



ECONOMIC ANALYSIS OF THE NEGATIVE INTEREST RATE POLICY (NIRP) ON ASSET PRICE INFLATION: THE CASE OF THE EUROZONE

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Abstract

Since the beginning of 2014, the European Central Bank (ECB) has employed a Negative Interest Rate Policy (NIRP) on bank deposits. This unconventional policy was set to provide additional monetary stimulus to the economy of the EU in the aftermath of the financial crisis of 2008. Taking into consideration the fact that there is a precedent for negative policy rates, little is known regarding the impact of employing NIRP to an economy as large as the Eurozone (19 countries) for a prolonged period. This paper studies the effect of NIRP employed by the ECB on the housing markets in the Eurozone. This paper also presents an assessment of the implications of NIRP by analyzing the behavior of a set of social and economic variables. Moreover, it is shown that there is a negative relationship between the house price index and the ECB deposit interest rates. It is also noticed that there is positive relationship between house price index and deposit interest rate, catering for unemployment rate, nominal labor cost, and government deficit as moderator variable.

Keywords: Eurozone, price inflation, Negative Interest Rate (NIR), house price index



INTRODUCTION

Negative Interest Rate Policy or simply NIRP is a nonconventional monetary policy enforced by central banks which aims at stimulating growth and raising inflation expectation by encouraging lending to the real economy, and by suppressing borrowing costs. The main idea behind NIRP is by charging commercial banks for reserves placed on deposit with the central bank. NIRP has been employed by many central banks throughout the world including the Bank of Japan, the European Central Bank, (ECB), the Swiss National Bank (SNB), the Swedish Riksbank, and the Danish Central Bank (DN) (Palley, 2016).

The motivation behind adopting NIRP in mid-2014 and early 2015 differed between the ECB, SNB, DN and Riksbank; with each one of them facing a challenging macroeconomic environment in its area. In some cases, the central banks' declared objective was to counter a subdued inflation outlook, while in others they focused on currency appreciation pressures in the context of bilateral pegs or floors on their exchange rates (Bech & Malkhozov, 2016).

Historically, Negative Interest Rate Policy (policy-determined or otherwise) has been an extremely rare phenomenon. In the United States, some Treasury bill yields briefly fell below zero during the Great Depression and during the height of the 2008–2009 global financial crises. The SNB sporadically introduced negative interest rates on foreign deposits during the 1970s to prevent capital inflows and excessive appreciation of the Swiss franc (Meggyesi, 2010). Yields on some Japanese government bonds were negative for a brief period during the downturn of the late 1990s. Swedish Riksbank temporarily lowered its deposit rate below zero in 2009. However, the widespread emergence of negative interest rates outside of a financial crisis is unprecedented (Arteta et al, 2016).

NIRP is becoming a mainstream macroeconomic approach and a part of central banks' policy tools. Ben Bernanke, the former chairman of the Federal Reserve (FED) announced in December 2015 that the FED was prone to adding NIRP as a policy tools to be used in the future. Bernanke followed that statement up in March 2016 with an extended Brookings Institution blog on the tools the central banks have to fight slow growth, beginning with negative interest rates. Janet Yellen, the Federal Reserve Chairwoman, reconfirmed those statements in February 2016, asserting that NIRP were still on the policy table. The IMF jumped on to the negative interest rate bandwagon in April 2016 when Managing Director Lagarde declared that they are a net positive to the global economy, a position that was strongly echoed by IMF financial counsellor Jose Vinals in a briefing at the IMF in 2016 spring meetings (Palley, 2016).

THE RESEARCH PROBLEM

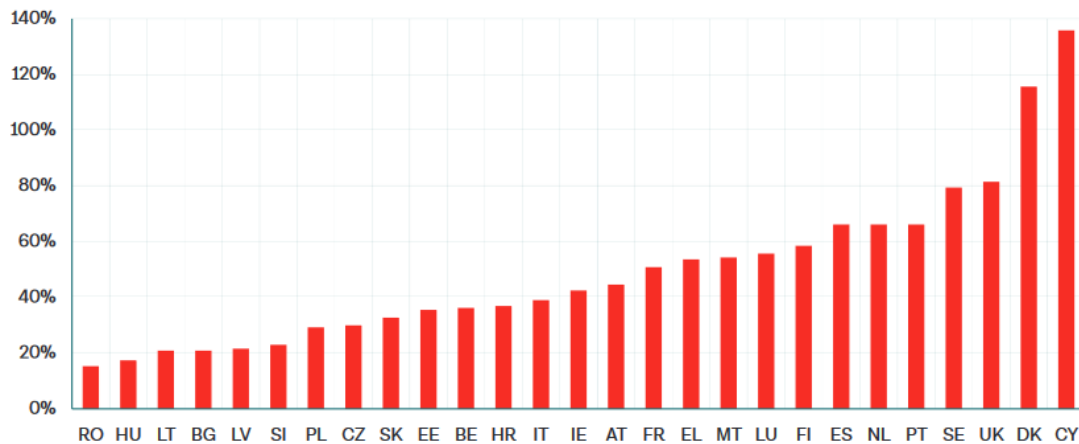
Housing affordability is one of the key factors that can describe the socioeconomic stability and development of a country. Housing affordability is aimed to ensure that the housing provided is affordable by every income earner group whether low-income, middle-income, or high-income group (Suhaida et al, 2011).

