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RATES UNIVERSITY

16. Asset Swaps

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Contents

This module is an introduction to Asset Swaps.

An Asset Swap combines the purchase or sale of a security with an interest rate swap.

The interest rate swap allows the investor to transform the cashflows of the Asset into a synthetic Bond with more desirable risk / return properties.

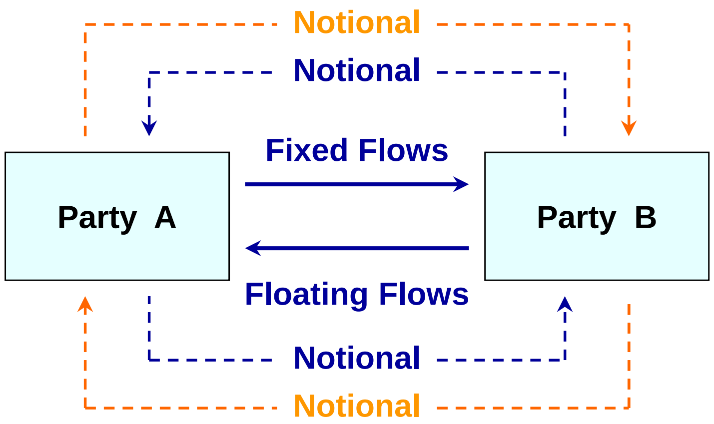
We will look at the following ...

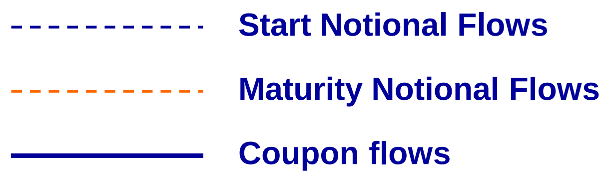
- recap of Basic Swaps
- Asset Swap definition
- Par Asset Swaps vs market value Asset Swaps
- Asset Swap examples

Swap Recap

A simple swap can be looked at as 2 simultaneous loans (or Bonds)

Fixed Rate loan / Bond	Party B has lent the Notional Amount to Party A as a fixed rate loan Thus Party A makes fixed rate interest payments to Party B
Floating Rate loan / Bond	Party A has lent the Notional Amount to Party B as a floating rate loan Thus Party B makes floating rate interest payments to Party A





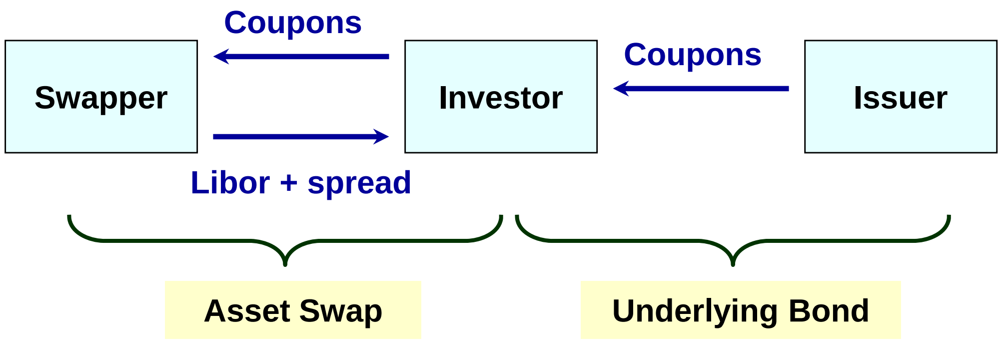
Each side of the swap is priced separately.
The value of the swap is the Net Present Value.

In a Cross Currency swap it is essential to include the Notional exchanges at Start & Maturity, since these are real cashflows in different currencies.

In a Single Currency swap, it is still good practice to include Notional Exchanges, even when they net to 0 in the common currency. This practice of always including Notionals facilitates understanding of the value of each side as a loan, either fixed or floating.

Asset Swaps

Frequently an investor will seek to buy a Bond and use a so-called Asset Swap to convert the coupons on the Bond into a floating rate Note.



The coupons on the underlying Bond can range from simple fixed rate coupons up to any type of highly structured coupon.

The Asset Swap allows the investor to convert the “yield” from the Bond into a spread over Libor.

At the same time, if the coupons in the Bond are contingent then the Asset Swap swaps out that risk, so that the investor is only left with the minimal interest rate exposure implicit in a Floating Rate Note.

Often the investor will simultaneously purchase the Bond and enter the Asset Swap, which allows the investor to hedge the Bond’s coupon risk immediately.

Asset Swap Uses

The uses of Asset Swaps are many and varied. They include …

- Asset Swaps allow investors to buy Bonds with high relative value and swap them into synthetic Bonds with more desirable risk / return profiles.

- Asset Swaps are used extensively by dealers in the secondary market.
  Structured Notes can be bought and combined with an Asset swap to create a synthetic floater which is then sold to an investor.

- Asset Swaps can be used to hedge the risks inherent in a Structured Note.
  An investor holding a Structured Note can use an Asset Swap to remove the interest rate, volatility, and FX risks associated with the Note (they are "swapped out")
  However, the credit risk of course is not mitigated by this process.

- Asset Swaps can be used by investors to express a view in the relative performance of a particular Bond against swaps. For example, an investor who believes that a particular Bond will "outperform" swaps can buy the Bond, and Asset swap into Libor + spread.
  If the investor view is then realised and the Bond appreciates in price relative to the swap market (so that the yield of the Bond falls faster / rises slower than the corresponding swap yields), the investor can unwind the position for a profit. We will see an example later of how this is done.

