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The structure, functioning, and performance of the Chinese stock markets

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THE STRUCTURE, FUNCTIONING, AND PERFORMANCE OF THE CHINESE STOCK MARKETS

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

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by

Yu-Tsui Lin

December 2003

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December 2003

Approved by:

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11-25-03

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Dr. Otto Chang, Department Chair,
Accounting & Finance

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ABSTRACT

This thesis focuses on the stocks in two major stock exchanges in China: the Shanghai Stock Exchange and the Shenzhen Stock Exchange. In order to understand the overall performance of the Chinese stock markets, the research compares the performance among the Chinese stock markets, other emerging stock markets, and the S&P 500 Index during the 1990s. The Chinese stock markets did not perform very well, but the markets had a relatively low correlation with the U.S. markets making them suitable for diversification purpose. The research specifically uses the AR-TGARCH-M model to examine the Shanghai A-share Index, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index. The findings conclude that the Chinese stock markets are not weak-form efficient markets since future returns may be predictable from past observations. Moreover, future returns may be predicted from the conditional volatilities. The future returns may be influenced by risk premium. The volatilities of the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index are influenced more by previous volatilities rather than past shocks, however the Shanghai A-share Index is just the

opposite. Asymmetric effect only exists in the Shanghai A-share Index.

ACKNOWLEDGMENTS

I am so blessed that Dr. Francisca Beer and Dr. Otto Chang give me lots of encouragement and recognition of doing this thesis. I appreciate that they encourage me to go for Ph.D. I'll work hard to fulfill my Ph.D. dream in the near future. Furthermore, I want to express my special thanks to Dr. George Ogum of La Sierra University for data analysis. My good friend, Chi-Shun Chu (Susan), deserved special mention for her contributions to the project. I have learned how to start, keep going on, and where to stop through lots of discussion and brainstorming with her. She spent lots of time driving back and forth from Riverside to San Bernardino in order to help me. I also want to thank Hui-Yu Huang for the data from Beijing. Meanwhile, I want to thank Pastor John Lee and many brothers and sisters in Jesus for their prayers. Finally, I want to thank my parents for supporting me to study in the U.S., to take double majors, and to extend graduation date to do this thesis. Six months is not very long in my life, however, the good memory of working on this thesis will last long in my whole life.

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CHAPTER ONE

INTRODUCTION

Since 1990, the Chinese stock markets play important roles in China's rapidly growing economy. The stock markets facilitate the reform of the state-owned enterprises in obtaining capital injection from open markets and in building the competitiveness in the global economy.

The purpose of this thesis is to discover the nature of volatility, the persistence of stock returns, risk premium, asymmetric effect caused by shocks, and whether the volatility is a significant factor to predict expected returns. This paper focuses on stocks of two major Chinese stock markets: the Shanghai and the Shenzhen Stock Exchanges. The data consists of the Shanghai A-share Index, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index.

Literature Review

Engle and Patton (2001) explain that a good volatility model must be able to forecast volatility and capture the characteristics of volatility, such as volatility persistence, and the asymmetric effect.

Mandelbrot (1963), Fama (1965), Engle (1982), Chou (1988), Schwert (1989), Baillie, Bollerslev, and Mikkelsen (1996) examine the serial correlation of asset volatility and find volatility clustering, which means large volatilities are followed by other large volatilities, and small volatilities are followed by small volatilities. Volatility clustering, explained in detail in chapter four, implies that past shocks may influence future volatility for many periods, which is called volatility persistence.

Engle and Patton (2001) have discovered that many people use the autoregressive conditionally heteroscedastic (ARCH) class of models to test for conditional volatility. Some of these people include: Engle (1982), and extended by Bollerslev (1986), Engle, Lilien, and Robins (1987), Nelson (1991), Glosten, Jagannathan, and Runkle (1993). Chapter four explains the methodology in great detail.

Moreover, Nelson (1991) and Glosten et al. (1993) capture the asymmetric effect, which indicates a negative shock has a greater impact on future volatility than a positive shock of the same magnitude. Zakoian (1994) extends their concept and develops the Threshold

Autoregressive Generalized GARCH-in-mean (AR-TGARCH-M) model.

Chiang and Doong (2001) use the Threshold Autoregressive GARCH (1,1)-in-mean (AR-TGARCH-M) model to test the relationship between stock returns and unexpected volatility of seven Asian stock markets: Hong Kong, Malaysia, Philippines, Singapore, South Korea, Thailand, and Taiwan. The results conclude that Hong Kong, Singapore, and Thailand have a significant relationship between stock returns and unexpected volatility. The asymmetric effect is significant in the daily data of the seven markets. The returns of the seven markets display positive serial correlation.

The AR-TGARCH-M model is applied as the methodology to examine the Chinese stock markets. This model was chosen because of the research conducted on the seven Asian stock markets. Chapter six explains the empirical results and finding by using the AR-TGARCH-M model to test returns predictability, volatility persistence, asymmetric effect caused by previous shocks, and risk premium.

CHAPTER TWO

EMERGING STOCK MARKETS

Generally, the world stock markets can be categorized into developed stock markets and emerging stock markets. Contrary to developed stock markets, such as the New York Stock Exchange (NYSE), the term "emerging stock markets" implies that "stock markets are in transition, increasing in size, activity, or level of sophistication", such as the Chinese stock markets (Standard & Poor's, 2000, February, p. 2). As stated in the Emerging Stock Markets Factbook 1994, many of emerging stock markets not only "provide secondary markets to facilitate the transfer of assets", but also "provide mechanisms for the sale of state-owned enterprises and by linking domestic capital markets to broader international capital markets" (International Finance Corporation, 1994, p. 8).

In order to analyze the performance of the Chinese stock markets, the performance of the S&P 500 Index and other Asian emerging stock markets indices were used as benchmarks for comparison. The reason for using an index as a measurement is because it composes the stocks that represent the overall market or the entire industry. For instance, the S&P 500 Index consists of 500 stocks

according to market size, liquidity, and industry group, which represent the U.S. stock market (Investorpedia.com, 2003).

In this chapter, all the comparisons are based on the indices from the Emerging Markets Data Base, which are introduced first. Second, the indices markets are illustrated. Third, the adjustments of the market capitalization are explained in detail. Fourth, the price indices are categorized into market indices and regional indices. Fifth, the indices performance is analyzed based on the category. Finally, the performance of the Chinese stock markets is compared with other Asian emerging stock markets, the Japan stock market, and the U.S. stock market. The data analyzed is from 1990 to 1999 because of limited resources.

The International Finance Corporation and the Emerging Markets Data Base

The International Finance Corporation (IFC) had collected the emerging stock markets' monthly data in the Emerging Markets Data Base (EMDB) since 1975. The EMDB has been recognized worldwide as a benchmark and reliable emerging stock markets database for global investors. On December 30, 1999, Standard and Poor's (S&P), a division of McGraw-Hill Companies, acquired the EMDB from

International Finance Corporation (IFC) to be one of the S&P global indices. Therefore, in the following sections, the indices will be named as the S&P/IFC indices (Standard & Poor's, 2000, p. VII).

In the year 1999, there were 111 stock markets in the world. Thirty of them were developed stock markets, while eighty-one of them were emerging stock markets. The S&P included thirty of them in the S&P/IFC Investable Indices (S&P/IFCI Indices). "Investable" means stocks are available to foreign institutional investors and pass screening for minimum size and liquidity. To be considered "Investable", the S&P/IFCI Indices have derived two criteria, which are discussed in the following sections. The S&P/IFCI Indices are "designed to measure the type of returns foreign portfolio investors might receive from investing in emerging market securities that were legally and practically available to them" (Standard & Poor's, 2000, p. IX).

The Standard and Poor/International Finance Corporation Investable (S&P/IFCI) Indices Markets

The thirty S&P/IFC emerging stock markets were selected because the stock market met both criteria: 1) the GNP per capita[1] in the economy must be in the

"low-income" or "middle-income"[2] level based on the classification by the World Bank for at least one of the last three consecutive years; 2) the index market's investable market capitalization-to-GNP ratio has to be below 25% for the last three consecutive years. If any one of these criteria is not satisfied for three consecutive years, a stock market can be removed from the coverage of the S&P/IFCI emerging stock markets' index markets (Standard & Poor's, 2000, February, p. 2).

In S&P/IFC Indices, an index stock market may have more than one stock exchange. For example, the Chinese stock markets include the Shanghai Stock Exchange, the Hong Kong Stock Exchange and the Shenzhen Stock Exchange. Therefore, any one of the S&P/IFCI index markets may be composed of more than one stock exchange so that these exchanges represent the most liquid markets for securities (Standard & Poor's, 2000, February, p. 15).

However, the S&P not only selects the markets according to the above criteria, but it also adjusts market capitalization to what is called "investable" market capitalization. The reasons are discussed in the following section.

The Investable Market Capitalization of the S&P/IFCI Indices

The S&P/IFCI Indices are market capitalization weighted indices, which means that the indices are the summation of each market's weight times its index value. In order to reveal the truly "investable" market capitalization in the index market, the S&P/IFCI indices make three adjustments to the market capitalization: 1) adjusting for foreign limits, 2) remove capitalization of government ownership, 3) exclude cross holding (Standard & Poor's, 2000, February, p. 11-12).

The S&P/IFCI indices include stocks "whose issuing company is headquartered in an emerging market but listed only on foreign exchanges" (Standard & Poor's, 2000, February, p. 56), for example, the Chinese H-shares listed in the Hong Kong Stock Exchange. The S&P/IFCI indices also consider national laws, regulations, and company status, which prohibit foreign ownership in the markets. Thus, the S&P/IFCI indices exclude holdings not truly available for foreign portfolio investors. For instance, only some qualified foreign institutional investors are allowed to acquire and trade the Chinese A-shares. Therefore, the S&P/IFCI China index considers only B-shares and H-shares, which are 100% open to foreign investors.

The S&P/IFCI indices' second adjustment removes the market capitalization of government ownership. It is common in emerging stock markets that "government ownership is quite significant, even many of the shares are released to private sector. These partial privatizations commonly bring large amounts of stock to the market, making the issues the largest and most liquid stocks in their home markets, yet, significant and easily identifiable portions remain in government hands and are not available for trading" (Standard & Poor's, 2000, February, p. 12).

The final S&P/IFCI indices adjustment excludes the cross-holdings. "Cross-holding" means that "one company owns stock in a second company, both being constituents of a calculated market index" (Standard & Poor's, 2000, February, p. 12). For example, if Company A owns 40% of Company B, when an investor buys all of Company A shares, the investor would automatically acquires proportionately Company B's shares. This can overstate the weighted market capitalization in the calculation of market indices. The S&P/IFCI indices remove the double counting in market capitalization, which is not truly available for investors.

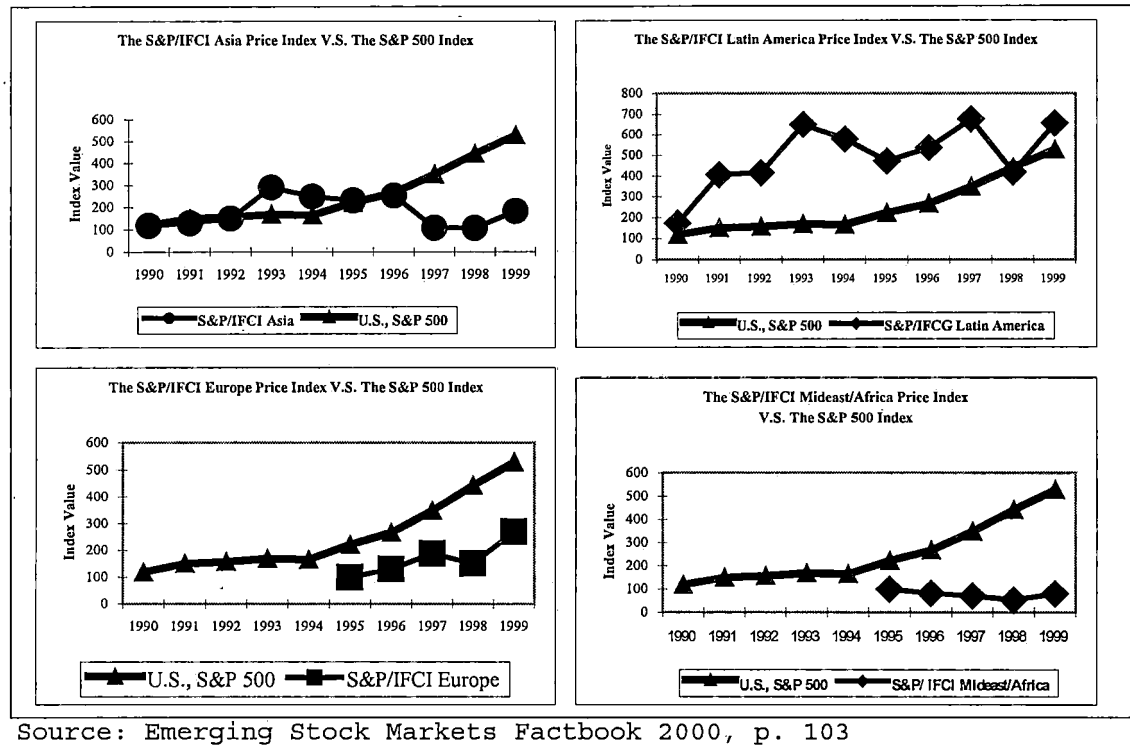
The Category of the S&P/IFCI Price Indices

The S&P/IFCI Price Indices can be classified into the S&P/IFCI Market Indices and the S&P/IFCI Regional Indices. In 1999, the S&P/IFCI Market Indices covered thirty emerging stock markets, including the S&P/IFCI China Index. These thirty emerging stock markets are classified into four regions - Asia, Latin America, Europe, and Mideast/Africa, which compose the S&P/IFCI Regional Indices.

