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OPTIMIZING THE RISK & RETURN OF SHANGHAI STOCK EXCHANGE FOR EUROPEAN MARKETS: APPLICATION OF MODERN PORTFOLIO THEORY

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Abstract

The Modern Portfolio (MP) Theory developed by Markowitz discuss the problem of distribution of asset capitals. Although many studies have discussed the relationship of asset allocation vs its related risk and return in the World stock markets, however less attention has been paid on the Chinese stock market and its dealing with the European Union. This article attempts to investigate Risk and Return and optimization of returns for the Shanghai Stock Exchange, which is considered as the backbone of Chinese Stock Market. A dynamic portfolio based on high value stocks of different industries which are trading in European Union have been prepared to apply the test. Subsequently their return, co variance, standard deviations have been calculated. The Risk-utility relations have been focused by gathering empirical stock-price data, and resultantly descriptive portfolio has been optimized using the empirical data. The dynamic portfolio delivering superior outperformance relative to the passive and buy-and-hold stable stock portfolios for the Chinese companies trading in the European Markets.

Key words: Modern Portfolio Theory, Optimization of Returns, Chinese Stock Exchange, Shanghai Stock Exchange, The European Union

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Introduction

Stock exchanges of a country and a union, provide a fair assessment of the trade and business conditions of that particular area. This is due to the fact that Stock Exchange is the most vulnerable and volatile assessment of the business impact of any country.[1] Last couple of decades, the list of top 10 stock exchanges of the world have witnessed a drastic change in the three major stock exchanges of China enable them to secure positions under 10.[2] This includes Shanghai, Hongkong and Shenzhen Stock Exchanges on number 5,6 and 8 respectively.[3] This was a surprise for the world as Shanghai and Hongkong exchanges has surpassed the ranking of Europe's largest stock market, the Euronext.[4] In addition to these leading stock exchanges have emerged as the largest traders in the world. Ultimately, European Union has become China's largest trading partner.

The focused of the article in is on Modern Portfolio Theory (MPT) of the Chinese Stock Exchanges and its impact of the European Markets through various statistical tools.

Research methodology is used for calculating the quantitative and qualitative techniques. For the purpose of analysis, the stocks selection shall be carried out with the help of qualitative data analysis. Followed by data analysis including binomial test on survey data and content analysis approach on qualitative data. The stocks have been selected on the basis of their weights in the Shanghai Stock Exchange Index (SSE) and their trading relations/ activities in the European Markets.

Scope and Limitations

Currently China has three stock exchanges, namely Shanghai Stock Exchange (SSE), Shenzhen Stock Exchange (SZS) and Stock Exchange of Hong Kong Limited (SEHK). For deeper understanding of the typical Chinese

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1 P. Bongini, L. Laeven, & G. Majnoni, How Good is the Market at Assessing Bank Fragility? A Horse Race between Different Indicators, in *Ratings, Rating Agencies and the Global Financial System* (MA Boston, Springer, 2002), 159-176.

2 L. Kuijs, *China Through 2020: A Macroeconomic Scenario,* World Bank, 2009.

3 W. Ben, Here are the 10 Biggest Stock Exchanges in the World, ranked by Market Cap, 2020 at https://markets.businessinsider.com/news/stocks/biggest-stock-exchanges-world-ranked-market-cap-nyse-nasdaq-trading-2020-6-1029325478#.

4 Z. S. Xiaobin, L. Qionghua, & C. N. Y. Ming, The Rise of China and the Development of Financial Centres in Hong Kong, Beijing, Shanghai, and Shenzhen, *Journal of Globalization Studies* 4, no.1 (2013).

Stock Market, SEHK is excluded. SEHK was a British protectorate till 1997. Therefore, its policies and regulations are quite different from the mainland Chinese stocks exchanges. As Shanghai stock exchange is the oldest stock market of China. So, the focused of the article is on SSE.

The Chinese study economic growth on the rise. The extraordinary financial development of China in the last two decades has turned the focus of the world towards it. Therefore, researchers have carried out various in-depth analysis of the stock markets of China. Additionally, the world has witnessed an unprecedented and deep bilateral economic trade activities between the European Union and China. Hence it becomes interesting to assess the risk and return of the Chinese companies' operation in Europe.

