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WAS THE INTEREST RATE POLICY OF THE ECB TOO LOOSE? INSIGHT FROM A SIMPLE TAYLOR RULE

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Abstract

The interest setting of a central bank can be explained using a rule-based monetary policy. A rule-based monetary policy framework considers major economic variables to make a recommended interest rate. In an economy, the fluctuations in major economic variables are vital indicators that signal an action from the central bank. In this paper, we scrutinize the short-term interest rate setting of the European Central Bank (ECB) based on the observed economic conditions. We have based our analysis on a simple Taylor rule. The investigation includes evidence and implication from a selected time period to reflect on the interest rate setting practice followed. For comparison purposes, the applicability and validity of a rule-based monetary policy are then analyzed for the US relying on the interest rate setting of the Federal Reserve. Our empirical findings confirm that the interest rate adjustments in the two central banks go along with the recommendations from a simple Taylor rule. Finally, taking the difference between the interest rate settings of the two banks, an empirical analysis is made to identify whether this difference can be attributed to the difference in simple Taylor rule recommendations.

Keywords: Monetary Policy, Interest Rate Setting, Simple Taylor Rule, Inflation, Unemployment Gap

JEL Classifications: E3, E43, E58

1. Introduction

In pursuit of its price stability mandate, the European Central Bank (ECB) in euro-area[1] sets three main policy rates as a conventional monetary policy measure. The most important of these policy rates is the short-term interest rate on its main refinancing operations (MRO). As of the year 2012, the ECB had been gradually reducing the interest rate on MRO before finally reaching the zero-lower-bound. At the end of the first quarter of 2016, the ECB made a monetary policy decision to decrease the interest rate on MRO by 5 basis points to 0.00% which is historically the lowest. (ECB, 2016).

[1] The euro-area consists of these 19 countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain.

In an environment where the short-term interest rate is at the zero-lower-bound for a longer time period, the extent of responsiveness of a conventional monetary policy measure to business cycle fluctuations has been under scrutiny. In case of a future recession, as claimed by Claeys and Demertzis (2017), the ECB might not be able to rely on cutting its short-term interest rate. On the other hand, regardless of some periods where the euro-area has enjoyed economic recovery which in turn favored a possible increase in interest rate, ECB has adhered to the 0.00% interest rate on MRO. Such observations lead to a mere conclusion that this conventional monetary policy measure of the ECB has lost its punch and has been completely ignored.

A similar assumption on the non-responsiveness of monetary policy cannot be made for the US as the Federal Reserve has a conventional monetary policy room left. Evidently, in the year 2020, the Federal Reserve has reduced its Federal Fund target rate from 1.55% in January to 0.65% in March aiming to address adverse economic effects of Covid-19. (FRED, 2020).

Generally, the central bank's monetary policy decisions are well explained in connection with business cycle fluctuations. In this regard, one can ponder a rule-based policy measure that integrates the dynamics in major economic variables with a recommended conventional monetary policy action. Accordingly, a Taylor monetary policy rule as coiled in the seminal article by Taylor (1993) can be used. This rule depicts a linear relationship between the policy interest rate and major economic variables such as the inflation rate and the output or unemployment gap.

In this paper, based on the recommendation from a simple Taylor rule, the question of whether ECB's interest rate setting was too loose is explored. First, a brief review focusing on the first half of 2018, which can be deemed to reflect favorable economic recovery conditions for an interest rate adjustment, is presented. This assessment is done for both the euro-area and the US. Subsequently, using Nechio's (2011) version of a simple Taylor rule with inflation and unemployment gap, interest rate settings in euro-area and the US are contrasted with the corresponding Taylor recommendations. Here, the applicability of a rule-based policy monetary policy measure is assessed. Thirdly, interest setting synchronization and interdependence between the euro-area and the US are investigated. An insight into the economic conditions in both the euro-area and the US is already captured with the Taylor rule. This insight is then used to see whether the differences in economic conditions are determinant for the prevailing interest rate differences between the two central banks.

In general, this paper examines the reaction of a monetary policy tool with respect to variations in economic variables. By maintaining the simplicity advantage of a Taylor rule, this paper aims to add an international context to the interest rate setting. By considering the two central banks, it touches up on the prevailing economic condition differences between euro-area and the US.

The remainder of the paper is organized as follows: In section 2, a brief review of the selected time period in both euro-area and the US is made. Here, the economic conditions and the reactions of monetary policy in this business-cycle fluctuation are reflected. Section 3 describes the data set and makes implications on the model used. The last section derives the empirical results, interprets the findings, and concludes.