From the S&P/IFCI Market Indices and the S&P/IFCI Regional Indices, the indices markets' performance rankings can be analyzed according to the annual percentage change of their value. The performance comparison of the S&P/IFCI Regional Indices and the S&P 500 Index is investigated to analyze the performance of the Chinese stock markets from 1990 to 1999. The performance comparisons and correlations between the S&P/IFCI China Index and other Asian stock markets' indices are analyzed and explained in detail later.

Performance of the S&P/IFCI Regional Indices

Generally, the S&P 500 Index had a continual increasing trend during the 1990s as presented in figure 1. The S&P/IFCI Latin America also had an



Source: Emerging Stock Markets Factbook 2000, p. 103

Figure 1. The Standard and Poor/International Finance Corporation Investable (S&P/IFCI) Regional Price Indices Versus The Standard and Poor (S&P) 500 Index.

increasing trend, but with more fluctuation than the S&P 500 during the same period. The S&P/IFCI Asia Index was unstable and with a slightly downward trend during the decade. With the base date started in 1995, the S&P/IFCI Europe Index had an upward trend from 1995 to 1999 and fluctuated in the same direction as the S&P/IFCI Latin America Index. The S&P/IFCI Mideast/Africa Index, also with a base date started in 1995, had a downward trend in those five years. The market trend in figure 1 is divided

into four periods: 1990-1993, 1993-1995, 1995-1998, and 1998-1999. The potential reasons for these movements are chronically explored specifically according to the years 1993, 1995, 1998, and 1999 in the following sections.

Performance of Emerging Stock Markets in 1993

According to the Emerging Stock Markets Factbook 1994, "1993 may be seen as a watershed year in which emerging stock markets came into their own as capital raising mechanisms and became firmly established as a distinct asset class for the world's investment community" (International Finance Corporation, 1994, p. 8). Based on the statistics in 1994 Factbook, the world total market capitalization achieved the historical high of $14 trillion, which increased 28% from $10.9 trillion in 1993. The market capitalization of the emerging stock markets covered by S&P increased 75% from $0.96 trillion to $1.67 trillion, while all developed stock markets increased only 21% from $9.9 trillion to $12 trillion.

In 1993, the S&P/IFCI Asia Index and the S&P/IFCI Latin America Index rose to the historically highest level since 1990. As demonstrated in figure 1, the S&P/IFCI Asia Index and the S&P/IFCI Latin America climbed 94% and 56% respectively during 1993, while, the S&P 500 Index had a 7% growth rate during 1993. As stated in the Emerging

Stock Markets Factbook 1994, "the combination of very low real interest rates in the U.S. and strong economic growth in the developing world combined to create an enthusiasm for emerging market equities, which pushed markets beyond their fundamental values" (International Finance Corporation, 1994, p. 8).

Performance of Emerging Stock Markets in 1995

Numerous emerging stock markets were negatively impacted by Mexican peso crisis, which began in December 1994. In 1995, the S&P/IFCI Latin America and S&P/IFCI Asia Price Indices plunged 19% and 7% respectively. On the contrary, the S&P 500 Index increased 34% during 1995. As analyzed by the Emerging Stock Markets Factbook 1996, "international equity offerings by emerging market companies slowed considerably in 1995, as did foreign portfolio capital flows. This might have been expected given the dramatic price declines in Latin American and other markets from the end of 1994 and the attraction of bull stock markets in the U.S. and a few other major markets throughout 1995" (International Finance Corporation, 1996, p. 9).

Performance of Emerging Stock Markets in 1998

The Emerging Stock Markets Factbook 1999 describes, "1998 was the worst year ever for emerging stock markets.

The "contagion"[3] had its beginning in July 1997, when a sharp decline in the value of the Thai Baht initiated major risk reassessments throughout Europe, Africa, and Latin America, underpinning sharp declines in both currencies and equities in those regions. Stock markets in countries with weakest macroeconomic fundamentals generally suffered the sharpest losses, but countries with stronger economic policies and more robust financial sectors were not able to escape effects of the contagion completely" (International Finance Corporation, 1999, p. 10).

The S&P/IFCI Latin America Price Index had the steepest decline of the regions examined, falling 38% during 1998, as demonstrated in figure 1. The S&P/IFCI Europe Price Index and the S&P/IFCI Mideast/Africa Price Index also declined 20.5% and 25% respectively. The S&P/IFCI Asia Price Index, after falling from more than 57% in 1997, slightly declined 0.7%. According to the statistics in the Emerging Stock Markets Factbook 1999, during 1998, "the S&P 500 Index soared 26.7%, powered by a surge in the most heavily capitalized issued" (International Finance Corporation, 1999, p. 10).

Performance of Emerging Stock Markets in 1999

Figure 1 depicts the dramatic rebound of all emerging stock markets in 1999. The Emerging Stock Markets Factbook 2000 states, "emerging stock markets posted strong positive returns in 1999, ending the Asian market crisis that rippled through developing equity markets in 1997 and 1998" (Standard & Poor's, 2000, p. 10). The statistics in 1999 show that "of the thirty markets tracked by the S&P/IFCI Indices in 1999, twenty four markets registered positive returns. Among the twenty four markets, eighteen reported a 12-month gain of more than 20%" (Standard & Poor's, 2000, p. 10). Moreover, "the Russian and Turkish markets recorded returns in excess of 200%, while China, South Korea, and Zimbabwe saw gains of more than 100%" (Standard & Poor's 2000, p. 10).

All emerging stock markets regained upward momentum in 1999, as displayed in figure 1. The S&P/IFCI Europe Price Index performed the best with increase rate of 80% during 1999. The S&P/IFCI Asia Price Index climbed up 70% during the year. The S&P/IFCI Regional Index for Latin America and Mideast/Africa turned up 57% and 49% respectively. In the developed stock market, the S&P 500 Index increased 19.5% during 1999.

On average, the correlation coefficient between the U.S. stock market and other stock markets is 0.65 (Brigham & Ehrhardt, 2002, p. 217). As illustrated in table 1, the Regional Indices had a relatively low correlation with the S&P 500 Index. During this time period, the correlation of the Asia Index was 0.56, while the Latin America Index was 0.57 and the Mideast/Africa Index was 0.56. Finally, the Europe Index with a correlation coefficient of 0.45 was far below the 0.65 of the S&P 500 Index.

Between 1994 and 1999, as revealed in table 1, Europe had the greatest annualized return of 26.40%, almost 2% higher than the return of the S&P 500. On the other hand, during the same period, the S&P/IFCI Asia and the S&P/IFCI Mideast/Africa Indices had negative annualized returns of -0.84% and -4.80% respectively.

All emerging stock markets regional indices had nearly twice the risk of the S&P 500 Index. The S&P/IFCI Asia Index had the highest risk of 32.94% during the analyzed period. The S&P/IFCI Latin America Index and the S&P/IFCI Europe Index had 31.52% and 31.84% risks respectively. The fluctuation of the S&P/IFCI Mideast/Africa Index was less than other Regional Indices;

Table 1. Statistics of the Standard and Poor/International Finance Corporation Investable (S&P/IFCI) Price Indices

Emerging Market	Annualized Mean of % Change (Return)	Annualized Standard Deviation %(Risk)	Risk Per Unit of Return	Correlation with S&P500
Asia	-0.84	32.94	-39.21	0.56
Europe	26.40	31.52	1.19	0.45
Latin America	7.92	31.84	4.02	0.57
Mideast/Africa	-4.80	25.01	-5.21	0.56
U.S., S&P 500	24.48	13.93	0.57	1.00

Annualized Mean of % Change: known as "return", is calculated by adding monthly percentage change of the S&P/IFCI Price Index of each year then averages the yearly means.

Annualized Standard Deviation: is calculated by adding the monthly standard deviation of each year, and then averages the yearly amount.

Risk Per Unit of Return: is the annualized standard deviation divided by annualized mean of percentage change.

(US$, December 1994-December 1999)
Source: Emerging Stock Markets Factbook, 2000, p. 110

therefore, it had lower risk of 25.01%. However, when compared to the S&P 500, the risk was still high.

Based on the analysis, the risk per unit of return, from the S&P/IFCI Asia Index (-39.21), was higher than that of other regional indices and the S&P 500 Index. The S&P/IFCI Europe Index had comparatively less risk of 1.19 among other emerging regions. Unlike the emerging markets, the S&P 500 only had the risk per unit of return of 0.57.

With the lowest risk per unit, and a low correlation with the S&P 500, the European markets are ideal for U.S. investors seeking to diversify their portfolios. Moreover,

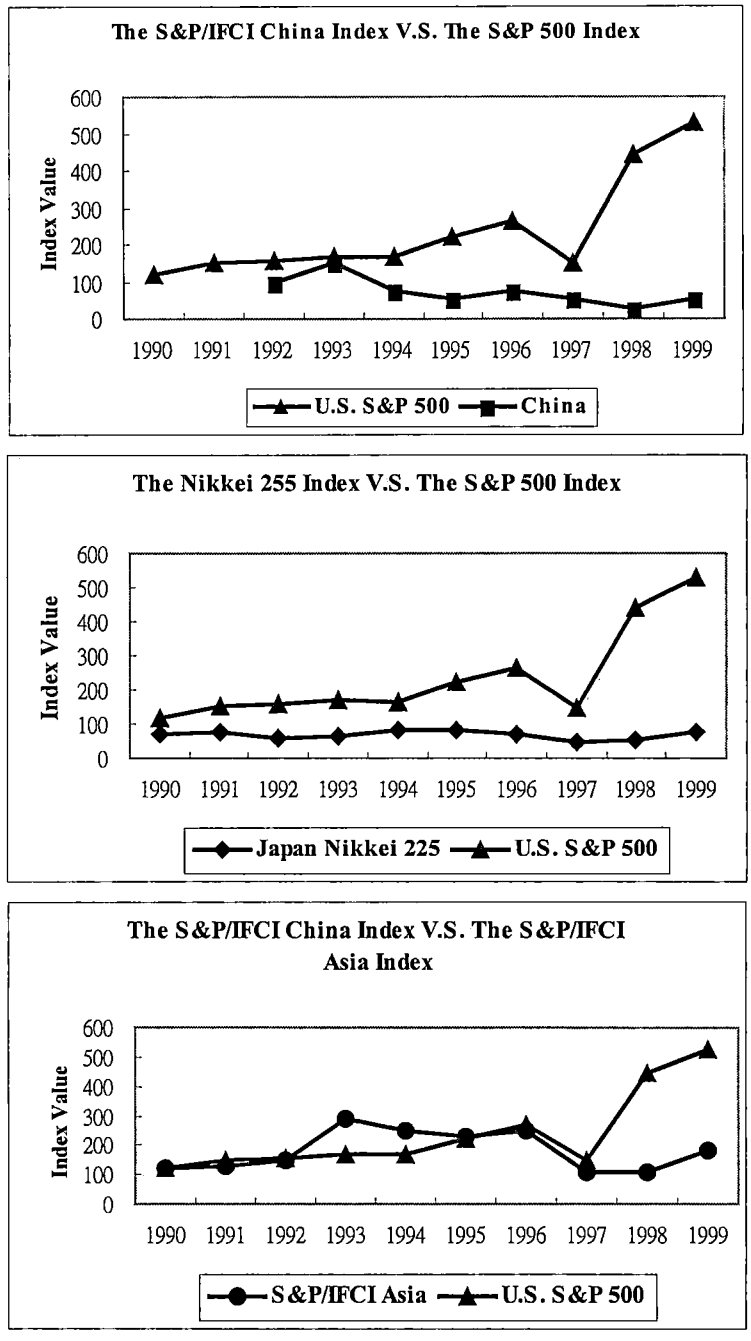
the Europe Index had the best performance during the time period. The S&P/IFCI Asia Index was the worst performer because of the comparatively low returns and high risk (with -39.21 risk per unit of return).

Performance of the Chinese Stock Markets

As shown in figure 2, the S&P/IFCI China Index had the same trend as the S&P/IFCI Asia Index. The Nikkei Index of Japan had a relative smooth and stable trend during the decade. The S&P 500 had increased to peak in 1996 (266.7), and then in 1997 it dropped to the historical low level (149.4) close to that of 1990 (118.9). In 1998, the S&P 500 dramatically soared to 442.6, and reached the historical high level of 529 in 1999.

Table 2 demonstrates that China had a lower correlation of 0.33 with the S&P 500 Index. The Nikkei Index of Japan (0.42) and the S&P/IFCI Asia Index (0.56) also had a low correlation with the S&P 500 Index.

