Investigating the Impact of Interbank Interest Rate on Information Asymmetry. Evidence from Bucharest Stock Exchange

Danut Georgian MIHAI[1], Catalina Ioana TOADER[1], Antonela BICHIR[2], Ludovic Cosmin TRIFU[1], Florin BLAGA[1]

[1]Faculty of Finance and Banking, Bucharest University of Economic Studies, Romania,
[2]Valahia University of Târgoviște, Romania

Abstract
The aim of this article is to examine the relationship between several economic and financial variables and the 3-month Romanian Interbank Offered Rate (ROBOR3M) in Romania. Using a database that covers August 2019 to October 2020 period, our results show that information asymmetry is influencing the interest rate evolution in such way that during episodes of increased uncertainty, a higher level of informed traders are executing transactions on Bucharest Stock Exchange which leads to higher interbank rates. Moreover, our study uncovers statistically significant associations between ROBOR3M and various factors, including prior ROBOR performance, shifts in currency exchange rates, movements in the stock market, fluctuations in cryptocurrency values, alterations in government bond yields, and the presence of information asymmetry among major banks.
Keywords: Interbank Interest Rate, Information Asymmetry, Bucharest Stock Exchange

Introduction
The COVID-19 pandemic, an unprecedented global shock, inflicted substantial economic losses on economies and financial institutions worldwide. Countless individuals and entities experienced abrupt disruptions in their income. This health crisis had a multifaceted impact, affecting both demand and supply dynamics, alongside other key financial variables. This study addresses a critical need by providing a nuanced understanding of the drivers behind the ROBOR3M movements. The significance is that it provides policy makers, financial institutions and investors with the insights necessary to make informed decisions in the face of a volatile economic environment. With the identified factors and a well-specified model, the study aims to serve as a valuable tool for forecasting and risk assessment in the Romanian financial landscape. Moreover, the study fulfils the demand for comprehensive and precise insights that allow stakeholders to tackle the complexity of the financial environment with

greater confidence and strategic acumen. Moreover, our study is highly relevant for several reasons, such as understanding the financial markets, policy implications, financial institutions, regulators or financial institutions.In response to this multifaceted crisis, central banks around the world swiftly implemented a series of comprehensive measures. These measures included providing liquidity support to financial markets, engaging in asset purchases to stabilize financial conditions, and reducing policy interest rates. These actions were undertaken with the overarching goal of alleviating the financial burdens faced by businesses and households as they sought to navigate the challenges posed by the pandemic. These monetary policy interventions aimed to facilitate and expedite the recovery process, offering critical support to those grappling with the pandemic's far-reaching economic consequences.

In Romania, the onset of the COVID-19 crisis in March 2020 led to the abrupt closure of the economy, triggering immediate consequences for financial markets. One significant impact was the rapid increase in ROBOR3M, the Romanian Interbank Offered Rate 3M. This surge occurred as the Ministry of Finance encountered difficulties in securing essential funding for the national budget. Investors, recognizing the elevated risks both within Romania and the global economic landscape, began demanding higher interest rates on government bonds.

However, it's important to note that the situation also highlighted the crucial role played by the National Bank of Romania. The central bank swiftly intervened by decisively reducing the policy rate from 2.5% to 2%. This action not only signalled the bank's commitment to stabilizing financial conditions but also sent a clear message to the market that it was prepared to take further steps to ensure liquidity and stability. Additionally, the prospect of the central bank's potential entry into the secondary government securities market acted as a potent deterrent, further influencing market dynamics.

These combined efforts had a substantial impact on the financial landscape. ROBOR 3M, which had initially surged, was brought back below the 2% threshold, and the yields on 10-year government securities decreased significantly from 6.3% to 4%. This demonstrated how proactive and decisive central bank actions, backed by a credible commitment to market stability, could mitigate the economic fallout of a crisis and facilitate a more rapid recovery.

