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Devolved Monetary Policy

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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This Research Project has been submitted for examination with my approval as the Supervisor.

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CHAPTER 1: INTRODUCTION

i) Background of the study

Inflation is the sustained increase in the prices of goods and services. Inflation is a double-edged sword, such that too much or too little will affect the economy poorly. Various Governments employ their Central banks or Federal reserves to try and regulate inflation. The Central banks and Federal reserves have various tools in their fight to restrain inflation to a level they feel is optimal for their country. These are referred to as monetary policies, they include, but are not limited to: interest rates and open market operations. In this changing world, with all the advances in technology and such, monetary policy must be flexible and adjust quickly to several scenarios that could prove critical to a nation's economy. Tinbergen's (1952) Rule that the number of achievable policy goals cannot exceed the number of policy instruments dictates that a mechanical monetary policy rule can fail to achieve its stated objectives of full employment and target inflation. The 2007 financial crisis that brought about increased inflation globally and small instances such as the effect of the election period in Kenya had on the economy; these are some of the examples that call upon flexible monetary policy.

Due to the various changes globally, we have seen rise of Regions such as the Euro Zone, which is a monetary union of 18 out of the 28 European Union member states that have adopted the Euro. This paper attempts to see if monetary policy, especially within a region such as the Euro zone, can be more effective and more considerate especially for member countries going through different business cycles. The paper highlights on one key monetary policy, which is interest rates and hence will take a look at inflation targeting and how the European Central Bank sets its target rate and whether it is optimal for all member states. A proper example of that would be in Germany and Greece, both of whom, adhere to the same monetary policy rule (inflation target rate set by the European Central Bank), yet their economies are experiencing different problems.

The Taylor rule (1993) has formed a platform for calculating the best target rate, this paper does not look to refute it but alter the approach in calculating the best rate for regions such as the Eurozone keeping in mind that different member states experience different economic conditions at different times. Arestis and Chortareas (2006), felt that one huge disadvantage of the Taylor rule lay in its use of a limited number of variables but its simplicity is second to none. This paper looks closely into the Euro zone and how optimal the rate set by the ECB has been in the recent

years and whether the process of setting the target rate can be improved by a unique approach to the Taylor rule, which considers the best target rate for each member states and consolidates them to form one rate that is optimal for all.

ii) Problem statement

Statistics from the ECB website show that Germany currently (September 2017) have an inflation rate of 1.6%, Italy: 1% and Greece: 1.17%, based on the consumer price index for each of those countries. The ECB by these statistics, has been able to keep inflation at a unitary level for all of these countries but how healthy is this? In recent months, Greece's economy has grown steadily but the low inflation may have inhibited the rate at which Greece is growing at. Germany's economy cannot be compared to that of Greece and hence having them with an almost similar interest rate makes no sense. A closer look at the above countries' output gaps tell us that this is should not be the case. Germany: 1.819%, Italy: -2.432% and Greece: -10.492%. In his paper, Delong (2000) concluded that the historical belief that low inflation is good for growth is wrong. This is the case where we see Greece, with a lower inflation rate than Germany, is not up to per economically (based on the difference in the output gap).

Therefore, the use of the current unitary rate is not helping Greece as much as the low rate will discourage investments and might create more problems for Greece down the line especially with their creditors. Also, the speed at which the ECB would adjust its interest rate if a member state was to have hyper-inflation due to unforeseen circumstances such as political instability and natural disasters, may also come into question. Flexible monetary policy is extremely important. One major question is whether the European Central Bank's policies are optimal for all the countries in the Eurozone or if they disproportionately favor certain countries in the monetary union at the expense of others. For example, last year's decision to increase the interest rate led to criticism that the ECB is "tightening when only Germany even arguably needs it." It has also been argued that a recent increase in interest rates is what turned Greece's liquidity problem into an overall solvency issue, Srivangipuram (2015). In a recent working paper, Surico (2003), by the ECB it stated that, 'While the objective of price stability is symmetric, the one on real activity is not in that output contractions require larger policy responses. Moreover, the actual Euro interest rate highly commoves with the counterfactual rate that the Bundesbank would have

followed if charged to set policy rates for the Euro area'. Hence a lot of influence in the target rate is based on Germany's performance economically.