2. Monetary policy reactions during business-cycle fluctuations

The ECB sets inflation target rate to below, but close to, 2% over the medium-term in line with its price stability objective. While price stability is its major objective, the ECB does not, however, rule out the importance of observing unemployment rates. In the US, the Federal Reserve has an objective of stabilizing price, sustaining employment, and keeping the long-term interest rates to be moderate. Similar to that of the ECB, the Federal Reserve set an inflation target of 2% (Federal Reserve Board, 2020).

The underlying objectives of the two central banks magnify the importance of investigating monetary policy instruments with respect to fluctuations in inflation and unemployment rates. The trends of these two variables are often explained with the position of an economy on the business cycle. During business-cycle expansion, an economy is characterized by an increase in inflation and a decreasing unemployment rate. The central bank would thus perform tightening monetary policy measures to maintain its target inflation rate. Contrarily, during a recession, an economy is characterized by declining inflation and a rising unemployment rate. Here again, the central bank would undertake expansionary monetary policy measures which in turn helps to balance the inflation rate with the target.

The theoretical framework that reflects how monetary policy should react to during business-cycle fluctuations can be well materialized by contemplating a simple rule-based policy instrument. In this paper, a simple Taylor rule is used to model the short-term interest rate reaction to business-cycle fluctuations. Although different versions of the Taylor rule have been developed since the original work of Taylor (1993), the version that captures the deviations of inflation from its target and unemployment from its natural rate following Nechio (2011) is chosen here.

$$Taylor\ rule\ target\ rate\ = 1 + 1.5 \cdot Inflation - 1 \cdot Unemployment\ gap \quad (1)$$

Accordingly, Equation (1) reflects a positive relationship between the short-term interest rate and inflation. If inflation increases by 1 percentage point, the central bank shall react with a tightening monetary policy of increasing its interest rate by 1.5 percentage points. Besides, a negative relationship between the short-term interest rate and unemployment gap is depicted here.

This version of Taylor rule adheres more to the dual mandate followed by the Federal Reserve (Mattson and Pjesky, 2019). Debortoli *et al*. (2019) state that as of 1977, the Federal Reserve aims at promoting maximum employment within the context of price stability. Billi (2020) shows that in times of economic fluctuations due to supply shocks, employment targeting is helpful to achieve optimal monetary policy. Although ECB's primary mandate is price stability, Svensson (2018) explains a more transparent objective of the ECB: aiming to achieve full employment without prejudice to the price stability objective. Sandbu (2020) refers to Article 3 of the Treaty on EU to confirm that ECB is legally obliged to support general economic policies which off course includes a closer attention to unemployment rates.

As mentioned, the ECB has set its primary objective of keeping the euro-area inflation rate to below, but close to, 2% over the medium-term. It is here important to mention that rather than core inflation, the ECB explicitly uses headline inflation, which is also referred to as all-items HICP inflation (Nechio, 2011). The subsequent discussions about euro-area would thus focus on headline inflation.

As of the first quarter of 2018, the European economy enjoyed an economic recovery characterized by increasing inflation and low unemployment rates. The first half of 2018, in general, can be regarded as periods where recovery from the Euro Zone crisis is completed. Following Eurostat and ECB calculations, the unemployment rate in the euro-area has declined significantly while all-items HICP inflation has reflected an increasing trend as of late 2017 (see Warmedinger and Koester, 2018). Similarly, ECB's assessment of the year 2018 showed an increase in inflation and a fall in the unemployment rate while the latter had reached its lowest level in almost a decade. Headline inflation continued its strong increase before reaching around 2.1% in September of 2018 which is largely due to high oil prices (ECB, 2018b).

The simple Taylor rule described in Equation (1) would suggest that in the period of falling unemployment and increasing inflation rates, the short-term interest rate should be increased. However, in 2018, despite the prevailing economic conditions, the ECB opted to keep the interest rate at the historically low level of 0.00%.

The decision of the ECB shall not imply that the ECB is not following a rule-based monetary policy. Taylor (1993) stated that always following a particular algebraic formula that describes a policy rule is practically impossible as a certain extent of judgments is required to come up with a fitting interest rate. The reason why the ECB had refrained from an interest rate increase can be attributed to the fact that the increase in HICP inflation due to the oil price has affected the euro-area countries to different extents. A judgmental decision is made here as the increase in inflation is regarded as to be short-lived and had a moderate contribution to headline HICP inflation and cross-country differences (Rubene, 2018).

