TUNIS BUSINESS SCHOOL
UNIVERSITY OF TUNIS

Project report

As a partial requirement for the Derivatives class

Title

Swap contract Design

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Within

BH LEASING إيجار

SOCIETE GENERALE UIB
الإتحاد الدولي للبنوك
UNION INTERNATIONALE DE BANQUES

Academic year

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Outline

I/ Introduction

Purpose: the main purpose of a swap is risk management, it is used to manage and mitigate risks associated with interest rate fluctuations. In addition, a swap is a tool to facilitate efficient funding and liquidity management for both parties of the contract.

Objective: Leasing companies typically have long-term lease contracts with their clients, which generate long-term fixed-rate cash flows. However, the company's debt obligations may have different durations or interest rate structures.
By utilizing interest rate swaps, the leasing company can align the duration and interest rate characteristics of its assets (lease contracts) and liabilities (debt) more effectively. This improves the overall matching of cash flows, reducing the risk of any imbalances or mismatches.

Parties involved:

BH Leasing: BH Leasing was set up by BH Bank (Banque de l'Habitat) in March 1997 as a limited company specializing in leasing operations, with an initial capital of 5 MD, raised to 35MD in 2015. Its corporate purpose is to carry out leasing operations involving movable assets (cars, construction equipment, office furniture, medical equipment, etc.) and real estate for professional, industrial, agricultural, commercial, and service use. It may also carry out any financial, industrial, commercial, securities, and real estate transactions directly or indirectly related to the above-mentioned purpose.

Union Internationale des Banques (UIB): UIB is one of the most important actors in the Tunisian banking sector. Based on a diversified universal banking model, UIB combines financial strength with a strategy of sustainable growth, with the ambition of being THE relationship bank, a benchmark in its markets, close to its customers, chosen for the quality and commitment of its teams. Its 1,471 employees provide day-to-day support to more than 750,000 customers. UIB's teams offer advice and services to individuals, businesses, and institutional clients in three main areas:

- retail banking

- corporate and investment banking

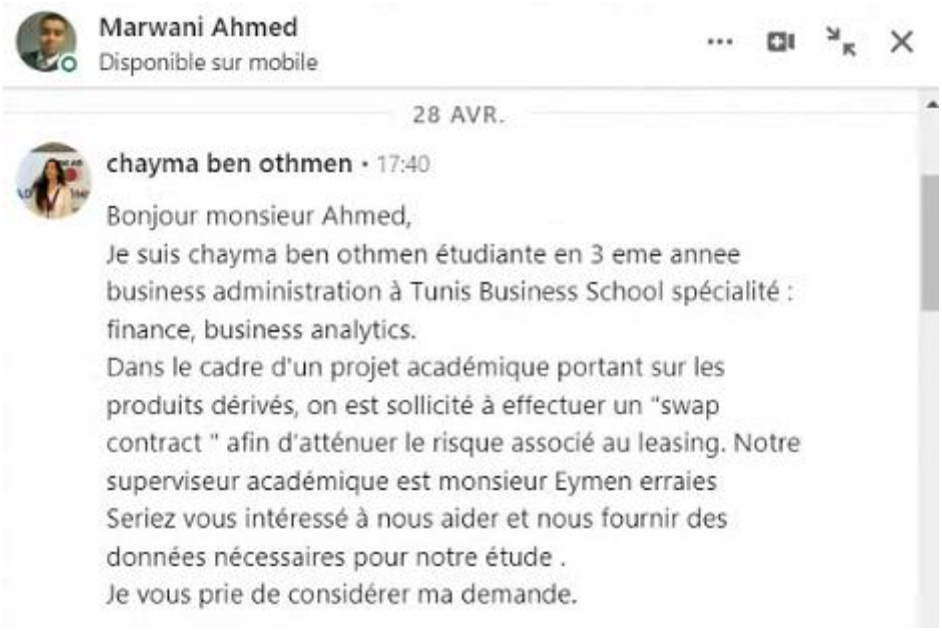
- asset management and investor services

