MONETARY POLICY AND BANK PROFITABILITY: UNVEILING NONLINEARITIES IN AN ERA OF LOW INTEREST RATES AND FLATTENING YIELD CURVES

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NOTES

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ABSTRACT

The progressive reduction of the key interest rate over recent years, exemplifying the accommodative monetary policy implemented by the Bank of Albania, necessitates a thorough examination of the repercussions of monetary policy on both bank profitability and the stability of the financial sector in Albania. This research endeavours to examine the influence of monetary policy and the structure of interest rates on the net interest income of banks, which serves as their primary revenue stream, by considering the existence of a non-linear correlation between these two variables. Our study employs comprehensive data encompassing all commercial banks operating within the Albanian banking sector from 2004 to 2020. The analysis is categorized into three distinct groups based on the respective proportions of these banks’ assets within the banking sector. The findings indicate a noteworthy concave association solely between the level of the monetary policy rate and the net interest margin for small banks, whereas for larger banks, the observed effects tend to be statistically insignificant. The investigation also reveals a non-linear relationship when substituting the monetary policy rate with the short-term rate and the slope of the yield curve.

JEL classification: C53, E43, E52, G21

Key words: monetary policy, net interest margin, non-linear relation
1. INTRODUCTION

Comprehending the interconnection between interest rates and the profitability of banks is paramount when assessing the implications of monetary policy on the stability of the financial sector. While it is acknowledged that monetary policy is not the sole determinant of bank interest rates, its influence remains significant. The central bank exercises authority over short-term rates and shapes longer-term rates by means of direct securities purchases and by shaping the expectations of market participants regarding short-term rates. Conversely, diminished profitability, indicative of reduced capital generation capabilities on the banks’ side, can engender more stringent lending practices, thereby undermining the efficacy of accommodating monetary policy measures.

The relationship between monetary policy and bank profitability becomes particularly crucial when banks’ capital levels approach regulatory requirements and face limitations in raising capital from the market. Although the capital reserves of the banking system in Albania have shown substantial improvement in recent years, the presence of non-performing loans (NPLs) remains relatively high, despite the Central Bank’s efforts to address this issue through the write-off of bad loans. This matter assumes even greater significance within the context of the Bank of Albania’s significant relaxation of monetary conditions, characterized by a sustained reduction in the policy rate in recent years. The objective behind this approach is twofold: to stimulate inflation towards the targeted level and to facilitate increased lending to the real economy in an environment of subdued economic growth.

Remarkably, the examination of the association between monetary policy and bank profitability in Albania remains an area that has received limited scholar attention. While previous studies by Papavangjeli and Leka (2016) and Kalluci (2010) have encompassed the key rate as one of the factors influencing net interest margin in the Albanian banking sector, they do not specifically concentrate on the direct impact of monetary policy on banks’ profitability. Thus, the present study seeks to delve deeper
into this relationship by exploring the intricate connection between the monetary policy rate and banks’ net interest margin, which serves as the primary constituent of their profitability. Furthermore, we incorporate non-linearities within this relationship, enhancing the comprehensiveness of our analysis.

In order to provide an up-to-date perspective, our investigation employs the most recent available data from the banking sector. We categorize the analysis into three distinct groups based on the relative proportions of these banks’ assets within the total banking sector. Our estimation methodology employs an Ordinary Least Squares (OLS)-based Panel Corrected Standard Errors (PCSE) procedure, effectively accounting for critical issues such as autocorrelation, residual correlation between equations, and cross-sectional heteroscedasticity. This approach not only improves the efficiency of parameter estimation, but also generates more precise t-statistics, thereby enhancing the accuracy of our findings.

The paper continues as follows. Section 2 gives a simple illustrative theoretical model for the non-linear relation between monetary policy rate and net interest margin and provides a review of the empirical results of previous research regarding this relation in other countries, in order to help setting the econometric analysis. Section 3 describes the main developments in the Albanian banking sector, differentiating between small, medium and large banks, according to their share on the total assets of the banking sector. Section 4 presents the econometric analysis and discusses the empirical results. The paper concludes with Section 5.
2. THEORETICAL ANALYSIS AND EMPIRICAL LITERATURE

2.1 ANALYTICAL FRAMEWORK BEHIND THE NON-LINEAR RELATION

Interest rates exert an important impact on banks’ net interest income, which is defined as the discrepancy between interest income and interest expenses, operating through several key mechanisms. Notably, lower interest rates stimulate an upsurge in the demand for loans, subsequently culminating in amplified lending volumes and thereby augmenting interest income. Conversely, the reduced cost of borrowing enhances the debt repayment capacity of borrowers, potentially curbing credit losses and alleviating the need for provisions to mitigate anticipated credit losses. Consequently, the association between lower interest rates and diminished levels of non-performing loans, accompanied by reduced provisions for expected credit losses, is anticipated.

It is worth noting that liabilities tend to exhibit greater sensitivity to interest rate fluctuations compared to assets due to disparities in their respective maturities, manifesting a phenomenon known as “maturity mismatch.” Banks typically adopt a lending strategy characterized by longer-term loans and shorter-term borrowing, resulting in an asymmetry that renders liabilities more susceptible to interest rate adjustments. Consequently, when market interest rates decline, the funding costs borne by banks typically diminish at a faster pace than their interest income, thereby bolstering net interest income.

As interest rates decline to exceptionally low levels, a further decrease in rates is expected to exert a more pronounced impact on loan interest rates compared to deposit rates, as the latter cannot plummet below zero. Consequently, this asymmetry contributes to a reduction in net interest income (Borio et al., 2015). Moreover, heightened lending activity stimulated by the prevailing lower market rates initially enhances profitability. However, over the course of a few years, the repayment capacity of borrowers may deteriorate,
leading to the emergence of non-performing loans that erode banks’ profitability over time.

In conjunction with the level of interest rates, the slope of the yield curve exerts a notable influence on net interest income. When the yield curve exhibits an upward slope, it signifies a positive term premium, resulting in a relative rise in interest rates for longer-maturity treasuries in comparison to their shorter-maturity counterparts. In the short term, a steeper yield curve is anticipated to elevate net interest margins due to the phenomenon of maturity transformation, particularly when banks possess oligopolistic power. This is attributed to the relatively slower adjustment of deposit rates compared to lending rates. However, over the long-term horizon, the implications are nuanced, potentially leading to diminished interest profits in line with the aforementioned discussion.

The implementation of expansionary monetary policies by several central banks in recent years has facilitated enhanced accessibility to financing by lowering funding costs and augmenting credit availability, thereby stimulating aggregate demand. Nevertheless, an extended period of persistently low interest rates can yield adverse repercussions for banks’ profitability, particularly due to the presence of a floor in deposit interest rates. As a result, banks encounter challenges in passing on the decline in interest rates to deposit rates, as noted by the International Monetary Fund (IMF, 2016). Therefore, banks relying more heavily on deposit-based financing experience a more pronounced impact.

Likewise, the extent to which a bank’s loan portfolio comprises variable interest rate loans plays a significant role in determining the deterioration of its interest profits. This can be attributed to the decline in interest income resulting from the reduction of money market interest rates. As such, banks with a larger proportion of loans tied to changing interest rates experience a more substantial erosion in interest profits.

Contrarily, the European Central Bank (2019) asserts that the implementation of expansionary measures has engendered a heightened level of lending activity, an enhancement in the quality
of bank assets—owing to the financing of less risky ventures—and a decline in non-performing loans, attributable to the ongoing economic recovery. Additionally, Rostagno et al. (2016) furnish empirical evidence substantiating the surge in credit growth within the Eurozone, attributable to the expansive nature of monetary policy.

In light of this perspective, it becomes crucial to discern between the effects witnessed thus far as a result of declining interest rates and the potential ramifications that may arise from the persistence of these exceptionally low rates over an extended duration. Given the divergent viewpoints surrounding this matter, the present study undertakes an investigation into the influence of interest rate fluctuations on net interest margins, aiming to ascertain the presence of a potential non-linear relationship between the two variables. Such an investigation is poised to shed light on the varying impact of monetary policy, contingent upon the prevailing level of interest rates.

Hence, if there is a non-linear relationship, a reduction in interest rates may prove detrimental to bank margins when rates are already at a low level. Conversely, the same decline in rates can yield favorable outcomes in the presence of higher interest rate levels, attributable to heightened demand for credit, a decrease in non-performing loans, and other associated factors. By exploring the dynamics of this relationship, this research endeavors to offer valuable insights into the interplay between interest rates and net interest margins within the banking sector.

2.2 EMPIRICAL EVIDENCE ON POLICY RATE AND BANK PROFITABILITY RELATION

While much of the existing literature primarily focuses on the positive correlation between interest rates and bank profitability, there exists a dearth of empirical research exploring the potential non-linearities in monetary transmission associated with varying interest rate levels, as well as the ramifications of a prolonged period characterized by low interest rates on banks’ profitability.
Examining the impact of interest rate levels and yield curve slopes on banks’ profitability within the context of the US economy, Genay and Podjasek (2014) contribute to this limited empirical literature. Their findings indicate that persistently low interest rates exert a depressive effect on the profitability of US banks, particularly smaller institutions, in the short term. However, it is important to note that over the long term, the potential compensatory effects of heightened economic activity could counterbalance this impact. Notwithstanding, the estimated negative effects on bank profits are relatively modest from an economic standpoint, and any adverse consequences are likely outweighed by the anticipated positive effects of low interest rates in stimulating economic activity and subsequently bolstering profits.