The paper is conceptual and relies on several assumptions especially in regard to the Taylor Rule. Since in is constantly used in inflation targeting, the paper will not attempt to formulate another way to set the target rate rather a more optimal way to set it. Flexibility of these policies is a key factor behind these research, sticky wages and prices have proven a hinderance to fast implementation of monetary policy and the research aims to achieve a policy that regards smaller economic units in the macroeconomic process.

iii) Research Questions

The paper pivots on two research questions and uses them to guide the research and attempt to prove the hypothesis:

1. Can we develop a Target rate and get an interest rate for the European Union by using each individual member country rate?
2. How effective is the rate mentioned above and does it differ from current way of setting target rates?

iv) Research Objectives

The objectives of this research are based very much from the research questions as they guide the entire study.

1. Develop a target rate for the Euro Zone by building it from the member country variables and then use this to set the interest rate.
2. Compare the interest rates from the one set by the European Central bank and test for the effectiveness and appropriateness.

CHAPTER 2: Literature review

The literature review portion of this paper goes through the previous research done on the subject. It is divided into three parts: theoretical, conceptual framework and empirical literature review. The empirical literature review looks at various academics' writings on the subject and the empirical review looks at research findings and data obtained from the same.

i) Theoretical Review

The Taylor rule is a policy guideline that generates recommendations for a monetary authority's interest rate response to the paths of inflation and economic activity (Taylor 1993). Inflation targeting has become a key monetary instrument that is constantly used by many central banks and federal reserves. However, as Benanke and woodford (1997) pointed out; in an inflation targeting regime, the central bank or federal reserve establishes explicit goals for the inflation rate at medium term and long-term horizons, although pursuit of an inflation target does not exclude other objectives, such as short-run output or exchange -rate stabilization. Inflation targeting has many advantages and disadvantages. Inflation targeting is hailed for increasing transparency unlike other monetary policy tools such as open market operations. It shows the direction the policy makers want the economy to head. Inflation targeting helps avoid the 'velocity instability' problem which arises when the unexpected changes in the relationship between the intermediate target and the ultimate objective. One of the disadvantages is that inflation responds to the changes in monetary policy with a substantial lag. Parkin (1998), supported the use of monetary policy to influence inflation and even suggested the short-term interest rate according to contingency be set to target zero inflation. Woodford (2001) argues that both inflation and output-gap stabilization are sensible goals of monetary policy, as long as the "output gap" is correctly understood.

In understanding the Taylor rule and obtaining it the natural rate of interest will be very critical. Hristov (2016), describes the natural rate as the level at which rates must settle in due course to keep inflation stable over an extended period of time that is determined by the economy's underlying characteristics. It plays a big role in clarifying effects of monetary policy and macroeconomic relationships. Most central banks direct interest rates to match up with the natural rate. The natural rate is an important benchmark as to whether policies are too tight or too loose. Interest rates above this rate tend to lower inflation while those below it increase inflation.

Despite the importance of the natural rate of interest, using it to guide monetary policy decisions is highly problematic due to the fact that the natural rate is an unobservable variable, which limits its practicality as a gauge for measuring and tuning the stance of monetary policy.

The Taylor Rule is not perfect. There is evidence, however, that Taylor rules can be a source of economic instability in and of themselves. For example, Benhabib, Schmidt-Grohe, and Uribe (2001) demonstrate that steering under this policy may in fact introduce real indeterminacy in an otherwise determinate economy. As pointed out by Svensson (2003), even if the ultimate objective of monetary policy is to stabilize inflation and output, a simple Taylor rule will not be optimal in a reasonable macroeconomic model. Realized outcomes for inflation and output enter the optimal decision rule if they help to predict future inflation and output, but so will any other variable that provides information concerning future inflation and output. So monetary policy will, in general, be more complicated than the simple Taylor rule suggests

