OneChicago

EFPs Using Single Stock Futures

A single stock future (SSF) and its underlying stock are the same thing until the minute they are not, and that is what makes them so interesting. And they always are the same at expiration. At first, this sounds a little odd: How can two markets be the same sometimes and different at other times? The answer lies in interest rates and expected dividends.

All futures markets operate on the principle of equivalence over time. You should be indifferent between buying a stock today and paying all of the physical and financial holding costs involved with ownership and buying a contract for future delivery in which all of those same costs are priced into the contract. The resulting difference between the stock price and the futures price is called "basis." This basis, as we shall see, tells us who is borrowing or lending money over time. The rule is quite simple: If you expect to pay money solely as a function of time, you are a net borrower, and if you expect to receive money solely as a function of time, you are a net lender.

Interest Rates

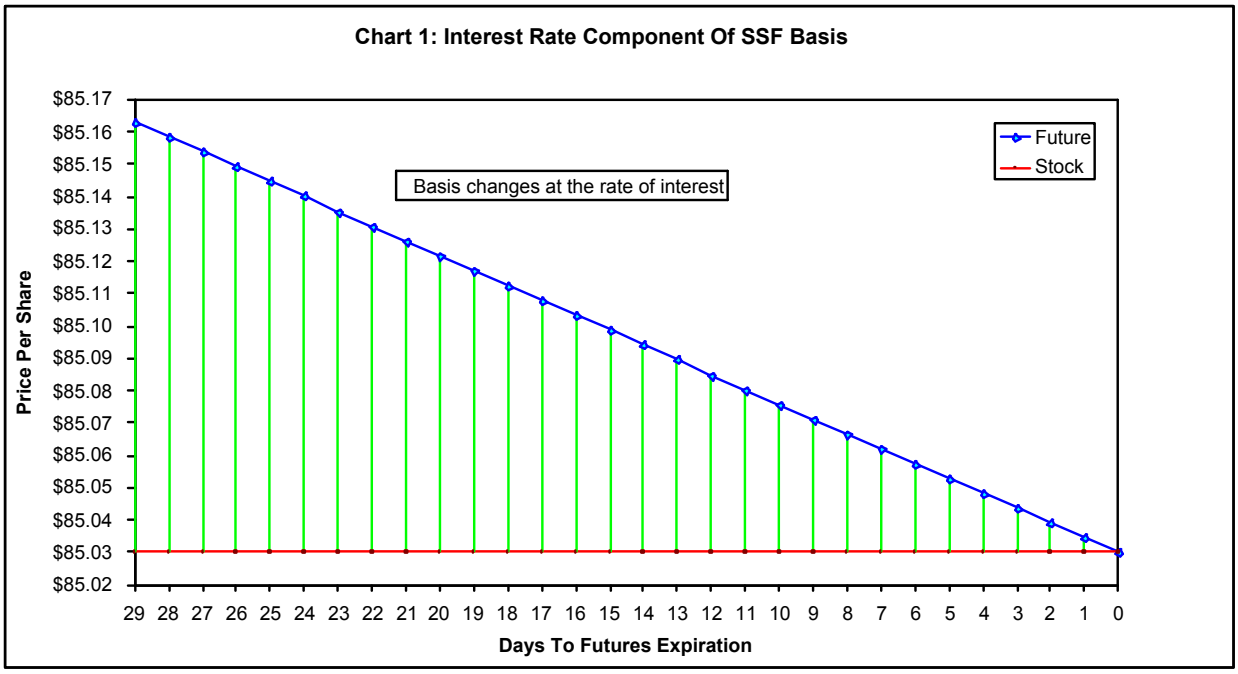
There are numerous ways to borrow money. The one most familiar to each of us in our daily lives involves going directly to a lender, receiving a lump-sum payment and agreeing to pay that loan, both in principal and with a defined rate of interest, back over time. A second way is to establish a line of credit, such as a credit card or a home equity line of credit and make payments against the outstanding balance.

A third way is an inevitable and inescapable part of investing, and that is the opportunity cost of holding any asset. Another way of putting this is all trades are spreads whether we realize it or not. You sell an interest-bearing instrument such as a Treasury bill or shares in a money market fund and buy a stock. Now the interest rate cost is indirect, the foregone earnings on the cash, but is just as real.

Thus every buyer of a stock is paying interest, regardless of whether the stock is bought on margin or of the margin levels and interest rates involved. This brings us to the first link between a stock and its SSF. As the SSF converts into the stock at expiration, anyone who is long the future must pay this same rate of interest to maintain equivalence. For a stock without a dividend, the fair value of the future is calculated quite simply as:

Equation 1. $SSF = Stock * e^{r*((t_x - t_0)/360)}$, where r is the effective federal funds rate, t_x is the expiration date of the future and t_0 is the date of evaluation.

