Interest Rate Risk, the Impact of Macroeconomic Factors on Deposit Interest Rates

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Abstract

Banks are financial institutions that play an intermediary role in the economy through channeling financial resources from surplus entities to the deficit one. They play an important role in economic growth, mainly by diversifying the risk for their activity and other economic agents. Interest rate risk is one of the most important financial risks of each bank which the banks face. Interest rate risk is the possibility that interest rate fluctuations affect interest income on the market value of each investor, constituting one of the most important channels of monetary policy transmission in an economy.

This paper explores the role and necessity of banking activity under today's conditions. Particular attention is paid to factors influencing the interest rate on deposits as well as the impact assessment of these factors on the interest rate, using the econometric model. The main objective of this paper is the impact on factors such the Gross domestic product and inflation that have on the deposit interest rates level.

Keywords: Gross Domestic Product, Banks, Inflation rate, Interest rate risk, Exchange rate

Introduction

Banks are just one part of financial institutions, standing alongside investment banks, insurance companies, finance companies, investment managers and other companies that profit from the creation and flow of money. As financial intermediaries, banks stand between depositors who supply capital and borrowers who demand capital. Taking into consideration how much trade and individual wealth rely on healthy banks, they are also among the most regulated businesses in the world.

Banks play a significant role in economic growth, namely through the diversification of the risk to their activity. Interest rate risk is one of the most important financial risks of each bank that banks face. Each risk is in itself a direct or indirect negative impact on the profits, activity, or realization of the ultimate goal of the banks. The interest rate risk in the banking portfolios is a risk of loss arising from unfavorable interest rate changes, as seen by the bank.

The main goal of this paper is the impact of macroeconomic factors on interest rates on deposits in Germany as one of the countries that is ranked first, according to GDP in the European Union. The main research question is: Is there a significant link between macroeconomic factors, such as GDP growth and inflation on interest rates of deposits. What effect do macroeconomic factors have in the interest rates on deposits in the banking sector in Germany?

The methodology of this research is based on the time series method by OLS - Ordinary Least Square. The data used are annual from 1990 to 2016 and the research is structured in this way. The section 2 is talking about the literature review. Section 3 describes the performance indicators being studied in the banking system in Germany. Section 4 corresponds to the description of the data obtained in the study and the used methodology, while section 5 will show the main results identified through the linear regression model. In section 6 will be presented the conclusions of the research.

Literature Review

Interest rates are one of the most important channels of monetary policy transmission in an economy. The operation of this transmission channel is affected by the macroeconomic conditions and financial structures of the country. Interest rates flow continuously. They depend on the terms of the monetary market and the financial market, depending on the country's economic activity.

Kown and Shin (1999) approve that the Gross Domestic Product, exchange rate, interest rate, inflation and market risk are the most important macroeconomic variables of any country to be closely monitored. This factor ultimately affects the general economy as suggested by Mishkin (2014) that economic growth is highly influenced by individual macroeconomic variables. It also created significant positive statistical relationships with the exchange rate and interest rate.

Some scholars believe there are two-way relationships between bank deposits and economic growth. Aurangzeb (2012) concluded that the banking sector has made a significant contribution to Pakistan's economic growth by using the regression and granger causality method. The result of regression shows that deposits, investments, advances, profits and interest earnings have a positive impact on Pakistan's economic growth. He further found that there is a dual causal relationship between deposits, advances and profitability with economic growth, while the unidirectional causality deriving from the investments and interests that gain in Pakistan's economic growth.

The German banking system in 2018

The banking system in Germany is a universal banking system. This means that financial institutions in Germany are permitted to conduct all types of banking activities. The German economy is facing the fifth consecutive upswing year. Although economic momentum slowed somewhat in the first quarter of 2018, overall economic output should nevertheless increase more than 2% on an annual average. Domestic demand remains robust. It is supported by continued employment growth and decent real wage increases.

Nevertheless, accompanied by low interest rates and the overall extraordinarily favorable financing conditions, lending to companies and the self-employed increased to €886 billion in 2017, up by 3.7% on the previous year. Due to the German Energy Transition and the new EU Action Plan "Financing Sustainable Growth", banks have launched many initiatives in recent years to promote sustainable financing. The very low and partly negative interest rates at present decrease profit opportunities for banks and increase the risk of distortions and price bubbles as well as the danger of zombie banks and firms. For banks in the euro area the negative deposit rate of the European Central Bank is a special tax with monthly tax earnings of around €500 million. In order to limit the side effects of the negative deposit rate, the Association of German

Banks proposes an amount of exemption for the excess liquidity holding at the ECB by commercial banks. (According to: European Banking Federation).

