it}$  – stands for growth of the Gross Domestic Product, annual in % ;
- $\Delta \pi_{it}$  – stands for inflation/deflation measured as consumer prices, annual in %;
- $\Delta i_{it}$  – stands for foreign direct investment (FDI), net inflows (% of GDP);
- $u_i$  – error which accounts for country specific;
- $\epsilon_{it}$  – random error which combine all unobserved factors which also influence on the dependent variable.

This way, using this regression I will study and interpret if there is present or not a negative relation among output growth and inflation. The negative relation that exists between inflation and GDP implies that when inflation increases then we should expect the output level to decrease. Being undesirable monetary phenomenon, low inflation should be eradicated as soon as possible, or treated and kept at the “optimal” level through different monetary instruments as the only way countries and governments can hope for an economic progress.

In the regression will be used lagged dependent variable and lagged independent variables, to produce robust estimates of the effects of independent variables - such as

inflation and FDI on the dependent variable (growth of GDP). Although there are some papers that have shown that using lagged variables in equations results in negatively biased coefficients of the estimates, in this order of ideas, I will show that these problems are easily eradicated by defining a regression model which accounts for the presence of autocorrelation in the error term.

## 4.2 Dependent Variable

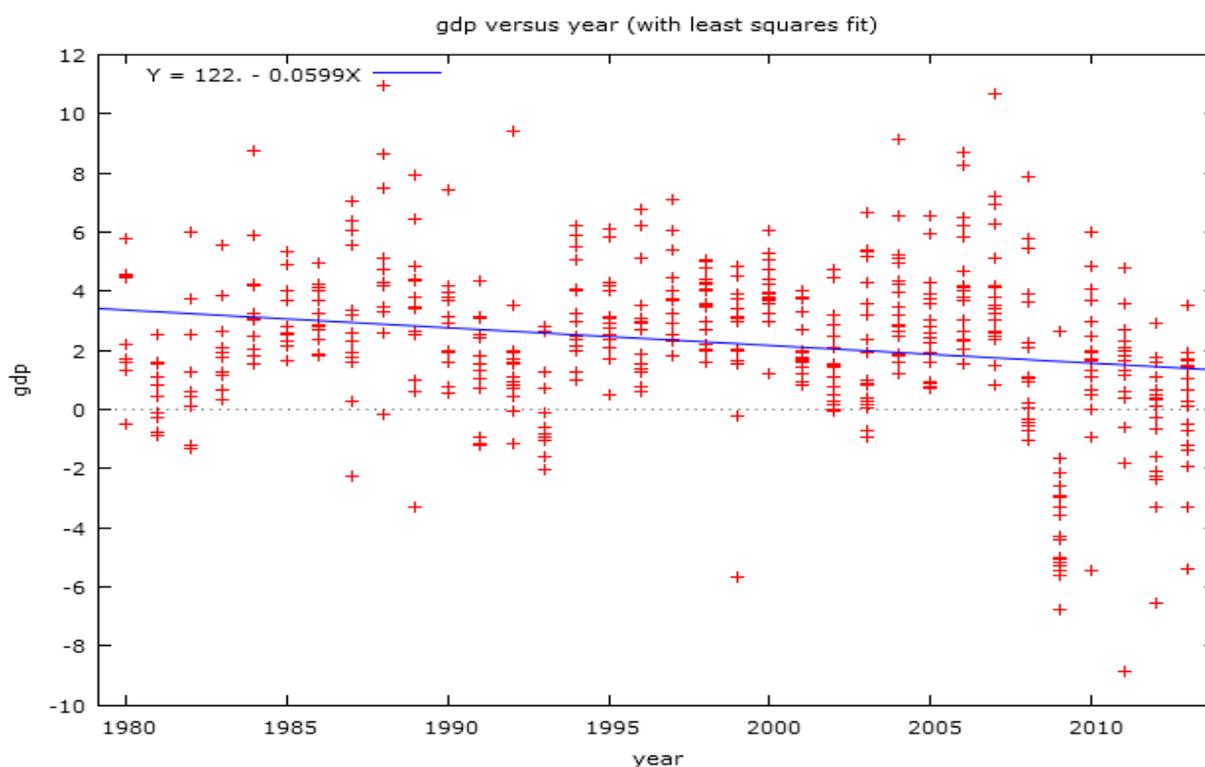
One of the main purposes of this paper is to analyze the growth of GDP during a period of 34 years. According to Business Dictionary, gross domestic product term stays for the value of a country's overall output of goods and services (typically during one fiscal year) at market prices, excluding net income from abroad.

Growth of GDP, shows what economic performance one country managed to reach. There are wide number of factors which impede or vice-versa, promote economic growth of the country. It is therefore essential and reasonable to try and observe which of the explanatory variables mentioned on the other papers come up as growth determinants.

It is easy to suppose and agree that economic production and growth of GDP have a great influence on everyone and everything linked directly or indirectly to an economy. When the economy is in a good condition or in other words, the economy is healthy, at that moment obviously can be observed low level of unemployment and meanwhile wage increases as a result of increasing businesses demand for competent labor. A substantial increase or decrease in GDP commonly has an important effect on the stock market of the country. When economy faces problems it leads to a decrease of earnings further followed by a decrease of stock prices. This decrease represents a signal for investors; they should stop to invest in an economy that has all the signals of easily entering into recession.

Plotting the data of GDP versus year, from 1980 until nowadays, we can observe that starting with 2008, the year when financial crises arose, many countries had to confront the decrease of growth of GDP due to unstable market condition, volatility of aggregated demand and supply, fall in purchasing power, or because of rise of imports, and increase of interest rate.

In the figure below, I have plotted the data.



**Figure 4.2.1: GDP growth (in %) versus year**

*Source:* author's computations.

Important thing to remember is that, so called negative growth is one of the tools used for measurement of recession or depression and that the statement of negative growth affects directly consumers and investors, but this is just one major factor from many other factors which can lead to recession or even depression.

## 4.3 Independent Variables

Following the idea above it is crucial to understand and be able to predict the growth of GDP. For this reason, it is very important to choose the right explanatory variables. In this paper, the independent variables are inflation/deflation rate measured as consumer prices, annual in percentage and FDI, calculated as net inflows, and represented in percentage of GDP.

According to Ryan Barnes, inflation can mean either an increase in the money supply or an increase in price levels. Generally, when we hear about inflation, we are hearing about a rise in prices compared to some benchmark. If the money supply has been increased, this will usually manifest itself in higher price levels - it is simply a matter of time.

The CPI measures inflation, in the present case, because this index does not include energy and food prices, which are extremely volatile. Perceiving how GDP and inflation are correlated with each other is not as simple as it can seem to be at first sight.

The main argument is that there are still many debates about this topic. But these 2 terms frequently are related together because the central banks and the government usually take decisions in accordance with these figures and they also try to shape them. Lowering inflation should determine growth of GDP.

Every economic entity including Bank of England, ECB and even Fed keeps saying us that deflation is one of most important event that can ever happen to a country. Then it is really impressive, given the "showed" importance of this issue — and the possible secondary negative impact of pro-inflation practices and management — that only a minor number of people seem to be bothered as to ask the wider, crucial question: does the historical data prove that deflation is actually a dangerous phenomenon?

The data demonstrates vice-versa that it is not. Taking a look at recent GDP growth rate, inflation, and FDI data, we could think that deflation can be even favorable for some countries. Some real examples are Greece, the Netherlands and Spain.