Asset Swap Example

As an example, consider the purchase of a 5yr semi-annual fixed coupon Bond with

- coupon = 5.00% Semi
- yield = 5.50% Semi

To simplify matters we assume the Bond is purchased on a coupon date. Then we can quickly calculate the Bond Price as …

$$\text{Bond Price} = \frac{2.50\%}{(1+2.75\%)^{1}} + \frac{2.50\%}{(1+2.75\%)^{2}} + \frac{2.50\%}{(1+2.75\%)^{3}} + \ldots + \frac{2.50\%}{(1+2.75\%)^{10}} + \frac{1}{(1+2.75\%)^{10}} = 97.84\%$$

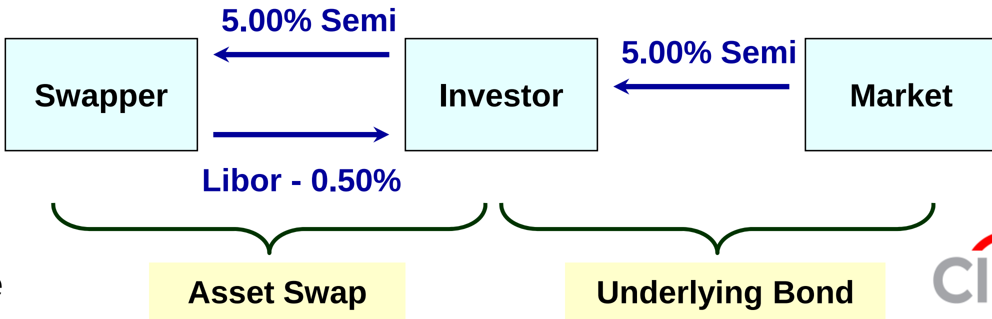
Assume now that the current swap rate is 6.00% Semi (vs 6m Libor)

If we construct the Asset Swap so that the fixed side of the swap replicates the Bond cashflows (including the purchase price), we see that the Internal Rate of Return (IRR) of the fixed side will be the Bond Yield of 5.50%. This IRR is 0.50% below the required IRR of the swap at 6.00%.

We can immediately conclude that to a very good approximation, the Bond flows could be asset swapped into 6m Libor – 0.50% on the full Bond Notional

- Bond Yield = 5.50%
- Swap Rate = 6.00%

- Spread = - 0.50%
  = Bond Yield – Swap Rate



Asset Swap Example

The analysis of the example assumed that we swapped the entire Face Value of the Bond into the synthetic Floating Rate Note (ie. that the Libor leg Notional on the swap is 100% of the Bond Notional)

In fact the investor may decide to set the Notional of the Libor leg to be the Bond purchase price, in this case 97.84% of the Bond Notional.

This distinction gives rise to the 2 basic types of Asset Swap

- Par Asset Swap — the Libor leg Notional is the Bond Notional of 100.00%
- Market Asset Swap — the Libor leg Notional is the Bond Price – in this case 97.84%

In both cases the fixed side of the Asset Swap matches the Bond cashflows of

- Purchase Price
- Coupons
- 100% Redemption

The only difference between Par and Market Asset Swaps lies in the size of the Notional on the floating side.

We will look at both in detail …

Par Asset Swap Example

Par Asset Swap

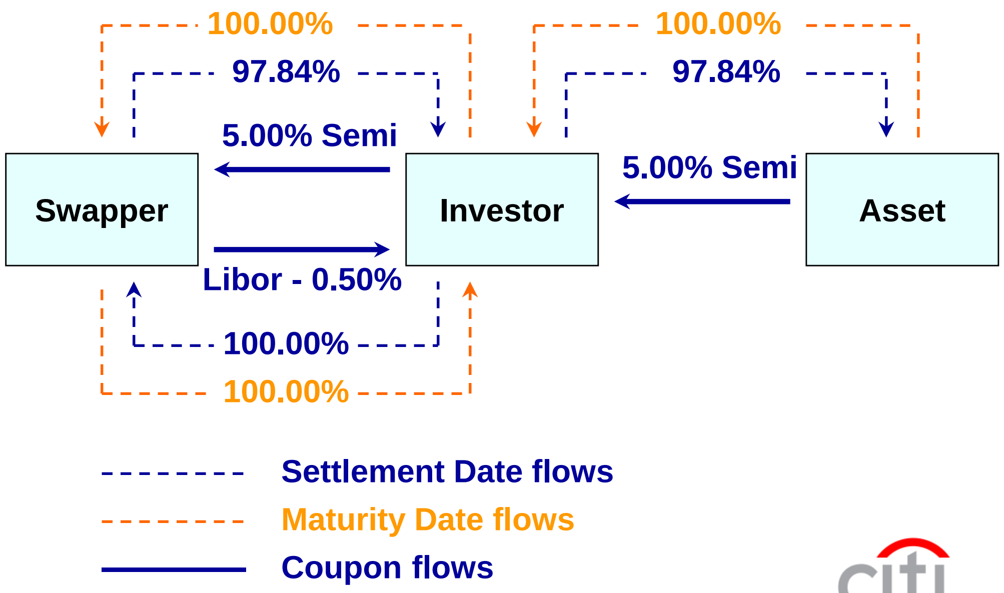
In a Par Asset Swap the investor swaps the entire Bond Notional (ie 100%) into Libor + Spread.

The fixed cashflows on the swap replicate the Bond cashflows. This means that the investor receives the Bond Price from the swapper as part of the initial exchange. Since the investor simultaneously invests the full Bond Notional of 100% in the floating side, the net outflow on the Settlement Date, between the purchase of the Asset and the inception of the Asset Swap, is 100.00%.
Hence the name Par Asset Swap.

For the example we considered above, let us consider the detailed cashflows.

