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Maintaining profitability targets and reducing interest rate risk in a scenario of interest rate volatility on the example of Banco Primus. Cost based approach.

MICHAŁ BOLESŁAW
SUTKOWSKI

Work project carried out under the supervision of:

GIORGIO OTTONELLO

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Abstract
The aim of this thesis is to analyze the impact of interest rate volatility on Banco Primus net interest margins. The research employs financial analysis tools such as duration analysis, forecasting of interest rates and cash flow, refinancing of fixed rate loans, duration gap analysis usage of derivatives. Findings indicate that interest rate volatility affects mortgage business lines most significantly. The study recommends implementation of fixed loans refinancing, interest rate swaps and reduction in duration gap by issuing auto loans with shorter maturities or extending the maturity of liabilities.

Keywords: Interest rate, loan, KPI, analysis, volatility, liquidity, duration, profit

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1.1 Introduction to Interest Rates and Their Role in Financial Markets

Interest rate is a phenomenal tool, very often used in modern economy and affecting everyone on an unimaginable scale. Interest rates are tightly knit together with economic cycles as central banks adjust rates to control inflation, influence consumption and investment, and stabilize economic growth during booms and recessions. This subchapter contains short definition of interest rate and its various types.

1.1.1 Definition and types of interest rates (e.g., fixed vs. variable rates)

Interest rates are - in the most rudimentary way - a cost of borrowing money, and a return earned. For the ones borrowing the money interest rates represent the amount of money that they are going to have to return on top of returning the borrowed amount itself. For investors however interest rates represent the amount of money they are going to receive for lending the money on top of getting the lended amount itself. The interest rate is a kind of reward for sacrificing liquidity (Stawska 2014). But in a broader context interest rates are one of the most powerful tools to regulate the economy – when "overheating" the interest rates rise and increase the cost of borrowing funds and decrease numbers of investments and loans and overall spending in given economy. But when spending is needed – decrease in interest rates effectively increase spending and numbers of investment loans, mortgages and overall stimulates the economy. Interest rates increasing can counteract inflation and decreasing can counteract stagflation. There are a few types of interest rates which could be grouped depending on their characteristics and context. Understanding these differences between types of interest rates is essential particularly in assessing interest rate risk or any other form of financial management:

1. Nominal interest rate – It is a standard quote on financial products like bonds, saving

accounts or loans. The inflation is not taken into account under this interest rate meaning it is the gross rate of reward/payment before adjusting for purchasing power (Mishkin 2019). It is the most visible rate for investors and consumers.

2. Real interest rate – It is a nominal interest rate adjusted for inflation. It is simply calculated by subtraction of inflation rate from nominal rate.
3. Fixed interest rate – This type of interest rate remains constant throughout whole duration of loan / investment. Most common in treasury bonds, car loans and mortgages. Fixed interest rates provide great stability to borrowers and investors because payments are always 100% predictable and are unaffected by fluctuations and economic cycles. Fixed rates are usually attractive when interest rates are relatively low since they allow to lock in favorable terms in case future economic situation worsens.
4. Variable (Floating) interest rate – This type of interest rate fluctuates over time, accordingly to its fluctuating reference rate such as LIBOR (London Interbank Offered Rate) or EURIBOR (European Interbank Offered Rate). Floating interest rates are most common in mortgages, credit cards and corporate bonds.
5. Benchmark interest rates – used as a reference for determining interest rates for various financial products mentioned above. Most popular benchmark interest rates are LIBOR, EURIBOR or SOFR.
6. Short and Long term – Last but not least there is an important distinction between short and long term interest rates depending on time to maturity of the loan / investment. Short term interest rates refer to loans / investments maturing in one year or less, and are usually more volatile and influenced by central banks policies. Long term interest rates refer to loans / investments maturing in more than one year which are usually less volatile and more resemble economic cycles.

1.1.2 Key economic factors influencing interest rates (e.g., inflation, central bank policies)

Understanding major economic variables that affect interest rates is crucial to assessing interest rates risk. These are a few key elements:

1. Inflation – Many Central Banks use interest rates to counteract inflation. High interest rates slow down economy, making borrowing money more expensive and decreasing incentive to spend it. Alternatively, during periods of stagflation lowering interest rates can stimulate the economy by making borrowing less costly.
2. Monetary policy – Central Banks monetary policy is big determinant of interest rates because it is the primary tool used to manage unemployment, inflation and overall economic stability of a given country.
3. Government debt – High level of government debt can influence interest rates. If government borrows a lot (through e.g. government bonds) then higher interest rates may be required to attract potential investors. Assessing real interest rates is essential for evaluation of government debt sustainability (Gohar et al. 2014).
4. Commercial banks and loan demand – The demand for and supply of loans (and mortgages) can be balanced with interest rates – in periods of high demand for loans increasing interest rates can decrease the demand, and in periods of high supply and low demand lowering interest rates can increase the incentive to take a loan.
5. Labor market conditions – Low unemployment suggest stronger economy which may lead to higher interest rates to prevent inflation. High unemployment may lead to lower interest rates to promote investments and hiring.

These and many more factors like economic growth, foreign exchange rates or even investor sentiment play pivotal role in determining levels of interest rates. Whole economic structure is affected by interest rates, it acts as a "system of interconnected vessels" which carry on information from point A to point B and interest rates affect such "system".

1.2 Interest Rate Volatility: Causes and Effects

The causes of interest rate volatility are directly related to the factors that influence their level. As previously mentioned – a tightly connected economic system can be affected through any link of the chain.

1.2.1 What is interest rate volatility?

The amount of interest rate variation or fluctuation over time is referred to as interest rate volatility. It shows the amount and frequency of how often interest rates go up and down. Volatility of interest rates plays an important role in determining the risk premiums that investors demand for bearing high interest rate risk (Joslin and Konchitchki 2018) High volatility means that interest rates fluctuate pretty often, and by significant amounts making it difficult to assess interest rate risk by potential investors and businesses like Banco Primus for which assessing such risk is key part of their day-to-day business. Low volatility means that interest rates fluctuation rate is fairly low and by insignificant amount meaning that economic situation of given country is stable and it is a good country for investments.

1.2.2 Economic and market factors driving interest rate fluctuations

Wide range of market and economic factors can influence levels of interest rates, understanding of which can give one valuable insight into understanding the schemes how interest rates affect various businesses and financial institutions like Banco Primus.

On one side of the spectrum there are market factors which are driven by actions of financial market participants (investors, financial institutions, corporations etc.), their impact is usually short term and and often has volatile effects. Market factors influence interest rates through most basic economic mechanism of supply and demand – for financial assets, credit and liquidity within financial market. Supply and demand for loans (as previously mentioned)

is balanced by adjusting the interest rates to the point of equilibrium. Global investors and foreign exchange markets also affect interest rates, because if a country's interest rates are way higher than other countries it may lead to international capital inflow which can drive further interest rate and also currency fluctuations. Another good example of market factor driving the fluctuation of interest rates may be financial market liquidity which when is high – interest rates may be low due to good access to capital. On the other hand – when financial market is illiquid cost of borrowing may rise.

On the other side of spectrum there are economic factors which refer to broader macroeconomic conditions and are influenced by central banks, macroeconomic data and governmental policies. These factors can impact the very foundation of country's economy and therefore have impact on inflation, economic growth employment, investments, monetary flows – all of which are interdependent with interest rates. Economic factors usually have long-term effects and their effects are more stable. One of the most popular economic factor is of course inflation, which if reaches higher than acceptable levels may prompt the increase in interest rates due to preservation of currency purchasing power. Fiscal policies of government and levels of budget deficits can influence interest rates to attract potential investors willing to buy riskier government bonds. Macroeconomic level forces are also a main driver in interest rate fluctuations. Such macro trends are shaping the worldwide economy and various countries central banks have to act in different ways to accommodate unstoppable trends affecting every country in a different way.

In the case of Banco Primus recognizing these drivers should be essential for managing the risk of interest rate, especially as the company operates with a products very sensitive to interest rate fluctuations such as car loans, leasing, and still has some portion of mortgages for real estate in Portugal and Spain.

1.2.3 Impact of interest rate volatility on financial institutions

Financial institutions such as Banco Primus are severely affected by interest rate volatility, which is understood as erratic changes in interest rates. These institutions rely heavily on interest rates and management of its risk because most of their products (so most of their money inflows) is based solely on interest rates, thus managing interest rate risk is essential for predicting future cash flows. Financial institutions are affected by interest rate volatility in many ways, often through suffering net interest margins, asset-liability mismatches, crippled liquidity, and difficulty in selecting potential future investment strategies.

Changes in net interest margins are most basic way interest rates impact financial institutions. NIM is calculated by subtracting interest expense on liabilities from the financial institution interest income. Net interest margin measures the efficiency of the financial institution because it measures the remuneration that an entity receives for financial services provided. Unpredictable fluctuations of interest rates may result as a difficulty in maintaining consistent NIM. For example a sudden increase in interest rates definitely will increase the cost of funding and it may happen more quickly than yields on loan adjust. On the other hand however, sudden drop in interest rates may decrease financial institutions interest income (Delis and Kouretas 2011), while maintaining relatively high rates on their liabilities.

Asset-liability management is also complicated when interest rates become volatile. Banks typically borrow short-term (e.g. deposits) and lend long-term (e.g. loans and mortgages) which creates a mismatch exposing them to interest rate risk leading to potential losses. For example, bank holding fixed-rate loans and funding them with short term liabilities may experience increase in funding cost when interest rate rise, while at the same time return on loans remain the same.

Liquidity is the entity’s ability to pay on time most mature (short-term) obligations

without incurring significant losses. Such ability may be crippled in terms of interest rate volatility as borrowing cost increase. Furthermore if interest rates suddenly rise – depositors may move their assets to higher-yielding and safer products such as government bonds leading to potential outflow of deposits. This phenomenon is particularly critical for commercial banks that rely heavily on deposits, which is not the case for Banco Primus. On the other hand, sudden decrease in interest rates may result in liquidity surplus as borrowers may seek to issue new debt at a lower rate.

Last but not least, volatility of interest rates could strongly influence investment strategies of financial institutions, which may hold large portfolio of fixed-income assets such as government bonds, or mortgage-backed securities, and the value of such assets may fluctuate when interest rates do. Furthermore – interest rate volatility can cripple investment decision making process due to increased uncertainty which may induce additional costs associated with more cautious long-term capital allocation, which may impact financial institution income generating abilities from their investment portfolios especially if they have to match liabilities with long-term assets.

Interest rate volatility poses a significant threat to financial institutions day-to-day operations as it introduces relevant uncertainties. Such uncertainties generate additional costs to financial institutions as robust assessment, planning, and managing interest rate risk is required to maintain profitability. It is safe to say that for long term stability of financial institutions income stable interest rates are desirable – no matter high or low, stability is the key for successful business.

1.3 Interest Rate Risk: Definition and Importance

Interest rate fluctuations can have potential negative impact on financial institutions earnings and capital. This is referred to as interest rate risk. For financial institutions like banks interest rate risk management is crucial to carry their day-to-day business out properly. Financial institutions products like loans and mortgages and assets like bonds and deposits can be interest sensitive balance sheet items depending on their exact type. Even though interest rate risk can be a source of "profitability" it is essential to assess interest rate risk and soundness of financial institutions (Ngalawa and Ngare 2014)

Mismatch in the maturities and repricing period of assets and liabilities (often referred to as maturity gap) is one of the most common sources of interest rate risk. For example a bank selling mortgages and loans on a fixed rate while simultaneously funding it with short-term deposits may be subject to volatility of interest rates.

Interest rate movements can impact both sides of financial institutions balance sheet and directly impact solvency and profitability. That's why proper management of interest rate risk is so important. If poorly managed – IRR can restrict banks ability to lend money and cause possible problems in other areas. Rising interest rates can also affect market value of fixed-income securities held by financial institutions like bonds which value goes down as interest rates increase since newly issued bonds will have higher fixed income based on higher interest rates.

Effective management of interest rate risk should include a mix of various techniques. One of the most common approaches is the gap analysis, which compares sensitivity of assets and liabilities to interest rates over various time periods. Next methos is duration analysis which assesses institution's equity sensitivity to changes in interest rates. Different techniques involve use of interest rate swaps, futures and interest rate options for more sophisticated methods of hedging the interest rate risk.

1.3.1 Different types of interest rate risks (e.g., repricing risk, basis risk)

Interest rate risk, which results from fluctuations in market interest rates is a crucial factor influencing investors and financial institutions. A variety of financial instruments may perform differently depending on type of interest rate risk. Below are some of them:

Repricing risk – Occurs when there are mismatches between assets and liabilities during interest rate change. If interest rates rise – funding cost for financial institution increase and fixed-rate loans remain constant – potential decline in net interest income may happen.

Yield curve risk is a potential change in relationship between rates with different maturities. Yield curve shows bonds with various maturities typically growing, which indicates that long term bonds have higher yields (Wernz 2020) . Different effects on the value of interest-sensitive assets and liabilities can result from changes in the yield curve's shape. For example rising long-term rates may decline present value of long-term bonds more than short-term bonds, exposing investors to potential yield curve risk.

Basis risk is another type of interest rate risk and it appears when there is discrepancy between the interest rates of different financial products that financial institutions sell and buy. For example, if a bank has a loan tier to LIBOR and funds it with deposits linked to EURIBOR – then a change in relationship between these rates can expose bank to basis risk and create new challenges in need for management of interest earned on assets and paid on liabilities.

Event risk is the most unpredictable of risks. It is a risk of unpredictable events that can affect the interest rates and thus affect interest-sensitive assets. Events like economic crises, extreme governmental policies, worldwide health crises (COVID-19) etc. can cause unpredictable shift in interest rates. For example during Covid people were backing their money from various investments due to unstable times, National Bank of Poland bought PLN 140 billion worth of bonds to stabilize the financial market, also NBP cut interest key interest

rates even to 0,1% to stimulate frozen economy. Government also issued over PLN 300 billion in “ani-crisis shields” (Sobanski 2021). Overall fiscal and monetary intervention reached over PLN 500 billion in less than two years, which resulted in galloping inflation (over 18%) a year later and a need to increase interest rates to extreme levels – 6,75% which is huge increase when compared to 0,1%.

Last type of interest rate risk described here will be inflation risk. When inflation increases (no matter the reason) the return on fixed-income assets decrease leading to decline in their market value. This means that nominal payments on such assets may not keep up with the rising prices, spoiling the return on investment, thus creating the need for hedging with assets covering inflation risk premium (Bekaert and Wang 2010).

Analyzing interest rate risk is critical for financial institutions (Abdymomunov and Gerlach 2014) which should navigate through complexities of all of mentioned above interest rate risks to ensure effective risk management strategies which should help to mitigate this risks and ensure the stability of the business.

1.3.2 How interest rate risk affects profitability, especially in leasing and car loans

Financial institutions engaged in leasing and auto loans may find that their profitability is considerably impacted by interest rate risk. This risk results from the possible negative impact of interest rate changes on borrowing costs, loan terms, and asset and liability values.

Leasing institutions like Banco Primus rely typically on borrowed funds to finance their operations. Rising interest rates can negatively impact cost of borrowing which decrease profit margins as lease contracts are typically fixed-rate financial products. On the other hand if interest rates decrease it may decrease borrowing cost and increase margins but clients might pay off their loans early or refinance to take advantage of lower rates, decreasing expected earnings of leasing company. Interest rate changes do affect consumer demand for

leasing cars, when they rise – the demand usually drops due to higher cost of financing for client, inversely – low rates can stimulate demand for leasing cars due to lower cost. (Viitanen 2021). Portfolios of auto loans and leasing must have effective asset-liability management (ALM) in order to reduce the impact of interest rate risk. To limit the vulnerability to fluctuating interest rates, businesses must carefully match the length of their obligations (borrowed funds) with their assets (loans and leases). Firms may be exposed to large IRR due to mismatches in maturities or interest rate arrangements, which could compromise profitability.

1.4 Theories and Models of Interest Rate Risk Management

1.4.1 Overview of key theories (e.g., the Expectations Theory, Liquidity Preference Theory)

The expectations theory of interest rates is a central model within interest rate risk management, offering insights into how future interest rate expectations shape the term structure of interest rates. The theory has evolved significantly since its inception, influenced by key economists who aimed to explain the relationship between short- and long-term rates and its implications for market dynamics.

The origins of the expectations theory can be traced to Irving Fisher, who, in the early 20th century, introduced the concept of the time value of money. Fisher examined the relationship between short-term and long-term interest rates, proposing that, under conditions of perfect foresight, long-term rates represent an average of current and expected future short-term rates. This concept suggests that anticipated future rates are embedded in current long-term rates, establishing a fundamental principle for understanding how market expectations influence interest rates across different maturities.

John Maynard Keynes significantly advanced the discourse on interest rates with his introduction of the liquidity preference theory in his seminal work, The General Theory of Employment, Interest, and Money (1936). He argued that the interest rate is influenced not only by the supply and demand for money but also by individuals' preference for liquidity. Keynes proposed that investors require a premium for holding longer-term securities, which are inherently less liquid and carry additional risk.

Building on Fisher's ideas and Keynes's liquidity preference theory, J.R. Hicks made significant contributions in his 1939 work, Value and Capital. Hicks explored how expectations of future rates shape the yield curve, the graphical representation of interest rates across various maturities. He highlighted that investor expectations about future economic conditions play a crucial role in determining the shape of the yield curve, introducing the notion that an upward-sloping curve reflects expectations of rising rates.

In the mid-20th century, F.A. Lutz further refined the expectations theory by examining the interplay between short- and long-term rates under conditions of uncertainty. Lutz introduced the idea of risk premiums to account for the variability and unpredictability of future rates, contributing to what later became known as the liquidity premium approach. This refinement bridged the expectations theory with the emerging liquidity preference theory, asserting that investors demand compensation for the risk of holding longer-term bonds.

Later, Eugene Fama expanded the applicability of the expectations theory to forward rates, which are implied future interest rates embedded in long-term securities. In his 1976 work, Forward Rates as Predictors of Future Spot Rates, Fama examined how well forward rates could predict actual future spot rates. His empirical approach provided the theory with a rigorous testing framework, assessing its practical predictive power in forecasting interest rates. He also

introduced considerations of market efficiency, suggesting that even with accurate predictions of future rates, liquidity preferences and investor risk aversion can alter the term structure.

In subsequent years, Robert Shiller continued to test the predictive accuracy of the expectations theory, particularly regarding bond yields and forward rates. His research in the 1970s and 1980s demonstrated that while expectations theory is useful, investor behavior and market conditions introduce complexities that can limit its accuracy, emphasizing that interest rate predictions are often influenced by behavioral and economic uncertainties.

Today, the expectations theory is most commonly understood in its "unbiased expectations" form. According to this interpretation, the shape of the yield curve—whether it slopes upward, downward, or remains flat—reflects market expectations for future short-term interest rates. An upward-sloping curve typically indicates that markets expect short-term rates to rise, while a downward-sloping curve suggests an expectation of falling rates.

The expectations theory is often used in conjunction with the liquidity premium theory, which emerged from the work of Keynes, Fama, and Lutz. This theory posits that, in addition to expected future rates, investors require a premium for holding longer-term securities to compensate for additional interest rate risk. This "liquidity premium" helps explain why yield curves tend to slope upward even when future rates are expected to remain stable, accounting for investors' preference for shorter-term, less risky bonds.

In practice, the expectations theory plays a crucial role in interest rate risk management. It informs hedging strategies, asset-liability management, and investment decisions based on anticipated rate movements. For organizations like Banco Primus, whose primary activities in

auto loans and mortgages are sensitive to interest rate fluctuations, accurately predicting future interest rate trends allows the bank to align its asset and liability profiles effectively. This alignment helps minimize exposure to interest rate risks and ensures stable profit margins. Furthermore, the application of these theories is instrumental in optimizing loan pricing and funding strategies, safeguarding against volatility in borrowing costs.

1.4.2 Common models used to manage interest rate risk (e.g., Duration-Gap analysis, Sensitivity analysis)

Managing interest rate risk is crucial for institutions like Banco Primus, whose day-to-day operations are significantly impacted by fluctuations in interest rates. One of the most widely used models for managing this risk is duration gap analysis. In this approach, duration serves as a measure of the weighted average time until interest and principal payments are received, accounting for the present value of each cash flow.

Duration gap analysis compares the duration of a bank's assets with the duration of its liabilities to assess the potential change in the market value of stockholders' equity when interest rates fluctuate (Armeanu, Bãlu, Obreja, 2008). This comparison helps institutions understand how shifts in interest rates will affect the value of their equity, given the differences in timing and size of cash flows on each side of the balance sheet. To conduct duration gap analysis, the duration of each asset and liability is calculated individually using the Macaulay Duration formula.

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{T}\left(\frac{Cash\ Flow_t \times t)}{(1+YTM)^t}\right.}{Bond\ Price}$$

Where:

- t = Time period of each cash flow in years
- Cash Flowt = Cash flow received at time t
- YTM = Yield to maturity
- Bond Price = Present value of all cash flows

After calculating the individual durations of all assets and liabilities, the next step is to compute the average duration of assets and average duration of liabilities.

Average Duration of assets DA is calculated as follows: DA= $\frac{\sum_{i=1}^{n}(PV_i \times D_i)}{PV_A}$, where n is the number of different asset cash flows, $\boldsymbol{PV_i}$ is the present value of cash flow i from the asset, $\boldsymbol{D_i}$ is the duration of cash flow i from the asset and PV_A is the total present value of all asset cash flows.

Average Duration of Liabilities is calculated in a similar way DL= $\frac{\sum_{i=1}^{n}(PV_i \times D_i)}{PV_L}$

Once the average durations of assets and liabilities are determined, the Duration Gap (DGAP) can be calculated as: DGAP = (DA - DL × $\frac{L}{A}$) , where L is the total size of liabilities and A is the total size of assets.

The Duration Gap is a measure of the bank's interest rate risk exposure. A larger gap between the average duration of assets and the average duration of liabilities indicates a higher level of interest rate risk.

If the DGAP is positive, it means that the bank's assets have a longer duration than its liabilities. In this case, a rise in interest rates will likely reduce the bank's equity market value, as the market value of assets would decline more than that of liabilities. Conversely, if the DGAP is

negative, a drop in interest rates could lead to a decrease in equity value, as liabilities would be more sensitive to interest rate changes than assets.

To mitigate interest rate risk, it is crucial to match the durations of assets and liabilities. By doing so, the Duration Gap can be minimized or ideally brought to zero, reducing the potential impact of interest rate changes on equity value. This alignment ensures that the institution remains financially stable in the face of changing interest rates.

Another commonly used tool in interest rate risk management is sensitivity analysis. This analysis involves observing the effects of simulated interest rate changes on assets and liabilities. The model assumes interest rate movements to evaluate how a bank's assets and liabilities will respond, providing insights into interest rate risk management. To conclude the sensitivity analysis, modified duration and convexity can be applied.

Modified duration (D*) is a measure of the sensitivity of the value of a security to changes in the underlying yield or discount rate. It is closely related to Macaulay duration D. (Handforth, Bland, Riley, 2016).

The formula for Modified duration is : $D^* = \frac{D}{1+\frac{YTM}{n}}$, where D is the Macaulay duration, YTM is the yield to maturity, (annual yield), and n is the number of compounding periods per year. The modified duration measures the price sensitivity of a bond when there is change in the yield to maturity. (Jiankkun Wu, 2022).

Although these methodologies were initially developed for bonds, they can also be applied to loans and mortgages, as they are all fixed-income instruments. While modified duration estimates the linear relationship between interest rate changes and price sensitivity, the additional modification using convexity provides a second-level adjustment to incorporate the curvature or non-linear relationship. The combination of modified duration and convexity yields a better estimate of interest rate risk than using modified duration alone.

Convexity is calculated as follows: $C = \frac{\sum_{t=1}^{T} \frac{(t^2+t)CF_t}{(1+YTM)^t}}{B_0}$, where T is the total number of cash flows and B_0 is the initial price of the bond (fixed instrument).

The modified convexity is given by : $MCONV = \frac{C}{(1+YTM)^2}$ (Mondello, 2020).

Finally to estimate the price change of the fixed instrument due to changes in the yield the combination of both models gives : $\Delta V = -D^* \cdot \Delta y + \frac{1}{2} MCONV \cdot (\Delta y)^2$, in this equation ΔV represents the change in price, Δy is the change in yield, D^*(modified duration) measures the linear sensitivity of the price to small changes in yield, and MCONV (modified convexity) captures non-linear effects of larger yield changes.

1.5 Tools and Techniques for Managing Interest Rate Risk

1.5.1 Hedging techniques: Derivatives (e.g., interest rate swaps, futures)

Hedging is an advanced financial strategy for risk management that involves taking an offsetting position in a related financial instrument or asset to mitigate risks from adverse price movements. As discussed earlier, interest rate movements can cause problems for institutions like Banco Primus. For example, when interest rates increase, the portfolio value of long-term fixed loans or mortgages decreases due to fixed rates, while borrowing costs increase and financing becomes more expensive.

Derivatives are mechanisms that can mitigate these risks and provide more stable profitability. Derivatives are financial contracts whose value is linked to an underlying asset. The most common derivatives include options, futures, forwards, and interest rate swaps.

Options are contracts that give a buyer the right, but not the obligation, to buy or sell an underlying asset at a predetermined price, known as the strike price, during a specific time

period. In contrast, futures are contracts that obligate the holder to buy or sell the underlying asset at an agreed price on a specific date.

Forwards are a more flexible type of contract, as they are not standardized and can be customized to meet the specific requirements of both parties involved. They are similar to futures in that they also impose an obligation rather than a right to execute the contract.

An interest rate swap is an agreement in which a bank exchanges fixed interest rate payment for floating-rate payments, or vice versa. All these mechanisms can be utilized to hedge interest rate risk.