There are few studies in the Euro zone that cover the relationship between negative interest rates (NIRP) and the changes in prices in the housing market. Moreover, there is a small number of studies on how macroeconomic indicators such as the government deficit rate, the unemployment rate, and labor cost and their effect on the housing market.

According to the World Bank (WB) 2018 report on Housing in the European Union, the slow emergence of long-term housing finance has further interfered with the smooth functioning of housing markets and households' tenure decisions. The level of financial intermediation in some EU countries remains very low even today, with residential loans amounting to less than 20 percent of Gross Domestic Product (GDP) in Hungary and Romania. In fact, the residential mortgage market in the EU is dominated by five countries: France, Germany, the Netherlands, Spain, and the United Kingdom. Housing is typically the largest asset owned by the household, and ownership is associated with a financial opportunity cost (figure, 1). Thus, housing finance is an important input in the provision of housing because a better-functioning housing finance system can lower housing prices relative to incomes. Underperforming mortgage markets reinforce financial constraints from low housing equity and can deter residential mobility (Inchauste et al, 2018).

Rising property prices pose a big problem for countries worldwide, and European countries are no exception; with increases in prices of properties and rent costs, wages have to keep up with the inflation in the housing market in order to maintain for individuals a steady standard of living. Moreover, unusual increases in property prices over prolonged periods of time could be an indication of a property bubble, which is when the prices of securities or other assets rise so sharply and at such a sustained rate that they exceed valuations justified by fundamentals, making a sudden collapse likely – at which point the bubble “bursts” (Financial Times, 2004).

Figure 1: Household Mortgage Portfolio, as a % of GDP in EU Countries, 2015



Source: European Credit Research Institute database.

Note: EU = European Union.

ASSET PRICING

In their paper, Goodhard and Hofmann found that there is an evidence of a significant multidirectional link between house prices, broad money, private credit and the macroeconomy. Money growth has a significant effect on house prices and credit, credit influences money and house prices and house prices influence both credit and money. This link is found to be stronger over a more recent sub-sample from 1985 to 2006 than over a longer sample going back to the early 1970s, a finding that most likely reflects the effects of financial system liberalizations in industrialized countries during the 1970s and early 1980s (Goodhard & Hofmann, 2008).

In his book “The bubble and beyond”, Michael Hudson discussed that the financialization of the economy (and indeed, of the political system) is more centralized than public planning by elected officials. And whereas government planning tends to be long-term, financial planning under neoliberalized conditions is hit-and-run. Whereas, government planning is supposed to promote capital formation and full employment, today’s financial planning makes returns by stripping assets, inflating asset-prices (the Bubble Economy), and minimizing the return to labor relative to rentier returns (Hudson 2012).

Research Question 1: What is the relationship between the house prices in the Eurozone and the Negative Interest Rate policy (NIRP) enforced by the ECB?

Research Question 2: What is the relationship between the house prices in the Eurozone with the Negative Interest Rate Policy (NIRP), considering unemployment rate, nominal labor cost, and government deficit as moderator variable?

LITERATURE REVIEW

Like other unconventional monetary policies, NIRP could also encourage excessive risk-taking, which could contribute over time to the formation of asset price bubbles. Recent research also documents an inverse relationship between short-term interest rates and bank risk-taking. Greater risk-taking may contribute to the formation of asset bubbles, which could be particularly damaging for the real economy if they take place in the housing market (Claessens, Kose, & Terrones, 2012). However, increases in equity and house prices have, thus far, remained moderate in most economies where NIRP has been implemented, with the noticeable exception of Sweden. There is no conclusive evidence as yet of a significant and broad-based increase in leverage, or of excessive asset price valuations that could signal looming financial stability risks (Arteta et al, 2016).

