Contracts "FRA" - Forward Rate Agreement: Interest Rate Forwards

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Abstract
In this paper we aim to offer a primary and general view of the FRA derivative financial instrument, analyzing some of its main characteristics, presenting the development of formulas for calculating the Price of an FRA, as well as the evolution and current situation within the markets unorganized derivatives or OTC (market "Over The Counter"), ending with a brief reference on the advantages and disadvantages of the use of the instrument under study by companies to manage the risk of fluctuations in future interest rates.

Keywords: Over the counter; OTC markets; Derivatives; Future interest rates; Interest rate risk; Risk management; Interest rate forwards; FRA; Forward rate; Hedges

Introduction
The FRAs are agreements on future interest rates and are included in derivative financial instruments on interest rates, fulfilling the function of guaranteeing the interest rate both in investment operations and in financing operations, for example, of a determined project for a company [1,2]. An FRA is basically a forward contract on interest rates through which, through an agreement of the parties, the interest rate of a theoretical deposit is established or determined at a fixed term and for a specific amount, which will be carried out in a future date established in the agreement. This operation will allow canceling the risk of volatility in interest rates during the period established in the aforementioned agreement between the parties. Consequently, it could be said that a FRA contract is not a financing instrument, but rather it can be said that it is a risk hedging instrument, offering the parties the elimination of the risk derived from possible fluctuations in the interest rates future interest [3].

Operational Mechanics of Operations with FRAs
As we have already mentioned, the FRAs are contracts between two parties ('Lender' and 'Taker'), which are negotiated in non-organized OTC markets, where each of the parties to the agreement ensures a certain interest rate on a deposit. With a future start date, being a medium and short term interest rate hedging instrument. FRAs are contracts that are very similar to financial futures contracts (for example, the Forwards on exchange rate), non-standardized products adjusted to the needs of the two contracting parties. The FRAs allow covering future interest flows, both to the "Takers" and to the "Providers" of funds, and this is very important for example for companies with a profile in foreign trade operations (either exporting the goods produced, or importing intermediate inputs for production, or final) [4,5]. In this context, since companies may have to finance either an Export or an Import within a certain future period, they could then cover the risk associated with the volatility of future interest rates using a tool such as the FRA [6].

So, as a first reference it can be said that in this type of FRA contracts three important dates can be established:

- t0: the date of signature of the contract where the interest rate is agreed, the start date, the term of the contract, and the amount of the transaction.
- t1: the start date of the contract, which corresponds to the start of the transaction to be guaranteed, resulting in settlement through the payment of the difference in the flow of interest between the current reference rate in the interbank market to date, and the interest rate agreed upon at the signing of the contract.
- t2: the expiration date of the contract, with the expiration of the financial transaction.

The mechanism of the operation with FRAs can be observed in a time scheme indicated in Figure 1.

In a temporary scheme:

The period of time from the signing of the contract to its beginning is called "Deferral Period" or "Deferred Term", while the period that goes from t1 and t2 is called "Guaranteed Period of Financial Operation" [7].

As an example, it can be said that an FRA Contract that has its start date within 2 months, and its completion within 6 months, would be FRA (2/8). In this specific operation, the duration of the contract or the period to be guaranteed would have a duration of 6 months.

We can exemplify notations of FRA Contracts, such as:
- FRA (1/4): Starts within 1 month, for a period of 3 months.
- FRA (3/6): Starts within 3 months, for a period of 3 months.

Figure 1: Temporary scheme of the operation with FRAs.
FRA (3/9): Starts within 3 months, for a period of 6 months.

The importance of the FRA Contracts is directed to the management of interest rates in medium/short term operations, being that at longer terms than those referenced, the FRA Contracts no longer have a good liquidity in the market [8,9].

Example: Be a company that must finance an export operation and want to protect itself within six months of a possible increase in the interest rate, for a period of three months, for an amount of USD 1,000,000. For this the company decides to buy a FRA (6/9), for a nominal value of USD 1,000,000, the agreed rate at the time of signing the FRA Contract of 3% per year. In any situation that occurs in the future, in this way the buyer of the FRA contract, in this case the exporting company, ensures that the interest rate that will be paid for a deposit of USD 1,000,000 within six months have a "floor" of 3%. The liquidation for differences will be made at the beginning of the bilateral contract, being able to fulfill:

1. That the market interest rate is greater than 3%, with which the selling party of the FRA should assume the difference, the cost of the deposit being greater than the guaranteed one.