The investor will …

- buy the Bond from market at 97.84%
- “swap” the full Bond Notional of 100.00% upfront with the swapper, but receive only the Bond Price of 97.84% in the initial exchange. This creates a net payment of 2.16% from the investor to the swapper.
- pay the 5.00% coupons on the 100% Bond Notional over life and in return receive Libor - 0.50% on the 100% swap notional.
- re-exchange the 100% Notionals at the Maturity of the Swap (no net cashflow)



Par Asset Swap Example

Note that receiving the Bond Price from the Swapper at inception, while paying full coupons on the entire Bond Notional over life, ensures that the fixed side of the swap has a yield (IRR) to the investor equal to the Bond Yield of 5.50%.

Since the market Swap Rate (which is effectively an IRR) is assumed to be 6.00% vs Libor flat, a 5.50% yielding fixed side equates to a floating side coupon of approximately Libor – 0.50%. Daycount differences ensure that the spread not exactly 0.50% but very close to it.

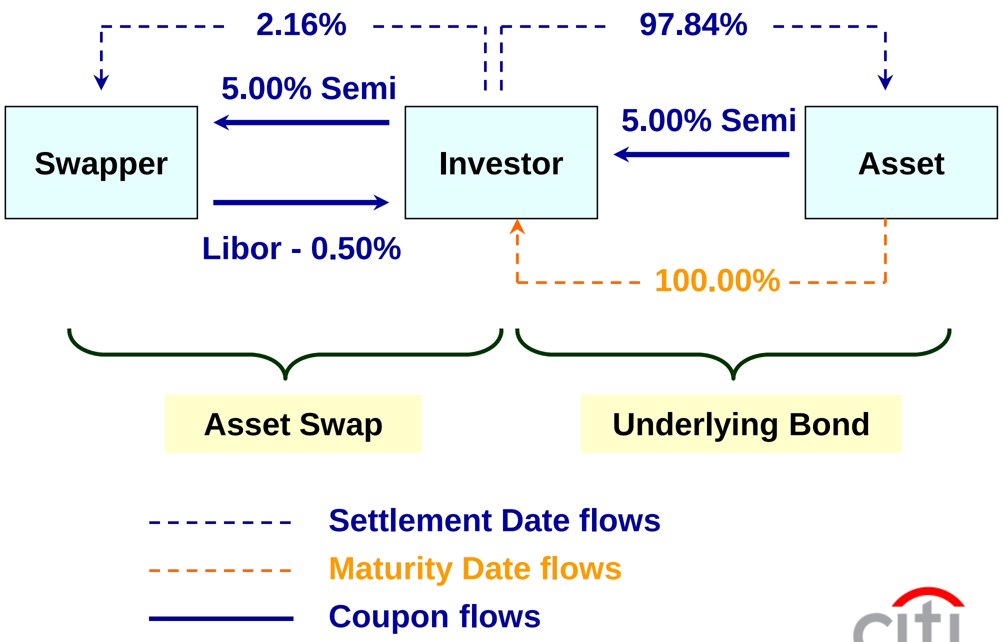
If we net out cashflows in this example, we see the following net cashflows …

This diagram shows that the net outflow for the investor on the settlement date is 100% (Par).

If the Bond trades at a Premium (Price > 100) then the investor would receive the premium from the swapper on the settlement date.

This would again ensure that the Asset Swap fixed side had a yield equal to the Bond Yield.

Once again the net initial outflow for the investor would be 100%.



Par Asset Swaps

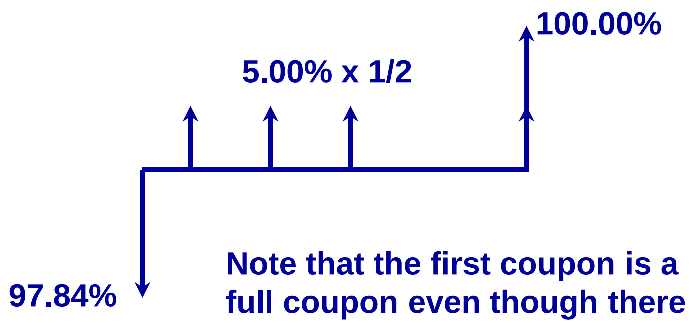
Let us look more closely at the cashflows in this Par Asset Swap example.

We consider …

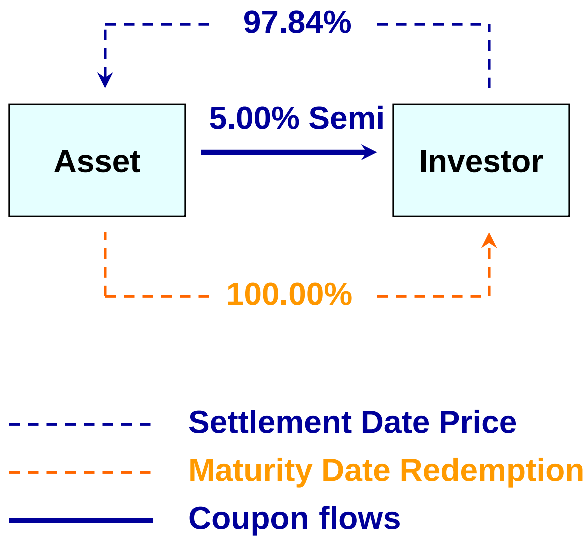
- Underlying Bond
- Asset Swap Fixed Side
- Asset Swap Floating side

Underlying Bond

- **on the Settlement Date, the investor buys the Note for 97.84%**
- **the investor receives full 5.00% coupons (no daycount adjustment) on a semi-annual basis over life.**
- **on the Maturity Date, the investor receives the 100% Redemption**



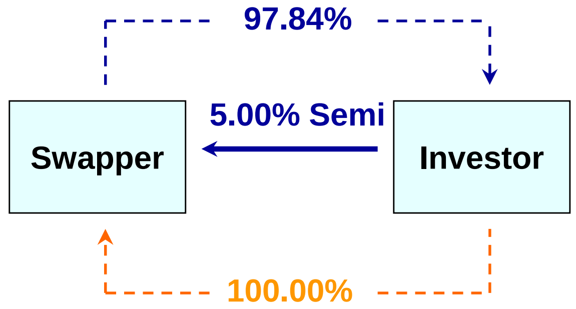
Note that the first coupon is a full coupon even though there is a stub period.



