A STUDY OF MARKET VOLATILITY AND SMES GROWTH EVALUATION* EMPIRICAL RESEARCH OF SMES BOARD

Xiaohong Chen[1] Ying Zhou[2] Jian She[3]
(1,2 Business School, Central South University, Changsha, 410083)
(3 Shenzhen Stock Exchange Postdoctoral workstation, Shenzhen, 518000)

ABSTRACT

SMEs board of Shenzhen Stock Exchange has been cared by market since May in 2004. Enterprises in SMEs board are influenced by market because their scales are small. This article evaluates the growth of the enterprises in the SMEs board by adding market volatility factor. On the basis of validity testing and comparatively analyzing for the two ranks, one of which consider factor of market volatility ,the other one of which does not consider factor of market volatility, we can conclude that the rank with the consider of market volatility is more effective. Making regression analysis of growth rank and market volatility, we find that growth rank and market volatility are obviously negative correlativity.
Keywords: SME, market volatility, growth evaluation, SMEs board

INTRODUCTION

The enterprises` growth reflects the ability to upgrade the company`s value during their developing processes by optimization of the relationship between the production essentials and the production result`s change paces. The enterprises` growth implies that the developmental industries, the bright productions foreground, the increased scale and benefits with the time. Compared with the large scale enterprises, the SMEs have better growth and higher instability in the growth process. The study of the growth of SMEs is an important basis for capital operation and stock investment [1]. The listed SMEs are always the stock market's focus because their scales of capital stocks are small. Shenzhen Stock Exchange developed SMEs board in May 2004, which provided the best suitable empirical samples for the study of the growth of the listed SMEs.

Nowadays, the researches of the growth SMEs mainly focus on the construction of the growth system, which analyses the growth elements and gives quantitative analysis on every element's changes. Frederic Delmar set up evaluation system with 19 indexes to evaluate high growth enterprises (2003) [2]. In China, researchers usually focus on the selection of financial indexes and use kinds of mathematical models to evaluate the enterprises` growth. Except for the financial indexes, the researchers start to use other indexes such as the employees` quality_Cheng Haifeng_2005_ and the enterprises` external environment_Sui Bo_2005_ to evaluate and analyze the enterprises` growth ability these years.

* This article is supported by Nation science fund committee nation preeminence youth science fund project(70125002)
Xiaohong Chen, Dean of School of Business, the Central South University, professor, main research director: medium and small-sized enterprises financing, corporation capital operation
Ying Zhou, doctor, main research director: medium and small-sized enterprises financing
Jian She, postdoctor, main research director: capital market, medium and small-sized enterprises financing
Corresponding author. Tel:13337319766; Email: csuzing@126.com_csuzing@gmail.com

The Listed SMEs' evaluation index system is different from the general enterprises for they have not only the characteristics of listed enterprises but also some special behaviors such as small capital stock, low anti-risk ability, low stability and high flexibility. Rik Donckels_1997_analyzed the growth of SMEs by the use of some indexes such as market share, enterprise competence, capital assets, output and the number of employees [6]. Cooper_1997_paid more attentions on the external factors such as enterprise information network, exchange of resource, population and environment, social-culture and economic development. However, Chinese researchers emphasize on the SMEs` internal factors and growth evaluation methods. For example, Wu Jianfang_2002_selected 15 financial indexes and used factor analysis to evaluate the growth of the Listed small enterprises. Based on the financial indexes, Zhu Heping_2004_introduced some other indexes such as human resources, market capacity, public relations capacity and innovation ability to analyze the Listed high-tech SMEs in details with AHP method[8]. Chen Xiaohong_2004_, who introduced a more comprehensive index system included "financial indexes" and "general indexes" , has been analyzing the growth of Listed SMEs for several years by the use of catastrophe theory and the factors that affected the growth of the Listed SMEs based on the analysis result.

On the basis of previous studies, we can find that the listed SMEs` evaluation indexes system has extended from financial indexes to human capital, technological innovation, social capital and other indexes; the study of the listed SMEs` impact factors has gone through improvement process from intrinsic factors to extrinsic factors. Although the indexes above could imply some information about enterprises` management conditions, the personnel quality and technological innovation ability on some extent, they nearly always neglected market volatility, a very important factor in external market environment, which plays a very important role in the evaluation of the listed enterprises growth.

Because finance, human capital and other indexes have their own limitations, the enterprises with good financial performances will be considered to be with high growth and high investment value based on the above index systems. In fact, these enterprises always have high stock prices and significant fluctuations. The volatility risk resulted from the listed trade limited the growth evaluation and misled investors and researchers. In this study, we will introduce the volatility risk index to perfect the evaluation system based on the certainty indexes and impact indexes constructed by Chen Xiaohong (2004). We also find that the new evaluation system has better performances in reliability and validity on the basis of empirical study.

MARKET VOLATILITY AND ITS EVALUATION

2.1 Literature Review

Volatility is mainly from two aspects: Firstly, the basic economic factors that promote price fluctuation have been changed; Secondly, the noise transactions due to asymmetric information or authorized temporary imbalance. Stable market and moderate volatility will help the stock market to perform its functions and is also an important standard to evaluate the market quality. In a volatile market, volatility will distort the price clearing mechanism and lead to the loss of stock market efficiency. At the same time, moderate volatility will increase the activity and improve the market liquidity. The volatility of prices is an important source for investors to invest

securities and gain profit. Stable prices will make the investors have no profit (except bonus) and limit the development of market and even break off the trade.

