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The Mergers & Acquisitions Market Trends and Stock Market of China

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Abstract

Since the 90s of last century, there is a substantial increase of the Chinese equity market and M&A market. In order to explain the phenomenon of the rapid development of Chinese M&A market, the paper introduced EMD method to divide the data into a number of cycle terms, and tried to use the stock market volatility information to explain the factors of Chinese M&A market. Specifically, M&A market time series data and the Shanghai Composite time series data are decomposed into multi-scale time series using EMD method. Three key components of high-frequency, low-frequency items and trends items, respectively, use Pearson correlation test of the corresponding component. Results showed that trends items of M&A market and stock market are highly correlated, the low-frequency items moderate correlation, and high-frequency items completely unrelated. The stock market index series carry sufficient information of macroeconomic, government policy and investor behavior information, so analysis of the factors China's M&A market could be discussed indirectly through stock market volatility. The findings indicate that sustained growth of China's macro economy is the main cause of China's M&A market development, and industrial restructuring, government policies and short-term capital markets irrational investment behavior are important factors of China's M&A fluctuations.

Key words: M&A market stock volatility; Empirical mode decomposition (EMD)

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INTRODUCTION

With rapid economic growth of China, industrial restructuring and upgrading of the external environment changes, there's a significant increase in M&A of Chinese enterprises and scale. CV Source investment China database showed, 2013 China announced M&A market transaction number of cases 5233, the number of cases disclosed the amount of money 4496, market size $ 332.851 billion, an increase of 17.15%,21.35%, 5.72% of last year. The number of M&A is the highest in nearly seven years. Among the specific transactions completed, Manufacturing, Energy and Mining, Finance and Food and Beverage Industry are tops. There's a large gathering of corporate M&A. With the ups and downs of the stock market and macro-economic changes, China M&A activity is also showing significant fluctuations. Nelson(1959)who studied M&A market trends earliest believe that the outbreak of a large number of M&A activity must be accompanied by a prolonged slump in M&A activity, like a wave as high and low tides, the assumption has also been validated by a large number of M&A activity data, statistical tests by Western scholars (Barkoulas, 2001). Andrade and Mitchell (2001) observed the phenomenon which wave of M&A within the industry extends to the inter-industry M&A wave, Harford (2005) found that several industries will enter the M&A wave simultaneously. Gartner and Halbheer (2009) again tested and explained M&A wave of 80 to 90 years for the United States and the United Kingdom from 60 to 70 years using Markov Regime Switching Model. These studies are considered, M&A wave is objective rather than random

phenomenon along with the development cycle of the economy, which has its inherent formation mechanism, influenced many factors.

In terms of the causes of M&A wave, Harford (2005) explain the theory of M&A wave into two categories according to different methods: classical methods and new methods of behavioral finance. The most influential hypothesis of classical theory is Industry Impact Hypothesis and Tobin's Q hypothesis. Industry Impact Hypothesis suggests that M&A wave derived from economic shocks. Mitchell and Mulherin (1996) systematically analyzed the relationship of industries impact and M&A activity, concluded the industry cluster merger wave and technological changes, economic and regulatory closely are highly related, Jovanovic and Rousseau (2002) suggested that technological change will obviously bring differentiation of Tobin's Q of firms, the firm of higher Q will merger those of lower Q, thereby forming a wave of M&A. In order to verify the correctness of the theory of industrial impact, Andrade and Stafford (2004) studied several M&A waves to further analyze the effect of the economic, technological and regulatory changes to the wave of M&A, and effectively explained the impact of the industry for the 1990s merger wave of Tobin's Q hypothesis, when the return on securities exceeds its cost of capital, rational response is to M&A as a quick and effective capital investment behavior, in the stock market boom, the original balancing scale manufacturers determined by the normal scale equilibrium and Tobin's Q is to break, causing widespread expansion to form a merger wave

