Floating rate securities

Floating rates

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Summary

File: MFME2_06.xls
FLOATING RATES

Floating rate securities are fixed income instruments which have a coupon rate or interest rate that varies based on a short-term rate index. Other terms are floating rate notes, floating rate certificates of deposit or variable rate notes. While this is more complex than fixed coupons, floating rates are generally advantageous for lenders when interest rates are rising.

Floating rate securities assume that the investor’s return is a coupon linked to an index which will change during the life of the security. The index could be quarterly or semi-annual such as three-month LIBOR (London Interbank Offer Rate). The British Bankers Association is the most widely used benchmark or reference rate for short-term interest rates and is the rate of interest at which banks borrow funds from other banks, in marketable size, in the London interbank market. Other interbank rates include Euro LIBOR, US Dollar LIBOR, GBP LIBOR and Japanese Yen LIBOR.

A floater is a fixed income instrument whose coupon fluctuates with some designated reference rate. A floating rate note (FRN) is a floater issued by a corporate or agency borrower. Typically, FRNs have maturities of about five years. The three-month or six-month LIBOR are two commonly used reference rates, as are treasury bill yields, the prime rate or the Federal funds rate. Collateralized mortgage obligations (CMOs) are also sometimes structured to have floating rate coupons.

For FRNs, the coupon rate is usually reset each time interest is paid. A typical arrangement might be to pay interest at the end of each quarter based on the value of three-month LIBOR at the start of the quarter. The coupon rate is calculated as the reference rate plus a fixed spread, which depends upon the issuer’s credit quality and specifics of how the instrument is structured. One feature that can affect the spread is a provision that places a cap or floor on the floating coupon rate. For example, an FRN might be issued with a cap of 7.5 per cent and a floor of 1.5 per cent.

In assessing credit risk from a single counterparty, three issues need to be considered:

- Default probability as the likelihood that the counterparty will default on its obligation either over the life of the obligation or over some specified horizon, such as a year. Calculated for a one-year horizon, this may be termed the expected default frequency.
- Credit exposure: in the event of a default, how large will the outstanding obligation be when the default occurs?
- Recovery rate: in the event of a default, what fraction of the exposure may be recovered through bankruptcy proceedings or some other form of settlement?
The credit quality of an obligation refers generally to the counterparty’s ability to perform on that obligation, which encompasses both the obligation’s default probability and anticipated recovery rate. Note that every risk comprises two elements: exposure and uncertainty. For credit risk, credit exposure represents the former, and credit quality represents the latter.

To investors, holding an FRN is similar to investing in money market instruments and continuously reinvesting as those instruments mature. The significant difference is the fact that the FRN entails long-term credit exposure to the issuer and this is typically reflected in the FRN’s spread. FRNs tend to have stable market values. If the floating rate is reset with each coupon payment (as is typically done) the duration of an FRN is simply the time until the next interest payment.

CHARACTERISTICS OF INTEREST RATE SECURITIES

Issuer

An organization which issues a bond is referred to as ‘the issuer’ or ‘the borrower’. The most active issuers of bonds today are governments and government agencies (government bonds), banks and corporations (corporate bonds).

Face value

Face value is the amount that is to be paid to an investor at the maturity date of a bond. Bonds can be issued at different face values; however, floating rate securities typically have a unit face value of 100.

Interest coupon

The coupon represents an interest payment paid at regular intervals by the issuer to owners of interest rate securities. The coupon rate is the interest rate paid to investors during the life of the bond and is set when the issuer first sells the securities into the market. A floating rate note has a coupon that varies in line with a benchmark rate, usually at a margin above the bank-bill rate, and is different at each payment date. Since the amount of coupon interest is known in advance, its accumulation is spread over the relevant period. This is referred to as the daily accrued interest. This contrasts with a share dividend which is only known shortly before it is paid.
Coupon frequency

Coupon payments are made at regular intervals throughout the life of the security and are usually quarterly or semi-annually. Floating rate notes normally pay interest quarterly.

Yield

The yield is the return an investor receives on a bond. The yield is based on the price paid by an investor for a bond and the payments (coupons) received if the bond is held to maturity. The most important types of yield are the nominal yield and the yield to maturity.