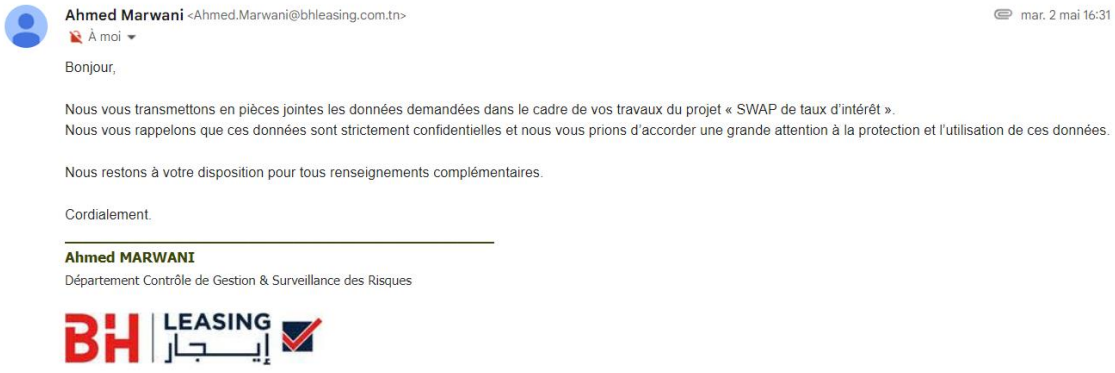
II/ Contact:

Our first contact with Hannibal lease was with the juridical director who transferred our request to the team responsible for the required data. There were several meetings to clarify our exact needs.

After signing the confidentiality agreement, a first sample of the assets data was delivered.

Due to several delays in attaining all the necessary documents for our research, we decided on switching to BH leasing as the contact is easier to establish, and the data was already processed by their risk department.
We first got in touch with Mr. Ahmed Marwani through LinkedIn and after signing the confidentiality paperwork through our administration, we were sent the data via email.





III/ Methodology:

As stated in the project, and after establishing contact with BH leasing, we started with calculating the duration, since defining the duration is crucial for

- Determining the appropriate design and structure of the swap agreement. It helps in choosing the desired maturity of the swap, the frequency of payment exchanges, and the choice between fixed-rate and floating-rate payments.
- Pricing and valuing interest rate swaps: The duration of the underlying cash flows is used to estimate the present value of future cash flows, which is essential in determining the swap's fair value.
- Managing risk: Duration is a measure of the sensitivity of the value of a financial instrument to changes in interest rates. By calculating the duration of its existing assets (lease contracts) and liabilities (debt obligations), the leasing company can assess its overall interest rate risk exposure. By identifying any potential imbalances or gaps in the duration profiles of assets and liabilities, this analysis assists the organization in successfully managing and mitigating interest rate risk.

1) Assets:

- Filtering the expired contracts: we first started by filtering the expired contracts, starting from May 5th, 2023.
- Remaining periods: we used the following Excel function to get the remaining periods between May 5th, 2023, and each contract's expiration date:

```
=(YEAR(end_date)-YEAR(start_date))*12+MONTH(end_date)-
MONTH(start_date)+(DAY(end_date)-DAY(start_date))/DAY(EOMONTH(start_date,0))
```

- Discount Rates: we decided to use the zero coupon yield rates from Tunisie Clearing with the addition of a risk premium. To start with, instead of working manually to get the discount rate corresponding to each contract, we programmed a LinearInterpolation() function using VBA that takes two variables: maturity and a table, looks for the corresponding maturity in the discount rates table (similarly to VLOOKUP), and if that maturity does not exist the function performs a linear interpolation using the rates of the closest maturities.

```
Function LinearInterpolation(maturity As Double, table As Range) As Double
    Dim row As Integer
    Dim x1 As Double, x2 As Double, y1 As Double, y2 As Double

    'Round the input maturity to 6 decimal places
    maturity = Round(maturity, 6)

    'Loop through the rows in the table
    For row = 1 To table.Rows.Count
        'Round the maturity in the table to 6 decimal places for comparison
        x1 = Round(table.Cells(row, 1).Value, 6)

        'Check if the maturity matches the value in the first column
        If x1 = maturity Then
            'If there's an exact match, round and return the rate in the second column
            LinearInterpolation = Round(table.Cells(row, 2).Value, 6)
            Exit Function
        ElseIf x1 > maturity Then
            'If the maturity is between two rows, interpolate between them
            x2 = x1
            y2 = table.Cells(row, 2).Value
            y1 = table.Cells(row - 1, 2).Value
            x1 = Round(table.Cells(row - 1, 1).Value, 6)
            LinearInterpolation = Round(y1 + ((y2 - y1) / (x2 - x1)) * (maturity - x1), 6)
            Exit Function
        End If
    Next row

    'If the maturity is beyond the table, return an error message
    LinearInterpolation = CVErr(xlErrValue)
End Function
```

- Duration: To calculate the duration of the leasing contract we created a function called leasingContractDuration() that takes the principal amount, the contract's interest rate (TEG), the discount rate, maturity, and remaining periods.
- We used the Excel function pmt() to calculate the cash flows (fixed payments), then

```
Function leasingContractDuration(amount As Double, rate As Double, discount_rate As Double, maturity As Double, remaining_periods As Double) As Double
    Application.Volatile

    Dim i          As Double
    Dim cf         As Double
    Dim pv_cf      As Double
    Dim sum_pv_cf  As Double
    Dim weight     As Double
    Dim sum_weights As Double
    Dim first_pvcf  As Double
    Dim first_df    As Double
```

we calculated the first discount factor corresponding to the first payment (difference in years between May 5th and the next payment date), using the GetDecimal() VBA function we created.