In euro zone, there are two countries considered to be the most affected ones by deflation, namely Spain and Greece. In Greece, deflation started since the beginning of 2013, when the prices started to fall sharply. Meanwhile in the second country, Spain, the annual inflation rate started to drop a little bit later, at the end of the spring 2013 and soon it declined steeply, to 0% boarder, in just a couple of months until the autumn. It further stayed at 0% boarder until 2014, when in summer it definitely decreased below 0.

Now looking at the GDP growth rate of Greece, we can notice that in the first quarter of 2013 this rate dropped by huge 5,8%, but the most interesting thing is that this big shrunk was registered only in the first quarter, later the decrease become smaller and smaller. But, in 2014, economic growth of Greece comes back, and it increased by almost 2%. The prices started to decrease as the economy started to recover and to go back to the healthy path, at the same time.

For Spain, we can observe the same inexplicable situation. In the end of January of 2015, this country announced 0,7% GDP growth rate for which represented the largest growth of the last 7 years.

Plotting only the Spanish GDP, in the figure below, we can observe that the rate of diminishing started to decrease in the first quarter of 2013, and later in the third quarter of the same year, the economy started to recover and to grow.

And this rate since that moment never stopped to increase, from 0,2% to 0,7% in the last 3 months of previous year. The paradox is that economic recovery took the place at the same time when the prices were falling, and inflation was slowly turning to deflation.



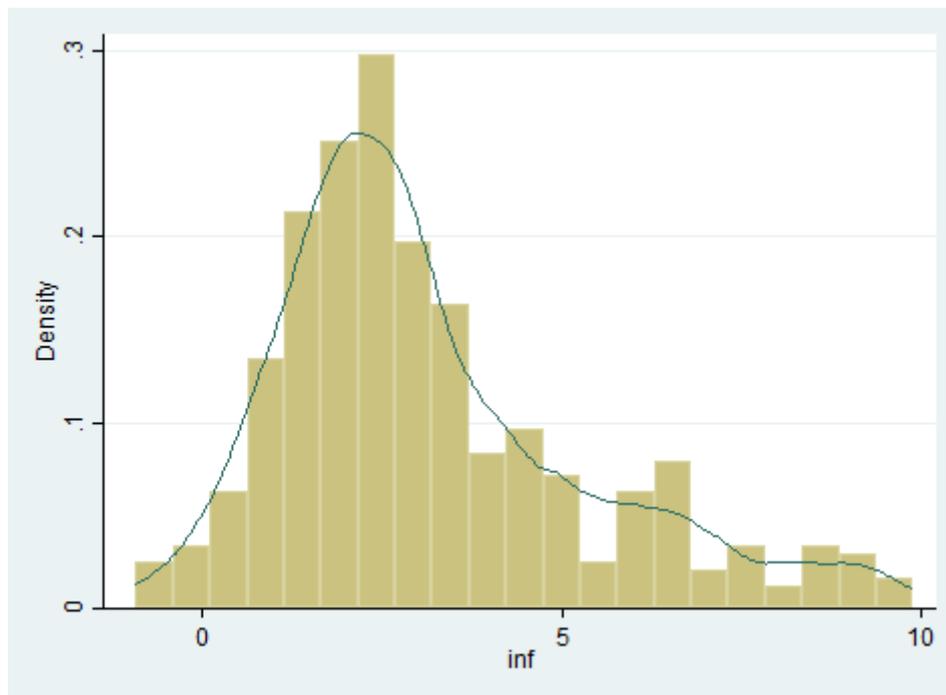
**Figure 4.3.1: Spain GDP growth (in %) versus year**

*Source:* author's computations.

Another example is Netherlands, where the inflation rate started to fall down in summer of 2013. In just a couple of months this rate decreased by 1,6% and achieved the frontier of 1,5%, meanwhile until the end of the year it got reduced to the critical limit of 0%, and recently it continued to decline even below 0. GDP growth as in previous cases showed a positive increase. These real cases contradict what we have been told from central banks and famous economists. That is why it is essential a better understanding of the effects of inflation which lead to deflation on the economic growth of the country.

In the graph below I plotted inflation distribution for 18 countries on these 34 years of interest. And from this graph is visible that the data does not have a normal distribution (for more details please check Annex 1 and Annex 2). All observation are concentrated from -1% to 10%.

The biggest cluster of observation we can notice at 2-3%. This distribution can be driven by some outliers from data. In order to obtain accurate estimates, later these outliers will be omitted.



**Figure 4.3.2: Inflation distribution (excluding outliers)**

*Source:* author's computations.

As we know, nowadays, world is continuously evolving through two main processes such as integration and globalization. One of the engines that drive them is foreign direct investment. FDI plays an important role in the economy because it contributes directly to the economic growth of the country, especially when speaking about developing countries. Since this investment can be developed or expanded in some sectors, It can also have a positive influence on the process of sharing knowledge and technology.

There is a common conclusion between policymakers that FDI can provide positive output effects for host countries. The most important instruments applied for these type of externalities are the implementation of new technology and know-how, which can be done through accredited agreements, legal imitation, various trainings for employee and employers, and the application of new mechanism, products and tools by foreign companies; by developing as well the formation of strong connections between domestic and foreign companies.

These advantages, jointly with financing through direct capital yields, can perform a crucial role in improving and renovating a national economy and boosting economic

development of the country. The empirical evidence on the presence of such a positive relationship is quite restrained.

Nowadays available empirical papers identify varied evidence on the existence of positive impact of FDI in the host country, this impact mainly being achieved by international companies. Local markets also play an important role in generating economic growth via backward connections.

In a tiny open economy, the production of final goods is accomplished by both domestic and multinational companies, which compete against each other for high skilled labor force, but also for inexperienced labor, and raw materials. To keep running a company from intermediate goods sector, businessmen must build up a new mixture of intermediate goods, a responsibility that involves upfront capital investments.

The more grown and mature the local financial markets of this country are, more accessible it is for capital embarrassed persons to create their own start-up. The boost in the number of available assortments of intermediate goods drives to benefic spillovers in the final goods sector. All in all, financial markets permit the backward relationships between domestic and international companies to evolve into FDI spillovers.

Analyzing macro empirical literature, I found a little support for the idea of existence of an exogenous positive impact of FDI on growth of GDP. Data and main findings in these researches show that a country's ability to use and perform the advantage of FDI externalities could be restricted by local situation and local specific, for example such as the progress of the local financial markets or the evolution of educational system of the country, i.e., assimilative abilities.

Xu (2000) and Borensztein, De Gregorio, and Lee (1998) in their works proved that FDI contribute to expansion of technology, which turns into greater economic growth only in the case when the host nation has a very low threshold of knowledge, habits, talents and so on, in other words – stock of human capital.

Another scientific such as Alfaro, Chanda, Kalemli-Ozcan and Sayek (2004), Durham (2004), and Hermes and Lensink (2003) present evidence that only countries which dispose of well-developed financial markets can take a significant advantage from FDI.