For example, if the bank expects interest rates to rise while holding a large portfolio of fixed-rate loans, it can purchase options on an interest rate index and exercise put options to sell the asset at a higher strike price to offset potential losses from the loans. Alternatively, the bank can engage in interest rate swaps, specifically by agreeing to pay a fixed rate and receive a floating rate. This way, the income received from the floating rate will increase, and the profits from the swap will help limit the losses associated with holding a substantial amount of fixed-rate auto loans or mortgages.

On the other hand, if the bank holds a larger portfolio of floating-rate loans as assets, it faces risks from downward movements in interest rates. In this case, the bank can engage in opposite interest rate swaps by paying floating rates and receiving fixed rates.

These instruments provide significant flexibility and opportunities to hedge against interest rate risks. The bank can utilize derivatives based on the nature of its portfolio to mitigate financial losses.

1.5.2 Balance sheet management tools (e.g., Asset-Liability Management (ALM))

Asset and Liability Management (ALM) is a strategic approach that focuses on the optimal investment of a bank's assets to meet future liabilities. Given the unpredictable nature of financial markets, organizations must implement effective ALM practices to navigate uncertainties and prevent mismatches between assets and liabilities. Banks encounter various risks and regulatory pressures, including market risk, liquidity risk, credit risk, and capital requirements, all of which necessitate effective ALM strategies. (Romanyuk, 2010)

Although ALM requires continuous decision-making, with portfolios frequently adjusted to align with evolving market conditions, the complexities associated with continuous time models render them impractical. Therefore, ALM is commonly approached as a multi-period decision problem, where portfolios are evaluated and modified at designated intervals, such as the end of each accounting period (Kusy & Ziemba, 1986).

The primary goal of ALM is to maximize the bank's profitability while adhering to financial, legal, and institutional constraints. To achieve this, banks utilize various analytical tools and techniques, including cash flow modeling, interest rate sensitivity analysis, and the use of derivatives for hedging purposes. By continuously monitoring and managing the balance sheet, banks can align their assets with liabilities, ensuring liquidity and financial stability in a constantly changing economic environment.

1.5.3 ALCO (Asset-Liability Committee) role in managing interest rate risk

The Asset-Liability Committee (ALCO) plays a critical role in managing interest rate risk within financial institutions. Composed of senior management and stakeholders from departments such as treasury, risk management, and finance, ALCO is responsible for

formulating ALM strategies, overseeing management reporting, and assessing key risk metrics, including liquidity, gap, and interest rate risk (Choudhry, 2011).

A primary responsibility of ALCO is to monitor the bank's exposure to interest rate fluctuations. To do so, ALCO uses tools such as gap analysis and stress testing to evaluate the institution's sensitivity to interest rate changes, enabling the development of effective risk mitigation strategies.

Beyond interest rate management, ALCO actively monitors liquidity and exchange rate risks to safeguard the bank's stability. Additionally, ALCO reviews variances between actual and forecasted performance metrics—such as net interest margin and balance sheet indicators—to ensure alignment with financial objectives. ALCO further supports the bank's budgeting and strategic planning by leveraging scenario analysis and forecasts to inform long-term growth decisions (Dedu & Vasilache, 2008)

1.6 Liquidity and Interest Rate Risk Interactions

1.6.1 How interest rate risk can impact liquidity

Interest rate risk poses a significant threat to a bank's financial stability, as sudden changes in interest rates can alter the costs of liabilities and returns on assets. This fluctuation negatively impacts the net interest margin, which is the difference between revenue from assets and expenses on liabilities. Rising interest rates can increase borrowing costs, especially for banks with many variable-rate loans, and can lead to declines in the market value of fixed-rate assets. Additionally, higher rates may reduce borrowing demand and increase defaults, straining liquidity and the bank's ability to meet short-term obligations. Furthermore, the findings from a study on a small Italian bank indicated that measures to

improve liquidity also led to a simultaneous reduction in interest rate risk exposure. This suggests that effective liquidity management strategies can mitigate the adverse effects of interest rate fluctuations. The research emphasizes that a bank's liquidity risk and interest rate risk are interlinked, reinforcing the need for integrated risk management approaches that consider both types of risks simultaneously (Baldan, Cinzia and Zen, Francesco and Rebonato, Tobia, 2012).

1.6.2 Managing the liquidity gap in the context of interest rate volatility

As interest rates fluctuate, banks must address the mismatch between their short-term liabilities and the liquidity of their assets. One effective strategy is the use of financial derivatives, particularly interest rate derivatives, which allow banks to hedge against potential increases in interest rates. Research has shown that when banks face higher liquidity risks, they tend to utilize these derivatives to enhance their potential gains from rising rates.(Esposito, Nobili, Ropele 2015) Specifically, a study found that banks with a larger funding gap were negatively correlated with their off-balance-sheet duration gap, indicating a preference for derivatives among banks with lower liquidity ratios (Froot et al., 1993; Purnanandam, 2007).

Additionally, the Basel III framework emphasizes the need for banks to hold high-quality liquid assets (HQLA) to ensure they can meet their short-term liabilities, especially during periods of financial stress. (Basel Committee on Banking Supervision 2013) By mandating adequate liquidity buffers, Basel III helps mitigate the risks associated with interest rate volatility, enabling banks to maintain operational stability even amid market fluctuations.

Chapter 2: Current situation analysis

This chapter will be devoted to individual work done by Michał which will consist of current situation analysis of Banco Primus, and possible solutions proposed by the student. This part will focus on costs (funding) of Banco Primus which is done through loans (from parent company?) and potential solutions for cost reduction. To ensure smoothness of analysis and to simplify the calculations the following assumptions have been made:

1. Reference date is 30.06.2024
2. Year takes 360 days and repricing happens every 180 days
3. Prognosed interest is calculated every 6 months for the whole 6 months of following period. Interest is paid monthly using equal payments method.
4. Capital part of the loans taken and loans sold is paid accordingly to data provided by Banco Primus
5. Prognosis of Euribor 6M holds
6. The analysis is done for a period December 2024 – December 2027

2.1 Methodology

Euribor 6M forecast is based on the official E6M rates by month, where each month's value was divided by the previous month's value, in this way an average decrease rate was calculated, by which the previous month's values were multiplied to forecast the next month.

Fixed and variable rate loan analysis – Total interest rate should be understood as the total amount of interest to be paid for a given loan, repricing has been taken into account. The average was counted as arithmetic averages unless specified otherwise. Forecast of interest payments on variable loans was calculated in the same way as E6M forecast.

Durations were calculated using this formula: $D = \frac{\sum_{t=1}^{T}(\frac{Cash\ Flow_t \times t)}{(1+YTM)^t}}{Loan\ amount}$

Nominal composition of loans – in this subchapter calculations were done by simple dividing number by number. Averages were calculated as arithmetic averages.

Net interest income was calculated using this formula: $NII = interest\ income - interest\ expense$ where interest income is interest payable on given loan, not taking into account capital part of the loan, the same for expenses.

Net interest margins were calculated as: $D = \frac{interest\ income - interest\ expense}{assets}$ where interest income are the same as in net interest income, and assets for each month are reported in advance in Banco Primus report.

Cash flow forecast was calculated according to E6M forecast, includes loans coming to maturity and repricing. It is to be understood as a sum of interest earnings and capital payments on all business lines minus sum of all interest and capital payments on all loans on all business lines.

2.2 Euribor 6M forecast

To begin the analysis it is essential to establish firm framework of current and future interest rates on which the analysis is going to be based. Since all loans taken out and sold to clients by Banco Primus are either fixed or variable based on Euribor 6M – this is the only interest rate that is going to be forecasted and used for all calculations. As we can see on developed forecast in (Table 1) Euribor 6M has been decreasing month by month giving 97.03% decrease rate, which means that Euribor 6M has been decreasing 2,97% per month. On this data forecast was developed which ends in December 2027 when forecasted rate of Euribor 6M is 0,95%.

2.3 Fixed rate loans analysis

Analysis was begun with the assessment of all fixed loans that Banco Primus has taken. Looking at the data it is possible to notice that not much fixed rate loans were taken during the covid period in which all interest rates were extremely low. For example – loan number 1291300SA was taken in December 2020 at total interest rate of 0,27% which is extremely low, and looking back it was a great business decision. Majority of fixed rate loans were taken in 2023 onwards when Euribor was at its highest since 2007/8 financial crisis. For example – loan number 1416988SA was taken in September 2023 at a total interest rate of 4,25%. That is a huge difference in interest compared to previously mentioned loan. Total interest rates were calculated (understood as total interest paid on a single loan) which vary from 1,10% to 13% which is the result of many loans taken at a different rates. Average total interest rate for Primus's fixed loans is 8,87% while weighted average interest rate equals 8,28%. Data received from the company suggests that fixed rate loans do not get repriced because e.g. first loan in the table taken in July 2020 has current interest rate of 0,49% which (if it was to be repriced in January 2024) would be much higher. This leads to final conclusions of fixed rate loans analysis – Probably due to worldwide uncertainty about economic situation during covid Banco Primus did not take super low interest fixed loan – it is understandable, yet management who knew that to run the business taking new loans is necessary should have secured cheap funding for years onward taking much more low interest rate fixed loans. It is striking compared to amount of variable rate loans taken in that time. Yet it may be related to Primus's relationship with its parent company. For improvement of that situation repricing of loans at current (lower) interest rates and those prognosed by forecast would be a good idea, but not for every loan – they will be specifically selected later in this thesis.

2.4 Variable rate loans analysis

All of variable loans are based on Euribor 6M and get repriced every 6 months. What immediately strikes is the fact that even though there is much less variable rate loans than fixed rate ones, the variable ones were taken in much higher amount during uncertain covid times. On top of that – it is noticeable that all loans are currently priced at high Euribor 6M and also spread is added further increasing interest rate to average of 4,41%. On a (Table 2) visible is forecast of monthly interest payments on variable loans. For purpose of this analysis this forecast does not take into account factor of some loans coming to maturity. We can see that (under the set assumptions and Euribor 6M forecast) interest payments on variable loans are going to decrease significantly, on average almost € 84 000 every 6 months which means that according to E6M forecast there is going to be decrease in interest payments of 15,67% on each period compared to previous one. There are significant conclusions to be drawn from this quick variable rate loans analysis: management should realize that during times of almost non existent interest rates taking a variable rate loan is only going to increase cost of funding in the future, fixed loans are the way to go – once again depending on a relationship with parent company and also current offer of other banks for investment loans (But such player as Banco Primus should participate their negotiating power to secure cheap funding for years to come). Another conclusion is the fact that variable rate loans are tightly connected to country's economic situation, but in this case its not even country that controls interest rates, its European Bank in Frankfurt. Once Euribor 6M decreases as in forecast on which other prognosis are based then interest payments should decrease as shown in (Table 2), thus making refinancing pointless. Other ways of controlling interest rate risk should be involved for variable rate loans such as interest rate swaps.

2.5 Duration analysis

When comparing two sets of loans first duration analysis was conducted. Based on previous analysis durations presented in (Table 3Table 3) were calculated. Further on that table of durations (Table 4Table 4) was created. Reading the information from it we can see that all durations are between 3 and 4 years making them medium long durations. The point of this calculation was to check how durations would change if in December 2024 Euribor 6M would be on a level from different forecast period corresponding to repricing dates. That's why duration of fixed rate loans remains constant and duration of variable rate loans increases over time (Graph 1) which means that at the moment variable loans are less susceptible to interest rate changes than they will be in the future assuming that E6M forecast holds. Meaning that if Euribor 6M decreases then value of cash flows moves further into the future and longer term cash flows are more susceptible to fluctuations in their discounted value.

2.6 Demonstrating reduction in loan costs

Next is important comparison on (Graph 2) which shows that on average the amount of interest paid in each 6 month period will obviously remain constant for fixed loans but in variable loans will decrease as interest rates decrease and after 2nd repricing after mid 2025 fixed and variable loans will pay equal interest at around 1,55% per each 6 month period showcasing that variable loans are costly now but as time progresses they will become more attractive (cheap) source of funding. This does not account for loans coming to maturity.

2.7 Nominal composition of loans

It would also be beneficial to assess the nominal composition of loans of each type devoted for each business line. As we can see in (Table 5) 9 out of 67 total loans for PT Auto

business line which is roughly 13,43% are variable which by calculations in (Table 6) are responsible for 18,66% of total PT Auto loans. Which means that on average capital amount of 1 PT Auto fixed loan is € 3 029 655 and average capital amount of 1 PT Auto variable loan is € 4 477 778 which means that on average variable loans are significantly bigger and are subject to interest rate risk. Although fixed loans do not carry the same risk as variable loans, they do carry the risk of losing potential savings when interest rates fall. Additionally, it is noticeable that PT MG and SP MG business lines are funded in 100% by variable loans based on Euribor 6M. Average amount of 1 loan for PT MG is € 9 166 667 while for SP MG it is € 5 598 000. Conclusions to be drawn from this part of analysis would suggest that mortgage business is more expensive per unit (obviously compared to cars) and thus is subject to higher risk due to higher average loan amount. While mortgage business is tightly connected to Euribor rates and will become less expensive as E6M drops, there is a room for improvement for PT Auto fixed loans which are responsible for funding 81,34% of Banco Primus's core business.

2.8 Net interest income analysis

To begin net interest income analysis it is essential to calculate interest income overall and for each business line separately to assess net interest income from each endeavour. For the purposes of this analysis (aside from those mentioned at the beginning of this chapter) following assumptions have been made: This is analysis of current situation and because of that Banco Primus does not sell any new loans nor does it take any new loans, fixed loans do not get repriced, variable loans get repriced according to their repricing dates (simplified 180/360) at rates forecasted in the first subchapter, loans come to maturity in their respective dates and the % of total cash flow that is interest in PT auto E6M is the same as in PT auto fixed, PT MG and SP MG in each month. We can clearly see on (Table 7) that Banco Primus

core business line is bringing a lot of net interest income – over € 1 500 000 on average per month. It is also shown on (Graph 3) that this business line is well balanced and brings stable income in long time period. On (Table 8) we can see that PT Auto business line based on E6M is doing fairly okay bringing decent € 79 000 per month on average, data on (Graph 4) seems to support this thesis, but it is worth to notice the spike in mid 2027 in which loans taken for funding PT Auto E6M business line are paid off. Moving on to (Table 9Table 9) we have net interest income for PT MG business line which is doing pretty poor because it brings in on average € 7 500 per month. Data on (Graph 5) Supports this showing that due to high interest rates Portuguese mortgages are not profitable at the moment. Big spike in NII in September 2026 is going to happen due to high predicted interest income in that month. SP MG business line shown on (Table 10Table 10) shows that Spanish mortgages are highly unprofitable when interest rates are high. Even when as shown on (Graph 6) they become profitable as interest rates lower, they still lose on average € 1 000 per month for whole period of analysis. Further on analysis of all business lines based on E6M was done in (Table 11) which shows huge net interest loses of € 184 498,58 per month on average until December 2025. Later when Euribor 6M gets lower – this business becomes more profitable bringing in around € 96 227 per month. Those numbers in total result in average loss of € 2 406 per month on all E6M business lines. Even though losses on E6M business lines are significant (Graph 9), core business of fixed PT Auto saves the bank as shown on (Graph 8) making the loses less significant. Furthermore, total net interest income was calculated in (Table 12) showing average net interest income of approx. € 1 650 000 per month. (Graph 10) also confirms that currently Banco Primus's total net interest income is coming up satisfactory.

2.9 Net interest margins

Based on previous net interest income analysis and report data from Banco Primus about their level of assets in each month the Net interest margins were calculated according to E6M forecast. On (Graph 18) we can see that Banco Primus's net interest margin is fairly low, on average 0,83%. This is mainly driven by PT Auto fixed business line NIM presented on (Graph 12). The highest average NIM is presented in PT MG business line – 2,55% but it is due to significant spark in september 2026 which is isolated incident and therefore shall be regarded as insignificant. Other graphs presented in appendices suggest that mortgage business lines create high costs when interest rates are high, and bring high income when interest rates are low. Fixed business line brings stable income over time. Overall Banco Primus's net interest margins are low which is normal in developed markets, in Euro zone usual net interest margins for banks are around 1,5% due to high competition, effective markets and low interest rates, but in this case interest rates are high at the beginning making net interest margins low and when interest rates decrease – then NIM increases, once again suggesting a mismatch between Banks assets and liabilities used to fund them

2.10 Cash flow forecast

To finish the current situation analysis – forecast of total cash flows will be assessed including capital payments of loans sold and taken by Banco Primus. Total net cash flow shown in (Table 13Table 13) was calculated. It is visible that in December 2024 there is huge decline in net cash flow because of big amount of capital parts (bigger than total income) of loans taken are to be paid, same situation happens in July and August 2025. Besides from these months in whole period of analysis Banco Primus is generating positive cash flows which on average result in approx. € 1 250 000 on average. The data on (Graph 11) supports the idea that Banco Primus needs to make a deal with its creditors to spread the capital payments over time to avoid the accumulation of capital payments as in December 2024, July

2025 and August 2025.

2.11 Conclusions from current situation analysis

Conclusions from current situation analysis are as follows: Banco Primus is able to generate positive cash flows in significant amounts, which mainly come from its core business which are PT Auto loans. Due to its specification bank can ensure great profitability of its core business when endeavor is funded and sold on a fixed rate. Unfortunately bank has some mortgages from the past which in terms of high interest rates generate much higher costs than profits, it happens due to mismatch between Primus's assets on this business line (very long term as mortgages usually are and their profitability changes slowly) and liabilities used to fund them (short to middle-long term which cost increase rapidly as interest rates rise). Primus's assets and liabilities on fixed business lines are matched well. The following potential improvements could be made: Refinancing of fixed loans taken in 2023 onwards during extra high Euribor rates, interest rate swaps to protect itself against potential increase in the future, spreading capital payments to its creditors evenly over time and considering significant changes in its assets such as asset (mortgages) sale which would immediately boost liquidity which could be used to pay off loans taken, or to increase PT Auto fixed sales which have been extremely stable and effective.

Chapter 3: Potential improvements

3.1 Refinancing of fixed rate loans

For this analysis potential refinancing will take place in April 2025 when forecasted E6M is going to be at 2,50%. A total of 52 fixed rate loans was selected to be refinanced, all of these loans have been taken from early 2023 onwards and have base rate >= 3,42%. Based on previous calculations and data from Banco Primus, spread for every fixed loan was calculated as a difference between base rate and actual E6M level at the loan start. Average spread of 0,33% was calculated and added to the base rate of 2,50% which equals to forecasted E6M. (Table 14) presents significant decrease of monthly interest payments on each fixed rate loans. On average each monthly payment was reduced by approx. € 2324 which gives about €120 000 of monthly interest savings at the beginning of refinancing. Furthermore refinancing influence on net interest income of PT Auto fixed business line was calculated and is presented on (Graph 19) which shows improvement especially in first year of analyzed period. Additionally (Graph 20) presents the effect of fixed loans refinancing on total net interest income. It is significant difference since PT Auto fixed business line is main revenue driver. What's more – refinancing effect on net interest margins was calculated and presented in (Graph 21) which shows that undertaking refinancing is positive for increasing net interest margins for PT Auto fixed business line by increasing NIM on average by 0,03% and also increasing total NIM presented in (Graph 22) by similar amount. Last but not least the effect of refinancing on total net cash flow was calculated. It is seen in (Table 15) how refinancing of chosen fixed rate loans influences total cash flow of the company. Unlike in strictly PT Auto fixed business line case, in this case PT Pessoal fixed loans were also taken into account. Nevertheless the increase in net cash flows is insignificant given the amount of cash it is compared to. It can also be seen on (Graph 23) that refinancing (although improves

financial performance) is not going to make an impression in overall company standing. It is worth noting that this calculations are an idealistic scenario that does not take into account additional refinancing costs such as fees for contract annexation, administrative work or legal costs and all loans are refinanced automatically without resistance from the institution that finances Banco Primus.

3.2 Securing net interest margins with interest rate swaps

To begin analysing how potential interest rate swaps can prevent degradation of net interest margins it is essential to establish hypothetical situation in which Euribor 6M increases suddenly and significantly. For this reason (Table 16) was created which showcases that in July 2025 Euribor 6M starts to increase due to unforeseen circumstances and reaches 4,50% in May 2026 and drops down to 4,00% in December 2027 which is ending period for this analysis. No further explanations for E6M increase will be provided since this analysis main matter is to assess the effects of interest rate increase as well as effectiveness of interest rate swaps rather than accurate forecasting of interest rates. First and foremost monthly interest payments on all variable rate loans were calculated accordingly to their repricing dates and in some cases (due to repricing dates closer to July) Euribor increase made impact sooner rather than later. Total effect of E6M increase was calculated and presented on (Graph 24) which indicates huge increase in interest payments (approx. € 98 000) in the first month affected by E6M increase. These increased interest payments decrease over time just as they would in original scenario due to loans coming to maturity, nevertheless scenario of interest rate rise presents that interest payments will rise by 64% on average from July 2025 until December 2027. Furthermore impact on net interest income of business lines based on variable loans was calculated and presented on (Graph 25) showcasing significant decrease of net interest income in affected period. Average decrease of net interest income in period from

July 2025 until December 2027 was estimated to be at 2,55% and average decrease in net interest income for affected period (from approx. January 2026 until December 2027) was estimated at 3,19% - in this case also 2nd half of 2027 was taken into account although all other variable loans come to maturity on June 2027 at latest. Without taking 2nd half of 2027 into account – this scenario of E6M increase results in 4,25% decrease in net interest income on average. (Graph 26) presents significant impact of Euribor increase on PT Auto E6M business line decreasing net interest income by 27% on average in period from July 2025 – December 2027. (Graph 27) shows no significant impact of Euribor increase on PT MG business line and (Graph 28) shows noticeable impact on SP MG business line. On (Graph 29) we can see that net interest margin decrease follows net interest income decrease showing similar average decrease of 27%. Same goes for insignificant decrease in net interest margin of PT MG business line on (Graph 30) and noticeable influence in SP MG net interest margin on (Graph 31). Although impact on total net interest margin at first glance on (Graph 32) may not seem like much, it results in average decrease of 2,50% relative to each other (not nominally) calculated as the average of ratios of net interest margins from both scenarios. All these calculations lead to conclusion that in case of unexpected rise in interest rates, key performance indicators of Banco Primus are going to worsen, thus emphasizing the need to protect the company from rising interest rates. In this case it is going to be done using interest rate swaps.

During calculations of securing company margins with interest rate swaps, prices of interest rate swaps for all variable rate loans separately were calculated based on Euro area yield curve, to which average margin for IRS selling bank of 10 basis points was added (low margin due to big amount of loans to secure) . In following calculations IRS will be calculated as “Plain Vanilla IRS” in which Banco Primus takes long position (RECEIVE

floating PAY fixed) which means that Primus will pay agreed fixed interest amount on all variable loans and will receive Euribor 6M. Beginning date of IRS is going to be January 2025 and interest rate swaps payments are going to be every 6 months – in June and December, unless if some loan comes to maturity in different month – then last payment will be adjusted (e.g. loan coming to maturity 15 months after IRS agreement begins, will have last payment after 3 months). Primus will receive E6M payments based on hypothetical forecast in (Table 16).

On (Graph 33) presented are approximate cash flows from potential interest rate swaps totaled, but due to semi annual payments on IRS this graph may not be accurate. Semi annual payments were divided to monthly payments (loan maturity date taken into account) and together with interest payments on all variable loans in scenario of increasing Euribor 6M was shown on (Graph 34) which shows effectiveness of IRS. Due to mechanism of this derivative we can see that it effectively decreases interest payments on variable loans (even though interest payments increase, but E6M is above IRS payable interest, thus IRS creates profit for Banco Primus in this hypothetical scenario, which was understood as interest payment reducement). In this scenario interest rate swaps create positive monthly cash flows of € 54 900 on average throughout analyzed period, or € 65 882 monthly until June 2027 when all current variable loans come to maturity. It is also worth noting that IRS immediately creates profit for loans with longest time to maturity – it is due to yield curve which shows market belief that E6M is going to decrease significantly soon, but currently E6M is above market yield curve (E6M approx. 2,7-2,8% vs yield curve approx. 2,1% on 2-3 year bonds).

Furthermore effect of interest rate swaps on PT Auto E6M business line was assessed in (Graph 35) which presents that its net interest income would decrease significantly if Euribor 6M was to increase, and IRS is a good tool to prevent degradation. Rise in interest rate would decrease monthly net interest income of this business line by € 23 990 on average

and IRS would increase monthly net interest income by € 24 400 compared to net interest income without IRS. (Graph 36) shows less significant impact on PT MG business line, which in case of E6M increase would drop its monthly NII by € 1 476 on average , and IRS would increase PT MG NII by € 4 656 on average (all until last PT MG variable loan comes to maturity in July 2026). On the other hand on (Graph 37) significant impact on SP MG business line is visible. SP MG monthly NII would decrease by € 18 705 on average, yet interest rate swap would increase monthly NII by 34 168 on average. Overall effect of IRS on Total NII is presented on (Graph 38) which shows that if E6M was to increase – average monthly NII would drop by approx. € 44 000 and IRS initiative would increase monthly NII by approx. € 63 000 compared to scenario of Euribor increase without IRS derivative.

Similarly effect of interest rate swaps on net interest margins were calculated. First on (Graph 39) is presented IRS effect on preserving PT Auto E6M business line net interest margin. Analysis shows that if E6M was to increase PT Auto E6M business line NIM would drop by 0,261% on average throughout analyzed period, and interest rate swap would increase this NIM by 0,221% on average in the same time frame, relative to NIM drop if no IRS measures were taken. Next is PT MG business line on (Graph 40) which shows less significant changes of E6M impact which would decrease NIM of this business line by 0,26%, yet IRS endeavor would increase it by 0,83% on average. Furthermore is SP MG business line on (Graph 41) which NIM would decrease by 1,76% on average in case of Euribor rise, but IRS derivative would increase NIM by 3,22% on average relative to decrease caused by rising interest rate. Finally effect of interest rate swaps on total net interest margin was calculated and presented on (Graph 42) which shows that in case of forecasted E6M increase, total NIM would decrease by 0,0188% and IRS mechanism would increase same NIM by 0,0228%. These numbers are low because of Banco Primus core business which is funded through fixed loans and was not subject to interest rate rise such as variable loans used

to fund other business lines.