Alessandri and Nelson (2015) identified a positive long-term relationship between profitability and both interest rates and the slope of the yield curve for the United Kingdom. However, in the short term, as interest rates decline, banks adjust their loan rates and expand credit provision, which exerts downward pressure on the net interest margin (NIM) as their balance sheets expand. In a study focused on the German banking system, Busch and Memmel (2015) demonstrate that higher rates, represented by the yield on outstanding government bonds, have a consistently positive impact on the net interest margin in the long run. However, in the short run, an increase in short-term rates tends to depress banks’ income. In normal interest rate environments, a 100 basis points change in the interest rate has only a marginal effect on net interest margins, approximately seven basis points. However, in the recent low-interest rate environment, Busch and Memmel observe significant declines in interest margins for retail deposits, particularly for term deposits, reaching up to 97 basis points. Supporting these findings, the Bundesbank’s Financial Stability Review (September 2015), which analyzes a sample of 1,500 banks, highlights persistently low interest rates as one of the primary risk factors weighing on the profitability of German banks. The review underscores the challenges posed by the prolonged period of low interest rates, emphasizing their negative impact on banks’ profitability in the German context.
Borio et al. (2015) undertake a comprehensive reassessment of the connection between bank profitability, net interest margin, and interest rates using a dataset encompassing 108 globally operating banks. Notably, their study incorporates the consideration of non-linearities within this relationship. The findings reveal compelling evidence that, when accounting for aggregate demand, a decrease in both short-term interest rates and the slope of the yield curve leads to a decline in the return on assets. Importantly, this effect intensifies as the reduction in interest rates becomes more pronounced. Moreover, the magnitude of the estimated impact is significantly larger compared to studies that do not account for non-linearities. The authors further identify a noteworthy concave relationship between the net interest margin and interest rates, shedding light on the intricate dynamics at play within this domain.

Aydemir and Ovenc (2016) conduct a comprehensive investigation focusing on the Turkish banking system spanning the period from 2002 to 2014. Their findings reveal a complex relationship between short-term interest rates, the slope of the yield curve, and bank profits. Specifically, in the short run, a negative association is observed between these variables. However, in the long run, this relationship transforms into a positive correlation. Similarly, Claessens et al. (2016) contribute empirical evidence highlighting the adverse impact of declining interest rates and a flattening yield curve on net interest margin and overall profitability. Notably, the magnitude of this impact is amplified when interest rates are initially low, resulting in a quadratic relationship between money market interest rates and net interest margin. In their study encompassing 3,418 banks from 47 countries over the period from 2005 to 2013, they further categorize countries into low- and high-rate environments based on the threshold of the three-month Treasury bill rate, with 1.25 percent serving as the main threshold (other thresholds were tested and yielded similar outcomes). Their research demonstrates that in high-rate environments, a 1 percentage point decrease in short-term interest rates corresponds to a 0.09 percentage point decrease in the net interest margin. However, in low-rate environments, this decrease expands to 0.17 percentage points. This discrepancy suggests that during low-rate periods, banks face greater challenges in reducing their funding rates, while they are compelled to pass
on lower rates to borrowers to a greater extent. This phenomenon can be attributed to heightened competition, including non-bank lenders, as well as reduced demand for loans amidst a climate of low interest rates and less robust economic activity. Consequently, net interest margins experience more pronounced declines. These empirical findings imply that lower interest rates gradually erode bank capital over time, particularly when rates are already low. This, in turn, could impede credit expansion, especially if the supply of credit is constrained by capital limitations. It is worth noting that banks typically exhibit hesitancy in raising external capital, further exacerbating the challenges posed by diminished interest rates.

Blot et al. (2016) examine the consequences of negative interest rates resulting from the ECB’s QE policies. This stimulates portfolio reallocation by commercial banks due to the intensified decline in market rates. It is expected to lead to increased lending in the euro area. As of October 2016, the total value of reserves and deposits subject to negative rates reached 1,047 billion euros, posing a gross cost for commercial banks. However, capital gains from selling securities to the ECB could offset this. Negative interest rates flatten the yield curve, reducing net interest margin and profitability in banks’ maturity transformation activities. In the short term, a flattened curve may have positive implications, but medium-term profitability is expected to decrease. To mitigate the impact, banks can implement additional fees and commissions. Lower interest rates also lower default risks among banks’ debtors, benefiting credit quality.

Additionally, Jobst and Lin (2016) have found that negative interest rates in the euro area have effectively facilitated more favorable financial conditions and contributed to a modest growth in credit, thus indicating that the constraints of the zero lower bound are less constraining than previously believed. However, it should be noted that interest rate reductions can exert downward pressure on bank profitability. Extensive rate cuts might eventually surpass the advantages derived from increased asset values and enhanced overall demand. Consequently, should further monetary accommodation be required, it may be necessary to place greater emphasis on credit easing and expanding the ECB’s balance sheet.
rather than relying solely on substantial additional reductions in the policy rate.

Borio and Gambacorta (2017) delve into the question of how low interest rates influence bank lending. Taking into account factors such as business and financial cycles, as well as various bank-specific characteristics including liquidity, capitalization, funding costs, risk, and income diversification, they reveal that the responsiveness of lending to declines in short-term interest rates diminishes when rates are already at a low level. Borio and Hofmann (2017) further elaborate on the weakening transmission of monetary policy in stimulating aggregate demand and output during periods characterized by persistently low interest rates. This diminished effect can be attributed to two primary factors: firstly, the presence of headwinds that typically arise in the aftermath of balance sheet recessions when interest rates are already low, and secondly, inherent non-linearities that manifest when interest rates persistently remain at a low level and attenuate their impact on expenditure.

Moreover, the impact of low interest rates on bank profitability is contingent upon factors such as the bank’s funding source and the degree of downward rigidity in retail deposit rates, as highlighted by Bernanke (2016). Banks reliant on wholesale funding or large and foreign depositors may not experience significant effects on profitability from negative short-term rates. Conversely, banks heavily reliant on retail deposits, which exhibit limited interest rate pass-through from negative rate policies, are more susceptible to margin compression compared to those relying primarily on wholesale funding.

Gros (2016) suggests that the effect of low interest rates on bank profits is inherently ambiguous, influenced by the bank’s business model, competitive dynamics, and the overall economic environment. While recent empirical studies generally indicate a positive relationship between interest rates (or the yield curve) and bank profits, this may be attributed to the fact that rates were historically high during favorable periods characterized by low loan losses and robust loan demand. Notably, countries such as
Switzerland, Sweden, and Denmark, which were early adopters of negative rates, have not experienced significant deterioration in bank profitability. Consequently, negative rates and persistently low long-term rates are seen more as contributing factors rather than the primary cause of the current profitability challenges faced by banks in the euro area.

Sääskilahti (2018) examines the relationship between low interest rates and retail bank interest margins in the Finnish market, accounting for non-linearities and discovering a positive association between market interest rates and net interest margins for both new and existing operations. Pérez and Ferrer (2018) explore the effects of these variables on bank profits and balance sheet structure in Spain over a period spanning 2000 to 2016. Their findings reveal a positive non-linear relationship between interest rates and profit measures, particularly net interest income. Similarly, Arce et al. (2018) find that in the euro area, banks with low capitalization and lower risk appetite are negatively affected by negative rates, although no significant differences in credit supply are observed. Bikker and Vervliet (2018) observe that low short-term interest rates compress net interest margins and reduce credit loss provisions in the United States banking sector, with a non-linear effect where the impact on net interest income offsets the effect on provisions, aligning with Borio et al. (2017)’s findings.

Cruz-García et al. (2019) analyze a sample of 32 OECD countries to examine the impact of interest rates and the slope of the yield curve on net interest margins. They identify a positive and non-linear relationship, although the effect of a flattening yield curve is less economically significant than that of interest rates. Angori et al. (2019) echo these findings for the euro area, revealing a positive and non-linear relationship between interest rates, the slope of the yield curve, and net interest margins. Molyneux et al. (2019) investigate the influence of negative interest rate policy (NIRP) on bank net interest margins and profitability across 33 OECD countries, finding that banks in NIRP-adopting countries experienced reduced margins and profits compared to non-adopting countries.
Conversely, some studies indicate no significant impact of the low interest rate environment on bank profitability. English (2002) finds no evidence of an effect of interest rates or the slope of the yield curve on net interest margins for various countries, except the United States where the yield curve slope positively affects margins, aligning with conventional perspectives. Scheiber et al. (2016) examine the risks and side effects of negative interest rates on bank profitability, particularly net interest income, focusing on Denmark, Sweden, and Switzerland. They conclude that negative rates have not led to a significant reduction in net interest income as declines in interest income have been offset by decreases in interest expenses. A similar outcome is observed by Turk Ariss (2016) in the case of Denmark and Sweden. Altavilla et al. (2018) study a panel of European banks and find no evidence of a substantial effect of interest rates on profitability when controlling for current and expected macroeconomic conditions, though they identify a positive effect on non-interest income and provisions. Some studies, such as Kohlscheen et al. (2018), demonstrate a negative relationship between interest rates and bank profitability, showing that higher short-term rates raise funding costs and reduce profitability in 19 emerging market economies.

3. RECENT DEVELOPMENTS IN THE ALBANIAN BANKING SECTOR

3.1 MONETARY POLICY

At the conclusion of 2000, the Bank of Albania (BoA) embarked on a new phase of monetary policy, discontinuing the use of direct control instruments. Over a span of approximately eight years, the implementation of monetary policy relied on two pivotal measures, which were essentially administrative decisions made by the BoA. These measures entailed restricting the growth of credit extended by commercial banks and imposing a minimum interest rate requirement on ALL time deposits in state-owned banks, as stipulated by the BoA.
However, in the third quarter of 2000, the response from banks did not align with the BoA’s progressive reduction of the administrative percentage. Consequently, a reevaluation of the entire operational framework was considered, leading to the decision that the BoA’s monetary policy would solely rely on market instruments. Specifically, it was determined that the repo agreement rate would assume the role of the key interest rate in the economy. Regular weekly auctions conducted by the BoA would facilitate these transactions. The primary market operation would involve (reverse) repurchase agreements with a maturity period of seven days, serving as the BoA’s principal tool for executing monetary policy. Its purpose is to manage short-term liquidity in the banking system and stabilize market interest rates. The determination of the interest rate for repurchase and reverse repurchase agreements with a one-week term establishes the stance of monetary policy. Within this context, the present study concentrates on the repo rate as the primary monetary policy instrument and examines its impact on the net interest margin of the banking sector in Albania.