With a return of 24.48% and a risk of 13.93% from 1994 to 1999, the S&P 500 Index performed better than the S&P/IFCI Japan and the S&P/IFCI China Indices. The risk per unit of return of the Japan Index and the China Index were comparatively higher than the S&P 500 Index. However,



Source: Emerging Stock Markets Factbook 2000, p.103

Figure 2. Comparison among China, Japan, the United States and the S&P/IFCI Asia Index

Table 2. Statistics of the S&P/IFCI Price Indices (Part A)

Market	Annualized Mean of % Change (Return)	Annualized Standard Deviation % (Risk)	Risk Per Unit of Return	Correlation with S&P500
China	3.84	48.36	12.59	0.33
Japan, Nikkei 225	1.20	22.59	18.83	0.42
U.S., S&P500	24.48	13.93	0.57	1.00
S&P/IFCI Asia	-0.84	32.94	-39.21	0.56

(US$, December 1994-December 1999)
Source: Emerging Stock Markets Factbook 2000, p. 103, 108

during the analyzed period, the risk per unit of return of the Asia Index more than tripled that of the S&P/IFCI China Index.

Comparing China with Other Asian Emerging Stock Markets

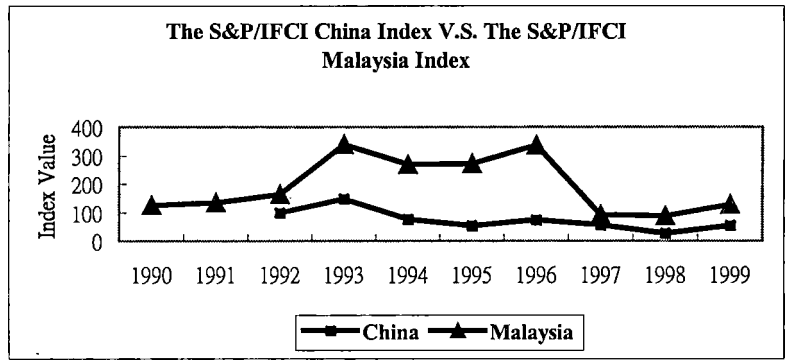
The S&P/IFCI China Index had a low return as that of India, and had the second highest risk per unit of return (see table 3). Between 1994 and 1999, the S&P/IFCI South Korea Index performed the best, since it had a low risk per unit of return and high return among analyzed markets. However, its return was less than half of that of the S&P 500 Index. Since the S&P/IFCI South Korea Index had low correlation with the S&P 500 Index, Korea may be the best choice for the U.S. investors to invest in the Asian emerging stock markets. As shown in figure 3, the S&P/IFCI Malaysia Index had the fiercest fluctuation among the

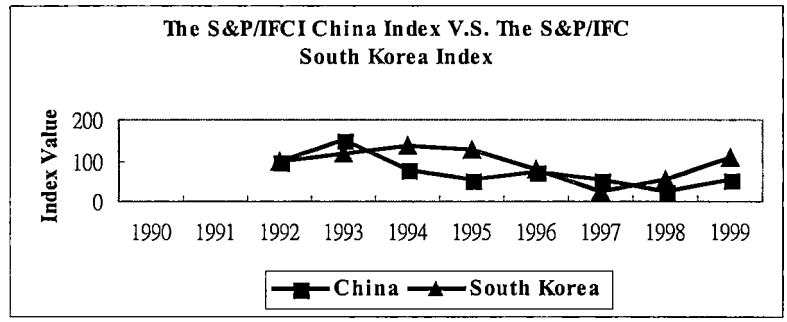
Table 3. Statistics of the S&P/IFCI Price Indices (Part B)

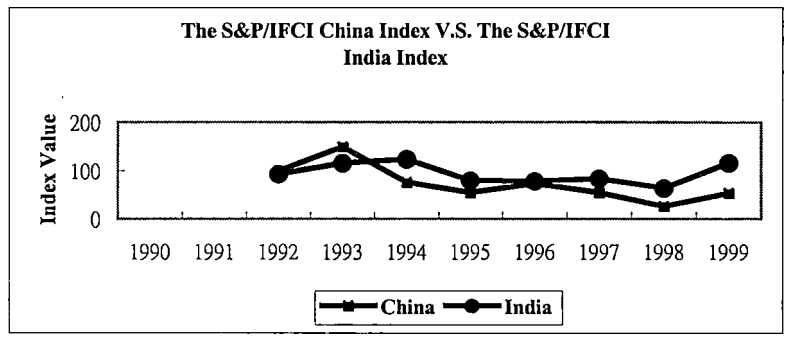
Asia Emerging Stock Markets	Annualized Mean of % Change (Return)	Annualized Standard Deviation % (Risk)	Risk Per Unit of Return	Correlation with S&P500
China	3.84	48.36	12.59	0.33
India	3.24	30.28	9.35	0.11
South Korea	10.80	58.30	5.40	0.28
Malaysia	-2.64	50.89	-19.28	0.50
Taiwan	6.48	32.15	4.96	0.42
Others				
S&P/IFCI Asia	-0.84	32.94	-39.21	0.56
U.S., S&P500	24.48	13.93	0.57	1.00

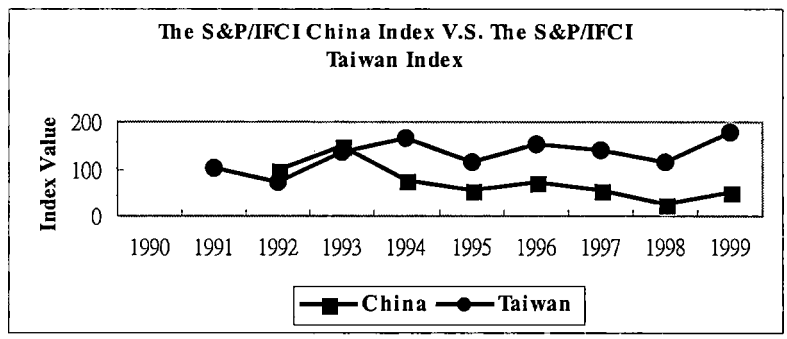
(December 1994-December 1999)
Source: Emerging Stock Markets Factbook, 2000, p. 108, 110

analyzed Asian emerging stock markets indices. The S&P/IFCI Malaysia Index performed the worst with a negative return, second highest risk, and the highest risk per unit of return in the same analyzed period. Although the S&P/IFCI Taiwan Index did not have the high return as that of South Korea, its risk per unit of return was the lowest among the analyzed markets. The S&P/IFCI India Index had a lowest correlation with the S&P 500 Index and the lowest risk among the Asian markets. To summarize, the Asian emerging markets indices had a higher risk per unit of return than that of the S&P 500. The S&P/IFCI China Index had a comparatively low return, and the second highest risk per unit of return among the listed Asia emerging stock markets.









Source: Emerging Stock Markets Factbook, 2000, p. 106

Figure 3. Comparisons between China and Asian Emerging Stock Markets

Conclusion

During the 1990s, the emerging stock markets of Asia, Latin America, Europe, and Mideast/Africa had a low correlation with the U.S. stock market. European stock markets performed the best because of the low risk per unit of return, while Asia performed the worst judging by the high risk per unit of return. The Chinese stock markets were a high-risk, low return market, but they had relatively low correlations to the U.S. stock market. Although the Chinese stock markets did not perform very well in the past decade, the markets are still developing and playing ever-increasing roles in the world economy.

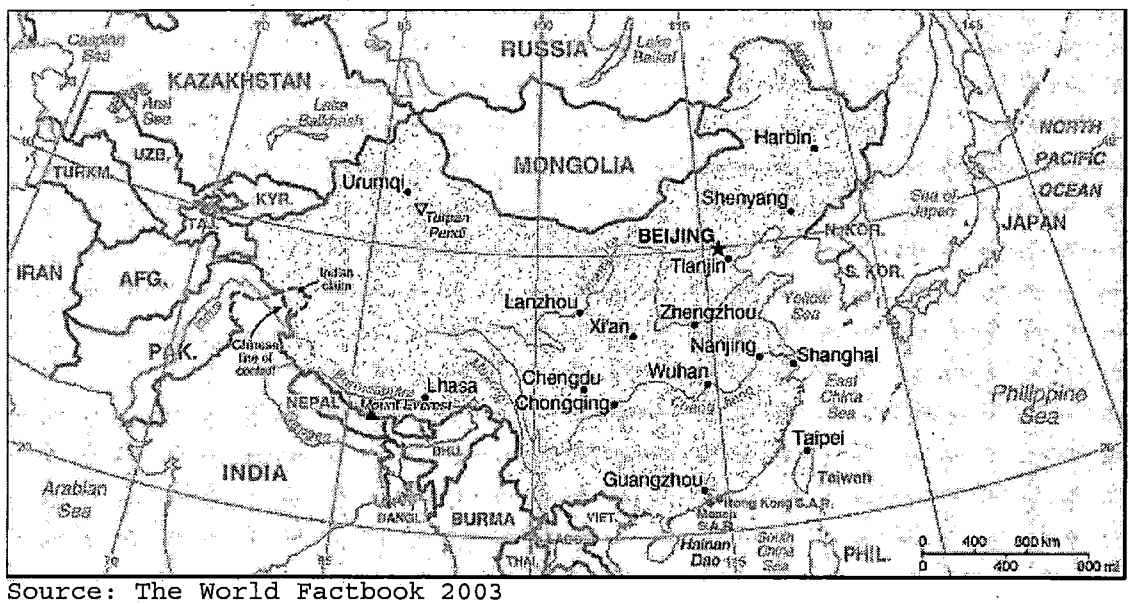
CHAPTER THREE

INTRODUCTION OF CHINA

The evolution of China in the 21st century has had a profound influence on the world economy. Having the largest population in the 4th largest territory in the world, China has reached the outstanding economic growth rate of 8% in 2002 during the world economic downturn. This chapter can be broken down into several categories: geography, society, economy, membership in WTO, and development of the Chinese stock markets.

Geography

As illustrated in figure 4, China is located in East Asia and has a 22,147.34 km land boundary. The border countries are North Korea in the east; Mongolia in the north; Russia in the northeast and northwest; Kazakhstan, Kyrgyzstan and Tajikistan in the northwest; Afghanistan, Pakistan, India, Nepal, and Bhutan in the west and southwest; and Burma, Laos, and Vietnam in the south. China has a 14,500 km coastline from the east to southeast, bordering the Korea Bay, Yellow Sea, East China Sea, and South China Sea. According to the data provided by The World Factbook 2003, geographically, China is the 4th largest country in the world after Russia, Canada, and



Source: The World Factbook 2003
(www.cia.gov/cia/publications/factbook/geos/ch.html)

Figure 4. Map of China

the U.S. China's area of 9,596,960 sq km is smaller than the 9,629,091 sq km of the U.S. (Central Intelligence Agency, 2003).

Society

As shown in table 4, China is the largest country in terms of population, and is home to one fifth of the people in the world. China and India have over one billion residents, which is far more than other country. As shown in figure 5, ten countries represent 59 percent of the global population. By July 2003, the estimated population of China is expected to reach 4.61 times that of the U.S. (U.S. Census Bureau, 2003).

Table 4. Countries Ranked by Population: 2003

Rank	Country	Population	Percentage
1	China	1,286,975,468	20.42
2	India	1,049,700,118	16.66
3	United States	290,342,554	4.61
4	Indonesia	234,893,453	3.73
5	Brazil	182,032,604	2.89
6	Pakistan	150,694,740	2.39
7	Russia	144,526,278	2.29
8	Bangladesh	138,448,210	2.20
9	Nigeria	133,881,703	2.12
10	Japan	127,214,499	2.02
Sum of the Top Ten		3,738,709,627	59.32
Others		2,563,600,064	40.68
Global		6,302,309,691	100.00

Source: U.S. Census Bureau, International Data Base. (July 17, 2003) (http://www.census.gov/cgi-bin/ipc/idbrank.pl)

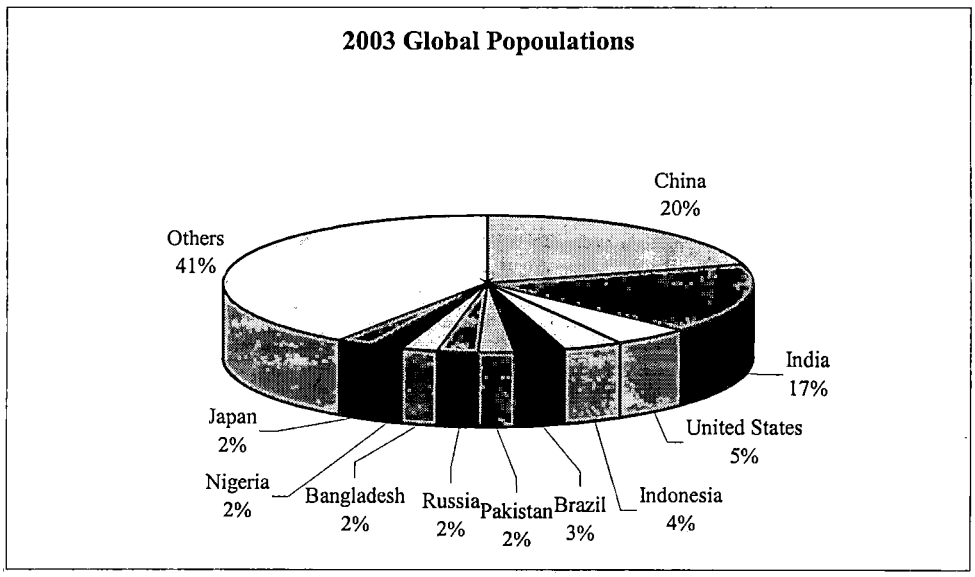


Figure 5. 2003 Global Populations

As illustrated in table 5, China has lower population growth rates, and birth rates than the U.S. However, the death rates of China (6.74 per 1,000 populations) are surprisingly lower than that of the U.S (8.44 per 1,000 populations). The average life expectancy at birth in China is 72.22 years. The majority ethnic group in China is Han Chinese, which is 91.9% of the total population. Only 8.1% are minority ethnic groups, such as Zhuang, Uygur, Hui, Yi, Tibetan, Miao, Manchu, Mongol, Buyi, and Korean. Mandarin, the Beijing dialect, is the standard language (Chinese pronunciation is Putonghua). People in different regions speak in different dialects; such as in Minbei people speak the Fuzhou dialect. The Chinese literacy rate is 86%, which is 11% lower than that of the U.S. (Central Intelligence Agency, 2003).