Research in the field of behavioral finance based on the assumption of non-validity of the irrational behavior of the capital markets and managers, which are mainly managers arrogant and non-valid hypothesis market hypothesis, Roll (1986) proposed manager "arrogant" hypothesis, the hypothesis believes that excessive optimism and overconfidence of managers may cause overestimation of synergies from acquisitions, resulting in large-scale M&A wave. Empirical research in the non-efficient market hypothesis showed the main driving force of M&A transactions is the stock market value, most rational managers will merger undervalued firms when vendors themselves overvalued. Some scholars believe that M&A wave is due to the acquisition of industrial manufacturers to adapt to the new environment and the resulting shock caused by rapid adjustment, noting that not all industrial vibration can lead to M&A wave, with the proviso that there is sufficient capital mobility. This gives an indirect explanation for the securities boom prone merger wave.

In China, some scholars began tracking and introducing the phenomenon of foreign M&A wave theory, but research on the wave of M&A of Chinese enterprises is still very rare. There is a large fluctuation from the M&A transaction data, less in some years, and in some years the number of M & A amazing. So, what causes fluctuations in M&A activity? This paper attempts to answer the factors of M&A wave of Chinese enterprises, given the Chinese stock market carries sufficient economic, policy and social factors information, therefore, explore the factors that influence the tide of M&A of Chinese enterprises by the correlation analysis of stock market volatility and M&A market volatility, trying to explain the phenomenon of the Chinese enterprises M&A wave using the inherent information of stock market volatility.

1. LIMITATIONS OF EXISTING METHODS OF RESEARCH ON FACTORS AFFECTING M&A MARKET ACTIVITY

In the recognition of merger wave form factors, current research methods are mainly based on empirical statistical test methods, namely using statistical tests of sequence fluctuation correlation of M&A wave fluctuations and economic variables sequence to analyze economic variables, policy variables and behavioral variables influencing factors of investors. These documents come from the macroeconomic field and behavioral finance research fields. But the problems of this approach to M&A wave is, due to the sample restrictions, time zone data are usually random intercepted in the selected range of data acquisition and then describe the characteristics of tidal fluctuation test analysis relevant factors. This ignores an important issue, M&A wave has large fluctuations and small fluctuations. There is a large-scale phenomenon merger wave in the long run macroeconomic fluctuations, while in local short term, there are a small wave phenomena, however, the influx of these factors at different time scales merger is completely different. Therefore, it is necessary to improve the existing M&A wave identification method from the time scale, through the acquisition of appropriate decomposition tidal fluctuations, fluctuations in the long-term and short-term fluctuations in the effective separation, volatility factors were studied, which is more realistic.

Due to the large number of factors impacting stock market volatility, it's lack of theoretical support and feasibility to analyze the general stock market volatility and the M&A wave fluctuation correlation, let alone the appropriate results. Therefore, it is necessary to decompose the signal of stock market volatility series effectively, while the merger wave signal sequences may also be decomposed. Because of the frequency of different signal time series are quite different, factors which may directly reflect implicit in the real economy. Therefore, it is possible to check correlation of sample corresponding to the two time series. Therefore, this paper attempts to use Empirical Mode Decomposition (EMD) method to decompose both time series, and use the information of each signal representing an attempt to explain the factors of Chinese enterprises M&A wave activity.

EMD is a method of electronic signal processing, which is originally developed by Huang et al. in 1998 proposed the basic idea is to use the volatility and lower mean envelope to determine the "instantaneous equilibrium position" and then extract the intrinsic mode function(IMF). IMF has the following characteristics: extreme (maximum and minimum values) had an equal number with the number zero or up to a difference value; at any time, the mean upper and lower envelope must be 0. The advantage of this approach is that non-linear, non-stationary processes data be processed linear and smooth, the final decomposition function is almost orthogonal to each other, the characteristics of data itself retain as far as possible the process of decomposition.