Par Asset Swaps

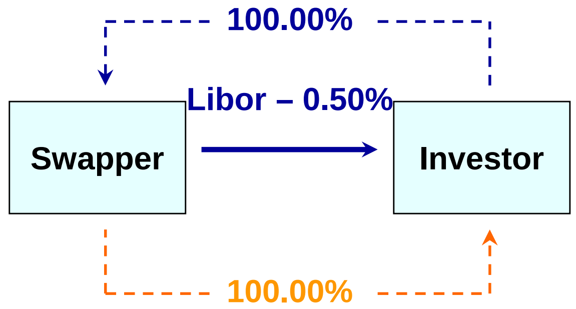
Asset Swap Fixed Side

- **on the Settlement Date, the investor "borrows" 100% from the swapper on a 5.00% fixed rate basis. The investor simultaneously pays the Bond discount of 2.16% back to the swapper in order to simulate a Bond sale at 97.84%**
- **the investor pays the full 5.00% coupons over life**
- **on the Maturity Date, the investor pays back the 100% Notional to the swapper.**



Asset Swap Floating Side

- **on the Settlement Date, the investor "invests" 100% with the swapper on a (Libor – 0.50%) floating rate basis**
- **the investor receives the (Libor – 0.50%) coupons over life**
- **on the Maturity Date, the investor "redeems" the 100% floating rate investment made with the swapper**

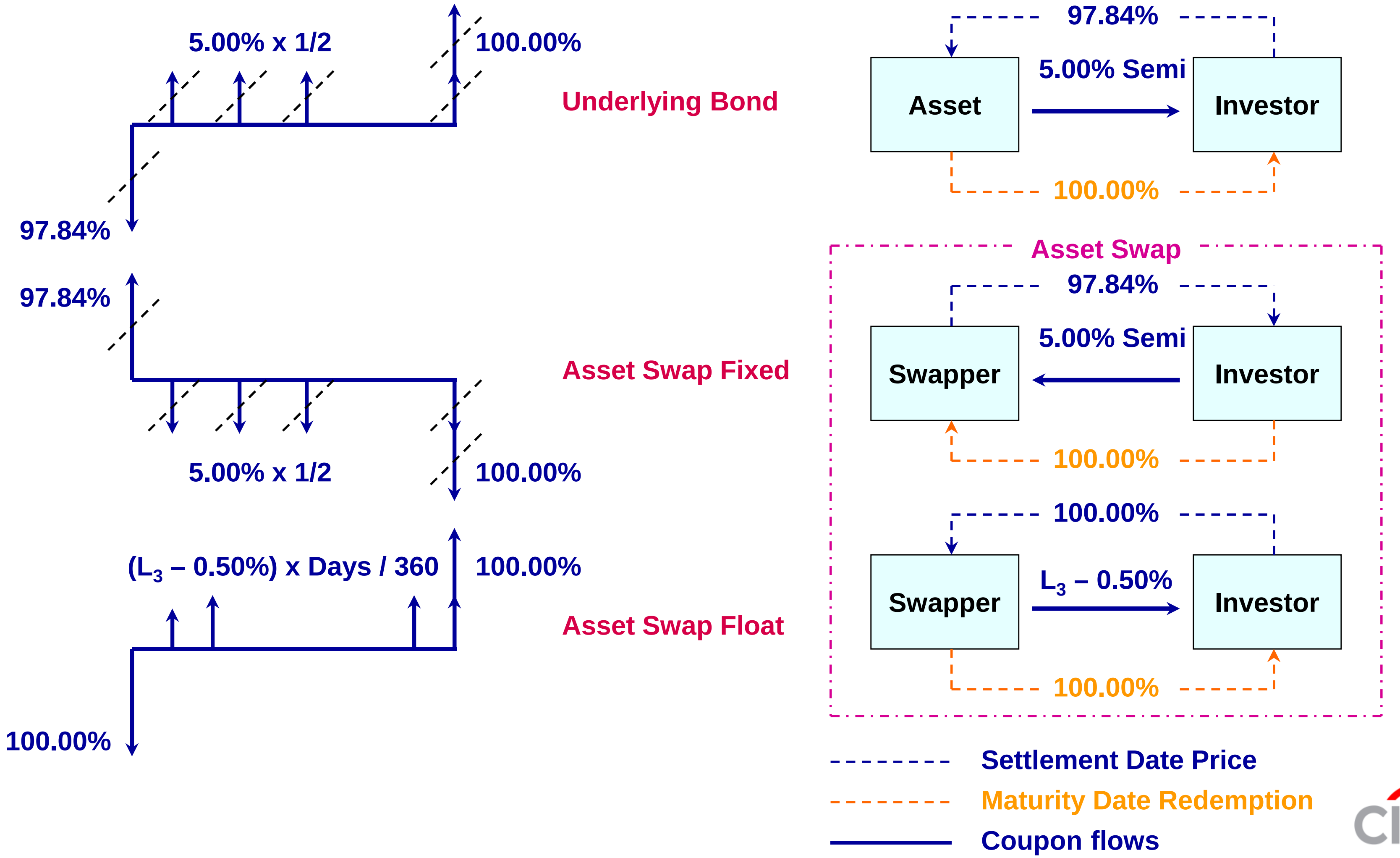


Note that notional flows are included in the analysis in order to facilitate the treatment of the Asset Swap as simultaneously a fixed rate Bond against a Floating Rate Note.