Economy

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is the total market value of all final goods and services produced in a country in a given year, equal to total consumption, investment and government spending, plus the value of exports, minus the value of imports (InvestorWords.com).

Table 5. Population Comparisons between China and United States of America

	China	U.S.A.
Population	1,286,975,468	290,342,554
Population growth rates (%)	0.60	0.92
Birth rates (per 1,000 populations)	12.96	14.14
Death rates (per 1,000 populations)	6.74	8.44
Life expectancy (years)	72.22	77.14
Ethnic groups (2002)	Han Chinese 91.9%, Zhuang, Uygur, Hui, Yi, Tibetan, Miao, Manchu, Mongol, Buyi, Korean, and other nationalities 8.1%	white 77.1%, black 12.9%, Asian 4.2%, Amerindian and Alaska native 1.5%, native Hawaiian and other Pacific islander 0.3%, other 4%
Languages	Standard Chinese or Mandarin (Putonghua, based on the Beijing dialect), Yue (Cantonese), Wu (Shanghaiese), Minbei (Fuzhou), Minnan, Xiang, Gan, Hakka dialects	English, Spanish
Literacy (Definition: age 15 and over can read and write)	86%	97%

Notes and Definitions:
Population: This entry gives an estimate from the U.S. Bureau of the Census based on statistics from population censuses, vital statistics registration systems, or sample surveys to the recent past and on assumptions about future trends.
Population growth rate: This entry gives the average annual percent change in the population, resulting from a surplus (or deficit) of births over deaths and the balance of migrants entering and leaving a country.
Birth rate: The average annual number of births during a year per 1,000 persons in the population at midyear.
Death rate: This entry gives the average annual number of deaths during a year per 1,000 populations at midyear.
Life expectancy (at birth): This entry contains the average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future.
Ethnic groups: This entry provides a rank ordering of ethnic groups starting with the largest and normally includes the percent of total population.
Languages: This entry provides a rank ordering of languages starting with the largest and sometimes includes the percent of total population speaking that language.
Literacy: This entry includes a definition of literacy and Census Bureau percentages for the total population, males, and females.
Source: The World Factbook 2003, August 1. (www.cia.gov/cia/publications/factbook)

Compared to the 2002 GDP growth rate of 0.3% in the U.S., China had an 8% outstanding GDP growth rate for 2002, which was admired by many countries in an economic downturn. However, as shown in table 6, the GDP per capital of China ($4,600) was only 12.67% of that of the U.S. ($36,300). Around half of the GDP of China was generated by the industry sector. The services sector was the second largest sector after the industry sector.

Table 6. China and United States of America Gross Domestic Product Comparison

	China	U.S.A.
GDP (Billion Dollars)	1,200	10,100
GDP- real growth rate (annual %)	8	0.3
GDP- per capital (One Dollar)	4,600	36,300
GDP composition by agriculture sector	18%	2%
GDP composition by industry sector	49%	18%
GDP composition by services sector	33%	80%

Notes and Definitions:
GDP: GDP dollar estimates in the *Factbook* are derived from purchasing power parity (PPP) calculations.
GDP- real growth rate: This entry shows GDP on a purchasing power parity basis divided by population as of 1 July for the same year.
GDP- per capital: This entry shows GDP on a purchasing power parity basis divided by population as of 1 July for the same year.
GDP- composition by sector: This entry gives the percentage contribution of agriculture, industry, and services to total GDP.
Source: The World Factbook 2002 (www.cia.gov/cia/publications/factbook)

Unemployment Rates

Table 7 lists the unemployment rates between China and its major trading partners, such as Japan, South

Table 7. Unemployment Rate Annual Percentage Change

Unemployment Rate %	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
China	2.5	2.3	2.3	2.6	2.8	N/A	3.0	3.0	3.1	3.1	3.1	N/A	N/A
Japan	2.1	2.1	2.2	2.5	2.9	3.2	3.4	3.4	4.1	4.7	4.7	5.0	5.4
South Korea	2.4	2.3	2.4	2.8	2.4	2.0	2.0	2.6	6.8	6.3	4.1	3.8	3.1
USA	5.5	6.7	7.4	6.8	6.1	5.6	5.4	5.0	4.6	4.2	4.0	4.7	N/A

Source: International Financial Statistics, International Monetary Fund, various issues.

Korea, and the U.S. China's unemployment rate has been relatively stable for the whole period analyzed. The unemployment rate varies between 2.3% and 3.1%. Japan's unemployment had been increasing since 1992. It has increased from 2.1% (1990) to 5.4% (2002). South Korea's unemployment rate was similar to that of China until 1998 when the numbers of people without work rose to 6.8%. South Korea's unemployment rate drops to 3.1% in 2002. The unemployment rate in the U.S. had been increasing from 5.5% (1990) to 7.4% (1992), then the rate in the U.S. began to decrease to 4.0% (2000). However, the rate increased to 4.7% in 2001 (International Monetary Fund, 1990-2003).

Exports and Imports

Table 8 shows that China's exports increased over twenty percent in 1997 and 2000. China's imports increased 18.2% in 1999 and 35.8% in 2000. Both exports and imports

Table 8. The Percentage Changes of China's Exports and Imports: 1997 to 2001

Year	Exports (Billion Dollars)	Exports Growth Rate %	Imports (Billion Dollars)	Imports Growth Rate %	Total Trading (Billion Dollars)	Total Trading Growth Rate %
1997	182.7	20.9	142.4	2.5	325.1	12.1
1998	183.8	0.5	140.2	-1.5	323.9	0.4
1999	194.9	6.1	165.8	18.2	360.7	11.3
2000	249.2	27.8	225.1	35.8	474.3	31.5
2001	241.6	6.3	221.2	8.6	462.8	7.4

Source: China National Bureau of Statistics (NBS), Asia Pulse. January 03, 2002

showed a significant increase in 2000, which induced a 31.5% total trading growth rate in 2000 (China National Bureau of Statistics, 2002).

In 2002, China's exports were estimated at $312.8 billion, which was 26% of its 2002 GDP. In the same year, the U.S. exported only 7% of its GDP (Central Intelligence Agency, 2003). According to table 6, in 2002, China had larger exports ($312.8 billion) than imports ($268.6), resulting in a 44.2 billion dollar trading surplus. International trade has played an important role in China's economy.

As shown in table 9, 22.5% of the total export commodities are shared with the United States: China's largest export partner. On the contrary, China is the fourth largest import partner of the U.S., which shares

Table 9. China's Trading Partners Ranking: 2002

China's Major Exports Partners: 2002			China's Major Imports Partners: 2002		
Ranking	Partners	Percentage	Ranking	Partners	Percentage
1	U.S	22.5	1	Japan	18.1
2	H.K.	18.0	2	Taiwan	12.9
3	Japan	14.9	3	Korea	9.7
4	South Korea	4.8	4	U.S.	9.2
5	Germany	3.5	5	Germany	5.6
6	Netherlands	2.8	6	H.K.	3.6
7	U.K.	2.5	7	Malaysia	3.1
8	Singapore	2.1	8	Russia	2.8
9	Taiwan	2.0			
Sum of Top 9		73.1	Sum of Top 8		65
Others		26.9	Others		35
Total		100	Total		100

Notes and Definitions:
Exports partners: This entry provides a rank ordering of trading partners starting with the most important.
Imports partners: This entry provides the total U.S. dollar amount of imports on a c.i.f. (cost, insurance, and freight) or f.o.b. (free on board) basis.
Sources: The World Factbook 2003 (www.cia.gov/cia/publications/factbook)

8.9% of the total import commodities of the U.S. China's other major exports partners are Hong Kong, Japan, South Korea, Germany, the Netherlands, the U.K., Singapore, and Taiwan. The major export commodities are machinery, equipment, textiles, clothing, footwear, toys, sporting goods, and mineral fuels (Central Intelligence Agency, 2003).

China imported lots of machines and equipment, such as mineral fuels, plastics, iron and steel, chemicals, manufacturing techniques, and production facilities

respectively from Japan 17.6%, Taiwan 11.2%, and the U.S. 10.8% in 2001. Chinese society was developing at a rapid speed and had the potential to be the most influential market in the world (Central Intelligence Agency, 2003).

Membership of World Trade Organization

The World Trade Organization (WTO), founded on January 1, 1995 in Geneva, Switzerland, is the only global organization coordinating the global rules of trade between member nations. Through the multilateral agreement signed by member nations, the purpose of WTO is to facilitate international trade between member nations, administer global trade agreements, and resolve trading disputes when they arise (World Trade Organization, 2003).

On December 11, 2001, after fifteen years of effort, China successfully became the 143rd member of the World Trade Organization. Adhikari and Yang[4] (2002) mentioned "China's motivation for joining the WTO is rooted in the realization that it needs an external impetus to overcome domestic obstacles to further reforms and protection of its trade interests if it is to sustain the rapid economic growth of the 1980s and 1990s"[5].

Zumwalt (2002, January), Economic Minister Counselor of United States Embassy, Beijing, states:

> Chinese consumers will be the direct beneficiaries as competition encourages a larger range of choices, lower prices, and higher quality, not to mention a greater awareness of and appreciation for intellectual property rights and consumer rights. Competition will foster gains in efficiency and productivity, which will strengthen China's economy over time and enhance the ability of Chinese firms to compete with the best multinationals in any market. (Zumwalt, 2002, January)

Moreover,

> WTO membership will generate tremendous benefits for China -- expanding trade, spearheading further economic reform, attracting even higher levels of foreign investment, and fostering the rule of law. (Zumwalt, 2002, January)

As a result:

> WTO membership will inextricably link China to the global economic community, eventually bringing with it more employment and investment opportunities, and greater social stability, as the rule of law takes deeper root in governing economic transactions in China. Americans will benefit from greater export opportunities in China, more job creation at home, and more diverse options for overseas investment.[6] (Zumwalt, 2002, January)

On the Anniversary of China's entry into the WTO, People's Daily, the main newspaper in China, reviewed a year of changes after WTO accession, an article states:

> The 8 percent growth rate for gross domestic product (GDP) clearly exemplifies the outstanding performance of the Chinese economy. More exciting are the robust growth in trade and rocketing inflow of foreign direct investment. China will likely become the fifth trading country with an import-export volume worth US$600 billion and the most attractive

> destination for foreign direct investment with an annual inflow that has exceeded US$50 billion this year. (People's Daily Online, 2002, December 11)

With the increase of international trade, according to statistics compiled by the World Trade Organization, China's export in 2001, against the background of a global economic downturn, was the fourth largest trading nation in the world.

Development of the Chinese Stock Market

The development of the Chinese stock market can be traced back to the reform of state-owned enterprises. Before the formal stock exchange was set up, there was an experimental stage. In the early 1990, two public stock exchanges were founded in Shanghai and Shenzhen. The evolution of the stock market is introduced in the following sections.

The Reform of State-Owned Enterprises (SOE)

The Chinese stock markets are unique in the world due to the economic reform from socialism to market oriented economy. The reform started in 1978 when Mao Zedong's[7] successor Deng Xiaoping[8] gradually introduced market-oriented reforms and decentralized economic decision-making and allowed private-owned assets.

As a communist society, state-owned enterprises are the mainstay of Chinese economy. In 1993, state-owned enterprises still accounted for more than 40% of the total industrial employment. However, in 1995, the Chinese government admitted that almost 50% of its state-owned enterprises lost money (World Bank, 2001). In 1997, there were around 305,000 state-owned enterprises. Among them, 113,800 were industrial enterprises, and 76% of these industrial enterprises had independent accounting systems. Obviously, the real bad debts of state-owned enterprises were questionable and underestimated if those enterprises were to conform to international accounting standards (Lee, Wang, & Mok, 1999)[9].

Since many state-owned enterprises are protected by government and rely heavily on state subsidies or cheap bank loans, they have little competition and their productivity is low. The main reasons for loses listed by state-owned enterprises were heavy burdens of debt (40.6%), government policies (18.1%), products without markets (13%), heavy social burdens (8.5%), mismanagement of enterprises (4.8%), low quality of products (2.2%), and others (10.9%)[10] (Lee et al., 1999). Therefore, reforming state-owned enterprises and the banking system were the main objective for the Chinese government since the

mid-1990s. The Chinese government, unlike Eastern Europe, only chose to reform 1,000 core state-owned enterprises. Eastern Europe closed the state-owned enterprises that were losing money. The remaining state-owned enterprises in China became candidates for bankruptcy, mergers, divestiture or buyout.