Now, the study of volatility mainly focus on the following two aspects: (1) the relationship between volatility and risk premium, the expected return_Bollerslev_1981_French_1987_. (2) The evaluation model construction for volatility such as Engle's ARCH model (1982) and Bollerslev's GARCH model (1986, 1992). In China, the study of volatility can be divided into two kinds_Some researchers analyzed Chinese Stock market qualitatively by watching the stock index or the range, frequency of the single stock price fluctuation (Liu Hailong, 2005; Chen Weiyun, 2005). Other researchers used the quantitative model to evaluate the volatility of the Chinese stock market`s stock index or of single stock profit (Song Fengming, 2003; Wang Yanhui, 2004; Zhang Wei, 2005). These studies used kinds of quantitative analysis methods to analyze Chinese Stock Market's volatility and they all showed that the stock market had a very intense volatility and great instability. The results showed that it is necessary to consider the volatility for the evaluation of the listed SMEs growth. The volatility of the listed SMEs' stock prices was evaluated by using the GARCH model and the volatility index was added into the growth evaluation system of the listed SMEs in this paper. The new growth evaluation of the listed SMEs considering the volatility index was obtained.

2.2 Evaluation of Volatility

GRACH model is the most commonly used dynamic model to estimate volatility (Bollerslev, 1986), which is an extension of ARCH model(Engle_1982). Time series data of stock prices always performed unstably and the volatility with large range will accumulate in a specific time, which is called volatility accumulation phenomenon. Traditional econometric models assumed that the variance of sample was constant, but empirical studies had proved that the hypothesis was not suitable for the analysis of time series data of stock market. Researchers start to seek specific time series technique to estimate the variance of financial assets yield successfully. GRACH model divided the variance into unconditional parts and conditional parts depended on the time series. GRACH model manifested the properties of time series data in financial field. Many empirical studies proved that the application of GARCH model in the dynamic models evaluating the volatility of financial market will improve the interpretation of high-order earning rate and get a better estimation than others. In practical application, GRACH (1, 1) model is commonly used.

This paper will use the GARCH (1, 1) model, the formulation will be given by the mean equation and conditional variance equation. GARCH (1, 1) model's equations are listed:

$$y_t = \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + \varepsilon_t \quad (1)$$

$$\varepsilon_t £ ?v_t \sqrt{h_t} \quad (2)$$

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} \quad (3)$$

Formula(1) is usually an ARMA model describing the model's conditional expectation, information that investors got from the trade depended on the past incomes and the error that between estimated income in past and actual income. Formula(3) describes the model's conditional variance part which is not only the linear function lagging random disturbance's square disturbances but also the linear function lagging conditional variance. Formula (3) also proves that the past volatility

has a positive mitigated impact on future prices volatility, and then simulates the volatility accumulation phenomenon.

$$\sum_{i=1}^{q} \alpha_i + \sum_{j=1}^{p} \beta_j < 1 \quad (4)$$

Formula (4) is the necessary and sufficient conditions for the shock process $\{\varepsilon_t\}$ which has limited variance. Its value reflect the continuity of series` volatility, we also have

$$\sigma^2 = E(\varepsilon_t^2) = \alpha_0 / (1 - \sum_{i=1}^{q} \alpha_i - \sum_{j=1}^{p} \beta_j) \sum_{i=1}^{q} \alpha_i \quad (5)$$

From formula(5)_we can compare the value of σ^2 to estimate the volatility of series` incomes

The GRACH model was applied to estimate the market volatility of listed SMEs board. To avoid the non-continuity and inconsistency of data, the daily closing price (ex dividend) was adopted as sample data, its parameters' confidence level 95%, its hold time 1 day. Take XHC(0020001) as example, its closing prices in 2005 are used as sample data. Firstly, the daily closing price Pt is logarithmic transformed, then ln(Pt) is obtained. Based on the logarithm yield formula:

$R_{t+1} = \ln(P_{t+1}) - \ln(P_t)$

The yield series in 2005 is obtained. The series is with autocorrelation, abnormality and heteroscedasticity so we can use the EVIEWS software to calculate the XHC(002001) volatility value in 2005 which is 0.025524.

Based on the computing formula of yield, we get all the enterprises' yield listed in table 1.

Table 1 Descriptive statistic of daily yield of enterprises in the SMEs board of Shenzhen Stock Exchange

	maximum	minimum	mean	standard deviation
maximum of daily yield	0.242851	0.078643	0.105989	0.029057
minimum of daily yield	-0.0672	-0.20645	-0.10564	0.030019
mean of daily yield	0.003796	-0.00161	0.00053	0.001218
deviation of daily yield	0.036433	0.024036	0.028912	0.002935
skewness of daily yield	2.323823	-1.13435	0.23605	0.553589
kurtosis of daily yield	18.4311	0.811022	3.170233	3.06533

From the table 1, we can find that:

(1) The average kurtosis coefficient of daily yield is 3, which shows that their distribution is different from normal distribution and presents a fat tail and spike characteristic. However, the standard deviation of daily yield is big and the gap between maximum and minimum is large.

