

The modern monetary policy of the Bank of England and the impact of the stock market

Abstract

The aim of this research is to identify features of the modern monetary policy of the Bank of England in the context of stock market volatility. In terms of relatively favorable economic situation and in the context of the financial crisis, the importance and role of monetary policy as an integral part of the state's economic policy is increasing. Conducting a balanced monetary and credit policy can ensure the creation of optimal conditions for effective interaction of the banking sector and economic entities, also it can help to solve a set of socio-economic problems facing the economy.

Monetary policy is an important factor in the development of both the financial market and the real sector of the economy. By influencing the amount of money in circulation, monetary regulators - Central Banks - tend to achieve their goals in various areas. Thus, in fact, in many countries, monetary authorities made their choice in the problem of "rule" against discretionary policy, in favor of the first principle. The classic model is the simple "Taylor rule" described by Taylor in his research. According to the simple "Taylor rule", the central bank rate depends linearly on deviation of actual or expected inflation and actual or expected inflation output from their target values (i.e., some measure of output deviation from potential level or trend). The most attractive target variable for monetary authorities is inflation. Another traditionally used benchmark is the size of aggregate consumption, such as GDP, or the level of economic activity in general. Short - term interest rate is used as a tool in the standard case.

In the economic literature, there are many opposite opinions as to which variables to include in the model for more appropriate analysis. A special place is occupied by the discussion about the inclusion of asset prices in the regression model. In this case, the opinions of economists are divided. One of the first works devoted to the study of the impact of asset prices on monetary policy is Patelis. In this article, author considers the question of whether predictability in excess returns of shares can be taken into account in monetary policy. Patelis concludes that variable monetary policies are tools for forecasting future earnings, although they do not always take into account the predictability of stock returns.

A study conducted by Asso, P.F., G. Kahn, and R. Leeson, points out that in 2001-2009 the Taylor rule has played an important background role in the monetary policy of Bank of England. The authors note that, despite the fact that the Bank of England has formally adhered to the regime of inflation targeting, the Taylor rule plays a significant role in making decisions about changing the key rate. Further, an empirical study of the monetary policy of the Bank of England in 2010-2016 will be carried out. This study answered the question of whether the Bank of England adheres to Taylor rule or not. In this study, in order to build a linear Taylor model for the monetary policy of the Bank of England in 2010-2016, the least-squares method was used. To achieve the stated aim of the study, a model of the monetary policy of the Bank of England was constructed in accordance with Taylor rule.

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I. Introduction

Globalization has a significant impact on the formation of financial and economic policies in all states of the world, including the United Kingdom. On the one hand, globalization leads to close trade, economic and monetary integration between countries, but on the other hand, it strengthens the instability of the global financial system. Instability is caused by the fact that the emerging problems in the development of the economy of one country have become much faster to be transferred between states through the mechanisms of monetary policy.

United Kingdom is the oldest capitalist country, for a long time it was the leader of the world economy. It defined trends of development and it relied on other countries. Monetary system of England has been an example for other states, but in modern conditions, despite the loss of leading positions, the UK continues to play the role of one of the world's leading powers in the world economy.

Nowadays it is known that the role of monetary policy is growing as one of the most important parts of the country's economic policy, especially in the conditions of instability of the world financial system. Conducting an effective monetary policy allows to create favorable conditions for successful interaction of the banking sector and households, besides, it allows to solve a lot of social and economic problems facing the economy.

Monetary policy is an important factor in the development of both the financial market and the real sector of the economy. By influencing the amount of money in circulation, monetary regulators - Central Banks - tend to achieve their goals in various areas.

Analysis of economic literature shows the presence of a great interest to study monetary policy. Among existing researchers it should be noted Taylor, J. B. (1993), Bernanke, B. S. (2000, 2001), Gertler, M. (2000, 2001), Castelnuovo, E. (2007), Cecchetti, S., Genberg, H. Wadhvani, S. (2002) Clarida, Richard, Gali, Jordi, and Gertler Mark (1998), Fuhrer, J. and Tootell G. (2008) et al.

The aim of this research is to identify features of the modern monetary policy of the Bank of England in the context of stock market volatility.

The objectives of the research are:

1. defining the term “monetary policy” and to identify major types of monetary policy;
2. defining the term “stock market” and to study the impact of it on monetary policy;

3. examining the rules of monetary policy;
4. creating and estimating of the modern monetary policy of the Bank of England (2010-2016) in accordance with Taylor rule.

The research is organized in the following way. Section II provides a detailed literature review on the monetary policy problem and the influence of stock exchange on it, starting with an analysis of the problem with definition of “monetary policy” term. Then I turn to the analysis of rules of monetary policy including classic “Taylor rule” which determines the correspondence of the nominal interest rate in case of changes in GDP indicators, inflation and other economic indicators. The model and an experimental design for the influence of various factors on the monetary policy of the Bank of England are described in section III. Section IV concludes.

II. Literature review

2.1 Definition and types of “monetary policy”

Monetary policy of the Central Bank plays a significant role in regulating of the economy. The state of the monetary sphere affects the state of not only the national economy, but also the position of the country at the international level. In the world economic practice, there are many definitions regarding the concept of "monetary policy."

Monetary policy is a macroeconomic policy of monetary authorities, a set of measures aimed at managing aggregate demand through money market conditions such as the short-term interest rate, nominal exchange rate or current banking sector liquidity level, to achieve a combination of ultimate goals, which may include price stability, maintaining a stable exchange rate, financial stability and the promotion of balanced economic growth. The monetary policy is carried out by the central bank of the country or by other responsible institutions.

There are two types of monetary policy: discretionary policy and policy, following a certain rule. Such division was first proposed by Henry Simons (1936) (Simons, Henry C. Rules versus Authorities in Monetary Policy // *Journal of Political Economy*, February 1936, pp. 1-30) raising the issue of choice within the monetary policy between the following rules and the adoption of special decisions by the authorities, that is discretionary policy.

