

WHEN THE BUBBLE IS GOING TO BURST ...

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There has been constant debate about the predictability of the security markets. We examine the relationship between the prices of a stock and its convertible bond during the Hong Kong stock market bubble of 1997 and its subsequent crash. We find that the price behavior of the share and the convertible bond not only gave a clear signal of the market reversal, but also the minimum range of the stock price change. This example offers concrete evidence that the market becomes highly predictable at times and gives us a chance to understand the relationship of the underlying stock and its derivatives during market bubbles.

1. Introduction

The recent Asian financial crisis offers another example of boom to bust. In the bull markets of 1993, 1994 and 1996, 1997, a large volume of derivative instruments such as warrants and convertible bonds were issued. The issuers had a keen interest in keeping the underlying share prices within a certain range at certain times. This created price anomaly. In this paper, working on a particular convertible bond issue, we will find that market data can reveal a surprisingly large amount of information about the future market movement.

There has been constant debate about the predictability of the security markets. Cowles' [7] test of the Dow Theory based on William Peter Hamilton's forecasting provided strong support for the efficiency of the stock market. In a recent paper, Brown, Goetzmann and Kumar [4] reviewed Cowles' evidence and found that Hamilton's timing strategies did yield positive risk-adjusted returns. Lo and MacKinlay [8] found that the return of large stocks tended to lead those of smaller stocks. Bouldoukh, Richardson, and Whitelaw [3] reexamined the lead-lag pattern and provided support for a market efficiency-based explanation of the evidence. Those debates show that, by examining the stock prices alone with standard statistical methods, even if the market is not totally efficient, it is not far away from it.

However, if we look at the derivatives pricing and their relation with the pricing of the underlying stocks, the picture becomes much clearer. For the same reason that a CAT-Scan, which takes X-ray pictures from different directions of the same

part of the human body, gives us a much clearer understanding about the medical condition, various derivative instruments on the same underlying security give us a much deeper understanding of that security. In this paper, by examining prices of a share and its convertible bond, we find a clear case where not only the direction of the market movement but also the range of movement of the stock can be accurately predicted.

There has been persistent interest on the financial bubbles and their bust. (See for example [1, 6, 10, and references there in].) In these papers, the focus of the modeling is on the asymmetry of information, as in [6, 10], or the compensation system, as in [1], which are not directly quantifiable for the trading purpose. In this paper, we will discuss, after a bubble has developed, how the relation between the prices of a share and its convertible bond, which are observable by all market participants, can signal the trend reversal.

McQueen and Thorley [9] derive a testable implication from the rational speculative bubbles models. Chan, McQueen and Thorley [5] use this method to evaluate the six Asian stock market for evidence of rational speculative bubbles and note that "The bubble literature is also silent about how and why rational bubbles begin and why and when they end." This paper provides a concrete example to answer these questions.

Traditionally, we assume share prices follow lognormal processes and the value of their derivatives is equal to the discounted future payoff. So the introduction of a new derivative instrument does not add new information about the underlying security in a complete market. However, in reality a market is never complete. A new financial instrument is created because the existing instruments cannot fully represent all the information about the underlying asset. So the price behavior of a new derivative instrument offers fresh insight into the underlying asset. When financial bubbles develop, the future share price movement will not follow the lognormal processes and this will be reflected in the derivative pricing.

This paper contains two contributions. The first is to provide a concrete example where the trend reversal and range of change can be accurately predicted purely from the financial data. The second is to explore the relation between the share prices and the prices of its derivatives when a financial bubble develops.

The rest of the paper is organized as follows. In Sec. 1, we briefly discuss the bubbles of the Hong Kong stock market and the red chip stocks at the pre-handover period. We also introduce the pricing of convertible bonds. In Sec. 2, we give a detailed account of how an individual stock developed a bubble and how the trend reversal was detected. Section 3 concludes the paper.

2. The Stock Market Bubble of Hong Kong During the Pre-Handover Period

Before the handover of Hong Kong from British administration to China in July 1997, the Chinese government made a strong commitment not to interfere in Hong

Kong's economic affairs and promised that Hong Kong's future would be better. Many investors believed that the Chinese government would do its best to push the stock market higher after the handover. This caused a mania of stock buying, especially those so-called red chip companies, which are Chinese government-controlled companies based in Hong Kong with its main business in mainland China. These companies enjoy special privileges from the Chinese government but usually show very little earnings because of poor management. For some years, the stock prices of the red chip companies performed very poorly due to poor earnings. To stimulate the stock prices, the Chinese government injected a lot of assets into some red chip companies at very low prices. As a result, the stock prices of most red chips companies increased several fold on the expectation that cheap assets would be continuously injected into the red chip companies. At one time, many red chip companies were trading at P/E of several hundreds, notwithstanding the fact that most of these red chip companies are very creative in their accounting practices to boost their earnings. By GAAP, many red chip companies actually lost money. Not only did the share prices of the red chips got higher and higher, but any company that was "dyled red" (which means that part of its shares were bought by the red chip companies), also saw their share prices jump overnight. At that price level, a huge bubble had clearly formed. A bubble is defined as a price path supported by the trading of agents who are willing to pay more for a security than they would pay if obliged to hold it to horizon. Now the question is: "When will the bubble burst?"