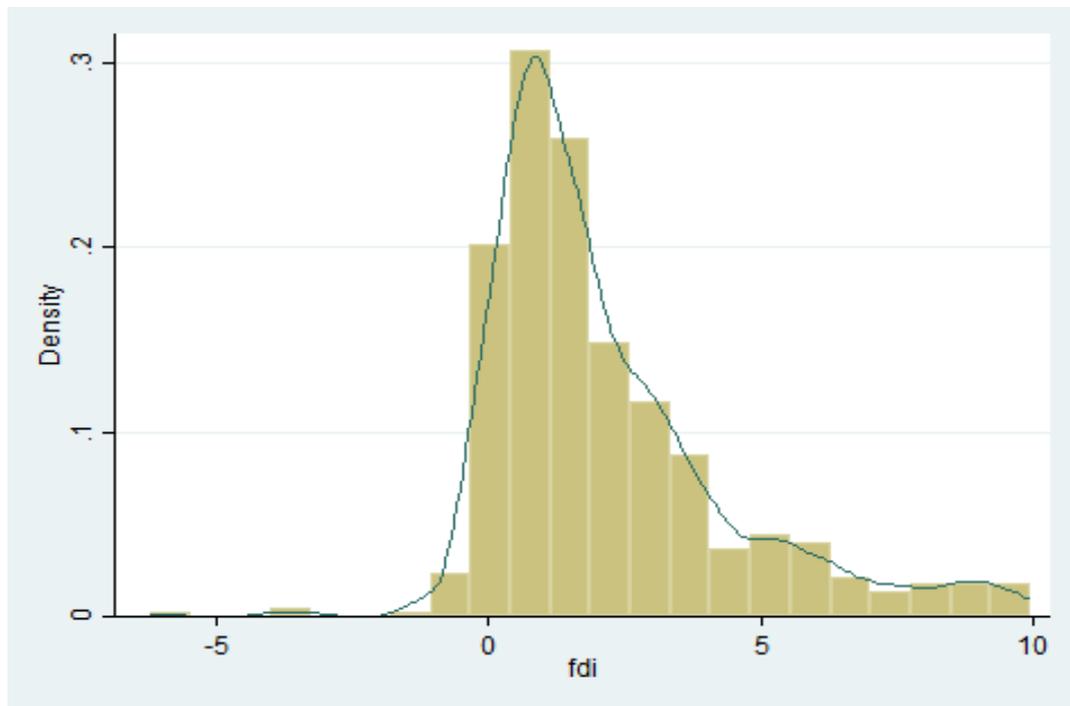
From another point of view, the micro empirical literature identifies uncertain and questionable results for the impact of FDI on company's production. The researches appeared in three consecutive waves. The first well-known work being the paper written by Caves in 1974 belongs to the first generation papers which were centralized on country particular case studies and industry level cross sectional studies.

Further studies showed up a positive relation between the productivity of a multinational enterprise (MNE) and the generated increase of growth of GDP of country.

The impressive rise in FDI inflows, demands comprehensive analysis of their potential linkage, because the hypothesis that there is a positive relationship between FDI inflows and GDP growth cannot work for all countries, as was mentioned above it depends on the size of financial markets and national specific features of each country apart. Such an important concern merits to be examined for one group of countries, to clearly determine their connection.

Hence, this paper aims to show and specify the relation between FDI inflows and GDP growth of 18 European countries over 1980 to 2013.

In the graph below I projected the distribution of FDI for 18 analyzed countries, excluding all outliers above 10%. From the graph we can remark that the biggest cluster of FDI is localized at the level of 0-3% .



**Figure 4.3.3: FDI distribution (excluding outliers)**

Source: author's computations.

## 4.4 Assumptions and Hypotheses

The past economic situation in Japan and current financial condition in the whole world, inspired many scientists, so there have been done many studies which analyze the possible link that could exist between these two fundamental indicators. Therefore there is a large number of assumptions and hypotheses.

According to one recent research realized from the Bank for International Settlements, one of the main hypotheses is *that the tie between economic growth rate and constantly falling prices is extremely fragile and powerless*. They found that since World War II (WWII), in the whole world, during one century, there were approximately 38 countries which suffered of short-term deflation, and that during that deflation period the average growth of GDP was higher with 0,5 % than in periods with inflation, in which average growth of GDP was approximately estimated at 2,7 %.

Followers of Keynes theory affirm that *in periods of expansion, there cannot be place for a negative CPI*, but after Civil War, the world had occasion to observe during at least 6 years (1879, 1895, 1922, 1928, 1939, and 1955) this phenomenon. In all these 6 years, US's economy registered growth of GDP and progress in the whole country industry.

The Bureau of Labor Statistics (BLS) in written report from 2004 highlighted an interesting fact that CPI was below 0% rate during 11 years in the end of 19th century. The year of 1879 as well as 1895 were only two years from these 11 already mentioned. The National Bureau of Economic Research (NBER) statistical journal demonstrates that actually the world economy during these 2 years was in expansion phase, in 1879 for 9 months and in 1895 for almost whole year (11 months) regardless of a negative CPI in both years.

Rattan J. Bhatia in his research propose the hypothesis of *existence of a two-way relationship between change in the price level and change of GDP*, because from one side prices influence GDP and from another we can see a vice-versa situation. Also he supposes that it is very difficult to predict this linkage due to the fact that it is hard to define which one is the dependent variable and which one is the independent one. His hypothesis was based on the conclusions which were drawn from past years studies.

From the past we can observe two opposite episodes. When we speak about Germany, the rates of GDP growth were inversely related to the rates of change in prices, meanwhile for Sweden these rates had the tendency to move jointly in the same direction.

A.P. Thirlwall and C.A Barton in 1971 state another assumption, and namely that *only mild inflation can be favorable for GDP growth*. They tested this idea by taking 17 most developed countries in the world with medium rate of inflation (3-8%), and the evidence from this cross-sectional data proved their assumption. But for less developed countries, they agreed that the evidence is still ambiguous.

In this research I want to test 3 main hypotheses. First of all I want to find out if there is present *positive relationship between rate of change of prices and rate of change of the output growth of the country*. Secondly, I am interested to see if *FDI have a significant and positive relationship with GDP growth*. Thirdly, as many economists nowadays suppose that monetary policy of the country is one of the main sources of deflation and stagnation risk, in the situation when price stability is fully trustworthy, these facts generate questions, such as: “Which are tools of monetary policy can be applied in condition of deflation?” or “Could one monetary policy be suitable for all EU members?”. In this context, my scope is to analyze the risks and the consequences of different approaches applied by the policy makers, and to find the answers at these questions.

It is very important to see the results of testing the hypotheses above and to know the answers for these questions, since on the worldwide financial market at the moment we can observe a very unstable and unpredictable situation, one recent example being the oil prices catastrophe.

In the last six months we were witnessing an oil disaster, more specifically, a crash of oil prices which declined abruptly. This decrease froze all big transactions. According to famous economists from the whole world, this crash was caused mainly by the existence of an excess of supply of oil on the market.

Last month or in February of this year, Goldman Sachs group presented an interesting research that illustrates what many of us already suspected: Guilty in this oil crash has been a great amount or supply of oil on the world market, which as a result caused a large supply shock in the second half of 2014. In two first months of this year the situation did not get better, slowing demand led to the continued sell-off. Such unexpected events showed to us that oil represents a key component of almost every product in the world, interacting with each entity in one way or another. That is why, in the moment when energy prices fall, products prices will also decline, and falling prices is indeed the core of deflation. So, oil crash can be also classified as one of the main factors that contributed to deflation in 2014.

## 4.5 Methodology

The series for almost each country starts in the same year (1980), but the sample that I have is unbalanced panel dataset. Because my dataset does not contain a time variable, also each panel contains the different number of observations due to some missing observations. There is a possibility of potential unobserved country-specific effects - to solve this I imply the fixed effects model, random effects model and also generalized method of moments (GMM) for estimation of the effect of change in the prices on the change of the output growth.

I include 3 different methods of estimation for the reason of checking and comparing the results, and only after doing that I will select the best model that fits my data in a proper way. The motivation behind choosing fixed and random effects models is clear and understandable, panel data is often estimated namely by these methods. GMM estimators involve assumptions about the moments of the arbitrary chosen variables to derive an objective function. I use GMM because during the estimation of GDP growth, as independent variable I work with GDP time lag of first and second order.