(2) The skewness of daily yield shows that the average skewness is positive. This result proves that the skewness of most enterprises is positive and deflect right, which is similar as the skewness of western's market index. Other companies` skewness coefficients deflect left but are small, so we can think the distribution is symmetric approximately.

(3) The mean daily yield of most companies is positive. The range of all the companies' daily yield is below 10%. The values of standard deviation are all equal to 0.03 approximately.

Based on the mean daily yield we can find that most enterprises of SMEs board in Shenzhen Stock Exchange have a good development. The range of daily yield is mostly below 10% because the range of daily yield is limited below 10% in our country.

3 EMPIRICAL STUDY

Chen Xiaohong and She Jian have established the evaluation system for the Listed SMEs since 2004. They also have researched the growth of the Listed SMEs in Shanghai and Shenzhen stock market for several years. This paper will complete the old index system and add the market volatility risk index, based on which we will have an empirical study for the listed SMEs.

3.1 Establish the Evaluation Index System Considering the Index of Market Volatility Risk

In the old growth evaluation index system for the listed SMEs, financial indexes are mainly used to measure the enterprises` growth ability, profitability and financial ability; general indexes are usually used to evaluate the enterprises` market expectations and their sizes. The GARCH model evaluates the potential losses due to the volatility risk which will affect the enterprises` income in the future, so we will add the index of market volatility risk into the first order index of the evaluation index system. The evaluation listed as table 2:

Table 2 Growth evaluation index system for the listed SMEs

Financial indexes X_A	Growth ability A_1	gross income rate of main business A_{11}
		average growth rate of net profit of per share in last 3 years A_{12}
		average growth rate of net assets of per share in last 3 years A_{13}
	Profitability A_2	gross profit rate of main business A_{21}
		Average Return rate on net Assets in last 3 years A_{22}
	Fund-raising ability A_3	cash flow of per share in current period A_{31}
		capital turnover rate of current period A_{32}
General indexes X_B	Market expectations B_1	multiple rate of net assets B_{11}
		The ratio of profit gain rate and p/e ratio B_{12}
	Size B_2	Total assets of current period B_{21}
		Total number of employees B_{22}
Risk index Xc	Market Volatility risk C	

3.2 Sample Selection

The selected sample contained 50 enterprises, which are all in the SMEs board of Shenzhen Stock Exchange. In order to test the efficiency of index system considering the index of market volatility risk, we adopt the sample data of 2005 year, then based on the market return of 2005 year and 2006 year, test the efficiency of two kinds of evaluation methods, one of which consider the index of market volatility, the other of which is not considering the index. Sample data are from the Wan De Database.

3.3 Growth Evaluation Steps

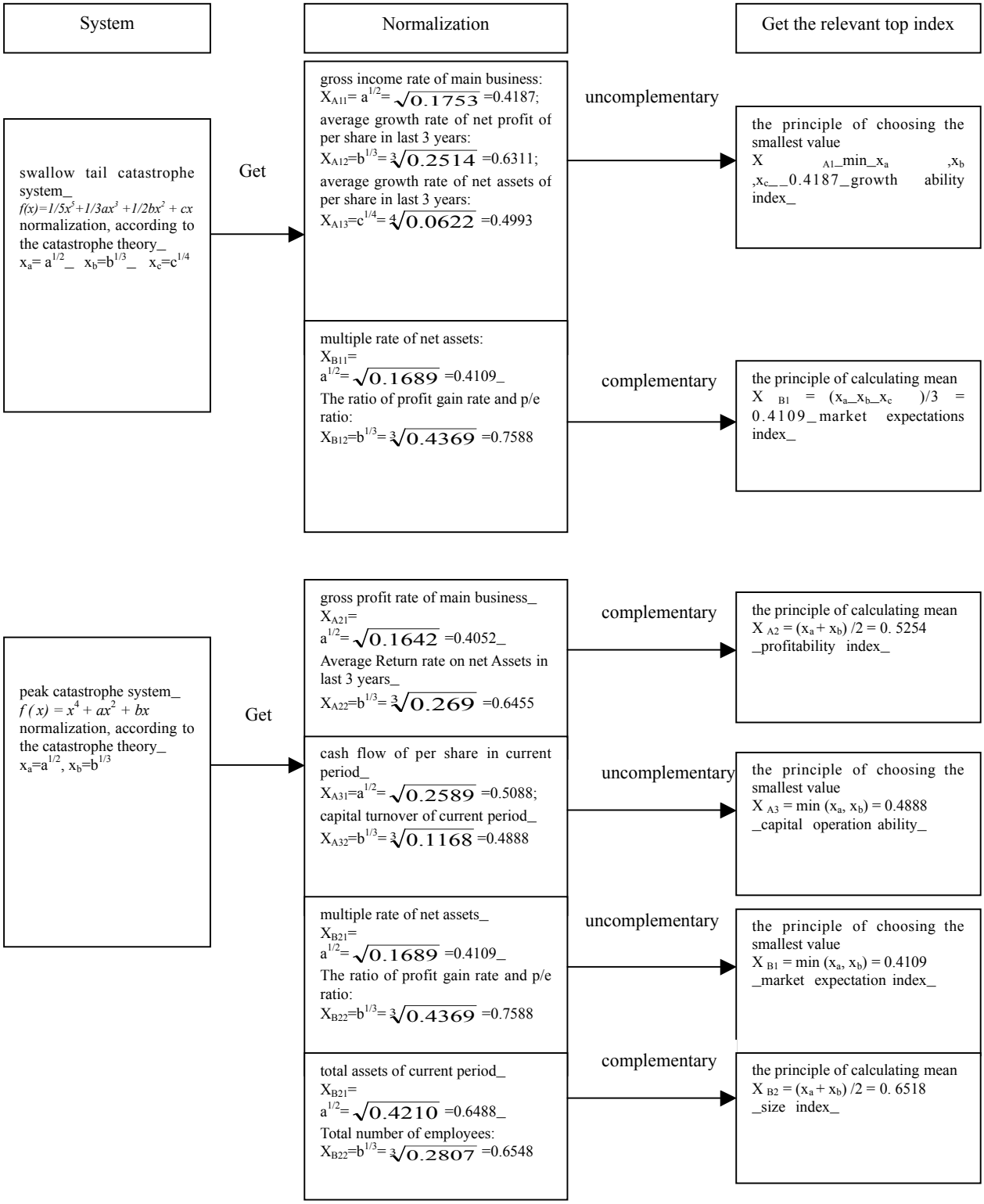
This paper will introduce the catastrophe progression method as empirical study method. The catastrophe progression method doesn't need to give weight to each indexes and its calculation is simple and exact.

