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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA**

**PRICING MALAYSIAN WARRANTS: AN EMPIRICAL  
STUDY ON BLACK-SCHOLES MODEL**

BY

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**PRICING MALAYSIAN WARRANTS: AN EMPIRICAL STUDY ON  
BLACK-SCHOLES MODEL**

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## **ABSTRACT**

This project paper used samples of 22,651 valid daily actual warrant prices of 37 Malaysian public listed companies, from January 1996 to February 2000 to empirically investigate the potential of using the famous option pricing model proposed by Black and Scholes (1973). And subsequent adjusted option pricing model proposed by Merton (1973), Galai and Schneller (1978) and Dubofsky (1992). To conclude that whether theoretical prices computed by both models can be used as a benchmark for the Malaysian equity warrant investors in their daily trading activities.

With 95% confident level ( $\alpha = 0.05$ ), statistic test conducted using one way ANOVA showed that at least 94% of the time, means theoretical prices computed by both Black-Scholes Option Pricing Model (BSOPM) and Adjusted black-Scholes Option Pricing Model (ABSOPM) are significantly different from the means of actual market warrant prices. Statistic test conducted using Tukey-Kramer HSD also showed that at least 94% of the time, means theoretical prices computed using BSOPM are significantly different from the means of the actual market prices. And at least 74% of the time, means theoretical prices computed using ABSOPM are significantly different with the means of the actual market prices. Both statistic tests yield consistent result and therefore, the study concluded that theoretical prices computed by either BSOPM or ABSOPM should not be used as a benchmark in actual warrant trading in Malaysia. This empirical finding is consistent with the study conducted by Masashi Toshino (1992) on Nikkei Stock Index Options.

## **CHAPTER 1**

### **INTRODUCTION**

The Kuala Lumpur Stock Exchange (KLSE), as we know it today, was established in 1973 upon the termination of currency interchangeability between Malaysia and Singapore. Before the establishment of the KLSE, shares, bond and various other securities of Malaysian listed companies were traded via the Singapore Stockbrokers' Association from as early as 1930. However, derivative instruments such as warrant, stock index futures, crude palm oil futures and interest rate futures, were only introduced in Malaysia in the 1990's.

Warrants were incorporated and traded on the KLSE in 1990. Since then, it has become a highly popular financial instrument amongst listed companies and were often used by them as a sweetener for fund raising, usually by attaching the warrants together with other rights and bonds issued. Since the trading of this derivative instrument was introduced in the Malaysian stock market 10 years ago, it is a short period of time compared with ordinary shares trading in other warrant market across the world such as America, Europe and Japan. Nonetheless, the bull-run of Malaysia's stock market in 1996, the subsequent regional financial crisis in 1997 and the imposition of capital control in 1998. Had provided a good avenue to the investigation of the effectiveness of using the Black-Scholes Option Pricing Model (BSOPM) and the Adjusted Black-Scholes Option Pricing Model (ABSOPM) in pricing actual warrant prices. For the period between 1996 to 2000, both models can

be tested under three clearly defined market scenarios of bull, bear and recovering stage of Malaysian's stock market. The bull market will be classified as *event window 1*; the bear market as *event window 2* and the recovering stage as *event window 3*. The beginning of the regional financial crisis in July 1997 and the imposition of capital control by Malaysian Government in September 1998 will be used as the cut-off dates to differentiate between event windows 1, 2 and 3. Subsequently, various charts, analysis and statistical tests were prepared and tested on the market warrant price versus theoretical value of BSOPM and ABSOPM to obtain the final conclusion.

The remainder of the thesis is organized as follows:

Chapter 2 presents the overview of the evolvement of the Malaysian warrant market. The differences between equity warrants and call warrants, as well as their basic characteristics are explained. Some policy guidelines regarding the issuance of warrants in Malaysia will also be highlighted to give the reader some understanding of Malaysian warrants.

Chapter 3 presents the literature review on BSOPM and ABSOPM, the usefulness of Black Scholes Option Pricing model in pricing options and its shortcoming in pricing warrant. The differences between option and warrant will also be discussed. The same chapter will also discuss ways to overcome the weaknesses inherent in BSOPM to price warrant and how the model can be modified to ABSOPM to price warrants.

Chapter 4 describes the methodology and the criteria for data selection.

Chapter 5 presents the summary of the empirical test result.