Arguments Surrounding NRP

In support of negative interest rates, Jobs and Lin argued in 2016 (NIRP, Implications for Monetary Transmission and Bank Profitability in the Euro Area) that in an environment of low inflation and a declining equilibrium real rate of interest, negative rates restore the signaling capacity of the central bank by effectively removing the zero-lower-bound (ZLB). Moving the marginal policy rate into negative territory can help the real rate adjust downward, compensating for inflation below the inflation target and contributing to a significant flattening of the yield curve. In other words, a decline in the nominal rate could lower its real rate component, allowing inflation expectations to rise and boosting aggregate demand; however, if both nominal and real interest rates are shifted down, a widening gap leads to deflation pressure (Musmeci). Thus, if banks hold excess reserves, cuts to the central bank deposit rate (as the marginal policy rate) can effectively lower the interbank and other interest rates, encouraging banks to take greater risks and facilitating portfolio rebalancing (Jobs & Lin, 2016).

Economic Effects Of NIRP

Many researchers argue that the adverse effects of negative interest rates outweigh its benefits, especially when applied over prolonged periods of time. Undesirable effects of NIRP span across many aspects of the economy and pose a great risk for many social classes such as the pensioners, poor and lower middle-class households.

Negative interest rates have direct and indirect short and long-term implications on the economy of states. Such policies increase the price of financial assets particularly risky assets like equities which become more attractive as interest rates fall. Since such risky assets are

predominantly held by wealthier households, that further increases the relative wealth of those households at a time of heightened income and wealth inequality (Palley, 2016).

As much as negative rates ease financial constraints on borrowers in the short run, they could distort the long-term debt affordability for borrowers if lending rates become negative in real terms. The reduced debt service burden under NIRP could delay the exit of nonviable firms, hurting demand prospects of healthy firms by adding to excess capacity and delaying the efficient allocation of capital and labor (Caballero et al, 2008; Kwon et al, 2015).

Negative rates also have distributional implications that are beyond the scope of this paper. For instance, negative rates could increase the re-distributional impact of monetary policy on wealth and income. Any reduction in interest rates makes savers worse off while borrowers benefit and could have important intergenerational implications. Elderly people tend to have accumulated savings, so moving from positive to negative interest rates could increase intergenerational inequality as retirement income declines. However, higher asset prices increase the net worth in present value terms. Lower borrowing rates also support consumption and investment of liquidity constrained households and firms, raising aggregate demand over time and outweighing any adverse impact on savings (Jobs & Lin, 2016).

The problem is even worse with house prices, which are particularly prone to NIRP induced bubbles. House purchases are largely financed with mortgages, and lower interest rates therefore drive up prices by lowering mortgage payments and increasing cash-flow affordability. However, there are massive downsides stemming from mortgage debt. The interest payment on a \$200,000 home at 6% is the same as the payment on a \$400,000 home at 3%. Yet, purchasers are saddled with a larger mortgage that they must pay back in the future, and they also lose financial flexibility and are rendered more financially fragile (Palley, 2016).

Property Markets

Property is recognized by both institutional and private investors as being an investment medium, the relative attractiveness of which can be evaluated against other asset classes. In particular property provides a means of reducing or spreading risk by diversifying the asset base of a portfolio either directly or indirectly into real estate (Adair et al, 1999).

From a policy perspective, it is important in a monetary union such as the Euro area to understand how housing price shocks propagate across countries of the union, as they can have a significant impact on the wider economy. The epicenter of the latest global financial and economic crisis, the most severe since the Great Depression, was the US subprime mortgage market. The consequences of burst housing bubbles play a major role in the current difficulties

of countries such as Ireland and Spain. More formally, the economic literature has widely documented links between housing markets and the macroeconomy (Gupta et al, 2015).

Property Markets In The Eurozone

In an integrated economic region such as the Euro area, housing prices could be expected to exhibit some co-movement, even though local factors play an important role in housing price dynamics. However, while cross country influences may move Euro area housing prices, significant lags are to be expected, as housing prices tend to be highly persistent. Hence, the extent of co-movement may be difficult to assess through simple correlations, or even more sophisticated techniques that do not allow for sluggish adjustments (Gupta et al, 2015).

Until the early 2000s, housing market institutions in most CEE countries were weak and housing finance almost nonexistent. Improvements in the regulatory and institutional framework necessary for the development of the property market have largely occurred as a result of the EU accession process. Reforms in legislation and judiciary practices that make it easier for creditors to seize real estate collateral removed a key obstacle to the buying and selling of property (Égert & Mihaljek, 2007).