Catastrophe progression method has the merits that are no need to consider index weight and are more objective. So we will do empirical research with catastrophe progression method. The catastrophe progression method is a kind of evaluation methods that divides the object into several layers and then combines them with catastrophe theory and ambiguity mathematics to get catastrophe ambiguity membership function, which do comprehensive quantitative calculating to get the only parameter with normalized formula, that is, the gross membership function, we can acquire the comprehensive evaluation result at last.

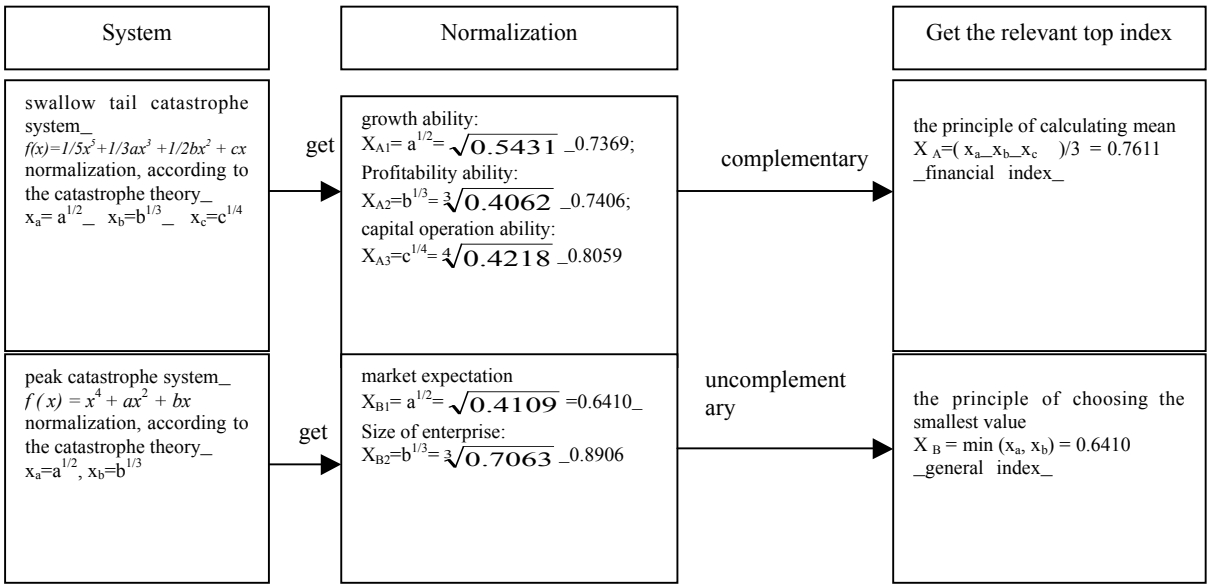
Firstly, we divide the evaluation gross index into several layers according to the evaluation purpose, whose target level structure array adverse tree, from evaluation index to under layer index and then to lower sub-index, whose the lowest sub-indexes` value is the original data. Secondly, confirm the catastrophe system types of catastrophe evaluation index system, including peak catastrophe system (one index is divided into two sub-indexes), swallow tail catastrophe system (one index is divided into three sub-indexes), butterfly catastrophe system (one system is divided into four sub-indexes). Thirdly, calculate corresponding X value of each control variable (evaluation index) with normalized formula according to the catastrophe theory. If the relation of the indexes with the same object is not complementary, then we choose the smallest value; if the relation of the indexes with the same object is complementary, we get the average value. Based on the above principle, we calculate the upper index value with the original data of the lowest level sub-index. In this way, we can get the score of the gross evaluation index by calculating the corresponding upper index value according to the lower index value step by step.