Maturity date

The final coupon and the face value of a bond are repaid to the investor on its maturity date. The time to maturity can vary greatly, although it is typically between two and twenty years.

Purchase price

The price of a bond is stated as a percentage of its face value. For example, a price of 100 means 100 per cent of face value; a price of 99.80 is 99.8 per cent of face value; a price of 102.5 is 102.5 per cent of face value.

The purchase price (also known as the gross price) is the total amount that an investor pays for a bond. The total purchase price comprises the number of bonds that an investor buys times the price paid for a bond.

The purchase price includes two components:

- Capital price which is the price of the bond as estimated by the market based on a number of variables including interest rates, maturity date, ranking and credit quality.

- Accrued interest on the bond which is the amount of interest accumulated on a bond since the last coupon payment. Because interest is paid at regular intervals the bond price increases daily by the amount of interest accruing. On a 6.50 per cent annual coupon, interest accrues at 1.78 per 100 per day. Immediately following the coupon payment the price should fall by the amount of that coupon payment.
YIELD EVALUATION

Two methods of evaluating the yield on floating securities are:

- effective margin both simple and compound;
- current marginal income.

Since floating rate securities are linked to an index, an investor is concerned with the margin above or below the index. A further position is the implied coupon date price, which is a price-based evaluation against the price in the market together with the cost of carrying the position. This is a way of marking the floating investment to market.

Effective margin

This is the total marginal return over the index to maturity and comprises a combination of margin (negative or positive) over the index plus capital growth or depreciation (see Figure 6.1). The formula is:

\[
\text{Simple effective margin} = \text{margin} + \frac{\text{redemption value} - \text{price}}{\text{life}}
\]

<table>
<thead>
<tr>
<th>Life</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margin</td>
<td>25 basis points over six month LIBOR</td>
</tr>
<tr>
<td>Clean price</td>
<td>99.0</td>
</tr>
<tr>
<td>Redemption</td>
<td>100</td>
</tr>
</tbody>
</table>

**Figure 6.1**

Simple effective margin

![Simple effective margin Excel sheet](image)
The second formula takes into account the price of the floating rate note with this formula:

\[
\text{Modified simple effective margin} = \left[ \frac{\text{margin} + (\text{redemption value} - \text{price})}{\text{life}} \right] / \text{price}
\]

The simple effective margin is 35 basis points. This result can be compared with similar bonds as a basis for evaluation since the variables for the calculation are the life, margin over the index, price and par value. The effective margin is increased by a larger margin over LIBOR and conversely decreased by a smaller margin. The main factor is the price since the margin increases as the price falls (Figure 6.2).

With the price reduced to 97 the margin rises to 55 basis points. This simple method does not take into account the present value of future cash flows in the same way as the simple yield on a fixed bond. Using standard bond calculations you can calculate the bond as a fixed bond at par and then compare the yield on the variable bond.

Column C in Figure 6.3 shows an 8 per cent bond at par with the price and redemption value the same. Column D evaluates an 8.25 per cent semi-annual bond priced at 99. The coupon is therefore 4.125 payable every six months with 20 payments in total.

The \textsc{rate} function (see Figure 6.4) derives the yield per period and this is multiplied by two to form an annual nominal rate. The effective margin is therefore 8.4 per cent less the index value of 8 per cent. This figure can be used for evaluating a potential investment where the key factors are price, margin, period and index value. With dates in the calculation you could, of course, use the \textsc{yieldd} function in Excel.
Current marginal income

The current marginal income is a simple spread figure and represents the annual income from the floating rate security taking into account funding the investment at LIBOR. In other words this is the difference between the cost of the investment and the benefit derived. The formula is:

\[
\text{Current marginal income} = (\text{LIBOR} + \text{FRM margin}) - (\text{price} \times \text{LIBOR}/100)
\]

\[
CMI = 8.25\% - (99 \times 8\%) = 0.33\%
\]

The price and LIBOR rate are key factors in generating the current marginal income. Figure 6.5 shows the effect: for example, the margin increases with an increase in LIBOR and a decrease in the price. The lowest margin in the table is found at the highest price and lowest LIBOR.
Implied coupon date price

The implied coupon date price is the level at which the security must be sold in order to break even on the investment (Figure 6.6). It is one method of marking the instrument to market the current holding in a specific security.