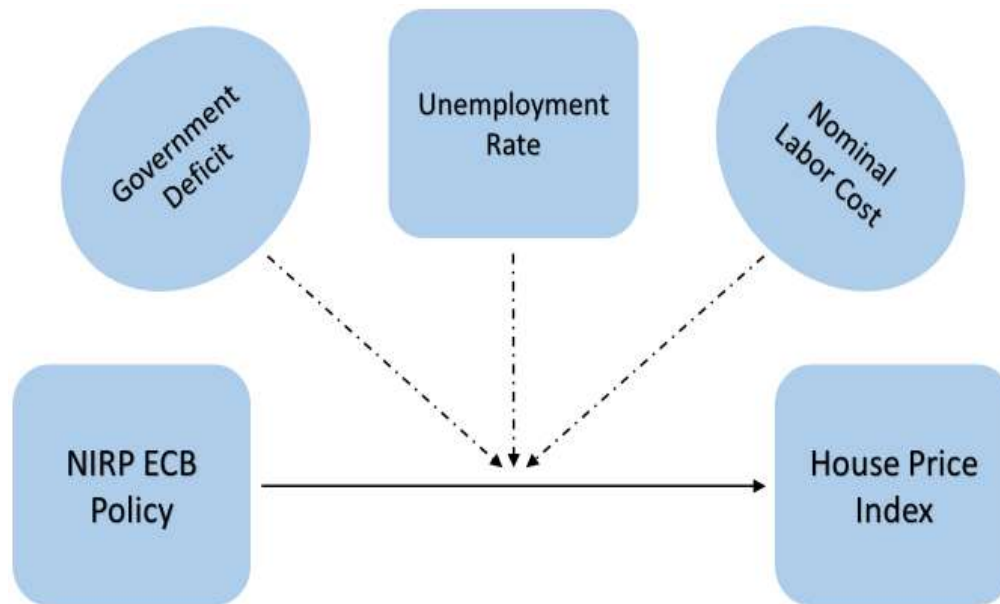
Together with the restructuring of the banking sector and acquisitions of local banks by strategic foreign investors with strong retail expertise, these reforms have spurred the development of housing markets and housing finance (Mihaljek, 2006). Many banks in CEE started to provide longer-term housing loans; the loan-to-value ratios increased; and interest rates started to decline. Although mortgage penetration in CEE remains much lower than in Western Europe, and access to mortgage loans is still limited to higher-income households, housing finance is highly competitive, with margins beginning to approach western European levels in some countries (Égert & Mihaljek, 2007).

The following table (table, 1) contains the hypotheses regarding the Deposit Interest Rate in the Eurozone and the House Price Index in the Eurozone:

Table 1: The Hypotheses

H1: Determine the direct relationship between the Deposit Interest Rate in the Eurozone and the House Price Index in the Eurozone	H2: Determine the indirect relationship between the Deposit Interest Rate in the Eurozone and the House Price Index in the Eurozone, catering for Unemployment Rate, Nominal Labor Cost, and Government Deficit
H1.1: Deposit Interest Rate will have a negative relation with House Price Index	H2.1: Deposit Interest Rate will have a negative relation with House Price Index, catering for Unemployment Rate, Nominal Labor Cost, and Government Deficit

Figure 2: Conceptual Framework



METHODOLOGY

This paper adopted the time-series research design that is most used in macroeconomic studies.

The Data

Secondary data on deposit interest rates and on unemployment rate in the Eurozone was acquired from the European central bank (ECB) website, and the data on house price index was acquired from Eurostat website (the statistical office of the European Union situated in Luxembourg) (figure,2). The data covers the Eurozone (or officially called the Euro area) which is a monetary union of 19 of the 28 European Union member states which have adopted the Euro as their common currency and sole legal tender. The Eurozone consists of Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. The data analysis was then carried out using R v3.6.1 and Rstudio. The data set contained 58 quarterly data points.

The table 2 contains the relevant data regarding each of o variables utilized by the paper.