Now take the XHC (002001) as example, introducing the demonstration of its growth evaluation by using catastrophe progression method in details. (Figure 1)

(1)Calculating the third-order index



_2_Calculating the second-order index



_3_Calculating the first-order index

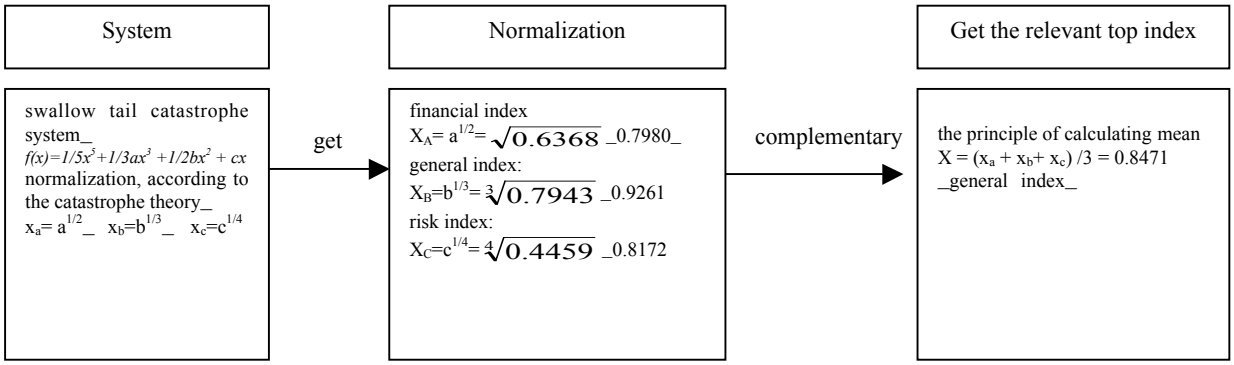


Figure 1 Steps of calculating XHC(002001) by using catastrophe progression method

We can get the growth ability score of XHC is 0.8620, following the steps as figure 1. Finally we rank the growth of the sample enterprises based on the scores.

3 RANKING AND COMPARING THE GROWTH OF THE SMES BOARD

We evaluate the growth of enterprises in the SMEs board based on the index system that consider volatility risk index and without the index by using the catastrophe progression method to get the empirical result which is listed in table 3. We assume that the rank considering volatility risk index is_ and the rank without the volatility risk index is_.

Table 3 The rank of the growth of enterprises in the SMEs Board of Shenzhen Stock Exchange in 2005 year

Securities Code	Securities for short	_Rank	_Rank	Securities Code	Securities for short	_Rank	_Rank
2025	HTDQ	1	1	2043	TBB	26	31
2050	SHGF	2	8	2030	DAJY	27	23
2029	QPL	3	11	2039	QYDL	28	39
2041	DHZY	4	4	2036	YKKJ	29	37
2032	SBE	5	19	2049	JYDZ	30	12
2022	KHSW	6	6	2026	SDWD	31	40
2008	DZJG	7	3	2027	QXKG	32	28
2014	YXGF	8	22	2013	ZHJJ	33	33
2003	WXGF	9	5	2037	JLFZ	34	30
2024	SNDQ	10	7	2017	DXHP	35	38
2023	HTGX	11	20	2002	JSQH	36	36
2040	NJG	12	9	2044	JSSY	37	29
2048	NBHX	13	13	2019	XFYY	38	21
2033	LJLY	14	27	2006	JGKJ	39	34
2001	XHC	15	25	2021	ZJGF	40	42
2046	ZYKJ	16	16	2009	TQGF	41	43
2004	HBZY	17	15	2034	MXD	42	41
2010	CHGF	18	14	2042	FYGF	43	45
2035	HDGF	19	18	2028	SYDQ	44	2
2045	GZGG	20	35	2047	CLGF	45	47
2007	HLSW	21	17	2038	SLYY	46	46
2031	JLGF	22	10	2011	DAHJ	47	48
2018	HXHG	23	24	2012	KEGF	48	44
2015	XKHB	24	32	2016	WEKJ	49	49
2020	JXYY	25	26	2005	DHRD	50	50

4 EFFICIENCY TEST TWO KINDS OF RANKS

4.1 Non Parametric Test

Firstly, we have a non parametric test on rank_ (considering volatility risk factor) and rank_ (without considering volatility risk factor). We will test whether there is a significant difference between the two ranks with Weierkekesen symbols rank test and Spearman rank correlation multiplier method.

