Event-Driven Finance

IEOR – Fall 2017

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Lecture 8f  

Take-Overs

- From time to time stocks are acquired for cash, stock, or some combination of the two.

- There are many scenarios for these deals:
  - Big buyer, small target
  - Equals
  - Take-unders
  - Spin-offs
  - Government intervention
  - Litigation
  - Friendly
  - Hostile
  - Two-tier deal

- SDC Platinum (from Thomson Reuters) for Mergers & Acquisitions.
• The duration for completion of a deal can be brief, i.e. several months, or prolonged, i.e. several years.

• Because there are so many possible scenarios, we will content ourselves with a few choice observations, and also restrict the discussion to deals with fixed cash and stock portions (one of which could be 0).


• A typical cash deal involves a tender offer, by the acquirer, for all the stock of the acquiree, at a premium above the last traded price.
• AT&T Reaches Deal to Buy Time Warner for $85.4 Billion

• Wireless carrier agrees to pay $107.50 a share in half-cash, half-stock deal
Take-Overs

The chart shows the stock price movements and volume changes over a period of days. The stock price spikes significantly on a particular day, indicating a major event or news related to the company. The volume also increases correspondingly, suggesting higher trading activity. This could be indicative of a take-over event or significant corporate news that has affected the stock price.
Four Reasons 2016 Will Be a Strong Year For M&A

2015 was a banner year for corporate deal-making, as global

Dec. 26, 2016

2016 Was a Year for Undoing Major Deals

By Michael J. de la Merced
• The timeline for undisputed cash deals looks a little bit as follows:
• After a deal is announced the volatility surface of the acquiree becomes severely distorted. Why?
• The price of the target company moves up, but not to the take-over price.
  – Why?
  – What does the price discount represent?
• Let’s take a concrete example to examine the problem:
• AZZ acquires XYZ for cash, Jun 2008 (XYZ << AZZ)
  – XYZ pre-takeover price, $S_0 = 32.25$
  – Target price, $S_{++} = 46.30$
  – Post price, $S_+ = 45.26$
  – Pre-takeover, XYZ has flat vol profiles, $\sigma = 35$
The following might be a typical vol profile after the announcement:

- $\sigma(\text{Jun 30}) = 8$, $\sigma(\text{Jun 32.5}) = 10$, $\sigma(\text{Jun 35}) = 35$, $\sigma(\text{Jun 37.5}) = 60$, $\sigma(\text{Jun 40}) = 75$, $\sigma(\text{Jun 45}) = 75$, $\sigma(\text{Jun 50}) = 8$.
- $\sigma(\text{Jul})$ = similar to Jun
- $\sigma(\text{outer months}) \ll \text{Jul}$, $\sigma(\text{outer 45’s})$ not large.

Why? Specifically, why are some vols so low and others very high? What would happen if the deal doesn’t go through? Why might this happen?
• Now let’s consider some delicate questions.

• What would be the consequence of insider trading before a take-over?
• What if there were take-over rumors whether they were founded on fact or not?
• Can insider trading be reinforced in the options markets?

• The answer to the last question is YES.
• To get an idea of the consequences of leaked deals and insider trading on the options markets, we need to think about the result of a deal on an option portfolio.

• Consider the following two positions in XYZ:

1. +100 Jun(35) C –100 Nov(35) C

2. – 50 Jun(32.5) C +200 Jun(35) C

• For the parameters we chose, 35 vol, $S_0 = 32.25$, on June 1, the Jun 35’s are worth $0.16$, the Nov 35’s $2.25$, and the Jun 32.5’s $0.82$.
  – So we can put on the Jun-Nov calendar spread, if we are adroit, for a credit of $2.10$.
  – Likewise, the 32/35 4 x 1, can be done for a credit of $0.18$. 
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Take-Overs

[Diagram of a stock market interface with stock prices and strike prices displayed in a table format.]
• What are the post-takeover values of the spreads?
  – When XYZ goes to $45+, the calendar falls to parity (from $2.10).
  – The 4 x 1 loses $12.76 once and makes $10.26 four times for a gain of $28.28. (But this doesn’t include the 18 cent credit we put this play on for. Net $28.46.)

• The temptation for cheating may be very strong!!

• So what will happen if takeover rumors begin and make their way to the trading floor?
  – The Markets will respond by factoring the possibility into the pricing of options.
Take-Overs

Higher Strikes

MONTH ONE  MONTH TWO  LONG TERMS

AT THE $  LOWER  MUCH  LOWER!!

HIGHER ++
• The previous slide is a caricature of the way volatilities change as a result of takeover potentiality.

• Problem Set VII delves into both the pre- and post-announcement volatility scenarios.

• Option market makers never get asked by the SEC about takeovers, but they should be, because with zero inside information they can abstract a likelihood that information has been leaked.