As the economy is also facing a lot of economic time series data signals needed to explore its own rules, therefore, some scholars have begun to EMD method is introduced to the field of social and economic development. Yu et al (2008) used the EMD and neural network forecasting tool combined crude oil price fluctuations, and achieved good results; Wang Wenbo, etc. presents a Chinese stock market modeling EMD neural network model and forecast using EMD decomposition algorithm, chaos theory and neural network analysis; Yang Yunfei, used EMD and SVMs model to get high accuracy predictive value of crude oil price forecast. Financial data sequence generated by the stock market is non-linear, non-stationary, the linear analysis using conventional methods may result in a sequence of some important information lost, resulting in some error in the analysis. The use of EMD method is not only the data linearization, smoothing, and retains the characteristics of the data itself, with more accurate results. Therefore, this article will try to decompose stock market volatility and M&A market volatility time series are into a corresponding plurality using EMD method, different multiscale time series represents different meanings of information and the test on the basis of their relevance can explain the occurrence of M&A wave of Chinese enterprises factors.

2. EMD DATA PROCESS OF THE STOCK MARKET VOLATILITY AND THE M&A MARKET ACTIVITY

2.1 Data Sources

M&A market time series data used in this article comes from the Choice information database. As the Shanghai Composite Index in China's stock market is one of the most representative indexes, this article stock market data select the Shanghai index, from the Choice same information database. Two types of data time period: May 1, 1994 to March 8, 2014. As the M&A activity and stock data belong to the high-frequency data, and study in this paper M&A market and the stock market volatility does not need to be accurate to the specific day time scale, but if the time scale is too large in turn, will affect the characteristic fluctuation data. Therefore, we use "weeks" for the time scale units. In practice, excluding non- trading days, based on the value of the transaction to take every day average closing price of a " week 's closing price " of data items in the trading day; As for M&A transactions, the same should be removed of non-trading day on the basis of the data, the value of the number of items to get a weekly sum of the number of M&As, "Week's M&A times" M&A market activity time series. Obtain 998 data points of the Shanghai Composite time-series data acquisition frequency time series data, hereinafter referred to as "M&A sequence" and "SSE sequence", respectively, S_1 and S_2 represented by the variables.

2.2 EMD Decomposition Process and Algorithm

Given a signal $x(t)$, the effective algorithm of EMD can be summarized as follows.

a. Identify all extremum of $x(t)$

b. Interpolate between minima (resp. maxima), ending up with some envelope $e_{\min}(t)$ (resp. $e_{\min}(t)$)

c. Compute the mean $m_1(t) = \left(e_{\min}(t) + e_{\max}(t)\right)/2$ (1)

d. Extract the detail $h_1(t) = x(t) - m_1(t)$ (2)

e. Iterate k times on the residual $m(t)$. If it fit the definition of IMF, then we get one IMF, $c_{ü}(t) = IMF(t) = h_1^k(t)$. We use S_D to identify the result is one IMF or not. Gabriel (2003) suggested, when $S_D \leq 0.3$, the result is one IMF.

$$S_D = \sum_{k=1}^{T} \frac{|h_1^{k-1}(t) - h_1^k(t)|^2}{[h_1^{k-1}(t)]^2} \quad (3)$$

f. Get a new signal $r_1(t)$, and $r_1(t)=x(t)-c_1(t)$ (4)

g. Repeat the above process. When $r_n(t)$ is smaller than the threshold value, then we get $x(t) = \sum_{i=1}^{n} c_i(t) + r_n(t)$ (5)

Where $r_n(t)$ stands the remaining non-oscillating term trend, the overall trend on behalf of the signal, the algorithm flow chart shown in Figure 1.

2.3 Pearson Correlation Analysis Algorithms

$$\rho_{XY} = \frac{Cov(X,Y)}{\sigma_X \sigma_Y} = \frac{\sum_{i=1}^{n}(X-\bar{X})(Y-\bar{Y})/(n-1)}{\sqrt{\sum_{i=1}^{n}(X-\bar{X})^2/(n-1)}.\sqrt{\sum_{i=1}^{n}(Y-\bar{Y})^2/(n-1)}} \quad (6)$$