Modern Portfolio Theory

The Modern Portfolio theory (MPT) is an investment endeavor that suggests that portfolios should be selected for investment instead of the individual securities put forward by Harry Markowitz in 1952.[5] This theory is a tool that helps to make the future less risky with the same or even more amount of return. It helps in minimizing the risk and maximizing the return that an investor has to face and thus maximizes his utility. Thus, the portfolio theory is concerned about the risk and the return of the portfolio. Risk has two parts:

i. Uncertainty
ii. Exposure

Before the introduction of the portfolio theory, investors used to analyze any security on the basis of the risk return tradeoff presented by that particular security. Any stock that offered maximum return for minimum amount of risk was considered good and thus portfolio was constructed by the combining these good profiles together. Thus, these conditions helped in evolution of portfolio theory. Hence, Harry Markowitz focused his attention on diversification of portfolio in a different manner by looking at the behavior of individual security when it is combined in a portfolio. He analyzed that there is a relationship among securities in the market. Some securities move up as the market moves up while there are others whose returns go down with upward movement of market or have no relation

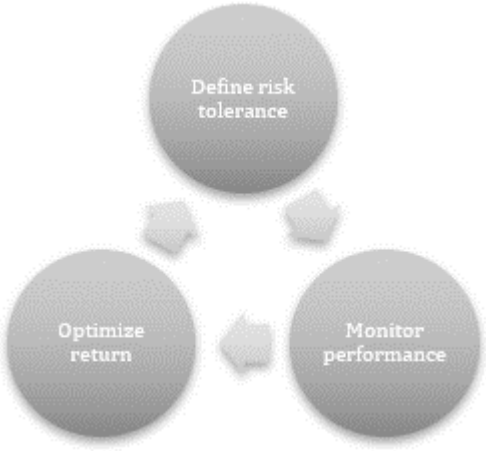
[5] H. M. Markowitz, Portfolio Selection Harry Markowitz, *The Journal of Finance* 7, no.1 (1952): 77-91.

with the market. This link is the correlation of securities. Based on this observation, he suggested that risk and return of a particular stock should not be analyzed on a stand-alone basis. The behavior of a security should be analyzed on the basis of its behavior with respect to the market. Thus, securities should be selected for a portfolio in a way that it minimizes the overall risk of the portfolio and maximizes the return. Combining securities that are not in perfect correlation with each other can do this.[6]

Thus, this is an investment strategy that suggests the formulation of optimal portfolio that will offer all-out return for the least level of risk possible. This theory is not only applicable to the securities but also to the physical assets and business portfolios of different firms and corporations. Firms apply this model in diversifying their business portfolios by taking an effort to reduce their risk while minimizing their returns.

As shown in the figure 1, any investor has following model for investment.

Figure 1- Model of Investment



Assumptions of Portfolio Theory

For the Chinese stock market, it is very important to understand the inherent assumptions in the portfolio theory. It assumes that:

[6] Robert Merton, "An Analytic Derivation of the Efficient Portfolio Frontier", *Journal of Financial and Quantitative Analysis* 7 (September 1972), 1851-1872.

1. Investors are inherently risk averse and they will invest in assets that provide maximum return for the minimum level of risk.[7] There may be several collections that have the same standard deviation. Moreover, the Modern portfolio theory has another assumption that for a particular standard deviation, a logical investor will choose the portfolio which has the highest return. Similarly, there are numerous portfolios that have the similar return, but for a specified level of return; a logical investor would choose the portfolio which has the lowest standard deviation.
2. Markets are efficient.[8] This means that the behavior of the market will be same for all the investors. That is to say, if the investor takes more risk usually the market will give highest profit or highest loss in the high-risk cases.

Portfolios Creations

In order to create certain portfolios, there are four step by step ways to get the result[9]:

(1) Security and its Valuation
(2) Asset vs its Allocation
(3) Portfolio and its Optimization
(4) Performance and its Measurement

Security Valuation

Any investor will acquire a security when it is undervalued and sell it when it is overvalued. The real issue is to find out the fact, as to when the security is overvalued and when is it undervalued. This solely depends on the risk which is linked with the security.[10]

Asset Allocation

In asset allocation, an investor usually assigns his capital to numerous asset modules based on different approaches taking into deliberation their

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[7] S. Lizarazo, Default Risk and Risk Averse International Investors, *Journal of International Economics* 89, no.2 (2013): 317-330.

[8] J. H. Kim, & A. Shamsuddin, Are Asian Stock Markets Efficient? Evidence from New Multiple Variance Ratio Tests, *Journal of Empirical Finance* 15, no.3 (2008): 518-532.