3.2 DEVELOPMENTS IN THE BANKING SECTOR

The global financial crisis of 2007, led to difficult times for all developed economies. Albania is a small country with underdeveloped financial markets, which has protected domestic investors from investments in companies or banks’ securities in America and Europe during the year 2000. However, although not directly, Albania inherited the financial crisis of its neighbour developed countries, that significantly lowered their investments in Albania due to their poor economic situation. In order to stimulate inflation and increase the lending of the real economy, that encourages the increase of the gross domestic product, the BoA has pursued an expansionary monetary policy through the continuous repo rate decline since 2009 (see Figure 1, left chart).

The downward trend of the repo rate was followed more strictly by the interest on deposits compared to loans (Figure 1, left chart) because short-term deposits have much more diversity in contract
types compared to short-term loans. Loans interest rates are also closely related to the performance of the 12-month treasury bills yields issued by the Albanian government.

Figure 1 Development of repo, deposit and lending rates over the period 2005-2017.

During 2004-2017, the profitability of the banking system, although volatile, is always positive (Figure 2, right). In the positive values of banks net result, the main impact is attributed to the positive net interest income, which accounts for the major share of income (over 80%). The years 2009-2013 are accompanied by relatively low levels of net income and return on assets (ROA). This is also closely related to the materialization of the credit risk, where the rapid growth of the credit flow (2004-2009) was accompanied by a rise in non-performing loans. The latter led to a significant increase in the loan loss provision expenses after 2009, reducing the profitability of banks. After 2013, the profitability of banks begins to recover, where there is considerable expansion of net profits in the banking system. Banks’ profitability has increased considerably (especially during 2015), mainly driven by banks’ efforts to clear their balance sheets from classified “lost” loans for more than 3 years. During

1 Short-term deposits include 1-, 3-, 6- and 12-month deposits, meanwhile short-term loans include 6- and 12-months loans.
2015, about 28 billion ALL of “lost” loans have been deleted from the banks’ balance sheets. This has led to a rapid decline in non-performing loans stock, and at the same time to a decrease of loan loss provisions.

As a result of existing inefficiencies, the Albanian banking system has experienced a consolidation process. The number of banks operating in Albania at the end of 2019 fell to 12, from 16 in 2017, shifting the origin of bank capital to domestic ownership. By the end of 2019, four banks that make up about 29% of the banking system were domestically owned. However, despite these consolidation processes, the banking activity has continued to expand and the main performance indicators of the Albanian banking system have been improving.

The data in Figure 2 show that net interest income has not been directly affected by the documented decline in the interest rates. This can be explained by two main reasons: One is that a falling interest rate only applies to new loans. Since loan growth is weak after 2011, this would mostly affect the rolling-over of existing loans. The lower rate therefore only gradually feeds into net interest income. Moreover, it is possible that banks increasingly manage to
compensate for the falling rates with a rise of fees (loan origination fees, net of loan origination costs, are recognized as interest). The latter possibility would suggest that banks can successfully adjust their ability to generate profits to the quantitative easing environment.

Figure 3 Deposits and loans composition by maturities.

For the period 2004-2017, there is a steady rise in net interest income in the banking sector (Figure 4). During 2004-2011, the expansion of the net interest income was accompanied by a rapid credit growth. In the early 2000s, the loans accounted for only 9% of the banking system’s total assets, while at the end of 2011 this ratio rose to 42%. Since the end of 2013, the faster pace of decrease in deposit interest rates towards credit rates have led to banks’ financing costs falling faster than interest income, contributing to the expansion of net interest income, which has been in line with the easing policy pursued by the BoA through the continued decline of the key rate (repo). The key rate cut is reflected in the significant fall in interest rates paid to customers for the deposits of the banking system. Customer deposits (individuals or businesses) consist mainly of short maturities. About 90% of the banking sector deposits are settled with a maturity up to one year (Figure 3, left). For this reason, their frequent renewal was required with new interest rates and at the same time lower than previous periods (because of repo rate decrease), significantly reducing the cost of banks.
On the other hand, banks tend to lend long-term maturity loans, which are secured by collateral, to reduce the credit risk. Approximately 50% of the outstanding credit is composed by long-term maturity (over 5 years). When interest rates fall, banks’ financing costs usually fall faster than their interest income and the net interest income increases. Over time, interest income (interest received by customers) has declined as loans are repaid or renewed at lower interest rates. However, the faster fall in deposit rates than credit rates have contributed to the continued expansion of net interest income from customers’ interests and, consequently, to total net interest income.

Interest paid to customers constitutes the major share of interest expenditures (about 70% in June 2017). Other interest expenses are those paid for “securities” and “for treasury and interbank transactions”. On the other hand, interest income consists of: interest received from customers; interest received from securities and those received from treasury and interbank transactions. The main...
component of interest income is the interest received by customers (around 63%), followed by interest received from securities (35%).

Figure 5 Composition of banking sector loans and deposits by maturity.

In addition to the interests received by clients, interest received from securities has also contributed to the development of net interest income. Since 2010, banks have significantly increased their exposure to government securities by investing in government bonds, which have high investment return rates. The continuous decline in the repo rate (since the beginning of 2009) has been accompanied by a fall in the interest rate on loans, however its negative effect on interest income is observed only after 2011. This is also closely related to the fact that banks tend to “lend long-term loans and short-term loans” hence the average loan maturity tends to exceed the average maturity of deposits.
A further analysis explores loans and deposits rates during the period 2004-Q2 2017 fragmented by maturity according to bank groups. The short term maturity comprises maturities from 1 month to 1 year, medium term maturity comprises over 1 year to 5 years maturities and long term maturity represents maturities over 5 years.

### 3.3 Deeper Analysis by Bank Groups

The performance of a bank depends on the fact that more efficient banks gain market share at the expense of less efficient banks, thus making the market more concentrated. In this paper, we split the analysis into three bank groups according to bank size\(^2\): The banks which have a share of their total assets to the overall banking sector assets below 2% are considered small banks; those that have a share larger than 2% and lower than 7% are considered medium banks; and those with a share larger than 7% are considered large banks. This helps us to provide a deeper analysis of monetary policy rate on banks profitability, as small banks are more sensitive towards an interest decrease compared to bigger ones.

Large banks (G3) make up 64% of total private and public sector credit in the country, and about 70% of customers’ deposits (individuals and businesses). The spread between the interest rate on credit and deposits is reported to high and stable levels for large banks, expanding even more in the recent years.

Figure 7 shows the interest rate spreads by maturity and by bank size. Short term spreads show the difference between short term interest rate of loans and deposits and the same goes with medium term spreads. The rate for long term loans is taken into consideration as a representative for the long term spread as deposits in this maturity are almost inexistent\(^3\).

From 2004 until the end of 2005 the repo rate declined from 6.5% to 5.0%. This decline of the base rate was followed by an

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\(^2\) This is a conventional categorization used by BoA.

\(^3\) There is no data for the period on flows and interest rates of long term deposits. By the end of June long term deposits weight only 3% of long term loans and deposits (see the Long term graph, Figure 5).
increase of the NIM rate from 2.6% to 3.6% for the small size banks (G1). From 2006 to the end of 2007 the repo rate increased to 6.25% followed by a decrease of the NIM rate of small banks to 3.0%. During this period, while repo rates are relatively high, we can see the inverse correlation between the base rate and the profitability of banks.

Figure 6 Evolution of loan and deposit rates by bank groups.

The year after crisis the repo rate begins its decrease that is accompanied by the slowdown of the loan growth and a decrease of interest rate spreads. These developments were reflected in the downfall of the NIM rate to the lowest level of 1.5% by 2010 Q3. After 2010, small banks recuperate their loan growth and applied higher spreads that limit the further decline of NIM. During 2014-2015 the repo rate decreased gradually from 2.75% to 1.75% while the NIM increased by 0.6 pp. The on-going downfall of the repo to 1.25% in the following year was accompanied by a decrease of the NIM rate to 2.7%. The long-term interest rate of loans, even though some fluctuations remained at high levels until late 2013. This behaviour was also combined with the deterioration of the loan portfolio quality. The following 2 years, small banks
visibly decreased their long-term interest rates and in fact it was reflected in the increase of their long-term loans.

Figure 7. NIM and interest rate spreads by bank size.

The medium size banks (G2) show a similar behaviour as small banks during the first period from 2004 to the end of 2007 where a decrease of the repo rate is followed by an increase of the NIM rate for banks and vice versa. From mid-2007 to 2008, loans increased notably for the medium size banks while the spreads of interest rates decreased sharply. Following the decrease of the repo starting in 2009 the NIM for medium size banks decreased from 4.2% to its lowest value of 2.3% in 2010 Q3. Through some oscillations of interest rates spreads, even though at the expense of loan growth, medium size banks gradually recovered their NIM rate during the period. The continuous decrease to 1.25% of the repo was followed by a net interest margin of 3.2%.
The large banks (G3) show a different behaviour from the small and medium size banks. The short-term and medium-term spreads of interest rates display some oscillations, but in between the same range, with short-term spread always higher than the medium term spread, testifying for the high interest rate of short-term loans. Only the interest rate for long-term loans follows rigorously the repo rate decrease. It seems that except the decrease during 2010 (at the same time with other groups) the NIM rate behaviour for larger banks is unaffected by the repo rate shifts.
Figure 10 presents the net interest margin (NIM), the quadratic trend of NIM and monetary policy rate (repo) for each bank group. The concave relationship between the two variables is more evident for small banks compared to the other two groups.

![Figure 10 Relationship between monetary policy rate and net interest margin according to bank groups.](image)

Source: BoA and authors' calculations.

4. METHODOLOGY AND DATA

4.1 An illustrative theoretical model

In this section, we present an illustrative theoretical model that is also applicable to the context of Albania, aiming to enhance our comprehension of the quadratic relationship between the monetary policy rate, yield curve slope, and banks' margin, aligning with the econometric analysis conducted throughout this paper. This model represents an adaptation of the Monti-Klein (MK) model, initially proposed by Klein (1971) and Monti (1972), and specifically tailored for the context of banks operating within an oligopolistic competitive framework.