Simplification of the above equation can be obtained:

$$\rho_{XY} = \frac{n\sum_{i=1}^{n} X_i Y_i - \sum_{i=1}^{n} X_i \sum_{i=1}^{n} Y_i}{\sqrt{n\sum_{i=1}^{n} X_i^2 - (\sum_{i=1}^{n} X_i)^2}.\sqrt{n\sum_{i=1}^{n} Y_i^2 - (\sum_{i=1}^{n} Y_i)^2}} \quad (7)$$

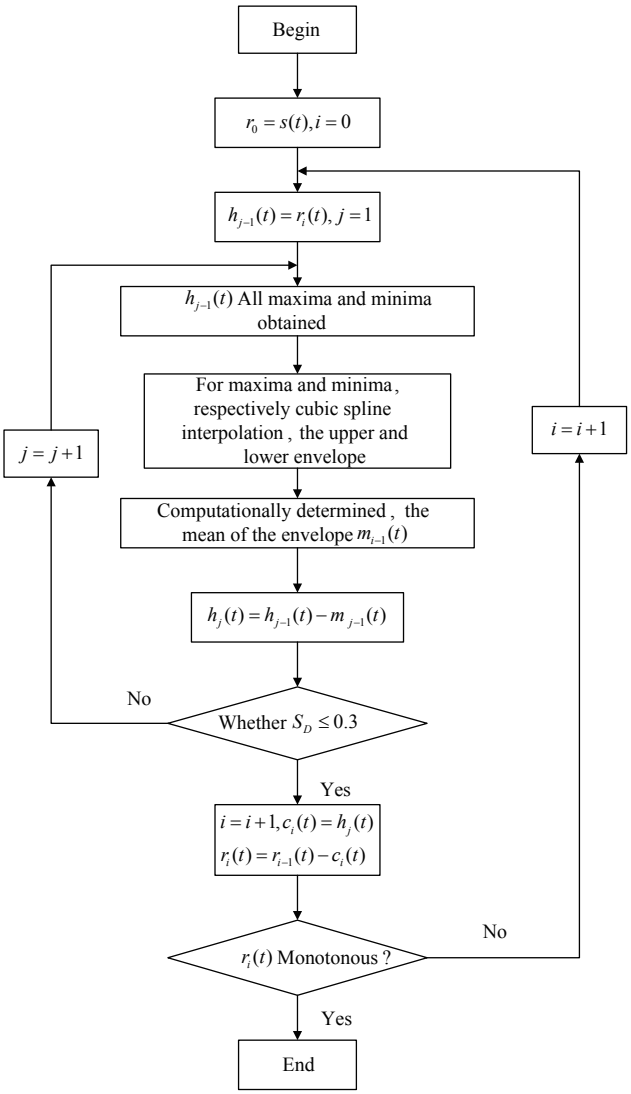
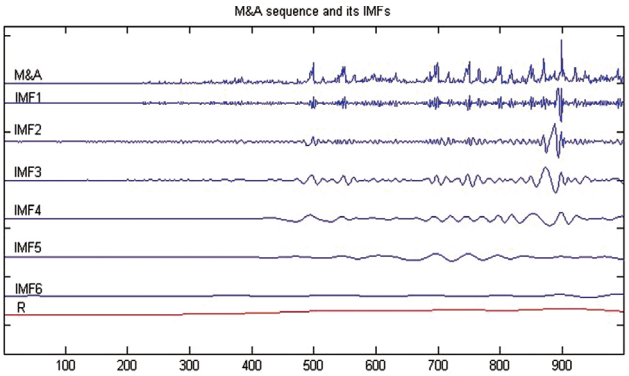


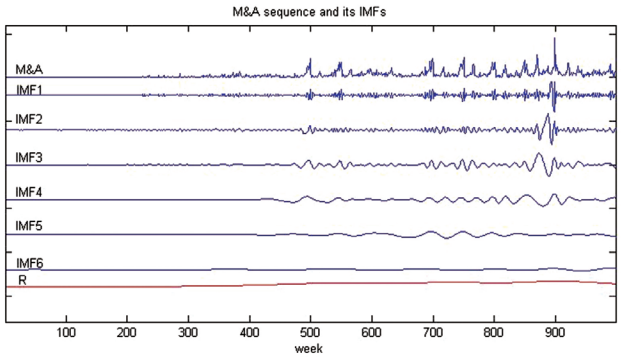
Figure 1
Flow Chart of the Algorithm EMD

2.4 EMD Decomposition Results

According to the above calculation, respectively decompose M&A sequence S_1 and SSE sequence S_2 into six IMF component and a residual component, shown in Figure 2 (a), (b).



