

Derivative securities: what they tell us

Jing Chen discusses how the study of derivative securities provides a simple way of understanding financial markets and how derivative deals offer some early warning signals.

1. Introduction

The trading of many derivative securities, especially over-the-counter derivatives, is designed to implement a specific view and maximize the returns in a particular environment that cannot be achieved by standard securities. That is why derivative securities are usually more sensitive to environmental changes than standard securities, such as stocks and bonds. The changes of values of derivative deals often offer early warning signals for the financial market and financial system. By studying these derivative deals in their particular environment, we can often gain a deeper understanding of the financial system and trading environment that may seem opaque at first glance.

Take matrix theory as an analogy. For a matrix, the maximum speed of movement is obtained along the direction of its eigenvectors. The representation of a matrix by the coordinate system formed from the eigenvectors gives the simplest form of that matrix. Since derivative securities are often designed to maximize the returns under specific assumptions, studying the financial markets via the derivative securities offers a similar advantage. It is often much simpler to study the derivative securities than to study the standard securities, such as stocks and bonds, themselves.

Specifically, the price of a stock is determined by many factors, which influence the value of the underlying asset in complex and highly nonlinear ways. The 'intrinsic' value of a stock is extremely difficult, if not impossible, to define. It is very difficult to determine directly if a stock is under- or over-valued. However, the theoretical value of a derivative security with respect to an underlying asset is generally well defined. Serious deviations from the theoretical value often reveal the existence of market opera-

tions on a large scale, which usually precede significant price movement.

Since the structure and trading of derivative securities is an intimate reflection of a particular environment, we will give a detailed account of each case discussed. The insight generated from the cases will lead to more systematic research.

The rest of the paper is organized as follows. Section 2 presents examples of derivative deals and their impacts. Section 3 contains the conclusions.

2. Some examples

Some of the most popular derivative securities are equity swaps and convertible bonds. We will study the functions of these derivative securities and explain how the trading and price patterns reveal a large amount of information about the underlying securities. These cases also offer evidence on market efficiency.

Equity swaps

An equity swap, which is also called an equity loan, is a swap of equity return for interest rate return, which is usually LIBOR based. Essentially, it is a loan with equity as collateral. In the boom years of stock markets, many controlling shareholders of listed companies became very rich. However, they

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did not have enough cash to make additional investments and they were reluctant to sell their share holdings because this would reduce their control over their firms. They usually preferred to borrow money against their share holdings. If they went to a commercial bank, the bank might lend, at most, 30% of the face value of the shares for non-blue chip stocks. Loans from commercial banks are usually longer term. It is very common for share prices to drop by more than 70% over an extended period, especially for small stocks. However an investment bank, which is trading-oriented, thinks it can monitor and manage risk better and is often willing to lend cash at 70% of the face value of the shares. So the controlling shareholders usually turn to investment banks for an equity swap, or a loan collateral by equity stakes.

The borrowers could use the proceeds to invest in other business concerns or, as often happens, to buy more shares of their companies to push up the share prices. They might use a third party or an offshore company to purchase the shares in the market to avoid public scrutiny. When the share price rose, they could use more shares for another equity swap, this time at a higher price. As the share prices moved higher and higher, they could borrow more and more money to buy the shares and push the share prices to new heights. The high share price then puts the company in a strong position to negotiate new mergers and acquisitions or spin off an entity from the company at a good price. When well planned in a bull market, the financial leverage can often be transformed into a permanent increase in equity value.

Leading Spirit, listed in the Hong Kong Stock Exchange, is a Hong Kong-based Chinese company specializing in electronic products, such as TVs and washing machines. Before the suspension of trading of Leading Spirit on 15 January 1998, the chairman of the company had signed 30 to 40 equity swap contracts and loans with different investment banks and commercial banks (Wong 1998). When the share price went higher, he borrowed more money to buy more shares. As a result, the share price of Leading Spirit went from 20 cents on 1 January 1996 to 1.79 dollars on 1 September 1997, when the share price reached its peak. Along the way, Leading Spirit made several acquisitions and spun off parts of the company into another listed company, Lead-

ing Spirit Conrowa, at the end of June 1997, near the peak of a bull market. Starting from the beginning of September 1997, the share price went down with the general market. As the share prices went down, the banks which signed equity swaps at high prices needed to call more collateral from the borrower, the chairman of Leading Spirit. Since all his money was tied up in the stock market and real estate, he could not put on more margin. So the banks had to sell the shares to reduce their risk. The selling pushed the prices down, which induced more selling by other banks, which had signed similar contracts when the share prices were lower. This price movement quickly triggered a cascade of selling. From 9 January 1998, the share price of Leading Spirit tumbled from 70 cents to 6 cents in four trading days. At that level, the share was suspended from trading. See figure 1 for the price movement of Leading Spirit from January 1996 to January 1998, when it was suspended from trading.