It is also critical for us to understand the Euro zone more to comprehend the need for the research. In the euro area, consumer price inflation is measured by the Harmonized Index of Consumer Prices (HICP). The term "harmonized" denotes the fact that all the countries in the European Union follow the same methodology. This ensures that the data for one country can be compared with the data for another. In the Euro zone, all monetary decisions stem from the European Central Bank. The ECB uses inflation targeting as one of its monetary policy instrument (current target inflation rate set below 2 percent). They hold firm that their monetary policies are indicative of changing economic conditions in the Euro area as a whole and does not show the diversity among individual national economies of the member countries. Euro area experiences low labour mobility and no nominal exchange rate due to its member countries adopting the Euro and there being free border movement between citizens of member nations. Fernanda Nechio (2011), divided the Euro zone into 'core' and 'peripheral' countries and discovered that from the mid-2008 onward the ECB's actual policy rate was well above the rate recommended by the Taylor rule for the peripheral countries, but below the Taylor rule recommendation for the core countries because the peripheral countries are still struggling to recover from the sovereign debt crisis. The paper borrows heavily from Srivangipuram (2015), who highlighted the huge inflation differentials between those countries that cause structural inefficiencies in factor markets and could cause negative implications in countries that

experience higher inflation within the Euro Zone. Inflation differentials causes are categorized as those that arise:

- Due to convergence
- Due to business cycle differences between the member countries
- Due to asymmetric demand and supply shocks
- Due to characteristics of domestic product, labour and other factor markets
- Due to wage and price rigidities

The above differentials cannot be affected by monetary policy directly.

ii) Empirical review

While the available observations do not allow any way out of the small sample size, we discuss below the extent to which our estimates provide a useful preliminary evaluation of how the ECB conducts monetary policy. The main results using monthly Euro area aggregated data over the period 1997:7-2002:10 can be summarized as follows. First, there is no evidence of asymmetric responses to movements in inflation since the ECB appears to be concerned about risks of deflation as well inflation. Second, output contractions of a given amount bring about a more vigorous policy response than output expansions of the same magnitude, consistently with an asymmetric objective. Third, the observed path of the Euro policy rate highly commoves with the counterfactual targets implied by the estimates of the Bundesbank and the Fed reaction functions, given the historical Euro area measures of inflation and output gaps. However, unlike the Bundesbank, the Fed-type of behavior would require a substantially more aggressive policy stance, Surico (2003).

The empirical work on Taylor rules entails a number of problems, the main ones can be summarized as follows: there is a lack of consensus on the price variable; there is no satisfactory way of estimating the output gap variable; the equilibrium rate of interest (r*) is a difficult variable to estimate, indeed, it might not be a constant because it can vary with the sample period; more fundamentally, the equilibrium rate of interest is an unobservable variable; there is the question of whether current or lagged data should be used in the estimation of interest rates, or should forward-looking estimates be used; should current-time or real-time data be used to account for revisions in data; should a smoothing variable be considered; and should the

exchange rate be incorporated in Taylor rules, or ignored because its impact is reflected in aggregate demand and cost of production, Arestis and Georgios Chortareas(2006).

With regard to the natural rate approach proposed by Laubach and Williams (2003; henceforth LW) applied to data for the United States. The authors estimated the natural real interest rate and potential output growth simultaneously, using a small-scale macroeconomic model linking real GDP, inflation and a short-term interest rate. In this model, by construction, the gap between real and potential GDP is a function of past gaps between the real interest rate and the real natural rate. The method makes it possible to separate fluctuations in the natural rate driven by long-run developments in the economy's underlying characteristics from those caused by cyclical factors. Thus, as discussed in a recent article by the two authors (Laubach and Williams 2015), the proposed measure is best-suited to gauge the level of the natural rate in the long run.

iii) Conceptual framework

The paper is very conceptual, the idea behind breaking down the Taylor rule to a national level then using it to come up with a rate for the whole region is purely based on a mere pyramid design that the rate can incorporate so much more information to build a strong base for the rate such that it is more accommodating and can give a better inflation forecast.