In the context of unprecedented economic challenges posed by the COVID-19 pandemic, this study investigates the dynamics of the 3 months Romanian Interbank Offered Rate (ROBOR3M) in Romania and its intricate relationship with a multitude of economic and financial variables. The findings of our analysis reveal crucial insights into the behaviour of ROBOR3M under varying conditions of economic and political uncertainty within the Eurozone, as measured by the European Economic and Political Uncertainty Index (EPU). Notably, our study identifies statistically significant relationships between ROBOR3M and other covariates such as lagged ROBOR performance, changes in exchange rates, stock market dynamics, cryptocurrency prices, government bond yields, and informational asymmetry for major banks. These findings offer a nuanced understanding of the drivers behind ROBOR3M movements, enabling policymakers, financial institutions, and investors to make more informed decisions in navigating volatile economic environments. Additionally, our well-specified model, with an R-squared value of approximately 89%, underscores the utility of this analysis as a valuable tool for forecasting and risk assessment in the Romanian financial landscape.Our study of the impact of interbank interest rates on information asymmetry is useful to a wide audience, including policy makers, investors, financial institutions, the academic community and regulators. The benefit lies in the opportunity to support decision

making, improve risk management and contribute to the advancement of financial market theories and regulations.

Literature review

Interest rates are subject to the influence of a multitude of factors. A primary driver is central bank policy, with benchmark interest rates established by central banks serving as a foundational element (Bernanke and Kuttner, 2005). These rates directly impact short-term interest rates throughout the economy. Furthermore, the anticipation of changes in inflation rates plays a significant role in determining nominal interest rates, which is encapsulated by the Fisher equation (Fisher, 1930). When inflation expectations rise, lenders often require higher interest rates to offset the expected erosion in the real value of their investments. Additionally, the broader economic context is critical. Economic growth, as measured by GDP growth and employment levels, shapes the trajectory of interest rates. Strong economic growth can prompt central banks to raise interest rates as a precautionary measure to prevent an overheating economy (Romer & Romer, 2004).

Interest rates are intricately tied to the dynamics of financial markets. Yield curves, which depict the interest rates on government bonds with various maturities, provide valuable insights into the expected direction of interest rates. An inverted yield curve, where short-term interest rates surpass long-term rates, is often seen as a precursor to economic downturns, making it a crucial indicator for market participants (Estrella & Mishkin, 1998). Furthermore, the perception of risk in financial markets significantly influences interest rates. Investors typically demand higher interest rates for riskier investments, such as corporate bonds, compared to the relatively safer government bonds (Merton, 1974). Market liquidity conditions can also exert considerable influence. Scarcity of liquidity may lead to higher lending costs, particularly in short-term money markets where liquidity shortages can amplify interest rate fluctuations (Gorton and Metrick, 2012).

The regulatory and policy landscape plays an increasingly prominent role in determining interest rates. Changes in regulatory frameworks, exemplified by legislation like the Dodd-Frank Act, have a direct impact on market behaviour and lending practices, which, in turn, affect interest rate dynamics (Duffie, 2010). These regulatory changes aim to enhance transparency, improve market integrity, and mitigate systemic risks. Additionally, the policy actions of central banks, such as quantitative easing, can exert substantial influence. Quantitative easing involves central banks purchasing government bonds and other financial assets, increasing demand for these securities and subsequently exerting downward pressure on long-term interest rates (Gagnon et al., 2011). These policies have become instrumental tools for central banks during periods of economic crisis.

Beyond the quantitative aspects, market sentiment and behavioural factors also influence interest rates. Psychological biases and herding behavior among market participants can lead to amplified movements in interest rates (DeLisle & Jarrow, 1997). Behavioral biases, like overreaction to news or information, can create short-term fluctuations in interest rates that may not be justified by fundamental economic factors. These elements of market psychology can introduce volatility and distortions into interest rate movements, making them subject to short-term irrational behavior.

Material and Methods
Data description
In this paper, we examine a dataset that encompasses various economic and financial variables, focusing on the dynamics of the weekly ROBOR 3-month index in Romania. Our database covers the August 2019 to October 2020 period. A detailed description of the selected variables is presented in Table 1.