Settlement Date Flows
Maturity Date Flow
Coupon flows

Par Asset Swaps

A comparison of cashflow diagrams shows how the Asset Swap converts the Fixed Rate Note into a Floating Rate Note …



Market Value Asset Swap Example

Market Value Asset Swap

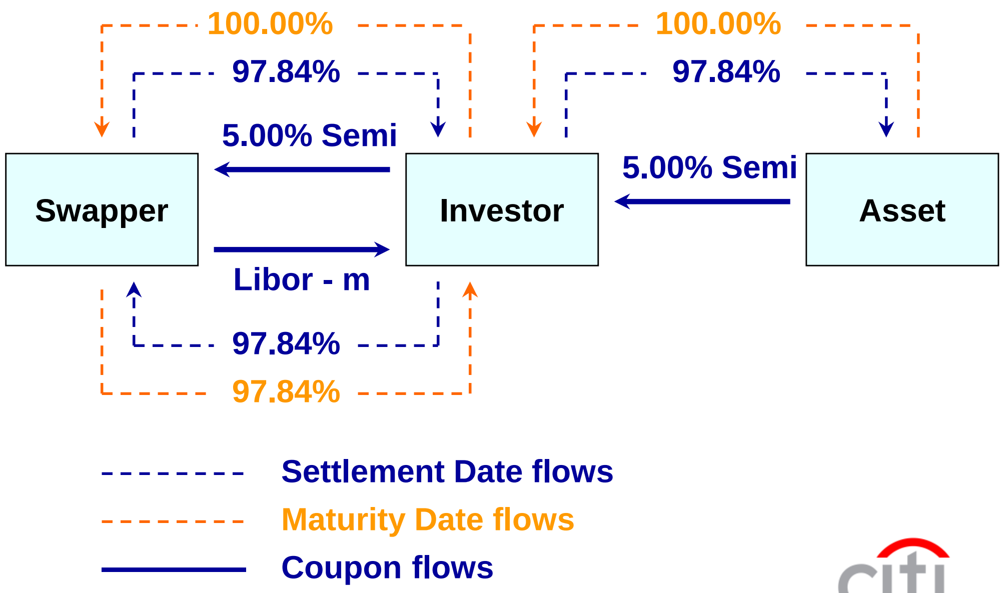
In a Market Value Asset Swap the investor swaps the Bond Price (not the Bond Notional) into Libor + Spread.

As in the Par Asset Swap, the fixed cashflows on the swap replicate the Bond cashflows.
The investor receives the Bond Price from the swapper as part of the initial exchange. This time however, the investor simultaneously invests just the the Bond Price back to the swapper on the floating side.

Thus the net outflow for the investor on the Settlement Date is the Bond Price. Hence the name Market Value Asset Swap.

This time the investor would …

- buy the Bond from market at 97.84%
- “swap” the Bond Price of 97.84% (not the full 100% Notional) upfront with the swapper (no net cashflow)
- pay 5.00% coupons on the full 100% Bond Notional over life and in return receive Libor - m on the swap notional of 97.84%
- pay net 2.16% to the swapper at Maturity (pay the Bond Notional to the Swapper, and receive the swap notional of 97.84%)



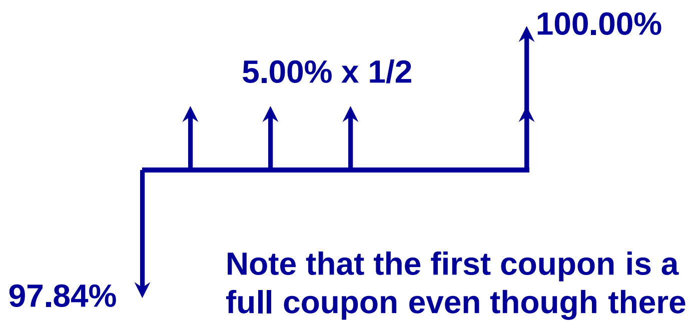
Market Value Asset Swaps

Let us this time look closely at the cashflows in the Market Value Asset Swap example.

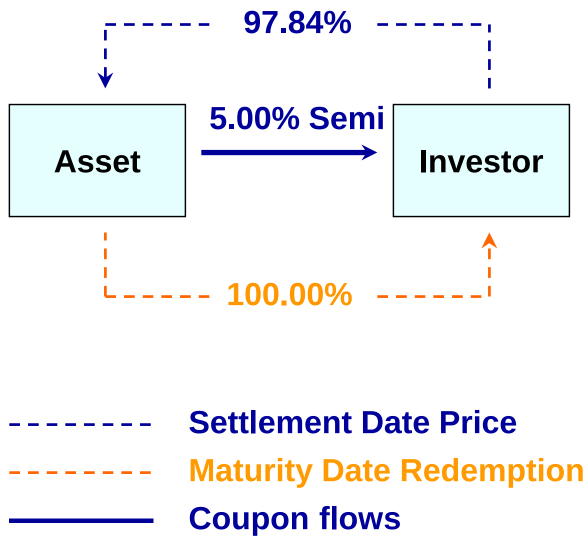
We consider …
- Underlying Bond
- Asset Swap Fixed Side
- Asset Swap Floating side

Underlying Bond

- **on the Settlement Date, the investor buys the Note for 97.84%**
- **the investor receives full 5.00% coupons (no daycount adjustment) on a semi-annual basis over life**
- **on the Maturity Date, the investor receives the 100% Redemption**



Note that the first coupon is a full coupon even though there is a stub period.