The formula is:

\[
\text{Price} + \left[ \frac{(\text{price} \times \text{days A} \times \text{cost/funds})}{360 \times 100} \right] - \frac{(\text{coupon} \times \text{days B})}{360}
\]

Days A = days from settlement to next coupon
Days B = days between coupons
360 = number of days in the reference year according to convention
The cost of holding the investment is \[ ((\text{price} \times \text{days A} \times \text{cost/funds}) / 360 \times 100) \] and the reward is \((\text{coupon} \times \text{days B}) / 360\). The Excel sheet breaks the calculation down into three stages:

A. Dirty price = clean price + accrued interest from 20 to 25 May
   \[ = 98.50 + 5 \times 8.25 / 360 = 98.615 \]

B. Cost of carrying FRM to the next coupon date
   \[ \text{Cost: } = \text{price} \times \text{days A} \times \text{cost/funds}) / 360 \times 100 \]
   \[ = (98.615 \times 179 \text{ days} \times 8.00) / 36,000 = 3.923 \]

C. Less coupon to be received at the next coupon date
   \[ \text{Reward } = (\text{coupon} \times \text{days B}) / 360 \]
   \[ = (8.25 \times 184 \text{ days}) / 360 = 4.217 \]

Therefore the total calculation = 98.615 + 3.923 – 4.217 = 98.321

The factors affecting the potential profit or loss on the investment against the market price are:

- purchase price of the security;
- cost of finding the purchase, current LIBOR or index;
- coupon as a combination of LIBOR and the margin. LIBOR could be different from the current rate depending when the rate was set. This could arise if the floating rate security was purchased between coupons and LIBOR has moved since the last coupon was reset.
**COUPON STRIPPING**

Coupon stripping is a further use of discounting mathematics as a way of producing a profit from the difference in the coupon and market interest rates. A bond can be purchased at the market price and the coupons can be ‘stripped off’ and sold separately as zero coupon instruments. The bond without the coupons is a zero coupon bond.

The arbitrage possibility arises from the difference from reselling each of the cash flows separately and the bond itself. The individual profits will depend on the yield curve from selling a one, two, three, etc. year instrument.

**Figure 6.7**

![Coupon stripping](image)

Figure 6.7 shows a ten-year bond with a 12 per cent coupon with a price of 101.00 based on a yield of 11.75 per cent. The first part of the spreadsheet confirms the present value of the cash flows at 11.75 per cent. The second part of the schedule shows the input yields and in line 25 the calculations for the individual discount factors. The formula is the cash flow / (1 + interest rate) ^ period number. The stripped cash flows add up to 103.19 and this represents a potential profit of 1.77.

The difficulty of realizing a profit depends primarily on the size of the coupon values to make it worthwhile in terms of time and effort. Nevertheless the difference in yields could give rise to a potential profit.
EXERCISE

Extend the coupon stripping model to allow for up to 20 periods and calculate the profit or loss on this scenario. The model (see Figure 6.8) requires the use of dates rather than a fixed number of periods together with IF statements to cease the coupon payments after 31 December 2022 and trigger the principal repayment.

Figure 6.8

Exercise inputs

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<td>Jun-16</td>
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<th>E</th>
<th>F</th>
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<td>5.00</td>
<td>5.00</td>
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<td>4.58</td>
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<td>4.19</td>
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<tr>
<td>PV Cash Flow</td>
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<td>4.19</td>
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<tr>
<td>Sum</td>
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<td>4.58</td>
<td>4.38</td>
<td>4.19</td>
<td>4.01</td>
<td>3.84</td>
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Figure 6.9 shows a portion of the answers with the individual coupons discounted at the individual rate and added together to form a profit.

**SUMMARY**

This chapter reviews floating rate instruments where the coupon varies depending on the margin over an index rate. Relevant yield measures can be calculated such as the effective margin, current marginal income and the implied coupon date price. As a further example of discounting mathematics, coupon stripping shows a potential profit based on the difference in interest rates and the yield curve.