According to a research by Jefferson and Rawski[11] (1994), the annual growth rate of industrial output between 1978 and 1992 was 7.8% in state-owned enterprises (SOEs), but 18.4% in collectively-owned enterprises (COEs), 37.2% in joint-ventures and other foreign-funded enterprises and 64.9% in individually-owned enterprises [IOEs]. The change in the Chinese economy is an example of how privatization increased performance. Since rapid modernization of the economy needed a large amount of capital, state-owned enterprises not only issued shares to staff and workers, but also to other legal persons[12] (Ho, 2000, p. 89). The nonnegotiable shares[13] were non-tradable in the public stock exchange markets (China Security Regulatory Commission, 2003).

The Chinese government also sought more capital from the public and foreign investors through opening stock exchange markets, which are introduced in the following two sections- "The Experiment Stage" and "The

Establishment of Two Stock Exchange Markets". The negotiable shares will be introduced in the section- "Different Types of Shares in Exchange Markets."

The Experimental Stage

Prior to the formation of the stock markets, several companies issued shares to the public in informal market without any regulation. Local government set up the operation rules. As trading grew in different regions, the Chinese government found it difficult to monitor and control share issuance and exchange. In order to avoid social unrest caused by stock speculation, the Chinese government tried to experiment with open trading in the legal stock market.

In 1987, the experimental Shenzhen Stock Exchange was authorized to set up in Shenzhen. At the beginning, the stock market was greatly influenced by the Hang Seng Stock Exchange in Hong Kong, since the Shenzhen Special Economic Zone is near Hong Kong. In May 1987, the Shenzhen Development Bank issued the first security to Chinese citizens.

The Establishment of Two Stock Exchange Markets

Although the Shenzhen Stock Exchange was founded first, the Shanghai Stock Exchange was the largest stock exchange market in China, established on November 26, 1990

and started trading operation on December 19, 1990. The Shenzhen Stock Exchange was established on December 1, 1990 and started trading operation on July 3, 1991.

These two exchange markets are not-for-profit institutions governed by the China Securities Regulatory Commission (CSRC). The daily functions of the exchange markets are to provide a marketplace for trading, formulate business rules, accept and arrange listings, organize and monitor securities trading, regulate listed companies, and disseminate market information. According to the CSRC, the setting of the exchange markets facilitates a transparent, open, safe, and efficient marketplace (CSRC, 2003).

The Shanghai Stock Exchange is equipped with a high-speed modern trading system, which allows more than 8,000 transactions per second. The daily trading capacity of the trading system of the Shenzhen Stock Exchange is 20 million trades. The capacity is far more than the historical peak trading record of 4.5 million trades. However, the trading capacity of these two trading systems is still small compared to the NYSE trading system-SuperDot[14], which can process 2.5 billion shares per day (New York Stock Exchange, 2003). These systems match the order according to price and time priority. Through the

domestic satellite and optical communication network, real-time information can be disseminated all over the world. The China Securities Central Clearing & Registration Corporation (CSCCRC) is responsible for the central depository, registration, and clearing of the securities.

The Evolution of the Market

China's capital market expanded rapidly from 1991 to 1999 as listed in table 10. In 1991, only fourteen companies were listed; the market capitalization was approximately two billion dollars and the trading value was $820 million dollars. As of 1999, the number of listed companies increased 11% from 1998 to 950 companies. The market capitalization increased 178% to $330 million dollars. The trading value of the Shanghai and Shenzhen

Table 10. China's Capital Market

	Number of listed companies	Market Capitalization (Million Dollars)	Trading Value (Million Dollars)
1991	14	2,028	820
1992	52	18,255	16,715
1993	183	40,567	43,395
1994	291	43,521	97,526
1995	323	42,055	49,774
1996	540	113,755	256,008
1997	764	206,366	369,574
1998	853	231,322	284,770
1999	950	330,703	377,099

Sources: Emerging Stock Markets Factbook Various Issues

Stock Exchanges increased more than four hundred fifty times of that of the year 1991. As depicted in table 11, after twelve years of existence, the Shanghai Stock Exchange is much greater tradable stock value, number of members, and the total market capitalization.

Table 11. The Comparison of Shanghai and Shenzhen Stock Exchange

(RMB, 100 million)	Shanghai Stock Exchange	Shenzhen Stock Exchange
Number of listed companies	744	500
Number of shares listed	787	543
Total market capitalization	28584.7	13276.92
Tradable market value	8306.24	5181.99
Tradable stock value	1076.58	715.15
Number of members (10,000)	3611.38	3355.47
Market Cap over 2002 GDP %	27.92	12.97

RMB stands for China currency Renminbi, the basic unit is Yuan
Exchange rate: 1 USD = 8.27 RMB, Source: Bloomberg L.P. <http://www.bloomberg.com/markets/currencies/asiapac_currencies.html> as of July 21, 2003
Sources: Shenzhen Securities Information Co., Ltd. <www.cninfo.com.cn> as of July 21, 2003

Different Types of Shares in Exchange Markets

For the purpose of fully controlling the path of the open market, and raising capital from different channels or regions, the Chinese government categorized stocks into A-shares, B-shares, H-shares, N-shares, and Red Chips. These shares have the same rights, same obligations, and, theoretically, should have the same price.

A-shares. A-shares refer to companies incorporated in China and trade in the Shanghai and the Shenzhen Stock Exchange. A-shares have existed since those two stock exchanges were created. These shares are quoted in Renminbi (RMB), and the participants must be Chinese citizens. On December 1, 2002, the Chinese government approved the Qualified Foreign Institutional Investor (QFII) program, which allowed a selection of foreign institutional investors to trade on the RMB denominated A-shares markets.

B-shares. B-shares were initiated in 1991, solely for foreign investors, as a legal investment channel in China's equity markets. The Shanghai B-shares are quoted in U.S. Dollars. The Shenzhen B-shares are quoted in Hong Kong Dollars. After February 19, 2001, domestic investors with legitimate foreign currency accounts were also allowed to acquire B-shares.

H-shares. In order to make state-owned enterprises more competitive in the international market, the Chinese government encouraged better performing state-owned enterprises to raise foreign capital from Hong Kong. The first H-share, Tsingtao Brewery, was issued on July 3, 1993 in the Hang Seng Stock Exchange in Hong Kong. All

H-shares are traded in Hong Kong Dollars and are included in the Hang Seng China Enterprises Index (HSCEI).

N-shares. On Oct. 9, 1992, Brilliance China Automotive successfully went public on the New York Stock Exchange (NYSE:CBA). This was the first Chinese company listed in a foreign stock market. It has a profound meaning that a Chinese company was recognized by international market. Through foreign open markets, the Chinese enterprises can raise more capitals from international capital markets.

Red Chips. "Red Chips", which means Chinese affiliated, generally refer to Hong Kong-listed companies that are at least 35 per cent directly or indirectly owned by state institutions, provincial or municipal organizations in Mainland China. These companies are not mainland-incorporated companies but may be incorporated in Hong Kong or elsewhere overseas. All Red Chips are traded in Hong Kong Dollars and included in the Hang Seng China-Affiliated Corp (HSCC) Index.

As mentioned above, only A-shares and B-shares are issued in Mainland China. H-shares, N-shares, and Red Chips are published overseas. Although China has gradually deregulated its stock markets, Chinese domestic investors still cannot trade these overseas-listed shares[15].

Indices

According to the definition by InvestorWords.com, an index is "a statistical indicator providing a representation of the value of the securities, which constitute it. Indices often serve as barometers for a given market or industry and benchmarks against which financial or economic performance is measured." For example, the S&P 500 Index (Standard & Poor's Composite 500 Stock Index) is an index consisting of 500 stocks chosen for market size, liquidity, and industry group representation. It is a market-value-weighted index (stock price times number of shares outstanding), with each stock's weight in the index proportionate to its market value. The index is one of the most widely used benchmarks of U.S. equity performance.

The Shanghai Stock Exchange lists four indices, the SSE Composite Index, the 180 Index, the A-share Index, and the B-share Index. The Shenzhen Stock Exchange lists more indices, including the SZSE Composite Index, the SZSE 100 Index, the A-share Index, the B-share Index, the SZSE Composite Sub-index, the A-share Sub-Index, and the B-share Sub-index. The Composite index measures all common stocks listed on the exchange. The Sub-index is a group of securities that are part of an index, but which are also

tracked on their own as a smaller, separate index (InvestorWords.com)[16].

The A-share Index includes all A-shares traded in the Shanghai and the Shenzhen Stock Exchanges respectively. The same is true for the B-share Index, which includes all B-shares traded in the Shanghai and the Shenzhen Stock Exchanges respectively. Both the A-share Index and the B-share Index are market-value-weighted indices quoted in RMB with 100 base points, but the base dates are different in the Shanghai and the Shenzhen Stock Exchanges. The base date of the Shanghai A-share Index is on December 19, 1990. The base date of the Shanghai B-share Index is on February 21, 1992. The base date of the Shenzhen A-share Index is on April 3, 1991. The base date of the Shenzhen B-share Index is on February 28, 1992.

In order to focus more on stock market structure and performance in Mainland China, this research mainly investigates the A-share Index and the B-share Index in the Shanghai and the Shenzhen Stock Exchanges.

CHAPTER FOUR

METHODOLOGIES

As mentioned previously, the purpose of this thesis is to apply the best analysis model to exam the nature of volatility, the persistence of stock returns, risk, asymmetric effect caused by shocks, and whether the volatility is a significant factor to predict expected return. In this chapter, linear models are described first because linear models are normally used. The reasons why linear models, functions, assumptions and constraints do not apply to this research are analyzed and explained in detail. The non-linear models are then introduced, since the non-linear models do not have the same constraints as the linear models do.

Linear Models

The linear regression model explains the relationship between an independent variable, denoted by X, and a dependent variable, denoted by Y. The relationship between X and Y is a straight-line relationship.

$$Y = \alpha + \beta X + \varepsilon_t$$

Y is the dependent variable, which we wish to explain or predict. Y is also called effect variable, or explained variable. X is the independent variable, also named causal

variables, explanatory variables or predictor variable. α is the intercept of the straight line given by $Y = \alpha + \beta X + \varepsilon_t$, while β is the slope of the line (Brooks, 2002, p. 42). Since the observations do not exactly lie on the line, the error term, denoted by ε_t, is the difference between the real value and the predicted Y.

The Assumption Underlying the Linear Regression Model

The linear regression model has underlying assumptions. First, ε_t, the error term, has a mean of zero ($\sum(\varepsilon_t)=0$), and is normally distributed. The normal distribution has a constant variance of σ^2. Next, the errors are statistically independent of one another. Further, there is no relationship between the errors themselves and the corresponding X values (Brooks, 2002, p. 56).

The Limitations of the Linear Regression Model

The variance of the error term typically is not constant; therefore the regression model has limitations explaining the "volatility clustering" or "volatility pooling", which means large returns are expected to follow large returns and small returns are expected to follow small returns. The linear regression model is not

applicable to the data analysis when the level of volatility is highly positively correlated.

To examine whether the linear regression model is appropriate for the analysis of the Chinese stock markets, figure 6 through figure 9 illustrate the volatility of index daily return in time series. The Shanghai A-share Index and the Shanghai B-share Index are analyzed from December 31, 1992 to July 21, 2003. The Shenzhen A-share Index and the Shenzhen B-share Index are analyzed from January 31, 1996 to July 21, 2003.

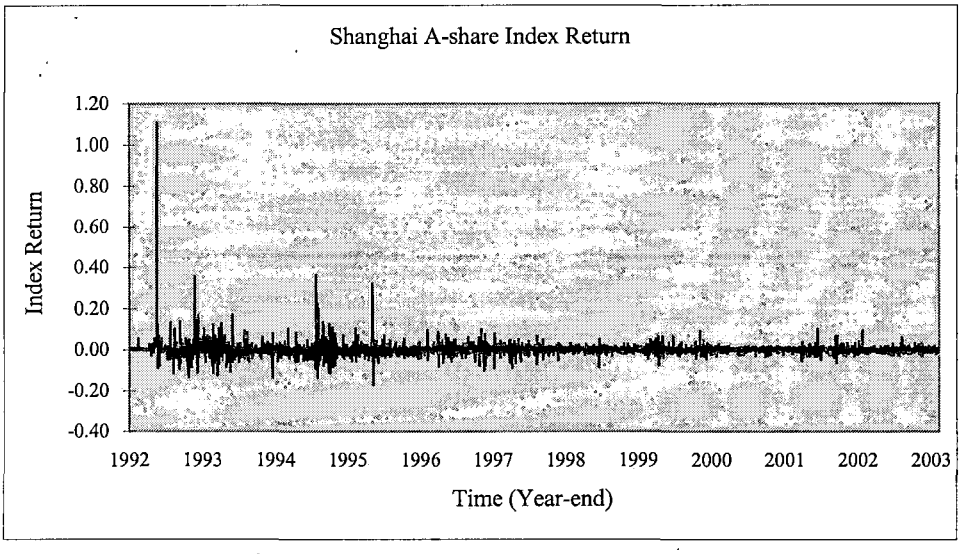


Figure 6. Shanghai A-share Index Return

The return of the Shanghai A-share Index exhibited high volatility, which fluctuated between -0.17 and 1.11. As presented in figure 6, the Shanghai A-share Index return achieved the historical high of 1.11 on May 21,

1992. After the large changes, the return followed by large clustered changes until mid-1995. After the return plunged to -0.17 on May 23, 1995, the return only fluctuated within -0.1 and 0.1 and had a relative tranquil period, which showed that small changes followed by small changes.