Nevertheless it is worth to check how situation would look if Banco Primus decided to go for interest rate swaps in January 2025 but E6M would not increase, rather keep levels from original forecast. Such comparison was calculated and presented on (Graph 43) which shows average increase in monthly interest payments of approx. € 22 200 until last loan come to maturity. Cash flows from only interest rate swap initiative in case of E6M not increasing can be seen on (Graph 44). Effect of IRS in case of Euribor keeping forecasted levels for each business line separately was assumed to be unnecessary, yet its effect on total net interest income was calculated on (Graph 45) which shows noticeable decrease in net interest income, although it does not impact total net interest margin much which can be seen on (Graph 46). The IRS initiative in case of E6M keeping original forecasted levels would decrease total net interest margin by less than 0,01% on average.

3.3 Summary

In this individual part of the thesis were presented 2 potential methods that Banco Primus could use to increase and prevent degradation of their net interest margins. Due to big amount of fixed rate loans and fixed rate income, the refinancing was calculated which has yielded promising results in decreasing interest on fixed rate loans. Next potential interest rate swaps effect on variable rate loans was calculated which (if interest rates increase) can prevent reduction of net interest margins or if interest rates rise even more – bring profit. But as presented on (Graph 43) IRS can be a double-edged sword and should be carefully aligned with company's risk management policy. It is also worth noting that even though methods presented in this thesis may not look like they impact total net interest margin, it is because of incredibly huge amount of assets on PT Auto fixed business line which bring relatively low amount of income. This also means that Banco Primus in inflexible in terms of increasing /

preventing drops of net interest margins but only in case of fixed rate business line, variable ones, as presented in analysis, can be influenced moderately by means described. Other means to increase net interest margin would be to decrease the amount of assets allocated to the PT Auto fixed business line if feasible.

The analysis in this individual part of the thesis underscores the importance of effective interest rate risk management in a dynamically changing financial environment, while opening the field for further research into optimizing strategies in this area.

Reference list

Abdymomunov, Azamat, and Gerlach Jeffrey. 2014. "Stress Testing Interest Rate Risk Exposure." *Journal of Banking & Finance* 49: 287–301. https://doi.org/10.1016/j.jbankfin.2014.08.013.

Ayub, Ghulam, Nadeem U. Rehman, Muhammad Iqbal, Qaiser Zaman, and Muhammad Atif. 2014. "Relationship between Inflation and Interest Rate: Evidence from Pakistan." *Research Journal of Recent Sciences* 3 (4): 51–55. https://www.isca.me/rjrs/archive/v3/i4/9.ISCA-RJRS-2013-838.pdf.

Bekaert, Geert, and Wang, Xiaozheng. 2010. "Inflation Risk and the Inflation Risk Premium." *Economic Policy* 25 (64): 755–806. https://doi.org/10.1111/j.1468-0327.2010.00253.x.

Delis, Manthos D., and Georgios P. Kouretas. 2011. "Interest Rates and Bank Risk-Taking." *Journal of Banking & Finance* 35 (4): 840–55. https://doi.org/10.1016/j.jbankfin.2010.09.032.

Joslin, Scott, and Konchitchki, Yaniv 2018. "Interest Rate Volatility, the Term Structure, and the Macroeconomy." *Journal of Financial Economics* 128 (2): 344–62. https://doi.org/10.1016/j.jfineco.2017.12.004.

Mishkin, F. S. (2019). *The Economics of Money, Banking, and Financial Markets* (12th ed.). Pearson Education.

Ngalawa, James, and Ngare, Philip. 2014. "Interest Rate Risk Management for Commercial Banks in Kenya." *IOSR Journal of Economics and Finance* 4 (1): 11–21. https://www.iosrjournals.org/iosr-jef/papers/vol4-issue1/B0411121.pdf.

Sobanski, Konrad. 2021. "Economic Policy Response to the COVID-19 Crisis: The Case of Poland." In *Eurasian Business and Economics Perspectives: Proceedings of the 31st Eurasia Business and Economics Society Conference*, 107–18. Cham: Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-030-71869-5_7.

Stawska, Joanna. 2014. *Stopy procentowe a inwestycje w Polsce i strefie euro*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego. https://dx.doi.org/10.18778/7969-062-6.

Viitanen, Jani. 2021. *Leasing Cars in the Region of Kainuu*. International Business, Spring 2021. https://www.theseus.fi/bitstream/handle/10024/499279/Leasing%20Cars%20in%20the%20Region%20of%20Kainuu.pdf?sequence=2&isAllowed=y.

Wernz, Johannes. 2014. *Bank Management and Control: Strategy, Pricing, Capital and Risk Management*. https://link.springer.com/content/pdf/10.1007/978-3-030-42866-2.pdf

Appendices

Tables

Euribor 6M forecasted												
Year		Febru ary	March	April	May	June	July	Augu st	Septem ber	Octo ber	Novem ber	December (pronosed)
2024 (actual)		3,83%	3,91%	3,84 %	3,83 %	3,76 %	3,68 %	3,56 %	3,35%	3,09 %	2,91%	2,82%
Decrease month/month =			102,0 9%	98,21 %	99,64 %	98,09 %	97,95 %	96,87 %	94,05%	92,27 %	94,11%	
Average decrease rate =	97,03 %											
Year	Janua ry	Febru ary	March	April	May	June	July	Augu st	Septem ber	Octo ber	Novem ber	December
2025 (prognosed)	2,74 %	2,66%	2,58%	2,50 %	2,43 %	2,36 %	2,29 %	2,22 %	2,15%	2,09 %	2,03%	1,97%
Year	Janua ry	Febru ary	March	April	May	June	July	Augu st	Septem ber	Octo ber	Novem ber	December
2026 (prognosed)	1,91 %	1,85%	1,80%	1,74 %	1,69 %	1,64 %	1,59 %	1,55 %	1,50%	1,46 %	1,41%	1,37%
Year	Janua ry	Febru ary	March	April	May	June	July	Augu st	Septem ber	Octo ber	Novem ber	December
2027 (prognosed)	1,33 %	1,29%	1,25%	1,21 %	1,18 %	1,14 %	1,11 %	1,08 %	1,04%	1,01 %	0,98%	0,95%

Table 1. Euribor 6M forecast. Based on https://www.euribor-rates.eu/en/current-euribor-rates/3/euribor-rate-6-months/

Loan id	Monthly interest payments	monthly interest payment (jan 25 - jun25)	monthly interest payment (jul 25 - dec 25)	pognosed monthly interest payments (jan 26 - jun 26)	pognosed monthly interest payments (jul 26 - dec 26)	pognosed monthly interest payments (jan 27 - jun 27)	pognosed monthly interest payments (jul 27 - dec 27)
1291280SA	€ 23 219,78	€ 19 955,00	€ 16 097,80	€ 12 184,09	€ 10 698,13	€ 9 457,95	€ 8 422,90
1291281SA	€ 29 637,29	€ 25 193,75	€ 20 372,25	€ 15 480,11	€ 13 622,67	€ 12 072,44	€ 10 778,62
1291285SA	€ 3 815,89	€ 3 135,00	€ 2 644,16	€ 2 011,23	€ 1 770,93	€ 1 570,37	€ 1 402,98
1291286SA	€ 9 690,10	€ 7 920,83	€ 6 693,73	€ 5 111,42	€ 4 510,65	€ 4 009,25	€ 3 590,77
1291289SA	€ 3 817,58	€ 3 126,67	€ 2 635,82	€ 2 002,90	€ 1 762,59	€ 1 562,03	€ 1 394,64
1291293SA	€ 3 795,00	€ 2 975,00	€ 2 573,91	€ 1 959,77	€ 1 726,60	€ 1 531,99	€ 1 369,57
1291295SA	€ 37 692,92	€ 30 083,33	€ 26 072,42	€ 19 931,06	€ 17 599,32	€ 15 653,24	€ 14 029,04
1291296SA	€ 67 802,50	€ 52 104,29	€ 45 098,95	€ 34 372,65	€ 30 300,10	€ 26 901,14	€ 24 064,37
1291297SA	€ 11 272,29	€ 8 809,05	€ 7 641,49	€ 5 853,77	€ 5 175,02	€ 4 608,52	€ 4 135,73
1291299SA	€ 11 105,14	€ 8 684,05	€ 7 516,49	€ 5 728,77	€ 5 050,02	€ 4 483,52	€ 4 010,73
1291303SA	€ 7 381,87	€ 6 931,83	€ 5 446,36	€ 4 130,02	€ 3 630,24	€ 3 213,12	€ 2 864,99
1291304SA	€ 11 466,00	€ 10 657,50	€ 8 396,19	€ 6 379,46	€ 5 613,76	€ 4 974,70	€ 4 441,34
1291307SA	€ 36 285,69	€ 30 981,00	€ 25 066,63	€ 19 065,60	€ 16 787,14	€ 14 885,53	€ 13 298,44
1291308SA	€ 3 920,22	€ 3 367,50	€ 2 724,63	€ 2 072,35	€ 1 824,69	€ 1 617,99	€ 1 445,48
1291312SA	€ 83 451,23	€ 71 696,63	€ 57 907,15	€ 43 915,61	€ 38 603,32	€ 34 169,68	€ 30 469,35
1291310SA	€ 25 104,93	€ 21 726,25	€ 17 547,62	€ 13 307,76	€ 11 697,98	€ 10 354,45	€ 9 233,14
1291311SA	€ 80 977,17	€ 69 492,50	€ 55 992,31	€ 42 294,31	€ 37 093,46	€ 32 752,83	€ 29 130,13
1291314SA	€ 7 638,94	€ 6 303,33	€ 5 321,65	€ 4 055,80	€ 3 575,19	€ 3 174,06	€ 2 839,29
1291315SA	€ 20 762,63	€ 17 334,17	€ 14 294,00	€ 10 916,25	€ 9 831,76	€ 8 563,45	€ 7 808,04
1291317SA	€ 16 903,25	€ 13 500,00	€ 11 695,09	€ 8 931,48	€ 7 882,19	€ 7 006,46	€ 6 275,57
1291318SA	€ 22 068,50	€ 19 194,75	€ 15 530,41	€ 11 812,38	€ 10 400,73	€ 9 222,55	€ 8 239,25
1291319SA	€ 10 117,53	€ 8 241,33	€ 6 866,97	€ 5 094,79	€ 4 421,93	€ 3 860,36	€ 3 391,67

1291321SA	€ 7 928,96	€ 6 019,97	€ 5 163,76	€ 3 852,77	€ 3 355,01	€ 2 939,58	€ 2 592,87
1348585SA	€ 9 390,69	€ 7 375,00	€ 6 372,27	€ 4 836,93	€ 4 254,00	€ 3 767,48	€ 3 361,43
1351501SA	€ 32 588,11	€ 25 740,00	€ 22 210,39	€ 16 437,74	€ 14 754,07	€ 13 041,52	€ 11 612,22
1359226SA	€ 83 223,29	€ 63 562,78	€ 54 494,76	€ 40 610,15	€ 35 338,46	€ 30 938,70	€ 27 266,65
1389834SA	€ 3 727,75	€ 2 866,67	€ 2 465,58	€ 1 851,44	€ 1 618,26	€ 1 423,66	€ 1 261,24
1396390SA	€ 9 092,81	€ 7 028,37	€ 6 055,41	€ 4 565,65	€ 4 000,01	€ 3 527,94	€ 3 133,94
1402928SA	€ 16 872,92	€ 15 780,00	€ 12 261,76	€ 9 144,13	€ 7 960,44	€ 6 972,52	€ 6 148,01
1436438SA	€ 3 609,17	€ 2 790,52	€ 2 401,33	€ 1 805,42	€ 1 579,17	€ 1 390,34	€ 1 232,74
1466297SA	€ 17 361,82	€ 13 990,33	€ 11 683,37	€ 8 708,63	€ 7 579,19	€ 6 636,55	€ 5 849,82
1467348SA	€ 6 258,13	€ 4 774,17	€ 4 092,31	€ 3 048,28	€ 2 651,88	€ 2 321,05	€ 2 044,94
1470041SA	€ 5 398,61	€ 4 175,00	€ 3 573,36	€ 2 652,16	€ 2 302,40	€ 2 010,49	€ 1 766,86
1470045SA	€ 3 599,07	€ 2 783,33	€ 2 382,24	€ 1 768,11	€ 1 534,93	€ 1 340,32	€ 1 177,90
1470211SA	€ 26 903,61	€ 20 812,50	€ 17 804,31	€ 13 198,30	€ 11 449,49	€ 9 989,93	€ 8 771,78
1479145SA	€ 14 023,10	€ 10 996,76	€ 9 478,94	€ 7 154,91	€ 6 272,52	€ 5 536,08	€ 4 921,45
1476297SA	€ 14 669,06	€ 11 287,37	€ 9 691,71	€ 7 248,49	€ 6 320,86	€ 5 546,65	€ 4 900,49
Total=	€ 782 573,55	€ 641 396,53	€ 534 267,54	€ 403 494,71	€ 354 549,08	€ 313 028,43	€ 278 678,37
Avg decrease=	€ -	€ 141 177,01	€ 107 129,00	€ 130 772,83	€ 48 945,64	€ 41 520,65	€ 34 350,07
Decrease rate=	€ -	81,96%	83,30%	75,52%	87,87%	88,29%	89,03%
Avg decrease rate=	84,33%						

Table 2. Forecast of variable rate loans interest payments

FIXED RATE LOANS					VARIABLE RATE LOANS										
Loan id	Loan amount	Value-Date (Loan start)	Term Date (Maturity)	Duration (fixed loans)	Loan id	Loan amount	Value-Date (Loan start)	Term Date (Maturity)	Duration (At current interest rate)	Duration after repricing	Duration after 2nd repricing	Duration after 3rd repricing	Duration after 4th repricing	Duration after 5th repricing	Duration after 6th repricing
1291273SA	6 160 000,00	27.07.2020	28.07.2025	4,92	1291280SA	6 000 000,00	18.09.2020	18.09.2024	3,62	3,66	3,73	3,79	3,81	3,83	3,85
1291274SA	8 000 000,00	31.07.2020	31.07.2025	4,94	1291281SA	7 500 000,00	21.09.2020	22.09.2025	4,33	4,40	4,51	4,62	4,66	4,70	4,73
1291275SA	1 500 000,00	31.07.2020	31.07.2025	4,94	1291285SA	1 000 000,00	09.10.2020	09.10.2024	3,62	3,68	3,73	3,79	3,82	3,84	3,85
1291276SA	11 000 000,00	10.08.2020	11.08.2025	4,92	1291286SA	2 500 000,00	16.10.2020	16.10.2025	4,42	4,51	4,59	4,68	4,71	4,75	4,77
1291277SA	2 000 000,00	17.08.2020	18.08.2025	4,93	1291289SA	1 000 000,00	23.10.2020	23.10.2024	3,62	3,68	3,73	3,79	3,82	3,84	3,85
1291278SA	4 000 000,00	21.08.2020	21.08.2025	4,95	1291293SA	1 000 000,00	20.11.2020	20.11.2024	3,63	3,70	3,74	3,80	3,82	3,84	3,86
1291282SA	1 300 000,00	28.09.2020	29.09.2025	4,95	1291295SA	10 000 000,00	30.11.2020	02.12.2025	4,35	4,46	4,53	4,64	4,68	4,71	4,74
1291284SA	1 000 000,00	29.09.2020	29.09.2025	4,95	1291296SA	18 000 000,00	14.12.2020	16.12.2024	3,56	3,65	3,69	3,76	3,79	3,81	3,83
1291287SA	1 000 000,00	19.10.2020	20.10.2025	4,95	1291297SA	3 000 000,00	18.12.2020	18.12.2025	4,44	4,55	4,60	4,69	4,73	4,76	4,78
1291288SA	3 000 000,00	23.10.2020	23.10.2024	3,97	1291299SA	3 000 000,00	29.12.2020	30.12.2024	3,56	3,64	3,69	3,76	3,79	3,81	3,83
1291290SA	1 500 000,00	30.10.2020	30.10.2025	4,95	1291303SA	1 900 000,00	29.01.2021	29.01.2026	4,42	4,45	4,56	4,66	4,70	4,73	4,76
1291292SA	1 500 000,00	16.11.2020	17.11.2025	4,95	1291304SA	3 000 000,00	01.02.2021	02.02.2026	4,33	4,37	4,49	4,61	4,66	4,69	4,72
1291294SA	9 000 000,00	30.11.2020	02.12.2024	3,98	1291307SA	9 200 000,00	01.03.2021	02.03.2026	4,32	4,40	4,51	4,62	4,66	4,70	4,73
1291300SA	10 500 000,00	29.12.2020	30.12.2024	3,97	1291308SA	1 000 000,00	09.03.2021	09.03.2026	4,42	4,49	4,58	4,67	4,71	4,74	4,77
1291301SA	1 000 000,00	25.01.2021	27.01.2025	3,98	1291312SA	21 450 000,00	29.03.2021	30.03.2026	4,34	4,40	4,51	4,62	4,67	4,70	4,74
1291305SA	1 000 000,00	03.02.2021	03.02.2025	3,98	1291310SA	6 500 000,00	26.03.2021	26.03.2026	4,43	4,49	4,58	4,68	4,72	4,75	4,77
1371661SA	1 500 000,00	13.02.2023	13.02.2026	2,81	1291311SA	21 000 000,00	29.03.2021	31.03.2025	3,55	3,60	3,67	3,75	3,78	3,80	3,83
1372184SA	1 500 000,00	15.02.2023	15.02.2026	2,81	1291314SA	2 000 000,00	20.04.2021	20.04.2026	4,43	4,52	4,59	4,68	4,72	4,75	4,77
1375581SA	1 000 000,00	03.03.2023	03.03.2026	2,79	1291315SA	5 500 000,00	30.04.2021	30.04.2026	4,43	4,52	4,60	4,69	4,72	4,75	4,77
1378013SA	2 000 000,00	16.03.2023	16.03.2026	2,81	1291317SA	4 500 000,00	31.05.2021	29.05.2026	4,43	4,53	4,59	4,68	4,72	4,75	4,77
1379522SA	2 500 000,00	23.03.2023	23.03.2026	2,81	1291318SA	5 700 000,00	27.09.2021	28.09.2026	4,33	4,40	4,51	4,62	4,66	4,70	4,73
1381906SA	8 000 000,00	03.04.2023	03.04.2026	2,80	1291319SA	2 800 000,00	29.10.2021	29.10.2026	4,46	4,55	4,62	4,71	4,75	4,78	4,81
1384708SA	1 200 000,00	19.04.2023	20.04.2026	2,75	1291321SA	2 200 000,00	14.12.2021	14.12.2026	4,47	4,58	4,63	4,72	4,76	4,79	4,81

138697 1SA	1 500 000,00	27.04. 2023	27.04.2 026	2,80	134858 5SA	2 500 000,00	04.11. 2022	04.05.2 025	2,34	2,37	2,39	2,42	2,43	2,43	2,44
138754 9SA	2 500 000,00	02.05. 2023	04.05.2 026	2,75	135150 1SA	8 800 000,00	18.11. 2022	18.11.2 025	2,78	2,82	2,85	2,89	2,90	2,91	2,92
139055 5SA	3 000 000,00	19.05. 2023	19.05.2 026	2,80	135922 6SA	23 300 000,00	16.12. 2022	16.12.2 025	2,79	2,84	2,86	2,89	2,91	2,92	2,93
139221 9SA	3 500 000,00	26.05. 2023	26.05.2 026	2,79	138983 4SA	1 000 000,00	16.05. 2023	19.05.2 026	2,73	2,79	2,82	2,86	2,88	2,90	2,91
139351 4SA	1 000 000,00	01.06. 2023	01.06.2 025	1,91	139639 0SA	2 500 000,00	16.06. 2023	16.06.2 026	2,79	2,83	2,85	2,89	2,90	2,91	2,92
139677 5SA	1 000 000,00	19.06. 2023	19.06.2 025	1,90	140292 8SA	4 500 000,00	13.07. 2023	13.07.2 026	2,78	2,79	2,84	2,88	2,89	2,90	2,92
139835 0SA	2 500 000,00	26.06. 2023	26.06.2 026	2,79	143643 8SA	1 000 000,00	18.12. 2023	18.12.2 026	2,79	2,83	2,85	2,89	2,90	2,91	2,92
139834 5SA	14 500 000,00	26.06. 2023	26.06.2 026	2,79	146629 7SA	4 700 000,00	26.04. 2024	26.04.2 027	2,79	2,82	2,85	2,89	2,90	2,91	2,92
139955 9SA	1 000 000,00	29.06. 2023	30.12.2 024	1,41	146734 8SA	1 700 000,00	02.05. 2024	03.05.2 027	2,73	2,79	2,82	2,86	2,88	2,89	2,91
140432 6SA	3 600 000,00	20.07. 2023	20.07.2 026	2,79	147004 1SA	1 500 000,00	20.05. 2024	20.05.2 027	2,79	2,83	2,86	2,89	2,91	2,92	2,93
140446 5SA	6 000 000,00	21.07. 2023	21.07.2 026	2,79	147004 5SA	1 000 000,00	20.05. 2024	20.05.2 027	2,79	2,83	2,86	2,89	2,91	2,92	2,93
140477 1SA	4 000 000,00	24.07. 2023	24.07.2 026	2,80	147021 1SA	7 500 000,00	21.05. 2024	21.05.2 027	2,79	2,83	2,86	2,89	2,91	2,92	2,93
140592 8SA	2 000 000,00	26.07. 2023	26.07.2 026	2,79	147914 5SA	3 900 000,00	26.06. 2024	28.06.2 027	2,74	2,79	2,82	2,86	2,88	2,89	2,91
140771 1SA	2 000 000,00	01.08. 2023	27.07.2 026	2,79	147629 7SA	4 100 000,00	17.06. 2024	17.06.2 027	2,79	2,83	2,86	2,89	2,91	2,92	2,93
140822 3SA	1 000 000,00	03.08. 2023	03.08.2 026	2,80											
141250 0SA	1 000 000,00	30.08. 2023	31.08.2 026	2,74											
141429 2SA	2 000 000,00	11.09. 2023	11.09.2 026	2,79											
141568 0SA	1 200 000,00	18.09. 2023	18.09.2 026	2,79											
141698 8SA	3 000 000,00	25.09. 2023	25.09.2 026	2,79											
141880 7SA	3 000 000,00	29.09. 2023	29.09.2 026	2,79											
141969 3SA	1 500 000,00	03.10. 2023	05.10.2 026	2,74											
142627 1SA	1 000 000,00	02.11. 2023	02.11.2 025	1,90											
142627 7SA	1 460 000,00	02.11. 2023	02.11.2 026	2,80											
142877 3SA	2 000 000,00	16.11. 2023	16.11.2 026	2,80											
142929 7SA	1 400 000,00	20.11. 2023	20.11.2 026	2,80											
143294 0SA	1 000 000,00	04.12. 2023	04.12.2 025	1,91											
143528 0SA	2 500 000,00	13.12. 2023	14.12.2 026	2,77											
143643 9SA	1 000 000,00	18.12. 2023	18.12.2 025	1,92											
143882 3SA	2 000 000,00	27.12. 2023	28.12.2 026	2,79											
143990 2SA	4 400 000,00	29.12. 2023	29.12.2 026	2,83											
144367 9SA	2 000 000,00	22.01. 2024	22.01.2 027	2,82											
144535 1SA	4 000 000,00	26.01. 2024	26.01.2 027	2,83											
144696 7SA	1 600 000,00	01.02. 2024	02.02.2 026	1,89											
145287 2SA	1 000 000,00	28.02. 2024	26.02.2 027	2,81											
145378 6SA	1 200 000,00	04.03. 2024	04.03.2 027	2,82											
145659 7SA	1 800 000,00	18.03. 2024	18.03.2 026	1,91											
145681 6SA	1 500 000,00	19.03. 2024	19.03.2 027	2,82											
145841 7SA	3 500 000,00	25.03. 2024	25.03.2 027	2,82											
146034 5SA	3 000 000,00	02.04. 2024	02.04.2 027	2,82											
146063 0SA	1 700 000,00	03.04. 2024	03.04.2 027	2,82											
146380 7SA	1 000 000,00	19.04. 2024	20.04.2 026	1,88											
146950 8SA	1 000 000,00	16.05. 2024	16.05.2 027	2,82											
147132 1SA	2 300 000,00	27.05. 2024	27.05.2 027	2,81											
147348 8SA	1 800 000,00	03.06. 2024	03.06.2 027	2,81											
147665 7SA	1 000 000,00	18.06. 2024	18.06.2 026	1,91											

Table 3. Duration analysis

Duration	Dec 2024	Jan25 - Jun25	Jul25-Dec25	Jan26 - Jun26	Jul26 - Dec26	Jan27 - Jun27	Jul27 - Dec27
Fixed	3,09	3,09	3,09	3,09	3,09	3,09	3,09
Variable	3,62	3,68	3,74	3,81	3,84	3,86	3,88
Weighted Duration	Dec 2024	Jan25 - Jun25	Jul25-Dec25	Jan26 - Jun26	Jul26 - Dec26	Jan27 - Jun27	Jul27 - Dec27
Fixed	3,34	3,34	3,34	3,34	3,34	3,34	3,34
Variable	3,65	3,71	3,77	3,85	3,88	3,90	3,92

Table 4. Durations table

Business line loans	Fixed rate	Variable rate
PT Auto	58	9
PT MG	0	3
SP MG	0	25
PT Pessoal	10	0
Total	68	37

Table 5. Loans composition breakdown

Business line loans	Fixed rate	Variable rate	Total
PT Auto	€ 175 720 000,00	€ 40 300 000,00	€ 216 020 000,00
PT MG	0	€ 27 500 000,00	€ 27 500 000,00
SP MG	0	€ 139 950 000,00	€ 139 950 000,00
PT Pessoal	€ 11 400 000,00	0	€ 11 400 000,00
Total	€ 187 120 000,00	€ 207 750 000,00	€ 394 870 000,00