CHAPTER 3: METHODOLOGY

These are the steps taken by the research to support the line of thinking.

i) research design

The research uses a deductive approach where we make an inference from the data that is collected. First, we will try and formulate a target rate for the Euro zone by regressing the target rates for each of the eighteen countries that are in the Euro area and weighting them based on their economy size relative the Euro zone economy. This target rate will then be used to obtain an interest rate for the Euro area. Second, the rate obtained above will be compared to past rates and checked for similarities. Then, the same will be applied in the monthly data to see if it is more flexible and will adjust according to member states business cycles. Finally, a test for the future, the same will be used to model future rates and see how well it works, this part will rely mainly on time series forecasting.

i) data and data sources

The reason why this research is concentrated on the Euro Area is due to the availability of data. Most of the data in the Research will be obtained from the ECB database, OECD data base and the world bank open data. It will encompass inflation and output statistics of the individual nations as well as the inflation statistics for the Euro Area. Initially when determining the target rate cross-sectional data will be used and since the secondary data exists on all this, this will not be an uphill task.

ii) model

The model for this research is broken down to several parts: We start first by looking at the original Taylor Rule:

$$R_{taylor} = r_{neutral} + \alpha(i_{actual} - i_{target}) + \beta(Y_{actual} - Y_{potential})$$

Key notes:

- $r_{neutral}$: is the natural rate of interest
- R_{taylor}: the Taylor series prescribed rate of interest

- $\alpha(i_{actual} - i_{target})$: is the α*inflation gap, if the inflation gap > 0 then we raise the real policy rate as per the Taylor rule recommendation.
- $\beta\ (Y_{actual} - Y_{potential})$: is the β*output gap, if the output gap > 0, then we raise the real policy rate as per the Taylor rule recommendation.

We will use the Taylor Rule above to obtain each of the member states target rates, using their variables then we will regress each of the target rates to get the Eurozone target rate (dependent variable) using:

$$Y = \sum_{N=1}^{18} \beta nXn + \square$$

B: will be obtained by the economy of the member country divided by the economy of the Euro area.

X: will be the target rates for each of the member countries

□: will be the error term

Once this is done the target rate will be applied to the Taylor rule to obtain the Euro zone interest rate. This will then be compared to target rates in the same period that were set by the ECB.

Finally, forecasting will be done, the interest rates obtained above will be employed in a time series ARMA modelling.

An ARMA model is composed of two parts an auto regressive component and a moving average process both of these are combined to form the ARMA process. The simplest type of autoregressive model (AR (1)) has this property: $Xt = \alpha\ X_{t-1} + \varepsilon_t$, where ε_t is zero-mean white noise. Autoregressive process of order p (AR(p)):

$$Xt = \mu + \alpha_1\ (X_{t-1} - \mu) + \alpha_2\ (X_{t-2} - \mu) + \ldots\ \alpha_p\ (X_{t-p} - \mu) + \varepsilon_t$$

A realisation of a white noise process is very 'jagged', since successive observations are realisations of independent variables... Most time series observed in practice have a smoother time series plot than a realisation of a white noise process, since in this process the successive observations are realisations of independent variables. In that respect, taking a "moving average" is a standard way of smoothing an observed time series. The simplest type of moving average

(MA) process is: $X_t = \mu + \varepsilon_t + \beta\varepsilon_{t-1}$ where εt is zero-mean white noise. Moving average process of order (q) (MA (q)):

$X_t = \mu + \varepsilon_t + \beta_1 \varepsilon_{t-1} + \ldots + \beta_q \varepsilon_{t-q}$