Table 1.
Data description

Variable	Definition	Source
ROBOR3M	This is the dependent variable representing the weekly change in the ROBOR 3-month index. ROBOR is the Romanian Interbank Offered Rate, a significant financial benchmark.	The National Bank of Romania Database
ER	This variable measures the weekly change in the exchange rate between the Euro (EUR) and the Romanian Leu (RON), reflecting currency market dynamics.	The National Bank of Romania Database
BET	The weekly change in the value of the BET index, which tracks the performance of the Bucharest Stock Exchange (BVB).	Refinitiv
BITCOIN	This variable records the weekly change in the price of Bitcoin, a leading cryptocurrency.	Yahoo Finance
BOND10Y	This represents the dynamics of the yields on 10-year government bonds (TB_10Y), providing insights into the government bond market.	Refinitiv
PIN	This variable reflects the dynamics of informational asymmetry in the stock market for two major banks listed on the Bucharest Stock Exchange, Banca Transilvania and BRD. We use weekly change in the average measure of PIN as a proxy for the information asymmetry on Bucharest Stock Exchange	Bloomberg, Own calculation, using Easley et al. (1996)
EPU	This serves as a threshold variable and measures economic and political uncertainty within the European Union (EU). It categorizes periods of high and low uncertainty.	Economic Policy Uncertainty Database[1]

Except for EPU, all the variables are non-stationary using ADF unit root test but become stationary in the first difference. For this reason, we include the fist difference in the threshold regression model. Furthermore, the pairwise correlation coefficient among the selected covariates is below the 40%, indicating that multicollinearity is not an issue for the econometric procedure.

Econometric Approach
To study the nonlinear impact exerted by different variables on the evolution of ROBOR3M we use a threshold regression analysis related to Tong (1990) and Hansen (2011, p. 123–127.). These approaches are suitable substitutes to classical OLS methods when it

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[1] https://www.policyuncertainty.com/

comes to capturing asymmetric patterns or sudden breaks that can be observed in financial time series. A threshold regression with two regions can be specified as follows Eq. (1):

$$y_t = \begin{cases} x_t\beta + z_t\delta_1 + \epsilon_t, & -\infty < w_t \leq \gamma \\ x_t\beta + z_t\delta_2 + \epsilon_t, & \gamma < w_t \leq \infty. \end{cases} \quad (1)$$

In Eq. (1), y_t is the dependent variable (ROBOR 3M weekly percentage change), the set of explanatory variables withouth threshold effects are given by x_t and might also include lagged values of y_t while z_t is a matrix of independent variables featuring some region-specific coefficients captured by δ_1 and δ_2. Furthermore, β is a vector containing region-invariant estimates, w_t is the threshold variable given by COVID-19 related informations while ϵ_t is an IID error term with zero mean and constant variance σ^2. Region 1 contains those observations associated with w_t less than the threshold γ. Similarly, Region 2 is restricted to the subset of observations where the value of w_t is greater than γ.

Performing inference on γ, which is a nuisance parameter is a difficult task mainly due to its nonstandard asymptotic distribution. In this regard, to identify the threshold value ($\hat{\gamma}$) it is necessary to perform the least square optimization to Eq. (2) with T observations and two regions:

$$y_t = x_t\beta + z_t\delta_1 I(-\infty < w_t \leq \gamma) + z_t\delta_2 I(\gamma < w_t \leq \infty) + \epsilon_t. \quad (2)$$

The threshold is calculated based on the following minimization algorithm:

$$\hat{\gamma} = \arg\min_{\gamma \in \Gamma} S_{T_1}(\gamma). \quad (3)$$

In Eq. (3), $\Gamma \in (-\infty, \infty)$, T_1 is a sequence of values in w_t, with $T_1 < T$ and corresponds to the number of observations between two certain quantiles of w_t distribution. In addition, $S_{T_1}(\gamma)$ can be computed as:

$$S_{T_1}(\gamma) = \sum_{t=1}^{T} [y_t - x_t\beta - z_t\delta_1 I(-\infty < w_t \leq \gamma) - z_t\delta_2 I(\gamma < w_t \leq \infty)]^2. \quad (4)$$

Eq. (4) represents a $T_1 x 1$ vector of SSR given γ which is a $T_1 x 1$ vector of potential thresholds.