Table 6. Loans composition breakdown 2

	PT Auto fixed interest inflow	PT Auto fixed interest outflow	PT Auto net interest income
Dec 2024	€ 2 291 611,02	€ 395 650,19	€ 1 895 960,83
Jan 2025	€ 2 263 145,89	€ 391 129,57	€ 1 872 016,32
Feb 2025	€ 2 234 627,70	€ 390 902,07	€ 1 843 725,63
Mar 2025	€ 2 206 090,55	€ 390 674,57	€ 1 815 415,98
Apr 2025	€ 2 177 659,02	€ 390 674,57	€ 1 786 984,45
May 2025	€ 2 149 110,52	€ 390 674,57	€ 1 758 435,95
Jun 2025	€ 2 120 488,68	€ 390 674,57	€ 1 729 814,11
Jul 2025	€ 2 091 873,59	€ 390 674,57	€ 1 701 199,02
Aug 2025	€ 2 063 231,43	€ 384 449,16	€ 1 678 782,27
Sep 2025	€ 2 034 662,54	€ 377 851,66	€ 1 656 810,88
Oct 2025	€ 2 006 180,06	€ 377 178,27	€ 1 629 001,79
Nov 2025	€ 1 977 699,25	€ 376 454,98	€ 1 601 244,27
Dec 2025	€ 1 949 296,22	€ 376 015,82	€ 1 573 280,40

Jan 2026	€ 1 920 958,06	€ 376 015,82	€ 1 544 942,24
Feb 2026	€ 1 892 649,87	€ 376 015,82	€ 1 516 634,05
Mar 2026	€ 1 864 374,17	€ 366 511,37	€ 1 497 862,80
Apr 2026	€ 1 836 131,46	€ 348 449,45	€ 1 487 682,01
May 2026	€ 1 807 957,14	€ 312 718,76	€ 1 495 238,38
Jun 2026	€ 1 779 845,29	€ 281 835,21	€ 1 498 010,08
Jul 2026	€ 1 751 777,31	€ 220 723,36	€ 1 531 053,95
Aug 2026	€ 1 723 757,51	€ 158 799,55	€ 1 564 957,96
Sep 2026	€ 1 695 859,26	€ 151 879,59	€ 1 543 979,67
Oct 2026	€ 1 668 042,82	€ 118 620,54	€ 1 549 422,28
Nov 2026	€ 1 640 363,21	€ 113 219,50	€ 1 527 143,71
Dec 2026	€ 1 612 792,25	€ 96 575,69	€ 1 516 216,56
Jan 2027	€ 1 585 340,85	€ 70 434,61	€ 1 514 906,24
Feb 2027	€ 1 557 980,84	€ 52 723,31	€ 1 505 257,53
Mar 2027	€ 1 530 695,40	€ 49 580,44	€ 1 481 114,96
Apr 2027	€ 1 503 542,66	€ 30 412,92	€ 1 473 129,74
May 2027	€ 1 476 063,22	€ 16 248,21	€ 1 459 815,01
Jun 2027	€ 1 447 793,79	€ 5 718,75	€ 1 442 075,04
Jul 2027	€ 1 420 768,97	€ -	€ 1 420 768,97
Aug 2027	€ 1 392 335,41	€ -	€ 1 392 335,41
Sep 2027	€ 1 363 920,81	€ -	€ 1 363 920,81
Oct 2027	€ 1 337 453,18	€ -	€ 1 337 453,18
Nov 2027	€ 1 311 181,10	€ -	€ 1 311 181,10
Dec 2027	€ 1 285 314,54	€ -	€ 1 285 314,54

Table 7. PT Auto fixed NII

	PT Auto E6M interest inflow	PT Auto E6M interest outflow	PT Auto E6M net interest income
Dec 2024	€ 154 592,62	€ 124 687,49	€ 29 905,13
Jan 2025	€ 154 029,84	€ 101 668,76	€ 52 361,07
Feb 2025	€ 151 833,43	€ 101 668,76	€ 50 164,66
Mar 2025	€ 151 428,88	€ 101 668,76	€ 49 760,12
Apr 2025	€ 148 403,89	€ 101 668,76	€ 46 735,13
May 2025	€ 146 451,68	€ 101 668,76	€ 44 782,92
Jun 2025	€ 144 052,91	€ 101 668,76	€ 42 384,15
Jul 2025	€ 143 160,71	€ 84 552,17	€ 58 608,54
Aug 2025	€ 139 236,37	€ 84 552,17	€ 54 684,20
Sep 2025	€ 138 286,85	€ 84 552,17	€ 53 734,68
Oct 2025	€ 142 337,23	€ 64 179,92	€ 78 157,31
Nov 2025	€ 135 144,02	€ 64 179,92	€ 70 964,10
Dec 2025	€ 136 481,66	€ 64 179,92	€ 72 301,74
Jan 2026	€ 131 308,23	€ 48 070,04	€ 83 238,19
Feb 2026	€ 131 594,83	€ 48 070,04	€ 83 524,79
Mar 2026	€ 127 756,57	€ 48 070,04	€ 79 686,53
Apr 2026	€ 131 916,88	€ 34 762,28	€ 97 154,61
May 2026	€ 123 595,74	€ 34 762,28	€ 88 833,46
Jun 2026	€ 123 188,47	€ 34 762,28	€ 88 426,19
Jul 2026	€ 121 243,87	€ 30 255,48	€ 90 988,40
Aug 2026	€ 124 119,66	€ 30 255,48	€ 93 864,18
Sep 2026	€ 116 305,10	€ 30 255,48	€ 86 049,63
Oct 2026	€ 114 732,10	€ 30 255,48	€ 84 476,62
Nov 2026	€ 120 648,30	€ 30 255,48	€ 90 392,82
Dec 2026	€ 141 828,91	€ 30 255,48	€ 111 573,43
Jan 2027	€ 108 147,19	€ 26 494,10	€ 81 653,09
Feb 2027	€ 105 449,35	€ 26 494,10	€ 78 955,25

Mar 2027	€ 107 282,58	€ 26 494,10	€ 80 788,49
Apr 2027	€ 99 320,90	€ 26 494,10	€ 72 826,81
May 2027	€ 147 020,27	€ 19 857,55	€ 127 162,72
Jun 2027	€ 213 287,56	€ 5 536,08	€ 207 751,48
Jul 2027	€ 81 166,01	€ -	€ 81 166,01
Aug 2027	€ 80 056,94	€ -	€ 80 056,94
Sep 2027	€ 85 000,92	€ -	€ 85 000,92
Oct 2027	€ 84 742,33	€ -	€ 84 742,33
Nov 2027	€ 82 313,34	€ -	€ 82 313,34
Dec 2027	€ 78 225,73	€ -	€ 78 225,73

Table 8. PT Auto E6M NII

	PT MG E6M interest inflow	PT MG E6M interest outflow	PT MG Net interest income
Dec 2024	€ 25 122,13	€ 105 489,03	-€ 80 366,90
Jan 2025	€ 24 971,49	€ 91 575,83	-€ 66 604,35
Feb 2025	€ 40 566,74	€ 91 575,83	-€ 51 009,10
Mar 2025	€ 24 347,06	€ 91 575,83	-€ 67 228,77
Apr 2025	€ 24 133,76	€ 22 083,33	€ 2 050,43
May 2025	€ 36 152,84	€ 22 083,33	€ 14 069,50
Jun 2025	€ 23 080,93	€ 22 083,33	€ 997,59
Jul 2025	€ 22 785,70	€ 17 583,41	€ 5 202,29
Aug 2025	€ 37 854,20	€ 17 583,41	€ 20 270,79
Sep 2025	€ 22 645,69	€ 17 583,41	€ 5 062,28
Oct 2025	€ 22 150,78	€ 17 583,41	€ 4 567,37
Nov 2025	€ 22 058,79	€ 17 583,41	€ 4 475,38
Dec 2025	€ 22 035,49	€ 17 583,41	€ 4 452,08
Jan 2026	€ 29 364,12	€ 13 199,94	€ 16 164,18
Feb 2026	€ 41 135,34	€ 13 199,94	€ 27 935,40
Mar 2026	€ 30 957,44	€ 13 199,94	€ 17 757,51
Apr 2026	€ 20 450,00	€ 13 199,94	€ 7 250,07
May 2026	€ 20 157,24	€ 9 144,13	€ 11 013,11
Jun 2026	€ 20 034,14	€ 9 144,13	€ 10 890,01
Jul 2026	€ 19 474,85	€ 7 960,44	€ 11 514,41
Aug 2026	€ 32 998,64	€ -	€ 32 998,64
Sep 2026	€ 93 791,18	€ -	€ 93 791,18
Oct 2026	€ 17 505,25	€ -	€ 17 505,25
Nov 2026	€ 17 249,18	€ -	€ 17 249,18
Dec 2026	€ 16 052,32	€ -	€ 16 052,32
Jan 2027	€ 15 970,64	€ -	€ 15 970,64
Feb 2027	€ 28 928,22	€ -	€ 28 928,22
Mar 2027	€ 15 115,44	€ -	€ 15 115,44
Apr 2027	€ 14 271,10	€ -	€ 14 271,10
May 2027	€ 13 470,11	€ -	€ 13 470,11
Jun 2027	€ 14 149,09	€ -	€ 14 149,09
Jul 2027	€ 26 549,63	€ -	€ 26 549,63
Aug 2027	€ 23 582,88	€ -	€ 23 582,88
Sep 2027	€ 13 266,20	€ -	€ 13 266,20
Oct 2027	€ 13 129,21	€ -	€ 13 129,21
Nov 2027	€ 13 291,14	€ -	€ 13 291,14
Dec 2027	€ 12 689,40	€ -	€ 12 689,40

Table 9. PT MG NII

	SP MG E6M interest inflow	SP MG E6M interest outflow	SP MG Net interest income
Dec 2024	€ 160 904,68	€ 517 748,78	-€ 356 844,11
Jan 2025	€ 165 093,07	€ 358 171,93	-€ 193 078,86
Feb 2025	€ 156 802,83	€ 358 171,93	-€ 201 369,10
Mar 2025	€ 155 412,60	€ 358 171,93	-€ 202 759,33
Apr 2025	€ 162 955,04	€ 358 171,93	-€ 195 216,89
May 2025	€ 168 732,41	€ 358 171,93	-€ 189 439,52
Jun 2025	€ 149 300,09	€ 350 796,93	-€ 201 496,83
Jul 2025	€ 162 539,96	€ 293 200,24	-€ 130 660,27
Aug 2025	€ 144 119,53	€ 293 200,24	-€ 149 080,71
Sep 2025	€ 142 992,44	€ 293 200,24	-€ 150 207,80
Oct 2025	€ 152 254,92	€ 293 200,24	-€ 140 945,32
Nov 2025	€ 139 142,70	€ 286 506,51	-€ 147 363,80
Dec 2025	€ 174 738,91	€ 264 296,11	-€ 89 557,21
Jan 2026	€ 136 240,72	€ 133 409,83	€ 2 830,89
Feb 2026	€ 134 771,38	€ 129 279,80	€ 5 491,57
Mar 2026	€ 133 205,10	€ 122 900,34	€ 10 304,76
Apr 2026	€ 130 854,29	€ 57 846,78	€ 73 007,52
May 2026	€ 139 229,34	€ 46 930,53	€ 92 298,81
Jun 2026	€ 127 476,48	€ 36 147,61	€ 91 328,87
Jul 2026	€ 159 777,97	€ 27 612,62	€ 132 165,34
Aug 2026	€ 123 903,76	€ 27 612,62	€ 96 291,13
Sep 2026	€ 121 817,15	€ 27 612,62	€ 94 204,52
Oct 2026	€ 121 094,72	€ 17 211,90	€ 103 882,82
Nov 2026	€ 142 232,69	€ 12 789,97	€ 129 442,72
Dec 2026	€ 133 311,19	€ 12 789,97	€ 120 521,22
Jan 2027	€ 116 151,65	€ 6 886,97	€ 109 264,67
Feb 2027	€ 114 447,73	€ 6 886,97	€ 107 560,76
Mar 2027	€ 113 545,88	€ 6 886,97	€ 106 658,91
Apr 2027	€ 108 836,38	€ 6 886,97	€ 101 949,41
May 2027	€ 102 179,81	€ 6 886,97	€ 95 292,84
Jun 2027	€ 132 143,33	€ 5 546,65	€ 126 596,68
Jul 2027	€ 116 678,05	€ -	€ 116 678,05
Aug 2027	€ 116 038,93	€ -	€ 116 038,93
Sep 2027	€ 104 757,29	€ -	€ 104 757,29
Oct 2027	€ 103 875,46	€ -	€ 103 875,46
Nov 2027	€ 122 143,84	€ -	€ 122 143,84
Dec 2027	€ 146 864,89	€ -	€ 146 864,89

Table 10. SP MG NII

	E6M Business interest inflow	E6M Business interest outflow	E6M Business net interest income
Dec 2024	€ 340 619,43	€ 747 925,30	-€ 407 305,87
Jan 2025	€ 165 093,07	€ 358 171,93	-€ 193 078,86
Feb 2025	€ 156 802,83	€ 358 171,93	-€ 201 369,10
Mar 2025	€ 155 412,60	€ 358 171,93	-€ 202 759,33
Apr 2025	€ 162 955,04	€ 358 171,93	-€ 195 216,89
May 2025	€ 168 732,41	€ 358 171,93	-€ 189 439,52
Jun 2025	€ 149 300,09	€ 350 796,93	-€ 201 496,83
Jul 2025	€ 162 539,96	€ 293 200,24	-€ 130 660,27
Aug 2025	€ 144 119,53	€ 293 200,24	-€ 149 080,71
Sep 2025	€ 142 992,44	€ 293 200,24	-€ 150 207,80
Oct 2025	€ 152 254,92	€ 293 200,24	-€ 140 945,32
Nov 2025	€ 139 142,70	€ 286 506,51	-€ 147 363,80

Dec 2025	€	174 738,91	€	264 296,11	-€	89 557,21
Jan 2026	€	136 240,72	€	133 409,83	€	2 830,89
Feb 2026	€	134 771,38	€	129 279,80	€	5 491,57
Mar 2026	€	133 205,10	€	122 900,34	€	10 304,76
Apr 2026	€	130 854,29	€	57 846,78	€	73 007,52
May 2026	€	139 229,34	€	46 930,53	€	92 298,81
Jun 2026	€	127 476,48	€	36 147,61	€	91 328,87
Jul 2026	€	159 777,97	€	27 612,62	€	132 165,34
Aug 2026	€	123 903,76	€	27 612,62	€	96 291,13
Sep 2026	€	121 817,15	€	27 612,62	€	94 204,52
Oct 2026	€	121 094,72	€	17 211,90	€	103 882,82
Nov 2026	€	142 232,69	€	12 789,97	€	129 442,72
Dec 2026	€	133 311,19	€	12 789,97	€	120 521,22
Jan 2027	€	116 151,65	€	6 886,97	€	109 264,67
Feb 2027	€	114 447,73	€	6 886,97	€	107 560,76
Mar 2027	€	113 545,88	€	6 886,97	€	106 658,91
Apr 2027	€	108 836,38	€	6 886,97	€	101 949,41
May 2027	€	102 179,81	€	6 886,97	€	95 292,84
Jun 2027	€	132 143,33	€	5 546,65	€	126 596,68
Jul 2027	€	116 678,05	€	-	€	116 678,05
Aug 2027	€	116 038,93	€	-	€	116 038,93
Sep 2027	€	104 757,29	€	-	€	104 757,29
Oct 2027	€	103 875,46	€	-	€	103 875,46
Nov 2027	€	122 143,84	€	-	€	122 143,84
Dec 2027	€	146 864,89	€	-	€	146 864,89

Table 11. NII of all business lines based on E6M combined

	Total interest inflow		Total interest outflow		Total NII	
Dec 2024	€	2 632 230,45	€	1 143 575,49	€	1 488 654,95
Jan 2025	€	2 607 240,28	€	942 546,10	€	1 664 694,19
Feb 2025	€	2 583 830,69	€	942 318,60	€	1 641 512,09
Mar 2025	€	2 537 279,10	€	942 091,10	€	1 595 188,00
Apr 2025	€	2 513 151,71	€	872 598,60	€	1 640 553,12
May 2025	€	2 500 447,45	€	872 598,60	€	1 627 848,85
Jun 2025	€	2 436 922,62	€	865 223,60	€	1 571 699,02
Jul 2025	€	2 420 359,96	€	786 010,39	€	1 634 349,57
Aug 2025	€	2 384 441,53	€	779 784,98	€	1 604 656,55
Sep 2025	€	2 338 587,52	€	773 187,48	€	1 565 400,04
Oct 2025	€	2 322 922,99	€	752 141,83	€	1 570 781,15
Nov 2025	€	2 274 044,77	€	744 724,82	€	1 529 319,95
Dec 2025	€	2 282 552,28	€	722 075,26	€	1 560 477,02
Jan 2026	€	2 217 871,12	€	570 695,62	€	1 647 175,50
Feb 2026	€	2 200 151,41	€	566 565,59	€	1 633 585,82
Mar 2026	€	2 156 293,28	€	550 681,68	€	1 605 611,59
Apr 2026	€	2 119 352,64	€	454 258,44	€	1 665 094,20
May 2026	€	2 090 939,46	€	403 555,69	€	1 687 383,76
Jun 2026	€	2 050 544,38	€	361 889,23	€	1 688 655,14
Jul 2026	€	2 052 274,00	€	286 551,90	€	1 765 722,10
Aug 2026	€	2 004 779,56	€	216 667,65	€	1 788 111,91
Sep 2026	€	2 027 772,69	€	209 747,69	€	1 818 025,00
Oct 2026	€	1 921 374,89	€	166 087,91	€	1 755 286,97
Nov 2026	€	1 920 493,38	€	156 264,94	€	1 764 228,43
Dec 2026	€	1 903 984,67	€	139 621,14	€	1 764 363,53
Jan 2027	€	1 825 610,32	€	103 815,68	€	1 721 794,64

Feb 2027	€	1 806 806,13	€	86 104,38	€	1 720 701,75
Mar 2027	€	1 766 639,31	€	82 961,51	€	1 683 677,80
Apr 2027	€	1 725 971,04	€	63 793,99	€	1 662 177,05
May 2027	€	1 738 733,41	€	42 992,73	€	1 695 740,68
Jun 2027	€	1 807 373,77	€	16 801,48	€	1 790 572,29
Jul 2027	€	1 645 162,66	€	-	€	1 645 162,66
Aug 2027	€	1 612 014,17	€	-	€	1 612 014,17
Sep 2027	€	1 566 945,22	€	-	€	1 566 945,22
Oct 2027	€	1 539 200,18	€	-	€	1 539 200,18
Nov 2027	€	1 528 929,42	€	-	€	1 528 929,42
Dec 2027	€	1 523 094,56	€	-	€	1 523 094,56

Table 12. Total NII

	NET CF=	
Dec 2024	-€	67 717 204,82
Jan 2025	€	1 930 769,54
Feb 2025	€	3 787 904,28
Mar 2025	€	2 523 342,77
Apr 2025	€	3 446 222,11
May 2025	€	3 443 641,75
Jun 2025	€	562 902,32
Jul 2025	-€	12 722 701,83
Aug 2025	-€	12 246 706,04
Sep 2025	€	166 829,74
Oct 2025	€	876 199,23
Nov 2025	€	1 738 154,14
Dec 2025	€	1 096 140,65
Jan 2026	€	2 877 091,29
Feb 2026	€	4 750 726,64
Mar 2026	€	2 495 142,81
Apr 2026	€	3 418 369,99
May 2026	€	3 636 218,27
Jun 2026	€	1 600 633,83
Jul 2026	€	3 021 004,68
Aug 2026	€	5 750 582,06
Sep 2026	€	4 163 436,01
Oct 2026	€	5 430 216,83
Nov 2026	€	5 177 857,57
Dec 2026	€	4 754 971,33
Jan 2027	€	5 356 028,93
Feb 2027	€	6 208 755,38
Mar 2027	€	5 254 487,59
Apr 2027	€	5 566 632,26
May 2027	€	6 186 004,67
Jun 2027	€	6 474 962,66
Jul 2027	€	6 641 413,41
Aug 2027	€	6 605 220,68
Sep 2027	€	6 019 780,67
Oct 2027	€	5 958 898,06
Nov 2027	€	5 897 126,25

Dec 2027	€	6 073 442,20

Table 13. Total Net CF

	Base rate	Spread	Interest rate	Interest rate diff after refinancing	Interest every 6 months	Monthly interest payments after refinancing	Monthly payments difference
27.07.2020	0,490%	0,000%	0,490%	0,000%	€ 15 092,00	€ 2 543,28	€ -
31.07.2020	0,460%	0,000%	0,460%	0,000%	€ 18 400,00	€ 3 100,74	€ -
31.07.2020	0,460%	0,000%	0,460%	0,000%	€ 3 450,00	€ 581,39	€ -
10.08.2020	0,490%	0,000%	0,490%	0,000%	€ 26 950,00	€ 4 541,57	€ -
17.08.2020	0,480%	0,000%	0,480%	0,000%	€ 4 800,00	€ 808,89	€ -
21.08.2020	0,370%	0,000%	0,370%	0,000%	€ 7 400,00	€ 1 247,04	€ -
28.09.2020	0,340%	0,000%	0,340%	0,000%	€ 2 210,00	€ 380,61	€ -
29.09.2020	0,340%	0,000%	0,340%	0,000%	€ 1 700,00	€ 292,78	€ -
19.10.2020	0,340%	0,000%	0,340%	0,000%	€ 1 700,00	€ 291,20	€ -
23.10.2020	0,280%	0,000%	0,280%	0,000%	€ 4 200,00	€ 711,67	€ -
30.10.2020	0,340%	0,000%	0,340%	0,000%	€ 2 550,00	€ 432,08	€ -
16.11.2020	0,340%	0,000%	0,340%	0,000%	€ 2 550,00	€ 439,17	€ -
30.11.2020	0,270%	0,000%	0,270%	0,000%	€ 12 150,00	€ 2 092,50	€ -
29.12.2020	0,270%	0,000%	0,270%	0,000%	€ 14 175,00	€ 2 428,13	€ -
25.01.2021	0,270%	0,000%	0,270%	0,000%	€ 1 350,00	€ 227,50	€ -
03.02.2021	0,270%	0,000%	0,270%	0,000%	€ 1 350,00	€ 227,50	€ -
13.02.2023	2,50%	0,330%	2,830%	-0,960%	€ 21 224,45	€ 3 537,41	-€ 1 252,73
15.02.2023	2,50%	0,330%	2,830%	-0,900%	€ 21 224,45	€ 3 537,41	-€ 1 176,90
03.03.2023	2,50%	0,330%	2,830%	-1,470%	€ 14 149,63	€ 2 358,27	-€ 1 284,78
16.03.2023	2,50%	0,330%	2,830%	-0,930%	€ 28 299,26	€ 4 716,54	-€ 1 619,75
23.03.2023	2,50%	0,330%	2,830%	-1,007%	€ 35 374,08	€ 5 895,68	-€ 2 186,89
03.04.2023	2,50%	0,330%	2,830%	-1,100%	€ 113 197,06	€ 18 866,18	-€ 7 770,49
19.04.2023	2,50%	0,330%	2,830%	-1,210%	€ 16 979,56	€ 2 829,93	-€ 1 322,30
27.04.2023	2,50%	0,330%	2,830%	-1,080%	€ 21 224,45	€ 3 537,41	-€ 1 404,40
02.05.2023	2,50%	0,330%	2,830%	-1,140%	€ 35 374,08	€ 5 895,68	-€ 2 650,85
19.05.2023	2,50%	0,330%	2,830%	-1,140%	€ 42 448,90	€ 7 074,82	-€ 3 015,60
26.05.2023	2,50%	0,330%	2,830%	-1,300%	€ 49 523,71	€ 8 253,95	-€ 3 992,65
01.06.2023	2,50%	0,330%	2,830%	-1,070%	€ 14 149,63	€ 2 358,27	-€ 927,84
19.06.2023	2,50%	0,330%	2,830%	-1,310%	€ 14 149,63	€ 2 358,27	-€ 1 149,23
26.06.2023	2,50%	0,330%	2,830%	-1,390%	€ 35 374,08	€ 5 895,68	-€ 3 091,36
26.06.2023	2,50%	0,330%	2,830%	-1,390%	€ 205 169,67	€ 34 194,94	-€ 17 929,87
29.06.2023	2,50%	0,330%	2,830%	-1,340%	€ 14 149,63	€ 2 358,27	-€ 1 213,26
20.07.2023	2,50%	0,330%	2,830%	-1,390%	€ 50 938,68	€ 8 489,78	-€ 4 310,89
21.07.2023	2,50%	0,330%	2,830%	-1,410%	€ 84 897,79	€ 14 149,63	-€ 7 285,92
24.07.2023	2,50%	0,330%	2,830%	-1,280%	€ 56 598,53	€ 9 433,09	-€ 4 419,13
26.07.2023	2,50%	0,330%	2,830%	-1,310%	€ 28 299,26	€ 4 716,54	-€ 2 260,12
01.08.2023	2,50%	0,330%	2,830%	-1,240%	€ 28 299,26	€ 4 716,54	-€ 2 142,16
03.08.2023	2,50%	0,330%	2,830%	-1,230%	€ 14 149,63	€ 2 358,27	-€ 1 062,65
30.08.2023	2,50%	0,330%	2,830%	-1,300%	€ 14 149,63	€ 2 358,27	-€ 1 140,76
11.09.2023	2,50%	0,330%	2,830%	-1,310%	€ 28 299,26	€ 4 716,54	-€ 2 336,79
18.09.2023	2,50%	0,330%	2,830%	-1,390%	€ 16 979,56	€ 2 829,93	-€ 1 483,85
25.09.2023	2,50%	0,330%	2,830%	-1,420%	€ 42 448,90	€ 7 074,82	-€ 3 786,29
29.09.2023	2,50%	0,330%	2,830%	-1,440%	€ 42 448,90	€ 7 074,82	-€ 3 956,02
03.10.2023	2,50%	0,330%	2,830%	-1,420%	€ 21 224,45	€ 3 537,41	-€ 1 863,63
02.11.2023	2,50%	0,330%	2,830%	-1,240%	€ 14 149,63	€ 2 358,27	-€ 1 146,45
02.11.2023	2,50%	0,330%	2,830%	-1,140%	€ 20 658,46	€ 3 443,08	-€ 1 548,10
16.11.2023	2,50%	0,330%	2,830%	-1,180%	€ 28 299,26	€ 4 716,54	-€ 2 189,57
20.11.2023	2,50%	0,330%	2,830%	-1,150%	€ 19 809,49	€ 3 301,58	-€ 1 444,94
04.12.2023	2,50%	0,330%	2,830%	-0,820%	€ 14 149,63	€ 2 358,27	-€ 734,09