When discretionary monetary policy is implemented the Central Bank at the time of decision-making analyzes all available information and focuses primarily on its judgments in the context of specific circumstances. With this type of policy, there are no restrictions on the

parameters chosen by the Central Bank. Thus, the Central Bank is guided only by the objectives of monetary policy, taking the necessary actions at its discretion to achieve these goals.

Unlike the discretionary policy, a policy based on a rule suggests that the Central Bank is guided by a certain sequence of actions. Monetary policy is defined as a function of several observable variables, associated, as a rule, with inflationary and real indicators of the economy. Following the rules increases the accountability of the Central Bank, increases the confidence of economic agents in its future actions, and improves the ease of perception of monetary policy by participants in the financial market.

There are several types of monetary policy rules: instrumental rules and targeting rules. Instrumental rules, which are also known as response functions, consist in the fact that, when used, monetary policy can be expressed as a dependence on several variables. There are two types of instrumental rules: explicit and implicit. In explicit rules, the Central Bank makes a decision depending on the specific value of the observed variables. The most famous example of an explicit rule is the Taylor rule, where the Central Bank reacts to the deviation of the actual GDP from the potential GDP (output gap) and the deviation of the observed inflation from the target. In contrast to explicit rules, in implicit tool rules, the explanatory variables are the expected values of the variables. The expediency of using implicit rules is that when making decisions, policies are guided by future, rather than current, values of variables. A policy based on explicit and implicit instrumental rules can be analyzed by formal methods and embedded in models.

The second kind of policy based on the rule is targeting rules. The targeting rules are based on the known utility function of the Central Bank - the target level of the regulator's preferences. A target is called either as a specific digit or as an interval. The most well-known forms of targeting are inflation targeting and monetary targeting aimed at achieving the target growth rate of the monetary base.

2.2 Monetary policy and asset prices

Effectiveness of functions of the Central Bank facilitates the implementation of policies based on clear principles, i.e. such policy, which would be oriented towards the achievement of the set goals and provided a very definite reaction to standard situations. Researches, which are conducted for various countries, confirmed that in practice central banks in many respects follow a certain set of predetermined rules in advance, reacting to various shocks of macroeconomics.

Thus, in fact, in many countries, monetary authorities made their choice in the problem of "rule" against discretionary policy, in favor of the first principle.

On the theory side, Kydland and Prescott (1977) argue that central banks, following the "rule", will achieve less inflation than if their policy is discretionary. We all know existence of a compromise in the choice of monetary policy between inflation and level of economic activity in some assumptions, which is known as The Phillips curve. Indeed, in conditions of rational expectations in the medium term, monetary authorities can not promote greater economic growth without generating more inflation. However, in each individual period, the Central Bank may be tempted to stimulate economic growth above potential and to soften monetary policy unexpectedly. As a consequence, in conditions of rational expectations, in the medium term such a policy will generate large rate of inflation with the same growth rates. Solutions of this "discretionary" policies problem can be achieved if the behavior of the central bank will be limited by a certain "rule". Moreover, according to Barro and Gordon (1983), the fastest reduction in inflation can be achieved using the role of the CB's reputation and in this way forming more favorable expectations of agents to reduce inflation.

On the other hand, the existence of the rule does not imply a rigid rule performance. As pointed out by McCallum (1997), behavior similar to predetermined by the rule, simply proposes an application on a certain set periods of a simpler decision-making method that would follow a certain standard formula for determining the value of a tool as an alternative dynamic optimization in each period.

In other words, the rule of monetary policy was conceived as a fairly simple formula that explicitly sets a certain value of the instrument, if the fluctuations of the dynamics of the target variables remain close to certain target trajectories. The classic model is the simple "Taylor rule" described by Taylor (1993) in his research (Taylor, J. B. Discretion versus Policy Rules in Practice. — Carnegie-Rochester Conference Series on Public Policy, 1993. — № 39. — P. 195-214).

According to the simple "Taylor rule", the central bank rate depends linearly on deviation of actual or expected inflation and actual or expected inflation output from their target values (i.e., some measure of output deviation from potential level or trend). The most attractive target variable for monetary authorities is inflation. Another traditionally used benchmark is the size of aggregate consumption, such as GDP, or the level of economic activity in general. Short - term interest rate is used as a tool in the standard case.

Thus, the simple “Taylor rule” (1993) takes the following form:

$$i_t = \alpha + \beta (\pi_t - \pi_t^*) + \gamma(y_t - y_t^*) + \epsilon_t,$$

where α is the stabilizing interest rate when $\pi_t = \pi_t^*$ and $y_t = y_t^*$; $(\pi_t - \pi_t^*)$ is the deviation of inflation; $(y_t - y_t^*)$ is the deviation of output; ϵ_t is the random term.

According to Taylor rule, the real interest rate should respond to the difference between the output and the level of output at full employment and to the difference between inflation and its target value (which was determined by Taylor (1993) at 2%, or 0.02).

If the output is in the level of full employment and inflation corresponds to the target of 2%, then the central bank sets a real rate of 2%, which is approximately equal to its long-term average level according to Taylor rule. If the economy is "overheated" and the output is higher than its value under conditions of full employment, and inflation is above the target value, then the central bank tightens monetary policy by raising the interest rate above 2%. If the GDP is below the production level at full employment and inflation is below the target value, then the rate should fall below 2%, thereby softening monetary policy should be used. Taylor in his work (Taylor, J. B. Discretion versus Policy Rules in Practice. — Carnegie-Rochester Conference Series on Public Policy, 1993. — № 39. — P. 195-214) showed that this rule statistically describes the actual behavior of the US Federal Reserve.