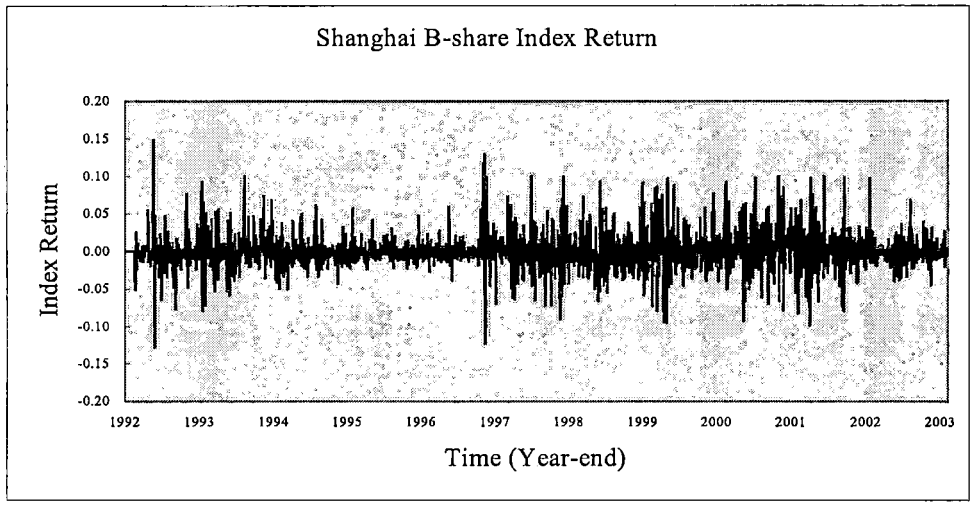


Figure 7. Shanghai B-share Index Return

When compared to the return of the Shanghai A-share Index, the return of the Shanghai B-share Index had smaller fluctuations between -0.13 and 0.15. Figure 7 shows that the return experienced moderate volatility before 1994. Between 1994 and 1996, the volatility of return was stable with small changes. After 1997 the return of the index was far more volatile than before with intense fluctuations between positive and negative

returns. Thus, the volatilities of the Shanghai A-share Index return exhibited a clustering phenomenon.

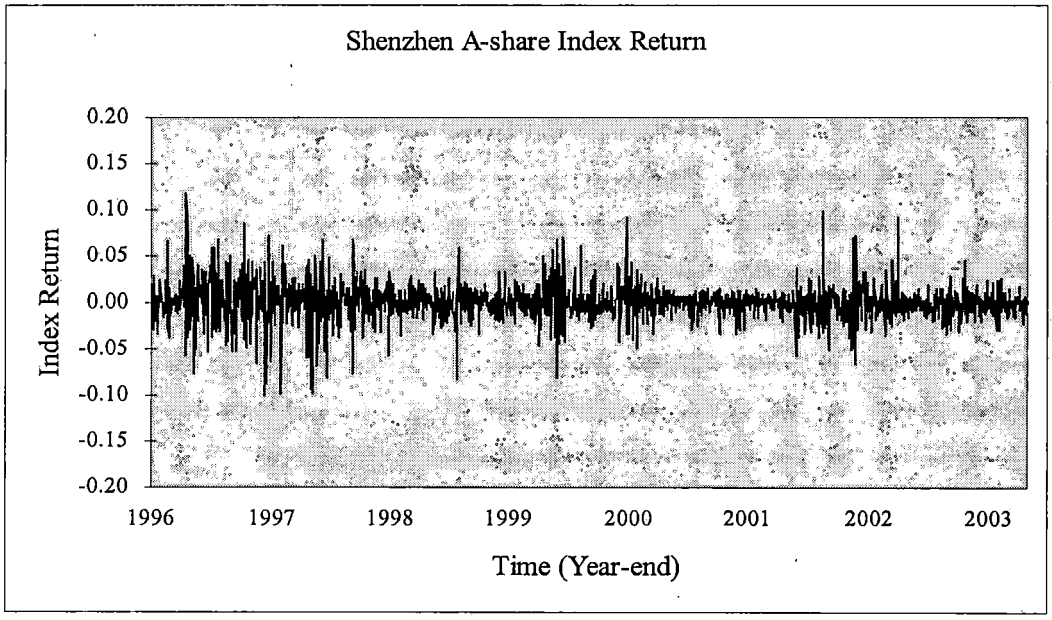


Figure 8. Shenzhen A-share Index Return

As shown in figure 8, the return of the Shenzhen A-share Index achieved 0.12 on April 26, 1996, and experienced drastic changes until 2000. After that, the volatility was gentle, and changes were smaller. Following the jump to 0.1 on October 23, 2001, the volatility fluctuated by large clustered changes resulting in positive and negative returns. Volatility clustering implied that volatilities of the index return were correlated, as future periods are positively correlated to the periods immediately preceding them.

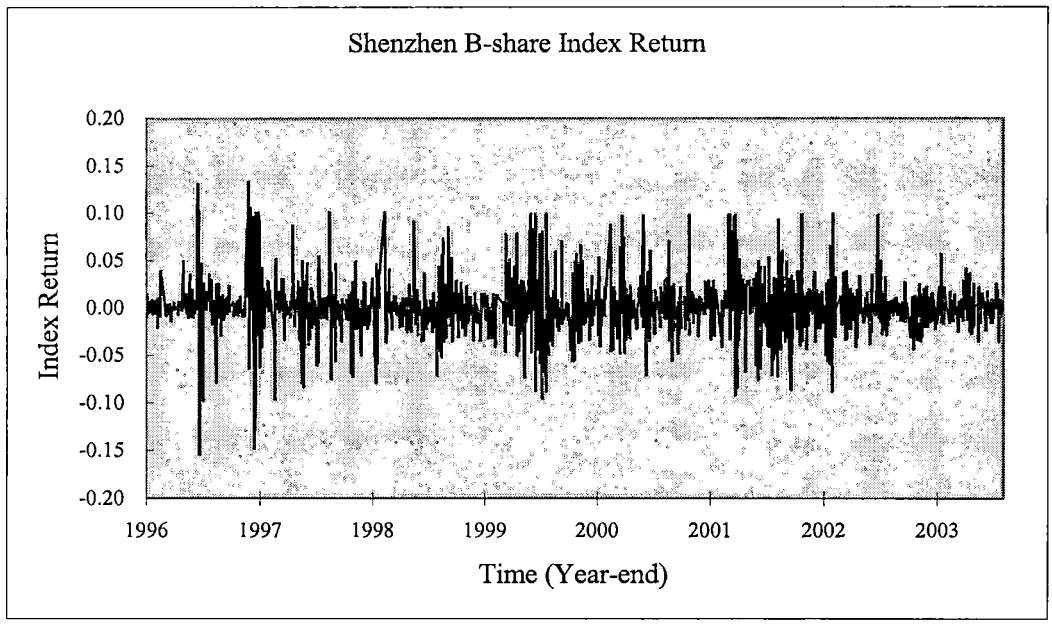


Figure 9. Shenzhen B-share Index Return

The return of the Shenzhen B-share Index had higher volatility than that of the Shenzhen A-share Index as presented in figure 9. The frequency of volatility was very high before 2003. The observations also demonstrated that high volatility clustering characterized the Shenzhen B-share Index. From the previous analysis, the volatility of each index return is clustering, which means linear regression models do not apply to the data analysis of the Chinese stock markets.

Non-linear Models

In the assumption of the classical linear regression model, if the variance of the errors is constant, it is called homoscedasticity. If the variance of the errors is

not constant, it is called heteroscedastic. In order to model non-constant variance of the errors, the Autoregressive Conditionally Heteroscedastic (ARCH) models were designed to test the non-constant variance of the errors, also called the conditional variance of errors. Based on the notion of the ARCH models, many non-linear models were developed to test non-constant variances of error term, simplify denoted by h_t in the following sections.

Most non-linear models were developed from the ARCH models. Since the ARCH models still had limitations, the GARCH models were introduced, and then they were extended to become the EGARCH model, the GJR model, and the GARCH-M model. The definition and limitations of each model are explained in detail.

The Autoregressive Conditionally Heteroscedastic (ARCH) Models

Engle introduced the Autoregressive Conditionally Heteroscedastic (ARCH) Model in 1982 to explain the volatility of inflation rates.

The ARCH (1) Model. Under the ARCH (1) model, volatility clustering is modeled by allowing the conditional variance of the error term (σ_t^2 or h_t), to depend on the immediately previous value of the squared

error, so that the conditional variance depends only on one lagged squared error.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1}$$

The ARCH (q) Model. The ARCH (1) model could be extended to the ARCH (q) model when the error variance depends on q lags of squared errors.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \alpha_2 \varepsilon^2_{t-2} + \ldots + \alpha_q \varepsilon^2_{t-q}$$

The Limitations of ARCH (q) Models. Even though the ARCH models were applied to test the autocorrelation in volatility, these models still had some limitations as followings (Brooks, 2002, p. 452):

1. It is hard to determine the value of q, the number of lags of the squared error in the model.
2. The value of q, which is required to capture all of the dependence in the conditional variance, might be very large and difficult to estimate.
3. The more parameters, α_i, the more likely that they will have negative estimated values. The non-negativity constraints of variance might be violated. Therefore, $\alpha_i \geq 0$, I = 0, 1, 2, ..., q

is the non-negativity constraints on parameters in the ARCH (q) Models.

The Generalized ARCH (GARCH) Models

Since the ARCH (q) models were difficult to estimate, Bollerslev (1986) and Taylor (1986) derived the Generalized ARCH (GARCH) models, which improved the ARCH models. The GARCH models are better than the ARCH models because they are simpler. The GARCH models allow an infinite number of past squared errors to influence the current conditional variance.

The GARCH (1,1) Model. The significant difference between the ARCH and the GARCH (1,1) model is that the conditional variance, denoted by σ_t^2, in the GARCH models depends on the previous lags. In other words, the current variance could be estimated based on precedent information.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta \sigma^2_{t-1}$$

The variance σ_t^2, is a function of an intercept (α_0), a shock from the prior period (α_1), and the variance from the last period (β_1).

The GARCH (p, q) Models. The GARCH (p, q) model was extended from the GARCH (1, 1) model. In the GARCH (p, q) model, the current conditional variance is parameterized

to depend on q lags of the square error and p lags of the conditional variance.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \sum_{j=1}^{p} \alpha_j \varepsilon^2_{t-j} + \sum_{k=1}^{q} \beta_k \sigma^2_{t-k}$$

The linear GARCH models allow prior shocks to have a symmetric affect on the conditional variance σ_t^2. However the GARCH models still have non-negative constraints on the parameters. In other words, the GARCH model does not explain the fact that in finance a negative shock causes more volatility than a positive shock.

The GARCH-M Model. Engle, Lilien, and Robins (1987) took into account the risk premium in the GARCH-M model, which supposed that investors would like to take additional risk in order to gain higher return.

$$Y_t = \mu + \delta \sigma_{t-1} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma_t^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta \sigma^2_{t-1}$$

In this model, "if [the risk premium] δ is positive and statistically significant, then increased risk, given by an increase in the conditional variance, leads to a rise in the mean return" (Brooks, 2002, p.480).

The Exponential GARCH (EGARCH) Model. To find a solution to the limitations of the ARCH and the GARCH models, Nelson introduced the exponential GARCH (EGARCH)

model in 1991 to account for possible asymmetries, which captured that negative shocks had more impact on future volatility than positive shocks of the same magnitude. When unexpected new information causes stock returns to increase more than the expected returns, the information is called a positive shock, and vice versa. The EGARCH model differed from other models mentioned before because the variance (h_t or σ_t^2) is calculated by logarithm.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$\text{Log}(\sigma_t^2) = w + \alpha_1 z_{t-1} + \gamma_1 (|z_{t-1}| - E[z_{t-1}]) + \beta_1 \log(\sigma_{t-1}^2)$$

$$z_t = \varepsilon_t / h_t$$

Even if the parameters are negative, σ_t^2 will be positive. The EGARCH model does not have the non-negativity constraints on parameters as the ARCH models do. If the relationship between volatility and returns is negative, γ_1 will be negative, which means that asymmetries are allowed under the EGARCH model. The important meaning behind this model is that a negative shock to financial time series is likely to cause volatility to rise by more than a positive shock of the same magnitude.

The GJR model. The GJR model was named after the authors, Glosten, Jagannathan and Runkle (1993). Comparing to the GARCH model, the GJR model used a dummy variable (d_{t-1}) to allow possible asymmetries.

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_p X_{pt} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma^2)$$

$$h_t = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta\sigma^2_{t-1} + \gamma \varepsilon^2_{t-1} d_{t-1}$$

where $d_{t-1} = 1$ if $\varepsilon_{t-1} < 0$, and 0 otherwise.

From the equation, when γ is positive, the impact of the negative shock ($\varepsilon_{t-1} < 0$) will be greater than that of the positive shock. In order to respect the non-negativity constraints, all parameters should be positive (i.e. $\alpha > 0$, $\beta > 0$, $\alpha + \gamma > 0$).

The GJR model shows that volatility increases more after a negative shock than a positive shock. The GJR model is easier to apply because the GJR model does not have to calculate logarithm as the EGARCH model.