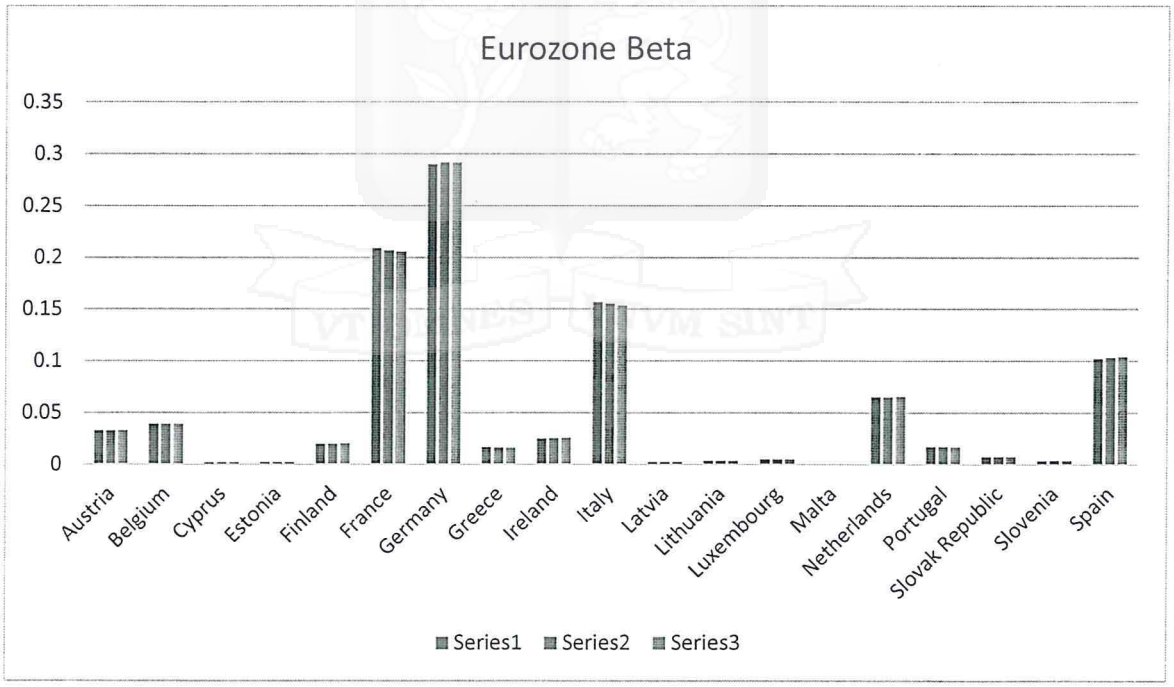
ARMA processes « combine » AR and MA parts:

$X_t = \mu + \alpha_1(X_{t-1} - \mu) + \ldots + \alpha_p(X_{t-p} - \mu) + \varepsilon_t + \beta_1\varepsilon_{t-1} + \ldots + \beta_q \varepsilon_{t-q}$

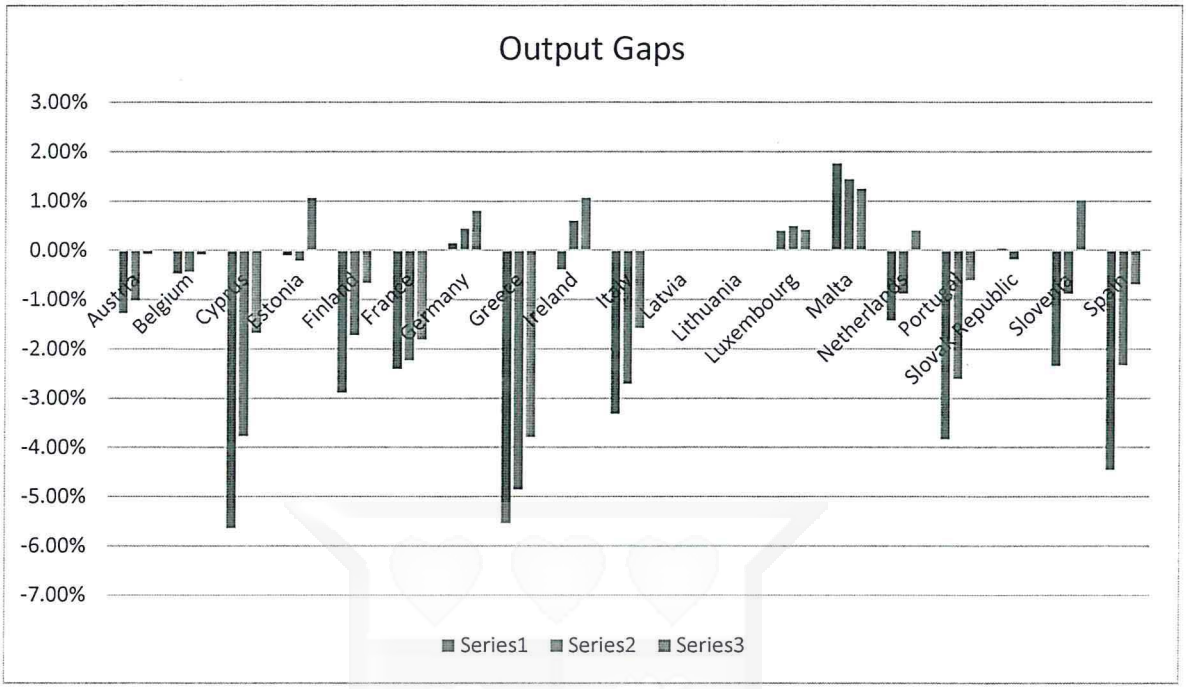
ARIMA maybe more effective due to lags but the extent of the lags may not be measurable and may not make our data white noise.