All things being equal, an increase in inflation by 1% should lead to an increase in the interest rate by more than 1%. This regularity is called the “Taylor principle”. Since the real interest rate is equal to the nominal interest rate minus the inflation rate, the real interest rate should be increased in order to cool the economy with an increase in inflation (the nominal interest rate will increase more than the inflation rate).

Taylor rule, which linked the federal funds rate to inflation and output, is the most well-known rule of monetary policy. Taylor conceived his rule as a normative rule, that is, a rule giving a recommendation on how the Fed should pursue a monetary policy. Subsequently, for many years Taylor rule was used not only for normative, but also for positive analysis. Researchers evaluating various variants of the Taylor rule on historical data sought an answer to the question of which policies the Fed and other Central Banks followed in different time periods. And although no Central Bank has followed the pure Taylor rule on an ongoing basis, the rule has become a useful criterion for evaluating monetary policy. The Taylor rule influenced the way politicians and researchers think.

In the classical version, the Taylor rule has a linear form, that is, the interest rate is linearly dependent on inflation and output gap. However, Petersen (2007) showed that there are a number of reasons why the US Federal Reserve System can use a non-linear modification of the Taylor rule. The main reasons why the Fed can use the nonlinear form of Taylor rule are the use of different weights for negative and positive inflation and output gap, and also if inflation and output gap are non-linear with an asymmetric regulatory process.

One of the main problems with Taylor rule is data revision. This issue was first raised in 1997 in the study of Orphanides and Athanasios (1997) (*Monetary Policy Rules Based on Real-Time Data* // Board of Governors of the Federal Reserve System). The problem is in the fact that when central bank make decisions about the level of the interest rate, policies are based on data available in real time (real-time data). At the same time, Taylor, explaining the setting of the interest rate in period t , used the issue data and inflation in the same period t . These data were known at the time of the study, but were not known at the time the decision was made by politicians. However, according to Orphanides and Athanasios (1997), on later, revised data, modeling cannot be based, since they can differ significantly from real-time data.

Orphanides and Athanasios (1997) conducted an empirical test of Taylor rule and concluded that the rule works well on the revised data, but does not work on real-time data, with which it is better to model monetary policy to achieve the greatest resemblance to reality. Thus, the possibility of using Taylor rule for modeling monetary policy was questioned.

Another problematic aspect of Taylor rule is the question of which policy-makers are guided by the target values of which period when making decisions. Clarida et al. (1998) first proposed to take into account the fact that expectations are more important for policymakers than current values of variables. This proposal was formalized in the Taylor rule, where the deviations of the forecast of the value of the gap in output and inflation from the target. This rule is called the forward-looking Taylor rule.

In the economic literature, there are many opposite opinions as to which variables to include in the model for more appropriate analysis. A special place is occupied by the discussion about the inclusion of asset prices in the regression model. In this case, the opinions of economists are divided.

One of the first works devoted to the study of the impact of asset prices on monetary policy is Patelis (1997) (Patelis, A. D. Predictability of stock returns and the role of the monetary economy. *Journal of Finance* 52 (5): 1951-1972). In this article, author considers the question of

whether predictability in excess returns of shares can be taken into account in monetary policy. Patelis (1997) concludes that variable monetary policies are tools for forecasting future earnings, although they do not always take into account the predictability of stock returns.

In Bernanke and Gertler (2001) research (Bernanke, B. S., Gertler, M. Should central banks respond to movements in asset prices? *American Economic Review*, 91(2): 253-257) argued that the change in asset prices should influence monetary policy only in the forecast of inflation. Bernanke and Gertler (2001) conducted a series of studies in which they were moderating what would happen if central banks began to control asset prices. According to the proposed model, such actions will not lead to the desired results. In addition, if the actions of central banks to control asset prices lead to economic growth, then this growth will be small while inflation may increase.

The opposite opinion is shared by number of economists. For example, Vickers (2000) (Vickers, J. Monetary policy and asset prices, *The Manchester School*, 68 (1): 1-22) argues that asset prices should be taken into account in the modeling of monetary policy, as they help to build forecasts for the level of inflation.

Another research of Cecchetti, Genberg and Wadhvani (2002) who believe that the central bank of a country should systematically react to changes in asset prices. The authors believe that there are theoretical grounds for believing that the purpose of the inflation rate can be improved through responding to disagreement. Cecchetti, Genberg and Wadhvani (2002) argue that the response to asset prices improves macroeconomic performance.

In their research Cecchetti et al. (2002) insists on the need to investigate in more detail the dynamics of asset prices to clarify the nature of the possible consequences, and in the absence of a clear forecast - to act with extreme caution. Central banks should not deliberately ignore the development of asset markets, when there is a reasonable likelihood that inaction will lead to erroneous decisions in the areas of investment and consumption. Arguing his position Cecchetti et al. (2002) point to the missed opportunity for the US to influence the course of well-known events in the 1990s. It's about raising interest rates. According to Cecchetti, Genberg and Wadhvani (2002) the key decision should be taken in 1997. The increase in interest rates would have allowed to smooth out the "Asian crisis" that came in a few months, and the Russian default of 1998. But the financial authorities did not give the markets a warning sign. The price of this inaction was too slow economic growth in the years to come.

In the previous study (Cecchetti St. G., Genberg H., Lipsky J., Wadhvani S. *Asset Prices and Central Bank Policy*. — Geneva, 2000) Cecchetti et al. (2000) proposed three different economic models that demonstrated the advantages of accounting asset prices in the long term. The appearance since then of new data indicates the unacceptability of a mechanical response to sudden changes in the value of assets, which means that the response must be timely, justified and adequate. Therefore, it becomes necessary to clearly visualize the characteristic signs of the emergence of a "bubble". Since monetary policy is always conducted in conditions of uncertainty, it is important to have a certain list of signs and features of financial "bubbles". Also the research of Fuhrer and Tootell (2008) show that information about asset prices volatility is one of the most important instruments to implement the monetary policy.