- In the next phase, we used a loop to calculate the sum of the present value of cash flows (the value of the contract).

```
'Get the cashflow (fixed) using pmt() function
cf = WorksheetFunction.Pmt(rate / 12, maturity, -amount)

'Get the discount factor for the next payment using GetDecimal() function we created in Module2
first_df = Round(GetDecimalPart(remaining_periods), 2)

'Get the present value of the first CF
first_pvcf = cf / Exp(discount_rate * first_df / 12)

'Calculate the sum of the present values of CFs (contract price)
sum_pv_cf = first_pvcf

For i = 1 + first_df To remaining_periods Step 1
    pv_cf = cf / Exp(discount_rate * i / 12)
    sum_pv_cf = sum_pv_cf + pv_cf
Next i
```

- Subsequently, we created a loop that calculates the duration of each contract by determining each contract's weight, multiplies it by the difference in time between the payment date and May 5th, 2023, and adds it to the sum ().

```
        'calculate the weight of the first payment
        weight_first_pmt = first_pvcf / sum_pv_cf

        'calculate the duration
        sum_weights = first_df / 12 * weight_first_pmt

        For i = 1 + first_df To remaining_periods Step 1
            pv_cf = cf / Exp(discount_rate * i / 12)
            weight = pv_cf / sum_pv_cf
            tW = i / 12 * weight
            sum_weights = sum_weights + tW
        Next i

        leasingContractDuration = sum_weights
    End Function
```

- Eventually, after calculating the duration of each contract, we determined the value of each contract using the function sum_pvcf() that we created. Next, we calculated the weight of each contract to determine the duration of total Assets, the calculations are similar to creating a portfolio of durations.

```
Function sum_pvcf(amount As Double, rate As Double, discount_rate As Double, maturity As Double, remaining_periods As Double) As Double
    Application.Volatile

    Dim i           As Double
    Dim cf          As Double
    Dim pv_cf       As Double
    Dim sum_pv_cf   As Double
    Dim first_pvcf  As Double
    Dim next_pmt_date As Double

    cf = WorksheetFunction.Pmt(rate / 12, maturity, -amount)

    next_pmt_date = Round(GetDecimalPart(remaining_periods), 2)

    first_pvcf = cf / Exp(discount_rate * next_pmt_date / 12)

    sum_pv_cf = first_pvcf

    For i = 1 + next_pmt_date To remaining_periods Step 1

        pv_cf = cf / Exp(discount_rate * i / 12)
        sum_pv_cf = sum_pv_cf + pv_cf

    Next i

    sum_pvcf = sum_pv_cf

End Function
```

2) Liabilities:

- **CMT**

a. Calculating the remaining period

With the same formula used to discard the expired contracts, we selected the remaining outstanding contracts.

b. Precising the corresponding rate

With the function LinearInterpolation() used in assets computation, we find the corresponding zero rate of each outstanding contract. And thereafter, we compute each of the present values of the future cash flows of the contracts.

c. **Calculating the duration**:

It's the sum of the weighted present values of the cash flows multiplied by the remaining period.

Remaining periods (months)	Discount rate
68.32	9.427737

T	CF	PVCF	weight*t
0.19	$684,711.11	$672,268.71	0.02385151
0.70	$683,022.22	$639,484.50	0.08148634
1.20	$661,333.33	$590,744.41	0.12900177
1.70	$639,644.44	$544,850.69	0.16907669
2.20	$617,955.56	$502,333.69	0.20131739
2.70	$596,266.67	$462,205.66	0.22773344
3.20	$574,577.78	$425,049.73	0.24787072
3.70	$552,888.89	$390,021.41	0.26330459
4.20	$531,200.00	$357,606.04	0.27376520
4.70	$509,511.11	$327,084.61	0.28047362
5.20	$487,822.22	$298,780.36	0.28337588
5.70	$466,133.34	$272,245.24	0.28324069
		$5,482,675.05	2.46449786

- **EOS and CDs :**

The outstanding contracts were selected manually by comparing the expiration date of each contract to May 5th, 2023.

d. Calculating the average duration: it's the sum of the weighted present values of the cash flows multiplied by each contract's duration (the calculations are similar to creating a portfolio of durations)

3) Net duration

We used the formula assets duration – liabilities duration, which is equal to -0.07.

Conclusion: As we did not expect a negative value, we went to check calculations with BH leasing and came up with the following explanation: the leasing company borrows a high amount of funds to meet the clients' requirements. The higher amount of funds, therefore, has a higher duration than loans issued to customers, which explains the value of duration being negative.