[9] J. Leistensnider, & T. Loop, U.S. Patent No. 6,839,685 (Washington, DC: U.S. Patent and Trademark Office, 2005).

[10] R. K. Pace, Global Financial Management, *The North American Journal of Economics and Finance* 8, no.1 (1997).

possible rate of returns as against his risk tolerances.[11] Modern Portfolio Theory (MPT) supports a process of selecting an ideal mixture of asset types based on their past and forecast returns, volatility i.e. Standard Deviation and Beta Values. Furthermore, the investor also focuses on cross relationships, risk tolerance and rate of return.

Portfolio Optimization

Portfolio optimization begins after primary assortment of asset classes. Minimum and maximum holding ranges are pre-determined for each of the portfolio so that maximum diversification is ensured before conducting the test.[12] In this step following data is used:

- Historical data of returns.
- Forecasted data of returns.
- Standard deviation.
- Correlation and its coefficients.
- Covariance.

Performance Measurement

Stockholder's optimum portfolio is executed by choosing different securities, which carefully characterize selected asset class features. For example, if 20% holdings are fixed for income and growth class mutual fund then all separate assets are to be identified which are most relevant to the growth & income characteristics. The asset presentation is then measured and the distribution of the asset in different properties is reanalyzed.

Quantitative Scale in Portfolio Theory

Individual securities provide its average return to the portfolio, and ultimately its sum then contributes for formation of overall return of the portfolio. In this case, magnitude of each security's contribution is proportionate to the respective allocation or size of that security in the overall selection. Hence, the amount of these separate contributions is the portfolio average return which is also called the weighted average of the security mean returns.

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[11] E. J. Elton, & M. J. Gruber, The Rationality of Asset Allocation Recommendations, *Journal of Financial and Quantitative Analysis* 35, no.1 (2000): 27-41.

[12] F. J. Fabozzi, F. Gupta, & H. M. Markowitz, The Legacy of Modern Portfolio Theory, *The Journal of Investing* 11, no.3 (2002): 7-22.

Portfolio Return = $w_1\mu_1 + w_2\mu_2 \ldots\ldots\ldots\ldots + w_n\mu_n$

w = weight of each security (portfolio wise)
μ = mean return (security wise)
n = total number of securities (portfolio wise)

In order to define risk of a portfolio, mathematically it's the return variance or its square root which is also known as return standard deviation. It's quite different from the portfolio average return where we simply take the weighted average of all security variances, portfolio variance is different. It is a blend of three things, namely; security return variances, covariance amid all securities and the proportion of each security in the portfolio. The return of the security and its covariance measures how the combined returns of two securities deviate from their individual averages.

Portfolio Variance =
Σ^2 (portfolio) = $w_1^2\,\sigma_1^2 + w_2^2\,\sigma_2^2 + w_3^2\,\sigma_3^2 + w_{n-1}^2\,\sigma_n^2 + 2w_1w_2\,cov_{1,2} + 2w_1w_3\,cov_{1,3} + 2w_2w_3\,cov_{2,3} + 2w_{n-1}w_n\,cov_{n-1,n}$

Portfolio Standard deviation =√ (variance of portfolio)
$\Sigma = \sqrt{\sigma^2}$

σ^2 = portfolio variance
$Cov_{1,2}$ = covariance among the securities

Mathematically, as the quantity of securities in a portfolio goes up, the contribution of an individual security's variance to portfolio variance decreases. This is the main reason for which individual risk of securities is reduced. As the quantity of securities gets very large, the influence of the individual securities' variance to the portfolio variance reduces, and the portfolio variance approaches the average covariance.

Recent Studies on the subject

Since the introduction of Modern Portfolio theory and later on the Capital Asset Pricing Model, many researchers have used these theories along with relevant statistical tools to study the stock markets of the world. In China, most recently the study of Liu studied the risk-return relation in the Chinese stock market: Decomposition of risk premium and volatility

feedback effect.[13] In another study Chen & Jategaonkar in 2015 studied the Risk and Return in the Chinese Stock Market focused on Equity Return Dispersions.[14] A correlation analysis of the sector indices of China's Stock Market was studied by Cao in 2013.[15] Lingzhi in 2011 assessed the Effect of Liquidity Level and Liquidity Risk to Asset Return in the Chinese Stock Market. These latest studies are supposed to apply the MPT and CAPM tools in the stock markets of world's second largest economy. However, before applying these theories, it is imperative to have a review of the literature of the theoretical aspects of Modern portfolio theory and the relevant statistical terms which may be used later.