Another work devoted to the study of the impact of the price of assets on monetary policy is owned by Rigobon and Sack (2002) (*The impact of the monetary policy on asset price*. NBER WP 8794). Usually the estimation of the impact of the asset prices on monetary policy is complicated by the endogenous decisions of the authorities, and also because the interest rate and the price of assets are subject to the influence of a large number of other variables. In the Rigobon and Sack (2002) study, the authors conclude that an increase in short-term interest rates leads to a decline in stock prices and an increase in the yield curve.

Another question is how fast monetary policy should be implemented. The classical answer to this question is that the Central Bank should implement its policy gradually, which is explained by the principle of "optimal caution". However, a number of specialists, such as Rudebush (2002), believe that the slowness of monetary policy depends on consistently correlated exogenous shocks. In Castelnovo, E. (2007) (*Castelnovo, E. Taylor Rules and Interest Rate Smoothing in the Euro Area*, *The Manchester School*, 75 (1): 1-16), the author builds model for assessing the "endogenous" and "exogenous" gradualness for the Eurozone. At the same time, Castelnovo, E. (2007) pays special attention to the smoothing of interest rates in the Taylor model.

Another paper on the assessment of the Taylor rule for the Eurozone belongs to Gorter, Jacobs and de Haan (2008) (Gorter, J., Jacobs, J. and de Haan, J. Taylor et al., *Scandinavian Journal of Economics*, 110 (3): 473-488). In the study, the authors evaluate the Taylor rule for the Euro area using consensus economics data for expected inflation and production growth. Also, the authors compare the estimates and conclude that the European Central Bank takes into account the expected inflation and production growth in forecasting and setting interest rates. It

is worth noting that in the classical model the coefficient of realized inflation differs from zero insignificantly.

A study conducted by Asso, P.F., G. Kahn, and R. Leeson (2010), points out that in 2001-2009 the Taylor rule has played an important background role in the monetary policy of Bank of England. The authors note that, despite the fact that the Bank of England has formally adhered to the regime of inflation targeting, the Taylor rule plays a significant role in making decisions about changing the key rate.

Further, an empirical study of the monetary policy of the Bank of England in 2010-2016 will be carried out. This study will answer the question of whether the Bank of England adheres to Taylor rule or not.

III. Empirical Framework and Data description

3.1 Research methodology

In this study, in order to build a linear Taylor model for the monetary policy of the Bank of England in 2010-2016, the least-squares method will be used.

The method of least squares (OLS) is one of the methods of regression analysis for estimating unknown quantities from the results of measurements containing random errors. This method is also used to approximate a given function with other (simpler) functions and is often useful in processing observations.

The model parameters are chosen in such a way that the sum of the squares of the deviations of the empirical values from the model values is minimal:

$$RSS = \sum_{i=1}^n (y_i^* - y_i)^2 = \sum_{i=1}^n (a + bx_i - y_i)^2 \rightarrow \min$$

Among the advantages of the method of least squares, it is especially important to note the ease of the computational procedure and the good estimates for statistical properties.

First of all, we note that for linear models, OLS estimates are linear estimates, as follows from the above formula. For unbiasedness of OLS-estimates, it is necessary and sufficient to perform the most important condition of regression analysis: the conditional mathematical expectation of a random error must be zero. This condition, in particular, is fulfilled if:

1. the mathematical expectation of random errors is zero;

2. factors and random errors are independent random variables.

The first condition can always be considered satisfied for models with a constant, since the constant takes on the non-zero mathematical expectation of the errors (therefore, models with a constant are generally preferable).

The second condition - the condition of exogenous factors - is fundamental. If this property is not fulfilled, then we can assume that almost any estimates will be extremely unsatisfactory: they will not even be well-founded (that is, even a very large amount of data does not allow obtaining qualitative estimates in this case). In the classical case, a stronger assumption is made about the determinism of the factors, in contrast to a random error, which automatically means the fulfillment of the exogenous condition. In the general case, it is sufficient for the consistency of the estimates to satisfy the condition of exogeneity, together with the convergence of the matrix to a certain non-degenerate matrix with increasing sample volume to infinity.

In order to ensure that in addition to consistency and unbiasedness, estimates of (ordinary) OLS were also effective (best in the class of linear unbiased estimates), it is necessary to perform additional properties of a random error:

- constant (same) variance of random errors in all observations (absence of heteroscedasticity):

$$V(\varepsilon_t) = \sigma^2 = \text{const}$$

- absence of correlation (autocorrelation) of random errors in different observations among themselves:

$$\text{cov}(\varepsilon_i; \varepsilon_j) = 0$$

The OLS estimates for classical linear regression are the best linear unbiased estimate. The main disadvantage of this method is that there is a high sensitivity of the estimates to the abrupt emissions that occur in the initial data.

3.2 Data description

Using the least squares method, the following Taylor rule model for the Bank of England was built:

$$i_t = \alpha + \beta(\pi_t - \pi_t^*) + \gamma(y_t - y_t^*) + \sum_{k=1}^n \delta_k s_{t-k} + \varepsilon_t$$

To build this model, quarterly data were collected and the following indicators were calculated:

- RGDP (real GDP in 2010 prices). The use of real GDP, rather than nominal GDP, allows to eliminate the influence of inflation when assessing the dependence of OUTPUTGAP on the monetary policy of the Bank of England. Data were collected on the Eurostat website (Eurostat, 2017b);

- the key interest rate of the Bank of England. Data was collected on the Bank of England's official website (Bank of England, 2017);

- CPI (Consumer Price Index) - the price index, created to measure the average level of prices for goods and services (consumer basket) for a certain period in the economy. This index is based on a fixed price level for a variety of goods and services of the consumer basket and is calculated as the result of dividing the sum of the products of the current year's prices and the base year's issues by the sum of products of the price level and the base year issues. Data were collected on the Eurostat website (Eurostat, 2017);