Whether margin-financed trading leads to price instability is a topic of much debate. Seguin and Jarrell (1993) argued that margin trading is irrelevant to price depreciation. They stated, ‘... any forced selling was correctly interpreted by the market participants as uninformed trading’. In their work, the availability of margin trading is assumed to be public information. However, over-the-counter-derivative contracts such as equity swaps are off-balance sheet and the information is not available to the public. Gennotte and Leland (1990) suggested that, ‘If, however, investors (or a fraction of investors) are unaware of hedging plans, crashes can occur for much smaller levels of hedging activity’. The average trading volume of the last three days before the shares of Leading Spirit were suspended from trading was 80 times higher than the normal average, as measured by the previous one-hundred-day average. With this huge amount of trading volume, it is difficult to imagine how the market could absorb the selling without a big impact on prices. See figure 2 for the price level and trading volume of Leading Spirit before it was suspended from trading.

If the public is unaware of the leverage of a company brought by the equity swaps deals, the company can give an impression that it has low debt and expands actively. This type of company is usually the favourite

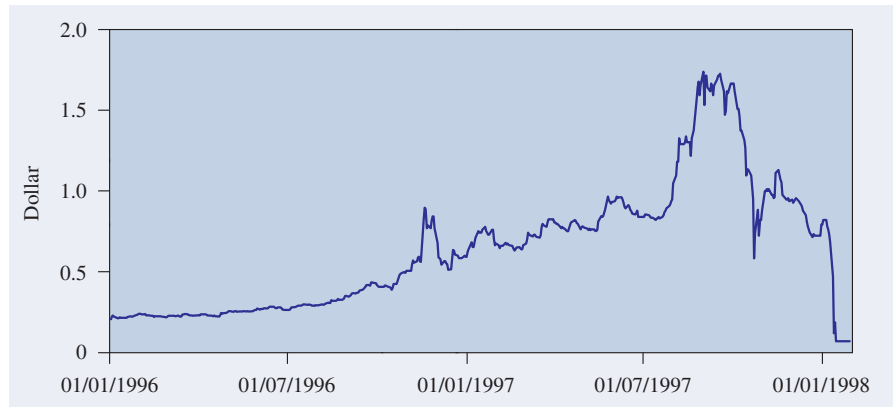


Figure 1. The price movement of Leading Spirit from January 1996 to January 1998.

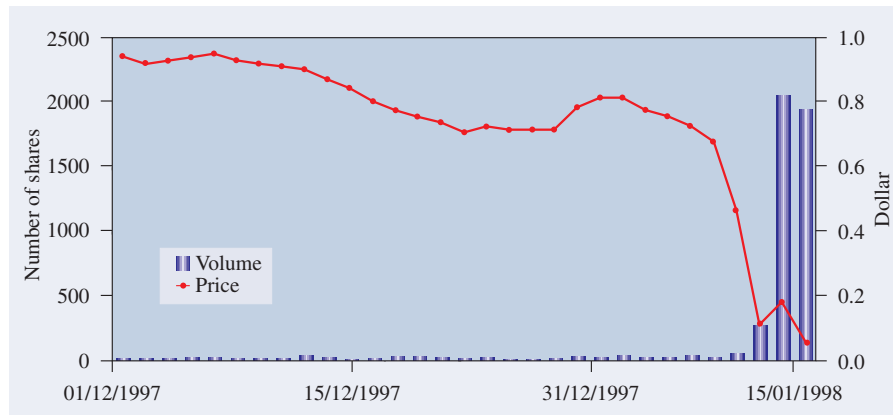


Figure 2. The price level and trading volume (in thousands of shares) of Leading Spirit. The data are from 1 December 1997 to 15 January 1998, when the stock was suspended from trading. We note that the trading volumes for the last three days are significantly higher than for other days.

of the investors. To reduce this kind of information asymmetry, FASB proposed that all derivative deals be reported on the balance sheet. (Bodnar *et al* 1998) This reduces market instability and changes the valuation of companies engaged in equity swaps.