2. That the market rate is lower than 3%, with which the buying party should assume the difference up to the rate of 3%, with the cost of the deposit lower than the guaranteed [10,11].

In order to determine the amount of the settlement of the transaction, the interest is calculated at the expiration of the contract, and then updated, since these types of contracts are settled on the start date thereof, and not at expiration.

Determination of the FRA Price

Then, as already mentioned in this paper, the FRA contract is settled as the difference between the negotiated FRA interest rate ("i fra"), and the market interest rate ("im") at the time of the date of recruitment of the FRA. The difference with the market is paid in advance. Consequently, it can be written that:

\[ C = \frac{(im - ifra) \cdot N \cdot ifra}{1 + im \cdot ifra} \cdot \frac{365}{365} \]

Where "i fra" are the days of the period of validity of the contract, and "N" the Nominal to cover. As a result, the buyer will receive from the seller this amount or this "C" amount, on the start date, that is, if the market rate at the time the Contract begins is higher than the FRA rate on the contract date.

Calculation of the Theoretical Interest Rate of the FRA

Suppose now that you want to know what would be the price of an FRA or "Theoretical term rate", with start date within 3 months and period of validity 3 months [12,13]. This can be seen in Figure 2.

For equivalences of interest rates, it must be fulfilled that:

\[ (1 + i0; 6) = (1 + i0; 3) \cdot (1 + i3; 6) \]

Where i3; 6 = Forward Rate = FRA Rate =?

Therefore, we can write:

\[ \frac{1 + i0; 6}{1 + i0; 3} = \frac{\frac{180}{365}}{\frac{90}{365}} \]

Negotiation of Financial Derivatives and Contracts

According to the data collected from the BIS, the trading of Interest Rate Derivatives has remained relatively stable from 2015 to 2017, which reflects the importance of managing the interest rate risk. Figure 1 shows this evolution in more detail (Graph 1) [14-16].

On the other hand, Graph 2 shows the negotiations of FRA Contracts during 2018, which confirms the use of this instrument as a risk management tool for interest rates (Tables 1-3 and Graph 3) [17].

Conclusions on the Advantages and Disadvantages of Operating with FRAs

Regarding the first conclusions, in this sense it can begin with the disadvantages of operations with FRA Contracts, and in this sense,
it could be mentioned that there is a "risk of default" in the case that the counterparty that should make the payment, not make declaring yourself insolvent. On this point it is worth mentioning that this type of risk does not have the operations carried out in the Market with "Futures on interest rates", since there is a "Clearing House" or "Compensation Chamber" that assumes the risk (for another part, the Futures can be liquidated before the expiration).

But it is very important to highlight as an advantage, that for companies the FRA Contracts are very important as a tool in the protection against volatility risks or fluctuations in interest rates, both

### Table 1: Interest rate derivatives - In billions of US dollars - 2017.

<table>
<thead>
<tr>
<th></th>
<th>USD</th>
<th>EUR</th>
<th>JPY</th>
<th>GBP</th>
<th>CHF</th>
<th>CAD</th>
<th>SEK</th>
<th>Other currencies</th>
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<td></td>
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<td>38,77</td>
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<td>4,11</td>
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<td>18,763</td>
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<td>0</td>
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### Table 2: Interest rate derivatives - In billions of US dollars and Herfindahl points – 2018.

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Graph 2: Negotiations of FRA Contracts during 2018 in USD (dollars), operations worldwide.

http://stats.bis.org/statx/srs/table/d7

Graph 3: Interest rate derivatives - In billions of US dollars and Herfindahl points – 2018.

http://stats.bis.org/statx/srs/table/d7
upwards and downwards, since it gives certainty about future costs of operations in financial matters. As the liquidation of the operation is affected by differences, the risk with the counterparty is limited to the difference of interest, without there being any possibility of loss of the nominal value established in the operation.

References