The AR-TGARCH-M Model. Zakoian (1994) further expanded the GARCH-M and GJR models to create the AR-TGARCH-M model. The purpose of this new model was to test the impact of shocks.

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i Y_{t-i} + \delta h_t + \varepsilon_t \qquad \varepsilon_{t|\Omega t-1} \sim N(0, h_t) \qquad (1)$$

$$h_t = \sigma_t^2 = b_0 + \sum_{j=1}^{p} b_j \varepsilon^2_{t-j} + \sum_{k=1}^{q} \beta_k \sigma^2_{t-k} + \gamma \varepsilon^2_{t-1} d_{t-1} \qquad (2)$$

where $d_{t-1} = 1$ if $\varepsilon_{t-1} < 0$, and 0 otherwise.

In AR-TGARCH-M model, shocks can be classified into good news and bad news. Good news ($\varepsilon_t > 0$), and bad news ($\varepsilon_t < 0$) have differential effects on the conditional variance σ_t^2, which is denoted by h_t. Good news has an

impact of b_j, while bad news has an impact of $b_j + \gamma$. If $\gamma > 0$, the leverage effect exists, and the news impact is asymmetric. The equation (1) is the mean equation modified from the GARCH-M model, which considers the risk premium (δ). Any impact of volatility on the rate of return in equation (1) is captured by the δ coefficient. If the risk premium (δ) increases, the rate of returns (Y_t) will also increase. The independent variable Y_{t-i} is the lagged rate of return.

The conditional variance equation (2) is to examine the unconditional stock price volatility through the b_0 coefficient. Similar to the spirit of the GJR model, the equation adds $\gamma\ \varepsilon^2_{t-1}\ d_{t-1}$ in the equation and uses the dummy variable of d_{t-1} to insure that the conditional variance is positive regardless of the sign of the other coefficients.

Conclusion

Since the linear regression models cannot explain volatility clustering, non-linear models are used. Among the non-linear models, the AR-TGARCH-M model is the most advanced model. This thesis uses the AR-TGARCH-M model to examine the rate of returns from the Shanghai A-share

Index, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index.

CHAPTER FIVE

DATA AND SUMMARY STATISTICS

This chapter starts with the explanations of the data and the source, and then introduces the computer software-EViews 3.1 and how it is applied to the data. Through the data analysis by EViews 3.1, the summary statistics are illustrated in detail in the following section.

Data

The daily closing index value of the Chinese stock markets is retrieved from Datastream in London, which provides professional financial and economic database for researchers all over the world. Returns are calculated from the index value in local currencies and expressed in percentage form. All returns are obtained by taking the logarithmic difference of the daily stock index value times 100. That is, $R_t = (100)* (\log P_t - \log P_{t-1})$. The sample for the Shanghai A-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index includes 2,855 observations from January 3, 1996 to September 15, 2003, while the Shanghai B-share Index has 2010 observations from February 27, 1992 to September 15, 2003.

To Model the Index Value: EViews

EViews 3.1 is the computer program that is applied to model the financial econometrics data, such as the daily closing index value of the Chinese stock markets. EViews 3.1 is a product of Quantitative MicroSoftware, which provides functions to test the non-linear model, the serial correlation, and the conditional variance of a variable. Through EViews 3.1 program, the AR-TGARCH-M model can be examined. Therefore, the summary statistics and empirical results are running by EViews 3.1 program (Brooks, 2002, p. 31).

Descriptive Statistics for Daily Chinese Stock Returns

Mean, Maximum, and Minimum

The mean of the return is the average of the observations in each index. In average, the Shanghai B-share Index has the highest return (0.0357%) among these four indices. During the analyzed period, the returns of the Shanghai A-share Index and the Shenzhen A-share Index range from around 30% maximum to negative 19% minimum returns respectively.

Standard Deviation

Generally, the A-share indices have higher risk than the B-share indices, since the standard deviations of the

Shanghai A-share Index (2.6952) and the Shenzhen A-share Index (2.4512) are larger than the Shanghai B-share Index (2.3944) and the Shenzhen B-share Index (2.2623).

Skewness and Kurtosis

Skewness measures the degree of asymmetry of a frequency distribution. For example, if the distribution stretches more to the right than it does to the left, the distribution is a right-skewed distribution, and vise versa. Kurtosis measures the flatness of frequency distributions (how fat the tails of the distribution are). Flat distributions are called platykurtic, and peaked distributions are called leptokurtic. A neutral distribution- not too flat and not too peaked- is called mesokurtic. The value of skewness equals zero in a normal distribution (Aczel, 1999, p. 32). As shown in Table 12, the Skewness of each index return is greater than zero. Furthermore, when the Kurtosis of each index is far larger than three, this implied that the returns of these indices are not a normal distribution (Brooks, 2002, p. 179). That is to say, the linear model does not apply to the research of the Chinese stock markets.

Table 12. Descriptive Statistics for Daily Chinese Stock Returns

	Shanghai Index		Shenzhen Index	
Statistics	A-share	B-share	A-share	B-share
Observations	2855	2010	2855	2855
Mean	0.0249	0.0357	0.0122	0.0152
Max	30.8523	12.1837	29.5777	13.7981
Min	-18.4271	-13.0846	-19.6323	-16.6994
Std. Dev.	2.6952	2.3944	2.4512	2.2623
Skewness	1.7341	0.3859	1.0278	0.3857
Kurtosis	26.2318	7.4962	21.0574	10.8640

* and ** denote statistical significance at 1% and 10% levels respectively.

CHAPTER SIX

EMPIRICAL RESULTS AND FINDINGS

This chapter explains the empirical results of the AR-TGARCH-M model through two equations. The result of the conditional mean equation (1) shows whether the expected returns are predictable, which is discussed in the beginning two sections. The variance equation (2) shows whether the volatility changes over time in a predictable pattern, which is illustrated in the following two sections.

Expected Returns and Serial Correlations

In evaluating a time series of data, the measurement of the correlation between successive observations over time is called an autocorrelation (Wilson & Keating, 2002). From the autocorrelation test result in table 13, most coefficients of returns and squared returns are statistical significance at 10% level, indicating strong autocorrelation of returns of the Shanghai A-share Index, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index.

As listed in table 14, the parameter α examines the serial correlations between expected returns in time t (Y_t) and its lagged return (Y_{t-i}). In general, the

parameter α is significant in the Chinese stock markets, except the Shenzhen A-shares. The significant parameter α implies that the previous returns have influences on the future returns.

According to the hypothesis of the "weak-form efficient market", stock prices fully and instantaneously reflect all historical information, such as prices, returns, trading volume, short interest, odd lots and other variables (Fama, 1970). In a weak-form efficient market, investors cannot earn abnormal returns by developing a trading model based on historical information, which implies that stock prices are not predictable and have no correlation with previous volatilities. Since the future returns may be predictable and correlated to previous volatilities and shocks, the efficient market hypothesis is rejected.

In a weak-form efficient market, stock prices already reflect all available information and prices only change in response to unexpected new information, which arrives randomly. Therefore, if stock prices follow a random walk, the series of prices' changes have zero autocorrelation.

Recalling that the random walk model is a methodology to examine whether the serial correlation is autocorrelated or not. The random walk theory assumes that

stock prices move randomly and independently (Kendall, 1953). Stock price's future movement and direction cannot be predicted based on the historical movement. Therefore, the Chinese stock markets are not weak-form efficient markets.

Expected Returns and Risks Premium

In mean equation (1), the risk premium (δ) is expected to be positive correlated with the expected return. As listed in table 14, the risk premium of the Chinese stock markets is significantly positively correlated with the expected return, which means more volatility will lead to higher expected returns. The future returns of the Chinese stock markets can be predicted from previous returns and volatilities.

Volatility Predictability, and Shocks

The parameter β_k in the variance equation (2) is an indicator to examine whether volatility changes in a predictable pattern. On average, the parameter β_k shows that previous volatility is significant correlated with future volatility except the Shanghai A-share Index.

The parameter b_j in the variance equation (2) is the parameter of shocks (ε_{t-j}). It is an indicator of the predictability of the volatility. The empirical result in

table 14 shows that shocks in general are significantly correlated with the future volatility.

Since both lagged volatility and shocks are correlated with the future volatility, the volatility of the Chinese stock markets changes in a predictable pattern. In addition, the magnitude of β_k is larger than b_j, implying that future volatility may be influenced more by previous volatility than by shocks.

Asymmetric Conditional Heteroskedasticy

According to the analysis of volatilities, risks, and shocks, the future return volatilities may be influenced by previous shocks. However, a positive shock and a negative shock may have a different magnitude of impact on the future return volatilities, which is called asymmetric effect on volatility.

In the variance equation (2), the dummy variable γ is to examine the asymmetric nature of volatility. Good news has an impact of b_j, while bad news has an impact of $b_j + \gamma$. If γ equals zero, the negative shocks have the same influence as the positive shocks, which means the asymmetric effect does not exist. If γ is positive and significant, the negative shocks have greater influence on the volatilities than the positive shocks. Since the

negative shocks cause the stock value of a company to drop, the financial leverage of a company rises, which is called the leverage effects.

In general, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index have no asymmetric effect because of their insignificant parameter γ. Only the Shanghai A-share Index has a positive significant γ. Therefore, the negative shocks influence the volatilities of the Shanghai A-share Index more than the positive shocks.

Findings and Conclusion

The Chinese stock markets were high-risk markets when compared to developed stock markets like the S&P 500 Index and the Nikkei 225 Index. The Chinese stock markets also had low correlation to the developed stock markets during the 1990's. The comparison of the Chinese stock markets with other Asian emerging markets shows that the Chinese stock markets were high risk, and low return markets and did not perform very well in the past decade.

In 2002, China reached an outstanding GDP growth rate of 8%. The market capitalization of the Shanghai and Shenzhen Stock Exchanges was 40.89% over 2002 GDP of China (see table 11). As a member of the WTO, China has

gradually reformed its state-owned enterprises and opened its international trade markets as well as the stock markets to attract more foreign investors. The Chinese stock markets are emerging and playing ever-increasing roles in the rapid growing economy.

Since an index represents the overall performance of the classified stocks, this thesis investigates the Shanghai A-share Index, the Shanghai B-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index. The sample for the Shanghai A-share Index, the Shenzhen A-share Index, and the Shenzhen B-share Index includes 2,855 observations from January 3, 1996 to September 15, 2003, while the Shanghai B-share Index has 2010 observations from February 27, 1992 to September 15, 2003.

This thesis examines the serial correlation between return and volatility, the predictability of the return from previous observations, the risk premium, and the asymmetric effect caused by shocks. Volatility clustering is graphically portrayed from figure 6 through figure 9, which implies that linear regression models cannot be applied to analyze the returns of the Chinese stock markets.

Among many non-linear models, the AR-TGARCH-M model does not have the limitations of the ARCH and GARCH

models. Using the program EView 3.1 and historical information from the Chinese stock markets, empirical results show the AR-TGARCH-M model captures the possibility to predict future returns.

Since the stock prices are predictable and have correlation with previous volatilities, the Chinese stock markets are not weak-form efficient markets. The model also shows that in the Chinese stock market volatility changes in a predictable pattern, and the previous conditional variance has a greater impact on the future volatility more than shocks do. Good news and bad news have the same impact on the volatility of the Chinese stock market, except the Shanghai A-share Index.

Recommendations for Further Research

Due to the limited sources, the data of emerging stock markets is only available from 1990 to 1999. If the data of 2000, 2001, and 2002 could be acquired, the research could reveal the latest performance and development of the emerging stock markets. Moreover, if the daily price changes of HSCEI Index (including all H-shares listed in Hang Seng Stock Exchange in Hong Kong) could be obtained, the research of the Chinese stock markets could be extended to H-shares.

