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Management of Interest Rate Risks in Economic Institutions

Ibtissem Kouider [1]

[1] University of Constantine 3, Algeria. Email: ibtissem.kouider@univ-constantine3.dz

Abstract---The study aims to present the various mechanisms and strategies that help economic institutions to cover interest rate risks resulting from sudden and unfavorable fluctuations in these prices, which affects the financial positions of these institutions, whether they are lenders or borrowers, and therefore some techniques and means must be used to reduce these risks. In this regard, we find the contracts negotiated in the consensual markets, which include contracts with fixed terms and optional contracts (CAPS, FLOORS and CALLARS), in addition to contracts negotiated in the regulated market, as is the case in the French international futures market, which includes a variety of products that guarantee coverage of interest rates in the currency Consolidated (Euro), this assortment mainly includes forward contracts and options for interest rates expressed in Euros, allowing economic institutions to manage and manage interest rate risks in an effective manner.

Keywords---interest rates, interest rate risk, futures contracts, optional contracts, swap contracts.

1. Introduction

Interest rates are among the most significant economic variables that characterise any economic entity. They are used as a tool to influence economic activity through monetary policy, and also affect individuals' decisions regarding how they distribute their income between current consumption and savings.

Due to imbalances in many monetary economies, interest rates have fluctuated suddenly and adversely, exposing lenders and borrowers to significant financial risks. Consequently, discussions about interest rates have attracted considerable attention from economists, who have sought to analyse the risks arising from these fluctuations precisely. Their aim is to develop techniques and mechanisms that

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enable interest rate risk to be covered, with the assistance of various stakeholders and specialists in the field of financial risk protection and prevention.

From this introduction, the following problem can be posed:

How can economic institutions cover interest rate risks? What mechanisms and strategies are employed to this end?

Objectives of the study:

This study aims to achieve the following objectives:

- Clarify various theoretical concepts related to interest rates.
- Highlight the different types of risk that economic institutions face due to interest rate fluctuations.
- Present the mechanisms and strategies for managing interest rate risk.

Methodology of the Study:

Given the nature of the topic, we will use both descriptive and analytical methodologies to clarify and analyse the various concepts related to the research, and to draw conclusions. To address the posed problem, our study will cover the following areas:

- Basic concepts of interest rates.
- Interest rate risks.
- Strategies for managing interest rate risks.

2. Basic concepts of interest rates

2.1 Definition of interest rate

The interest rate is the price paid to encourage individuals and institutions to save money instead of spending it, and to invest in long-term assets instead of holding cash (Patterson & Lygnerud, 1999, p. 4). Generally, the definition of the interest rate varies depending on the parties involved in the financial transaction, from the perspective of the borrower and the lender:

A. From the borrower's perspective:

The cost incurred by the borrower for borrowing a sum of money over a specified period. In this case, it is expressed as the cost of borrowing money.

B. From the lender's perspective:

It is the return or yield obtained by the lender for relinquishing liquidity for a specified period, expressed as the price of giving up liquidity.

2.2. Types of Interest Rates

Several types of interest rate can be distinguished (L'Araba, 2009, p. 66).

A. Nominal interest rate:

This is the rate on which the lending process is based and represents the percentage return that the lender receives from the borrower. It does not account for economic variables.

B. Real interest rate:

This is the effective interest rate at which banks provide loans, taking into account changes in the general price level, or inflation. It is calculated as follows:

Real Interest Rate = Nominal Interest Rate – Inflation Rate \].

C. Fixed Interest Rate:

This is a rate that is set at the beginning and does not change. This means that both the creditor and the debtor know the total balance at the end of the agreed period. The fixed interest rate is one of the most common types.

D. Variable interest rate:

This rate can change according to prevailing conditions. It can be further divided into:

- Pre-determined variable interest rate:

This type of rate changes based on a previously chosen reference rate. Both parties agree that financial developments may lead to an increase or decrease from the initially set rate. For example, if a rate of 8%

is agreed and, due to changes in the general price level, it rises to 10%, neither party can contest this, as the contract stipulates that the rate can change according to financial circumstances.