The key model for estimation of output growth I use in this paper is an autoregressive process. Autoregressive (AR) model is a representation of random process that allows characterizing and outlining this time-varying process in economics, such as change of the price level influence on the change of the output growth. Also AR model defines that the output variable depends linearly on its own previous values.

The model of this paper has as independent variables the lagged value of output growth and both the present and lagged change in prices, as following:

$$\Delta gdp_{it} = \beta_0 + \beta_1 \Delta gdp_{it-1} + \beta_2 \Delta \pi_{it} + \beta_3 \Delta \pi_{it-1} + \beta_4 \Delta i_{it} + \beta_5 \Delta i_{it-1} + u_i + \epsilon_{it}$$

Where  $\Delta gdp_{it}$  is growth of the Gross Domestic Product, annual in % ;  $\Delta \pi_{it}$  stands for inflation/deflation measured as consumer prices, annual in %;  $\Delta i_{it}$  represents foreign direct investment (FDI), net inflows (% of GDP);  $u_i$  and  $\epsilon_{it}$  are errors which accounts for missing data, unobserved factors of influence and for country specific.

As control variable I chose FDI because it is relevant for GDP another reason of choosing namely this variable being its availability as a historical data from 1980 year.

I use control variable because I am interested in the effect (correlation) of the change in price level and change in output growth. If I would simply take a look at the bivariate correlation, I would find a strong correlation from the immediate start. However, this strong correlation does not make too much sense. The point is that there can be another independent variable that could change the result, so the idea is that if I do not include it into my regression; I get this strange strong correlation that can be completely false or inadequate.

# 5 Results and Interpretations

## 5.1 Choosing the Model

First model which I tested was FE model, because in the beginning I was only interested in looking at the impact of independent variables that change over time. In this paper, FE model examines the link between predictor and outcome variables within a country. Each country, as it is easy to suppose, has its own specific characteristics that can or cannot affect largely the predictor variables.

Implying FE model, I assume that there can be some bias in the outcome variables, for solving this issue; I introduce a control variable – FDI. This is the idea that stays behind the hypothesis of the possible correlation between country's error term and independent variables. FE eliminates the impact of those time-invariant features from the independent variables in such a way that I can estimate and analyze the predictor variables net effect.

Another crucial premise of the FE model is that those time-invariant features are particular and distinctive for each country apart and should not be correlated with other specific characteristics.

Due to the fact that the data for each country are different, the calculated error term and the constant (which seizes specific characteristics) should not be correlated with the other variables from the regression. From all these characteristics described above, FE should be perfectly suitable for my data.

In the table below you can observe the results obtained by testing available data through FE model using 498 observations of included 18 cross-sectional units (countries) with time-series length of minimum 11 years and maximum 33 years.

FE						
	Coef	Std. Err	t	P> t	[ 95% Coef.	Interval ]
<b>gdp</b>						
<b>gdp D1</b>	.483619	.024893	19.43	0.000***	.4310995	.536139
<b>inf</b>	-.01078	.006447	-1.67	.0843*	-.0243854	.002818
<b>inf D1</b>	.004536	.003063	1.48	.157	-.0019271	.019987
<b>fdi</b>	.155374	.068492	2.27	.0037**	.0108667	.299881
<b>fdi D1</b>	.007925	.029716	0.03	0.979	-.0619036	.063489
<b>cons</b>	1.782309	.251424	7.09	0.000***	1.251851	2.312766
<b>sigma_u</b>	1.075122					
<b>sigma_e</b>	2.260435					

**Table 5.1.1: Fixed Effects Model Results**

Source: author's computations.

From the table, we observe that *const*, *inf*, *fdi* and *gdp D1* variables are significant, *const*, *gdp D1* are significant at 1% level, meanwhile *fdi* is significant statistically at 5% confidence interval and *inf* at 10%. Such highly statistically significant variables mean that the results have a 99%, 95% and 90% probability of being true. But the first difference of inflation and the same difference of FDI – *inf D1* and *fdi D1* both of them are insignificant.

Analyzing from the economic point of view, we will take a look at the magnitude and the sign of the estimated coefficient. From the table above, we can easily observe that only inflation comes with negative sign, meanwhile FDI and all the lags are positive. Also, the magnitude of estimated coefficients is very low, all of them being below 1% (except constants). These numbers turn out to be so small, that I can say that the variable of interest – deflation does not really affect GDP growth, or if it affects then in a very small proportion. This impact of deflation on GDP growth will be different as we take different currencies; in the example below I took Euros.

The inflation coefficient is negative and equal to -0,0107, it says that for every 1 percentage point increase in inflation (or increase in CPI, as inflation in this paper is represented as CPI change), ceteris paribus, GDP growth will decrease by -0,0107 percentage points. Meanwhile if we have deflation for example in 2013 Switzerland has it equal with -0.2409% then it results that Switzerland's GDP in that year

increased with 0,00259%. At the very beginning it seems to be extremely low value, but if to project this value on the Switzerland GDP in 2013, which was equal with approximately 658,87 USD (United States Dollar) Billions, then the equivalent of this percentage is equal to 1,706 USD Billion, which is bigger than Barbuda and Antigua, Belize, Central African Republic, Comoros, Djibouti, Kiribati, and other countries yearly GDP (2013 year).

To compare FE model with RE model and GMM, it is necessary to take a look at Hausman test results, also for the same purpose I analyzed the information criterions and R-squared. Akaike criterion (AIC) and Hannan-Quinn (HQC) criterion both of them are standards or methods used for measuring the relative quality of an econometric model for a given set of data. In case of testing panel data which I have through FE, I obtained the following numbers: AIC = 2248.010 and HQC= 2286.018. Without comparison to another model, these numbers do not say anything.

Within R-squared is quite high and equal to 0.304076 ( $\approx 30,40\%$ ), in case of panel data depending on the context the optimal R-squared is between 0.2 and 0.7. The test for differing group intercepts, showed that we reject  $H_0$  – *the groups have a common intercept* with a p-value = 1.6502e-008 (for other details of FE model results please see Annex 3).

For checking the time trend, I also implied FE model with time dummies that showed that only 4 years are insignificant (13, 14, 31 and 33). These 4 insignificant years mean that in 1992, 1993, 2009 and 2011 years analyzed countries did not have deflation. For more comprehensive results please see Annex 4.

The second tested model is RE model. The logic behind this model is that, in comparison to the FE model, the variation across countries is assumed to be random and uncorrelated with the predictor variables included in the present regression: “...the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not” (Greene, 2008).

Performing RE using 498 observations with 18 cross-sectional units and time-series length: minimum 11 and maximum 33 years I obtained the following results:

RE						
	coef	Std. Err	t	P> t	[ 95% Coef. Interval ]	
<b>gdp</b>						
<b>gdp D1</b>	.480843	.024985	19.24	0.000***	.4318	.529813
<b>inf</b>	-.01114	.005848	-1.91	0.057*	-.02261	.000319
<b>inf D1</b>	.004679	.002752	1.7	0.089*	-.00071	.010072
<b>fdi</b>	.13927	.066907	2.08	0.0037**	.008133	.270406
<b>fdi D1</b>	.009782	.027003	.36	0.717	-.04314	.062706
<b>cons</b>	1.824039	.348751	5.23	0.000***	1.1405	2.507579
<b>sigma_u</b>	.969541					
<b>sigma_e</b>	2.260435					

**Table 5.1.2: Random Effects Model Results**

Source: author's computations.

As in previous case, almost all variables (except *fdi D1*) are significant. The coefficient of the variable of interest *inf* is still negative (-0,01114). But we can notice that this coefficient slightly changed, and became even smaller (-0,0111431 < -0,01078). In the following table we can observe the differences even of information criterions. RE has higher information criterions, but it is normal because with random effects model we estimate more parameters.