13.12.2023	2,50%	0,330%	2,830%	-0,820%	€ 35 374,08	€ 5 895,68	-€ 1 835,22
18.12.2023	2,50%	0,330%	2,830%	-0,670%	€ 14 149,63	€ 2 358,27	-€ 607,01
27.12.2023	2,50%	0,330%	2,830%	-0,540%	€ 28 299,26	€ 4 716,54	-€ 993,73
29.12.2023	2,50%	0,330%	2,830%	-0,540%	€ 62 258,38	€ 10 376,40	-€ 2 323,51
22.01.2024	2,50%	0,330%	2,830%	-0,780%	€ 28 299,26	€ 4 716,54	-€ 1 366,97
26.01.2024	2,50%	0,330%	2,830%	-0,620%	€ 56 598,53	€ 9 433,09	-€ 2 194,69
01.02.2024	2,50%	0,330%	2,830%	-0,590%	€ 22 639,41	€ 3 773,24	-€ 837,43
28.02.2024	2,50%	0,330%	2,830%	-0,900%	€ 14 149,63	€ 2 358,27	-€ 784,60
04.03.2024	2,50%	0,330%	2,830%	-0,850%	€ 16 979,56	€ 2 829,93	-€ 931,85
18.03.2024	2,50%	0,330%	2,830%	-0,870%	€ 25 469,34	€ 4 244,89	-€ 1 428,44
19.03.2024	2,50%	0,330%	2,830%	-0,850%	€ 21 224,45	€ 3 537,41	-€ 1 164,81
25.03.2024	2,50%	0,330%	2,830%	-0,760%	€ 49 523,71	€ 8 253,95	-€ 2 449,57
02.04.2024	2,50%	0,330%	2,830%	-0,720%	€ 42 448,90	€ 7 074,82	-€ 1 948,10
03.04.2024	2,50%	0,330%	2,830%	-0,740%	€ 24 054,38	€ 4 009,06	-€ 1 132,73
19.04.2024	2,50%	0,330%	2,830%	-0,890%	€ 14 149,63	€ 2 358,27	-€ 827,84
16.05.2024	2,50%	0,330%	2,830%	-0,820%	€ 14 149,63	€ 2 358,27	-€ 784,78
27.05.2024	2,50%	0,330%	2,830%	-0,940%	€ 32 544,15	€ 5 424,03	-€ 1 962,38
03.06.2024	2,50%	0,330%	2,830%	-0,920%	€ 25 469,34	€ 4 244,89	-€ 1 473,86
18.06.2024	2,50%	0,330%	2,830%	-0,790%	€ 14 149,63	€ 2 358,27	-€ 708,67

Table 14. Fixed loans refinancing

	NET CF	NET CF after refinancing
Dec 2024	-€ 67 717 204,82	-€ 67 717 204,82
Jan 2025	€ 1 930 769,54	€ 1 930 769,54
Feb 2025	€ 3 787 904,28	€ 3 787 904,28
Mar 2025	€ 2 523 342,77	€ 2 523 342,77
Apr 2025	€ 3 446 222,11	€ 3 565 865,30
May 2025	€ 3 443 641,75	€ 3 563 284,94
Jun 2025	€ 562 902,32	€ 682 545,52
Jul 2025	-€ 12 722 701,83	-€ 12 605 135,70
Aug 2025	-€ 12 246 706,04	-€ 12 129 139,92
Sep 2025	€ 166 829,74	€ 284 395,87
Oct 2025	€ 876 199,23	€ 993 765,35
Nov 2025	€ 1 738 154,14	€ 1 855 720,27
Dec 2025	€ 1 096 140,65	€ 1 212 560,32
Jan 2026	€ 2 877 091,29	€ 2 992 169,87
Feb 2026	€ 4 750 726,64	€ 4 865 805,22
Mar 2026	€ 2 495 142,81	€ 2 606 954,34
Apr 2026	€ 3 418 369,99	€ 3 523 661,64
May 2026	€ 3 636 218,27	€ 3 730 184,90
Jun 2026	€ 1 600 633,83	€ 1 684 941,37
Jul 2026	€ 3 021 004,68	€ 3 083 582,31
Aug 2026	€ 5 750 582,06	€ 5 792 741,47
Sep 2026	€ 4 163 436,01	€ 4 203 392,01
Oct 2026	€ 5 430 216,83	€ 5 458 609,88
Nov 2026	€ 5 177 857,57	€ 5 204 386,99
Dec 2026	€ 4 754 971,33	€ 4 776 318,14
Jan 2027	€ 5 356 028,93	€ 5 372 223,28
Feb 2027	€ 6 208 755,38	€ 6 221 388,07
Mar 2027	€ 5 254 487,59	€ 5 266 335,68
Apr 2027	€ 5 566 632,26	€ 5 573 934,12
May 2027	€ 6 186 004,67	€ 6 190 225,70
Jun 2027	€ 6 474 962,66	€ 6 476 436,52
Jul 2027	€ 6 641 413,41	€ 6 641 413,41
Aug 2027	€ 6 605 220,68	€ 6 605 220,68

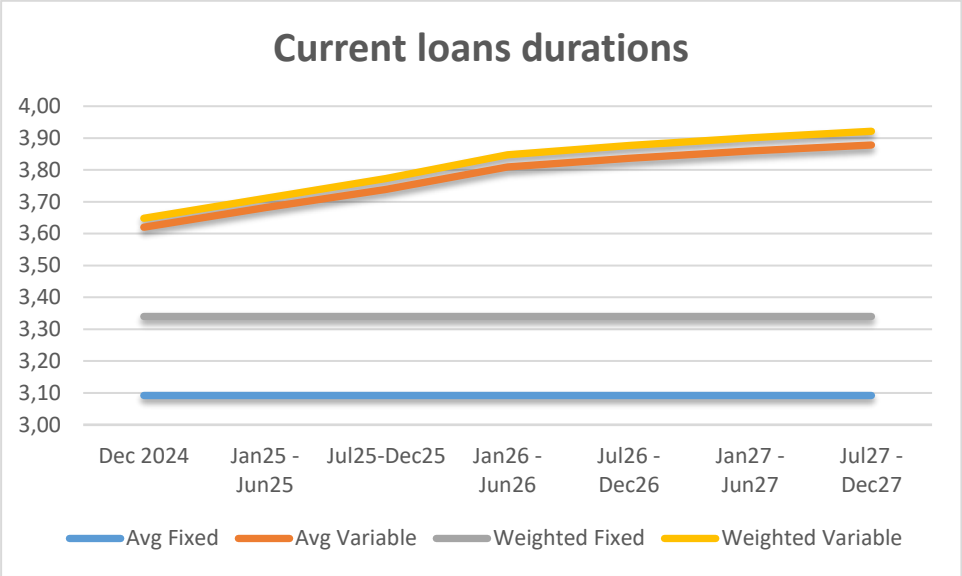
Sep 2027	€ 6 019 780,67	€ 6 019 780,67
Oct 2027	€ 5 958 898,06	€ 5 958 898,06
Nov 2027	€ 5 897 126,25	€ 5 897 126,25
Dec 2027	€ 6 073 442,20	€ 6 073 442,20

Table 15. Net cash flow refinancing comparison

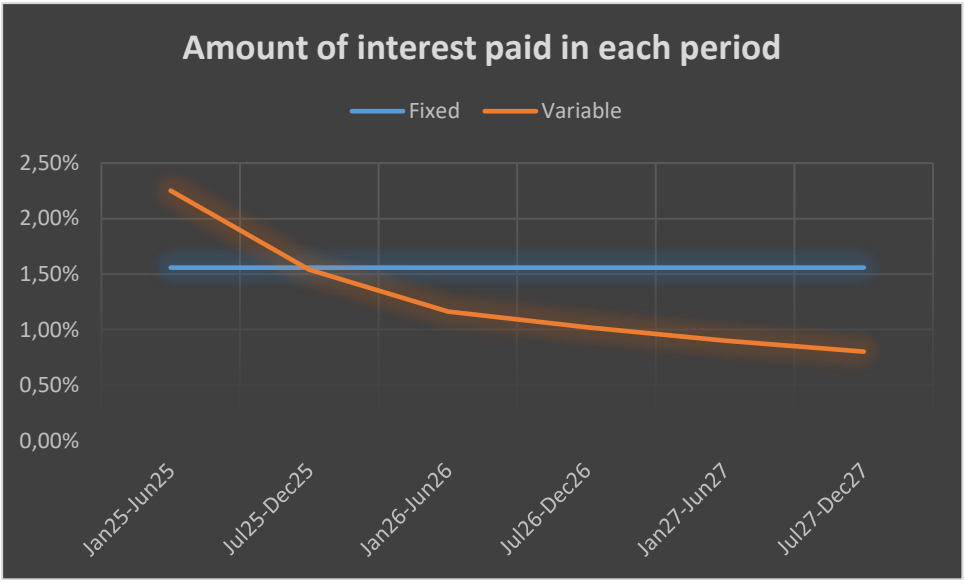
Date	E6M
Dec 2024	2,82%
Jan 2025	2,74%
Feb 2025	2,66%
Mar 2025	2,58%
Apr 2025	2,50%
May 2025	2,43%
Jun 2025	2,36%
Jul 2025	2,42%
Aug 2025	2,50%
Sep 2025	2,80%
Oct 2025	3,00%
Nov 2025	3,15%
Dec 2025	3,42%
Jan 2026	3,77%
Feb 2026	4,14%
Mar 2026	4,28%
Apr 2026	4,43%
May 2026	4,50%
Jun 2026	4,50%
Jul 2026	4,50%
Aug 2026	4,50%
Sep 2026	4,50%
Oct 2026	4,50%
Nov 2026	4,50%
Dec 2026	4,50%
Jan 2027	4,43%
Feb 2027	4,35%
Mar 2027	4,29%
Apr 2027	4,26%
May 2027	4,19%
Jun 2027	4,15%
Jul 2027	4,12%
Aug 2027	4,09%
Sep 2027	4,06%
Oct 2027	4,05%
Nov 2027	4,03%
Dec 2027	4,00%

Table 16. Hypothetical E6M increase

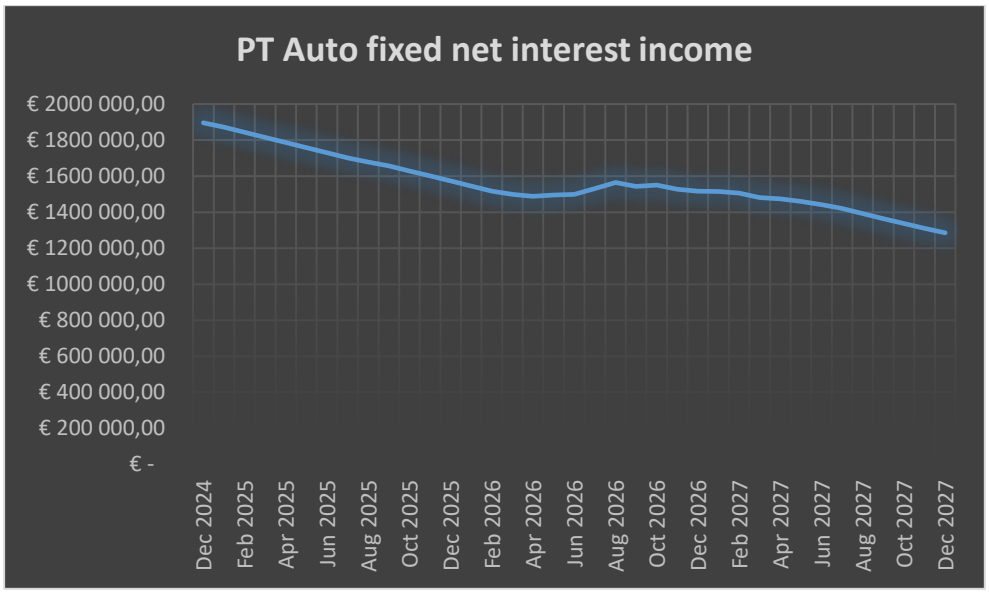
Graphs



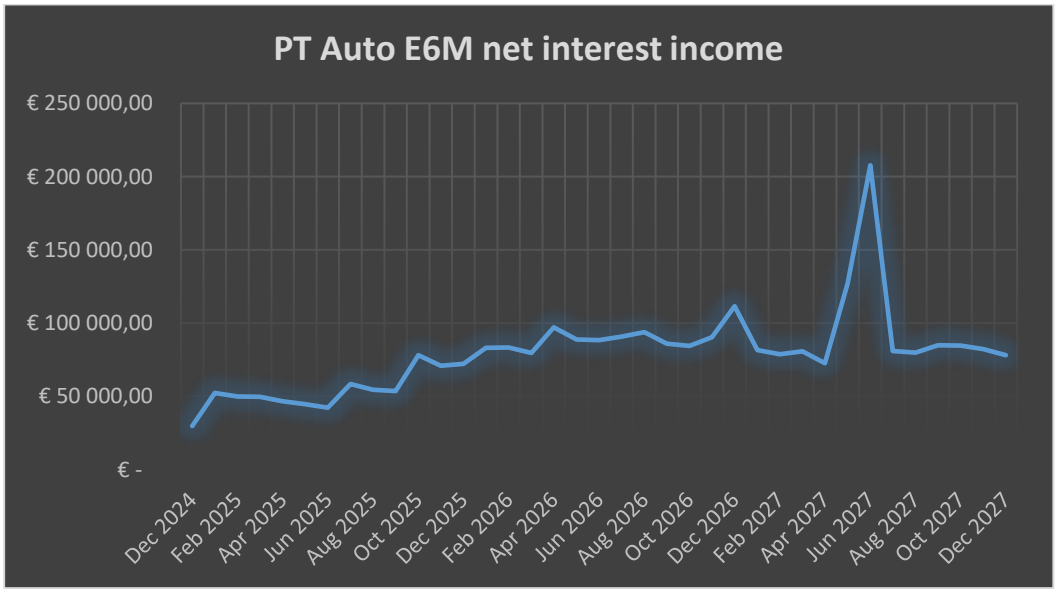
Graph 1. Durations graph



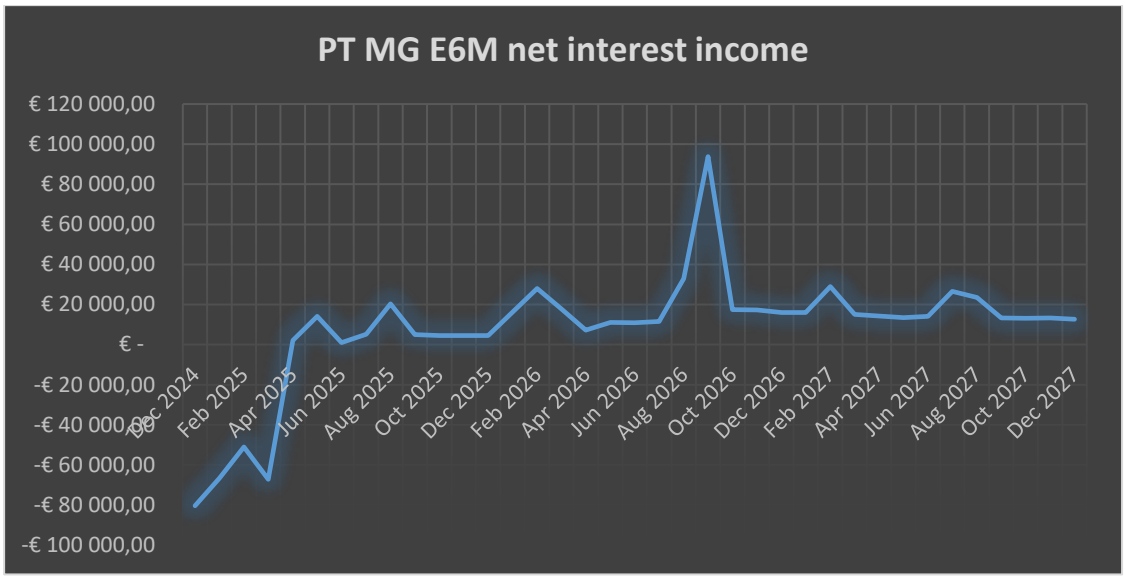
Graph 2. Amount of interest paid in each period



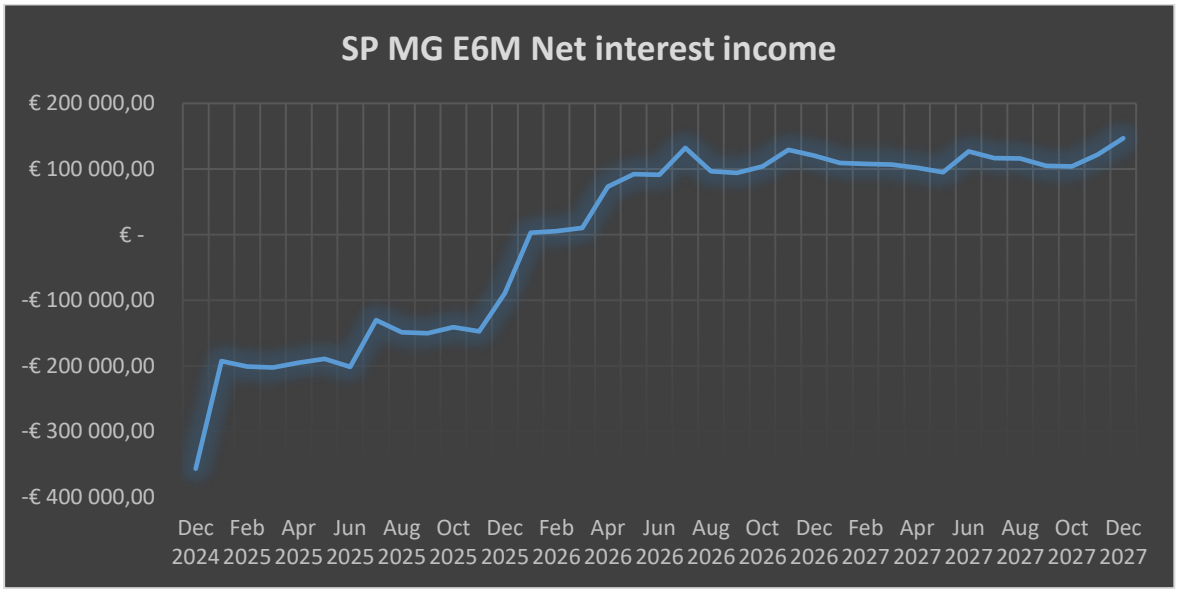
Graph 3. PT Auto fixed NII



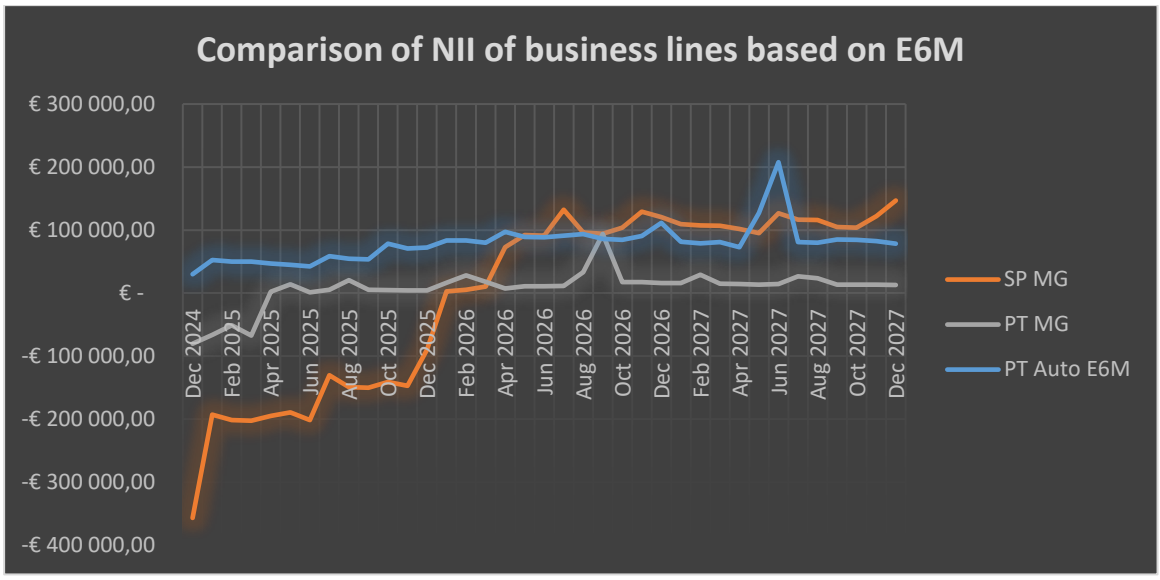
Graph 4. PT Auto E6M NII



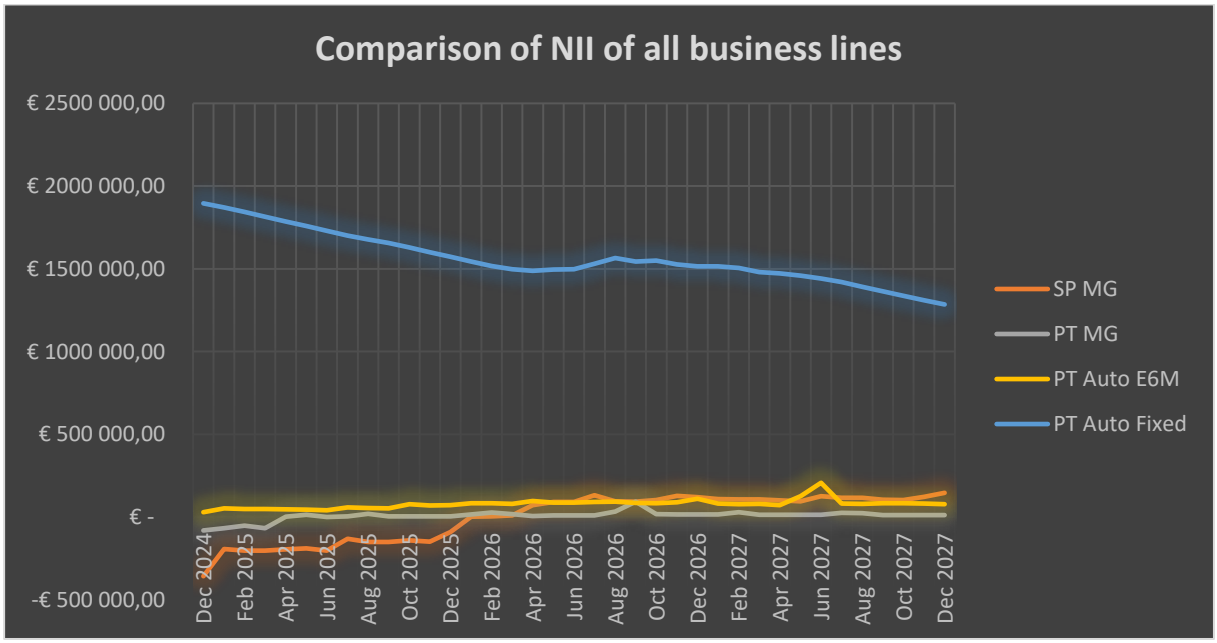
Graph 5. PT MG NII



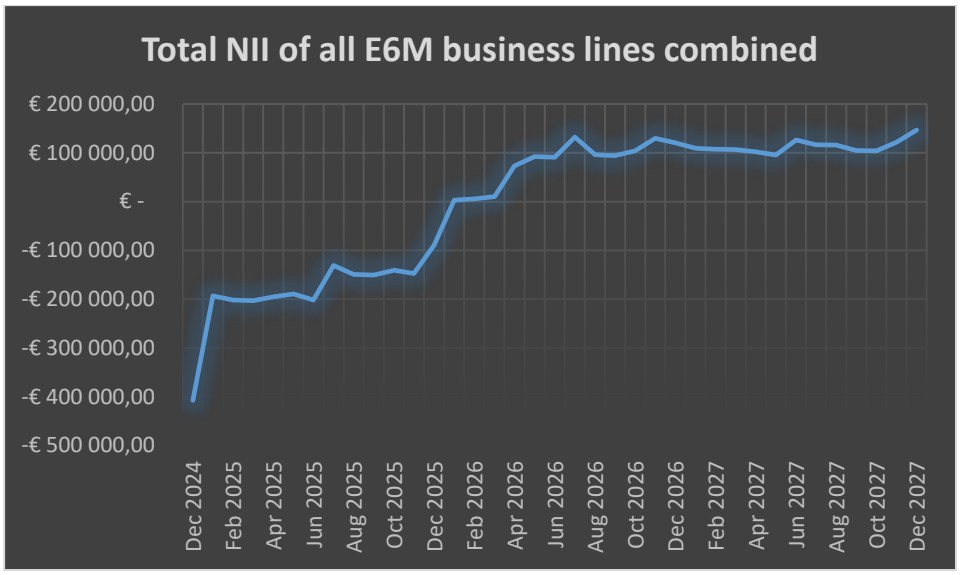
Graph 6. SP MG NII



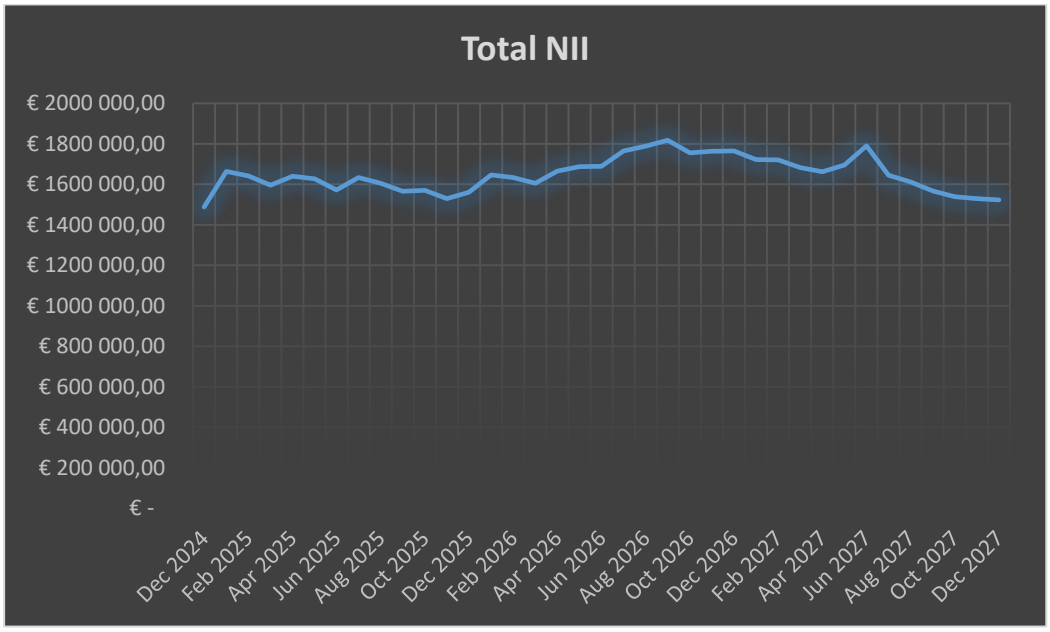
Graph 7. Comparison of NII of business lines based on E6M