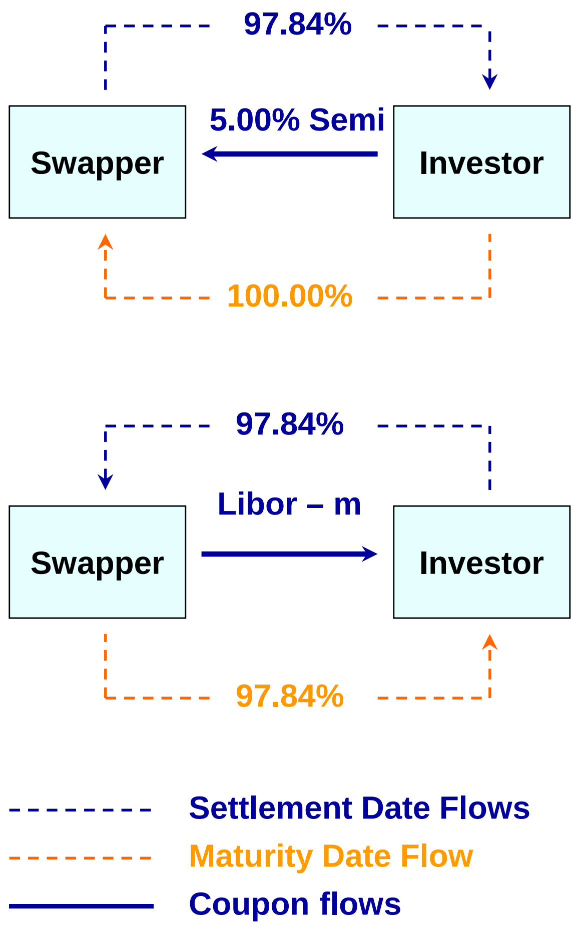
Market Value Asset Swaps

Asset Swap Fixed Side

- **on the Settlement Date, the investor “borrows” 100% from the swapper on a 5.00% fixed rate basis. The investor simultaneously pays the Bond discount of 2.16% back to the swapper in order to simulate a Bond sale at 97.84%**
- **the investor pays the 5.00% coupons over life**
- **on the Maturity Date, the investor pays back the 100% Notional to the swapper.**

Asset Swap Floating Side

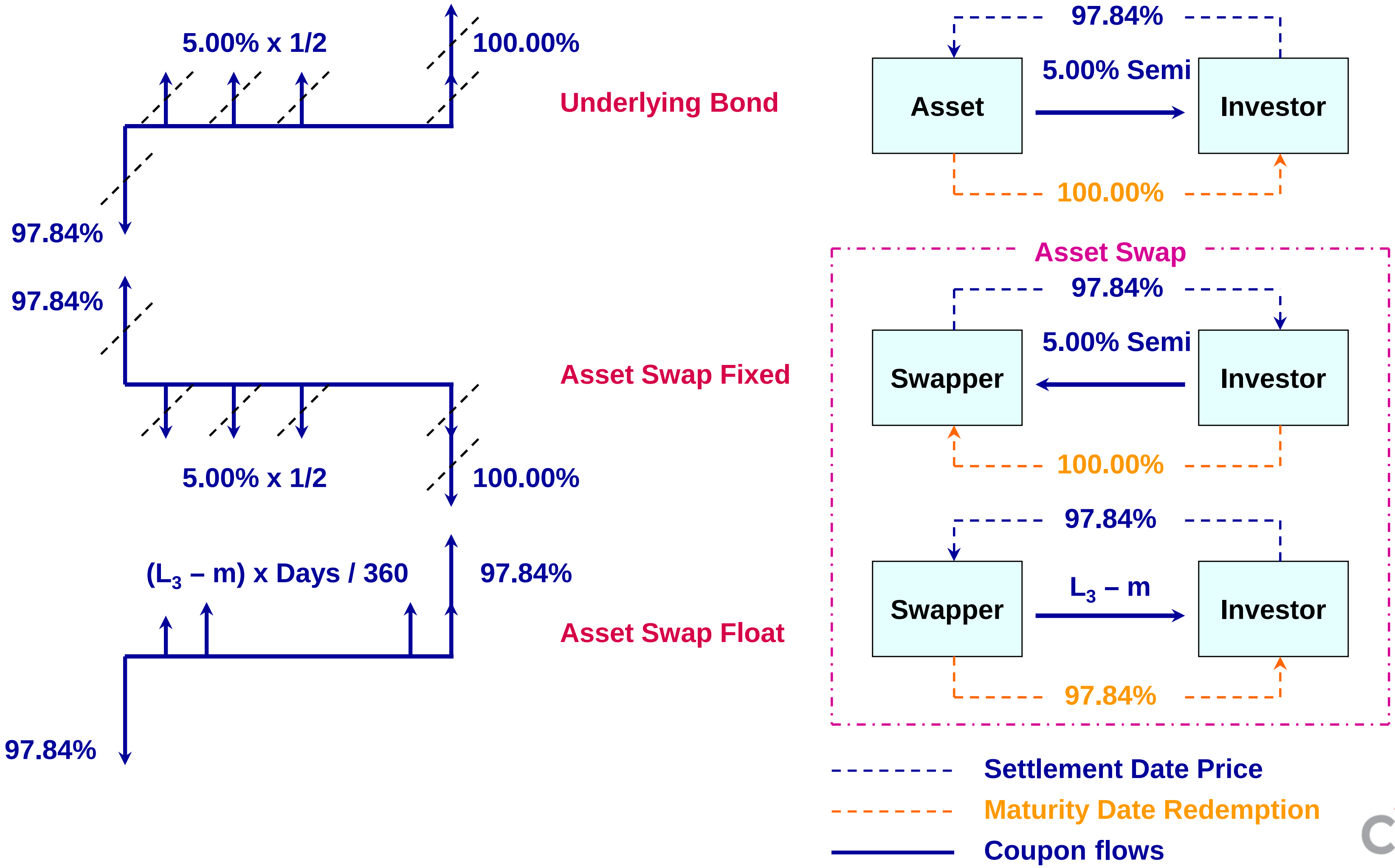
- **on the Settlement Date, the investor “invests” 97.84% with the swapper on a (Libor – m) floating rate basis**
- **the investor receives the (Libor – m) coupons over life**
- **on the Maturity Date, the investor “redeems” the 97.84% floating rate investment made with the swapper**