Let's see in Chart 1 how that interest rate component works for a stock trading at $85.03 with 29 days remaining on the SSF and with the effective federal funds rate at 1.94%. The fair value of the interest rate cost will place the futures price at $85.163. If we are long the future, we should expect this component of basis to decline over time, which by our definition above means we are a net borrower repaying our loan by owning a depreciating asset. By expiration, this loan has been repaid completely and the interest rate component of basis falls to $0.00.



What would happen if interest rates were higher? Then the fair value of the future would be higher to reflect the amortization of basis over time. The opposite would be true if interest rates were lower.

Now let's conclude this section with three observations:

1. Anyone who buys the stock and sells the future at greater than fair value whether this trade was done at initiation or "legged into" is going to make money solely as a function of time and therefore is a net lender;
2. Anyone who buys the stock and sells the future at less than fair value is going to lose money solely as a function of time and therefore is a net borrower; and
3. As short-term interest rates can and do change over the life of the trade, the fair value at each succeeding day of the trade will change in reflection thereof. However, the interest rate implied in the initial trade is locked in over the life of the trade regardless of what happens during the interim.

Expected Dividends

The effect of expected dividends on fair value is very different from that of interest rates. The owner of a stock is entitled to receive the dividend, if any, on the stock, while the long position on the SSF is not. The timing of the dividend is not certain, nor is its amount until one is declared. In addition, the holder of the stock can reinvest the dividend at the short-term interest rate prevailing at the time of payment, which in itself is uncertain unless fixed in advance by a forward rate agreement.

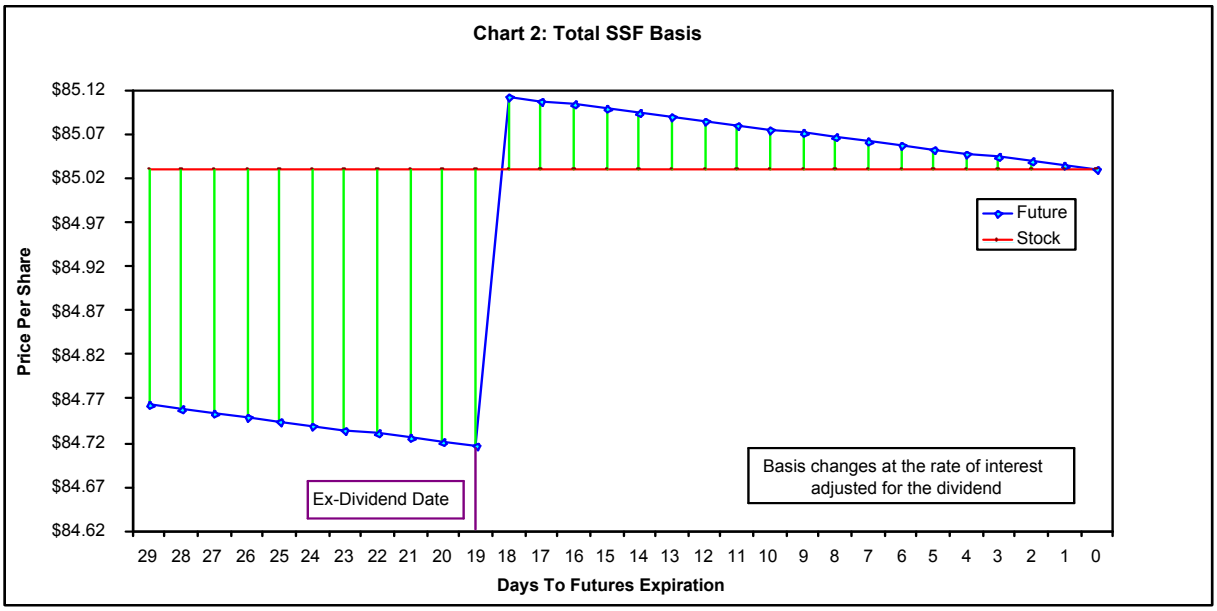
Thus while the interest rate component of basis is known, the dividend component is at risk. To preserve equivalence, the buyer of the future must deduct not only the expected dividend from the future but the expected reinvestment returns on that dividend as well. This "future value of the expected dividend" component – no interest charges are shown - is calculated as:

Equation 2. $SSF = Stock - Div * e^{r*((t_x - t_d)/360)}$, where r is the interest rate prevailing starting at the ex-dividend date, t_x is the futures expiration date and t_d is the ex-dividend date.