Overview of the Chinese Economy

From 1990's to 2010, China emerged as the biggest and fastest emerging economies in the world. The future of Asia was being associated with the future of China and now it is the second leading economy in the world. Now China is known as the factory of the world. Since the economic reforms introduced in 1980's to build a market-based economy grounded on deregulations and privatization, since than China's economy and stock markets have never looked back. Its ranking was ninth in 1978 and in 2017 it stands second to United States. The rate of economic acceleration has risen from 2% (GDP) in 1980 to 15% (GDP) in 2016.

Development of the Chinese Stock Market

The history of Chinese Stock Market dates back to 19th century. The stock market is mainly around the Shanghai Stock Exchange. Due to continuous wars and instability the stock markets the pace of the growth was very slow until 1980's. The end of First Opium war, the treaty of Nanjing in 1842 towards the establishment of International settlement in Shanghai. Later on, in 1860s the trading of securities started. The proper stock exchange established in 1880s after the boom of Chinese mining industry. The association of commerce and Hong Kong Stock Exchange was established in early part of the 19th century.

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[13] H. Liu, S. Shen, T. Wang, & Z. Huang, Revisiting the Risk-Return Relation in the Chinese Stock Market: Decomposition of Risk Premium and Volatility Feedback Effect, *China Economic Journal* 9, no.2 (2016): 140-153.

[14] C. D. Chen, R. Demirer, & S. P. Jategaonkar, Risk and Return in the Chinese Stock Market: Does Equity Return Dispersion Proxy Risk?, *Pacific-Basin Finance Journal* 33 (2015): 23-37.

[15] D. Cao, W. Long, & W. Yang, Sector Indices Correlation Analysis in China's Stock Market, *Procedia Computer Science* 17 (2013): 1241-1249.

The "Shanghai Securities and Commodities Exchange" was established in 1920. However, due to the invasion of Japan in 1941 during 1st world war, communist revolution in 1949 and the cultural revolution in 1970s, the stock market remained disturbed. Later when Deng Xiaoping took over, socialist market economy was setup in 1980s. Followed by this economic revolution, ultimately Shanghai Stock Exchange was reopened in 1990. At the same time, additional sensible step was taken to setup a secondary stock exchange in Shenzhen, a southern port city of China, focusing on technology and government securities.

The analysis of the risk and return depend upon application of portfolio theory to help further understanding of the Shanghai Stock Exchange. SSE is backbone of the Chinese stock market. The statistics of latest six years of Shanghai Stock exchange as available from official website is as follows:

Year	Annual Turnover Value (RMB 100 million)	Number of Trading Days	Average Daily Turnover Value (RMB 100 million)	Average Daily Trading Volume (100 Million shares)
2010	304312.009	242	1257.488	107.29
2011	237560.453	244	973.608	86.86
2012	164545.008	243	677.140	77.98
2013	230266.027	238	967.504	112.26
2014	377162.123	245	1539.437	175.26
2015	1330992.102	244	5454.886	420.02

Chinese Examples of Portfolio Management

The Chinese businesses are keeping a strict check with respect to MPT. In 2016, many Chinese companies sold their few businesses in China and bought golf courses around the world to grow their portfolios. These include 2,000-acre Sea Trail Golf Resort, N.C. and Rancho Duarte Golf Club, San Gabriel Valley. Some other Chinese companies have diversified their portfolio by purchasing various businesses in US, housing projects worldwide, famous Theatres chains, Sheraton hotels and also helped to raise the California housing markets as Arcadia and Irvine. These examples clearly depict the importance of portfolio diversification. Similarly, in last 10 years China has invested in businesses of Europe amounting to US $318

billion. This shows the Chinese interest in the European Markets and trade shifts.

China's Trade Activities in The European Union

With introduction of Chinese vision of One Belt One road and revitalizing the old silk route, the Chinese interest and activities in Europe have increased manifold.[16] On the other hand, the European Union has also shown is positive commitment of opening and extending cordial trading relations with China. In order to meet the standards of the European markets, the Stock markets of China have started regulating its markets as per the standards of World Trade Organizations in meeting the requirements of intellectual property rights.[17]

In order to enhance the cooperation of Chinese and European Stock Markets, China and the European Union has launched a series of negotiations for identifying strategies about enhancing the trading agreements.[18] These negotiations have helped to raise the confidence of the Chinese investors and ultimately the trading volumes have increased manifold. Following are some of the important facts about Chinese and EU trading:

- On average, China and Europe trade for over €1 billion in a day[19].
- China mainly export industrial goods, consumer products, machinery and equipment, and domestic use items to Europe[20].
- The European Markets main exports to China include machinery, vehicles, aircrafts and chemicals[21].