Before discussing the trend reversal, we will introduce convertible bonds. Convertible bonds are debt instruments that can be converted into equities at a certain price, which is called the conversion price. It is essentially a bond plus a call option on the equity. Because of the call option on the equity, convertible bonds usually pay lower coupon than straight bonds. Many young firms that are not rated by rating agencies prefer to issue convertible bonds because they may not be able to issue straight debt at favorable rates.

When the share price trades below the conversion price, the call option has very little value and the convertible bond generally behaves like straight bonds. When the share prices trade higher than the conversion price, the convertible bond behaves more and more like equity because the possibility of conversion is very high. For most convertible bonds, the issuers can call back the bonds and force the conversion when the underlying stocks reach a certain price, which is called the call price. So a convertible bond is a hybrid of debt and equity.

Since a convertible bond contains a call option on the equity and the value of an option is always positive, a convertible bond should always trade at a premium over the share price, i.e. the price of the convertible bond should always be higher than the corresponding share price. If a convertible is traded at a discount, this usually indicates that either there are some restrictions on the convertible bonds that reduce their values or some additional information has been revealed by this pricing anomaly, which we will explore later. One thing that often distorts convertible bond

prices in Asia is poor exercise procedures. For example in Taiwan you cannot short shares, and conversion takes up to six months from the time you lose the bonds to the time you get actual shares which you can sell. So convertible bonds in Taiwan often trade at large discounts. This shows that regulation often has the unintended consequence of raising the cost of capital for a company.

3. The Trend Reversal of the Stock of China Travel and the General Market

China Travel is a typical red chip company, which is engaged in freight forwarding and transportation services with particular emphasis on rail freight business between China and Hong Kong. China Travel issued a convertible bond with coupon rate of 4.25 per annum in November 1993, near the peak of the 1993 bull market. The maturity date was November 1998. The bond could be converted into stock at the conversion price of HK\$3.66. The issue size of the bond was US\$144m, which was quite large compared with the total equity, which stood at US\$420m at the end of June 1998. Its businesses was relatively stable, so was its earnings. Earnings per share from 1993 to 1997 were 0.12, 0.15, 0.1, 0.13 and 0.17 Hong Kong dollars respectively. However, with red chips in vogue, its stock prices jumped from HKD 1.24 at the beginning of 1996 to HKD 6.1 on 11 August, 1997, a historical high. At that level, the share price was clearly overvalued and the management had a strong incentive to convert the debt into equity. Since the company itself owned over 30% of the total shares, and the red chip stocks were widely held by other red chip companies, most of which were very active in the stock market, it was relatively easy to push up the share prices in that bull market.

To convert the bond into equity, the daily closing price of the stock of China Travel had to stay over HKD 5.49, the call price, which is 150% of the conversion price, for more than 20 of the 30 consecutive trading days. This call feature is known as a Parisian option, which is an attractive alternative to standard barrier options. Because the Parisian option feature requires share prices to stay over a certain level for an extended period before the conversion can take place, it makes market manipulation more difficult and easily detected, as we will see later, and hence offers more protection to convertible bond investors. On 6 August 1997, the share price of China Travel went over the call price for the first time and stayed above the call price for 17 trading days. In September 1997, the share price managed to stay above HKD 5.49 for two more days, which totals 19 days and only one day shy of the conversion requirement, and then went under when the general market dropped sharply. China Travel, with its best effort, could not maintain the price over the call price. This indicated that the trend reversal was imminent. Indeed, China Travel's share prices have had a swift and steady decline since and reached HKD 1 on 30 June 1998, only 16% of its peak value. See Fig. 1 for the movement of the share prices of China Traved.