Criterion/Model	FE	RE
<b>AIC</b>	2248.01	2287.08
<b>HQC</b>	2286.02	2296.99

**Table 5.1.3: Comparison of information criterions**

Source: author's computations.

In the following table I summarize the obtained results from FE and RE model. Taking a quick look at it we can notice that the coefficients do not differ too much, only the significance has slightly changed.

	(1)	(2)
	FE	RE
VARIABLES	gdp	Gdp
<b>D.gdp</b>	0.48362***	0.48084***
	(0.02489)	(0.02499)
<b>Inf</b>	-0.01078	-0.01114*
	(0.00645)	(0.00585)
<b>D.inf</b>	0.00454	0.00468*
	(0.00306)	(0.00275)
<b>Fdi</b>	0.15537**	0.13927**
	(0.06849)	(0.06691)
<b>D.fdi</b>	0.00079	0.00978
	(0.02972)	(0.02700)
<b>Constant</b>	1.78231***	1.82404***
	(0.25142)	(0.34875)
<b>Observations</b>	498	498
<b>R-squared</b>	0.30408	
<b>Number of cross</b>	18	18
<b>Robust standard errors in parentheses</b>		
<b>*** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</b>		

**Table 5.1.4: FE&RE results with robust SE**

Source: author's computations.

For choosing the best fitting model, I conducted Hausman test which can be also used to differentiate between FE model and RE model in panel data. RE is preferred under the null hypothesis due to higher efficiency; while under the alternative FE is at least consistent and thus preferred. This test is also presented in the table below.

	H <sub>0</sub> is true	H <sub>1</sub> is true
<b>b<sub>1</sub> (RE estimator)</b>	Consistent	Inconsistent
	Efficient	
<b>b<sub>0</sub> (FE estimator)</b>	Consistent	Consistent
	Inefficient	

**Table 5.1.5: Hausman Test**

Source: author's computations.

Performing this test on analyzed data, I obtained that  $p\text{-value} = 0.0607$  which means that we cannot reject null hypothesis ( $H_0 - RE$  is consistent and efficient) that proves that RE fits better data than FE (please see Annex 5).

Robust Hausman test			
Test of overidentifying restrictions: fixed vs random effects			
Cross-section time-series model: xtreg re robust cluster(cross)			
Sargan-Hansen statistic	10.565	Chi-sq(5)	P-value = 0.0607

**Table 5.1.6: Hausman Results**

Source: author's computations.

Next model which I perform is the Arellano – Bond GMM estimation because of the following factors:

- 1) GDP growth variable in case of inflation is assumed to be endogenous. Because I have causality which may run in both directions – from GDP growth to inflation and vice versa – these regressors may be correlated with the error term.
- 2) Time-invariant country specific features (fixed effects), such as for example geography and its demographics, may be correlated with the explanatory variables. The fixed effects are included in the error term, which consists of the unnoticed country-characteristic effects,  $u_i$ , and the observation specific errors,  $e_{it}$ .
- 3) The presence of the lagged dependent variable (lag of GDP growth) gives rise to autocorrelation problem.
- 4) The panel dataset has a short country dimension ( $n = 18$ ) and a larger time dimension ( $t = 34$ ).

As instruments (IV – instrumental variables), I decided to take mainly prior values of the regressors. Robert J. Barro used the same principle in NBER Working paper “Inflation and Growth”. In the following table are presented Arellano-Bond GMM estimation results:

<b>GMM</b>						
<b>gdp</b>	coef	Std. Err	z	P> t	[ 95% Coef.	Interval ]
<b>gdp L1</b>	.101472	.07646	1.33	.184	-.04839	.251331
<b>gdp L2</b>	-.19258	.069837	-2.76	.006	-.32945	-.0557
<b>inf</b>	.380562	.119289	3.19	.001	.146761	.614364
<b>fdi</b>	.127482	.079371	1.61	.108	-.02808	.283045
<b>cons</b>	.825835	.525009	1.57	0.116	-.20333	1.8549

**Table 5.1.7: Arellano-Bond GMM estimation results**

*Source:* author's computations.

GMM results show up that all included variables and lags (1 and 2) are significant statistically at the level of 95% and 90% confidence level. Inflation coefficient keeps the same negative sign.

GMM was estimated implying robust standard errors on full then on the restricted sample (without outliers). This model, it is different model than FE/RE, because I used two lags of GDP in the main equation (thus it is a dynamic model), another lags as instruments and first difference of GDP growth, of inflation and of FDI were used as additional instruments. In total there were used 67/68 instruments for estimation with robust errors with only one lag of GDP for full sample and two lags of GDP for restricted sample (inflation restricted to be smaller than 10% in the main equation).

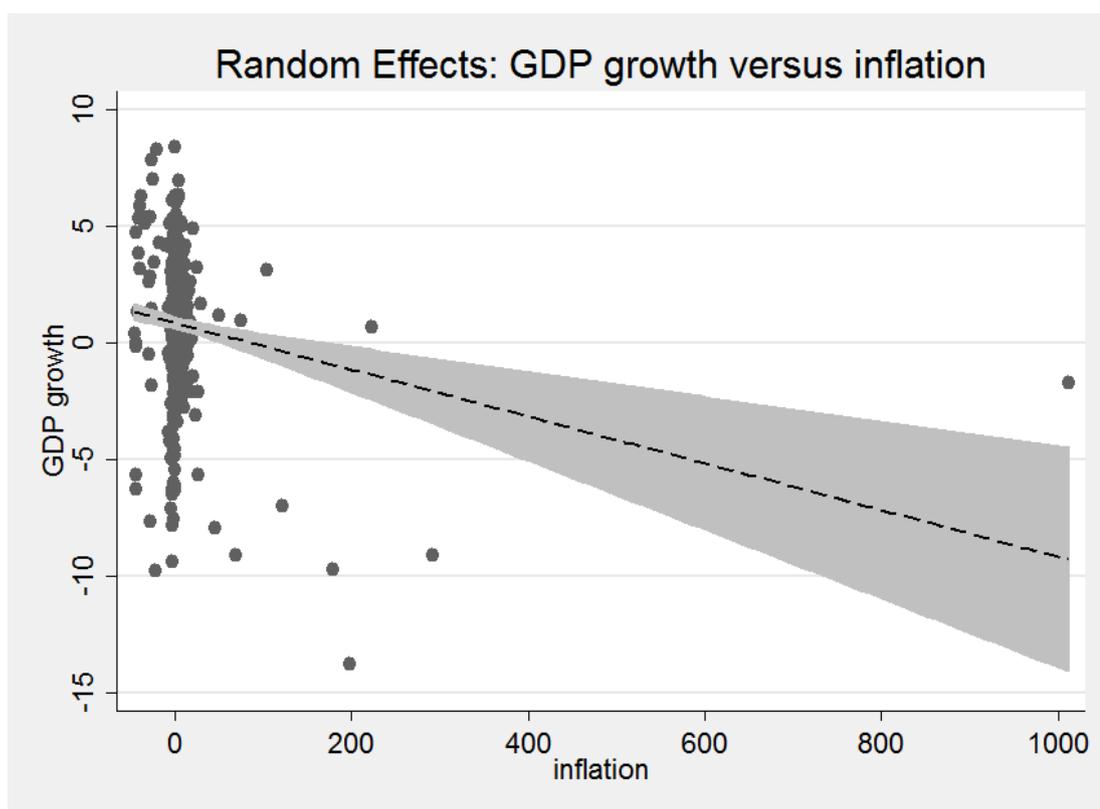
Running the model with one and then with two lags returned different results which are due to the presence of autocorrelation. But the autocorrelation problem is eradicated starting with the second lag (please see Annex 6). These other implied models are called Arellano-Bover and Blundell-Bond dynamic panel data models or simply System GMM.