CHAPTER 4: RESULTS AND FINDINGS

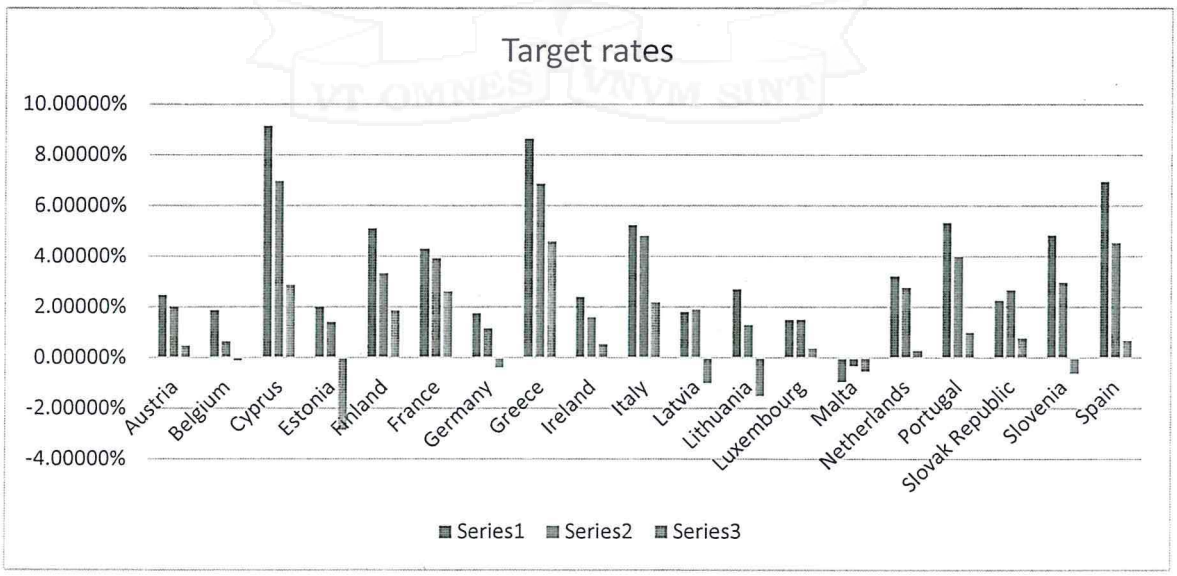
The outcome from the study and data analysis is inhibited by the absence of output data from Latvia and Lithuania. However, this does not limit our study since the paper is conceptual. A close look into the Eurozone economic betas (Ratio of member states economies to the Eurozone economy), will show that the Germany's economy is large and hence has a lot of control in the interest rates set. In determining the interest rate through the Taylor rule, we required to analyze: the output gap, the target rates and the current inflation.



The chat has the economic beta and it reflects some degree of imbalance in the region. Notice that when Germany's economic beta is growing France's and Italy's economies are declining. Greece faces the same problem. This may however be attributed to correlation since the variables are somewhat correlated.



The output gaps are a proper indication of disparities within the Eurozone area in the case for countries such as Germany they are over performing at an increasing rate, while Greece are improving, though at a slow rate. These disparities in the Euro zone are a strong indicator that the current interest rate system is not appropriate as it does not regard all the members. Economic development is a much better social goal than economic growth hence this system is hell bent on removing inflation but they forget that nations such as Greece gain from a slightly higher interest rate.



For the target rates, the paper applies a national rate of interest of 1% in calculating the target rates for each of the member countries. We adjust the Taylor rule to:

$\Pi^* = ((I-n-0.5(\text{output gap}))/0.5) - \pi$

Π^*: target rate

I: Interest rate

n: natural rate

π: inflation

We first obtain the rates for each country based on past data. The results are shown in the diagram above. It shows that during the last three years, the rates for countries such as Greece, Italy and Cyprus should have been much higher during that period. The chart above shows that though countries such as Germany should target a lower rate Greece, Cyprus, Spain, Italy and others should target a much higher rate.