(a)



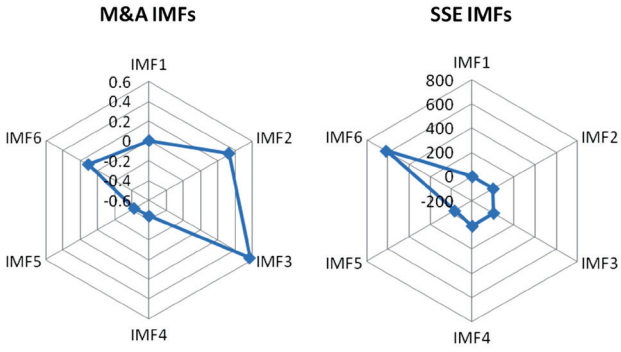
(b)

Figure 2
M&A and SSE Decomposition Results

To identify whether the individual IMF is a high-frequency signal or low frequency signals, there's need for an IMF mean analysis of M&A sequence and SSE sequence IMFs, shown in Table 1, and Figure 3 (a), (b).

Table 1
M&A and SSE IMFs Mean Value

IMFs	M&A IMFs mean value	SSE IMFs mean value
IMF1	-0.0041	0.3526
IMF2	0.3330	-1.3764
IMF3	0.5762	4.0842
IMF4	-0.4344	9.1097
IMF5	-0.4248	-32.2404
IMF6	0.1108	620.0243



(a) (b)

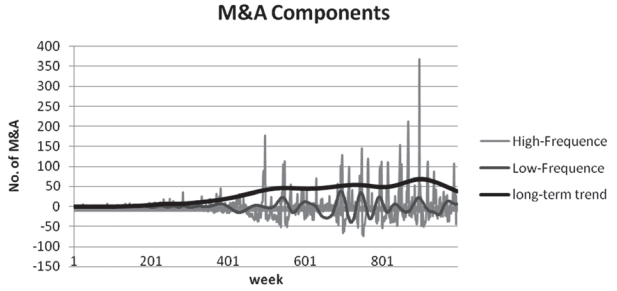
Figure 3
M&A and SSE IMFs Mean Value

After the mean test of each sequence IMF inspection, a significant deviation from the mean of 0 in the first IMF is IMF_2, description IMF_1 in the high frequency part of the entry for the mean near 0, representing normal fluctuations. $IMF_2 \sim IMF_6$ obtained by adding the low-frequency part of the acquisition sequence decomposed represents abnormal fluctuations. The remaining components of the same, on behalf of the long-term trend of M&A sequence.

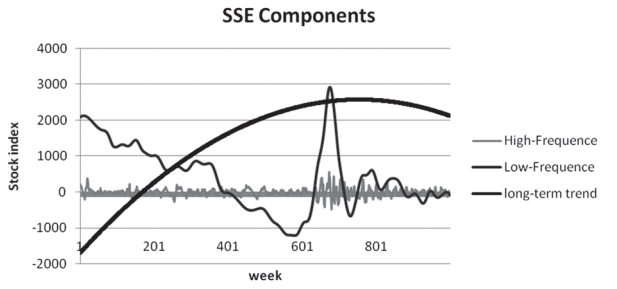
Similarly, for each IMF mean SSE sequence also test showed mean significant deviations in the first one IMF

0 for IMF_4, therefore, get the high-frequency portion of the card sequence is $IMF_1 \sim IMF_3$ sum, the low-frequency part of the $IMF_4 \sim IMF_6$, and in the long-term trend for the remaining term component.