Null hypothesis H0: there is no significant difference between the two ranks; alternative hypothesis H1: there is significant difference between the two ranks. The test is two-sided and its confidence is set 95%. The tested samples are all the enterprises in the SMEs board of Shenzhen Stock Exchange and the enterprises ranked in the first 15s and the last 15s separately. We test the three different samples separately by adopting SPSS software to acquire the result listed in the table 4 and table5:

Table 4 Results with Weierkekesen symbols rank test

Sample	number	rank_=rank_	rank_ > rank_	rank_ < rank_	Z	Asymp.Sig	Conclusion
Total sample	50	10	19	21	-0.444	0.657	Accept null hypothesis
First 15s	15	4	4	7	-2.048	0.041	Refuse null hypothesis
Last 15s	15	4	6	5	-1.608	0.108	Accept null hypothesis

Table 5 Results with Spearman rank correlation multiplier method

Sample	number	rank_=rank_	rank_ > rank_	rank_ < rank_	Z	Asymp.Sig	Conclusion
Total sample	50	10	19	21	-0.158	0.874	Accept null hypothesis
First 15s	15	4	4	7	0.549	0.549	Accept null hypothesis
Last 15s	15	4	6	5	1	1	Accept null hypothesis

With the Weierkekesen symbols rank test, we can see that there is significant difference between the rank_ and rank_ for the entire sample enterprises and the last 15s enterprises, but no significant difference for the first 15s enterprises. With the Spearman rank correlation multiplier method, we can see that there is significant difference between the rank_ and rank_ for the entire sample enterprises and the enterprises ranked in the first 15s and the last 15s.

4.2 Efficiency Test

With the non parametric test, we can see that there is significant difference between the evaluation results of rank_(considering volatility risk factor) and rank_ (without considering volatility risk factor). Then we adopt the stock returns in 2005 and 2006 to test the evaluation results of the two ranks.

This paper adopts the data of 2005 year to rank the growth of all the enterprises in the SMEs board of Shenzhen Stock Exchange. The enterprises` stock returns are got by the closing prices ex-rights on Apr 28, 2006 minus their closing prices ex-rights on Apr 29, 2005, with which the evaluation result of rank_ and rank_ is efficiency tested, then get the result of efficiency test listed in table 6:

Table 6 Returns test with the two growth rank index system

Return	general	Rank _ The First 15s	Rank _ The Last 15s	Rank_ The First 15s	Rank_ The Last 15s
Maximum	313.46%	313.46%	100.36%	313.46%	87.34%
Minimum	-46.96%	1.46%	-46.96%	-4.19%	-28.68%
Mean	49.39%	86.60%	20.48%	86.86%	26.18%
Standard deviation	0.60696	0.867524	0.446596	0.877816	0.389108

The returns of all the sample enterprises and the enterprise ranked in the first 15s and the last 15s are descriptive sta., based on which we compare and analyze. We can see based on the statistical result:
(1) The difference between the average return of the first 15s in rank_ and rank_ is little, but the average return of the last 15s in rank_ is 5.7% less than rank_ by comparison with the evaluation results based on the two index systems.
(2) The minimum return of the last 15s in rank_ with the value -46.96% is the same as the minimum value in the total sample, but the minimum return of the last 15s in rank_ with the value -26.68% is more than the minimum value in the total sample. The minimum return of the first 15s in rank_ with the value 1.46% is bigger than it with the value -4.19% in rank_ by comparison with the minimum return of the two ranks.
(3) The standard deviation returns of the two ranks are almost. The standard deviation return of the first 15s in rank_ is a bit less than it in rank_ and the standard deviation return of the last 15s in rank_ is a little bigger than it in rank_.
The average return of the enterprises in the SMEs board extended to 49.39% between 2005 and 2006, especially the average return of the high-growth enterprises reached up to 86% by sta. and comparing the returns in total sample and rank ____, which pulled the listed SMEs to develop in high speed. The evaluation considering the volatility risk factor is more objective. Although the index system considering volatility risk factor makes the evaluation of high-growth enterprises more conservatively, it makes the evaluation of low-growth enterprises more exactly. Results (1)__2_ above illuminate that both of the average and the minimum return of the high-growth enterprises and the low-growth enterprises in rank_ considering volatility risk factor make evaluation result more efficient and exactly.
We can make conclusion that the index system considering volatility risk factor is more reasonable and its result is more efficient based on the non parametric test and efficient test of returns.

5 VOLATILITY RISK AND GROWTH

There is significant difference between the results of rank_ and_ and the index system considering volatility risk factor is more efficient based on the efficiency test. However, what is the relationship between enterprises` volatility risk and growth?

5.1 Descriptive Statistic

Firstly, we sta. volatility rate in sort and then descriptive sta. the volatility rate for the entire sample and the enterprises of the first 15s and the last 15s in the rank_ and_ to get the result listed in table 7.
Table 7 Descriptive statistic of volatility rate

Volatility rate	All	Rank _		Rank _	
		The First 15s	The Last 15s	The First 15s	The Last 15s
Maximum	0.036502	0.030207	0.036502	0.036502	0.03639
Minimum	0.023885	0.024056	0.023885	0.025802	0.023885
Mean	0.028851	0.027207	0.030847	0.029498	0.028972
Standard deviation	0.002983	0.002115	0.003619	0.00257	0.00356

Based on the comparison and analysis of the statistic:
(1)The maximum, minimum, mean and standard deviation of the first 15s in rank_ are all less than rank_, but the maximum, minimum, mean and standard deviation of the last 15s in rank_ are all bigger than rank_
(2)The mean volatility rate of the first 15s is bigger than its last 15s in rank_ and both are bigger than the mean of the entire sample. The maximum volatility rate of the first 15s` with value 0.036502 is a bit bigger than its last 15s` in rank_ and it is equal to the maximum of the entire sample, which is the same as the maximum of the last 15s in rank_ .
(3)The maximum and minimum volatility rate of the entire sample are equal to the last 15 s' in rank_.
There is great difference between the maximum and minimum and the average volatility is relatively bigger for the volatility of all the listed enterprises in the SMEs board, which is easily influenced by the market volatility for their size small.
The index system considering volatility risk is proved more exactly and efficiently by the comparison and analysis rank_ and rank_. The rank based on the index system considering volatility risk make the high-growth enterprises with less potential risk and low-growth enterprises with stronger and more obviously risk. The index system considering volatility risk makes the growth evaluation more objective and scientific because the enterprises` stock volatility is the reflection of the investment market to the development and management of enterprises in the future.