In conjunction with the conventional Monti-Klein (MK) model, the variant utilized in this study incorporates crucial additional elements, namely the marginal cost of maturity transformation, minimum regulatory capital requirements, and loan loss provisions.
This refined model encompasses both monopoly \((N=1)\) and perfect competition \((N=\infty)\) scenarios, while being grounded on two significant simplifications: Firstly, the model assumes the homogeneity of banks, considering them as identical entities solely engaged in traditional intermediation activities. Consequently, alternative revenue sources such as trading income and service fees are excluded from the analysis. Secondly, the inclusion of derivative hedging costs is directly incorporated into the net interest margin, streamlining the framework’s complexity and facilitating a comprehensive evaluation of the relationship under investigation.

The demand for loans is characterized by the inverse demand function \(r_L = r_L(L)\), representing the willingness of borrowers to seek a loan amount \(L\) at a specific loan interest rate \(r_L\). The partial derivative of the demand function with respect to interest denoted as \(d_L(L)\) exhibits a negative sign, since a higher lending rate diminishes the demand for loans. Conversely, the inverse function governing the supply of deposits is captured by the function \(r_D = r_D(D)\), wherein the partial derivative with respect to interest, expressed as \(r_D(D)\) assumes a positive value, signifying that the volume of deposits increases alongside the increment in the interest paid on them. It is assumed that deposits display a relatively modest responsiveness to changes in the deposit rate, considering that they encompass payment services for customers. Consequently, the partial derivative \(r_D(D)\) is not significantly elevated, reflecting a limited sensitivity of deposits to variations in the deposit rate.

It is posited that the banks’ cost function exhibits divisibility, implying the absence of dual costs in the production of loans and deposits. This characteristic is mathematically encapsulated by the following equation:

\[
C_j(L,D) = C_L(L) + CD(D) = \gamma_F + \gamma_L L_j + \gamma_D D_j \tag{1}
\]

where \(L_j\) and \(D_j\) represent the volumes of loans and deposits for bank \(j\), with \(j=1, \ldots, N\), while \(\gamma_F\), \(\gamma_L\) and \(\gamma_D\) are some positive parameters. The functions \(\gamma_L(L)\) and \(\gamma_D(D)\) and \(C(L,D)\) are continuously differentiable at any order.
Let denote $r$ the exogenous money market rate at which banks can borrow or lend and the exogenous fraction of deposits that is required as a non-interest bearing reserve ($0 \leq \alpha \leq 1$). Both $r$ and are set by the central bank. For simplicity, the model considers only the net size of banks’ balance sheets $B$ and banks’ own debt, government and corporate securities, interbank claims are assumed to be perfect substitutes.

Due to maturity mismatch between loans and deposits, banks are exposed to interest rate risk, which they can mitigate by hedging through derivatives at a cost $\tau(\theta)L_j \geq 0$ that depends positively by the yield curve slope, i.e. $\tau'_{\theta} \geq 0$, since with the steeper the yield curve, the greater the difference between long-term and short-term rates and the more likely are banks to engage in maturity transformation. The banks’ net interest income is given by:

$$NII_j = (rL - \tau(\theta))L_j + rB_j - rD_j \quad (2)$$

In the absence of maturity mismatch, $\tau(\theta) = 0$ and we obtain the standard MK model.

For simplicity, the bank capital $K_j$ is assumed to equal to a minimum capital requirement and it is a given fraction $0 < p < 1$ of loans:

$$K_j = \rho L_j \quad (3)$$

Loan loss provisions $(P_j)$ are assumed to be a fraction $\mu$ of loans, which depends itself on the borrowers’ probability of default. The latter raises with the rise of the financing costs, i.e. interest rate, hence $\mu$ can be expressed as a function of interest market rate and the slope of yield curve and loan loss provisions as:

$$P_j = \mu(r, \theta)L_j \quad (4)$$

where $\mu'_{r} \geq 0$ and $\mu'_{\theta} \geq 0$.

Since the model is static, it is reasonable to assume that provisions incur as soon as the loan is granted.
The balance sheet for bank $j$ is thus given by:

$$R_j + L_j + B_j = D_j + K_j$$

(5)

where $R_j = aD_j$ represents the reserve requirements.

The bank’s decision problem on the level of $L$ and $D$ is to maximize its profits:

$$\pi_j = NII_j - C_j - P_j$$

(6)

subject to constraints (3)-(5). Rearranging the terms leads to the maximization problem:

$$\max_{L_j, D_j} \left[ r_L(L_j + L_{-j}) - \eta L_j - [r_D(D_j + D_{-j}) - \omega]D_j \right]$$

(7)

where $L_j = \sum_{h=1, h \neq j}^N L_h$, $D_j = \sum_{h=1, h \neq j}^N D_h$, $\eta = (1 - \rho)r + \mu(\theta, \phi) + \tau(\phi) + \gamma_L > 0$ and $\omega = (1 - \alpha)r - \gamma_D$.

Since the cost function is separable, so is the maximization problem as well, meaning that the optimal volume of loans $L^*$ and the corresponding interest rate $r_L^*$ does not depend on the deposit market characteristics, and the optimal volume of loans $D^*$ and the corresponding interest rate $r_D^*$ does not depend on the loan market characteristics.

Assuming that that profits function is strictly concave, the first order conditions lead to the following optimal market rates for loans and deposits:

$$r_L(L^*) = \frac{\eta}{1 - \frac{1}{N\varepsilon_L(L^*)}}$$

$$r_D(D^*) = \frac{\omega}{1 + \frac{1}{N\varepsilon_D(D^*)}}$$

where $\varepsilon_L(L^*, r) = -\frac{\partial L}{\partial r L} r_L$ and $\varepsilon_D(D^*, r) = -\frac{\partial D}{\partial r D} r_D$ are two positive quantities representing the coefficients of elasticity of the demand function of loans and supply of deposits, respectively.
Assuming constant elasticities of loans and deposit functions, $\varepsilon_L(L^*) = \varepsilon_L$ and $\varepsilon_D(D^*) = \varepsilon_D$ and applying the implicit function theorem to equations (8), yields to:

$$\frac{\partial L^*}{\partial r} = \frac{1 - \rho + \mu'_r}{r'_L(L^*)(1 - \frac{1}{N\varepsilon_L})} < 0$$

$$\frac{\partial D^*}{\partial r} = \frac{1 - \alpha}{r'_D(D^*)(1 + \frac{1}{N\varepsilon_D})} > 0$$

Analogously, the effects of changes in the slope on the optimal levels of loans and deposits are:

$$\frac{\partial L^*}{\partial \theta} = \frac{\tau'(\theta) + \mu'_\theta}{r'_L(L^*)(1 - \frac{1}{N\varepsilon_L})} < 0$$

$$\frac{\partial D^*}{\partial \theta} = 0$$

In line with the preceding discussion, considering the condition $\varepsilon_L < \frac{1}{N'}$, the first derivative is negative. The determination of the optimal loan volume, contingent upon the yield curve slope, hinges upon the degree to which banks engage in maturity transformation. In instances where the involvement in maturity transformation activities is insignificant ($\tau'_\theta = \mu'_\theta = 0$), variations in the yield curve do not impact the optimal loan volume. Conversely, the optimal deposit volume remains unaffected by changes in the yield curve slope. This assumption is grounded on the premise that the cost of hedging is directly linked to the loan volume, and the cost function possesses the property of separability.

The effect of changes in the monetary policy rate $\theta$ and in the yield curve slope on the optimal loan and deposit rates is given by:
according to which an increase in the policy rate raises both the lending cost and the deposits’ rate; whereas a steepening of the yield curve raises the lending rate, while leaving the deposit rate unchanged.

In addition, we analyse the effects of the policy rate and yield curve slope on net interest income, in line with the empirical analysis of the study, which is derived by equations (8)-(9), constraints (3)-(5), given by the following formula:

\[
\frac{\partial r_L(L^*)}{\partial r} = \frac{1 - \rho + \mu'_r}{(1 - \frac{1}{N\epsilon_L})} > 0
\]

\[
\frac{\partial r_D(D^*)}{\partial r} = \frac{1 - \alpha}{(1 + \frac{1}{N\epsilon_D})} > 0
\]

\[
\frac{\partial r_L(L^*)}{\partial \theta} = \frac{\tau'_\theta + \mu'_\theta}{(1 - \frac{1}{N\epsilon_L})} > 0
\]

\[
\frac{\partial r_D(D^*)}{\partial \theta} = 0
\]

where \( \eta = l(L^*) - (1-\rho)r > 0 \) can be seen as a mark-up of the lending rate on marginal funding costs, while \( \lambda = r(1-\alpha) - d(D^*) > 0 \) signifies a mark-down of the deposit rate with respect to the marginal funding cost. The derivative \( \frac{\partial NII}{\partial r} \) is a positive and linear function of \( r \), implying that the net interest income function is quadratic with respect to \( r \); however, the function curvature is determined by the elasticities and capital requirements. In particular, the function \( NII \) is concave with respect to \( r \) \( \left( \frac{\partial^2 NII}{\partial r^2} < 0 \right) \) if the loan demand is elastic to changes in the lending rate \( \left( \dot{r}_L'(L^*) \ll \right) \) and the deposit supply is inelastic with respect to changes in the deposit rate \( \left( \dot{r}_D'(D^*) \ll \right) \)
which seems a reasonable assumption considering that bank exercise more monopoly power in the deposit market than in the lending market (see for instance Gambacorta and Iannotti (2007)).

As regards the change of net interest income towards the yield curve slope, it is a linear function given by:

$$\frac{\partial NII_j}{\partial r} = v_0 + v_1 \theta$$

where $v_1 = \frac{2(\mu'_0 N - \mu'_0) r_0^2}{r'_1 (1 + N)^2}$. The relation between net interest income and the yield curve slope is ambiguous and is determined by the model structural parameters: it is negative when $v_1 < 0$, so when $N > \frac{r_0}{\mu'_0}$ (which occurs when the marginal cost of using derivative contracts is sufficiently low or the competition level in the market is sufficiently high and vice versa.