Table 2: Snapshot of the variable data content and Information on the adopted variables by the study

	Housing Price Index	Unemployment Rate	Deposit interest rate	Labor Cost Index	Government Deficit
Variable Title	House price index	Unemployment rate (as a % of labor force)	ECB Deposit facility - date of changes	Nominal unit Labor cost (NULC)	Government deficit(-)/surplus(+) (as % of GDP)
Variable Abbrev.	HPI	UER	IRS	NLC	GDS
Data Source	Eurostat	ECB	ECB	Eurostat	ECB
Starting Period	Q1 2005	Q2 1998	Jan 1999	Q1 1995	Q4 2002
Ending Period	Q2 2019	Q3 2019	Sep 2019	Q3 2019	Q2 2019
Unit of Measure	Quarterly index	Percent	Percent per annum	Percent per annum	Percent
Frequency	Quarterly	Monthly	Business (Daily)	Business (Daily)	Quarterly
YY.QQ	House Price Index	Deposit Interest Rate	Unemployment Rate	Nominal Labor Cost	Government Deficit Percentage
2016.Q4	107.08	-0.40%	9.72%	109.08	-1.45%
2016.Q3	105.99	-0.40%	9.92%	102.25	-1.65%
2016.Q2	104.02	-0.40%	10.18%	107.88	-1.65%
2016.Q1	101.78	-0.32%	10.31%	106.37	-1.82%
2015.Q4	101.27	-0.23%	10.50%	108.25	-1.98%
2015.Q3	101.13	-0.20%	10.68%	100.40	-2.09%
2015.Q2	99.95	-0.20%	11.05%	106.23	-2.35%
2015.Q1	97.65	-0.20%	11.22%	105.07	-2.40%
2014.Q4	97.94	-0.20%	11.45%	107.62	-2.46%
2014.Q3	98.35	-0.12%	11.52%	100.31	-2.52%
2014.Q2	97.34	-0.02%	11.63%	106.27	-2.62%

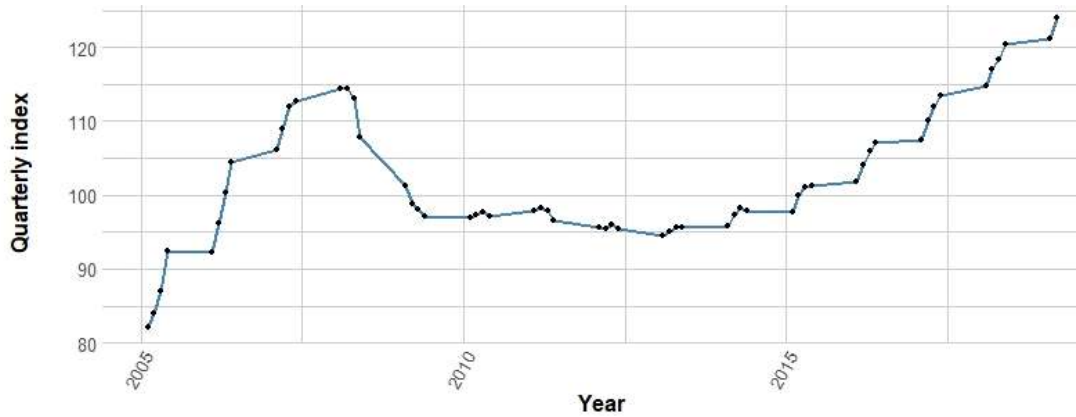
Source: The European central bank (ECB), 1995-2019

Data Transformation and Adjustment

The house price index retrieved from the Eurostat website is an index and uses a quarterly frequency as a granularity level (figure, 3). The data spans from quarter 1, 2005 till quarter 2 of

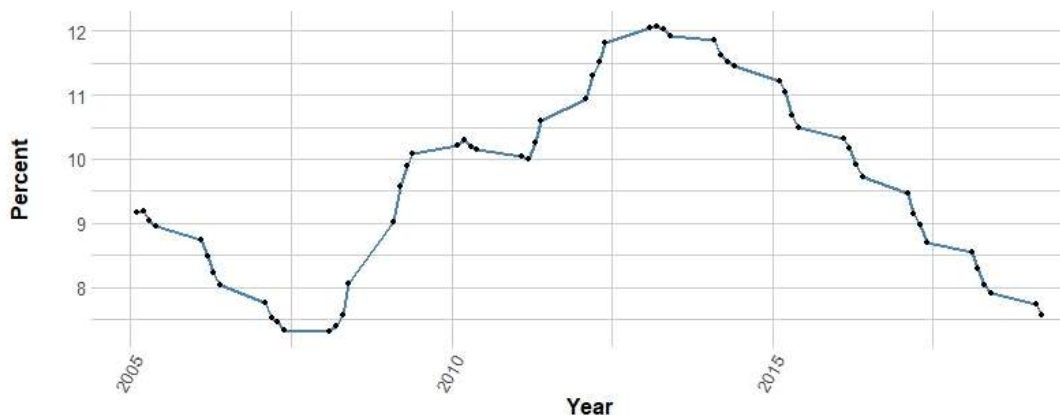
the year 2019. No transformations were applied to the data given, since it has a large granularity (quarterly periods), and has the least data periods among all variables being studied.