Identifying high-frequency signals and low-frequency signal is intended to rebuild time series reorganization to form a new plurality of high-frequency, low frequency and trend sequence items signal components etc. and these signal components are the original time series decomposition according to certain rules, but it does have very important economic and behavioral information. Here come the high-frequency fluctuation frequency items SSE data and M&A activity, and low-frequency items, in contrast, which reflects the long-term trend in the trend of the sequence. According to the above rules, relationships regroup after the IMF and the two sequences are shown in Figure 4 (a), (b).



(a)



(b)

Figure 4
M&A and SSE Components

3. THE CORRELATION OF M&A ACTIVITY AND THE SHANGHAI INDEX FLUCTUATION

Sequence of acquisitions S_1 and SSE sequence S_2 with EMD decomposition, may have three components are high-frequency items, low-frequency items and the trend term sequence. Among them, the high-frequency items, low-frequency items and the trend term of S_1 denoted as H_{S1}、L_{S1} and T_{S1}; the high-frequency items, similarly, low-frequency items and the trend term of S_2 denoted as H_{S2}、L_{S2} and T_{S2}.and all three represent different information. Among them, the high-frequency portion represents less impact factors on the sequence of the factors that influence the occurrence time sequence of events affecting a small area or a shorter duration, but the frequency of the factors is very high, such as enterprise information dissemination on the stock market influence the behavior of short-term investments, such as retail. LF term reflects the significant factors affecting sequence is an important part of the sequence is usually an important factor sequence generation and major volatility, such as the impact of industrial restructuring policy on the stock market, interest rate adjustments on the stock market, etc., will result in higher than long term trend sequence fluctuation is a major component sequences, representing the long-term trend of the sequence.

Decomposition results from the M&A sequence Figure 4 (a), the Chinese M&A tide presents two obvious regular "wave" feature : a presentation of the trend term fluctuations in long-span, but the volatility has been on the rise (Since data limitations have not seen the peak and decline of) ; another low-frequency items presented, with a small span of wave peaks and troughs significant fluctuations in value. Due to the high frequency entry is not showing a significant fluctuations in other words, its impact on M&A wave of the weak, and therefore, can not be considered, but only need to discuss the correlation between the two characteristics of M&A wave fluctuations between the stock market on it, which can reveal the main factors influx of Chinese M&A activity. Therefore, when verifying the correlation with M&A activity between the Shanghai index fluctuations, the paper takes its component of the test method, respectively. When correlation analysis is used Pearson correlation coefficient to measure whether there is a simple linear relationship between the two as shown in Table 2, the correlation coefficient M&A trends and SSE term trends in terms of 0.9043, highly relevant results indicate increasing trend of M&A activity and growth trend of the Shanghai index is synchronized. Meanwhile, the low-frequency part of the acquisition sequence and SSE sequences extracted (see Figure 4), the figure low frequency part of the two sequences are added to the trend line, the figure can be observed, the acquisition sequence trendline turning points are lagging behind on the card sequence trend line turning point. Each time lag interval basically the same, and therefore can be predicted to a certain extent on the card sequence lag with the acquisition of the low-frequency portion of the low-frequency part of a larger sequence correlation. Figure 5 shows the number of weeks with a lag serial correlation diagram, data show that when increasing the number of weeks from a lower hysteresis value, increasing the correlation coefficient, the correlation coefficient reaches a maximum 16 weeks 0.4028, although the sequence is not considered a major component of the trend term, low frequency portions of the two sequences can still reach the correlation moderate correlation, indicating that the low-frequency part of the SSE sequence for low-frequency portion of the acquisition sequence indeed played a leading role can not be ignored.