Note that notional flows are included in the analysis in order to facilitate the treatment of the Asset Swap as simultaneously a fixed rate Bond against a Floating Rate Note.

Market Value Asset Swaps

Once again, a comparison of cashflow diagrams shows how the Asset Swap converts the Fixed Rate Note into a Floating Rate Note …



Market Value Asset Swap Example

We note that the margin m on the Market Value Asset Swap is not the same as the – 0.50% margin calculated on the Par Asset swap.

The difference between the margins is that

- in a Market Value Asset Swap the margin m applies against the Bond Price P (in our example P = 97.84%)
- in a Par Asset Swap the margin applies against the full 100% Bond Notional

We know that the value of the floating leg of an Asset Swap (of either variety) is simply

Float Leg Value = margin x Swap Notional x Ann01

where Ann01 = Present Value of an annuity of 1 basis point p.a. occurring at the required frequency until Maturity

Clearly then, equating the 2 floating leg values leads to

Market Value Margin x Bond Price x Ann01 = Par Margin x 100% x Ann01

so that

Market Value Margin = Par Margin / Bond Price

Thus in our example … m = - 0.50% / 97.84% = - 0.51%

Bond Outperformance Example

Recall that Asset Swaps can be used by investors to express a view in the relative performance of a particular Bond against swaps.

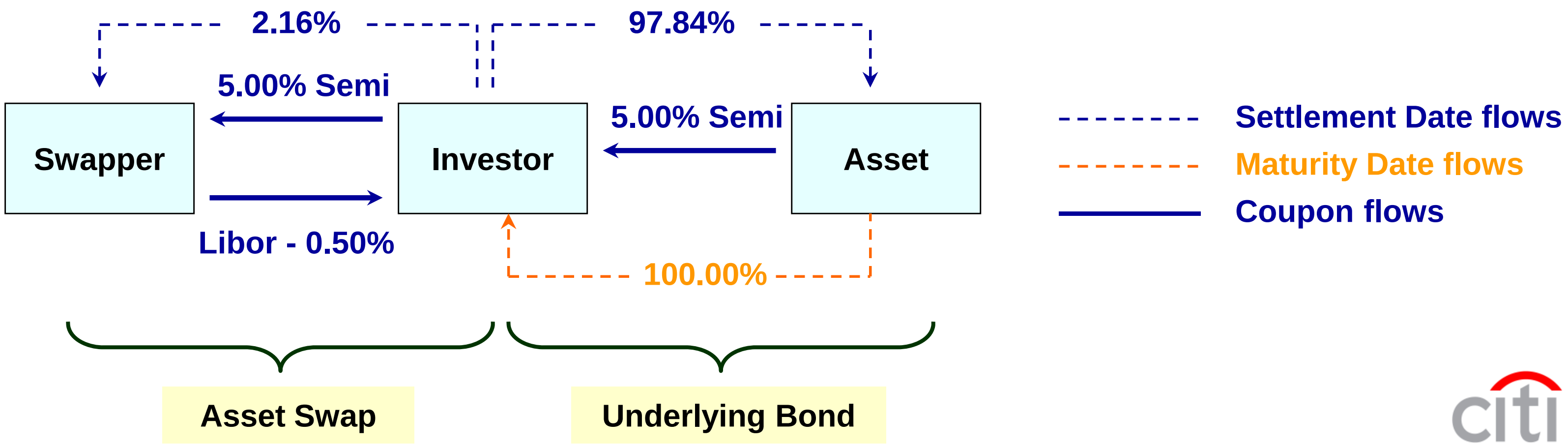
Suppose an investor believes that a particular Bond will “outperform” swaps (ie the yield of the Bond will fall faster or rise slower than the corresponding swap yields)

The investor can then buy the Bond, and Asset swap into Libor + spread.

For example, we look again at the Asset Swap we did earlier. We suppose that the Swap Rate is 6.00%, and the Bond Yield 5.50%.

The Bond Price is 97.84% and the Asset Swap spread will be 5.50% - 6.00% = - 0.50%