Chapter 6 summarizes the conclusion of this thesis.

## **CHAPTER 2**

### **MALAYSIAN WARRANTS MARKET**

#### **2.1 Kuala Lumpur Stock Exchange (KLSE)**

The securities industry in Malaysia effectively began in the late 19<sup>th</sup> century as an extension of the presence of British companies in the rubber and tin industries. The first formal organization in the securities business in Malaysia was the Singapore Stockbrokers' Association, which was established in 1930. There was no public trading of shares until 9<sup>th</sup> May 1960 when the Malayan Stock Exchange was formed to facilitate the transaction.

When Singapore was separated from Malaysia in 1965, this terminated the currency interchangeable between the two countries in 1973. Kuala Lumpur Stock Exchange Bhd was then formed to provide a central market place for buyers and sellers to transact business in the shares, bonds and various other securities of Malaysian listed companies. A significant milestone for the KLSE came in 1990 which saw the de-listing of Singapore incorporated companies from the KLSE and vice-versa for Malaysian companies listed in Stock Exchange of Singapore. This move heralded the growth of the KLSE as a stock exchange with a truly Malaysian identity. Subsequently, the exchange was renamed Kuala Lumpur Stock Exchange (KLSE) in 1994. The KLSE is a self-regulatory organization that governs the conduct of its members and member companies in securities dealing; it enforces the listing requirements that spell out the listing and disclosure standards to be maintained by

the public listed companies and are also responsible for surveillance of the market place.

## **2.2 Malaysian Equity Warrants**

Warrants, like any other derivative instruments such as forward, future contracts and option, have an illustrious history. The American Power Company issued the world's first warrants in 1911. Since then the product's popularity has fluctuated throughout time. During the depression of the 1930s, most warrants were issued by debt-ridden companies and this left a poor impression on the profitability in warrant investments. At that time, the regulatory authorities poorly understood the instruments. For example, until 1974 when American Telephone and Telegraph (ATT) issued warrants, the New York Stock Exchange did not permit the listing of the instruments. This shows the lack of understanding and support by the authorities on warrants in the early days.

In Japan, Daiei issued the first warrant in 1981. During the substantial so-called 'Nikko-Nomura' scandal in 1991, the 17 Japanese Securities companies that compensated client investment losses did so mainly via the use of warrants. The first European warrant issues came from two Italian companies at the beginning of the 1960s. In 1982, Mitsubishi Chemical (now Mitsubishi Kasei) issued the first warrant in the Eurobond markets.

In Malaysian, the derivative market started with the launch of Kuala Lumpur Commodity Exchange (KLCE) in July 1980, when the first ever Malaysian Crude Palm Oil (CPO) futures contract was launched. The emergence of Malaysian warrant market only started in 1990, which is about 80 years behind the American warrants market, 30 years behind the European and 9 years behind the Japanese. Subsequent to CPO futures and warrants, other derivative market was introduced with the launch of Kuala Lumpur Option and Financial Futures Exchange (Kloffe) in December 1995. Then, it was followed by the launch of the Commodity and Monetary Exchange of Malaysia (Commex) in May 1996 with the trading of the 3-month Kuala Lumpur Interbank Offer Rate (Klibor) futures.

The first equity warrant in Malaysia was issued and traded on the KLSE by Rashid Hussain Bhd (RHB) on 28<sup>th</sup> May 1990. Such derivative instrument was then known as Transferable Subscription Rights (TSRs). Since then, warrants have become a popular fund raising tool utilized by Malaysian listed corporations to attract public and private investors, and at the same time enabling them to access to a lower cost of fund.

### **2.3 Characteristics of Malaysian Warrants**

A warrant is an option to buy (call warrant) or sell (put warrant) a certain underlying asset at a predetermined price during a fixed period of time. There are two different types of warrants, commonly called company warrants and covered warrants. A

company warrant, or equity warrant, is a funding exercise for the corporation that issues call warrant over its own stocks. Upon exercise, the company will issue new shares and deliver them to the exercising warrant holders against payment of the exercise price.

An investment bank usually issues a covered warrant. The bank does not issue a warrant as a funding exercise but to provide investors with an efficient tool to manage their investment portfolio. The covered warrant is a listed security, traded on an exchange and constitutes a contract between the issuer and buyers of the warrant. The obligations of the issuer are materialized by the listing documents that detail all terms and conditions of the issue.