Figure 3: Housing Price Index in the Eurozone



The unemployment rate data retrieved from the ECB website is a percentage and uses a monthly frequency as a granularity level (figure, 4). The data spans from quarter 2, 1998 till quarter 3 of the year 2019. The data was transformed to quarterly data by calculating the average of the unemployment rate for the 19 Eurozone countries in each quarter. The periods between quarters 1, 2005 till quarter 2 of the year 2019 were chosen, while the rest of the periods were discarded.

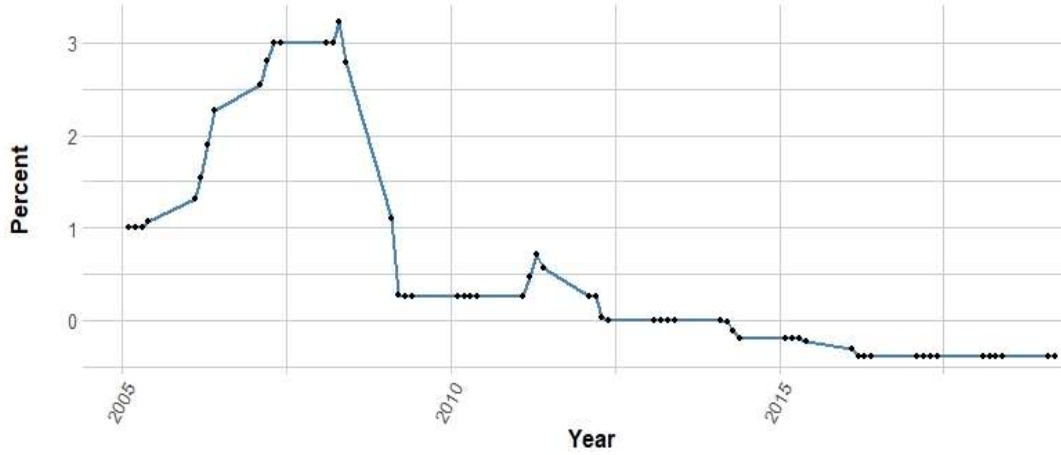
Figure 4: Unemployment Rate (as a % of labor force) in the Eurozone



The ECB Deposit facility - date of changes retrieved from the ECB website is a percentage and uses a daily frequency as a granularity level (figure, 5). The data spans from January 1999 till September 2019. The data was transformed to quarterly data by calculating the average of the

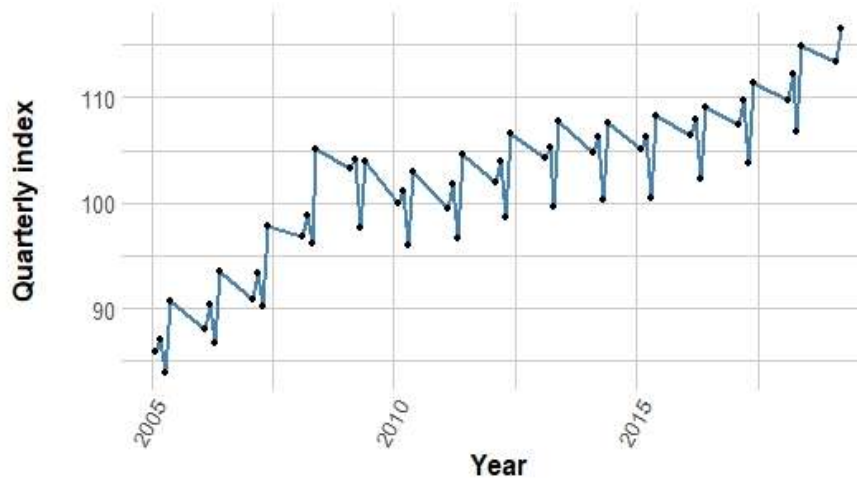
deposit interest rate in each quarter. The periods between quarters 1, 2005 till quarter 2 of the year 2019 were chosen, while the rest of the periods were discarded.