The net cashflows are then …



Bond Outperformance Example

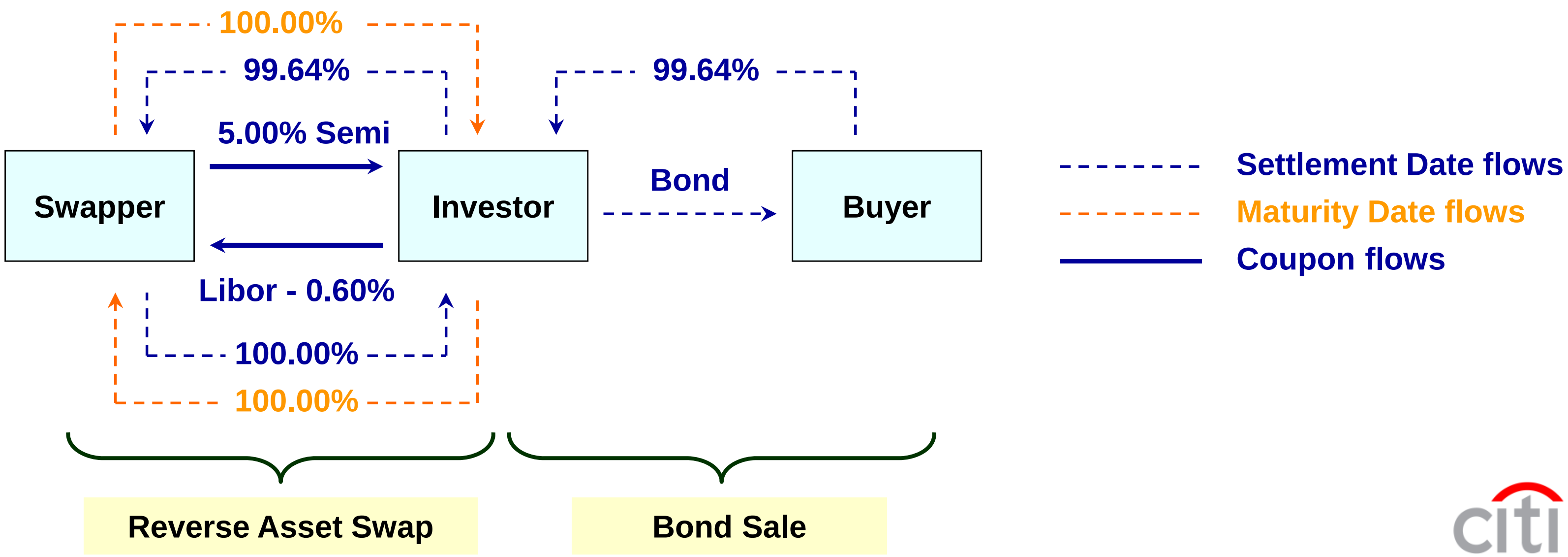
Suppose 1yr passes and the new market yields are

- Swap Rate 5.70% (down 0.30%)
- Bond Yield 5.10% (down 0.40%) so the new Bond Price is 99.64%

The investor view has thus been realised, and the Bond has outperformed swaps. The investor could in theory do a new “reverse” Asset Swap where they sell the Bond and use an Asset swap to synthetically create a Libor liability where they pay a margin of

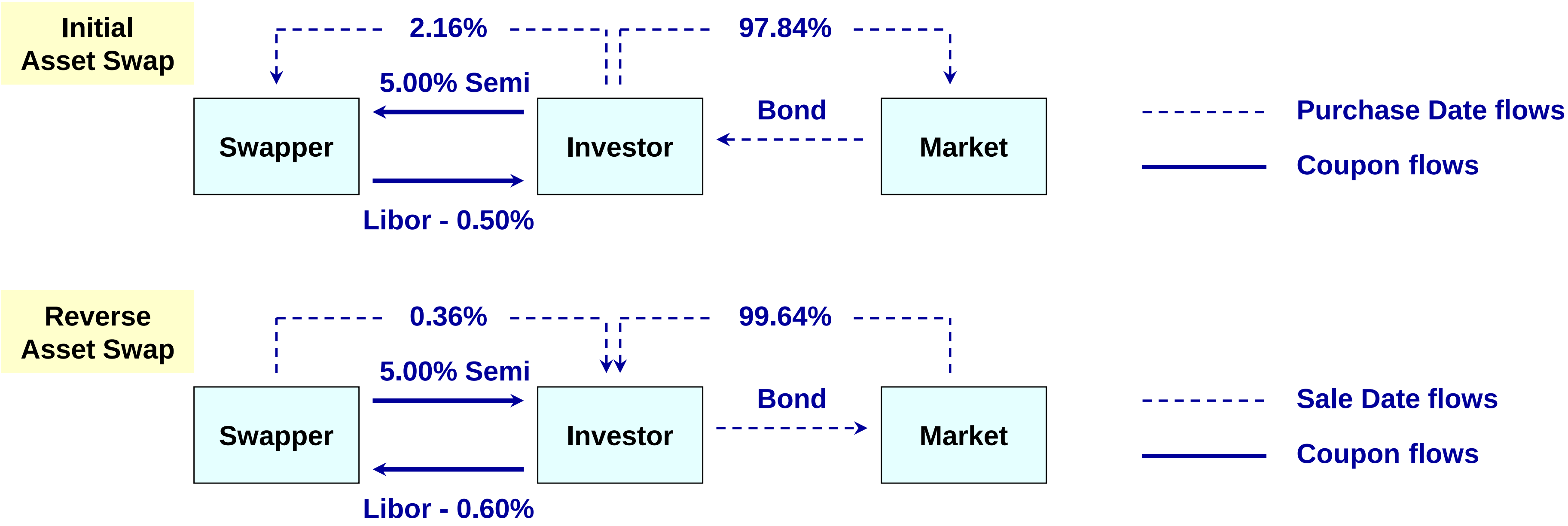
margin = Bond Yield – Swap Rate = - 0.60%

The “Liability Swap” cashflows would be …



Bond Outperformance Example

In totality then the 2 trades would have yielded (on a net cashflow basis) ...



Net / net the investor has bought the Bond on Asset Swap at Libor – 0.50% and subsequently sold the Bond on Asset Swap at Libor – 0.60%.

The investor is now square (having both bought and then sold the Bond) and there will be a profit generated by this process of 0.10% p.a. over the remaining life of the Bond.

In practice of course, the investor would find it easier to simply unwind the original Asset Swap, and this would yield the identical result of a 0.10% p.a. profit over the remaining life of the Bond.

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