- the year-on-year inflation was obtained by finding the log CPI (pt) and computing by the following formula:

$$\text{inflation} = 100 * ((pt - p(t-4)));$$

- OUTPUTGAP was obtained by finding the logarithm of RGDP (y), calculating the potential GDP using the Hodrick-Prescott method, and calculating it using the following formula:

$$\text{OUTPUTGAP} = (yt - yt *);$$

- year-to-year FTSE index was obtained by finding the logarithm of the FTSE (asset) index (London Stock Exchange, 2017) and calculating using the following formula:

$$S = 100 * (\text{asset} - \text{asset} (-4)).$$

Valid and complete surveys were downloaded into spreadsheet format and modified for statistical analysis. The sample consists of 24 observations. Final analysis of the data was made in the econometric program Eviews 6.0. In this program, the necessary indicators were calculated, and econometric tests were conducted.

IV. Empirical Analysis

4.1 Simple Taylor rule

To achieve the stated aim of the study, a model of the monetary policy of the Bank of England was constructed in accordance with Taylor rule. The model is based on quarterly data for 2010-2016. The task of constructing this model is the following:

- Creating and estimating of the modern monetary policy of the Bank of England (2010-2016) in accordance with Taylor rule.

Solving this problem will provide an understanding of how the monetary policy of the Bank of England changed after the global financial crisis of 2008-2009.

Two models of the monetary policy of the Bank of England were built: the standard Taylor rule and the augment Taylor rule.

According to the standard Taylor rule, the model looks like this:

$$i_t = \alpha + \beta(\pi_t - \pi_t^*) + \gamma(y_t - y_t^*) + \epsilon_t$$

where π_t – the actual level of inflation;

π_t^* - the target level of inflation. In this model, the target inflation rate is 0;

y_t – actual level of real GDP;

y_t^* - potential level of real GDP;

Based on a sample of 28 observations by the method of least squares, the following model was constructed:

$$i = -0.77 + 0.011 * INFLATION + 5.2 * OUTPUT \quad R^2 = 0.015$$

$$(0.06) \quad (0.025) \quad (12.34)$$

The results and estimates of the parameters of the constructed model are shown in Table 1.

Table 1. Results and estimates of the parameters of the constructed model in accordance with the classical Taylor rule.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.768308	0.063869	-12.02946	0.0000

INFLATION	0.011512	0.025026	0.460001	0.6495
OUTPUT	5.201068	12.34116	0.421441	0.6770
<hr/>				
R-squared	0.014665	Mean dependent var	0.742658	-
Adjusted R-squared	-0.064162	S.D. dependent var	0.181788	-
S.E. of regression	0.187530	Akaike info criterion	0.408802	-
Sum squared resid	0.879185	Schwarz criterion	0.266066	-
Log likelihood	8.723227	Hannan-Quinn criter.	0.365166	-
F-statistic	0.186040	Durbin-Watson stat	0.577076	-
Prob(F-statistic)	0.831379			

The carried out tests show that, according to t-tests, the INFLATION and OUTPUT variables are not significant at 5%, and according to the F-test, the entire equation is also not significant at 5%. The signs before the variables are expected and positive, but the lack of significance does not allow to conclude that the key rate of the Bank of England in 2010-2016 varied depending on variables such as output gap and inflation.

4.2 Augmented Taylor rule

To test the augmented Taylor rule, we need to add to the model a variable that characterizes the volatility of the stock market. The new equation will look like this:

$$i_t = \alpha + \beta(\pi_t - \pi_t^*) + \gamma(y_t - y_t^*) + \sum_{k=1}^n \delta_k s_{t-k} + \epsilon_t$$

where π_t – the actual level of inflation;

π_t^* - the target level of inflation. In this model, the target inflation rate is 0;

y_t – actual level of real GDP;

y_t^* - potential level of real GDP;

s_{t-k} – asset price volatility.

Based on a sample of 28 observations by the method of least squares, the following model was constructed:

$$i = -0.77 + 0.028 * INFLATION + 9.52 * OUTPUT - 0.006 * S(-1) \quad R^2 = 0.09$$

(0.06) (0.027) (12.47) (0.004)

The results and estimates of the parameters of the constructed model are shown in Table 2.

Table 2. Results and estimates of the parameters of the constructed model in accordance with the augmented Taylor rule.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.775313	0.062806	-12.34458	0.0000
INFLATION	0.028417	0.027272	1.041961	0.3078
OUTPUT	9.521287	12.47535	0.763208	0.4528
S	-0.005526	0.003894	-1.419169	0.1687
-				
R-squared	0.090951	Mean dependent var	0.742658	
Adjusted R-squared	-0.022680	S.D. dependent var	0.181788	
-				
S.E. of regression	0.183838	Akaike info criterion	0.417956	
-				
Sum squared resid	0.811117	Schwarz criterion	0.227641	
-				
Log likelihood	9.851384	Hannan-Quinn criter.	0.359775	
F-statistic	0.800405	Durbin-Watson stat	0.577887	
Prob(F-statistic)	0.505842			

The carried out tests show that, according to t-tests, the INFLATION and OUTPUT variables are not significant at 5%, and according to the F-test, the entire equation is also not significant at 5%. The signs for the INFLATION and OUTPUT variables are expected and positive, but the lack of significance does not allow to conclude that the Bank of England's key rate in 2010-2016 has changed depending on variables such as output gap, inflation and asset price volatility.

Then we should check the augmented part of the extended model for autocorrelation and heterosexuality. According to the Jarque Bera test, the hypothesis of the normal distribution of residues is rejected (Appendix 2). The White test does not reject the null hypothesis and allows one to conclude that the remnants are homoscedastic. The statistics of the DW equation is equal to 0.57, which indicates a positive autocorrelation of the remainders of the equation.