• Is this just idle speculation? The following is a screen for EDS after (unfounded?) takeover rumors began:
EDS after takeover rumors began 4 March, 2004

Mar 20 53 vol; Mar 22.5 58 vol; Sep 30 32 vol.
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Take-overs

Here is a screen shot of QLGC from March 2010 after rumors:
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### Take-Overs

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<th>Series</th>
<th>cPos</th>
<th>pPos</th>
<th>YAIVol</th>
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• We can look at several other examples. First let’s summarize what we expect to see:

  1) near-term $50\Delta$ and next-higher-strike vols may flip
  2) long term vols, especially higher strikes should tumble

  Let’s look at three stocks: FORE, DIGI and COFD
  We will follow the at-the-moneys, next higher strike and an upside leap
  For one of these, only the long terms came in in advance, for one, the near-terms flipped and for one both characteristics were exhibited.
Here is a chart of FORE in the year 1999:
There seems to be a price run-up prior to the $35 announced deal.
What were options doing?
The evidence is extraordinary. Even while near-term volatility exploded to over 100, leap volatility dropped by 33%!
FORE 25 1st Leap Straddle Price (mbbo)

Date
- 3/8/1999
- 3/10/1999
- 3/12/1999
- 3/14/1999
- 3/16/1999
- 3/18/1999
- 3/20/1999
- 3/22/1999
- 3/24/1999
- 3/26/1999
- 3/28/1999
- 3/30/1999
- 4/1/1999

Price
- 10
- 11
- 12
- 13
- 14
- 15
- 16

Jan 25 2000
On June 4, 1998 the French phone giant Alcatel acquired DSC (ticker: DIGI) for stock.

How can you tell it is for stock from this chart?
On March 17, 1997 COFD was acquired for cash. The following graph shows that both long-terms and near-terms behaved as expected:
• Now let’s look at what happens after a stock take-over has been announced.

• We have already seen for FORE that the stock jumps up to a price below that of the announced price.

• There are two reasons for this.

• What are they?
There are many reasons why a deal can fail.

Can you name some?

The post-announcement price is an integration by the marketplace of likelihood of success, final price (What are two reasons why this might be different than the announced price?), and time to completion.

Why is time to completion relevant?

Additionally, the stock price will fluctuate dramatically if news alters any of the parameters. One of the stocks I traded even traded above the deal price for a time!! Why?
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**Take-Overs**

- Just as the stock prices behave in a circumscribed fashion after a deal announcement, so the options after an announcement assume a very characteristic structure.

- Some strikes have vols of near 0; others have vols much higher than the levels seen prior to announcement.

- Which strikes would you guess are the fat ones, and which the cheap ones?

- Again, it is a simple bimodal cartoon model which can allow us to analyze the problem.
Let’s take a simple case: XYZ acquired for cash.

- \( S_t = 25.00 \)
- \( S_D = 36.00 \)
- \( S_t+ = 33.00 \)

Let’s make additional simplifying assumptions:
- Time to completion or breakup, 90 days
- Interest rate 5.0%
- Breakdown price 25.00

Strategy:
- Calculate the market’s estimate of success
- Calculate the implied volatilities of the 30 day 30 and 35 strike options
• The carry on the stock for 90 days is:
  \[ \frac{33}{4} \times 0.05 = 0.4125 \]

• Let’s call the market expectation of success, \( p \);
• \( p = 1 - f \), the failure probability.

• In this simple picture,
  \[ 33 = p \times 36 + f \times 25 - 0.41 \]
  \[ = 25 + 11p - 0.41 \]

• \( p = 76\% \); \( f = 24\% \)
This same analysis will allow us to find the volatilities of the 90 day 35 and 30 options.

First ignore carry.

We will look at two positions:
- 1) long a 35 call and short N units of stock
- 2) long a 30 call and short M units of stock

If both these positions are correctly priced then the returns for both these positions will be equal; from N and M we can determine the deltas.

Let’s look at the initial cash layouts

T=0;
1) \( c[35] - 33N \)
2) \( (3+c[30]) - 33M \)

Here \( c[X] \) is the pop of the X-strike call
• \( r = 0 \)
• At \( t_f \), the value for 1 is: \((1+(-N)(36))(.76)+(-N)(.24)(25) = -33.36N + .76\)
• The value for 2 is: \((6+(-M)(36))(.76)+(-M)(.24)(25) = -33.36M + 4.56\)

• What are these terms?

• So the payouts are:
  – 1) \(-33.36N + .76 - (c[35]-33N) = -0.36N + .76 - c[35]\)
  – 2) \(-33.36M + 4.56 - (3+c[30]-33M) = -0.36M + 1.56 - c[30]\)

• For fairly priced options there should be no advantage to owning the options hedged or owning the bond, so the premium on the 35-call is close to .76.
• The premium on the 30-call is close to 1.20. Why?
• The 30-call is $3 in the money, the $35 is only $2 out of the money, yet the premium on the 30-call is ca. 40% higher than on the 35-strike.

• **What does this say about the skew?**

• In fact, I used an approximation that the 30’s were 100 delta and the 35’s 0 delta so the skew is even more extreme!

• If the take-over were at $35, this bimodal assumption would lead to a value of 0 for the 35 call. **Why?** In fact it would trade at a non-zero bid. **What are two reasons for this?**

• We can put the pop’s into an American pricer and back out volatilities for the 30 and 35 strikes but the point is that the next lowest strike is much fatter than the at-the-money strike.

• The bimodal model also predicts the pop for the 27.5 strike. **Is it fatter or cheaper than the 30? Why?**
• What would be a good strategy for trading the volatilities of a possible take-over stock if you had an estimate for the likely take-over price?
• For example, suppose XYZ trades at $35 and the likely t.o. price were $46. Which lines in the short term would you want to own? Which lines would you not want to own?
• If the rumor gets strong, the stock may run up quickly to $40 and certain lines will get cheap and others fat. Which ones?
• Suppose you buy the new cheap lines and sell the fat ones. What event are you hoping for?
• Here is a graph of CFC for the first three months of 2007; the stock had been torn between threat of take-over and threat of catastrophic failure in the subprime lender crisis. We know what eventually did happen!!
Take-Overs
Take-Overs