4.2 EMPIRICAL ANALYSIS

The empirical analysis carried out in this study takes into account all previous contributions in the literature, as well as the theoretical model detailed in the previous section. Since the results of the existing literature are not conclusive i.e. some of them finding a positive relationship between the current expansionary monetary policy and bank profitability, and others finding an insignificant or negative relation, this indicates that the net impact of decreasing interest rates on bank profitability depends on how banks manage the additional factors that affect profitability such as: provisions, fees and commissions, the importance of deposits such as source of funding, etc. Therefore in our empirical analysis, we consider several additional determinants of the net interest margin, but focusing on the impact of interest rates and monetary policy.
4.2.1 SELECTED VARIABLES

Monetary policy variables

Monetary policy exerts its primary influence by directly impacting the short-term interest rate and the slope of the yield curve. The central bank exercises tight control over the short-term rate through its policy rate, while its influence on the yield curve is more indirect. It operates through shaping market participants’ expectations regarding the future path of the policy rate (known as the signalling channel) and by engaging in significant operations involving government securities, strategically aimed at affecting their prices—a typical example of “balance sheet policies” (Borio and Disyatat, 2010). The purchase of central bank assets is widely recognized for its effect on the term premium within long-term interest rates, accomplished through a channel of portfolio rebalancing (Bernanke, 2013).

Consequently, in addition to the policy rate, our analysis also explores the impact of two additional indicators—short-term interest rate and the slope of the yield curve—on banks’ profitability. Drawing from the works of Alessandri and Nelson (2015), Borio et al. (2017), Cruz-García et al. (2019), and Angori et al. (2019), among others, we employ the three-month interbank market interest rate as a proxy for short-term interest rates (referred to as Short-term interest rate). To capture the potential non-linear relationship between interest rate levels and each dependent variable, we include the squared term of this variable in the estimations. As discussed earlier in the paper, the effective lower limit on deposit remuneration prevents the reduction in interest rates from being transferred to deposit interest rates, resulting in a decrease in net interest income. Thus, we anticipate a positive relationship between interest rate levels and net interest income. The overall effect of the decline in interest rates on a bank’s net interest margin hinges on whether the negative impact on the margin can be counterbalanced by other opposing effects, as elucidated previously.

To capture the slope of the yield curve (referred to as slope of the yield curve), we utilize the difference between the interest rate on a ten-year bond and the three-month interbank market interest
rate, following the research of Aydemir and Ovenc (2016), Borio et al. (2017), Cruz-García et al. (2019), and Angori et al. (2019), among others. Similarly, this variable enters the model in quadratic terms to account for any potential non-linear relationship between the slope of the yield curve and the other dependent variables. Once again, we anticipate a positive relationship between the slope of the yield curve and the net interest margin, and the overall impact of the yield curve’s slope on a bank’s profitability will depend on whether the effect on the net interest margin is offset by other opposing factors.

**Banks’ specific indicators**

The determinants of banks’ profitability and financing costs for their clients are heavily influenced by the unique characteristics of individual banks. Key bank-specific variables commonly employed for this purpose encompass measures of operational efficiency, management quality, income and balance-sheet structure, credit activity, capital adequacy, liquidity, risk aversion, credit risk, interest risk, opportunity cost of bank reserves, and bank size, among others.

In line with the studies conducted by Entrop et al. (2015), Mamatzakis and Bermpei (2016), Borio et al. (2017), Cruz-García et al. (2019), and Angori et al. (2019), we incorporate the liquidity ratio, which approximates the ratio between liquid reserves and total assets, as an explanatory variable in our model. Insufficient liquidity stands as a prominent factor contributing to bank failures; however, holding liquid assets imposes an opportunity cost on banks due to their comparatively lower return when compared to illiquid assets. Consequently, the expected effect on profitability would typically be negative. Nevertheless, empirical studies such as those conducted by Pasiouras (2005) on the UK banking system, Kosmidou (2008) on Greece, and Olagunju, David, and Samuel (2012) on Nigeria have demonstrated a positive relationship between liquidity and banks’ profitability. These studies argue that banks establish higher margins to compensate for the opportunity cost associated with holding liquid assets.
In line with the research conducted by Maudos and Fernández de Guevara (2004), Entrop et al. (2015), Altavilla et al. (2018), and Cruz-García et al. (2019), we incorporate credit risk as an explanatory variable, measured by the ratio of non-performing loans (NPLs) to private credit. It is expected that banks would apply higher interest rates to compensate for the coverage of both anticipated and unanticipated credit risk. However, analysis of Latin American banking systems, as highlighted by Brock and Suárez (2000), has revealed a negative correlation between these two variables. In certain cases, commercial banks employ strategies such as reducing loan rates or increasing deposit interest rates, along with an increase in the proportion of non-performing loans relative to total credit, with the aim of expanding their market share.

According to the research conducted by Kasman et al. (2010), operating costs and operational efficiency have been consistently identified as key factors influencing the net interest margin. It is anticipated that operating expenses would have a positive impact on the net interest margin, as the margin should ideally cover these costs, as indicated by Maudos and de Guevara (2004). Furthermore, higher operational efficiency enables banks to reduce interest margins through lower loan rates or higher deposit rates, as highlighted by Claeys and Vander Vennet (2008).

The capital adequacy ratio serves as a crucial determinant, frequently employed as an assessment of a bank’s creditworthiness. Its primary objective is to establish prudential boundaries for risk-taking activities and uphold the stability of the banking sector, as eloquently elucidated by Claeys and Vander Vennet (2008). The intricate relationship between the net interest margin and the capital adequacy ratio can manifest in either a positive or negative correlation, contingent upon the extent to which these influences permeate through to clients. A higher capital adequacy ratio signifies that banks maintain a more substantial proportion of capital relative to their total assets. However, if market forces and competitive dynamics impede banks from effectively passing on the costs associated with excess capital to their clients, the consequence may be a reduction in net interest margins for more well-capitalized banks. On the contrary, it is equally plausible that
less capitalized banks, driven by an appetite for amplified returns, might exhibit a proclivity to undertake heightened risks, thereby potentially engendering moral hazard behavior, as cogently posited by Schweiger and Liebeg (2009).

Effective management entails the astute selection of lucrative assets and the acquisition of low-cost deposits, rendering it encapsulated by the cost-to-income ratio (the ratio of operating expenses to operating income) as suggested by Borio et al. (2017), Cruz-García et al. (2019), and Angori et al. (2019), among other esteemed researchers. The anticipated impact of the efficiency ratio on the net interest margin and profitability is adverse, given its inverse relationship with managerial efficacy, whereby banks exemplifying superior management practices tend to reap enhanced margins and profits.

The empirical evidence concerning the impact of economic growth on interest margins and efficiency yields varying and inconclusive results. As elucidated by Bernanke and Gertler (1989), the relationship between real GDP growth and net interest margins can exhibit a negative association. This phenomenon arises from the fact that during economic downturns, the creditworthiness and net worth of borrowers tend to deteriorate, necessitating an increase in loan rates to compensate for potential risks that may arise. Tan (2012) further substantiates this inverse correlation, contending that in times of economic prosperity, the favorable performance of firms mitigates bank defaults, subsequently reducing risks. Conversely, there can be a positive effect of real GDP growth on interest margins due to the heightened demand for loans that accompanies cyclical upswings. This surge in loan demand, stemming from increased investments, contributes to an augmentation in interest margins. Brock and Suarez (2000) present evidence demonstrating that uncertainty and a deterioration in macroeconomic conditions have the propensity to elevate interest margins.

Brock and Franken (2002) expand the scope of determinants by incorporating interest rate uncertainty and exchange rate volatility, broadening the understanding of factors influencing spreads. Similarly, Randall (1998) contributes to this discourse by including
the proportion of commercial bank public sector loans as an additional determinant within the Caribbean context. This inclusion aligns with the perspectives shared by stakeholders in Jamaica, as highlighted by Tennant (2006), who revealed that macro policy variables, including domestic borrowing by the public sector, discount rates, and Treasury bill rates, are widely perceived to exert an influence on commercial bank spreads. Thus, the comprehensive examination of these variables not only enriches our understanding but also acknowledges the significance of diverse factors in shaping commercial bank spreads.

3.1.2 EMPIRICAL METHODOLOGY AND DATA DESCRIPTION

There are two previous studies that investigate the determinants of net interest margin in the Albanian banking sector: one by Papavangjeli and Leka (2016) and the other one by Kalluci (2010). Among others, the first of these two papers include the monetary policy rate as an explanatory variable for the net interest margin and the authors find that the policy rate has a positive, but insignificant effect on the net interest margin within the current quarter. In this paper we go further by assuming a possible quadratic relationship between the two variables, in order to find a threshold level for the monetary policy rate, under which its impact on net interest margin will be positive and above which the net interest margin will decrease with the rising interest.

Our research hypothesis is the following: controlling for bank characteristics and macroeconomic variables, an increase in interest rates has a positive effect on net interest margin, the impact being greater when interest rates are low. In other words, we expect a positive and concave relationship between net interest income and the level of interest rates.