Figure 5: Deposit Interest Rates in Eurozone



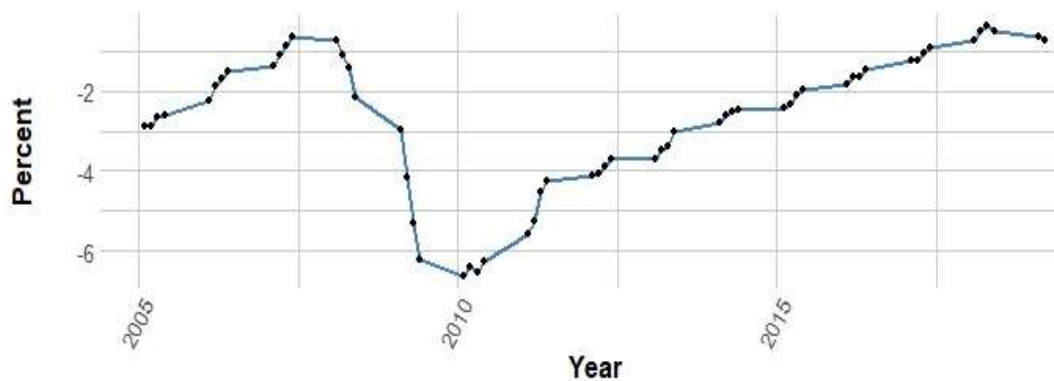
The nominal unit labor cost (index, 2010) data (figure, 6) retrieved from Eurostat website is an index and uses a quarterly frequency as a granularity level. The data spans from quarter 1, 1995 till quarter 3 of the year 2019. The data was transformed to quarterly data by calculating the average of the nominal unit labor cost for the 19 Eurozone countries in each quarter. The periods between quarters 1, 2005 till quarter 2 of the year 2019 were chosen, while the rest of the periods were discarded.

Figure 6: Nominal Unit Labour Cost (Index 2010)



The government deficit/surplus (percentage) data retrieved from ECB website is a percentage and uses a quarterly frequency as a granularity level (figure, 7). The data spans from quarter 4, 2002 till quarter 2 of the year 2019. The data was transformed to quarterly data by calculating the average of the nominal unit labor cost for the 19 Eurozone countries in each quarter. The periods between quarters 1, 2005 till quarter 2 of the year 2019 were chosen, while the rest of the periods were discarded.

Figure 7: Government deficit or surplus (As % of GDP).



FINDINGS

Regression analysis is a statistical and predictable process to forecast the changes in specific variables. Variables can be dependent (returns, gains...) and independent (income...). The regression analysis model measures the changes in the dependent variables based on the change of one or more independent variable. Regression analysis introduces the quantitative effect of variables caused by other variables. In addition, it includes the, statistical significance „that is the degree of confidence of the true relationship and its closeness and connectedness to the predicted relationship. (Sykes, 1983)

Regression analysis could be used to start a business or any endeavor, by which it helps to create the perfect image and shows how to focus and manage the changes. Moreover, it helps to figure out the closeness of the dependent and independent variables and how the circumstances are taking their place. Also it is commonly used to forecast events that didn't happened yet (Hamdar, Hamdan, and Kinawi, 2017).

A linear regression analysis was performed to examine the impact of independent explanatory variable Deposit Interest Rate on dependent variable House Price Index. The result indicates that there is a no direct relation between Deposit Interest Rate and House Price Index (Table 3).

Table 3: Summary statistics for the impact of Deposit Interest Rate on House Price Index

Term	Estimate	Standard		P.Value	
		Error	Statistic		
(Intercept)	102	1.36	74.8	0.00	
Deposit Interest Rate	0.671	1.09	0.616	0.54	
R.Squared	Adj. R.Squared	Sigma	Statistic	P.Value	DF
0.00673	-0.011	9.24	0.38	0.54	2

The R Square value of the regression model is not significant at 0.00673, indicating that there is no relationship between the two variables; the adjusted R- square is -0.011 also indicating no relationship between the two variables. The P -Value of the Deposit Interest Rate is 0.54 which indicates that the variable is not significant. The F- Statistic is 0.38 at two degrees of freedom.

The regression Line Formula is:

$$\text{House price index} = 102 + 0.671 \times \text{Deposit interest rate}$$

Testing for Moderator Effect

A linear regression analysis was performed to examine if there an indirect relationship between the independent explanatory variable (Deposit Interest Rate) on the dependent variable (House Price Index). The unemployment rate was added to the model to test the hypothesis. The result indicated that there is an indirect relation between Deposit Interest Rate and House Price Index, taking into consideration the effect of Unemployment rate as a moderator variable (Table 4).