Malaysian listed corporations often issue call warrants by attaching it to straight bonds or convertible bonds known as Irredeemable Convertible Unsecured Loan Stock (ICUL). The warrants were intended initially to act as a 'sweetener', and because of the advantages conferred by the warrants, the coupon rate on the bonds will obviously be lower than on an equivalent straight. This will directly lower the cost of fund to the corporation in their fund raising exercise

Warrants issued in Malaysia are essentially an American style equity call warrant. Each warrant holder will be entitled to purchase an equivalent of 1,000 shares of underlying stocks from the issuing corporation, at a predetermined price anytime



prior to their fixed maturity date. The fixed maturity rate will range between three to ten years. Before the amendment to section 68(1) of the Companies Act 1965, the maximum expiration period was five years and the act was amended in 1998 to increase it to a maximum of 10 years.

#### **2.4 Advantages of Warrants**

Equity call warrants are very attractive to Malaysian corporations issuing the warrants as well as to the investors. From the corporation's perspective, warrants form part of the firm equity without an earning dilution effect if it is not exercised, and are unlike debt where there is interest and a fixed repayment schedule. From the investor's point of view, investments in warrant allowed higher leverage since such instruments are far more cheaper than the underlying stock. The leverage effect enables investors to gain higher exposure to the underlying asset with the same amount of investment. For underlying stock investors who needed cash, the same leverage effect can be utilized by them as cash extraction by selling the underlying stocks and buying warrants to keep an exposure to the underlying stocks.

#### **2.5 Warrant Issuance Policy Guidelines**

Due to the attractiveness of the characteristics of the equity warrant, it has been so popular that on average, there are twelve warrants listed on KLSE yearly since its introduction in 1990. By the end of February 2000, there were 122 equity warrants listed and traded actively on KLSE. The issue of warrants would generally be allowed

for listed companies embarking on projects with a gestation period, such that the expiry of the exercise period of warrants coincide with the attainment of the earning potential of the project.

When application is made for the issue of warrants, the Security Commission (SC) would consider the rationale and merit of the issue. In addition, the issue would have to comply with the following requirements:

- I. A maximum of one warrant may be attached to each rights share or one Ringgit nominal value of debt securities. Each warrant shall give the registered holder the right to subscribe for one lot or 1,000 shares in the issuing company;
- II. Where the issue of warrants is not made by way of rights to shareholder, the number of new share arising from exercise of the warrants for which listing is applied and all such issues made within the preceding 12 months shall be limited to 10% of the company's enlarged capital;
- III. Where the issue of warrant is made by way of rights to shareholders, the number of new shares arising from the exercise of the warrant is limited to 50% of the company's issue capital at all times;

- IV. The number of new shares arising from all outstanding warrants must not exceed 50% of the issued capital at all times;
- V. The exercise price of warrants should be at a premium over the five day weighted average market price of the underlying stocks preceding the price-fixing date (i.e. the period between approval and book closure date);
- VI. Where warrants are issued together with debt securities on a bought deal basis, the offer price of the warrants should be such that the sum of the offer prices of the warrants and debt securities does not exceed the nominal/face value of the debt securities.
- VII. As a general rule, in determining the size of the issue of warrants, where the warrants are issued together with debt securities, the issuer should ensure that the proceeds from the exercise of the warrants, if exercised, should not substantially exceed the nominal face value of the debt securities. Proceeds should be utilized for the redemption of the debt securities or for other productive purposes.
- VIII. The issuer should notify the SC of the amount of warrants converted into ordinary shares and the utilization of proceeds to be derived from such

conversion at the end of each financial year until the end of the conversion period of the warrants.

- IX. The terms and conditions of the issue of warrants should provide for adjustments to the exercise price and, where appropriate, the number of warrants or convertible securities in the events of rights, bonus or other capitalized issues, consolidation of shares or capital reduction. The SC should approve any revision to the terms and conditions of the issue.
  
- X. The company issuing the warrants must be fundamentally strong in that its expected earnings should be good enough to support the additional shares arising from the exercise of the warrants.

## CHAPTER 3

### LITERATURE REVIEW

Pricing warrant has never been an easy task; it is a lot more complex because warrants are contingent claims that arise depending on certain outcome. At maturity, whether a warrant is worth anything depends on what the exercise price is and what the spot price turns out to be.