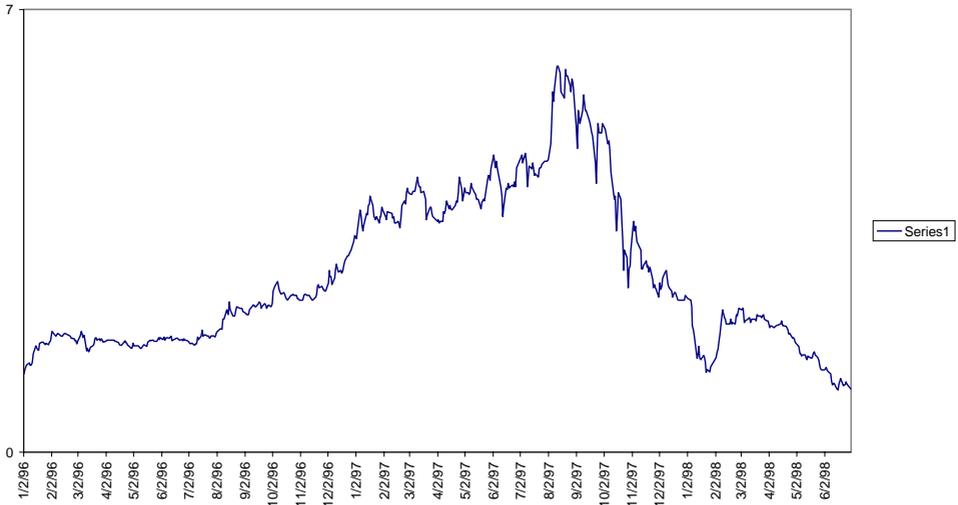


Fig. 1. The share price of China Travel before and after the bubble. We see that after the bubble burst, the share price returned to the pre-bubble level.

From the theory of Parisian option pricing (see [2]), the convertible bond should have traded at a large premium over the share price. However, at that time, the convertible bond actually traded at a discount to the share price, reflecting the market view that the convertible bond would certainly be converted, the option was worthless and the share price would drop during the conversion, which takes 14 days. See Fig. 2 for the change of premium of convertible bond price over share price before, during and after the market peak. This underpricing of the convertible bond created an arbitrage opportunity: long convertible bonds and short shares. If the share prices went up, the convertible bond would be converted into shares and there would be no gain or loss. If the share price went down, the convertible bond would go down much more slowly than the shares and yield a profit.

Failure of conversion from debt to equity not only signaled the free fall of the share price of China Travel, but also gave a minimum range of the fall. The face value of the convertible bond, which would mature in a year, was equivalent to the price of the share, HKD 3.66. Given the huge cost to push up the stock price, the share's value, by the assessment of the company's management, must be considerably lower than that amount. Within two months after the failed attempt, the share price dropped below HKD 3.66 and within one year, it fell below HKD 1. According to the equity value at the end of June 1998, China Travel would have made a profit of over USD 66, (USD 144 million debt saving minus USD 78 million asset dilution) if the conversion had been successful.

The trend reversal of the stocks of China Travel also gave a clear indication of the general market reversal. Not surprisingly, the Hang Seng Index and China Travel reached the peak at almost the same time. However the price behavior after

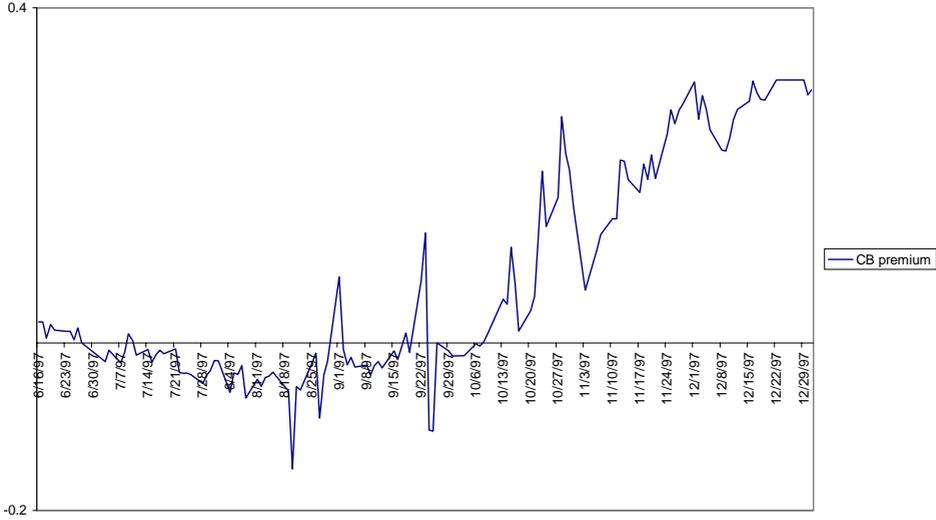


Fig. 2. Premium of the convertible bond prices over the share prices. According to the convertible bond pricing theory, the convertible bond premium should always be positive since an option value is always positive. However, in this case, the CB premium became negative as the share price was close and above the call price, indicating the market view that the share price will drop after the conversion.