An analysis of the 2015 interest rate shows that the Eurozone rate should have been 3.7761054 well above the bellow 2% target set by the ECB. The harmonized index, currently used by the ECB is generalized and does not regard the various effects on the member countries and its flexibility is wanting. 2016 and 2017 rates differ with the below 2% target set by the ECB.

Conclusion

Though the Eurozone has been performing well as a region, the same cannot be said of member states. As seen by different inflation levels and output gaps the Eurozone target inflation does not bode well for some member countries and seems to be in line with the Germany economy rather than a rate that would be more inclusive of the region in terms of flexibility and such. Auto regressive moving average forecasting has been limited in this model as past information is sufficient to show various flaws in the current ECB monetary policy. Further studies are required on the issue and the paper does not assume the model to be a conclusive way to set the Eurozone target rate. Devolved monetary policy is achievable in economic zones as long as the right approach is taken

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Country	target rates 2015	2016	2017	2015
Austria	0.02473	0.02019	0.00475	0.032377
Belgium	0.01873	0.00636	-0.0012	0.039078
Cyprus	0.09143	0.06971	0.02881	0.00168
Estonia	0.02004	0.01411	-0.02861	0.001938
Finland	0.0509	0.03325	0.01862	0.019963
France	0.04308	0.03938	0.02611	0.209011
Germany	0.0176	0.0116	-0.004	0.289921
Greece	0.08637	0.06861	0.0459	0.016736
Ireland	0.0239	0.01603	0.00542	0.024915
Italy	0.0522	0.04812	0.02185	0.156735
Latvia	0.018	0.019	-0.01	0.002321
Lithuania	0.027	0.013	-0.015	0.003556
Luxembourg	0.01496	0.01508	0.00377	0.004986
Malta	-0.00955	-0.0034	-0.00546	0.000883
Netherlands	0.03226	0.0278	0.0029	0.065102
Portugal	0.05336	0.04001	0.01006	0.017099
Slovak Republic	0.02266	0.02683	0.00789	0.007495
Slovenia	0.04843	0.02979	-0.00619	0.003699
Spain	0.06954	0.04532	0.00691	0.102459

target rates

Euro area	Output gap	Percent of potential GDP		-1.90%	-1.31%	-0.53%
	inflation			0.033	0.242	1.482
	natural rate of interest		1%			
	the ecb	target rate		2%	2%	2%
		interest rate then		0.00698	0.11444	0.738375

output gap				
2016	2017	2015	2016	2017
0.032425	0.032677	0.000800672	0.000654659	0.000155217
0.039133	0.039252	0.000731925	0.000248883	-4.71026E-05
0.001662	0.001685	0.000153599	0.000115827	4.85511E-05
0.001957	0.00205	3.88E-05	2.76116E-05	-5.86613E-05
0.020013	0.020077	0.001016141	0.00066542	0.000373829
0.206875	0.205557	0.009004201	0.008146739	0.005367101
0.29182	0.291544	0.005102607	0.003385114	-0.001166175
0.016325	0.01631	0.001445481	0.00112008	0.00074863
0.025534	0.025998	0.000595477	0.00040931	0.000140909
0.15523	0.153372	0.008181576	0.007469676	0.003351186
0.002322	0.002409	4.17819E-05	4.41258E-05	-2.40907E-05
0.003586	0.003726	9.60094E-05	4.662E-05	-5.5883E-05
0.005031	0.005071	7.45838E-05	7.58634E-05	1.9117E-05
0.000923	0.000959	-8.43664E-06	-3.13778E-06	-5.23552E-06
0.065217	0.065822	0.002100198	0.001813025	0.000190883
0.017165	0.016901	0.000912377	0.000686768	0.00017002
0.007509	0.007584	0.000169841	0.000201464	5.98377E-05
0.003751	0.003838	0.000179159	0.000111756	-2.37588E-05
0.103384	0.104357	0.007125019	0.004685359	0.000721105
		0.037761054	0.029905166	0.009965478