Thus, it can be concluded that the remnants of the derived augment equation of the Taylor rule are subject to autocorrelation. Autoregressive transformation in EViews allowed to get rid of autocorrelation of the remainders, but all coefficients of the equation are still insignificant at the level of 5% (Appendix 2).

Thus, the construction of the classical and augmented models of the Taylor rule does not allow us to conclude that the Bank of England adhered to this rule in 2010-2016.

4.3 Discussion of results

The study did not reveal a significant connection between the Bank of England's monetary policy and the volatility of the stock market. This suggests that the Bank of England was not guided by changes in asset prices when establishing a key rate, as discussed in Cecchetti et al. (2002). Moreover, failing to reject the null hypothesis that the estimated δ are equal to zero implies acceptance of the Bernanke and Gertler (2001) theory about the effect of asset prices on monetary policy.

One explanation for the fact that the Bank of England has ceased to follow Taylor rule, as indicated in the work Asso, P.F., G. Kahn, and R. Leeson (2010), may be an extremely low level of the Bank of England's key rate.

So, in 2009, the Bank of England lowered the key interest rate to 0.5%. This was an anti-crisis measure that was supposed to support the national economy from the negative effects of the global financial crisis. In subsequent years (2010-2015), the key interest rate did not increase, but remained the same, because of the slow economic growth of the UK economy and low inflation. In these conditions, further lowering of the interest rate is quite problematic. For this reason, during the period under review, the Bank of England pursued an alternative monetary policy - quantitative easing.

Quantitative easing, which refers to the acquisition by the central bank of government debt securities, is aimed at reducing their yields or spreads between the yields of assets with different maturities in a situation where the key interest rate is close to zero. The Bank of England proceeded to redeem government bonds in March 2009 under the framework of the APF (Asset Purchase Facility) mechanism.

As part of the quantitative easing policy, the Bank of England continues to increase the money supply in the economy, despite low interest rates. To this end, the Bank of England buys securities to increase their excess reserves, although the volume of purchases is already excessive relative to the volume that ensures the preservation of close to zero interest rates in the economy. It is important to note that the Bank of England does not conduct short-term REPO transactions for temporary changes in the volume of bank reserves, which corresponds to the classical monetary policy, as well as the final redemption of assets. At the same time, first of all, the "bad" assets of commercial banks are bought out. For a long time, the amount of assets that

was bought out under the quantitative easing program was maintained at a constant level of 375 billion pounds.

Nevertheless, in the third quarter of 2016, the Bank of England lowered the key rate to 0.25%. The previous decline occurred in March 2009. In addition, the regulator increased the total amount of the program of redemption of government bonds from £ 375 billion to £ 435 billion. The rate was lowered taking into account the decision of the majority of the referendum participants in favor of the UK exit from the European Union (Brexit). After the referendum on the withdrawal of the United Kingdom from the European Union, the exchange rate fell, and the outlook for growth in the short and medium term significantly weakened.

In order to support the national economy in such conditions, the Bank of England lowered the key rate to 0.25%. This decline, as well as the subsequent improvement in the economic situation in the economy, led to the fact that stock indices rose. Nevertheless, within the framework of the current study, this change in the interest rate cannot be explained using the Taylor rule. Moreover, econometric analysis showed that even significant positive and negative changes in such indicators as output gap and inflation did not lead to a change in the Bank of England's key rate.

Summarizing, we can conclude that the current monetary policy of the Bank of England is not based on the Taylor rule, which took place in the pre-crisis period of the development of the UK economy. The current monetary policy of the Bank of England implies a quantitative easing policy, which is especially relevant in the context of low interest rates. The change in the Bank of England's key rate in 2016 is largely due to the UK's exit from the European Union.

V. Conclusion

As a result of the conducted research, the goal was achieved: to identify the features of the modern monetary policy of the Bank of England in the context of stock market volatility.

To achieve this goal, the following tasks have been accomplished:

- Defining the term "monetary policy" and to identify major types of monetary policy;
- Defining the term "stock exchange" and to study the impact of it on monetary policy;
- Examining the rules of monetary policy;
- Creating and estimating of the modern monetary policy of the Bank of England (2010-2016) in accordance with Taylor rule.

The conducted research allows to draw the following conclusions:

1. This study examined the definition of monetary policy, as well as its main types. Monetary policy aimed at regulating the amount of money in circulation can be conducted according to a certain rule or on the basis of an analysis of a specific situation (discretionary policy). The advantages of discretionary policy and policy based on the rules are widely discussed in the scientific community and politics. In the unpredictability of the modern financial world, no Central Bank can use only a rule-based approach. The monetary rule can be viewed in a broad sense, as systematic instructions to politicians aimed at achieving fundamental goals.
2. Literature review showed that the Taylor Rule, proposed in 1993, is still the most famous tool for modeling monetary policy. Many researchers have finalized this rule, taking into account the revision of data, focusing not on current values, but on expectations, lags of monetary policy and other factors. And although no Central Bank has followed Taylor rule or any of its modifications in its pure form on an ongoing basis, the rule has become a useful criterion for evaluating monetary policy.
3. A study conducted by Asso, P.F., G. Kahn, and R. Leeson (2010), points out that in 2001-2009 the Taylor rule has played an important background role in the monetary policy of Bank of England. The authors note that, despite the fact that the Bank of England has formally adhered to the regime of inflation targeting, the Taylor rule plays a significant role in making decisions about changing the key rate. Current empirical study of the monetary policy of the Bank of England in 2010-2016 will be carried out. This study will answer the question of whether the Bank of England adheres to Taylor rule or not.
4. The conducted study did not reveal a significant connection between the Bank of England's monetary policy and the volatility of the stock market. This suggests that the Bank of England as a whole was not guided by changes in asset prices when establishing a key rate, as discussed in Cecchetti et al. (2002). Moreover, failing to reject the null hypothesis that the estimated δ are equal to zero implies acceptance of the Bernanke and Gertler (2001) theory about the effect of asset prices on monetary policy.
5. The current monetary policy of the Bank of England is not based on Taylor rule, which took place in the pre-crisis period of the development of the UK economy. One explanation for the fact that the Bank of England has ceased to follow Taylor rule, as indicated in the work Asso, P.F., G. Kahn, and R. Leeson (2010), may be an extremely low level of the Bank of England's key rate.