According to the Bundesbank's (2018) macroeconomic projections, the most probable scenario over the next few years is one in which real growth continues to be above potential growth. The German economy is experiencing the longest period of expansion since the country's reunification. For several years now, interest rates have been at very low levels, asset prices high and volatility in the financial markets relatively low. Moreover, economic growth is robust both at the global and the euro area level. The macroeconomic environment is not much different from last year when expectations of economic development were broadly confirmed. Continued economic robust development in the euro area and expectations that consumer prices will rise in the medium term are nudging interest rates upwards again. This is likely to strengthen financial stability. However, unlike last year, risks to future economic activity are currently skewed to the downside. Geopolitical tensions have deepened; trade disputes have erupted and may escalate.

Data and Methodology

Methodology

The primary objective of this study is to identify and evaluate an econometric model to assess the links between dependent and independent variables. Primary data in this study are derived from secondary sources, mainly identified from annual reports and statistics published by the world Bank, the global economy and other different sources for obtaining data and information and the variables for the banking sector in Germany are taken for analysis.

After setting the equation econometric data will be tested to evaluate the link between them. Test data will be explained on the hypothesis raised by the target-oriented information from the data included in the study. They will be processed with statistical program Eviews. In order to test the variables, the time series method was used by OLS-Ordinary Least Square in order to predict the values in empirical analysis and results.

The research pays special attention to the banking sector in Germany, from where we have determined the determinants for the banking sector and we analyzed them from 1990 to 2016, where the interest rate on deposits is a dependent variable, and GDP growth, the inflation rate and the exchange rate are the independent variables. In this work, the regression model with the dependent variable and the independent variables will be presented in the following form:

$$Y_t = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + u_t \qquad (1)$$

According to this equation we will analyze the relationship between the independent variable X_{1-3}, which in our model is GDP growth, the inflation rate, the exchange rate and the dependent variable Y_t which in our model is the interest rate on deposits. The econometric model is the simplest form of a multifactorial linear model, from the form above is gained this equation:

$$Y(DEP) = \beta_0 + \beta_1 (ECXH) + \beta_2 (INF) + \beta_3 (GDP.G) + u_t \quad (2)$$

- Where: β_0 – Constant,
- *DEP*-Deposit Interest Rate,
- *EXCH*-Exchange rates,
- *INF*-Inflation rate,
- *GDP g.* –GDP growth,

u_t −Represent the error, or the residual in the model, t = 1 ... 4 is the index of the time dimension-in this case, years. According to these data, hypotheses are:

I. Hypothesis none of the macroeconomic variables and identified banks will affect the performance of deposits.

II. Hypothesis at least one of the macroeconomic variables affects the identified periods of performance or bank deposits, respectively in the normal period.

The data on the regression calculation are taken from the annual reports for a period of 27 years, respectively from 1990-2016 by the World Bank, IMF and other annual reports.

Empirical Results

The data are processed from the statistical program Eviews 9.0. Rightly, appropriate tests have been developed to assess the variables and make the final model. Also tests of multicolinearity and autocorrelation were made. The multicolinearity test serves to evaluate the linear relationship between the variables. For this model, the value of the index between the variables is the highest between the interest rate on deposits and the exchange rate.

Apart from multilinearity, the variables are also tested if they are stationary, checked through the Unit Root Test. So, the series of interest rates and the exchange rate are not- stationary series for our model, and the series of inflation rate and GDP growth are stationary series. For non-stationary series we differentiated new series of first order and presented them in Table 1.

Table 1. The first order of integration − I (0) with Unit Root Test stationary variables

Variable	Augmented Dickey-Fuller test statistic		
	*	**	***
Deposit Interest Rate% (y-1)	0.0013	0.0037	0.0004
GDP grow %	0.0001	0.0004	0.0008
Inflation rate %	0.0001	0.0000	0.0006
Exchange rates$ (y-1)	0.0002	0.0007	0.0000

* Intercept** Trend and intercept***None

Source: Own calculations using Eviews 9.0.

The variables have been tested and reviewed for testing with the Durbin-Watson test. The Durbin-Watson test is the most popular test used to test the first level autocorrelation. The Durbin-Watson statistical value for the variables after differentiating the new series is 1.357. The result suggests that positive autocorrelation is not so significant and we are continuing to analyze data.