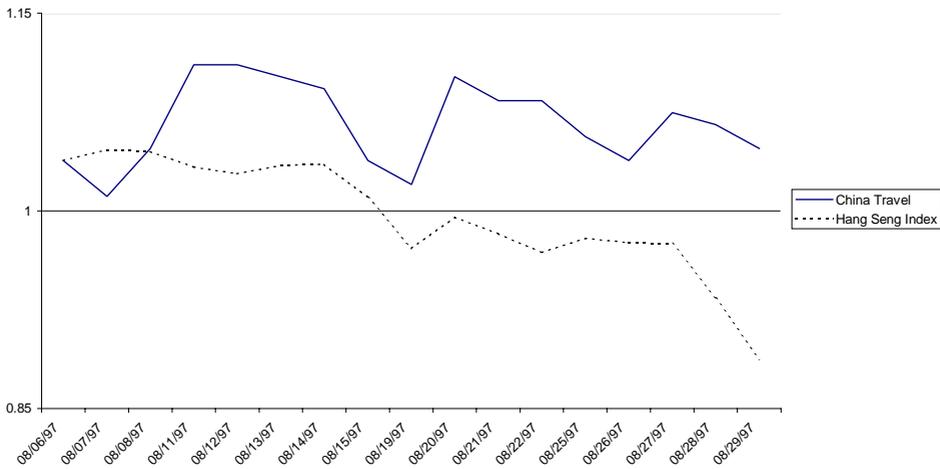


Fig. 3. The price movements of China Travel and Hang Seng Index at the peak scaled. One represents the call price of the convertible bond. The share prices of China Travel were supported above the call price for a long time when the general market retreated sharply.

that was quite different. The Hang Seng Index retreated very fast after peaking while China Travel stayed above the call price level for 17 consecutive trading days, indicating a strong effort to support the share price (see Fig. 3). After the failure of the conversion, the share price of China Travel fell much faster than the

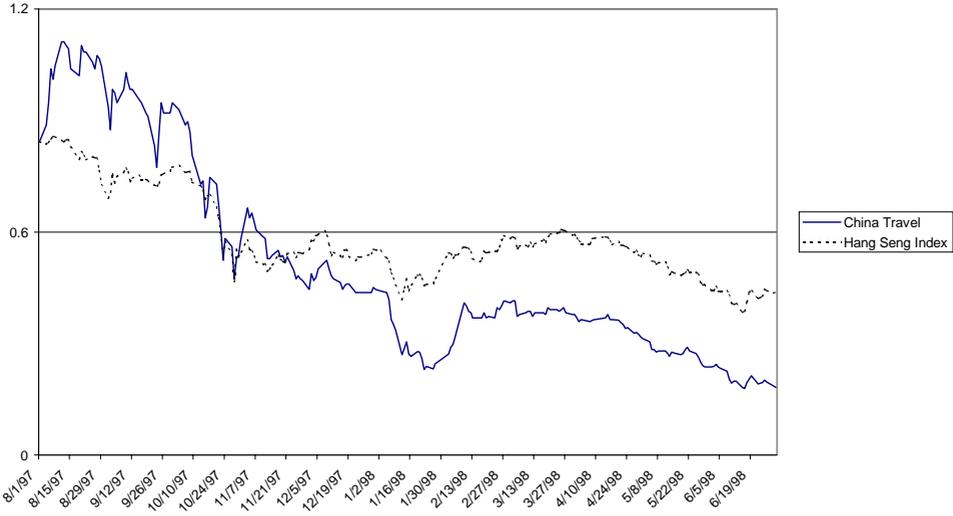


Fig. 4. The share price of China Travel and Hang Seng Index at and after the peak of the bubble, scaled. The share prices of China Travel were well supported at the peak and retreated more swiftly and steadily than the general market after the failure of the conversion, suggesting a stronger inflated price before the market crash.

general market, suggesting a stronger inflated price before the market crash (see Fig. 4). Overall, the unsuccessful conversion of the China Travel convertible bond in September 1997 gave a strong signal of market reversal. Those who heeded the signal were able to avoid the sensational market crash the following month.

4. Conclusion

With an issuance of a derivative instrument such as a convertible bond or a warrant, the issuer often has an interest in maintaining the share price at a certain level at a certain time. The failure to do so often indicates a major price reversal. Since convertible bonds and warrants are very popular in the Asian markets, systematic research of the interaction between the share prices and the prices of their derivative instruments can give great insight into the asset price movement. This type of market manipulation also poses a challenge to the regulators.

Since the start of the Asian financial crisis, many have blamed the speculators and short sellers for the downfall of the regional financial assets. However, from our analysis of this particular example, it is the bubble that was manipulated. The bust simply put the share price at its original value, before the bubble started (see Fig. 1).

It was rational for China Travel to prop up its stock price. If the bond conversion had been successful, it would have resulted in a huge profit for the company. It was rational for the ordinary investors to buy into the red chip mania, for the Chinese government had injected a large amount of money to support the red chip stocks.

Yet this short term rational behavior inevitably caused a big bubble and sowed the seed later of the bust. It is also this rationality that makes the market so predictable.

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