- 'Subsequently Determined Variable Interest Rate':

This type is characterised by the fact that it is not set until after the agreed period ends. This means that there is no prior agreement on an initial rate, but rather an agreement to determine the rate after the period has elapsed.

Other types of interest rates:

There are several other types of interest rate, including:

Short-term interest rate: This applies to transactions with a duration of less than one year.

- Medium-term interest rate: This applies to transactions ranging from two to seven years in duration.
- Long-term interest rate: This applies to transactions lasting more than seven years.

2.3 Justifications for Interest Rates

Economists provide several justifications for interest rates, including the following (Flèche, 2006, pp. 172–170):

Price of Scarcity:

Interest rates represent the price or compensation for scarcity. If capital were available to everyone who wanted it, it would have no price. Thus, the price of capital, expressed through interest rates, is fundamentally linked to its scarcity — it is the price of capital scarcity.

Productivity of capital:

Interest rates reflect the compensation for the productivity of capital. Capital is a productive resource that yields positive outcomes when utilised. Therefore, it should have a price that reflects this productivity. This means that the interest rate serves as compensation for using capital in production. Since this use results in positive productivity, the payment of interest is justified.

Price of sacrifice:

Interest rates represent the price of sacrifice. Accumulating and preserving capital requires individuals to forgo immediate consumption in order to build capital for increased future consumption. From this perspective, interest rates represent the cost of foregoing current consumption (Bean, 2017, p. 3).

Price of Risk:

Interest rates represent the cost to individuals of the risk they take when investing their money. Thus, interest rates act as compensation for the risks associated with invested funds, including the risk of non-repayment and declining purchasing power.

Price of liquidity:

Interest rates signify the price of liquidity. When an individual lends their money to others, they forgo funds that represent liquidity. Consequently, interest rates represent the cost to lenders of relinquishing liquidity, or the price to borrowers of obtaining it.

2.4 Factors affecting interest rates

Several factors influence interest rates, including:

A. Inflation:

Inflation is one of the most significant factors affecting interest rates. Specifically, monetary inflation arising from excessive money issuance leads to an increase in the general price level and a decrease in the purchasing power of money. In response, the central bank intervenes by adjusting the legal reserve ratio for commercial banks, thereby reducing the amount of loans granted and resulting in higher interest rates and limited investment in order to curb inflation (Khan & Habib, 2003, p. 40).

B. Money supply:

The relationship between the money supply and interest rates is inverse. An increase in the amount of money circulating in the economy means that commercial banks have greater capacity and willingness to extend credit, leading to a decrease in interest rates. Conversely, if the money supply decreases, banks reduce the credit they extend and raise the cost of loans, as represented by interest rates.

C. Savings and Investment:
Both savings and investment influence the prevailing interest rates in the market. When savings exceed investment, this leads to lower interest rates to encourage investment and achieve economic growth. Conversely, when investment exceeds savings, higher interest rates are introduced to limit investment and avoid inflation.

D. Government Budget:
In the event of a budget deficit, the government borrows from the money market to cover it, which increases demand for money and causes interest rates to rise.

E. Monetary Policy:
The central bank can influence the money supply and the level of funds available for lending, thereby affecting interest rates, using the following tools:

Open market operations:
The central bank buys or sells securities, particularly government bonds, in the securities market. The aim is to steer economic activity and influence the amount of cash reserves available to commercial banks, thereby affecting their lending activities. Open market operations impact the size of credit by influencing prevailing interest rates. When the central bank purchases government bonds, demand for these bonds increases, raising their price and subsequently lowering prevailing interest rates. Conversely, selling securities reduces their prices and raises market interest rates, leading to a decrease in demand for loans and a reduction in the volume of credit.