Chowdhry and Nanda (1998) proposed a model of how leveraged trading can result in price instability when there is more than one round of trading. In their model, there are two types of investors: one type is risk neutral and the other type is risk averse. They assume that there is no arrival of new information. The case of Leading Spirit offers a good example. Here we have two types of investors, the controlling shareholder whose main purpose is to push up the share prices and hence can be regarded as risk neutral, and the banks who, because their equity swap contracts could be at default risk when share prices fall, are risk averse. The trading decisions are not based on the fundamental information about the company, but rather on the price level itself. When the price

falls, the banks have to sell shares to reduce their exposure.

It is interesting to reflect upon the equity swap deals from the perspective of investment banks and news media. When a client approaches an investment bank for an equity swap deal, the bank knows he probably has many similar deals with other banks and the share prices are likely to be inflated. However, the bank is also confident the client is going to sign more deals after that. So as long as it is not the last one in the chain, the bank should have enough time to ask for more collateral or unload the positions when the price trend reverses. So the bank is willing to make a deal even if the positions are very risky.

A search through the *Asian Wall Street Journal* from 1993, when Leading Spirit first went to public, to 1998 finds 35 items on Leading Spirit. However, the first negative report appeared on 16 January 1998, one day after the stock was suspended from trading. All the previous reports on the

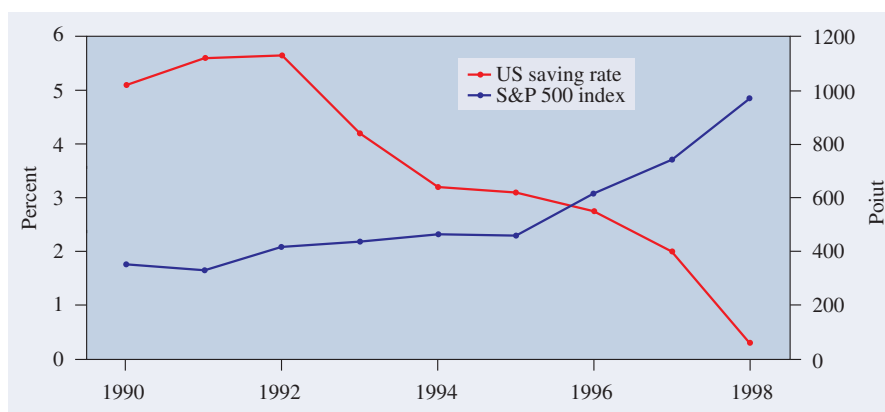


Figure 3. The relation between the US saving rate and the stock market level. The data are the US saving rate and S&P 500 index from 1990 to 1998. They are strongly inversely correlated.

prices and trading volumes of a share and its convertible bond, which are available to the general public.

Convertible bonds

Before going into the details, we will discuss some general properties of derivative securities. Given that the value of an asset is affected by many factors and represented by relatively few financial instruments such as stocks and bonds, the financial market could be argued to be incomplete. At the same time, many (see Ross (1989) for example) think that the market is price complete because we can price any derivative security to within an error of several percentage points. So the creation of new derivative securities is mainly driven by tax and regularity (Miller 1986), transaction cost (Merton 1988) and marketing cost (Ross 1989). However, with so many different characteristics of different firms, it is difficult to imagine that standard securities such as stocks and bonds are always optimal to represent or ‘span’ the values of the firms. It is reasonable to expect that some derivative securities are created to better represent the values of the underlying assets. The convertible bond is an example.

For young and small firms not rated by a rating agency, it is difficult to issue straight bonds with low yield as investors will demand a high return on their lent-out capital. At the same time, they may not want to issue additional shares at the current price level for this will dilute their ownership. Usually, small firms are volatile, which is often considered an unfavourable feature of a firm. However, the design of the convertible bond turns this feature into a positive one. Convertible bonds are debt instruments that can be converted into equities, usually a fixed number of shares, at a certain price, which is called the conversion price. It is essentially a bond plus a call option on the equity. The call options are highly valued since volatility is high for small firms. Because of the call option on the equity, convertible bonds pay lower coupon than the straight bonds. For most convertible bonds, the conversion price is set equal to the face value of the bond. The issuers can force the conversion from bond to shares at certain predetermined share prices, which are higher than the conversion prices, thus allowing the company to limit the maximum gain of the bond holder. This means bond holders are

prospects of Leading Spirit were very bullish. It was not that nobody knew about all these equity swap deals. Rather, all the parties involved had a keen interest in moving the share prices higher. So it is not surprising that all the reports were bullish. This is an example how private information can be kept private for a long time; in this case, it only became available when the trading was suspended.