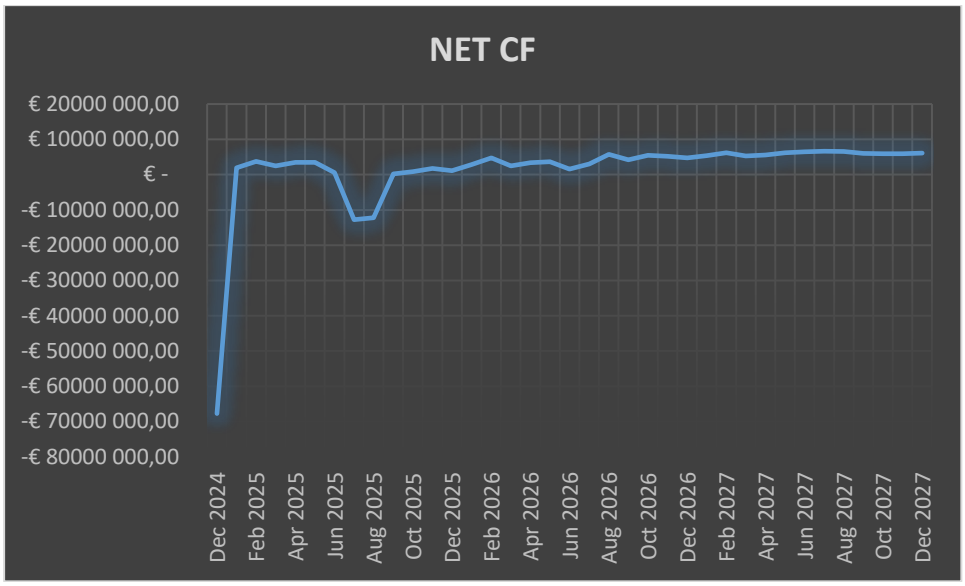
Graph 8. Comparison of NII of all business lines



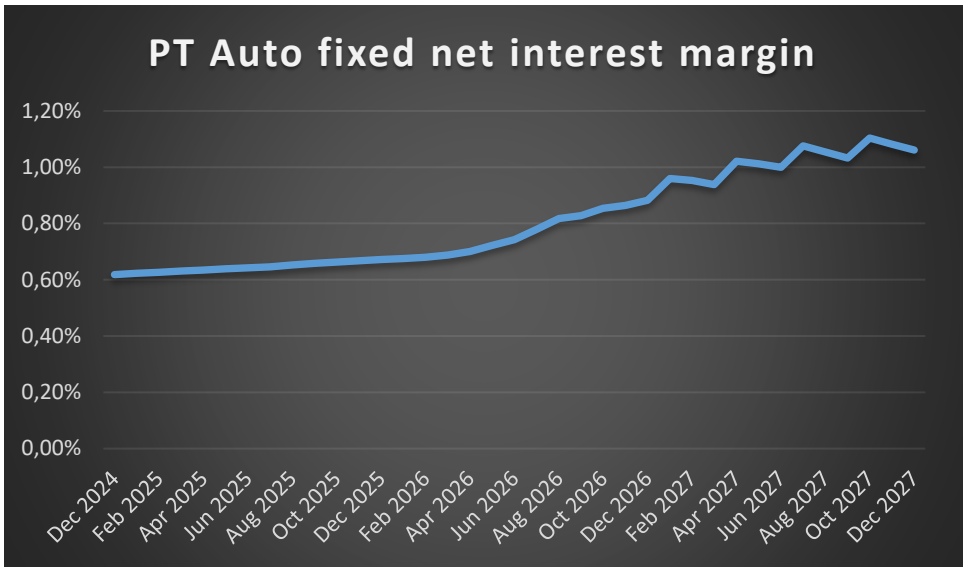
Graph 9. Total NII of all E6M business lines combined



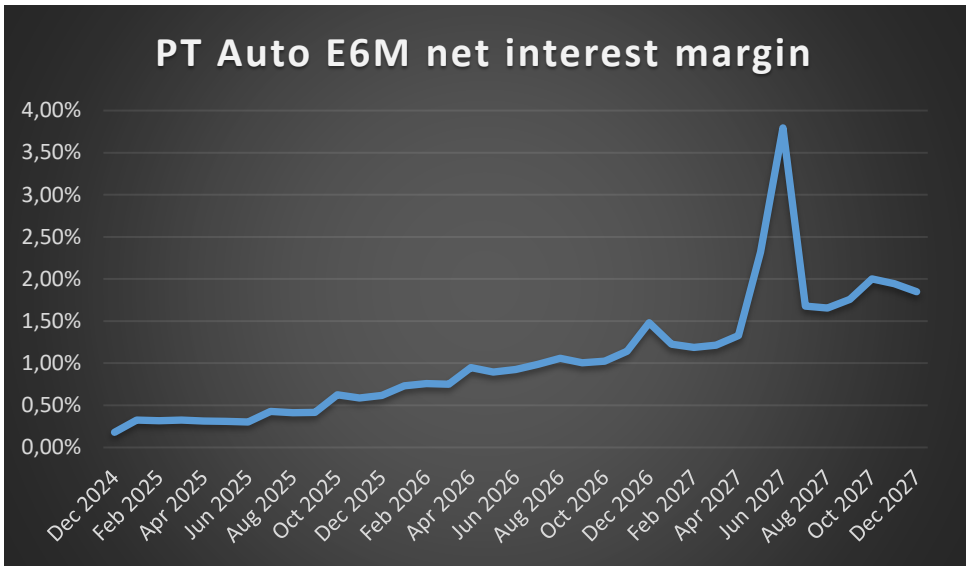
Graph 10. Total NII



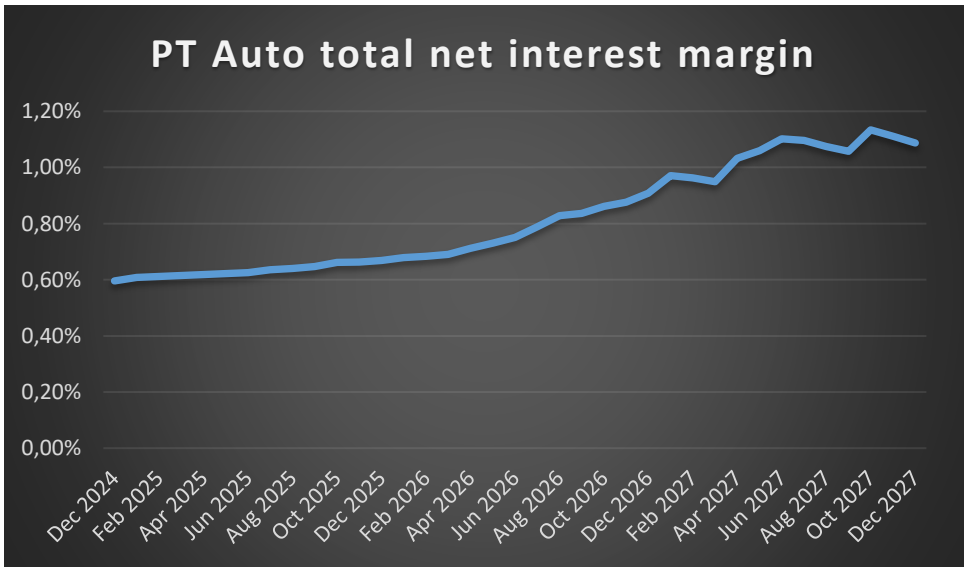
Graph 11. NET CF



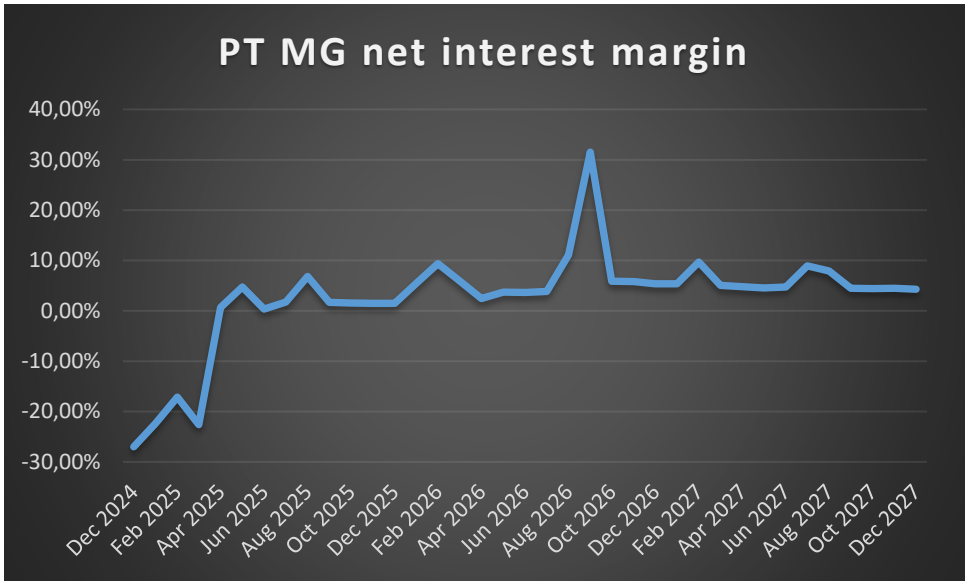
Graph 12. PT Auto fixed net interest margin



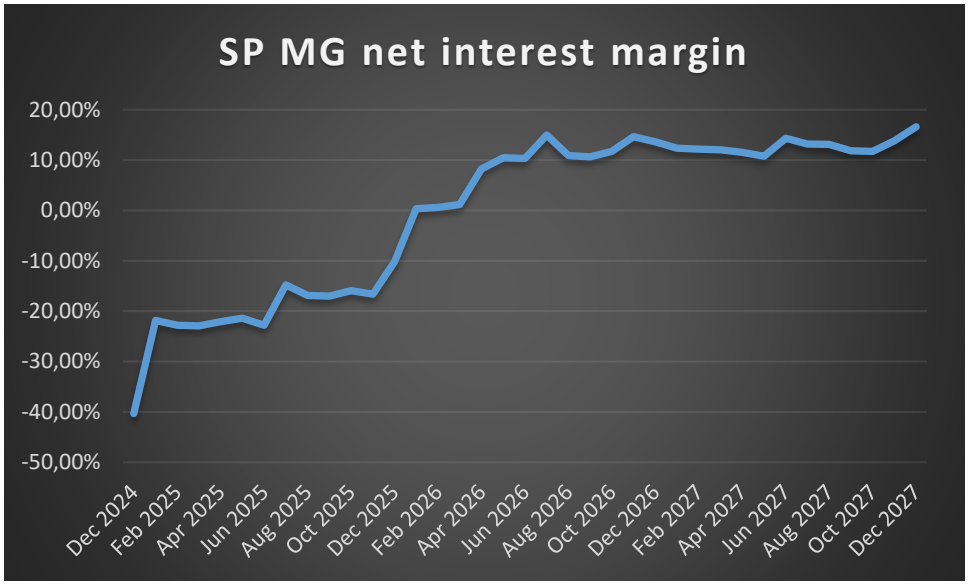
Graph 13. PT auto E6M net interest margin



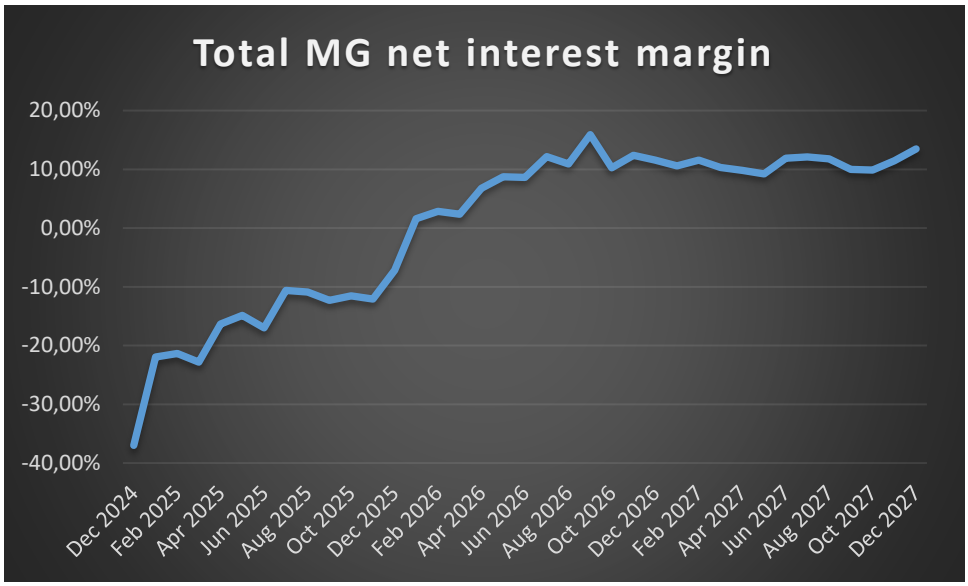
Graph 14. PT Auto total net interest margin