In the US, the Federal Reserve uses core inflation to set its target and control economic fluctuation. Federal Reserve Board published a monetary policy report in July of 2018, which confirmed that the target interest rate in the US during the first half of 2018 has gradually increased (Federal Reserve Board, 2018). This conventional tightening monetary policy measure is undertaken amid the growth observed in the economy vis-à-vis the economy approaching the maximum level of employment and price stability which is in line with the 2% inflation target.

As a rule-based monetary policy recommends, the low unemployment level and booming of the economy in the US are addressed by a conventional monetary policy. Accordingly, in the first half of 2018, the Federal Reserve gradually increased its interest rate (ECB, 2018a) and had continued to do so aiming at keeping its inflation target at a check (The Economist, 2019).

Having looked at the different reactions of the ECB and the Federal Reserve during the analyzed period, it is thus vital to further investigate why these differences occurred. The differences could be attributed to different economic variables. However, to what extent could this difference be explained by the interest rate suggested by a rule-based monetary policy would be at the heart of this particular paper.

3. Data and methodology

Data set sources for the euro-area and the US are described in the appendix (Table A1). A quarterly data set from Q1 1999 to Q1 2020 is used. The variables to compute the simple Taylor rule indicated in Equation (1) are headline inflation for the euro-area, core inflation for the US, and unemployment gap defined as the difference between the unemployment rate and its natural rate. A detailed description of the methodologies and models used to compute the results is presented in Equations (2) and (3).

The headline inflation data set for the euro-area is secured from the All-item HICP raw data provided by Eurostat. As only monthly data of All-item HICP raw data is secured, the arithmetic mean of three months' observation is used to come up with the quarterly data. Afterward, the percentage change of this quarterly data from the similar quarter of the previous year is calculated. Similarly, the arithmetic mean of three months' unemployment rate is used to compute the quarterly values. Thereupon, to determine the natural rate of unemployment, Hodrick-Prescott filter method, in accordance with Hodrick and Prescott (1997), is applied. In line with the usual procedure followed by economic literature, for the quarterly data set used, a value of $\lambda = 1,600$ is selected for the smoothing parameter. The short-run nominal interest rate on the main refinancing operations (MRO) is secured from the ECB website. The interest rate prevailing at the end of each quarter is considered as the interest rate for the entire quarter.

For the US, following the recommendations by Mendez–Carbajo et al. (2017), the paper relied on a data set from FRED, the St. Louis Fed's economic database. The Federal Open Market Committee (FOMC) in the US uses core inflation measured by the price index for total personal consumption expenditures (PCE) that exclude food and energy (Luciani and Trezzi, (2019).

After the simple Taylor rule recommendations based on the representation in Equation (1) are computed, a graphical comparison is made with the actual interest rates of the two central banks. Subsequently, a simple OLS regression applicable for both euro-area and the US is made using the model specified in Equation (2).

$$i_t = \beta_0 + \beta_1 \cdot \pi_t + \beta_2 \cdot Unemployment\_Gap_t \quad (2)$$

Equation (2) depicts the linear relationship between short-term interest rate (i_t) with the two variables of inflation π_t and unemployment gap ($Unemployment\_Gap_t$).

Finally, a comparison between euro-area and the US is made based on the interest rate settings over time and prevailing economic conditions. In addition, the analysis provides observation results to investigate whether the differences in interest rates are due to the differences in Taylor rule recommendations. Here again, an OLS regression is estimated using the model specified in Equation (3).

$$Differences\ in\ Interest\ Rates = \alpha_0 + \alpha_1 \cdot\ Differences\ in\ Taylor\ Rates \quad (3)$$

The differences in interest rates and Taylor rates in Equation (3) are computed by subtracting the values of the euro-area from that of the US.

4. Findings and discussion

As depicted in Figure 1, movements of actual interest rate and the Taylor recommended rate for the euro-area seem to be relatively consistent and synchronizing before the zero-lower-bound was reached in 2016. Until 2016, the figure reflects that the ECB had used a rule-based monetary policy in line with the recommendation of a Taylor rule. This intuitive conclusion is also confirmed in Nechio (2011), Darvas and Merler (2013), and Darvas (2014). However, after 2016, a similar conclusion could not be reached by observing the graph as a possible deviation of the interest rate set by ECB from the Taylor recommended is observed.