Table 4: Summary statistics for impact of Deposit Interest Rate on House Price Index, with Unemployment Rate as a moderator

Term	Estimate	Standard		P.Value	Significant
		Error	Statistic		
(Intercept)	325.98	122.79	2.65	0.01	Yes
IRS	341.25	144.78	2.36	0.02	Yes
UER	-29.32	13.30	-2.20	0.03	Yes
GDS	151.83	62.89	2.41	0.02	Yes
NLC	-1.53	1.13	-1.35	0.18	
IRS X UER	-47.88	20.34	-2.35	0.02	Yes
IRS X GDS	-91.38	56.63	-1.61	0.11	

UER X GDS	-16.25	6.06	-2.68	0.01	Yes
IRS X NLC	-3.19	1.48	-2.16	0.04	Yes
UER X NLC	0.22	0.12	1.79	0.08	
GDS X NLC	-1.34	0.60	-2.22	0.03	Yes
IRS X UER X GDS	7.67	7.01	1.09	0.28	
IRS X UER X NLC	0.44	0.21	2.14	0.04	Yes
IRS X GDS X NLC	0.86	0.57	1.51	0.14	
UER X GDS X NLC	0.15	0.06	2.50	0.02	Yes
IRS X UER X GDS X NLC	-0.07	0.07	-1.04	0.30	

Table 4...

Adj.					
R.Squared	R.Squared	Sigma	Statistic	P.Value	DF
0.976	0.967	1.67	112.18	0.000	16

The R Square value of the regression model is significant at 0.976, indicating that there is a relationship between the two variables given moderator effect of unemployment rate; the adjusted R- square is 0.967, also indicating a relationship between the two variables. The P - Value of the Deposit Interest Rate is 0.02, the P -Value of the Unemployment Rate is 0.03, and the P -Value of the Government Deficit is 0.02.

For the moderator effect, the significant P- Values are for Deposit Interest Rate X (X, means times) Unemployment Rate at 0.02, Unemployment Rate X Government Deficit at 0.01, Deposit Interest Rate X Labor Cost at 0.04, Government Deficit X Labor Cost at 0.03, Deposit Interest Rate X Unemployment Rate X Labor Cost at 0.04, and Unemployment Rate X Government Deficit X Labor Cost at 0.02. The F- Statistic is 112.18 at four degrees of freedom.

The testing of hypotheses by using the linear regression was delineated as follows:

- H1.1 Deposit Interest Rate and House Price Index; it has been shown through the analysis that deposit interest rate has no direct relation with house price index, and thus the hypothesis is not supported.
- H2.1 Deposit Interest Rate and House Price Index with Unemployment Rate, Nominal Labor Cost, and Government Deficit as a factor; it has been shown through the analysis that deposit interest rate has an indirect relation with house price index with unemployment rate, nominal labor cost, and government deficit as moderators, and thus the hypothesis is supported.

CONCLUSION

While there is no direct relationship reported between deposit interest rates and the housing price index in the Eurozone, the moderator effect model shows a strong relationship between the dependent variable house price index, and deposit interest rate, having unemployment rate, nominal labor cost, and government deficit as moderators.

Multiple reasons could be behind this relationship. When the central bank deposit interest rates go below zero (NIRP), banks are deterred from depositing their money reserves with the central bank. As such, banks are forced to lower the interest rates on institutional and individual depositors to zero, and sometimes below zero (NIRP). Such action has two consequences. First, individual depositors who don't want to watch their deposits getting taxed by the banks, tends to evade this situation by investing their funds. Many of the medium and large depositors look to the property market as a safe haven for their money. Second, banks decrease the lending interest rates in accommodation to the overall low interest rate policies, a move which increases the temptation and ability of individuals to borrow money, many of which is invested in the housing market by families and corporations alike.

NIRP policies, and when combined with specific macroeconomic conditions such as unemployment rate, nominal labor cost, and government deficit, can predict and with a high level of accuracy the inflation of house prices inside the Eurozone countries.

LIMITATIONS

While this research contributes to the limited body of knowledge on Negative Interest Rate Policy (NIRP) and house price index in the Eurozone countries, there are, of course, a number of limitations. First, the data was acquired from the Eurostat (Directorate-General of the European Commission) public data repository, which is a secondary data source; validation for data and reporting errors is not applicable. Second, the variables being studied had different levels of granularity, an aggregation transformation process to quarterly data was applied, and the average was calculated for the periods where the granularity was lower than quarterly (monthly, daily). Third, the Eurozone is made up of 19 countries, each of which has its unique socio-economic characteristics, this paper covers only a fraction of the macroeconomic indicators for these countries; social indicators which could influence the dependent variable house price index such as literacy levels and community ties were not included in the study.

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