Legal reserve ratio:
Legislation requires commercial banks to hold a certain percentage of their deposits as a credit balance with the central bank[1]. The central bank can change this reserve ratio according to its monetary policy goals. If the central bank wishes to tighten the credit market, it increases the legal reserve ratio, which leads to a reduction in the volume of loans granted by commercial banks. This policy is particularly effective during periods of inflation as it reduces commercial banks' excess cash reserves and increases interest rates. Conversely, during periods of economic contraction, the central bank lowers the legal reserve ratio, enabling commercial banks to increase their lending capacity and lowering interest rates.

Discount Rate:
The discount rate is the interest charged by the central bank for rediscounting commercial papers presented by commercial banks seeking liquidity. Thus, the discount rate is one of the tools available to the central bank for controlling banks' cash reserves. If the central bank wishes to reduce the amount of credit extended by banks, it raises the discount rate, leading to higher market interest rates. Conversely, if the central bank aims to increase the amount of credit extended, it lowers the discount rate, resulting in increased banking liquidity and lower interest rates.

E. Economic activity level
Economic conditions have a significant influence on interest rates. During economic downturns, employers' ability to raise prices is reduced due to decreased consumer demand, which in turn reduces price inflation. It also leads to lower wage inflation due to decreased demand for labour, resulting in reduced disposable income for individuals, who will subsequently lower their demand for consumer credit, such as consumer loans. Companies also reduce their investment levels due to decreased demand for their products, which leads to a decline in demand for commercial credit (business loans). These factors all contribute to a decline in inflation rates, consequently lowering interest rates (Borgham, 2010, p. 74).
Furthermore, during these periods of economic contraction, the central bank implements various measures to stimulate the economy, such as purchasing treasury bonds. This action injects additional

[1]- - Youssef Kamal Mohamed, Islamic Banking: Monetary Policy, Dar Al-Wafaa Publishing and Distribution, Mansoura, Egypt, 1996, p. 23.

liquidity into the market, increasing the supply of funds available for lending while raising bond prices. Ultimately, this results in lower interest rates.

It is important to note that short-term interest rates tend to decline more sharply than long-term rates during recessions. There are two reasons for this. First, the central bank's activities are primarily focused on the short-term sector of the market, which makes the impact of its interventions more pronounced in this area. Secondly, long-term interest rates reflect average expected inflation rates over the next twenty or thirty years, and these rates do not change significantly when current inflation rates are low during a recession or high during an economic recovery.

Additional factors affecting interest rates:

In addition to these macroeconomic factors, other factors related to the financial process also influence interest rates (Flèche, ibid., p. 182).

1. Risk associated with lending operations:

Specifically, the risk of non-repayment compels lenders to raise interest rates when the risk level increases. Conversely, interest rates decrease when the risk level is lower. Consequently, higher interest rates are imposed on borrowers with relatively weak financial positions, as their chances of defaulting are higher.

2. Loan Duration:

The length of the loan period can lead to changes that may elevate the risk of non-repayment and changes in the borrower's financial position. Additionally, the potential for a higher return due to the extended use of funds increases the interest rate on medium- and long-term lending. Therefore, interest rates increase with longer loan durations, while the opposite occurs with shorter loan periods due to the reduced likelihood of changes in the borrower's financial position. This results in lower probabilities of default and minimises variations that could decrease the purchasing power of borrowed funds. Consequently, lenders lower interest rates on short-term loans while raising them for medium- and long-term loans.

3. Interest rate risks

3.1 Definition of interest rate risk

Interest rate risk is generally defined as the risk that income or capital may be affected by fluctuations in interest rates. It refers to the potential exposure of a borrower or loan holder — either current or future — to significant changes in interest rates, whether they are increasing or decreasing, and whether the loan has a fixed or variable interest rate (Al Shbib, 2007, p. 160).

Interest rate risk also represents potential losses that economic institutions may incur due to adverse fluctuations in interest rates (Mansour, 2018, p. 2). Specifically, interest rate risk is the likelihood that a company or investor will be negatively impacted by changes in interest rates, resulting in decreased returns on investments or increased financing costs (Quémard & Golitin, 2005, p. 89).