The idea behind gaining the significance may be in wrong chosen instrumental variables, or in the too small number of observations. In comparison of RE and FE, the results by their magnitude show some economic significance. The coefficient of inflation increased and even changed the sign from negative to positive. In this order of ideas we have that 1% increase in inflation, ceteris paribus, GDP growth rate will increase by 0.38%.

Analyzing the results of three different models: FE, RE and System GMM; I arrived to the conclusion that in case of available data set the best fitting model is RE. The choice of RE model over FE model comes from the idea that the chosen countries were randomly defined from an enough large population (in paper where chosen only European countries which have ever had or nowadays have deflation). Furthermore, RE supposes that the unobserved country-specific features are uncorrelated with the regressors from the equation. In plus Hausman test showed that RE fits better data.

## 5.2 Modeling Data without Outliers

As I mentioned before, inflation does not have a normal distribution. That is why below I projected the results obtained implying RE, to see if I have or have not some outliers:



**Figure 5.2.1: RE: GDP growth versus Inflation**

*Source:* author's computations.

From the graph above is noticeable that there are some outliers, such as for example Bulgaria in 1997 had a inflation equal with 1058.37%, Poland in 1989 and 1990 (244.55% and respectively 555.38%), Romania in 1991 (230.62%) . These outliers happened predominantly in '90s when was dissolution of the Soviet Union, which was a shock for all markets of ex-member countries. Also in 1997 Bulgaria was one step from bankruptcy, brought to its knees by devastating economic policies and widespread corruption in the post-communist era.

These outliers distort obtained results. Also because these episodes occurred only several times, without any serial correlation, I decided to drop out all the observation of inflation which are above 10%. Nowadays, inflation higher than 10% is unlikely to appear.

In the table below, I summarized the results of FE and RE performed on the sample where inflation was set in the range of -5% to 10%, and of FE and RE performed on the whole sample.

Sample type	FULL	FULL	RESTRICTED	RESTRICTED
	FE	RE	FE	RE
<b>VARIABLES</b>	gdp	Gdp	Gdp	Gdp
<b>D.gdp</b>	0.48362***	0.48084***	0.51854***	0.51770***
	-0.02489	-0.02499	(0.01536)	(0.01629)
<b>Inf</b>	-0.01078	-0.01114*	0.27305***	0.28488***
	-0.00645	-0.00585	(0.08265)	(0.08101)
<b>D.inf</b>	0.00454	0.00468*	0.19589***	0.19092***
	-0.00306	-0.00275	(0.03897)	(0.03672)
<b>Fdi</b>	0.15537**	0.13927**	0.11065**	0.10451**
	-0.06849	-0.06691	(0.04873)	(0.05017)
<b>D.fdi</b>	0.00079	0.00978	0.01462	0.01748
	-0.02972	-0.027	(0.02714)	(0.02378)
<b>Constant</b>	1.78231***	1.82404***	1.14768***	1.12500***
	-0.25142	-0.34875	(0.28518)	(0.33529)
<b>Observations</b>	498	498	425	425
<b>R-squared</b>	0.30408		0.41455	
<b>Number of cross</b>	18	18	18	18
<b>Robust standard errors in parentheses</b>				
<b>*** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</b>				

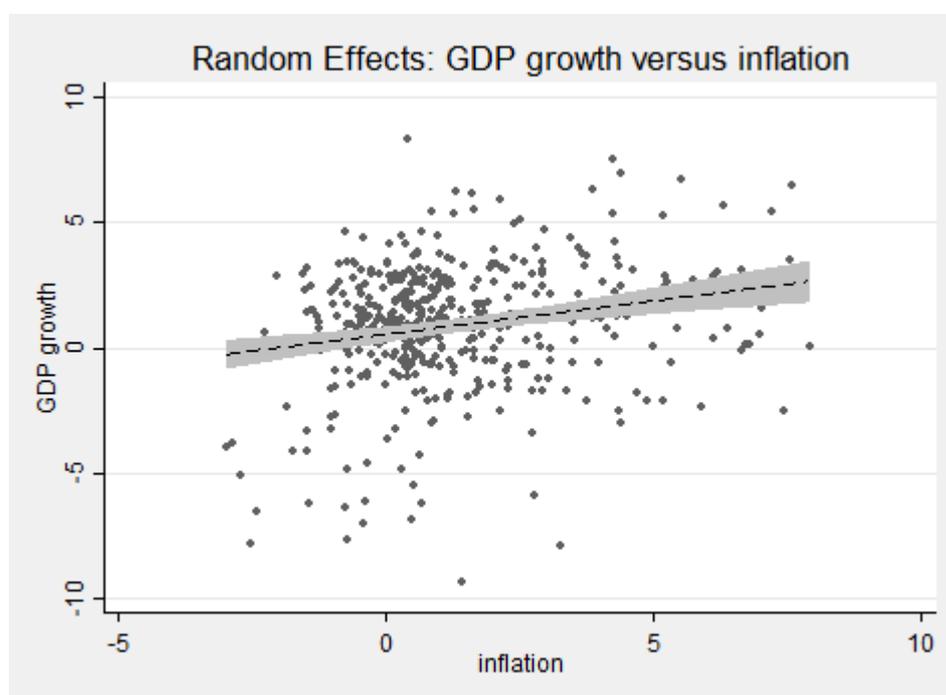
**Table 5.2.1: Comparison of RE and FE on full and restricted sample**

Source: author's computations.

Performing FE and RE without outliers, I obtained much more different results than before. Confidence interval is more precise for restricted model, in plus the coefficients of inflation, first lag of GDP growth and of inflation increased a lot. Moreover inflation and its lag changed the sign, from negative to positive.

These results can be due the distortion, or that data is contaminated with influential outliers and leverage points that largely drive the coefficients estimates for inflation and cause they are negative. Also I can detect that inflation gained statistical as well as economic significance. If inflation will increase by 1%, ceteris paribus, GDP growth will rise by 0,28% (RE results). I conducted again Hausman test, as in previous case, Re under the null hypothesis is consistent and efficient (see Annex 7).

In the figure bellow, I plotted the results of RE on restricted model.



**Figure 5.2.2: RE : GDP growth versus inflation**

*Source:* author's computations.

The graph changed a lot when I dropped outliers. The image now is clearer, and we can notice that inflation observations are clustered from -1% to 2%. This graph makes me think that dropping outliers estimates became more accurate and trustful.

## 5.3 Main Findings

The empirical method involved in this paper leads, in my opinion, to the following several findings:

- 1) There is a significant positive relation between GDP growth of the country and its inflation when the model is conducted on the data excluding outliers.
- 2) There is an insignificant relation between deflation and GDP growth.
- 3) FDI positively contributes and partly is responsible for the level of economic growth of the analyzed countries.

## 5.3 Conclusions

This thesis has analyzed the effect of deflation on macroeconomic stability for a group of European countries, using a panel data specification. The topic was covered from both points of view: theoretical well as empirical.

From the theoretical point of view, the paper has identified two main macroeconomic determinants of GDP growth, for the European countries included in the analysis: deflation and foreign direct investment.

Since the main focus of this thesis is on the determinants of GDP growth with an emphasis on deflation, I have studied and taken into consideration the available theoretical and empirical literature and finally arrived at the conclusion that the final lessons in this area can be divided into two. Some authors find a significant impact of deflation on GDP growth, while others do not detect a clear relationship between the deflation rate change and the rate of change of GDP growth. Following this idea, the current empirical work has conducted an original empirical investigation using a specific model based on traditional (FDI) and specific (deflation) GDP growth determinants that are expected to play an important role in the decision making process of central banks of these countries.