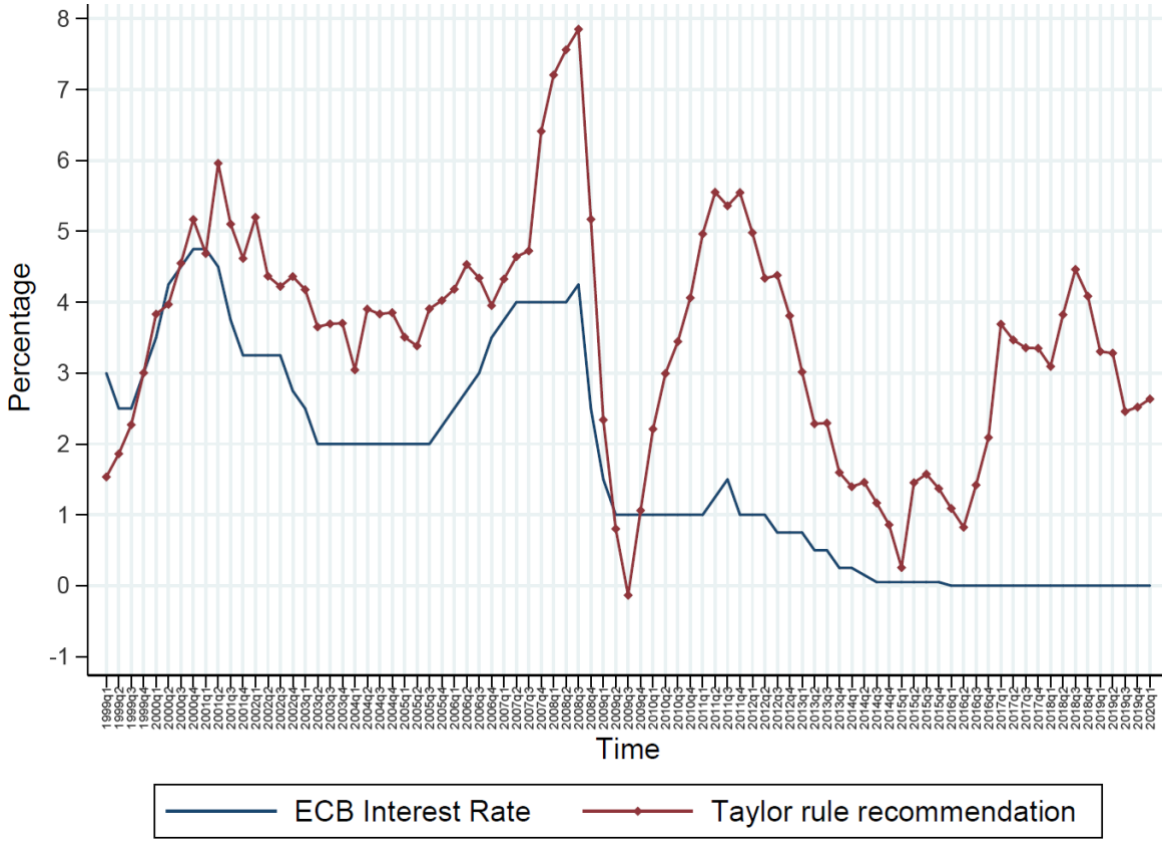

Figure 1. Taylor rule recommendation for euro-area
Source: See appendix

To provide a shred of concrete empirical evidence, following the specification in Equation (2), an OLS regression analysis is conducted. The second column of Table 2 presents the results for euro-area. Although an exact match of the simple Taylor rule coefficients could not be secured here, the results indicate that the ECB is basing its interest rate decisions on a rule-based monetary policy. Coefficients of the two independent variables of inflation and unemployment gap are statistically significant. This observation is thus evident that the ECB's interest rate policy was not too loose. The significant coefficients of the OLS also indicate that ECB has been following a rule-based monetary policy driven by economic conditions.

Table 2. OLS Regression results for euro-area and the US

Variables	euro-area	US
Inflation	0.83***	1.29***
	(0.12)	(0.48)
Unemployment Gap	-0.75***	-0.69***
	(0.25)	(0.10)
Constant	0.31	0.33
	(0.24)	(0.92)
Observations	85	85
R-squared	0.40	0.52

Note: *, **, *** represents 10%, 5% and 1% significance respectively and robust standard errors are shown in parentheses.