If we combine Equations 1 and 2, we arrive at the fair value price of a SSF:

Equation 3. $SSF = Stock * e^{r*((t_x - t_0)/360)} - Div * e^{r*((t_x - t_d)/360)}$

Let's see in Chart 2 how that dividend component affects this same stock trading at $85.03 with 29 days remaining on the SSF. Let's say the stock will be going ex-dividend ten days after the evaluation and is expected to pay a $0.40 per share dividend. We can lock in a forward rate of 2.025% for reinvestment. The fair value of the dividend payment will component should reduce the amount a buyer is willing to pay by 40.04¢. This makes the long position in the future equal to the long position in the cash stock subject to the risk the dividend will change.



Please note how the fair value of the SSF is substantially less than the price of the stock until the ex-dividend date. This is exactly what we should expect given how much larger the future value of the expected dividend is than the short-term interest rate cost of carry. Once the stock goes ex-dividend, the future rises over the stock as the short-term interest rate of 2.025% is greater than the indicated dividend yield of approximately 1.88%. All the discount before the ex-dividend date and the premium afterwards do is make the long SSF position equivalent to the long stock position after interest rate holding costs and the future value of the dividend are taken into account.

What happens if the dividend is expected to change prior to the SSF's expiration? If the market is expecting a cut in the dividend, the SSF will be priced at a level higher than fair value as we need to subtract a smaller number from the stock plus the interest rate cost of carry. If this happens, the apparent price of the SSF will rise to a level over fair value and appear to provide a net interest rate gain to anyone buying the stock and selling the future. In fact, whenever the SSF first appears to be priced at this "free money" level, the first thing you should do is do some fundamental analysis on the stock to see whether the dividend is considered at risk.

Regardless of whether the dividend is in danger, it is always at risk for the reasons discussed above. This is how we could say a SSF and its underlying stock are the same until the minute they are not, but they always are the same at expiration. It is also why fluctuations in the basis, the heart of the exchange of futures for physicals, or EFP, trade is so rich in information.

EFP Trades

EFPs originated in the physical commodities business, where differentials of location, grade and time are significant. For futures contracts to be useful for any facilitation of commerce outside of designated exchange delivery points, buyers and sellers had to be able to make alternative delivery arrangements at a premium or discount to the exchange delivery points. EFPs in the physical commodities business typically

are used to disconnect the pricing of the transaction from its physical consummation. Instead of the buyer paying a fixed price in cash, the buyer will grant the seller with a futures contract. Both parties are now floating on the price and can fix their price by the selling repurchasing the future and the buyer selling the future.

While differentials of grade and location do not obtain in the equities world, there are instances wherein a stock buyer may wish to assure purchase of the shares while remaining floating on the price. For example, an index fund positioning itself for a reconstitution and wishing to avoid the disruptions often seen around index reconstitution time may buy the shares in advance and sell the futures. The net position is zero; the long stock and short futures offset each other. Once the index fund is ready to buy the shares at a time allowed by its charter, all it has to do to fix the price is repurchase the SSFs. The SSF price becomes the purchase price of the shares.

A second application of EFPs in the securities world is a dividend hedge. If a stock is expected to raise its dividend after a near-month SSF expires, the intermonth or calendar trade of being long the near month and short a far month SSF would benefit from the increased dividend.

EFPs In Basis Points

A more generic application of the EFP is making or taking delivery prior to expiration. All futures contracts have a de facto European exercise. A long position can take delivery of the underlying asset at expiration, or the short position can make delivery of the underlying asset at, but not before, expiration. This restriction can be circumvented by trading the SSF for the underlying stock at or around its fair value. As an SSF and its underlying stock are equivalent at expiration, the resulting trade reflects the short-term interest rates and expected dividends involved and thus can be expressed in basis points, the convention used in all fixed income and many derivative markets:

Equation 4. $$Basis = [\ln((Future + Div * e^{r*(t_x - t_d)}) / Stock]^{-(t_x - t_0)/360}$$

The EFP process in SSFs gives us a clean and simple way to convert stock trades to interest rate trades, to learn about and manage dividend risk and to price the purchase and sale of a stock at a time of our convenience. It also assures us the SSF and its underlying stock will remain priced in convergence with each other at fair value. If they deviate outside of their fair value bounds, they will be brought back in quickly by dedicated EFP traders and the market makers involved in the SSF pricing.

Written by Howard Simons, the preceding is an abridged version of a column that appeard on RealMoney.com