The price trajectory of Leading Spirit (figure 1) is typical of a leveraged stock. The price moved up slowly as more and more money was pumped into that stock after each equity swap transaction. When the price eventually started to fall, the movement of share prices triggered more selling by the counter-parties of other equity swap contracts, which drove prices even lower. Although the equity swap offers a dramatic example, its mechanism exists in general stock markets, which are much less leveraged. Hsieh and Miller (1990) argued, ‘By the early 1970s, the total stock market credit, which, even at the height of the 1929 boom had never amounted to more than 10 per cent of the value of listed equities, was down to only 2 per cent of market value’. However, the data of the US stock market level and the savings rates in the 1990s (figure 3) show that the savings rates have dropped steadily as the market moves up. The leverage issue has to be considered in a larger framework. In boom years, because of the capital appreciation of the stocks, many families are inclined to spend more of their cash savings. In this sense, many families’ fortunes are more concentrated on the value of the stocks and the wealth of families is more sensitive to the market movement. As we have

observed from the above example, this makes the tolerance level of the negative market movement lower. A substantial drop in the stock market will reduce more wealth for the families in the boom years than in the average years when there are bigger cash holdings. That is the reason why, in general, the market moves up slowly and moves down sharply. We have witnessed several sensational market crashes while bull runs usually move at a more relaxed pace.

Leading Spirit and its chairman had signed equity swaps and loans with more than 30 banking institutions. Those who had signed equity swap contracts with Leading Spirit or had been approached by Leading Spirit for an equity swap deal could infer that it had signed similar contracts with other banks. So it was widely known that the company was probably highly leveraged. The banks involved could infer that when the price of Leading Spirit started to drop, it would drop sharply. This offers a good trading strategy. This trading strategy requires trade information. Next we will discuss another example of how information about the future can be obtained from the data of

The design of the convertible bond turns [the volatility of small firms] into a positive feature.

converted into equity holders after some capital gain. Since the convertible bonds properly ‘represent’ the features of young and small firms, they have become increasingly popular among these firms, especially among high tech start-ups.

When a bond and share are fairly priced, the underlying company has little incentive to move the market to force a conversion from bond to equity. However, when there is a market bubble and the share price of a company, according to the judgement of the company management, is highly over-valued, the company management has an incentive to force the conversion of the bonds to reduce the debt payment. Let us look at the following example.

China Travel, a Hong Kong-based Chinese company, issued a convertible bond with a coupon rate of 4.25 per annum in November 1993. The maturity date was November 1998. The bond could be converted into stock at the conversion price of HKD3.66. The issue size of the bond was USD144m, which was quite large compared with the total equity, which stood at USD420m at the end of 1998. During the handover of Hong Kong from British administration to China in July 1997, Hong Kong-based Chinese companies, or the so-called red chips, became extremely popular. Investors believed the red chips’ close ties with mainland China represented enormous profit potential. Under that background, the stock price of China Travel jumped from HKD1.24 at the beginning of 1996 to HKD6.1 on 11 August 1997, a historical high. However, the management of China Travel was conscious that the intrinsic value of the share was much lower than the debt value in the convertible bond, which was roughly HKD3.66 (figure 4) and tried to convert the bond into equity during the bull market¹. For more detailed background and analysis, see Chen (1999).