The observation based on the data from the US is presented in Figure 2. Here, one can clearly see a pattern and confirm that the Taylor recommended interest rate and the Federal Reserve's target rate are following a similar trend over time. The results presented here are in

line with the current implications observed from the economic literature on a simple Taylor rule. For instance, Taylor (2020) made indications on the importance of this simple monetary rule as an optimal rule for the Federal Reserve through being a vital part of overall economic policy. Such notation is also supported by Federal Reserve Board in its twice-yearly published report. In accordance, the report regarded this version of a simple Taylor rule used in this paper as one of the five monetary policy rules that embody three key principles of good monetary policy (Federal Reserve Board, 2020). Furthermore, the OLS regression result for the US, as reported in the third column of Table 2, indicates that the Federal Reserve is following a rule-based monetary policy. The coefficients are significant, and their signs are also in line with the theoretical framework.

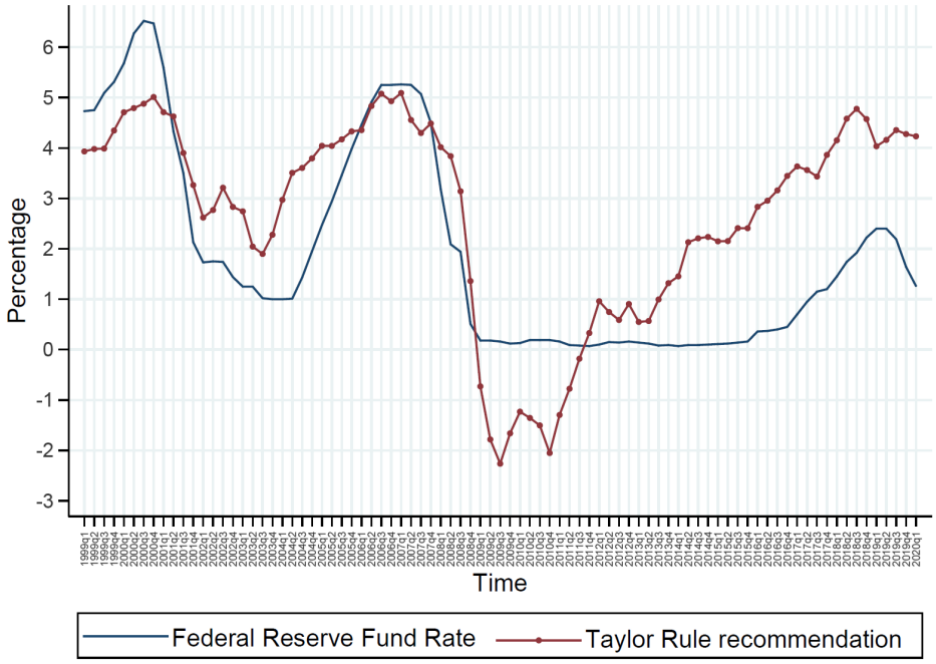

Figure 2. Taylor rule recommendation for US
Source: See appendix

The final investigation looks into the question of whether differences in interest rates set by the two central banks can be explained by differences in economic variables (as captured by the simple Taylor rule representations). Figure 3 makes a graphical depiction of the difference in interest rates set by both central banks and the Taylor recommended interest rates. The similar pattern of movement of both differences is then analyzed with the regression model specified in Equation (3). Accordingly, Table 3 presents the results of the simple linear regression. The first implication that can be made based on this result is pointing out that the differences in the actual interest rates are significantly influenced by the differences in the recommendations from the simple Taylor rule applied. Furthermore, the coefficient of the difference in Taylor rate variable in the OLS regression is significantly different from zero. This variable accounts for the differences in the two baseline economic variables of inflation and unemployment gap used to compute the Taylor recommendation. Thus, here, an insight is made into the significant difference in macroeconomic conditions between the euro-area and the US.