NOTE: When calculating the risk premium, we found that opinions deviated on the matter. So instead of setting a fixed value, we configured a variable cell that is linked to all calculations (By changing the value of the cell, all the calculations will be adjusted).

IV- Designing the swap contract:

After all the calculations are set, we need to choose the swap terms:

- Contract price: We agreed to select from the CMT the most recent contracts, their notionals sum up to equal 33M TND. (As shown in Sheet CMT selected)
- Duration of the contract: We chose the contract duration to match the nearest round value of the duration found of the liabilities (which is 2 years), then we set the payments to be semiannual payments.

- The leasing company will be paying fixed-rate (to be calculated below), and it will be receiving floating payments based on Taux Moyen de Marché Monétaire (TMM).

Choosing the floating rate to be received: The received floating rate is calculated as follows:

- Selecting the most recent TMM (which is equal to 8.01 in May).
- From the previously selected CMT contracts, we adjusted the Float rate to be equal to the latest TMM (it was previously based on December 2022 rate).
- We calculated the weighted average spread as shown in the column spread weight.
- The final float rate is, therefore, equal to TMM+Spread=**10.6918%**

Choosing the fixed rate: Moving to the swap valuation sheet, using the Goal Seek function, we set the cell of the difference between float and fixed payments equal to zero by changing the case of the fixed rate. It gives a value of **9.47%**

Valuation of the swap contract:

- We set the fixed payments for each payment date by selecting a random fixed rate.
- We set the floating payment according to the latest calculated TMM+Spread.
- Calculated the present value of fixed rate payments of each period.
- Calculated the float rate payments as if it was a bond (the future values of float payments are incorporated in the notional amount the second after the first payment was made).
- Set a cell for the difference between both payments.

V/ Presentation

The PowerPoint was pitched to a member of the risk management team. As shown on the outline page, it stated the several points needed to discuss for the swap contract.
NB: Concerning the slide "Comments About the variation of TMM", the comments were simultaneously described with the help of the chart drawn in the "TMM Variation Chart" sheet in the Swap valuation Excel sheet.

VI/ Proposal to the bank:

We established contact with the bank on May 23rd through a phone call and since it was not efficient to communicate the features of the whole project, we were asked to meet face-to-face to discuss further details.

The meeting took place on May 30 in the headquarters of UIB, during which we pitched the PowerPoint presentation.

Mrs. Ghada Hachani was cooperative and welcomed the idea but declined the proposal due to the lack of resources and knowledge of the field. She expressed, however, her willingness to rediscuss the idea in the future once we refine and clarify the idea further.

UIB

GROUPE SOCIETE GENERALE

Recommandation de soutien pour un projet universitaire

Je soussigne GHADA HACHANI, en tant qu'analyste risques de crédit au sein de l'Union Internationale des Banques, tiens par la présente à confirmer la tenue d'une réunion avec les étudiants : Chayma Ben Othmen, Haifa Taghouti, Med Haroun Cheriha et Mouwafak Alioui, portant sur le projet universitaire « **design d'un swap** » entre la BH leasing et l'UIB. La réunion a eu lieu le 30/05/2023 à 9 h dans nos locaux.

Au cours de notre rencontre, nous avons eu l'opportunité de discuter en détail le projet. Je souhaite souligner que l'équipe a démontré un niveau d'engagement, de compréhension et de professionnalisme exemplaires tout au long de nos échanges.

Les points suivants ont été abordés lors de notre réunion : une explication détaillée du concept du swap, les objectifs et les résultats attendus du projet. L'approche méthodologique et le plan d'exécution ont été clairement exposés.

N'hésitez pas à me solliciter si vous souhaitez obtenir davantage d'informations.

Cordialement,

Mme Ghada HACHANI
Analyste risques de crédit
Union Internationale des Banques

Signature :

le 30/05/2023

VII/ Conclusion:

Our project report concluded by outlining the steps and results of creating a swap contract between BH Leasing and UIB. Through this work, we learned new skills and received insightful knowledge that improved our comprehension of financial instruments and risk management tactics.

We were able to explore the complexities of interest rate swaps, interest rate mitigation, and regulatory compliance through the process of creating the swap contract. We discovered the value of painstaking due diligence, careful contract negotiation, and efficient interparty communication. Our understanding and expertise in financial markets and instruments have increased as a result of this endeavor.

Additionally, this endeavor's collaborative nature helped us deepen our friendships as we cooperated to achieve a common objective while supporting and motivating one another. We were able to effectively handle different areas of the project by equally splitting the labor, utilizing one another's abilities, and assuring a well-coordinated and successful end.