6. The current monetary policy of the Bank of England is characterized by the implementation of a policy of quantitative easing, which is especially relevant in conditions of low interest rates. For a long time, the amount of assets that was bought out under the quantitative easing program was maintained at a constant level of 375 billion pounds. Quantitative easing, which refers to the acquisition by the central bank of government debt securities, is aimed at reducing their yields or spreads between the yields of assets with different maturities in a situation where the key interest rate is zero or close to zero. As part of the quantitative easing policy, the Bank of England continues to increase the money supply in the economy, despite low interest rates.
7. The change in the Bank of England's key rate in 2016 is largely due to the UK's exit from the European Union. The rate was lowered taking into account the decision of the majority of the referendum participants in favor of the UK exit from the European Union (Brexit). After the referendum on the withdrawal of the United Kingdom from the European Union, the exchange rate fell, and the outlook for growth in the short and medium term significantly weakened. In order to support the national economy in such conditions, the Bank of England lowered the key rate to 0.25%. Nevertheless, within the framework of the current study, this change in the interest rate cannot be explained using the Taylor rule.

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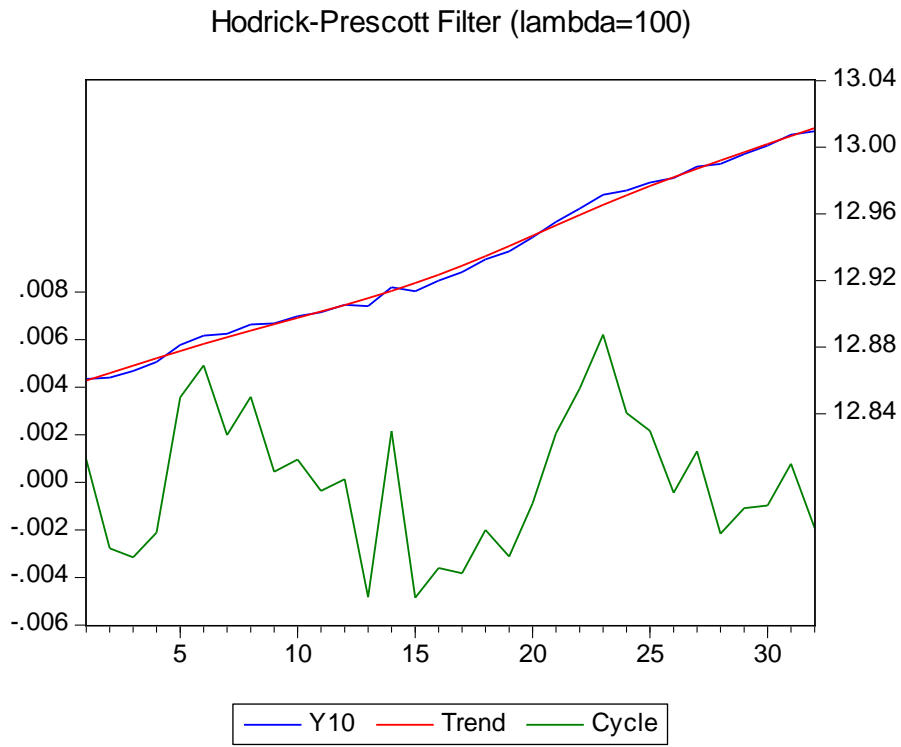
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Appendix 1. Initial model data.