Consequently, inverse movement in interest rates can result in:

- increased borrowing costs for borrowers;
- decreased returns for investors.
- Reduced profitability for financial service providers, such as banks.
- A decreased net present value for organisations due to changes in interest rates impacting the value of financial instruments.

3.2 Types of interest rate risk

Due to fluctuations in interest rates, institutions face various types of risk, which manifest in several ways, including:

A. Capital risk:

Also known as the risk of value loss, this refers to the risks faced by a bondholder when interest rates in the market rise (Shaheen, 2005, p. 5). For example, if a bond with a nominal value of 100 DZD and an interest rate of 8% is issued by a reputable entity, and interest rates rise to 10%, new long-term bonds

with the same reputation will be issued at a rate of 10%. In this case, the value of the original bond will decrease because the bondholder will likely try to sell it to purchase the new bonds.

B. Uncertainty risk:

This arises from borrowing at a variable interest rate, where the associated costs are unknown in advance and cannot be determined until the repayment date. If interest rates rise, the financial costs borne by the institution will be higher than those of borrowers with fixed rates.

C. Opportunity loss risk:

This results from borrowing at a fixed rate (the associated costs are fixed). If interest rates decrease, however, the institution will not benefit from this reduction as it will continue to pay higher costs than its new competitors.

4. Strategies for managing interest rate risks

Several strategies are employed by institutions and banking systems to address the risks arising from fluctuations in interest rates. The following is one such strategy (Ben Al-Muwafiq, 2006, p. 113):

4.1 Negotiated contracts in market agreements

Market agreements are markets in which the seller and buyer deal directly with each other, without intermediaries. The parties involved agree on the characteristics of the contract, such as the maturity date, amount and interest rate, without being under the supervision of an organisation. This makes the resale of these contracts difficult. The contracts present in this market are off-balance-sheet commitments that do not directly affect borrowing and investment operations. Their purpose is to influence interest rates, and then to settle or collect the difference in interest rates. These contracts fall into two main categories:

A. Fixed-Term Contracts

These contracts include the following (Ben Al-Muwafiq, previous reference, p. 114):

Forward contracts are negotiated between the institution and either the bank or another financial body. The latter specifies the rate applied to future operations and commits to providing the loan under the agreed conditions. The institution is bound by this contract and cannot benefit from positive changes that may occur in the market.

For example, on 01/09/2025, the institution must borrow 10 million Algerian dinars for 6 months, i.e. from 01/12/2025. However, the institution wants to secure liquidity and future borrowing conditions by contracting with the bank through a forward contract. To secure this contract, the bank covers the risks it may face as follows:

- The bank borrows 10 million Algerian dinars at an interest rate of 7.25% for nine months.
- The bank invests this sum for three months (from 1 September to 30 November) at an interest rate of 7.325%.
- The bank lends the institution the money from 1 December to 31 May at a rate resulting from balancing the cash flows, i.e. the cash flows from the loan granted to the institution and the cash flows from the investment. This rate is calculated as follows:

$[1 + (0.0725 \times 9) / 12] = [1 + (0.07325 \times 3) / 12] [1 + (Tg \times 6) / 12]$

Where $Tg = 7.07\ \%$

Interest rate swap contracts: To clarify the concept of a fixed-to-variable interest rate swap contract, let's consider two banks, Bank A and Bank B. Bank A issued bonds worth 100 million Algerian dinars at a fixed interest rate for ten years, while Bank B obtained a loan of 100 million Algerian dinars at a variable interest rate for ten years. Bank A expects interest rates to decrease, while Bank B expects them to increase. The two banks therefore have opposing interests: Bank A is committed to a fixed rate, expects interest rates to decrease, and wants to convert its obligation to a variable rate. Bank B is committed to a variable rate, expects interest rates to increase, and wants to convert its obligation to a fixed rate.

Thus, interest rate swaps fulfil the hopes of both parties and are executed as follows:

Bank A pays fixed interest on the bond market, but pays variable interest on 100 million Algerian dinars to Bank B.