Table 2
S_1, S_2 Each Component of the Pearson Correlation Test Results

Test object	Pearson coefficient	Correlation
T_{S1} & T_{S2}	0.9043	High
L_{S1} & L_{S2}	0.4028	Middle
H_{S1} & H_{S2}	-	-

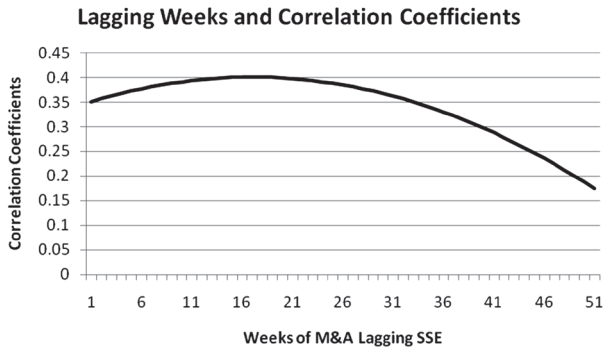


Figure 5
Lagging Weeks and Correlation Coeffients

In summary, the results of correlation analysis and SSE sequence acquisition sequence between the two components showed that: the two sequences term trends are highly correlated, while the low-frequency part of the acquisition sequence lag 16 weeks on the low-frequency portion of the card in sequence to achieve maximum the degree of relevance, which shows a very close relationship between the Chinese stock market and M&A wave activity, then, how to explain the reasons for M&A of Chinese enterprises tide it? Therefore, the stock must reveal important factor behind fluctuations.

4. EXPLANATION AND DISCUSSION

In fact, M&A wave phenomenon exists in every country, although the stage of the tide merger occurred in different countries, M&A wave duration varies, but the underlying factors merger wave occurred in the past, but there is no fundamental change. From the test of the correlation inspection can be seen, China's stock market volatility is indeed an important factor in the occurrence of corporate M&A wave, which verifies the assumption that the stock market-driven M&A wave. Since the stock market is a barometer of macroeconomic development, represents both growth and macroeconomic decline, but also a platform for a large number of institutional and individual investors, therefore, the stock market volatility factor analysis can be a reflection of the Chinese M&A fluctuations final factor.

From the macro aspect, the Shanghai index movements in long-term trends will inevitably affect the wave of M&A. Term trends can be seen from the results of the correlation of T_{S1} & T_{S2}, the trend term fluctuations of the M&A wave is result of changes in China's macroeconomic development. The M&A wave fluctuations component will increase with China's economic prosperity and economic output and growth, but also accompanied by a reduction in China's economic decline and reduced the total economy, which explains fully consistent with the existing merger wave theory. Neoclassical approach macroeconomic volatility, economies of scale theory that economic fluctuations will bring M&A wave of volatility in the period of rapid economic expansion of corporate M&A wave will reach the peak. Therefore, the basic trend of M&A of Chinese enterprises is subject to tidal fluctuations fundamental constraint on China's macro-economic variables. From the micro-level, macro irrational investment behavior under sustained growth is important cause of M&A of Chinese enterprises tide fluctuations. L_{S1} & L_{S2} have moderate correlation between the degree of correlation, which can be visually seen from Figure 3 the two components of the trend, in around 2007, both the M&A wave fluctuations or stock market volatility trend is consistent, both reached a peak in the year fluctuations in other words this part of the higher correlation. In fact from 2004 to 2007 China's stock market is the most crazy time, whether it is individual, institutional or corporate investment and capital market operations rise, the stock market peaked in 2007. M&A wave phenomena of this period can be explained by behavioral finance approach, behavioral finance approach has two hypotheses to explain M&A wave: one is that investor is limited rational, and the second is bounded rationality managers. Limited rational investors are reflected in the stock market mispricing conditions due to lack of rational investors and lead to blind acquisitions. Therefore, the error estimates and price movements to predict the stock market, stock market volatility makes contact with the M&A wave abnormal fluctuations closely, frequently accompanied by high M&A activity in the stock value. Bounded rationality reflects managers in their own management capabilities overconfidence and arrogance, typical theory is " arrogant hypothesis" whether investors or irrational behavior acquisitions managers, in fact, are based on the parties on the economic and policy environment surrounding the understanding and judgments, which can also be seen from the merger wave fluctuations and stock market volatility lag, the peak has been lagging behind the merger wave of stock market volatility peak, indicating that M&A investors have been on a stock market for timing behavior of decision-making. At that time the environment is a comprehensive reform of state-owned shares, tradable macroeconomic fully to the good, a lot of national industrial adjustment policies, the Olympics and other major events, especially domestic monetary policy, foreign hot money inflows caused by excess liquidity phenomenon. All of these factors combine spawned a surge in the stock market and the stock market value of the real miscarriage of justice, therefore, that the