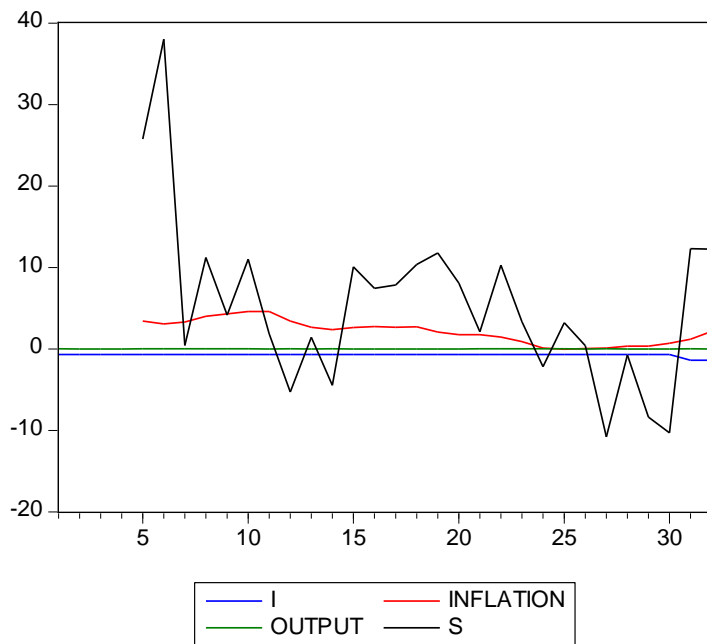
CPI	RGDP	INTEREST	INFLATION	OUTPUT	FTSE	S
96.57000	384971.7	0.5			4320.59	
97.20000	385244.6	0.5			3530.73	
97.91000	386814.4	0.5			5172.89	
98.66000	388940.2	0.5			5196.82	
99.93000	392878.59	0.5	3.42	0.00357	5590.7	25.771
100.2200	395081.2	0.5	3.05	0.00491	5163.6	38.012
101.1900	395538.7	0.5	3.29	0.00198	5195.3	0.4322
102.6800	397737.7	0.5	3.99	0.00359	5812.9	11.203
104.3200	398003.9	0.5	4.29	0.00044	5828.2	4.1603
104.9200	399717.7	0.5	4.58	0.00096	5765.5	11.025
105.9300	400709.7	0.5	4.57	-0.00035	5292.1	1.8460
106.2600	402480.3	0.5	3.42	0.000137	5512.9	-5.298
107.1200	402133.6	0.5	2.64	-0.00482	5911.3	1.4157
107.4200	406729.3	0.5	2.35	0.002158	5513.3	-4.4728
108.7600	405783.8	0.5	2.63	-0.00485	5852.6	10.067
109.2100	408345.6	0.5	2.73	-0.00360	5939.2	7.4483
109.9900	410473.41	0.5	2.64	-0.00381	6392.8	7.8306
110.3600	413589.3	0.5	2.70	-0.0020	6116	10.374
111.0300	415623.3	0.5	2.06	-0.0031	6583.1	11.761
111.1400	419145.7	0.5	1.75	-0.00088	6439.6	8.0907
111.9300	423024.2	0.5	1.74	0.002060	6528.1	2.0943
111.9600	426455.7	0.5	1.43	0.003938	6777.4	10.268
112.0400	430008.4	0.5	0.90	0.006206	6806.8	3.3416
111.2600	431083.7	0.5	0.10	0.002915	6300.8	-2.178
111.8900	433156.6	0.5	-0.0357	0.002170	6740.5	3.2018
112.0000	434333.2	0.5	0.03572	-0.00043	6804.5	0.3990
112.1500	437332.5	0.5	0.0981	0.001303	6109.2	-10.8126
111.6300	438006.2	0.5	0.3320	-0.00216	6254.8	-0.734331
112.2600	440639.9	0.5	0.3301	-0.00108	6199.3	-8.368159
112.7800	442841.6	0.5	0.6940	-0.000971	6138.1	-10.30689
113.4900	445769.1	0.25	1.1877	0.0007800	6909.2	12.305802
114.0500	446713.6	0.25	2.1447	-0.001922	7068.7	12.232741

Appendix 2. Results of Eviews OLS analysis.

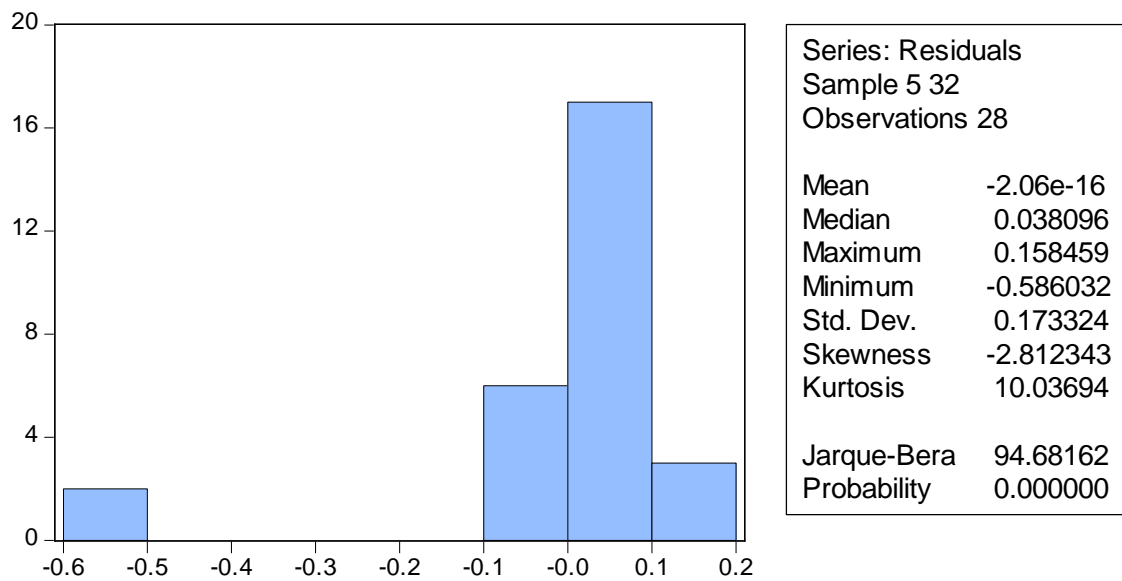
- Hodrick-Prescott Filter



- Plot of the variables



- Normality test



- Heteroskedasticity Test: White

Heteroskedasticity Test: White

F-statistic	1.125931	Prob. F(9,18)	0.3945
Obs*R-squared	10.08534	Prob. Chi-Square(9)	0.3436
Scaled explained SS	33.48023	Prob. Chi-Square(9)	0.0001

- Model after Autoregression Transformation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.473921	118.1901	-0.046315	0.9635
INFLATION	-0.053726	0.058633	-0.916305	0.3694
OUTPUT	-7.557774	8.665464	-0.872172	0.3925
S(-1)	-0.004712	0.002309	-2.040932	0.0534
AR(1)	0.993440	0.158493	6.268036	0.0000

R-squared	0.598625	Mean dependent var	0.744491
Adjusted R-squared	0.525647	S.D. dependent var	0.184987
S.E. of regression	0.127407	Akaike info criterion	1.117287
Sum squared resid	0.357115	Schwarz criterion	0.877317
Log likelihood	20.08338	Hannan-Quinn criter.	1.045932
F-statistic	8.202882	Durbin-Watson stat	2.419252

Prob(F-statistic) 0.000330

Inverted AR Roots .99