Results

The estimation results are presented in Table 2. Including lagged dependent variable, i.e., ROBOR3M (-1) is a common and important practice to account for temporal dependencies, improve model fit, and capture the dynamic nature of time series data. It helps address issues related to autocorrelation, model dynamics, and can enhance the overall accuracy and reliability of time series models.

Covariates	Regime 1		Regime 2	
	Coefficient	Prob.	Coefficient	Prob.
ROBOR3M (-1)	0.5693	0.0001	0.4753	0.0011
PIN	0.0002	0.6212	0.0470	0.0000
ER	-0.0174	0.1210	-0.0973	0.0164
BOND10Y	0. .1527	0.0058	0.6676	0.0000
BET	0.0012	0.6436	0.0016	0.7551
BITCOIN	-0.0006	05343	0.0216	0.0002
EPU intervals	EPU<299		EPU>=200	
R-squared	0.8903			

Note: an intercept was included but not reported

First, based on the EPU values we identify two distinct regimes describing the situations with moderate economic and policy uncertainty (Regime 1) versus the situation when the uncertainty is above average. First, we notice that the evolution of the interest rate is following an autoregressive pattern, regardless the level of uncertainty. Indeed, the coefficients associate to lagged ROBOR3M are statistically significant at 1% level in both regimes. However, the link weaknesses during episodes when economic and politic uncertainty is increasing. Indeed, during uncertain times, investors and economic agents tend to become more risk-averse. This heightened risk aversion can lead to changes in their behavior, causing them to place less emphasis on past interest rate data when making decisions.

Second, the information asymmetry is influencing the interest rate evolution only in Regime 2, since the coefficient associated to PIN is statistically significant at 5% level. This suggest that during episodes of increased uncertainty a higher level of informed traders executing transactions on Bucharest Stock Exchange is leading to higher interbank rates. The observed influence of information asymmetry on interest rate evolution in Regime 2 suggests that during periods of increased uncertainty, a higher level of informed traders participating in the Bucharest Stock Exchange can indirectly affect interbank rates. Their actions, driven by valuable information, contribute to fluctuations in interbank rates as market participants respond to changing economic and political conditions. This phenomenon underscores the dynamic nature of financial markets and the role of information in shaping interest rate dynamics during uncertain times.

Third, we notice that both exchange rate evolution, as well as 10 years government bond yield exhibit a significant influence on exchange rate evolution. The link between them is more pronounced in Regime 2, when the EPU index is above average. The results are in line with the economic intuition and Uncovered Interest Parity hypothesis. Furthermore, we fail to identify some significant relationship between interest rate dynamic ang the general evolution of the stock market proxied by BET dynamic.

The cornerstone of this study is the connection between interest rates and Bitcoin prices. We observe that this link is absent in Regime 1, when economic and policy uncertainty is low. However, in Regime 2, we identify a statistically significant positive coefficient at the 1% level, suggesting that an increase in Bitcoin prices correlates with higher interbank rates. Thus, during Regime 2, when economic and policy uncertainty is heightened, the positive correlation between Bitcoin price increases and interbank interest rates can be explained by market participants' flight to safety, reduced demand for riskier assets like Bitcoin, increased risk premiums for illiquid assets, and the implementation of stricter risk management by financial institutions. These factors collectively contribute to the observed relationship between Bitcoin price movements and interbank interest rates in this particular market environment.

Conclusions

The results of the paper provide significant insights into the behavior of ROBOR3M in response to changing levels of economic and political uncertainty within the Eurozone, as gauged by the European Economic and Political Uncertainty Index (EPU). Importantly, our research uncovers statistically significant associations between ROBOR3M and various factors, including prior ROBOR performance, shifts in currency exchange rates, movements in the stock market, fluctuations in cryptocurrency values, alterations in government bond yields, and the presence of information asymmetry among major banks. The study's findings

carry several policy implications. These include the need for proactive interest rate management, transparency and regulatory oversight to address information asymmetry, vigilance in monitoring exchange rates and bond markets, and careful consideration of emerging asset classes like cryptocurrencies. Additionally, robust risk management practices and effective communication strategies are essential tools for policymakers and market participants to navigate the dynamic landscape of financial markets during periods of uncertainty.

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