In line with Borio et al. (2015) and the previous section on the explanation of variables selection, we carry out the econometric analysis using the following benchmark model, indexing individual banks with $i$ and periods with $t$: 

-40-
\[ \text{NIM}_{it} = c + \alpha \text{NIM}_{i,t-1} + \beta_1 \text{MP}_{i,t} + \beta_2 \text{MP}^2_{i,t} + \gamma_i \text{Z}_{i,t} + \phi X_{i,t} + \epsilon_{i,t} \tag{1} \]

where \( \text{NIM}_{it} \) is the net interest income as a ratio of total assets. Because of persistency of bank profitability (Carbó and Rodríguez, 2007), we include the first lag of the income component in the right-hand side of the equation, in order to capture the inertia in its evolution. In line with the discussion above, the considered indicators for monetary policy are: the base interest rate or the so-called REPO rate, the 3-month interbank rate and the yield curve slope measured as the difference between 10-year government bonds yield and 3-month interbank rate. The monetary policy variables are included in the model in both linear and quadratic form, as discussed in the previous section. Banks that have been profitable in the previous period tend to be profitable even in the current period. In addition, we include some bank-specific factors incorporated in term \( Z_{i,t} \), such as: current liquidity ratio (LR), defined as the ratio of highly liquid assets to demand liabilities; the credit risk measured by non-performing loans ratio (NPL); the operating expenses (OP_EXP), calculated as a ratio of bank operational expenses to total assets; the capital adequacy ratio (CAR) which is a measure of a bank’s available capital expressed as a percentage of a bank’s risk-weighted credit exposures. Lastly \( X_{i,t} \), represents domestic macroeconomic indicators such as: the real economic growth rate in Albania (GROWTH), the nominal exchange rate change of Albanian Lek to Euro (ALL/EUR), and the house price index (HPI).

As for each of the sub-samples of our database (according to the three bank categories) the number of banks (cross-sections) is lower than the number of time periods, we do not use fixed effects estimators, since we already identify the individual effects of the banks by splitting the econometric analysis into three bank groups, according to their share in the total assets of the banking sector.

The estimation of equation (1) is associated with some complications related to the error term that should be addressed: autocorrelation (the error terms for each bank are interdependent over time; contemporaneous correlation (the error terms are correlated between banks as banks operate in the same industry
and country); heteroskedasticity (the errors variance tend to be non-
constant between banks (Beck and Katz, 1995). For these reasons,
the model is estimated through an OLS-based PCSE procedure,
which enhances parameters efficiency and produces more accurate
t-statistics, by correcting residual correlation between equations
and cross-sectional heteroskedasticity (Beck and Katz, 1995). The
presence of autocorrelation is tested in each of the three models
using a LM-test, because this procedure is based on the assumption
that the errors have low or no serial correlation. Test results suggest
that the level of autocorrelation in each of the three estimated models
is low, so we can proceed with this method.

Information on bank-specific variables are obtained from banks’
balance sheets, meanwhile macroeconomic variables are taken from
BoA’s database. The data are quarterly for the period 2004Q1-
2020Q4 (68 periods) and include all the banks of Albanian
banking system (16 to 12 banks due to the recent consolidation
process of the banking sector). The dataset is split in three sub-
samples according to each of the three bank categories: small,
medium and big ones and three regressions are estimated for each
of them. The total number of observations is 265, 446 and 268
for each of the groups, respectively. Table 1 in the Annex presents
a summary of the descriptive statistics and the expected impact of
explanatory variables on banks’ interest profits.
5. MODEL RESULTS AND THEIR INTERPRETATION

In this session, we present the main findings concerning the impact of monetary policy rate on net interest margin for each of the three bank categories, by adding successively the explanatory variables in the regression.

Table 1 Robustness check: OLS-PCSE based Panel Estimation Results for small banks (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th></th>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
<th>Equation 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIM(-1)</td>
<td>0.773***</td>
<td>0.794***</td>
<td>0.776***</td>
<td>0.785***</td>
<td>0.794***</td>
</tr>
<tr>
<td>REPO</td>
<td>0.179*</td>
<td>0.189*</td>
<td>0.175*</td>
<td>0.196***</td>
<td>0.123*</td>
</tr>
<tr>
<td>REPO2</td>
<td>-0.03*</td>
<td>-0.031**</td>
<td>-0.028*</td>
<td>-0.032**</td>
<td>-0.016***</td>
</tr>
<tr>
<td>LR</td>
<td>0.001</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPL</td>
<td>-0.009***</td>
<td>-0.008***</td>
<td>-0.009***</td>
<td>-0.009**</td>
<td>-0.008***</td>
</tr>
<tr>
<td>OP_EXP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.039**</td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td></td>
<td></td>
<td>-0.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td></td>
<td></td>
<td>-0.001</td>
<td>-0.001</td>
<td></td>
</tr>
<tr>
<td>GROWTH</td>
<td>0.038**</td>
<td>0.033**</td>
<td>0.033**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL_EUR</td>
<td></td>
<td></td>
<td></td>
<td>-0.078**</td>
<td></td>
</tr>
<tr>
<td>HPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>C</td>
<td>0.286</td>
<td>0.228</td>
<td>0.468</td>
<td>0.504</td>
<td>0.551</td>
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<tr>
<td>Adjusted R-square</td>
<td>0.818</td>
<td>0.819</td>
<td>0.816</td>
<td>0.817</td>
<td>0.813</td>
</tr>
<tr>
<td>F-statistic</td>
<td>119.3</td>
<td>109.9</td>
<td>117.7</td>
<td>119.2</td>
<td>128.6</td>
</tr>
<tr>
<td>Prob (F-statistic)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>N</td>
<td>265</td>
<td>265</td>
<td>265</td>
<td>265</td>
<td>265</td>
</tr>
</tbody>
</table>

Note: *significance at 10%, **significance at 5%, ***significance at 1%.
Table 2 Robustness check: OLS-PCSE based Panel Estimation Results for medium banks (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th></th>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
<th>Equation 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIM(-1)</td>
<td>0.772***</td>
<td>0.761***</td>
<td>0.822***</td>
<td>0.788***</td>
<td>0.792***</td>
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<tr>
<td>REPO</td>
<td>0.192</td>
<td>0.176</td>
<td>0.179</td>
<td>0.165</td>
<td>0.171</td>
</tr>
<tr>
<td>REPO²</td>
<td>-0.027</td>
<td>-0.028</td>
<td>-0.026</td>
<td>-0.022</td>
<td>-0.023</td>
</tr>
<tr>
<td>LR</td>
<td>0.003</td>
<td>0.0007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPL</td>
<td>-0.006*</td>
<td>-0.007**</td>
<td>-0.006**</td>
<td>-0.005**</td>
<td>-0.005**</td>
</tr>
<tr>
<td>OP_EXP</td>
<td></td>
<td></td>
<td>0.196***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td></td>
<td></td>
<td></td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td></td>
<td></td>
<td></td>
<td>-0.0076</td>
<td>-0.0075</td>
</tr>
<tr>
<td>GROWTH</td>
<td>0.011</td>
<td>0.010</td>
<td>0.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL_EUR</td>
<td></td>
<td></td>
<td></td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>HPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.011</td>
</tr>
<tr>
<td>C</td>
<td>0.494</td>
<td>0.128</td>
<td>0.445</td>
<td>0.446</td>
<td>0.404</td>
</tr>
</tbody>
</table>

Adjusted R-square | 0.751 | 0.766 | 0.748 | 0.751 | 0.749 |
F-statistic       | 113.1 | 113.2 | 221.5 | 112.9 | 121.7 |
Prob (F-statistic) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
N               | 446  | 446   | 446   | 446   | 446   |

Note: *significance at 10%, **significance at 5%, ***significance at 1%.

Table 3 Robustness check: OLS-PCSE based Panel Estimation Results for medium banks for large banks (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th></th>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
<th>Equation 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIM(-1)</td>
<td>0.709***</td>
<td>0.705***</td>
<td>0.727***</td>
<td>0.728***</td>
<td>0.723***</td>
</tr>
<tr>
<td>REPO</td>
<td>0.118</td>
<td>0.126</td>
<td>0.113</td>
<td>0.098</td>
<td>0.096</td>
</tr>
<tr>
<td>REPO²</td>
<td>-0.013</td>
<td>-0.016</td>
<td>-0.014</td>
<td>-0.009</td>
<td>-0.010*</td>
</tr>
<tr>
<td>LR</td>
<td>-0.004</td>
<td>-0.003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPL</td>
<td>0.0027</td>
<td>0.005</td>
<td>0.003</td>
<td>0.006</td>
<td>0.005</td>
</tr>
<tr>
<td>OP_EXP</td>
<td></td>
<td></td>
<td>0.267***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td></td>
<td></td>
<td></td>
<td>-0.0016</td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td></td>
<td></td>
<td></td>
<td>0.009</td>
<td>0.008</td>
</tr>
<tr>
<td>GROWTH</td>
<td>0.019</td>
<td>0.016</td>
<td>0.006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL_EUR</td>
<td></td>
<td></td>
<td></td>
<td>-0.009</td>
<td></td>
</tr>
<tr>
<td>HPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>C</td>
<td>0.797</td>
<td>0.257</td>
<td>0.754</td>
<td>0.767</td>
<td>0.785</td>
</tr>
</tbody>
</table>

Adjusted R-square | 0.732 | 0.746 | 0.729 | 0.728 | 0.667 |
F-statistic       | 82.1  | 79.6  | 81.1  | 80.4  | 80.5  |
Prob (F-statistic) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
N               | 268  | 268   | 268   | 268   | 268   |

Note: *significance at 10%, **significance at 5%, ***significance at 1%.
The adjusted $R^2$ is above 60% for all the three equations (excluding only the first equation of large banks), which means that more than 60 per cent of the variance of net interest margin is explained by the variance of explanatory variables included in the equation. The lagged dependent variable shows a positively high and significant coefficient, which confirms the strong inertia in the determinants of the net interest margin.

In line with the analytical discussion, net interest margin (the difference between interest received on lending and that paid on funding, divided by total assets) is positively correlated with the monetary policy rate for all the three bank categories. The quadratic term is negative, indicating that the functional relationship is concave in all the cases, but this relation is statistically significant only for small banks in all the model specifications.

The threshold level of the monetary policy rate is given by the estimated partial derivative of net interest income on monetary policy rate, which is calculated through the formula below for all bank groups:

$$\frac{\partial NIM}{\partial REPO} = \alpha_1 - 2 * \alpha_2 * REPO$$

The results indicate that small banks are more responsive to changes in the monetary policy rate compared to medium and large banks. For small banks, there exists a threshold level of the monetary policy rate, estimated to be between 2.8% and 3.2%, below which a tightening of monetary policy has a positive impact on net interest income. This suggests that when the REPO rate is below the threshold, increasing the monetary policy rate leads to higher interest profits for small banks.