Bank B pays Bank A fixed interest on 100 million Algerian dinars, but receives variable interest from Bank A.

The following figure illustrates this:

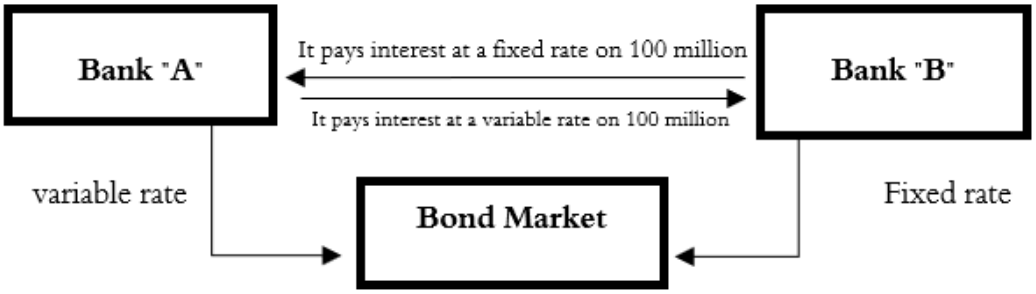


Figure 1: Mechanism of Fixed-to-Variable Interest Rate Swap Contracts.
Source: Samira Mohsen, 'Financial Derivatives and Their Role in Covering Financial Market Risks', Master's thesis, University of Constantine, 2006, p. 217.

Assuming the fixed interest rate is agreed at 6% and the variable interest rate at the time of signing the contract is 5%, On the maturity date, interest rates have risen to 8%, as expected by Bank B. In this case, Bank B will make a profit because it will only pay 6 million Algerian dinars instead of the 8 million dinars it would have paid without the swap contract. Conversely, Bank A will incur losses because it will pay 8 million Algerian dinars instead of the 6 million it would have paid under the fixed rate.
Conversely, if market interest rates fall to 3%, Bank A will make a profit because it will pay 3 million Algerian dinars instead of 6 million. Meanwhile, Bank B will incur losses because it will pay 6 million Algerian dinars instead of 3 million.
Term rate contracts are off-balance-sheet contracts that institutions wishing to invest and borrow can use to hedge against undesirable fluctuations in interest rates. They allow the rate applied to future operations to be stabilised. This contract can be sold, whereby the buyer of the contract is considered a future borrower, while the seller is considered a future lender. If the market interest rate is higher than the guaranteed rate, the contracting party (the seller) must compensate the buyer for the difference between the two rates. This amount serves as compensation for the additional cost of the loan. If interest rates are lower, the institution must pay the difference to the seller, i.e. the contracting party.

Table (2): Mechanism of Term Rate Contracts

	buyer (borrower).	Seller (lender)
interest rate increase.	Receives the difference	- Pays the difference
Interest rate decreases	pays the difference	- Receives the difference

Source: prepared by the researcher.

For example, let's assume that an institution purchased a forward rate agreement (FRA) with the following conditions: The loan amount is 5 million Algerian dinars; the agreed interest rate is 8%; the contract duration is 3 months; the signing date is 10 September; and the settlement date is 10 December. Let's also assume that the interest rate on 10 December was 10%.
We can see that the market rate is higher than the rate guaranteed in the contract. According to the contract, therefore, the bank will pay the institution the difference. This difference can be calculated as follows:
$(5{,}000{,}000 \times 0.10 \times 90/360 = 125{,}000)$.
$5{,}000{,}000 \times 0.08 \times 90/360 = 100{,}000$.

125,000 – 100,000 = 25,000.
One advantage of these contracts is that they are off-balance-sheet instruments and the preparation process is straightforward. However, a drawback is the final fixed interest rate.