5.2 Relative Analysis
Because the evaluation based on the index system considering volatility risk factor makes rank evidently change, we make the relative analysis of growth rank and volatility rate and market excess returns. Enterprises in top ranks with higher investment value will be the focus of investors to be with higher return rate, which means the growth rank is positively correlated with the excess return rate. On the other hand, enterprises in top ranks with higher growth ability and higher ability of defense risk make their volatility lower, which means that the growth rank is negatively correlated with the volatility rate. The regression model is set as follow:

$$Y = \alpha + \beta_1 AR + \beta_2 X_1$$

In the model, Y expresses the final score of the sample enterprises with catastrophe progression method, α expresses constant, AR expresses the excess return of the sample enterprises, X1 expresses the volatility rate of the sample enterprises.
We take the enterprises in the SMEs board of Shenzhen Stock Exchange and the enterprises of the first 15s and last 15s in the rank_ as sample to give regression analysis based on the above model.
Table 8 Regression analysis

_	All	Rank_ The First 15s	The Last 15s
Constant	1.15	0.874	0.598
Excess return	0.04865	-0.00141	0.000502
Volatility rate	-11.428	1.507	3.244
DW	1.91	0.226	0.103
Adjustment R^2	0.166	-0.097	-0.166
Sig value of excess return	0.038	0.746	0.994
Sig value of volatility	0.018	0.404	0.712

Regression results show:
(1)For all the enterprises in the SMEs board of Shenzhen Stock Exchange, the growth ranks are significant positively correlated with the stock excess returns and are significant negatively correlated with the market volatility risk (volatility rate).
(2) It is not consistent for the first 15s and the last 15s in rank_.For the first 15s, the growth ranks are insignificant negatively correlated with the stock excess returns and are insignificant positively correlated with the market volatility risk (volatility rate), which is reverse with the entire sample. However, for the last 15s in rank_,the growth ranks are insignificant positively correlated with the stock excess returns and the market volatility risk (volatility rate).
(3) The result of the entire sample is consistent with the hypothesis, but for the first 15s and the last 15s in rank_ it is not consistent even reverse. The reasons are maybe that capital market is still weak but efficient market in our country and the imperfect regulations lead to dense gamble. In this case, investors like to buy single stock, which cause stock prices fluctuate greater but can't reflect the real value of the enterprises completely and truly.

6 ECONOMIC INTERPRETATION AND CONCLUSIONS

This paper introduces the market volatility risk to evaluate the growth of SMEs in 2005 based on catastrophe progression method, then efficiency test its result with the data of 2005 & 2006 and analyze the relationship between market volatility risk and growth to make conclusions as follow:
(1) The SMEs board of Shenzhen Stock Exchange has been cared by society especially the investment market since May in 2004. We track the enterprises by statistics of daily yield and annual return, calculation of volatility rate and evaluation of growth. In that way, we find that the annual return of SMEs board reached up to 49% with well development trend, especially for the high-growth enterprises, whose annual return extended to 86% with strong growth tendency. Enterprises in the SMEs board are in good development trend but they are easily influenced by the market with high volatility for their small sizes. There is negative correlation between volatility rate and growth with quantitative analysis based on the index system considering the volatility risk factor, which have bad effect on the development of enterprises in a certain extent.
(2) The volatility of stock price can reflect the value anticipation of the stock by investors, so the index system considering market volatility risk factor evaluate the growth of enterprises more completely and more exactly. There are some changes for several enterprises by comparing the rank_ considering market volatility risk factor and rank_ without market volatility risk factor. For example, the annual return of XFYY (002019) is -46.96% from 2005 to 2006. Its growth descended great for its raw material and products being impacted by the medicine market. Its stock price fluctuated greatly for investment market is pessimism to its development of the main business. In the case, XFYY is high-growth enterprise with the 21st in rank_ considering market volatility risk factor but low-growth enterprise with the 38th in rank_ without market volatility risk factor in 2005.
However, not all the ranks of enterprises growth go down based on the index system considering the volatility risk, there are also some potential enterprises cared by investors, such as XHC(002001). Its index of per share returns deducting extraordinary profit and loss items extend to 0.36 Yuan on December 31, 2005. Its good assets quality, reasonable capital structure and strong ability of repaying debt

make investor be optimism to its development in the future, so its stock price tendency appeared well. In the case, XHC is common-growth enterprise with the 25th in rank_ without market volatility risk factor but high-growth enterprise with the 15th in rank_ considering market volatility risk factor in 2005.