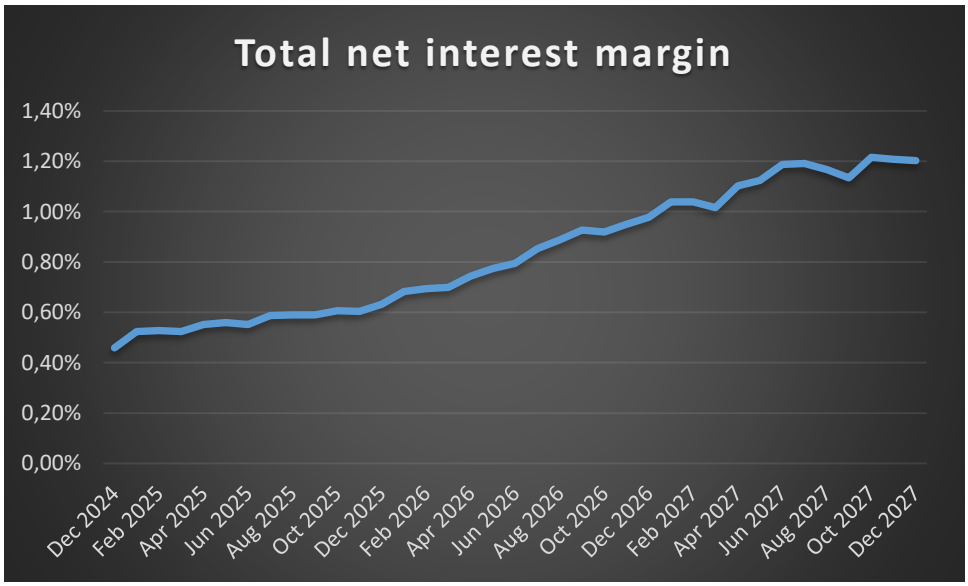
Graph 15. PT MG net interest margin



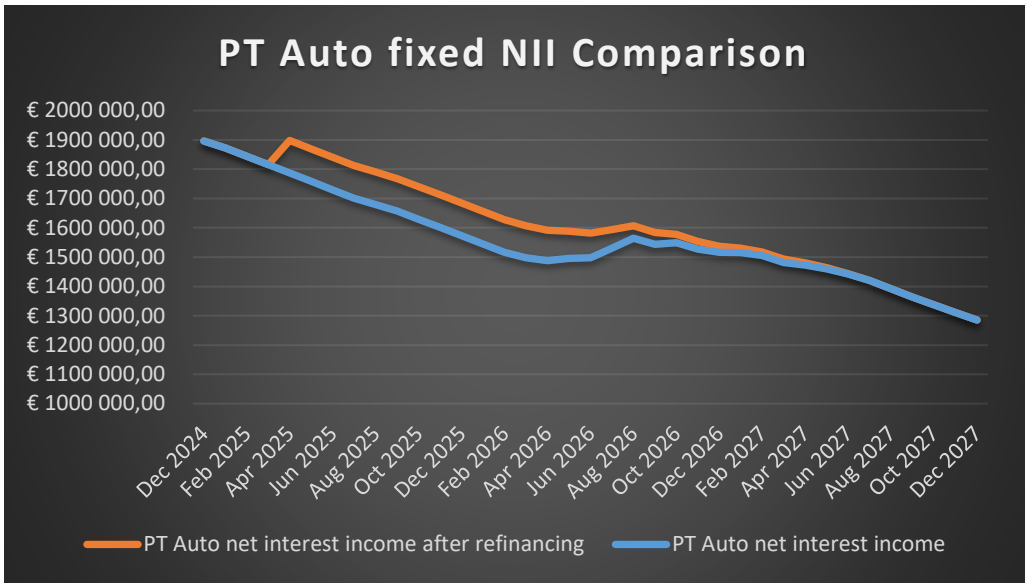
Graph 16. SP MG net interest margin



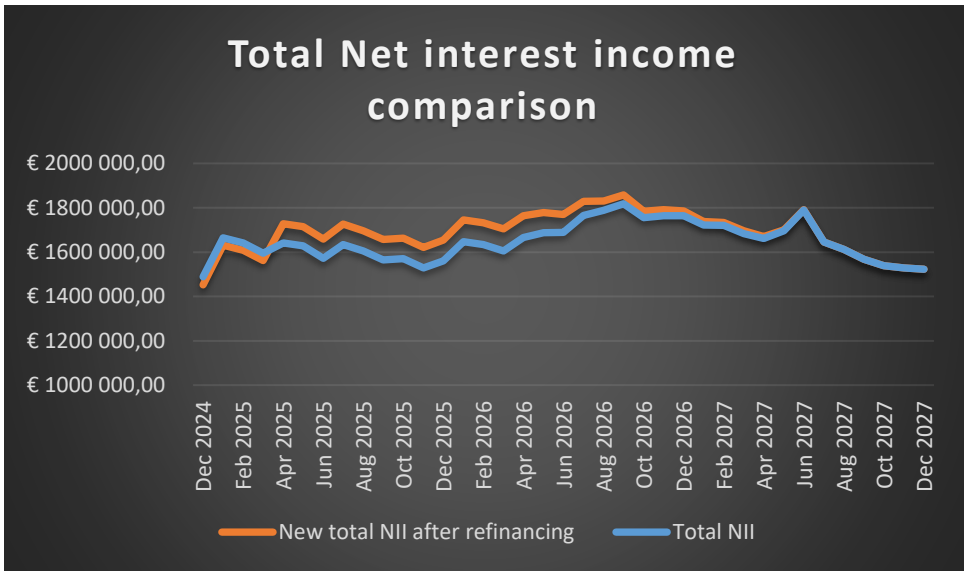
Graph 17. Total MG net interest margin



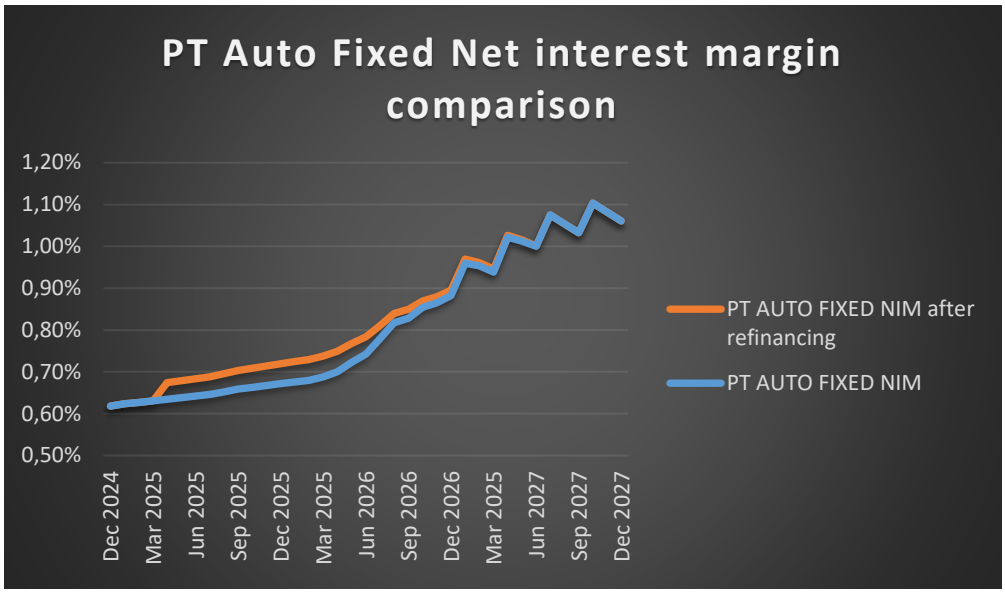
Graph 18. Total net interest margin



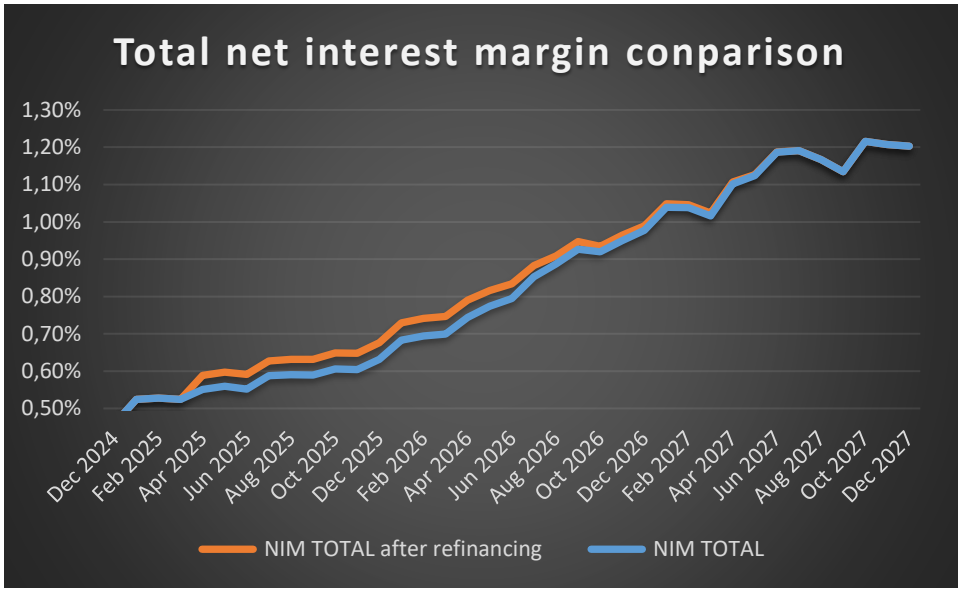
Graph 19. PT Auto NII Comparison



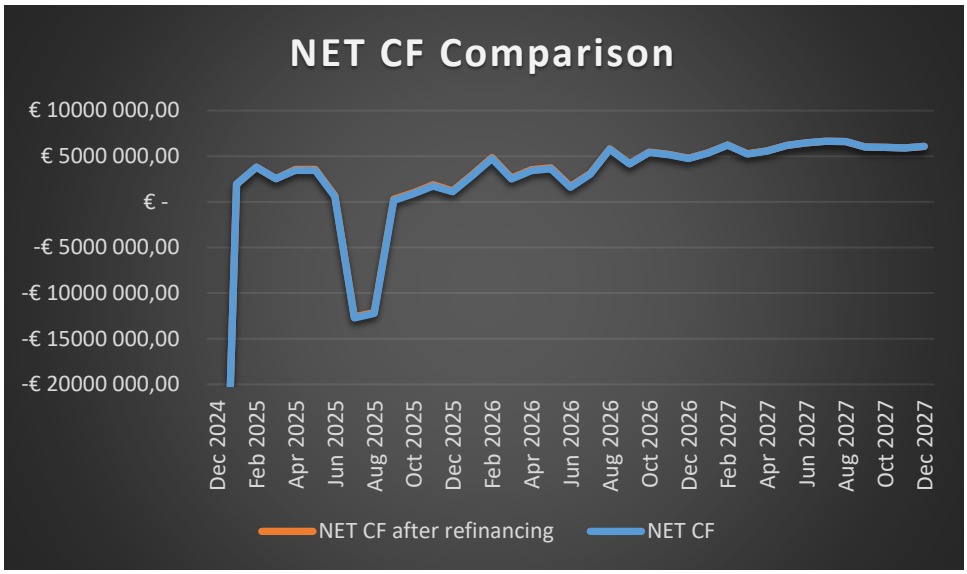
Graph 20. Total NII comparison



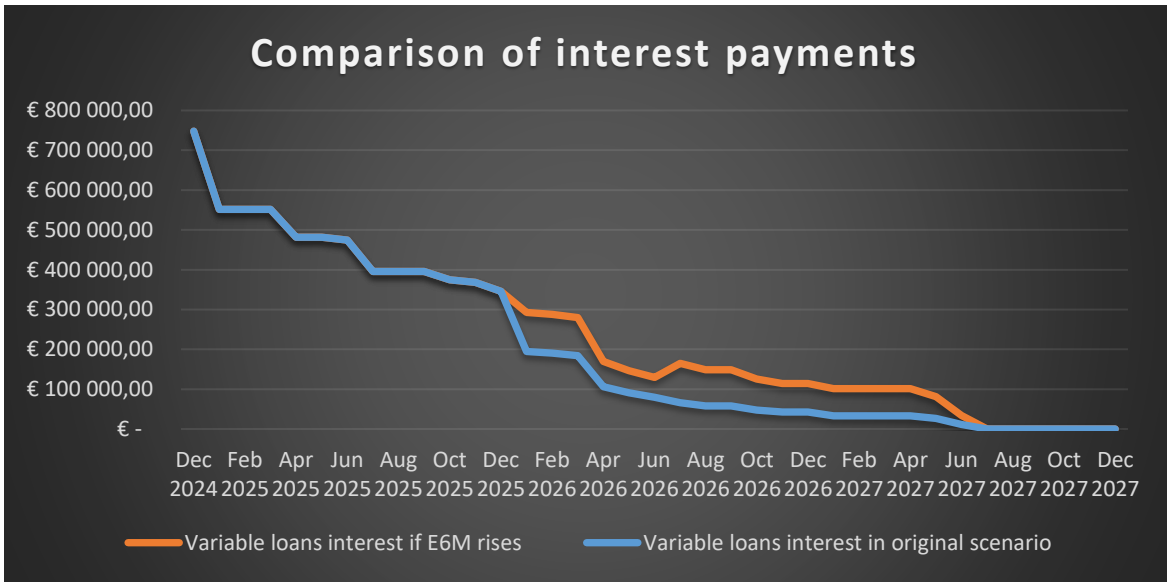
Graph 21. PT Auto fixed NIM comparison



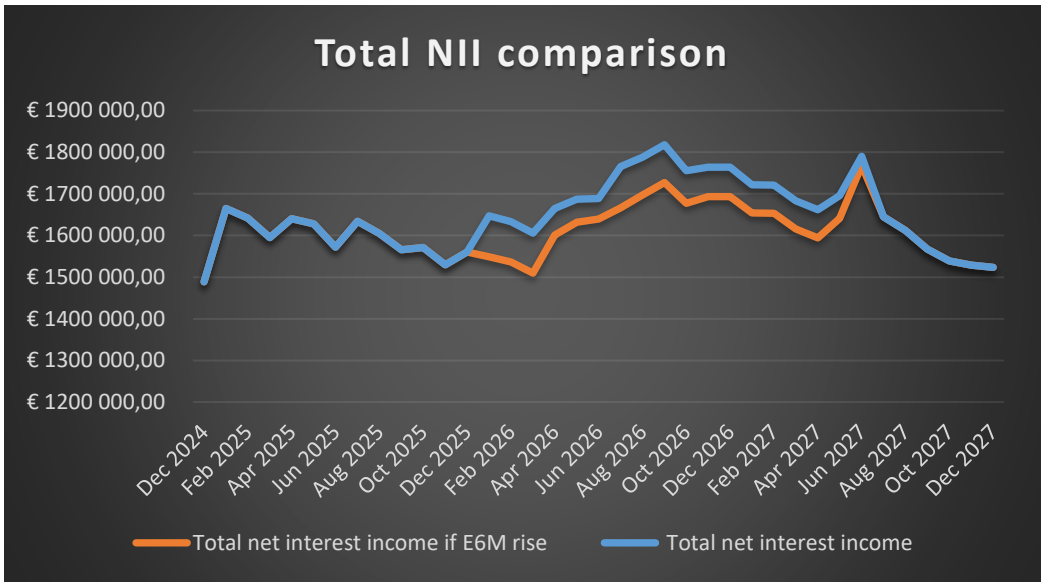
Graph 22. Total NIM comparison



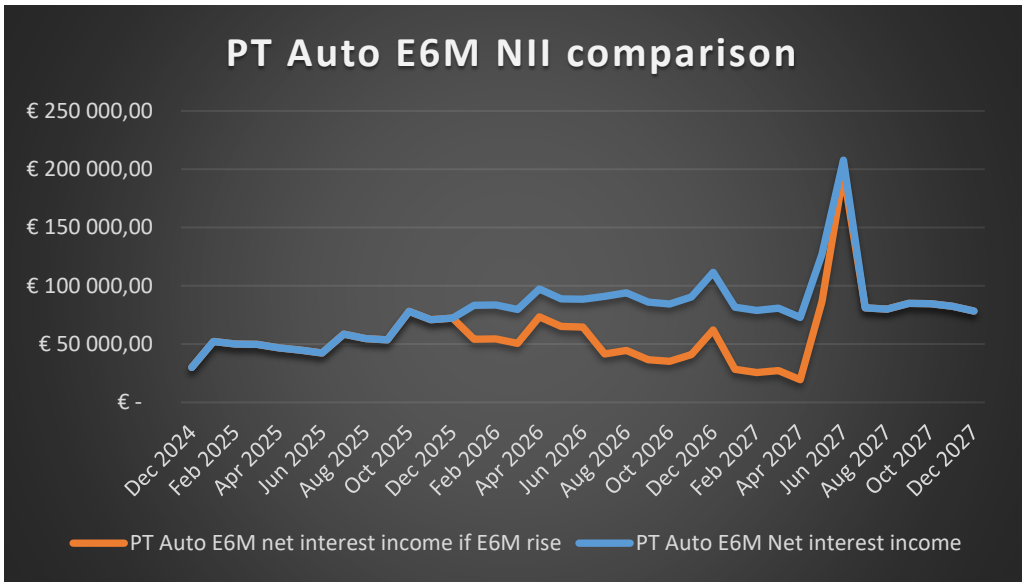
Graph 23. NET CF refinancing comparison



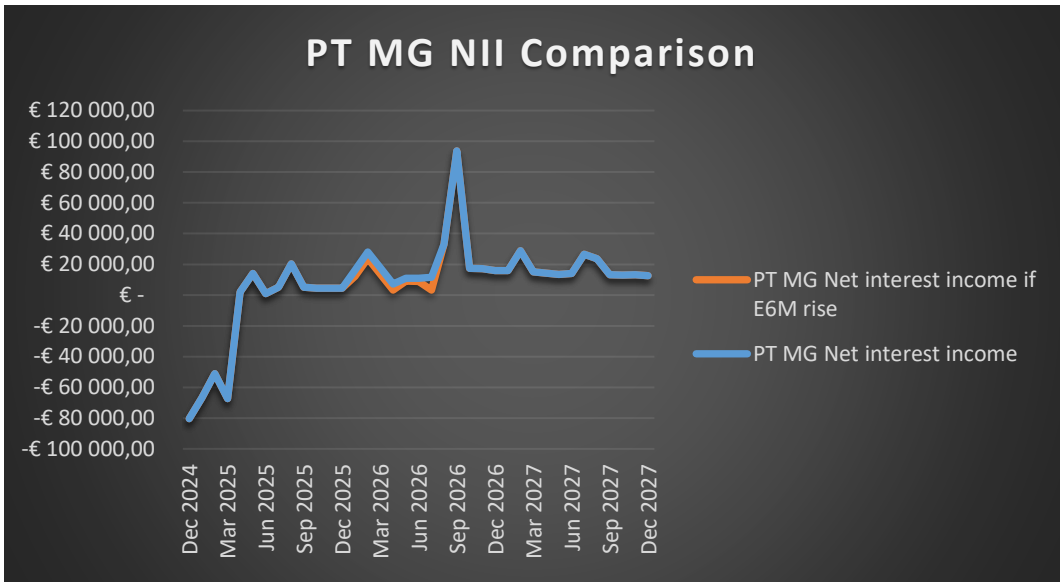
Graph 24. Comparison of interest payments in case of E6M increase



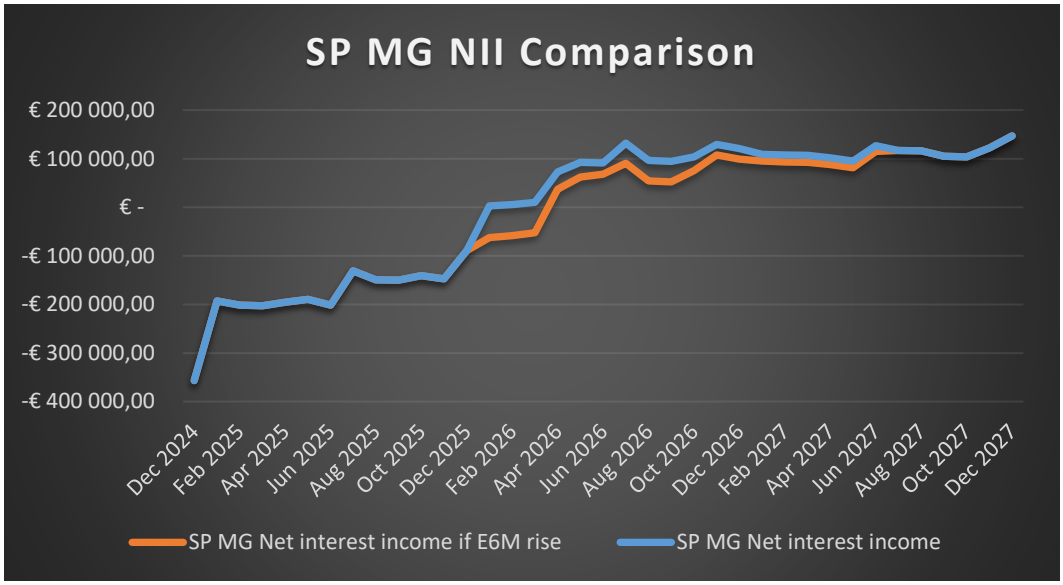
Graph 25. Total net interest income comparison in case of E6M increase



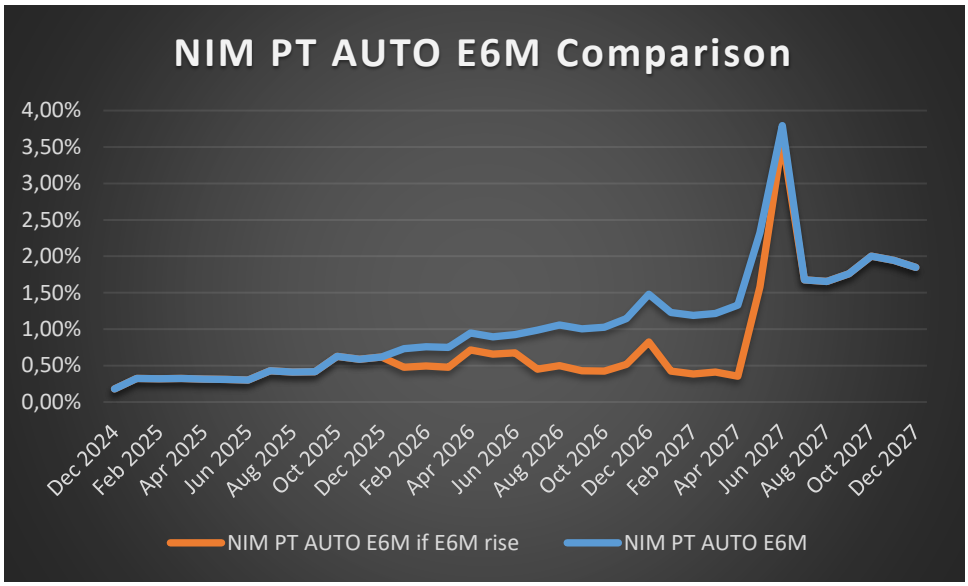
Graph 26. PT Auto E6M net interest income comparison in case of E6M increase



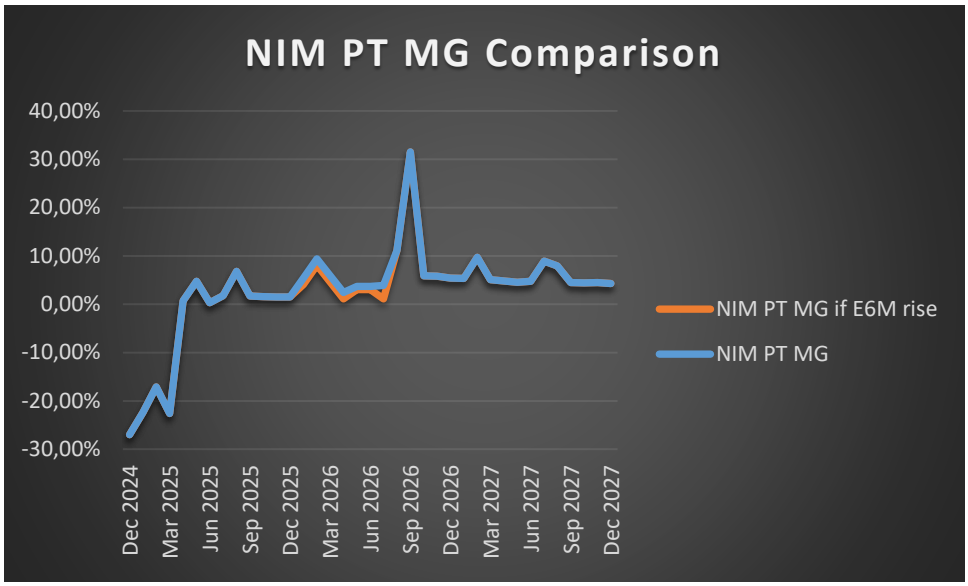
Graph 27. PT MG net interest income comparison in case of E6M increase



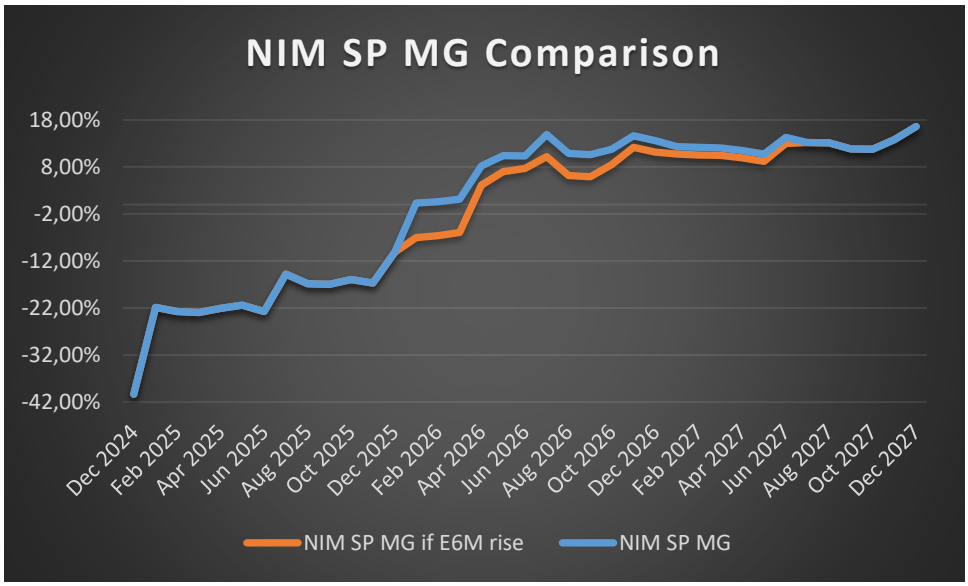
Graph 28. SP MG net interest income comparison in case of E6M increase



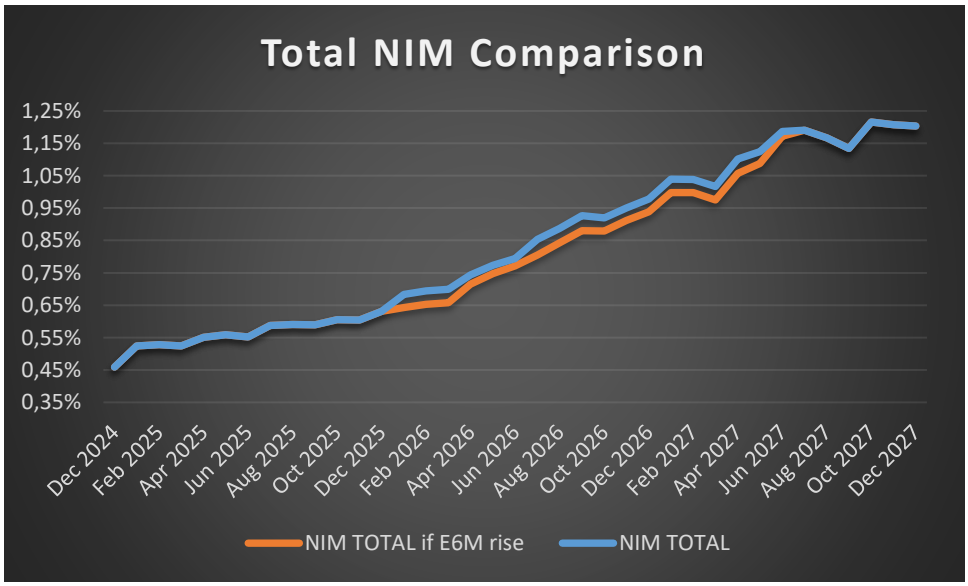
Graph 29. PT Auto net interest margin comparison in case of E6M increase



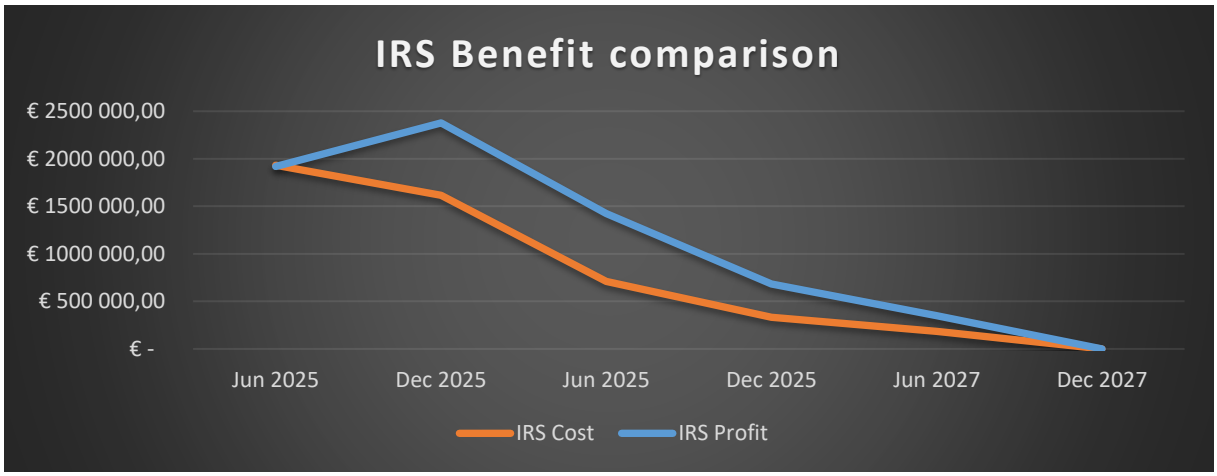
Graph 30. PT MG net interest margin comparison in case of E6M increase



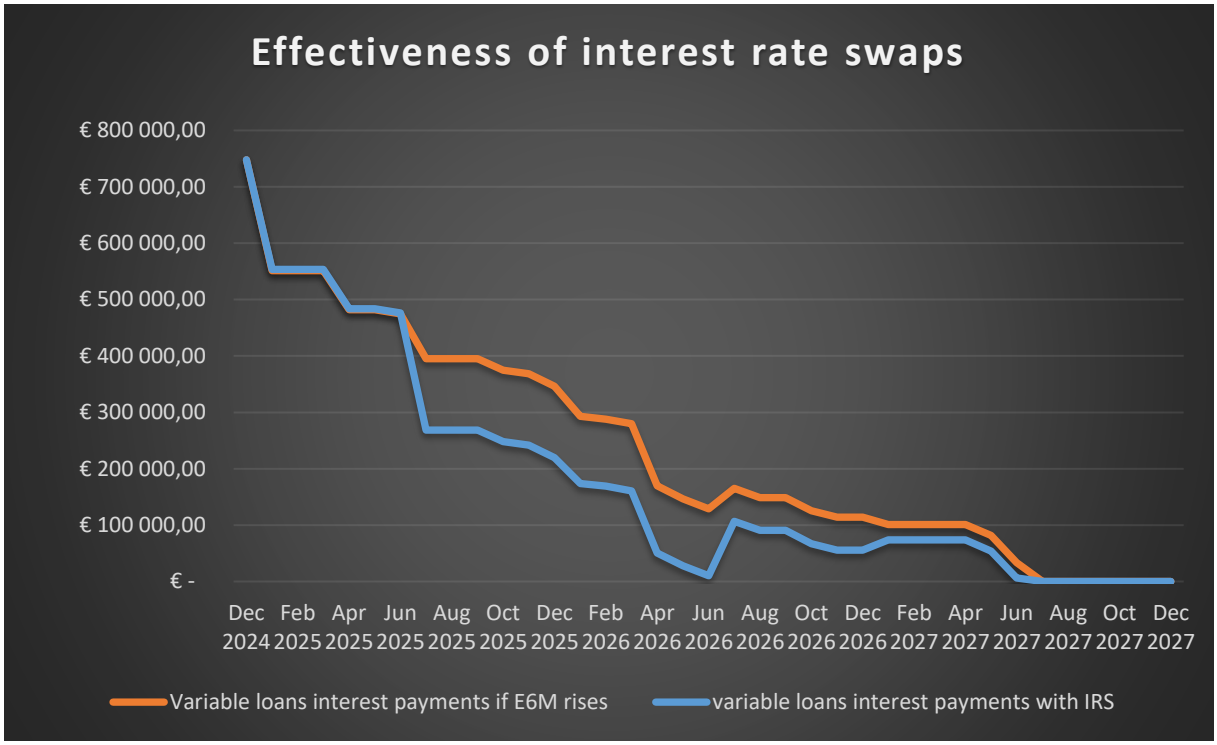
Graph 31. SP MG net interest margin comparison in case of E6M increase



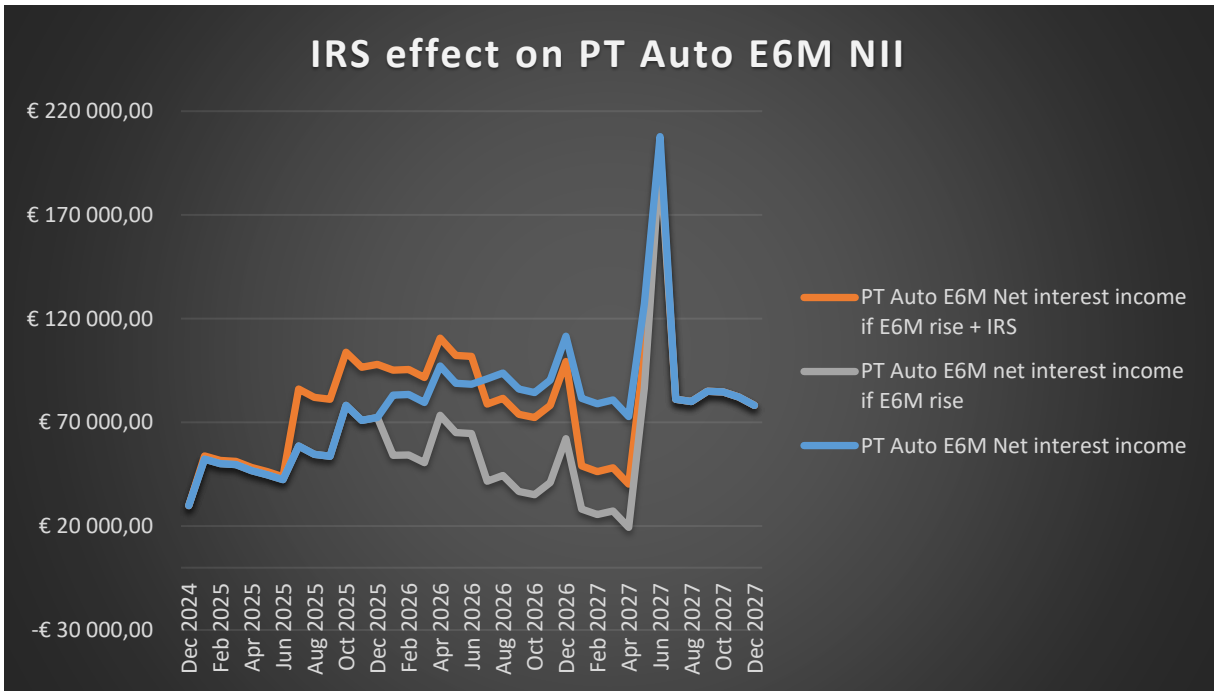
Graph 32. Total net interest margin comparison in case of E6M increase