B. Optional contracts: These include:

Interest rate caps are conditional contracts that enable the purchasing institution to determine the maximum cost of medium and long-term resources. They are also used to cover financing programmes and loans with variable interest rates

This type of contract is based on a comparison between the agreed contract rate and the market rate. The comparison is made on the maturity date and is associated with a premium, expressed as a percentage of the principal amount. This premium can be paid in a lump sum upon signing the contract, or in instalments at each maturity date (Al-Hinnawi, 2002, p. 400).

The mechanism of these contracts is as follows:

If the market interest rate is higher than the agreed contract rate, the contract is exercised and the purchasing institution receives the difference between the two rates. The cost of the loan is calculated as follows:

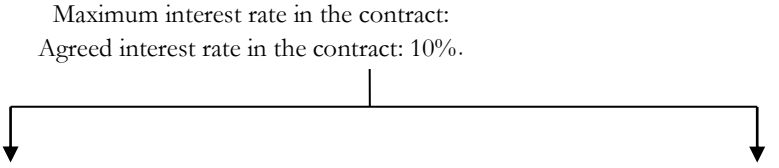
The cost of the loan is the agreed rate plus the premium.

If the market interest rate is lower than the agreed rate, the contract is not exercised and no cash exchange takes place. The cost of the loan is calculated as follows:

Cost of the loan = market interest rate + premium.

The following figure summarises this:

Figure 2: Mechanism of Interest Rate Cap Contracts.



If the variable interest rate is less than 10%,
- For example, 8%. No payments are required.

If the variable interest rate is greater than 10%, for example 12%, the buyer of the contract receives the difference of 2% from the issuer of the contract.
(e.g. 12%): The buyer of the contract receives the difference of 2% from the issuer of the contract.
Source: Mohamed Saleh Al-Hinnawi, previous reference, p. 401.

To further clarify the previous idea, let's assume that an institution is committed to a financing programme involving the issuance of bonds with a variable interest rate totalling one million Algerian dinars. To protect itself from the risk of rising interest rates, the institution purchased a cap contract with the following characteristics: an agreed rate of 10%, a premium of 0.5% of the principal, semi-annual maturities and a contract duration of 12 months.
In the first scenario, assume that the market rate reaches 11% after six months. In the second scenario, assume that the market rate is 9%.
In the first scenario, since the market interest rate is higher than the agreed rate, the contract will be executed and the purchasing institution will receive the following:
$1{,}000{,}000 \times (0.11 - 0.10) \times 6/12 = 5{,}000$.
The cost of the loan will be 10.5%, the agreed rate plus the premium (10% + 0.5%).
For the second scenario, since the contract rate is higher than the market rate, the institution will not receive or pay anything under the cap contract. Therefore, there will be no cash flows and the cost of the loan will be 9.5%, which is the market rate plus the premium (9% + 0.5%).

These contracts essentially enable the borrower to protect against rising interest rates above a predetermined level in exchange for a premium paid to the issuer of the contract.
Interest rate floors are conditional contracts used by institutions that invest their funds at a variable rate to hedge against the risk of falling interest rates. Under these contracts, the seller guarantees the buyer a minimum investment rate in exchange for a premium representing a percentage of the principal. This premium is paid either as a lump sum upon signing the contract or in instalments at each maturity date (Mohsen, previous reference, p. 194).
The mechanism of these contracts is as follows:

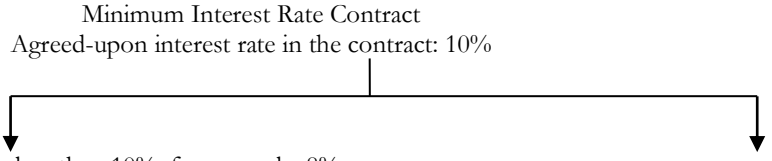
Income from investment = agreed rate – premium.

If the agreed rate in the contract is higher than the market rate, the buyer receives the difference between the two rates from the seller. The investment income is calculated as follows:

Income from investment = Market rate - premium.

If the market rate exceeds the agreed rate in the contract, no cash exchange will take place and the investment income will be calculated as follows:
The following figure illustrates this:

Figure 3: Mechanism of Interest Rate Floor Contracts.