To force the conversion of the China Travel convertible bond into common shares, the daily closing price of China Travel stock had to stay over HKD5.49, the call price, for more than 20 of 30 consecutive trading days. On 6 August 1997, the share price of China Travel went over the call price of

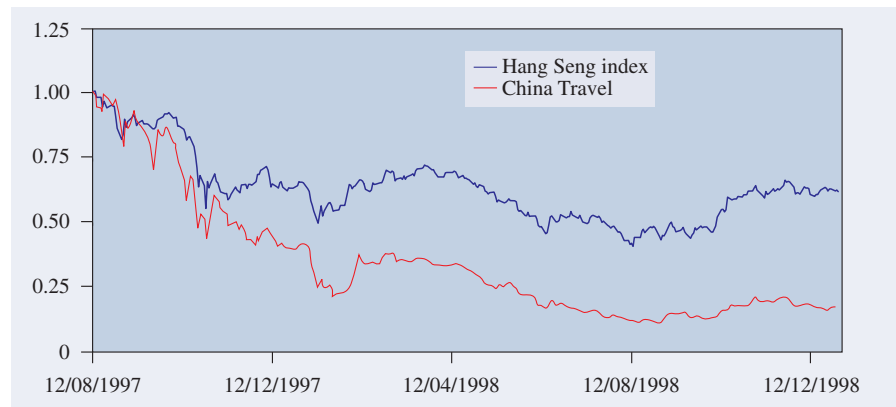


Figure 4. The price movement of China Travel and the general market, scaled. This is the comparison of China Travel share prices with the Hang Seng index from the market peak in August 1997 to the end of 1998. China Travel lost 84% of its peak value and dropped much more than the general market, suggesting that its share price was highly over-valued.

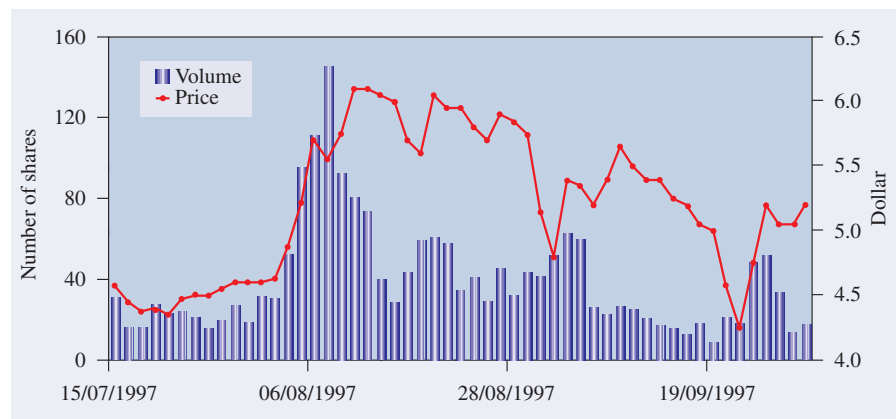


Figure 5. The price level and trading volume (in millions of shares) of China Travel. The price and trading volume data of China Travel around 6 August 1997, when the share price first went over the call price of HKD 5.49. Notice the volume spike near 6 August 1997.

HKD5.49 for the first time. Figure 5 shows the unusually high trading volume around that time, indicating strong market manipulation. However, the financial markets around Asia soon turned very bearish, which made it difficult for China Travel to support its share price. For example, on 21 September 1997, Soros said, ‘Dr Mahathir is a menace to his own country’. The following day, the share price of China Travel dropped sharply (figure 5). In the end, China Travel managed to support its share price over the call price for 19 days before it succumbed to the sharp fall of the general market. For all its effort, China Travel could not convert the bond into equity². The failure of con-

version of China Travel gave a clear sign of the trend reversal³.

3. Conclusion

The study of derivative deals often gives great insight into the market movement and the economic fundamentals. Over-the-counter-derivative securities are especially designed to exploit the maximum return under a particular situation. The cases we studied show that both financial markets are highly inefficient and the detection of these inefficiencies need intimate knowledge and clear insights about the derivative deals. Systematic research of the applications of the derivatives will generate new insight into

¹ Many red chips’ executives were keenly aware of the value of their companies and advised their friends not to touch the red chips. As a result, some ‘insiders’ missed the whole bull run of the Hong Kong market before Hong Kong’s handover to China in July 1997.

² According to the equity value of China Travel at the end of 1998, it would have made over 66 million US dollar profit if the conversion had been successful, comparing with the total profit of 17 million US dollar for the first half of the 1998.

³ A trader confirmed that he spotted this signal and used it in trading. Several traders in different firms told me that borrowing shares of China Travel at that time was very difficult, although they did not understand why.

cooperate governance, asset price movement and financial systems.

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Jing Chen is at the School of Business, University of Northern British Columbia, Prince George, BC, V2N 4Z9, Canada. E-mail: chenj@unbc.ca. Web address: http://web.unbc.ca/~chenj/.

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