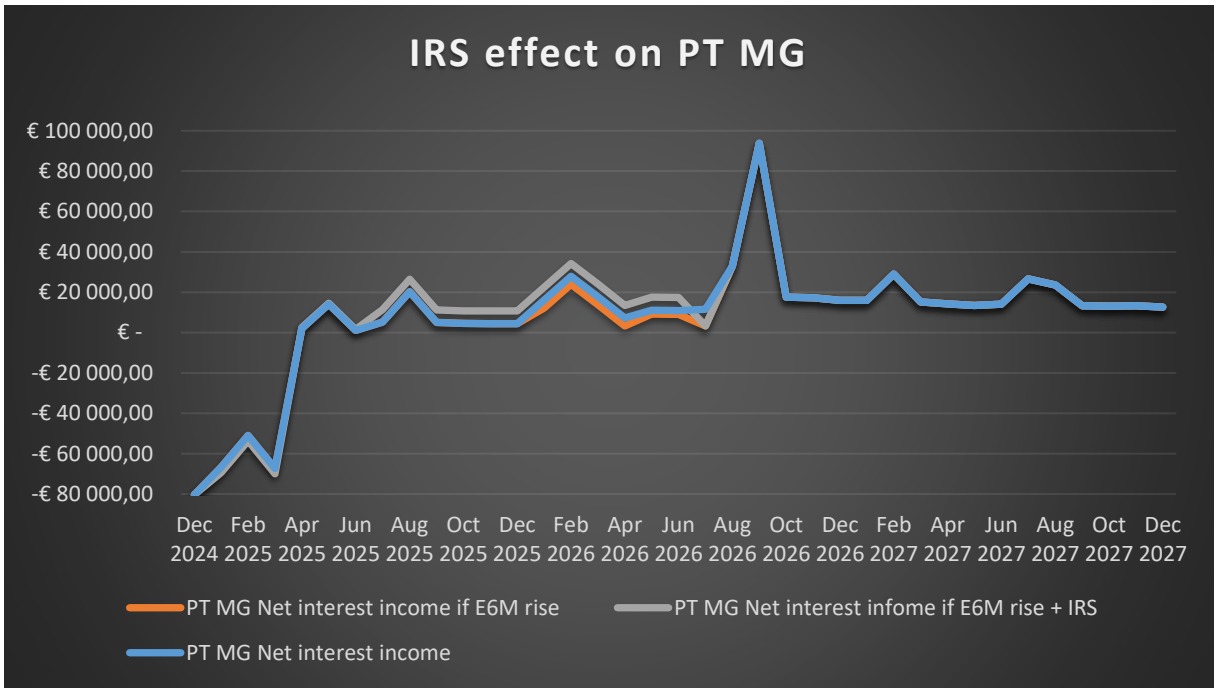
Graph 33. IRS Benefit comparison



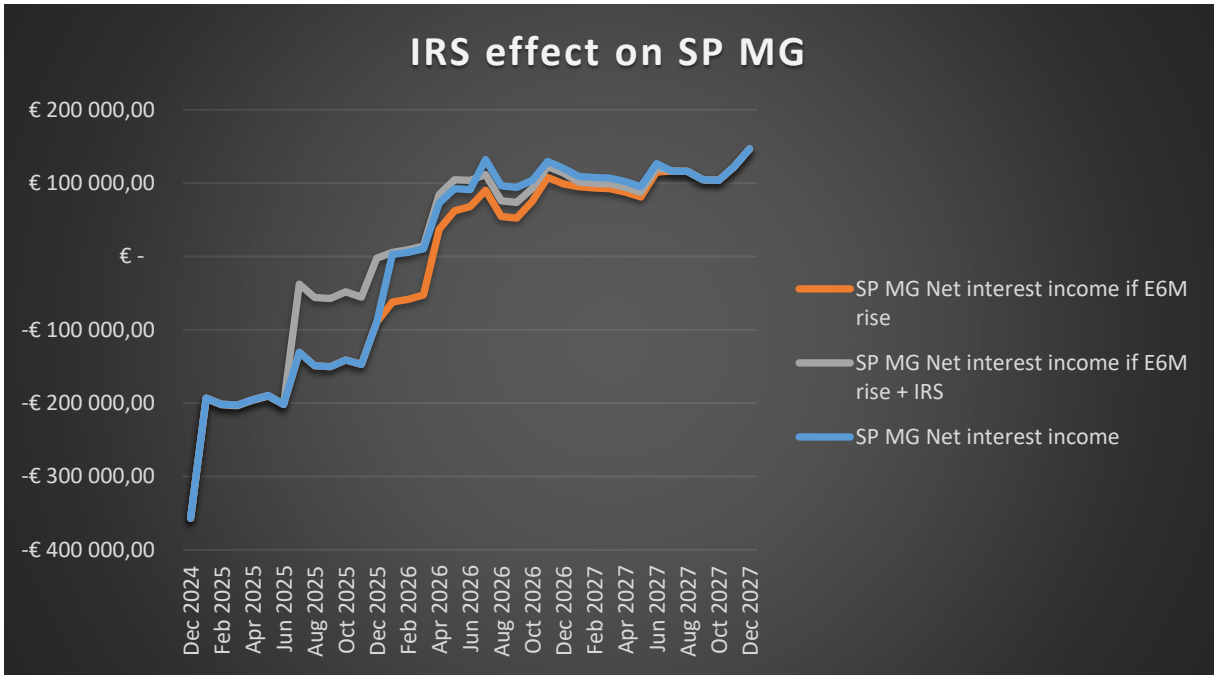
Graph 34. Effectiveness of interest rate swaps



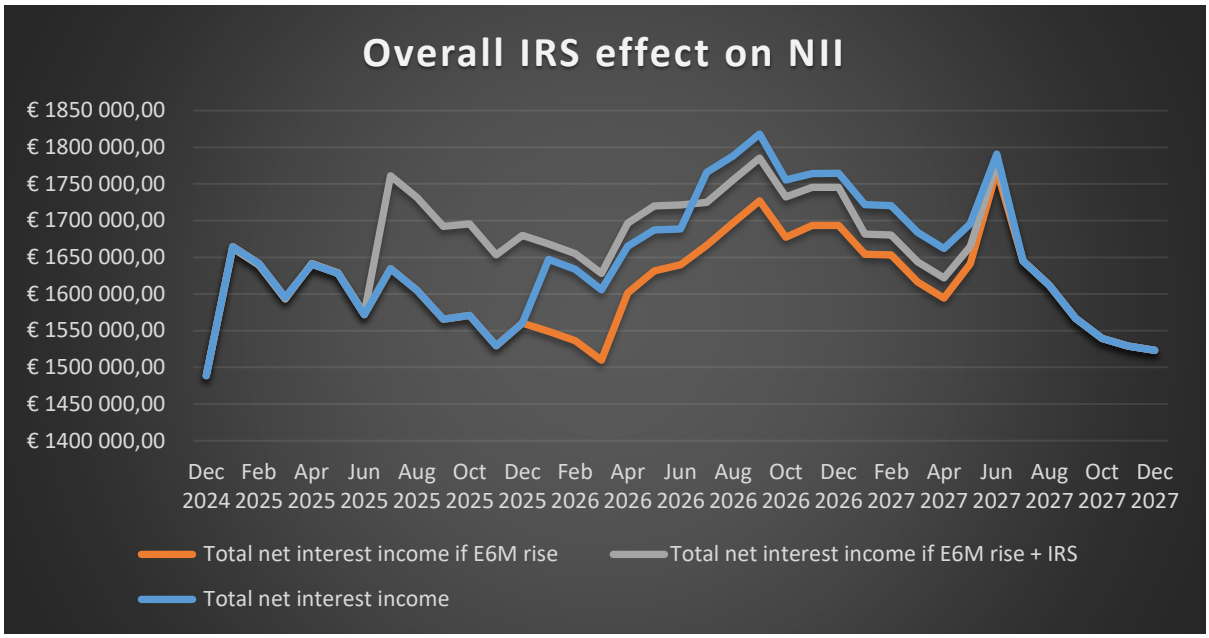
Graph 35. IRS effect on PT Auto E6M NII



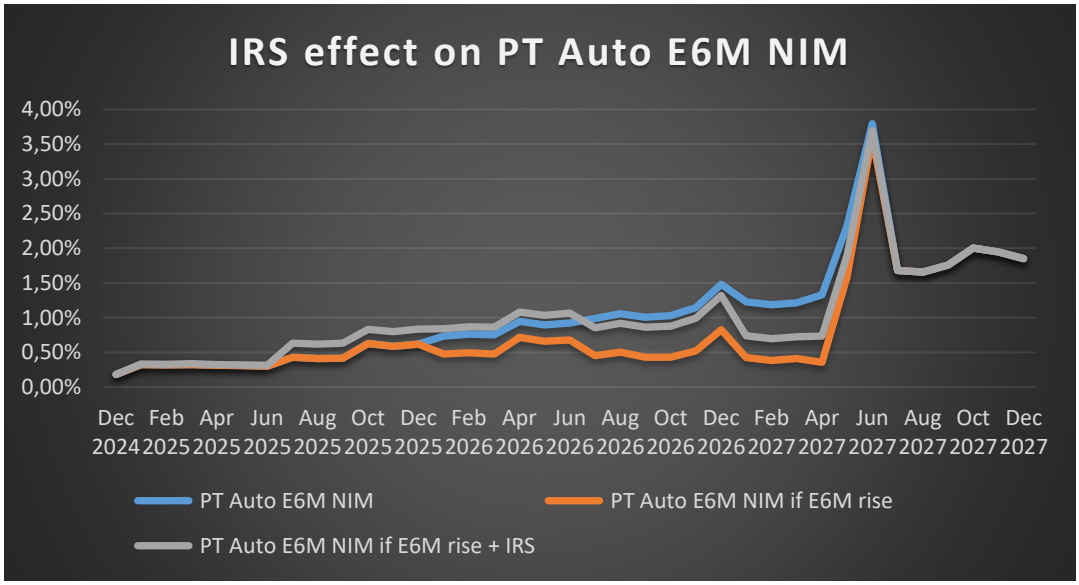
Graph 36. IRS effect on PT MG



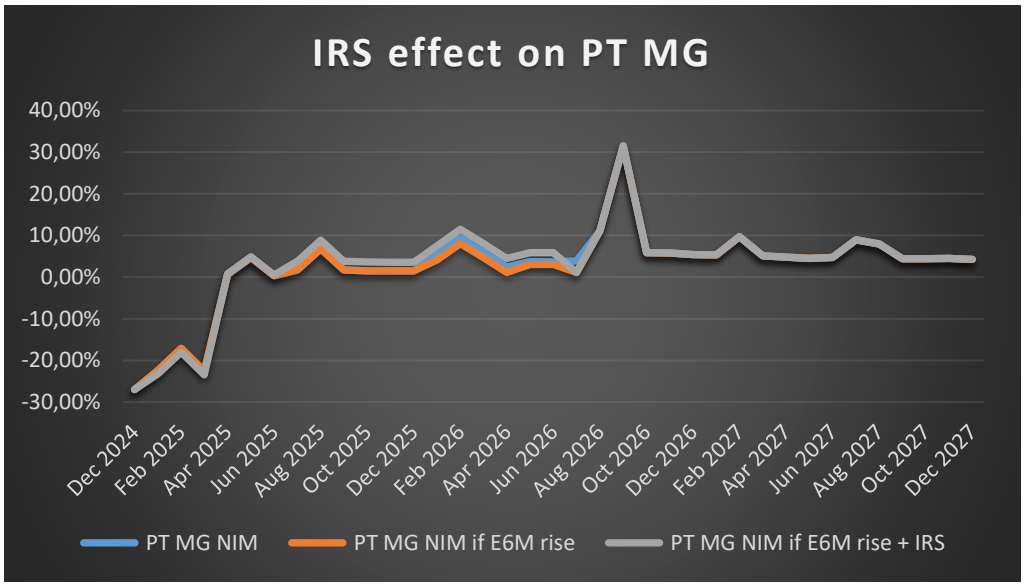
Graph 37. IRS effect on SP MG



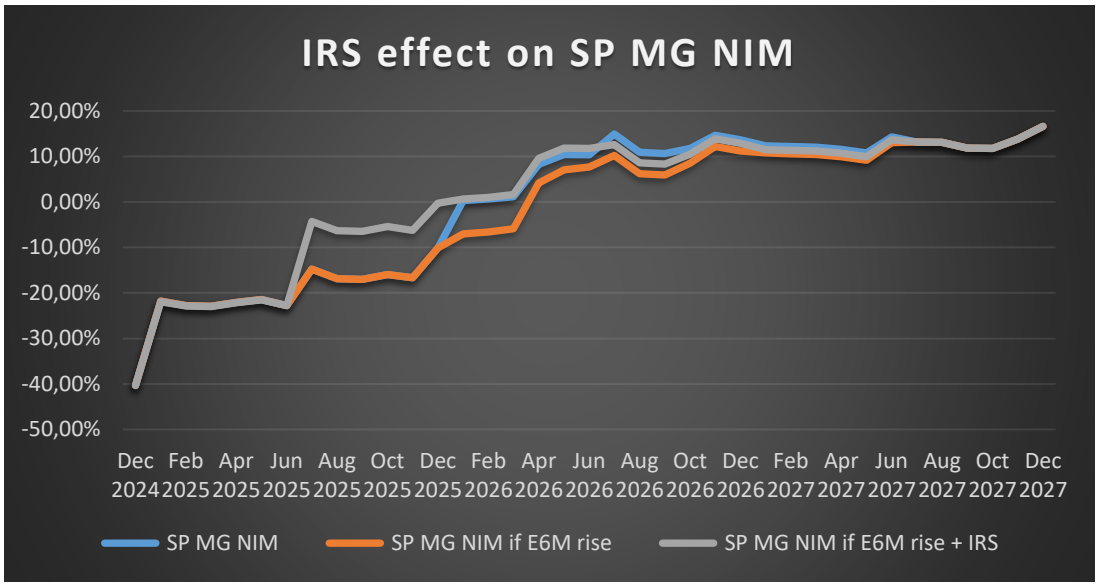
Graph 38. IRS overall effect on NII



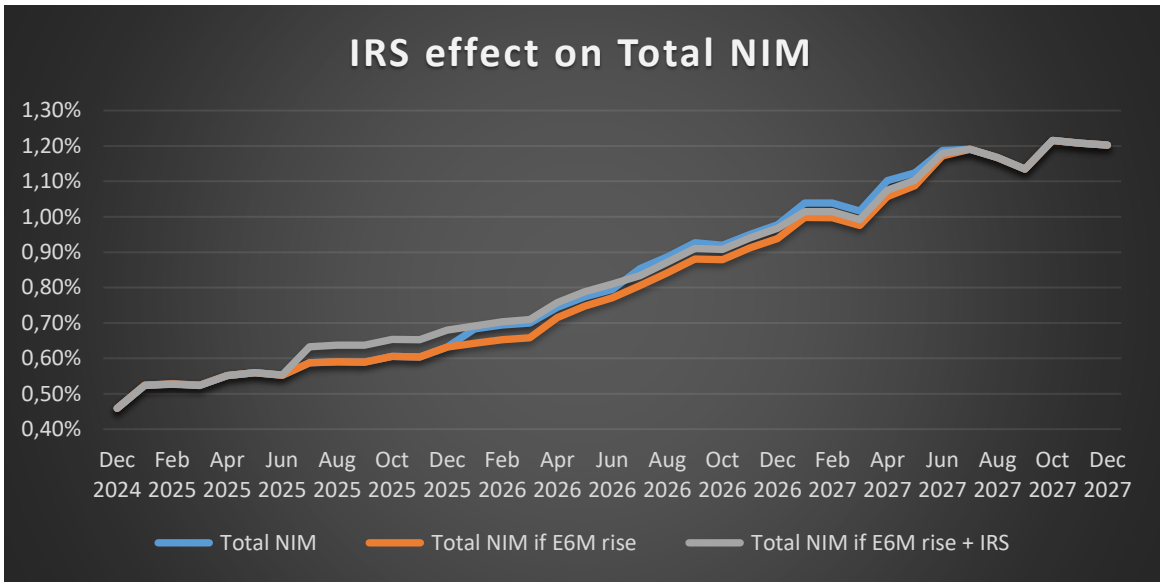
Graph 39. IRS effect on PT Auto E6M NIM



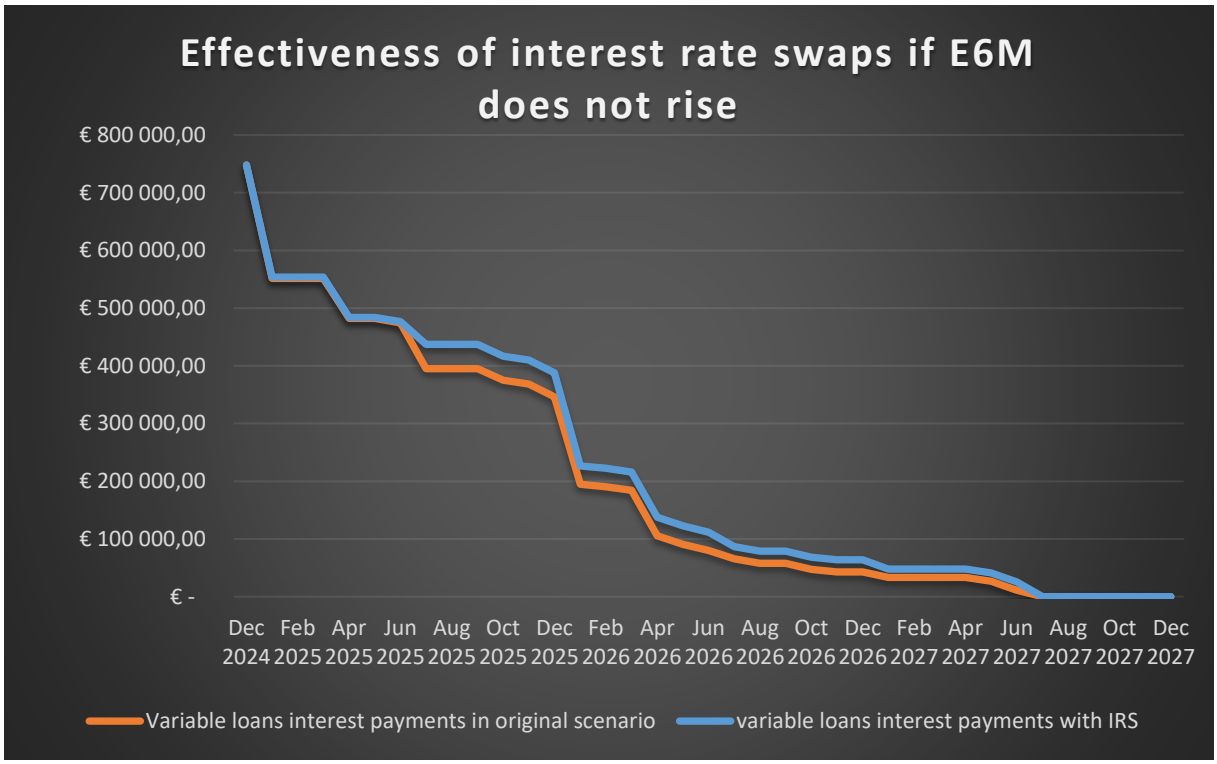
Graph 40. IRS effect on PT MG NIM



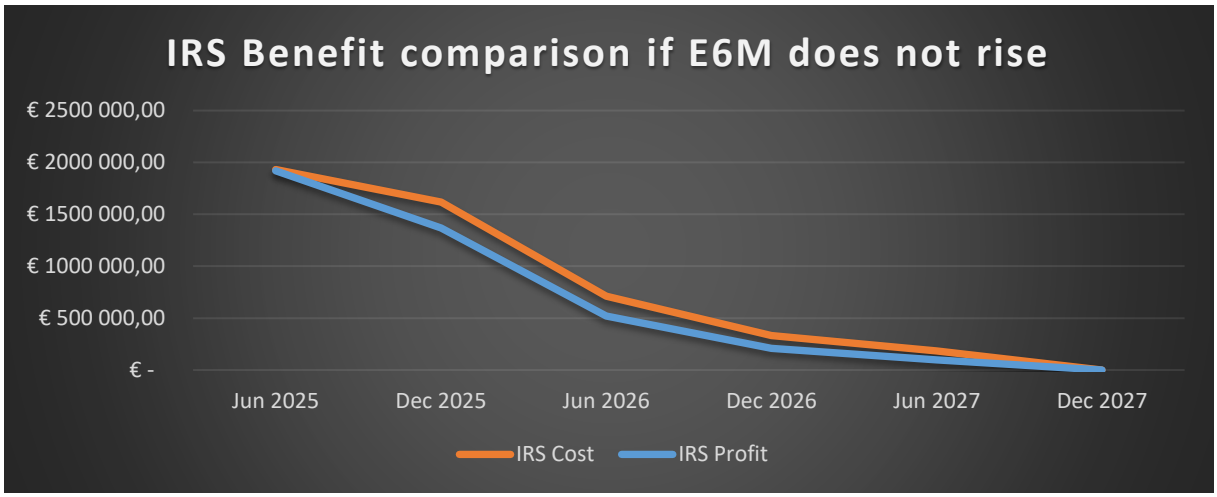
Graph 41. IRS effect on SP MG NIM



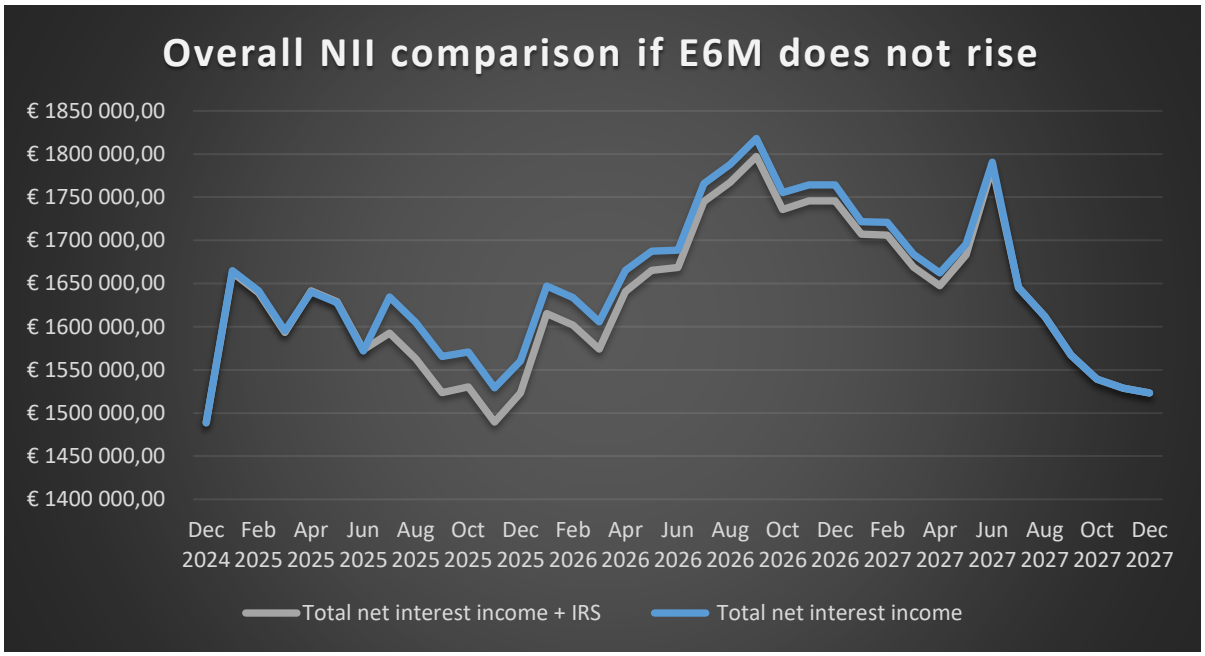
Graph 42. IRS effect on Total NIM



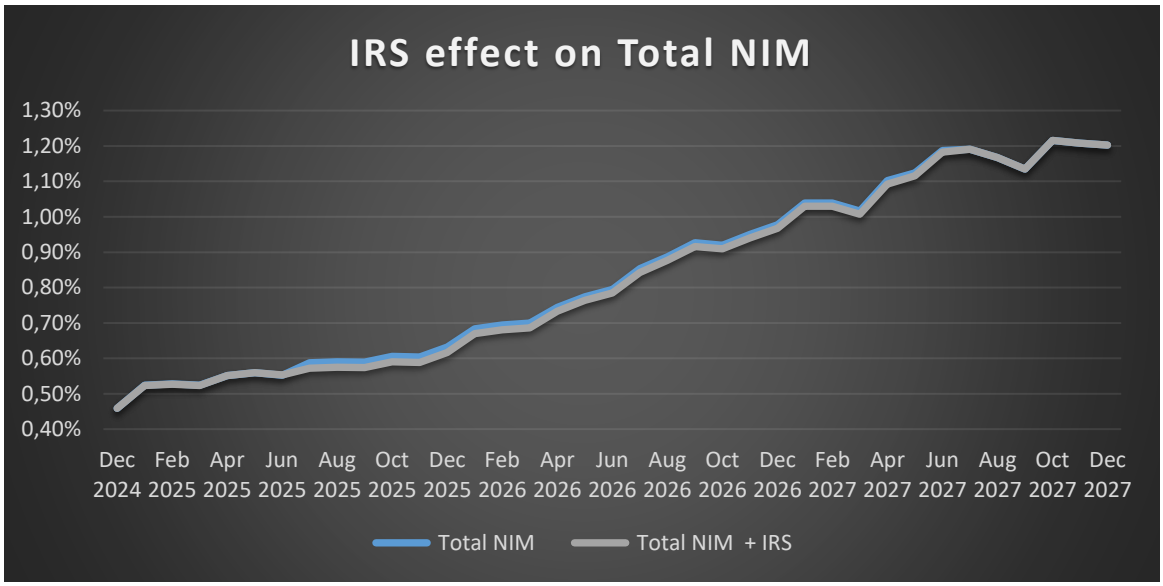
Graph 43. Effectiveness of IRS if E6M does not rise



Graph 44. IRS cash flows if E6M does not rise



Graph 45. Overall NII comparison if E6M does not rise



Graph 46. IRS effect on total NIM if E6M does not increase