If the variable interest rate is less than 10%, for example, 8%,
the contract buyer receives the 2% difference from the contract writer.

If the variable interest rate is greater than 10%, for example, 12%, no payments are required.

(e.g. 12%): The buyer of the contract receives the difference of 2% from the issuer of the contract.
Source: Mounir Ibrahim Hindi, Fundamentals of Investment in Securities, Manzilat Al-Ma'arif, Alexandria, 1999, p. 182.

Suppose an institution owns a portfolio of variable-rate bonds and has purchased a 'floor' contract to protect itself from falling interest rates. This contract has the following characteristics: an amount of 240 million Algerian dinars; an interest rate of 8%; a premium of 0.5% of the principal; a contract duration of 12 months; and monthly maturities.
Assuming that, after one month, the interest rate reached 7% in the first scenario and 8.5% in the second, what would the outcome be?
In the first scenario, as the agreed rate in the contract is higher than the market rate, the issuer pays the institution the difference, calculated as follows:
$240{,}000{,}000 \times (0.08 - 0.07) \times 1/12 = 200{,}000$.
The investment income would be 7.5%, the agreed rate minus the premium (8% - 0.5%).
In the second scenario, the market rate is higher than the agreed contract rate. Therefore, this contract will not be exercised and no payments will be made. The investment income will equal the market rate minus the value of the premium (8.5% - 0.5% = 8%).
Thus, these contracts essentially allow the buyer to hedge against the risk of falling interest rates in exchange for paying a premium to the issuer.

Mixed Contracts

One of the drawbacks of previous hedging methods is the substantial premium that must be paid, resulting in high costs. To reduce this, 'CALLARS' contracts are used, which combine 'FLOOR' and 'CAP' contracts (Al-Hinnawi, previous reference, p. 405). These allow a maximum and minimum interest rate to be established. There are two types of 'CALLARS' contracts:

Borrower collars: this involves buying a cap and selling a floor. The premium paid for purchasing the 'cap' is partially offset by the premium received from selling the 'floor'. This contract guarantees a maximum borrowing rate and enables the borrower to benefit from falling interest rates.

For example, suppose an institution wishes to borrow 12 million Algerian dinars at a variable rate over a period of 12 months. To reduce the premium, the institution purchases a 'collar' contract for 12 months within the range of 8% and 9%.

If the interest rate after one month is 7.5%, the 'floor' will be used and the institution will pay the difference between the two rates.

$12{,}000{,}000 \times (0.08 - 0.075) \div 12 = 5{,}000.$

If the interest rate is 9.6%, the institution will utilise the 'CAP' and receive the difference as follows:

$12{,}000{,}000 \times (0.096 - 0.09) \times 1/12 = 6{,}000.$

Borrower collars involve buying a 'floor' and selling a 'cap'. This guarantees a minimum investment rate and allows the borrower to benefit from rising interest rates (Mohsen, previous reference, p. 197).

For example, an institution might grant a loan of 12 million Algerian dinars at a monthly rate after six months. To hedge against the risk of falling interest rates and reduce the premium, it sells 'collar options' within the range of 8% and 9%.

If the interest rate on the maturity date is 9.4%, the institution will pay the difference between the two rates.

$12{,}000{,}000 \times (0.094 - 0.09) \times 1/12 = 4{,}000.$

If the interest rate at maturity is 7.2%, the institution will receive the difference between the two rates:

$12{,}000{,}000 \times (0.08 - 0.072) \times 1/12 = 8{,}000.$

4. Negotiated Contracts in Organised Markets

Interest rates can be negotiated in organised markets, as is practised in the International Forward Market in France, established in February 1986. This market provides economic operators with a comprehensive set of tools for effectively managing interest rate risks. These primarily include forward contracts and interest rate options denominated in euros, with durations ranging from three months to thirty years. The value of financial assets changes inversely to changes in interest rates: when interest rates rise, the value of financial assets decreases and vice versa. The market relies on this principle to determine the prices of forward and futures contracts, resulting in higher contract prices when interest rates fall.