On the other hand, when the REPO rate exceeds the threshold, a contractionary monetary policy has adverse effects on the interest profits of small banks. This implies that when the monetary policy rate is higher than the threshold, reducing the REPO rate becomes beneficial for small banks and helps increase their interest profits.
This threshold effect suggests that the relationship between the monetary policy rate and interest profits is non-linear for small banks.

In contrast, the study finds that the monetary policy rate does not have a statistically significant effect on the interest profits of medium and large banks. This suggests that these banks are less sensitive to changes in the monetary policy rate. One possible explanation for this finding is that medium and large banks have a different funding structure compared to small banks. They rely less on deposits and may have access to alternative sources of funding, such as capital market financing. As a result, changes in the monetary policy rate have a relatively smaller impact on their interest profits.

The liquidity ratio, while showing a mixed impact on profits, does not exhibit statistical significance across all bank sizes. For small and medium-sized banks, a positive effect on profits suggests that maintaining a higher level of liquid reserves relative to total assets contributes to their overall profitability. This could be attributed to the ability of these banks to efficiently manage their liquidity positions, ensuring that they have sufficient funds available to meet short-term obligations and capitalize on profitable opportunities. However, the lack of statistical significance indicates that this relationship requires further investigation and should be interpreted with caution. Conversely, large banks experience a negative effect on profits in relation to the liquidity ratio. This suggests that holding higher levels of liquid reserves compared to their total assets may impose an opportunity cost on these banks. Since liquid assets typically yield lower returns than illiquid assets, large banks may face challenges in maximizing their profitability. However, as the statistical significance is not established, it is important to conduct additional research to ascertain the significance of this relationship for larger banks.

Turning to the impact of NPLs on the net interest margin (NIM), the findings demonstrate varying effects depending on the size of the banks. For small and medium-sized banks, the negative effect on NIM indicates a deliberate strategy aimed at increasing their market share. These banks refrain from raising interest margins despite the presence of credit risk in order to attract borrowers and expand their lending activities. This finding aligns with the results reported
by Brock and Rojas Suárez (2000) in their study on Latin American banking systems, suggesting a common strategic behavior among smaller banks in response to credit risk.

On the other hand, large banks exhibit a positive effect on NIM in relation to NPLs. This implies that larger banks have successfully increased their interest margins by charging higher premiums to compensate for the increased costs associated with NPLs. This strategic response is in line with the theoretical framework discussed earlier, where larger banks may possess the resources and market power to offset the negative impact of credit risk on their profitability.

The results indicate that operating expenses have a positive coefficient, signifying that the net interest margin should adequately cover these costs. Thus, as operating expenses increase, the net interest margin also tends to rise. However, the statistical significance of this relationship is observed only for medium and large banks, suggesting that these institutions are more sensitive to variations in operating costs.

Furthermore, the findings unveil that banks with superior management practices exhibit a greater margin. This is evident from the negative coefficient associated with the efficiency variable, which indicates an inverse relationship between management efficiency and the net interest margin. In other words, banks that effectively allocate resources and optimize operational processes are able to achieve higher margins compared to their counterparts with lower management efficiency.

Regarding the capital adequacy ratio, its impact on banks’ interest profits exhibits a negative association for small and medium-sized banks, while demonstrating a positive association for large banks. The negative effect suggests that banks with higher capital adequacy, meaning those that hold a greater proportion of capital in relation to their total assets, experience lower interest profits and do not pass on these costs to their customers. Conversely, the positive coefficient observed for large banks implies that these institutions are able to transfer the additional costs associated with higher capital holdings to their clients. However, despite the differing signs of the
estimated coefficients across bank groups, the effect of the capital adequacy ratio is deemed statistically insignificant in all cases. This implies that the relationship between the capital adequacy ratio and interest profits does not reach a level of statistical significance, indicating that other factors may have a more substantial influence on banks' profitability.

Real economic growth exhibits a consistently positive and statistically significant impact across all three bank groups, indicating that periods characterized by economic booms have corresponded to increased lending activity and higher interest profits for banks. Furthermore, house prices display a positive correlation with net interest margins, implying a favorable influence of collateral value on lending. However, it is worth noting that the statistical significance of this relationship may be hindered by the limited length of the available time series for this particular indicator.

In contrast, the exchange rate demonstrates a significant negative effect solely for small banks, highlighting their heightened vulnerability to exchange rate risk. This finding suggests that smaller banks face greater exposure and potential adverse consequences when fluctuations in exchange rates occur.

Consistent with the preceding analysis, we extend our investigation beyond the monetary policy rate and delve into the impact of two additional indicators on banks' interest profits. These indicators encompass the 3-month interbank rate (3-M TRIBOR) and the yield curve slope, which quantifies the disparity between the yield on 10-year government bonds and the 3-month interbank rate (3-M TRIBOR). Notably, both indicators are incorporated into the model in linear and quadratic forms, allowing for a comprehensive evaluation of their influence on banks' interest profits.
Table 4 Robustness check results for small banks when using alternative monetary policy variables (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th>Equation</th>
<th>NIM(-1)</th>
<th>TRIBOR</th>
<th>TRIBOR²</th>
<th>SLOPE</th>
<th>SLOPE²</th>
<th>LR</th>
<th>NPL</th>
<th>OP_EXP</th>
<th>EFFICIENCY</th>
<th>CAR</th>
<th>GROWTH</th>
<th>ALL_EUR</th>
<th>HPI</th>
<th>C</th>
<th>Adjusted R-square</th>
<th>F-statistic</th>
<th>Prob (F-statistic)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.767***</td>
<td>0.03*</td>
<td>-0.002*</td>
<td>0.05*</td>
<td>-0.0047*</td>
<td>0.005</td>
<td>-0.007***</td>
<td>-0.007***</td>
<td>0.0002</td>
<td>-0.0003</td>
<td>0.027*</td>
<td>-0.009</td>
<td>0.718</td>
<td>0.464</td>
<td>0.592</td>
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<td>0.715</td>
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</tr>
<tr>
<td>2</td>
<td>0.763***</td>
<td>0.028*</td>
<td>-0.0019*</td>
<td>0.045</td>
<td>-0.0036*</td>
<td>0.005</td>
<td>-0.007***</td>
<td>-0.007***</td>
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<tr>
<td>3</td>
<td>0.774***</td>
<td>0.023*</td>
<td>-0.0016*</td>
<td>0.038*</td>
<td>-0.0032*</td>
<td>0.005</td>
<td>-0.007***</td>
<td>-0.007***</td>
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<td>4</td>
<td>0.801***</td>
<td>0.021*</td>
<td>-0.0015*</td>
<td>0.031</td>
<td>-0.0027*</td>
<td>0.005</td>
<td>-0.007***</td>
<td>-0.007***</td>
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</tr>
<tr>
<td>5</td>
<td>0.774***</td>
<td>0.027*</td>
<td>-0.0019</td>
<td>0.042</td>
<td>-0.0035*</td>
<td>0.005</td>
<td>-0.007***</td>
<td>-0.007***</td>
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</tr>
</tbody>
</table>

Table 5 Robustness check results for medium banks when using alternative monetary policy variables (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th>Equation</th>
<th>NIM(-1)</th>
<th>TRIBOR</th>
<th>TRIBOR²</th>
<th>SLOPE</th>
<th>SLOPE²</th>
<th>LR</th>
<th>NPL</th>
<th>OP_EXP</th>
<th>EFFICIENCY</th>
<th>CAR</th>
<th>GROWTH</th>
<th>ALL_EUR</th>
<th>HPI</th>
<th>C</th>
<th>Adjusted R-square</th>
<th>F-statistic</th>
<th>Prob (F-statistic)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.777***</td>
<td>0.052</td>
<td>-0.0035*</td>
<td>0.067</td>
<td>-0.0058</td>
<td>0.003</td>
<td>-0.008*</td>
<td>-0.0027*</td>
<td>-0.0004</td>
<td>-0.0055</td>
<td>0.005</td>
<td>0.0005</td>
<td>0.328</td>
<td>0.064</td>
<td>0.327</td>
<td>0.332</td>
<td>0.354</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.757***</td>
<td>0.047</td>
<td>-0.003</td>
<td>0.058</td>
<td>-0.0053</td>
<td>0.0019</td>
<td>-0.0027*</td>
<td>-0.0037*</td>
<td></td>
<td>-0.008</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>0.764***</td>
<td>0.039</td>
<td>-0.0026</td>
<td>0.063</td>
<td>-0.0055</td>
<td>0.0019</td>
<td>-0.0037*</td>
<td>-0.0055</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.854***</td>
<td>0.055</td>
<td>-0.0037</td>
<td>0.054</td>
<td>-0.0046</td>
<td>0.0022</td>
<td>0.005</td>
<td>-0.0055</td>
<td></td>
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<tr>
<td>5</td>
<td>0.833***</td>
<td>0.061</td>
<td>-0.004</td>
<td>0.056</td>
<td>-0.005</td>
<td>0.009</td>
<td>-0.004</td>
<td>-0.0055</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Adjusted R-square: 0.749, 0.766, 0.747, 0.742, 0.749
F-statistic: 111.4, 113.2, 328.9, 320.8, 332.5
Prob (F-statistic): 0.000, 0.000, 0.000, 0.000, 0.000
N: 446, 446, 446, 446, 446
The comprehensive analysis reveals a positive overall impact of the short-term interest rate on net interest margins. Specifically, the inclusion of squared monetary policy variables yields a noteworthy finding: for small banks, the functional relationship takes the form of an inverted U-shaped curve, akin to the initial model where only the repo rate was employed as a proxy for monetary policy. This indicates that alterations in the short-term interest rate exert a more pronounced influence on the intermediation margin when interest rates are at lower levels. The turning point of this inverted U-shaped relationship, representing the peak impact, is estimated to lie within the range of 7% to 7.5%, which falls between the 60th and 80th percentiles of the variable’s distribution. Consequently, it can be inferred that the net interest margin experiences an upward trajectory until this threshold interest rate level is reached, at which point it initiates a decline. This observation implies that further increases in the interest rate beyond this threshold may impede net interest margin growth. Consequently, it is advisable for banks to exercise prudence and careful consideration when interest rates

Table 6 Robustness check results for large banks when using alternative monetary policy variables (Dependent variable: Banks’ net interest margin).