Prior to maturity, since the exercise price is predetermined, the warrant's value will depend on the expected price of the underlying stock at the time of exercise. On the other hand, the expected price of the underlying stock at some point in the future will depend on its current price and the volatility of the stock as well as other financial performances of the company.

There are a few formulae that can be used to value a warrant. The simpler ones are by Giguere, G. (1958) and Kassouf, S.T. (1968) as illustrated below:

$$\text{Giguere's : } W = S^2 / 4k$$

$$\text{Kassouf's ; } W = \sqrt{S^2 + K^2} - S$$

whereby  $W$  = warrant price,  $S$  = stock price and  $K$  = exercise price.

The shortfall in Giquere's model is it tends to understate the value of warrants most of the time. On the other hand, Kassouf's formula, which was used to analyze warrant price behavior in U.S. from 1945 to 1964, is inconsistent in pricing warrant prices as well, sometimes understating or overstating the warrant's value. These models also did not take into consideration many other variables that might have an impact on warrant pricing such as risk-free interest rate and volatility of underlying stocks. (Phillip, G.A., 1989)

A more sophisticated way of valuing the warrant is by using Black-Scholes Option Pricing Model (BSOPM) and Binomial Option Pricing Model (BOPM). These are the two popular options pricing model widely used to evaluate the value of warrants. However, due to the inherent weaknesses of BOPM that is "open ended", a more realistic and familiar options model of BSOPM will be used instead to conclude the study of this thesis. BSOPM, which is more commonly known to Malaysian warrant investors, was also recently been used by The Edge Magazine to evaluate the value of warrants issued by Kumpulan Emas Berhad and IGB Berhad in their recent December 1999 publication.

### **3.1 Black-Scholes Option Model (BSOPM)**

Fischer Black and Myron Scholes developed BSOPM in the 1970s. Both the underlying principles of the Binomial Model and the replication principles were used to derive the model. The equation has proven to be a robust and reliable model for

pricing an option compared to the Binomial Option Pricing Model. Its biggest advantage is that it is user friendly and provides a “close end” solution to option pricing through the use of explicit equation.

Since the derivation of Black-Scholes Model, financial economists have speculated on its usefulness for warrant valuation. In their path-breaking paper, Black and Scholes (1973) claim that in many cases their model “can be used as an approximation to give an estimate of the warrant value.” Nevertheless, there are some inherent differences between options and warrant which need to be tackled before the model can be used to evaluate the value of warrants.

The major differences between the options and warrants are centered on the dilution effect, the originator of the transaction and the time to maturity. Options do not have any dilution effects, as the options sellers may not be the corporations of the underlying stocks. It can be any third party transaction between the seller and the purchaser of the options. On top of that, options will normally have shorter maturity period than warrants. The life of options are usually denominated in months compared to which warrants normally have maturity periods of several years, especially Malaysian warrants which have between three to five years and up to 10 years of maturity periods after October 1998. Corporations in Malaysia usually issue warrants with a longer maturity period due to the red-tape of getting the warrants approved by various approving authorities such as the Securities Commission (SC),

the KLSE and the shareholder of the corporations. It is quite time consuming and involves a substantial cost in order to get the warrants approved and listed for trading on KLSE. So, after 1998, most corporations will issue warrants with a maturity period of up to ten years; the latest examples of warrants with ten years maturity were issued by Berjaya Group Berhad, Insas Berhad and YTL Berhad in 1999 with maturity dates up to year 2009.

Due to the long period of maturity of Malaysian warrants, various parameters use in the BSOPM, such as interest rates, volatility and exercise price that are normally assumed as constant, may change during the tenure of the warrant's life. This will impose an additional complexity to the conventional BSOPM. On top of that, the long life span of a warrant will also make dividend an important factor in its valuation. After all, in the long life span of the warrant, the dividends paid out by the corporation can have a significant impact on the spot price of the underlying stock and thus the price of the warrants. If indeed the warrants are exercise by investors, the corporation will issue additional shares to meet their obligation and this will have a dilution effect on the underlying stock. Thus, the spot price of the underlying stocks shall theoretically fall proportionately. The falling spot price, will in return, affect the price of warrants which are dependent on the price of the underlying stock.

Nonetheless, even though Malaysian warrants are American style options, warrants are seldom exercised before expiry date in the Malaysian history of warrant market.