Table 13. Auto-Correlation

Shanghai				
	A-share Index		B-share Index	
ρ (lag)	Returns	Squared Returns	Returns	Squared Returns
ρ (1)	0.007	0.140**	0.141**	0.316**
ρ (2)	0.031	0.304**	-0.011**	0.237**
ρ (3)	0.090**	0.217**	0.044**	0.270**
ρ (4)	0.054**	0.192**	0.026**	0.236**
ρ (5)	0.042**	0.082**	-0.010**	0.201**

Shenzhen				
	A-share Index		B-share Index	
ρ (lag)	Returns	Squared Returns	Returns	Squared Returns
ρ (1)	0.012	0.107**	0.163**	0.375**
ρ (2)	0.037	0.212**	0.038**	0.254**
ρ (3)	0.020	0.206**	0.090**	0.303**
ρ (4)	0.078**	0.110**	0.094**	0.247**
ρ (5)	0.05**	0.079**	0.027**	0.170**

Table 14. Estimated Equations

	Shanghai		Shenzhen	
	A-Share Index	B-share Index	A-Share Index	B-share Index
Mean Equation:				
$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_I Y_{t-i} + \delta h_t + \varepsilon_t \quad \varepsilon_{t\|\Omega t-1} \sim N(0, h_t)$ (1)				
α_0	-0.1095** (0.1056)	-0.2073** (0.0295)	-0.1622* (0.0506)	-0.3485** (0.0002)
α_1	-	0.1235** (0.0000)	-	0.1698** (0.0000)
α_2	-	-	-	-
α_3	0.0531* (0.0636)	-	-	-
α_4	0.0458* (0.0656)	-	-	0.0450* (0.0643)
α_5	0.0460* (0.0475)	-	-	-
δ	0.0696 (0.1256)	0.1058* (0.0523)	0.1027* (0.0919)	0.1956* (0.0012)
Variance Equation:				
$h_t = \sigma_t^2 = b_0 + \sum_{j=1}^{p} b_j \varepsilon^2_{t-j} + \sum_{k=1}^{q} \beta_k h_{t-k} + \gamma \varepsilon^2_{t-1} d_{t-1}$ (2)				
b_0	-	0.8728** (0.0004)	0.0975** (0.0071)	0.4774** (0.0000)
b_1	0.1409** (0.0039)	0.2766** (0.0000)	0.0761** (0.0003)	0.3783** (0.0000)
b_2	-	0.3967** (0.0000)	0.0747** (0.0002)	0.0806* (0.0695)
b_3	-0.1671** (0.0182)	0.1429** (0.0079)	0.0792** (0.0002)	-
γ	0.0299** (0.0518)	-0.0144 (0.3275)	0.0082 (0.5863)	-0.1205 (0.1537)
β_1	0.9665 (0.0206)	-1.0245** (0.0000)	-	-
β_2	-	0.5455** (0.0000)	-0.1554** (0.0000)	0.5844** (0.0000)
β_3	-	0.6077** (0.0000)	0.9079** (0.0000)	-
Q (12)	17.481 (0.1320)	18.072 (0.114)	18.448 (0.103)	15.355 (0.223)
Q^2 (12)	2.604 (0.998)	3.576 (0.990)	7.099 (0.851)	2.977 (0.996)
n	2855	2010	2855	2855

ENDNOTES

1. GNP: Gross national product is the value of all final goods and services produced within a nation in a given year, plus income earned by its citizens abroad, minus income earned by foreigners from domestic production. GNP per capita is a country's GNP divided by its population in the same year.
2. According to the income grouping by the World Bank in 1998, the low-income level was $760 or less. The lower-middle income level was between $761 and $3,030. The upper-income level was between $3,031 and $9,360. The high-income level was $9,361 or more.
3. The term "contagion "was used by the financial press to describe the ripple effect of one country's economic problems and related misfortunes in other markets.
4. Ramesh Adhikari is a Senior Capacity Building Specialist and Principal Economist at the Asian Development Bank Institute, Japan. Yongzheng Yang is a Senior Economist in the IMF's Policy Development and Review Department.
5. In Ramesh Adhikari and Yongzheng Yang's article, "What Will WTO Membership Mean for China and Its Trading Partners?" at Finance and Development,

Finance and Development, September. 2002, Vol.39, Number 3 <http://www.imf.org/external/pubs/ft/fandd/2002/09/adhikari.htm>

6. From James P. Zumwalt's article, "How WTO Membership Affects China" at Economic Perspectives, January 2002, <http://usinfo.state.gov/journals/ites/0102/ijee/zumwalt.htm>

7. Mao Zedong (1893-1976) founded the communist People's Republic of China in 1949 and became its first leader.

8. Afrer Mao Zedong, Deng Xiaoping (1902-1997) was China's leader since 1978. He led China's major economic reforms to market oriented economy. He was succeeded by his protege Jiang Zemin in1989.

9. Grace O.M. Lee, Linda Wang, and Ka-ho Mok are Associate Professor at the Department of Public and Social Administration, City University of Hong Kong. Information listed above are From their article, "The Decline of State-owned Enterprises in China: Extent and Causes", Studies No 2, Department of Public and Social Administration, City University of Hong Kong, Hong Kong, 1999. <www.cityu.edu.hk/sa/working_paper/csop9902.pdf>

10. The data is from the survey by State Economic and Trade Commission, 1996, p. 223.

11. Gary H. Jefferson is associate professor of economics at Brandeis University. Thomas G. Rawski is professor of economics at the University of Pittsburgh.

12. John D. Ho, PhD (Minnesota), Associated Professor, Department of Laws, City University of Hong Kong, paraphrases "legal person status" in the book- "China Business: Challenges in The 21st Century" in page 76. "Under the Company Law, a company is reaffirmed to be an "enterprise legal person" (Company Law, Art. 3); However, a branch of foreign company does not have Chinese legal person status (Company Law, Art. 203). As an enterprise legal person, a company shall "manage its affairs independently and shall be responsible for its profits and losses" (Company Law, Art. 5). In particular, it has the power to manage its business and organize its production independently for the purpose of increasing productivity and economic benefits, and for the maintenance and appreciation of it assets, subject to the "macro-management and control of the state" (Company" Law, Art. 5)."

13. According to "Summary of Capital Structure: July 2003" by China Security Regulatory Commission, Chinese nonnegotiable shares can be categorized into 1) Sponsor's Legal Person Shares 2) Private Placement of Legal Person Shares 3) Staff Shares 4) Alter-right Issue Shares 5) Former OTC Nonnegotiable Shares 6) Specifically Issue Shares to Funds 7) Stratagem Investors Shares 8) Others. Total nonnegotiable shares are 64% of the total shares in China. Negotiable shares, such as A-shares, B-shares, H-shares and others are 36% of the total shares in China.

14. The SuperDOT system (Super Designated Order Turnaround System) is an electronic order-routing system through which NYSE member firms transmit market and limit orders directly to the trading post where the security is traded. After the order has been completed in the auction market, a report of execution is returned directly to the member-firm office over the same electronic circuit that brought the order to the Trading Floor. SuperDot can currently process about 2.5 billion shares per day. <www.nyse.com>

15. Zhou Xiaochuan, Chairman of China Securities Regulatory Commission, said, "There is no timetable for the launch of a program to allow Chinese domestic investors to trade overseas-listed shares." according to Reuters of November 22, 2002. The program is called Qualified Domestic Institutional Investor (QDII) program.

16. Defined by InvestorWords.com http://www.investorwords.com/cgi-bin/getword.cgi?5808&sub-index

17. In evaluating a time series of data, it is useful to look at the correlation between successive observations over time. This measure of correlation is called an autocorrelation. (Source: Business Forecasting, 4th Edition by J. Holton Wilson and Barry Keating)

REFERENCES

Aczel, A. D. (1999). Complete business statistics. New York: McGraw-Hill Companies.

Adhikari, R., & Yang, Y. (2002, September). What will WTO membership mean for China and its trading partners? Finance and Development, 39(3), Retrived August 10, 2003, from http://www.imf.org/external/pubs/ft/fandd/2002/09/adhikari.htm

Baillie, R. T., Bollerslev, T., & Mikkelsen, H. O. (1996). Fractionally integrated generalized autoregressive conditional heteroskedasticity. Journal of Econometrics, 74, 3-30.

Bloomberg L.P. Market data: World currencies. Retrieved July 21, 2003, from http://www.bloomberg.com/markets/currencies/asiapac_currencies.html

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. Journal of Econometrics, 31, 307-327.

Brigham, E. F., & Ehrhardt, M. C. (2002). Financial Management: Theory and practice. New York: Harcourt College Publishers

Brooks, C. (2002). Introductory econometrics for finance. Cambridge, UK: Cambridge University Press

Central Intelligence Agency. (2002). China. The world factbook 2002. Retrieved July 23, 2003, from http://www.cia.gov/cia/publications/factbook/geos/ch.html

Central Intelligence Agency. (2002). United States. The world factbook 2002. Retrieved July 23, 2003, from http://www.cia.gov/cia/publications/factbook/geos/us.html

Central Intelligence Agency. (2003). China. The world factbook 2003. Retrieved August 3, 2003, from http://www.cia.gov/cia/publications/factbook/geos/ch.html

Central Intelligence Agency. (2003). United States. The world factbook 2003. Retrieved August 3, 2003, from http://www.cia.gov/cia/publications/factbook/geos/us.html

Chaing, T. C., & Doong, S. C. (2001). Empirical analysis of stock returns and volatility: Evidence from seven Asian stock markets based on TAR-GARCH model. Review of Quantitative Finance and Accounting, 17(3), 301-317.

China National Bureau of Statistics. (2002, January 3) China exports and imports in US dollars for 1997 to 2001. International trade data. Beijing: Asia Pulse Pte Ltd.

China Security Regulatory Commission (2003) Summary of capital structure. Retrieved July 28, 2003 from http://www.csrc.gov.cn/CSRCSite/eng/tongjiku/199908/e-default.html

Chou, R. Y. (1988) Volatility persistence and stock valuations: some empirical evidence using GARCH. Journal of Applied Econometrics, 3, 279-294

Engle, R. F. (1982). Autoregressive conditional Heteroskedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50(4), 987-1008.

Engle, R. F., Lilien D., & Robins, R. (1987). Estimation of time varying risk premia in the term structure: the ARCH-M model. Econometrica, 55, 391-407

Engle, R. F., & Patton, A. J. (2001). What good is a volatility model? Quuantitative Finance, 1, 237-245.

Fama, E. F. (1965) The behavior of stock-market prices. Journal of Business, 38, 34-105.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. Journal of Finance, 25, 383-417

Golsten, L. R., Jagannathan, R., & Runkle, D. E. (1993). On the relation between the expected value and the volatility of the nominal excess returns on stocks. Journal of Finance, 48, 1779-1801.

Ho, J. (2000). The legal environment and business enterprises in the People's Republic of China. Chinese business: Challenges in the 21st century. Hong Kong: The Chinese University Press.

International Finance Corporation. (1994). Emerging stock markets factbook 1994. Washington, D.C.: International Finance Corporation.

International Finance Corporation. (1996). Emerging stock markets factbook 1996. Washington, D.C.: International Finance Corporation.

International Finance Corporation. (1999). Emerging stock markets factbook 1999. Washington, D.C.: International Finance Corporation.

International Monetary Fund. (1990-2003). Country tables. International Financial Statistics, 43-56. Washington D.C.: International Monetary Fund.

Investopedia.com. (2003) Dictionary: Standard and Poor's index - S&P 500. Retrieved August 12, 2003, from http://www.investopedia.com/terms/s/sp500.asp

InvestorWords.com. (2003). Glossary: GDP. Retrieved August 6, 2003, from http://www.investorwords.com/cgi-bin/getword.cgi?2153&GDP

InvestorWords.com. (2003). Glossary: Index. Retrieved August 18, 2003. from http://www.investorwords.com/cgi-bin/getword.cgi?2426

Jefferson, G. H. ,& Rawski, T. G. (1994). Enterprise reform in Chinese industry. Journal of Economic Perspectives, 8(2), 47-70.

Kendall, M .(1953). The analysis of economic time series, part I: Prices. Journal of the Royal Statistical Society, 116, 96.

Lee, G. O. M., Wang, L., & Mok, K. (1999) The decline of state-owned enterprises in China: Extent and causes. Department of Public and Social Administration, 2, 1-41. Hong Kong: City University of Hong Kong. Retrieved 2003, August 10, from http://www.cityu.edu.hk/sa/working_paper/csop9902.pdf

Mandelbrot, B.(1963). The variation of certain speculative prices. Journal of Business, 36, 394-419.

Nelson, D. B. (1991). Conditional heteroscedastocoty in asset returns: A new approach . Econometrica, 59, 347-170.

New York Stock Exchange. (2003). The technology: Equipment. Retrieved August 12, 2003, from http://www.nyse.com/floor/1022221394119.html

People's Daily. (2002, December 11). A year of changes after WTO accession: Review. People's Daily Online. Retrieved August 13, 2003, from http://english.peopledaily.com.cn/200212/11/eng20021211_108297.shtml

Schwert G. W. (1989). Why does stock market volatility change over time? Journal of Finance, 44, 1115-1153.

Shenzhen Securities Information Co., Ltd. Statistics. Retrieved July 21, 2003, from http://www.cninfo.com.cn

Standard & Poor's (2000, February) The S&P emerging market indices: Methodology, definitions, and practices. S&P's emerging markets data base, 2-56. New York: McGraw-Hill Companies.

Standard & Poor's. (2000) Emerging stock markets factbook 2000. Washington D.C.: McGraw-Hill Companies.

Taylor, S. J. (1986). Forecasting the volatility of currency exchange rates. International Journal of Forecasting 3, 159-170.

U.S. Census Bureau. (2003). Global top ten countries ranked by population in 1950, 2000 and forecast in 2050. International database. Retrieved August 10, 2003, from http://www.census.gov/ipc/www/idbrank.html

Wilson, J. H., & Keating, B. (2002). The foreasting process, data considerations, and model selection. In S. Isenberg, & L. Stone (Eds.) Business forecasting. Taipei, Taiwan: John Galt Solutions, Inc.

World Bank. (2001). Reform of China's state-owned enterprises a progress report of Oxford analytica. Transition newsletter: The newsletter about reforming economies, 1. Retrieved July 23, 2003, from http://www.worldbank.org/transitionnewsletter/n&d95/china.htm

World Trade Organization. (2003). What is the WTO? In the WTO, 1. Retrieved August 18, 2003 from http://www.wto.org/english/thewto_e/whatis_e/whatis_e.htm

Zakoian, J. M. (1994). Threshold heterosskedastic models. Journal of Economic Dynamics Control, 18, 931-955.

Zumwalt, J. P. (2002, January) How WTO membership affects China. United States Embassy, Beijing. Economic Perspectives. Retrieved August 10, 2003, from http://usinfo.state.gov/journals/ites/0102/ijee/zumwalt.htm