<table>
<thead>
<tr>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
<th>Equation 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIM(-1)</td>
<td>0.797***</td>
<td>0.819***</td>
<td>0.793***</td>
<td>0.792***</td>
</tr>
<tr>
<td>TRIBOR</td>
<td>0.055</td>
<td>0.047</td>
<td>0.061</td>
<td>0.065</td>
</tr>
<tr>
<td>TRIBOR^2</td>
<td>-0.0045</td>
<td>-0.004</td>
<td>-0.005</td>
<td>-0.0055</td>
</tr>
<tr>
<td>SLOPE</td>
<td>0.057</td>
<td>0.049</td>
<td>0.056</td>
<td>0.051</td>
</tr>
<tr>
<td>SLOPE^2</td>
<td>-0.003</td>
<td>-0.002</td>
<td>-0.003</td>
<td>-0.0027</td>
</tr>
<tr>
<td>LR</td>
<td>0.0013</td>
<td>0.004</td>
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<td></td>
</tr>
<tr>
<td>NPL</td>
<td>0.0019</td>
<td>0.0029</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td></td>
<td></td>
<td>-0.001</td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td></td>
<td>0.003</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>GROWTH</td>
<td>0.012</td>
<td>0.009</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>ALL_EUR</td>
<td></td>
<td></td>
<td>-0.018</td>
<td></td>
</tr>
<tr>
<td>HPI</td>
<td></td>
<td></td>
<td></td>
<td>0.0018</td>
</tr>
<tr>
<td>C</td>
<td>0.245</td>
<td>-0.145</td>
<td>0.257</td>
<td>0.318</td>
</tr>
<tr>
<td>Adjusted R-square</td>
<td>0.718</td>
<td>0.729</td>
<td>0.720</td>
<td>0.718</td>
</tr>
<tr>
<td>F-statistic</td>
<td>114.4</td>
<td>103.6</td>
<td>115.2</td>
<td>137.3</td>
</tr>
<tr>
<td>Prob (F-statistic)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>N</td>
<td>268</td>
<td>268</td>
<td>268</td>
<td>268</td>
</tr>
</tbody>
</table>
surpass this critical juncture, as sustained rate hikes could potentially erode profitability.

Notably, the relationship between monetary policy indicators and banks’ profits assumes a concave form, as evidenced by the negative and significant coefficients of the squared monetary policy variables for small banks. However, it is crucial to highlight that this concave pattern is statistically insignificant for medium and large banks. This alignment with the earlier explanation elucidates the disparities in the responses of different bank sizes to changes in monetary policy. The distinct funding structures and the stickiness of interest rates contribute to the divergent impact experienced by various bank groups.

Analogous to the impact of the short-term interest rate, the influence of the yield curve slope on the net interest margin also displays a positive overall effect, a trend that aligns with expectations given the substantial involvement of banks in maturity transformation. Notably, when examining the relationship between the yield curve slope and profit margins, the inclusion of squared variables yields intriguing results, particularly for small banks in certain model specifications. Here, the relationship assumes an inverted U-shaped pattern, signifying that variations in the slope of the yield curve exert a more pronounced impact on the profit margin as the curve becomes flatter. This non-linear association between short-term interest rates, yield curve dynamics, and banks’ net interest margins finds support in recent empirical studies, corroborating the significance of this relationship. Notable contributions in this regard include the works of Borio et al. (2015) and Claessens et al. (2016), which provide additional evidence and insights into the intricate interplay between interest rate dynamics and banks’ profitability.

The inclusion of the short-term interest rate and the slope of the yield curve in the model specification does not significantly alter the sign or statistical significance of the remaining explanatory variables across all bank groups. This observation underscores the stability and consistency of the coefficients, providing a valuable robustness check for the model’s overall integrity and reliability.
6. CONCLUDING REMARKS

This research endeavours to explore the implications of the monetary policy rate on the net interest margin within the context of the Albanian banking sector, which has been operating amidst an environment characterized by low interest rates and a flatter yield curve. These circumstances have arisen as a consequence of the monetary expansion policies implemented by the Bank of Albania subsequent to the Global Financial Crisis. By employing a comprehensive bank-level panel dataset spanning the period from 2004Q1 to 2020Q4, this study makes a valuable contribution to the existing literature on the Albanian banking sector, particularly by accounting for non-linearities in the relationship between interest rates and bank profitability. Moreover, unlike previous empirical work in this field, this research takes into account the slope of the yield curve, an aspect that has hitherto been overlooked.

To ensure a comprehensive analysis, this study considers both macroeconomic conditions and bank-specific characteristics while examining the effects of the monetary policy rate on net interest margin. The analysis is divided into three different bank groups based on the banks’s size, which facilitates a more in-depth investigation of the impact of the monetary policy rate on banks’ profitability. Despite the expansionary monetary policies implemented post-crisis, all bank groups experienced a decline in the net interest margin at some point. However, the small banks were particularly affected, and their recovery was relatively slower compared to larger banks, which demonstrated a swifter recuperation. Nevertheless, overall, banks have been able to manage exposures to the monetary policy rate and yield curve fluctuations, minimizing adverse effects on their net interest margins and on the broader health of the banking sector.

The findings of this study reveal significant non-linear relationships between interest rates and net interest margin, but only for small banks. This substantiates our prior belief that small banks are more responsive to changes in monetary policy, specifically indicating that the effect of policy rate variations on interest profits is more pronounced during periods of low interest rates compared to high interest rate
environments. This suggests that as the deposit rate cannot be negative, the difference between the market rate and the deposit rate narrows when interest rates are low, with this reduction being more prominent as interest rates decrease. A similar pattern emerges with respect to the impact of the yield curve slope on net interest margin, wherein the effect becomes more substantial as the yield curve flattens.

Interestingly, the findings suggest that policy easing measures tend to yield relatively greater benefits for medium-sized and large banks, which possess a lower proportion of deposits in their liabilities. Concurrently, banks engaged in more extensive maturity transformation activities exhibit a more positive response to a steepening yield curve.

The findings of this study carry significant implications regarding the unintended adverse effects that may arise from prolonged implementation of accommodative monetary policies on the financial stability of the banking sector. Should this situation persist for an extended duration, it could potentially lead to a contractionary impact on the net interest margin and subsequently on banks' profitability. This outcome primarily stems from the existence of a floor in interest rates on deposits and the resulting flattening of the yield curve, which has transpired alongside declining interest rates. The low profitability experienced by banks under these circumstances increases the likelihood that they may resort to assuming higher levels of risk in an attempt to compensate for diminished returns. Such a scenario has the potential to compromise the overall financial stability of the banking sector.

In light of this situation, banks confronted with reduced profitability face a significant challenge in their endeavor to enhance efficiency by implementing cost-cutting measures and diversifying their income sources beyond interest-related avenues. It is evident that the comprehensive impact of monetary policy on banks’ profits also hinges upon the influence of monetary policy on macroeconomic conditions, as economic growth emerges as a crucial determinant of banks’ interest profits. Particularly noteworthy is the efficacy of monetary policy in stimulating aggregate demand within a low-interest environment.
It is important to emphasize that the purpose of conducting these simulations is not to make judgments about monetary policy. The examination focuses narrowly on the effect of interest rates and acknowledges that monetary policy must be formulated based on a comprehensive understanding of the transmission mechanism. Additionally, it is vital to recognize that the net interest margin of banks is influenced not solely by interest rates, but rather by a dynamic interplay of various factors within the economy, which may fluctuate in their significance over time. Future research endeavors in this domain may involve the inclusion of additional explanatory variables in the empirical analysis, such as the degree of fintech adoption within the banking sector, measures of regulatory stringency, measures of environmental, social, and governance (ESG) etc.
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Blot, Ch. and P. Hubert (2016), “Negative interest rates: incentive or hindrance for the banking system?”, European Parliament


Christophe Blot et al. (2016), “NEGATIVE INTEREST RATES: INCENTIVE OR HINDRANCE FOR THE BANKING SYSTEM?”


Daniel Gros (2016), “LOW RATES = LOW BANKS’ PROFITS?”.


## Table 1. Variables’ description.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Notation</th>
<th>Description</th>
<th>Expected sign</th>
<th>Estimated coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net interest margin</strong></td>
<td>NIM</td>
<td>Ratio of net interest income to total assets</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Monetary policy rate</strong></td>
<td>REPO</td>
<td>Interest rate of the main monetary policy instrument</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>TRIBOR</td>
<td>Short-term interest rate</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>SLOPE</td>
<td>The slope of the yield curve calculated as a difference between 10-year and 3-month Treasury bills</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Monetary policy rate squared</strong></td>
<td>REPO²</td>
<td>The square of monetary policy rate</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>TRIBOR²</td>
<td>3-month interbank interest rate</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SLOPE²</td>
<td>The square of the slope of the yield curve</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Liquidity Ratio</strong></td>
<td>LR</td>
<td>Ratio of highly liquid assets to total assets</td>
<td>-</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Non-Performing Loans (Credit risk)</strong></td>
<td>NPL</td>
<td>Non-performing loans to total loans ratio</td>
<td>+/-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Operating expenses</strong></td>
<td>OP_EXP</td>
<td>Operating expenses to total expenses</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Operational efficiency</strong></td>
<td>EFFICIENCY</td>
<td>It is proxied by the ratio of operating expenses to operating income</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Capital adequacy ratio</strong></td>
<td>CAR</td>
<td>Ratio of a bank’s capital by its risk-weighted assets</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Economic Growth</strong></td>
<td>GROWTH</td>
<td>Growth of real GDP</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td><strong>Exchange rate</strong></td>
<td>ALL_EUR</td>
<td>Change of the exchange rate</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td><strong>House prices</strong></td>
<td>HPI</td>
<td>Change of the house price index</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
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