Results obtained by using the set of available data excluding outliers, show that there is a significant and positive relationship between inflation and GDP growth, but in case of unrestricted model I can say that there is little evidence that deflation has a positive relationship with GDP growth. This lack of strong evidence is likely due to the limited data, which includes only 13 incidences of deflation (inflation lower than the 0 bound) for 18 countries over the span of 34 years. But in more than half of the analyzed episodes we can observe extremely small inflation, with inflation rates just slightly above 0, particularly in the last 2 years, as it was showed in the Figure 5.2.2.

In addition, the results provided by the FE, RE and GMM analysis, suggest that the two main deflationary experiences that shape our understanding of deflation, namely the Great Depression in the 1930s in the United States and Japan from the 1990s until the present, are not absolutely ideal representatives for all deflation episodes, especially for the present situation. This study argues that a broader, historical outlook provides a more diversified view on the deflation phenomenon, one that can help us to critically weigh the possibility of two outcomes, in which an appropriate rate of deflation can be also seen as an engine for GDP growth and economic expansion.

The positive relationship between inflation and GDP reveals that if inflation goes up by 1%, *ceteris paribus*, then GDP will go as well up by 0.28%. We should keep in mind that deflation is a monetary phenomenon and it should be controlled through different monetary tools to enhance the GDP of EU countries in the analysis.

Many economic experts such as Pete Comely or Warren Buffett consider that this year – 2015 - is one of the most important years in our recent history, because the unsolved problem of low inflation can generate an economic “storm”. Nowadays, we face 3 main drivers of deflation such as:

- ✓ *Globalization*: jobs have a tendency to move from high income countries to low income countries, because as result of this shift the price of production

decreases and the potential for price cutting rises, while firms can freely maintain the same level of profits and market share.

- ✓ *Know-how innovations*: as a result of the continued evolution of new production processes these processes are using less resources and less people, which as result is followed by a fall in the price level.
  
- ✓ *Economic cycles and global shocks*: any economy in the world goes through ups and downs (phases of the economic cycle), and events that happen outside of the government's control of these countries also have an impact on their economic development and growth. An example is the global financial crisis of 2007, which in one year spread across the whole world, each country falling like a domino figure.

Altogether, the current period of deflation or near deflation is a sign of a much more larger event taking place across the globe that had just started to affect us. The lower consumer price index which we can observe in the last few years is a result of a much larger supply exceeding demand. Furthermore, as we move forward in the 21st century, the aggregated demand is going to decrease more and more, and it is easy to expect that deflation is going to become a frequent and very crucial topic of discussions.

Populations in majority of countries, especially in EU, are ageing. According to Eurostat, the average number of children which women are having nowadays is much below the replacement level of 2.1 in almost every developed market in the world. If the tendency will not change, then by 2050, some researchers show that world population may even start to decrease sharply.

Moreover, the ageing populations around the world are consuming less products. So it is easy to suppose that the net effect of these demographic changes will be lower demand and prices, which can lead again to deflation.

All in all, that is why it is so important for us, now to rigorously analyze the phenomenon of deflation, to know which actions will apply in the future and will help us, either solve it or how to turn it into a positive driver of GDP growth.

## 6 Contribution and Further Research

This thesis mainly had the scope to fulfil the gap in the current debate regarding the main determinants of macroeconomic stability of the country, and the debate about positive or negative influence of deflation on GDP growth. The empirical analysis applied in this paper explores the question whether the rate of deflation affects considerably GDP growth into these analyzed countries.

Although, there is not enough theoretical and empirical evidence available to provide different points of view and aspects on this specific topic, in this thesis I performed my own analysis in order to emphasize the importance of deflation from macroeconomic stability perspective.

Therefore, I created a model that connects and integrates traditional and more particular GDP growth determinants that are expected to play a crucial role in the decision making process of central banks of different countries. Also, one of my goals was to enhance and enlarge the existent literature that mainly stresses the deflation in Japan case or analyzes the deflation from the perspective of Great Depression in US. By employing only European countries on a specific span of time (1980 – 2013), I provide this way a wider analysis of the phenomenon and interpretation of obtained results that contributes with a new perspective on this hot topic of discussions. Taking in consideration the fact that previous available papers focused more on past episodes of deflation samples, I decided to perform my research more orientated on new available information, data and current situation which we can observe in Europe, in accordance with the availability of this new dataset, to expand the existing empirical researches.

The results of this paper show that inflation and FDI serve as good incentives for GDP growth of the country. These results are empirically less confirmed especially in case of positive influence of inflation on GDP nevertheless their importance is still significant and notable. Findings related to monetary policies applied by the central

banks, show that in case of immediate acting for stabilization of deflation can help to eradicate this phenomenon very fast, also that one of the most efficient tools which can be implemented by the banks is QQE which proved in time that it works.

But in general, I can certainly say that there is still insufficient number of empirical researches that can prove that deflation can serve as a good engine to economic growth of the country, but also there is a small number of papers which can deny this relation showing deflation as a destructive phenomenon.

The Great Depression in US was a crucial point from where to start analyzing deflation in past, some of these hypotheses (which illustrate that deflation can be harmful in some cases) maybe have proven to be true, but this does not mean that we need to generalize these results and conclusion to other episodes of deflation, especially to project them on the nowadays situation which we can observe in Europe.

Empirical available analyzes on the influence of deflation on macroeconomic stability of the country still remain in a very initial stage of evolution and much more scope is accessible for improvement. From the other hand, there can be done some important changes even in the data-related side, such as for example discovering other relevant and good enough control variables or other instrumental variables (other IV can be price of imports or money supply taken as M2 – monetary aggregate) which would have more available historical data than the control variable and IVs which I employed in this paper.

Further investigation of the present European deflation experience can imply an analysis with more frequent data, possible quarterly data, should be another goal of future researches. Also I can suppose that even totally different methods of analyzing the effect of deflation on GDP growth are also possible.

Examining some specific theories or taking a closer look to the transmission channels in one economy serve to study this relationship. This way can be determined how deflation may affect economic growth of the country. One theory can be the Mundell-Tobin effect, postponement of consumption expecting that the prices will continue to

fall or the theory of economic cycle – debt deflation theory can be utilized to formulate hypotheses which can be tested on investment, exports, consumption, national debt, and other variables. After this relationship will be sufficiently investigated, this could serve as an encouraging path how to learn and understand more about the role played by deflation in the economy.

Further research is appreciated and even welcomed since there may be many other aspects that were not covered and discussed in this paper, but taking into account the consideration from my conclusive remarks further analysis or research might be performed for a different outcome of the impact of deflation on GDP growth.

# Bibliography

Ahmad, N. and Luqman, M. (2012). A dynamic analysis of the relationship among inflation, investment, population growth, export and economic growth in Pakistan, *AJRBEM: Asian Journal of Research in Business Economics and Management*, Volume 2, Issue 8.

Alfaro L., A. Chanda, S. Kalemli-Ozcan and S. Sayek. (2003). FDI and Economic Growth: The Role of Local Financial Markets.” *Journal of International Economics*,

Altavilla, C. and Ciccarelli, M. (2007). Information combination and forecast stability. Evidence from vintages of time-series data, December.

Atkeson, A. and Kehoe, P. J. (2004). Deflation and Depression: Is There an Empirical Link? *American Economic Review*, Vol. 94, No. 2 (May), pp. 71 - 75.