pursuit of short-term capital market investment behavior acquisitions to maximize gains unprecedented increase in the emergence of M&A, and M&A wave herding capital markets. However, the M&A wave lasted only about a complete experience fluctuations in three or four years time, and the duration is so short also shows continued growth in short-term investments under the macroeconomic behavior is caused by M&A from 2005 to 2009 China formed tide major factor.

In addition, from Figure 3 (a) there can be seen in 2001, 2003 with an average annual peak tide of M&A, along with two very short-term fluctuations in M&A wave, which both volatility and correlation between stock market volatility is not high, this can be from both the degree of correlation between the overall judgment of 0.4028, in other words, these two M&A wave phenomenon is not a short-term fluctuations that can be explained with the stock market. In fact in the year 2000 China M&A wave phenomenon was affected by the significant restructuring and adjustment of the government's industrial policy. Within that period, the level of development of the securities market was low, M&A wave clearly was affected the stock market slightly, but this time is SOE reform is a critical period, the country 's industrial structure adjustment and macroeconomic restructuring policies in corporate played a major role in triggering M&A wave. The automotive, cement and steel, coal, food, telecommunications and other industries carried out lots of M&A business under the auspices of a lot of government policy, main form of RTO and state-owned shares. Among them, the Government's aim is to improve the nation's survival and competitiveness of enterprises through M&A, boycott of foreign capital after the accession of national industries to compete on impact, while the purpose of business is to be listed to use policy to fight as soon as possible, so there has been a lot of government policy support State-owned enterprises under the merger of group behavior. Thus, the phase of the merger wave is due to a great extent due to the state's industrial policy adjustments, which is the part of the merger wave causes of stock market volatility cannot be explained.

CONCLUSIONS

In this paper, the use of EMD on China M&A wave time-series data and the stock market index time series data for multi-scale decomposition, found trends in M&A tide sequence and the SSE sequence are highly correlated. Low-frequency part of the acquisition sequence of the low-frequency part of the lag in the Shanghai sequence, using correlation analysis found two sequences lag 16 weeks to achieve maximum low-frequency part of the positive correlation, indicating that China has a large merger wave phenomena correlated with stock market volatility, due to the capital markets carries enough information, so analysis and mining factors behind the stock market volatility also helps to understand and explain the Chinese M&A wave phenomenon. Combined M&A wave interpretation with existing theory and related test data from China, we find that the continued rapid growth of the Chinese economy is a fundamental factor in the long-term fluctuations for the M&A wave, and industrial restructuring, government policy and corporate behavior in short-term investments are the main factor in the influx of Chinese acquisitions of local fluctuations. Significance and innovation of this study is mainly reflected in two aspects: First, we use EMD methods to decompose merger wave sequence of events into long-term and short-term fluctuations in the signal fluctuations, which corresponds to the long-term fluctuations and short-term fluctuations. Because a merger wave time series cannot be caused by only one factor, and different factors merger wave volatility characteristics should be different. Therefore, we also do the stock market index corresponding time series decomposition, and then test its relevance, this approach may be feasible merger wave causes and mechanism of digging. Second, we got a comprehensive and integrated analysis of the possible factors for M&A wave of China since 1994 using the method, Western existing theories usually chase for M&A wave phenomenon one single factor test and verification, but we do not think that is a single factor caused the merger wave phenomenon this time, the influx of Chinese in terms of M&A, mainly due to fluctuations in the early industrial restructuring, government policies and other administrative dominant factor, later after the stock market was mature, fluctuate is caused by major corporate short-term arbitrage and investment behavior, but the fundamental long-term fluctuations in the M&A wave macro is close related to the growth of macro-economy of China.

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