In general, contract prices move in the same direction as the underlying assets. Any change in the value of the portfolio can be offset by an equivalent change in the contract price. The institution responsible for the market manages and organises negotiations, ensuring uniform prices by comparing supply and demand. This guarantees transparency, liquidity and transaction security for participants.

Since the introduction of the euro, the French International Forward Market's goal has been to develop a range of products that provide interest rate coverage in the single currency.

A. Closed forward contracts

In 1999, the market operated six forward contracts denominated in euros.

- E-BOND 30 YEARS
- EURO NOTIONAL
- EURO ALL SOVEREIGNS U.E.N.
- EURO 5 YEARS
- Euro 2 years
- EURIBOR 3 months

Here is a brief explanation of some of these contracts:

EURO NOTIONAL CONTRACT: This contract represents a notional loan converted into euros with a term of 8.5–10.5 years and repayment at the end of the term. It carries a coupon of 3%, providing coverage in the event of changes to interest rates during the ten-year period.
EURIBOR 3 MONTHS contract: This contract reflects the average interest rate between banks for three-month deposits in the Economic and Monetary Union, as published by the European Banking Federation. The objective of this contract is to hedge against short-term interest rate fluctuations.

B. Options on Forward Contracts

The efficiency and effectiveness of closed forward contracts in hedging against interest rate risks led the French International Forward Market to create options on forward contracts. Under these options, the participant can choose to exercise their rights or refrain from doing so, depending on the suitability of the transaction. Three of the most commonly used options include:
- Option on the Euro-notional contract
- Option on the Euro-notional contract
- Option on the Euro 5 Years Contract

4.3 Stress testing

Stress testing involves using various techniques to assess a bank's ability to withstand exposure to risk under challenging operating conditions, by measuring its impact on a set of financial indicators (Yahya Al-Sharif and Al-Eissani, 2021, p. 107).
It is a set of risk management techniques used to evaluate the potential effects of a series of defined changes in risk factors corresponding to extraordinary but plausible events on the bank's financial position.
Therefore, stress testing is considered a fundamental tool for managing banking risks, including interest rate risks. It measures the impact of interest rate changes on the bank's capital adequacy ratio using several methods.
Repricing gap calculation: this method measures the difference between the value of assets and liabilities that will be repriced within a specified period, indicating the possibility of obtaining a new interest rate.
Duration model: This measures the sensitivity of an investment's price (value) to changes in interest rates, expressed in years. Bond prices are inversely related to interest rates. Therefore, rising interest rates suggest that bond prices are likely to fall, while falling interest rates suggest that bond prices are likely to rise.

Conclusion

In conclusion, fluctuations in interest rates are one of the most significant risks faced by institutions, whether they are borrowing to finance projects or lending while investing funds. This applies to current and future operations, and to those with fixed or variable interest rates. Therefore, these institutions must consider various hedging methods against interest rate risk, including the risk of inadequacy, missed opportunities and loss of value (capital risk), which bondholders face due to rising market interest rates.

The study concluded that numerous means, strategies and contracts enable economic institutions to mitigate interest rate risk. These contracts fall into two categories: negotiated contracts in unregulated markets and those in organised markets. The former includes fixed-term and optional contracts, primarily represented by CAPS, FLOORS and COLLARS. The second type includes futures contracts and interest rate options established by the French forward market, for example.
Notably, an effective institution is one that can select appropriate means that align with its economic activity and financial strategy. It is also one that can adapt to changes in interest rates, capitalising on positive changes while mitigating the impact of negative ones.

In this regard, several points can be highlighted that represent new avenues for future studies, focusing either on delving deeper into some of the aspects addressed in this study or on exploring other areas not covered. Therefore, we propose the following topics for future study:
- The role of financial engineering and innovation in managing interest rate risk.
- Approaches to managing interest rate sensitivity gaps.
Strategies for financial risk management in Algerian economic institutions.

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