Results of the linear regression model

This section presents relevant results from the linear regression model through OLS testing of the identified factors and the impact of macroeconomic factors on interest rates on deposits in Germany.After the stationary of interest rates on deposits and exchange rates, the econometric model with the changes in the banking sector is presented in the following form:

$$\Delta \textbf{dep d} = \textbf{-0.725776C} + \textbf{0.327940 gdp g} + \textbf{u}_t \quad (3)$$

Statistic with Durbin-Watson test **1. 357, Prob (F-statistic) = 0.000250andr-square = 57%,**where it is noticeable that in the period 1990-2016, macroeconomic factors can explain 57% of the regression, presented in Table 2.

Table 2. Model Summary

OLS	Coefficient	Prob	R2	Adjusted R-Square
C	-0.725776	0.0001	.574	.516
ΔEcxh$	0.301209	0.5910		
Inf%	-0.006217	0.5104		
Gdp g. %	0.327940	0.0000		

Source**:** Own calculations using Eviews 9.0.

Dependent variable ΔDEP (the differential of the interest rate on deposits)

From the research it was noted that the results of the linear regression show that Δ (differential) of the exchange rate is not statistically significant because$\rho > 0.05\%$, also the inflation rate does not have any significance for the regression$\boldsymbol{\rho > 0.05\%}$,and GDP growth has a positive impact and is statistically significant for regression because $\rho < 0.05$ %.Durbin-Watson statistics is1,357, Prob(F-statistic) =0,000250.

In this regression model, the research pays attention to the normal distribution of parameters, tested with the Jarque - Bera test which is confirmed by the hypotheses below:

H_0 - Normal distribution;

H_1 - Not normal distribution.

The variables must have a normal distribution. From this test we see that the variables have a normal distribution because$\rho > 0.05\%$, respectively26% from the Jarque - Bera test and can be accepted H_0 -the variables have a normal distribution.

To evaluate the model, tests are performed if the model has a serial correlation or not, whether it is heteroscedasticity or not. For each observation, the variance of the error must be constant (*homoscedasticity*). To test whether the model has heteroscedasticity, we have used the Heteroscedasticity Test: Breusch-Pagan-Godfrey Test. According to this hypothesis set for this test are:

Null. Hyp. Is homoscedastisity- there is no serial correlation

Altrenhyp. Is heteroscedasticity - has a serial correlation

Prob.> 5%, we cannot reject the zero hypotheses. So, in this model residuals are homoscedasticity that are represented below: Obs*R-squared= 3.564927

Prob. F(3, 23)	0.3441
Prob. Chi-Square (3)	0.3124
Prob. Chi-Square (3)	0.3581

We used the Breusch-Godfrey Serial Correlation LM Test to test autocorrelation. We have this testobs * R-squared = 1284557 and Prob. Chi-Square(2)= 0.0016, it means$\rho < 0.05$ %and we can reject *Null. Hyp.*(H_0). So the model has a serial correlation of residuals.

In this research, it was made Chow Breakpoint Test. The Chow test shows whether regression coefficients are different for separate data groups. Basically, it tests whether a regression line or two separate regress lines best fit a separate data set. The test was made with regression and showed that it was accepted$H_0 − no\ break\ points$ so$\rho < 0.05\%$.

The results generated by linear regression show that all three have an impact on the level of deposits, but only GDP growth is statistically significant. It is noted that the inflation rate has a negative impact, while the other variable has a positive impact in dependent variable. So the research confirms that the GDP growth in deposits has had a greater impact on the behavior of depositors to save their funds.

Conclusion

The results of this work have identified significant results for deposits in the banking sector in Germany in the years 1990-2016. The study has analyzed the evolution of the relationship between the deposits and interest rates. Meanwhile, an important variable is included in this model and the level of GDP growth over the years. The idea is to express the linear equation if in different periods of growth will affect the change of deposits in the banking sector. Meanwhile, the model can constitute for about 57% of the deposit level.

The relationship between depositors and the bank is a mutually important and profitable. In this way, the banking system needs to appear as credible at economic agents. In such situations, the management of financial stability is easier in a country and overall, the risk situation suggests substantial cyclical risks. The aim of macro prudential supervision is to recognize dangers to financial stability at an early stage.

The results generated by linear regression show that all three have an impact on the level of deposits, but only GDP growth is statistically significant. It is worth noting that the inflation rate has a negative impact, while the other variable has a positive impact on the dependent variables. So the research confirms that the GDP growth in deposits has had a greater impact on the behavior of depositors to save their funds.

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