Barro, R. J. (1996). Determinants of Economic Growth: A Cross-Country Empirical Study. NBER Working Paper 5698, National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138, August.

Beckworth, D. (2008). Aggregate Supply-Driven Deflation and its Implication for Macroeconomic Stability, *Cato Journal*, Vol. 28, No. 3.

Bergheim, S. (2008). Long-Run Growth Forecasting, pp 36-41.

Bernanke, B. S. (1995). The Macroeconomics of the Great Depression: A Comparative Approach. *Journal of Money, Credit and Banking*, Vol. 27, No. 1 (February), pp. 1 - 28.

Bernanke, B. S. (2002). Deflation - Making Sure It Doesn't Happen Here. Speech before the National Economists Club, Washington, D.C., November 21.

Bernanke, B. S. and Gertler, M. (1989). Agency Costs, Net Worth, and Business Fluctuations. *American Economic Review*, Vol. 79, No. 1 (March), pp. 14 - 31.

Bindseil, Mercier, Papadia and Würtz (2011). Challenges for the next decade of monetary policy implementation, in Mercier and Papadia, *The concrete euro*. Oxford University Press. Bordo, M.D. (2010). Financial Crises Database. <http://sites.google.com/site/michaelbordo/home4>.

Bordo, M. D., Lane, J. L., and Redish, A. (2004). Good versus Bad Deation: Lessons from the Gold Standard Era. NBER Working Paper 10329.

Bordo, M. D. and Redish, A. (2003). Is Deflation Depressing? Evidence from the Classical Gold Standard. NBER Working Paper 9520.

Borensztein, E., J. De Gregorio, and J-W. Lee. (1998). How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics* 45: 115-35.

Ciccone, A. , and Jarocinski, M. , (2008). Determinants of Economic Growth Will Data Tell? Working Paper Series No. 852 ( January ).

Cole, H. and Ohanian L. E. (2004). New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis. *Journal of Political Economy*, Vol.112, No. 4 (August), pp. 779-816.

Delong, J.B. (1999) . Should We Fear Deflation?. *Brookings Papers on Economic Activity*, 1:1999.

Ferreira de Medonça, H. and Montes, G.C. (2008). Recovering Efectiveness of Monetary Policy Under a Deflationary Environment. *Investigación Económica*, September, pp. 121 – 144.

Fisher, I. (1933). The Debt-Deflation Theory of Great Depressions. *Econometrica*, Vol. 1, No.1 (October).

Fleckenstein, M., Longstaff, F.A., Lustig, H. (2013). Deflation Risk.

Goodfriend, M. (2001). Financial Stability, Deflation, and Monetary Policy, *Monetary and Economic Studies* ( Special Edition ).

Greene. H. W. (2008). *Econometric Analysis* 6th ed., Upper Saddle River, N.J. : Prentice Hall. , pp. 180.

Guerrero, F. and Parker, E. (2006). Deflation and Recession: Finding the Empirical Link. *Economics Letters* 93, pp. 12 - 17.

Hayek, F. A. (1931). The Paradox of Saving. *Economica*, No. 32, May, pp. 125 - 169.

Kaza, G. (2006). Deflation and Economic Growth. *The Quarterly Journal of Austrian Economics*, Vol. 9, No. 2, pp. 95 – 97

Kibria, U. , Usman Arshad, M. , Kamran, M. , Mehmood, Y. , Imdad, S. , Sajid, M. , (2014). Exploring the Impact of Macro Economic Variables on GDP Growth of Pakistan. *Research Journal of Management Sciences*, Vol. 3(9), September, pp. 1 – 6.

Khan M.S. and Senhadji S.A., (2011). Threshold effects in the relationship between inflation and growth, *International Monetary Fund*, 48(1), pp. 1-21.

Krugman, P. R. (1998). It's Baaack: Japan's Slump and the Return of the Liquidity Trap. *Brookings Papers on Economic Activity*, Vol. 1998, No. 2, pp. 137 - 205.

Lima, G.T. , Setterfield, M. , Jair da Silveira, J. (2013). Inflation Targeting and Macroeconomic Stability with Heterogeneous Inflation Expectations. Department of Economics, FEA-USP Working Paper No. 2013-11.

Maddison, A. (2010). *Statistics on World Population, GDP and Per Capita GDP, 1 – 2008 AD*. University of Groningen. <http://www.ggdc.net/maddison/oriindex.htm>.

McCandless, G. T. and Weber, W. (1995). Some Monetary Facts. *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 19, No. 3 (Summer), pp. 2 - 11.

Mitchell, B. R. (2003). *International Historical Statistics*. 4th edition. Palgrave Macmillan. Basingstoke.

Mundell, R. (1963). "Inflation and Real Interest". *Journal of Political Economy* 71 (3): 280–283. doi:10.1086/258771.

Ohanian, L. E. (2009). What - or Who - Started the Great Depression? *Journal of Economic Theory*, Vol. 144, pp. 2310 - 2335.

Ottaviano, G., Taglioni, D. and di Mauro F., (2007). Deeper, wider and more competitive? Monetary integration, Eastern enlargement and competitiveness in the European Union, December.

Palley, T. I. (2008). Keynesian Models of Deation and Depression Revisited. *Journal of Economic Behaviour & Organization*, Vol. 68, pp. 167 - 177.

Rattan J. B. Inflation, Deflation, and Economic Development *Staff Papers (International Monetary Fund)* Vol. 8, No. 1 (Nov., 1960), pp. 101-114.

Romer, C. D. (1992). What Ended the Great Depression? *Journal of Economic History*, Vol. 52, No. 4 (December), pp. 757 - 784.

Ryska P. (2014). "Deflation and Economic Growth in Long-Term Perspective" IES Working Paper 18/2014. IES FSV. Charles University.

Salerno, J. T. (2003). An Austrian Taxonomy of Deflation - with Applications to the U.S. Quarterly Journal of Austrian Economics, Vol. 6, No. 4 (Winter), pp. 81 - 109.

Schularick, M. and Solomou, S. (2009). Trade and Economic Growth: Historical Evidence. Cambridge Working Papers in Economics, No. 0936.

Silberston, R. (2014). Euro-zone deflation: Making sure 'it' happens here, Investec Asset Management.

Shahzad A. and Al-Swidi A.K., (2013) Effect of macroeconomic variables on the FDI inflows: The moderating role of political stability: Evidence from Pakistan, Asian Social Science, 9(9), pp. 270 - 279.

Shilling A., G. (2012). The Age of Deleveraging: Investment Strategies for a Decade of Slow Growth and Deflation

Smith, G.W. (2006) . The Spectre of Deflation: A Review of Empirical Evidence. Queen's Economics Department Working Paper No. 1086.

Taylor, J.B. (2000). A Keynote Speech: "Low Inflation, Deflation, and Policies for Future Price Stability, Prepared for the Ninth International Conference, The Role of Monetary Policy under Low Inflation: Deflationary Shocks and their Policy Responses, sponsored by the Institute for Monetary and Economic Studies, Bank of Japan, July 3-4.

Thirlwall A. , P. and Barton C. , A. (1971). Inflation and growth: the international evidence. PSL Quarterly Review. Vol 24, No 98

Tobin, J. (1965). "Money and Economic Growth". *Econometrica* 33 (4): 671–684. doi:10.2307/1910352

Xu, B. (2000). Multinational Enterprises, Technology Diffusion, and Host Country Productivity Growth. *Journal of Development Economics* 62: 477-493.

Wooldridge J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press. Cambridge, Massachusetts.

Wooldridge J. M. (2012). *Introductory Econometrics: A Modern Approach* 5th edition. South-Western College Publisher