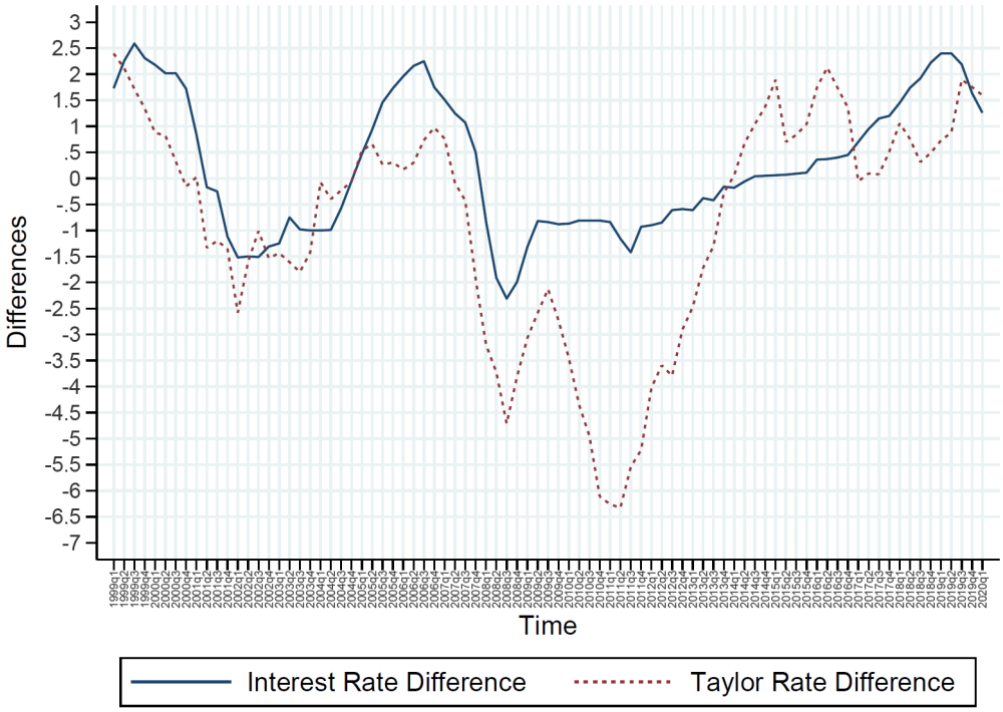

Figure 3. Differences between interest rates and Taylor rule recommendations (the US minus the euro-area) from Q1 1999 to Q1 2020

Source: See appendix

Table 3. OLS Regression results for interest rates differences between euro-area and the US

Variables	Differences in interest rates
Differences in Taylor rates	0.43***
	(0.04)
Constant	0.59***
	(0.11)
Observations	85
R-squared	0.53

Note: *, **, *** represents 10%, 5% and 1% significance respectively and robust standard errors are shown in parentheses.

5. Conclusion

In general, based on the presented results, the paper concludes that both central banks are following a rule-based monetary policy. It is important to note that a perfect and mechanical way of following the simple monetary rule is not to be expected at any time. However, in accordance with the theoretical frameworks discussed, a valid and well-placed build-up to a monetary policy based on the simple linear relationship is confirmed. Furthermore, having reached a similar conclusion for both euro-area and the US, the results in this paper imply a quantifiable level of synchronization in the international context. In this regard, such international cooperation can shed light on approaches that are useful to achieve a better global economy.

Further research could, for example, focus on incorporating additional central banks into the picture as compared to ECB and the Federal Reserve. In particular, a range of central banks from EU countries can be analyzed in line with the simple rule-based monetary policy framework. One scope limitation of this paper is its focus on the given simple Taylor rule version. Since more versions of the Taylor rule have been developed through time, another possible area of further research could be to consider these alternatives.

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Appendix

Table A1. Source of data

Variables	Source	Description
HICP Inflation	Eurostat	All-Item HICP (2015=199) monthly data (index)
Unemployment Rate	Eurostat	Harmonized unemployment rates (%) – monthly data
US Core Inflation	FRED	Personal consumption expenditures excluding food and energy (Chain-Type Price Index)
US Unemployment Rate	FRED	Unemployment rate (%), seasonally adjusted (UNRATE)
US Natural Rate of Employment	FRED	Natural rate of unemployment (Long-Term) (NROU)
Effective Federal Fund Rate	FRED	Effective Federal Funds rate (FEDFUNDS)
ECB Key Interest Rate	FRED	Euro area (changing composition) – Key interest rate – ECB main refinancing operations

Note: Description of the data set The HICP inflation and unemployment data set for euro-area counties are downloaded from Eurostat on 16/05/2020. The main referencing rate is downloaded from ECB website on 16/05/2020. The entire data set used for the US is secured on 17/05/2020 from the Federal Reserve Economic Data. The quarterly real GDP figures until end of 2019 are secured from OECD while the real GDP forecast for the first quarter of 2020 is downloaded from IMF (both datasets are downloaded on 17/05/2020).