The index system considering the volatility risk factor evaluates the growth of enterprises more objectively by comparing the growth of enterprises between 2005 year and 2006 year. We will find that the rank considering volatility risk will be more objective to reflect the firm growth with the comparison between 2005 and 2006. Investors can anticipate prospect of enterprises and make investment decision based on kinds of information presented by enterprises. Investors will adjust the investment decision if they think that they overestimate or underestimate the value of enterprises, which can reflect the real value of enterprises in the market. So we can calculate the growth ability of enterprises with the stock price volatility. Therefore the index system considering the market volatility risk factor evaluates enterprises growth more completely.

(3)There is obvious difference between the rank considering market volatility risk and the rank without market volatility risk based on the non parametric test, which illuminates volatility risk factor influent rank greatly. The weak defense to the market risk for the low-growth enterprises make their stock prices appear evidently in the capital market. So the index system considering volatility risk factor forecast low-growth enterprises more exactly based on return test. The rank without volatility risk factor has some errors based on the statistics. Therefore the evaluation system considering volatility risk factor will be conservative but more effective and objective.

(4) The high-growth enterprises are with less risk potential and low-growth enterprises are with more evident risk crisis in the rank considering volatility risk by comparing and analyzing the volatility of the two ranks. On the contrast, the rank without volatility risk can not evaluate the growth of enterprises overall and objectively for it can not calculate their risk. The evaluation of firm growth will be not that objective. On the basis of the regression analysis of the volatility risk and growth rank, the market volatility risk (volatility rate) is significant negatively correlated with the growth ranks for entire sample but positively correlated with the growth ranks for the 15s and the last 15s in the rank, which is reverse with the hypothesis. The reasons are maybe that capital market is in start stage in our country and the imperfect regulations lead to dense gamble. In this case, investors like to buy single stock, which cause stock prices fluctuate greater but can’t reflect the real value of the enterprises completely and truly.

REFERENCES

[1] Chen Xiaohong_She Jian_Zou Xiangjuan.The comparative research of evaluation of the growth of the listed SMEs[J].Science Research Management_2006,1.

[2] Wang Chunfeng_Jiang Xianglin_Li Gang. Estimating volatility of Chinese stock market by stochastic volatility model[J]. Journal of Management Sciences in China_2003_8.

[3] Zou Jianjun_Zhang Zongyi_Qin Zheng. The Application of GARCH Model in Computing the VaR of Chinese Stock Market[J]. Systems Engineering-theory & Practice_2003_5.

[4] Wang Yanhui_Wang Kaitao. The Effect of Trading Volume on the Volatility of Returns: A Case Study of Shenzhen Stock Market[J]. Journal of Finance_2004_

[5] Zhang Yongdong. Temporal dimension of risk: Empirical investigation of China's stock market[J]. Journal of Systems Engineering_2004_6

[6] Mo Yang. The comparative research of volatility of international stock market [J]. Quantitative & Technica Economics_2004_10

[7] Zhang Wei_Zhang Xiaotao_Xiong Xiong. Research on Asymmetry of Volatility of Shanghai Stock Market—Comparison of GJR-and VS-GARCH[J]. Application of Statistics and Management_2005_11

[8] Chen Weiyun_Huang Manhui_Wu Yong. Empirical Analysis on Return Distribution and Price-volume of SZCI[J]. Journal of Chongqing University(Natural Science Edition)_2005_1

[9] Zheng Mei_Miao Jia_Wang Sheng. Forecasting the Volatility of the Shanghai and the Shenzhen Stock Markets[J]. Systems Engineering-theory & Practice_2005_11

[10]Liu Hailong_Wu Wenfeng_Wu Chongfeng. Impact of Price Limits on Stock Market Volatility[J]. Journal of Shanghai Jiaotong University_2005_10

[11]Song Fengming_Jiang Jie. An Empirical Study of the Volatility in China's Stock Market[J]. Journal of Finance_2003_4

[12]Chen Zecong_Wu Jianfang. Statistic analysis of listed small enterprises growth index[J]. Finance and Economics_2002

[13]Rock, W. A.&Hommes. Heterogeneous beliefs and routes to chaos in a simple asset pricing model. Journal of Economic Dynamics and Control, 1998, 22 (8-9): 1235-1274

[14]K.C.John,Wei. A GMM Approach for Estimation of Volatility and Regression Models when Daily Price is Subject to Price Limits. Pacific-Basin Finance Journal, 2004,12:445-461

[15]Kim, Kenneth A. Price limits and stock market volatility, Economics Leters, 2001, 71: 131-136

[16]Kuhn, Besty A., Gregory J. Kurserk, and Peter Locke. Do circuit breakers moderate volatility? Evidence from October 1989, The Review of Futures Markets, 1991, 10: 136-175

[17]Lehmann, Bruce N. Volatility, Price Resolution, and the Effectiveness of Price Limits. Journal of Financial Services Research, 1989, 3: 205-209

[18]Ma, Christopher K., Ramesh, P. Rao, R Stephen Sears. Volatility, price resolution and the effectiveness of price limits. Journal of Financial Services Research, 1989, 3: 165—199

[19]Miller, Merton H., Commentary: Volatility, price resolution and the effectiveness of price limits, Journal of Financial Services Research, 1989, 3: 201-203

[20]PaganAR, SchwertGW. Alternative models for conditional stock market volatility. Journal of Econmetrics,1990,45:267-290