Presentation and Analysis of the Data

The point of consideration is the risk and return of Chinese stock market, the maximization of return and minimization of the risk associated with any

[16] W. Pascha, Belts, Roads, and Regions: The Dynamics of Chinese and Japanese Infrastructure Connectivity Initiatives and Europe's Responses, 2020.

[17] S. P. Darcy, & H. Xia, Insurance and China's Entry into the WTO, *Risk Management and Insurance Review* 6, no.1 (2003): 7-25.

[18] Y. Devuyst, European Union Law and Practice in the Negotiation and Conclusion of International Trade Agreements, *Journal of International Business and Law* 12 (2013): 259.

[19] Visit at https://ec.europa.eu/trade/policy/countries-and-regions/countries/china/.

[20] Visit at http://www.worldstopexports.com/chinas-top-10-exports/.

[21] Visit at https://ec.europa.eu/trade/policy/countries-and-regions/countries/china/

portfolio of assets. This portfolio optimization is achieved by applying quantitative techniques on the portfolio. For this purpose, a portfolio has been developed consisting of 13 out of top 25 stock companies listed in the SSE composite index which are involved in business activities in Europe. These companies have an average weight of constituent stocks of more than 2 in SSE composite index. The stock prices have been extracted from the fact sheets of SSE and the available data is from 2012 to 2015.

S.No.	NAME
1	Pudong Development Bank
2	Minsheng Bank
3	CITIC Securities
4	Poly Real Estate
5	Oriental Pearl TV Tower
6	China Shipbuilding Industry
7	China Shenhua
8	Kangmei Pharmaceutical
9	China Unicom
10	Fosun Pharmaceutical
11	Inner Mongolia Baotou Steel
12	Guangzhou Baiyunshan
13	Sun-Create Electronics

These companies are representing different sectors for diversification. This portfolio has companies from banking sector, consumer goods, telecommunication sector, steel, securities, electronics and machinery developers.

The performance of these stocks was predictive for the last four years i.e. 2012 to 2015. The return provided by each stock over the last four years is as follows:

Table 1 - Annual Returns of the Companies [22]

S. No.	Companies	Annual Returns			
		2012-13	2013-14	2014-15	2016-17
1	Pudong Development Bank	1.43	-0.49	6.26	2.58
2	Minsheng Bank	1.97	-0.14	3.16	-1.24
3	CITIC Securities	3.65	9.39	11.15	25.45
4	Poly Real Estate	3.6	-5.35	2.57	-0.18
5	Oriental Pearl TV Tower	0.28	4.21	4.07	3.23
6	China Shipbilding Industry	-0.34	0.84	3.6	0.19
7	China Shenhua	0.02	10.47	24.47	89.71
8	Kangmei Pharmaseutical	1.92	4.86	-2.28	0.71
9	China Unicom	-1.74	-0.29	1.74	1.23
10	Fosun Pharmaceutical	1.95	8.6	2.01	197.09
11	Inner Mongolia Baotou Steel	32.23	-1.09	21.57	8.95
12	Guangzhou Baiyunshan	5	2	0.11	10.78
13	Sun-Create Electronics	2.16	11.93	29.74	34.79

The portfolio has been developed by giving equal weight to each stock and then their optimal weights will be calculated. The standard deviation, expected returns and the proportion of each stock in the portfolio are as given below:

Table 2 - Standard deviation, Proportion in portfolio and Expected Return table

Companies	Standard Deviation	Proportion in portfolio	Expected Return
Pudong Development Bank	2.841	7.69	2.445
Minsheng Bank	1.992	7.69	0.9375
CITIC Securities	9.264	7.69	12.41
Poly Real Estate	4.005	7.69	0.16

[22] Visit at http://english.sse.com.cn/markets/equities/announcements/.

Oriental Pearl TV Tower	1.830	7.69	2.9475
China Shipbuilding Industry	1.753	7.69	1.0725
China Shenhua	40.293	7.69	31.1675
Kangmei Pharmaceutical	2.956	7.69	1.3025
China Unicom	1.574	7.69	0.235
Fosun Pharmaceutical	96.502	7.69	52.4125
Inner Mongolia Baotou Steel	14.547	7.69	15.415
Guangzhou Baiyunshan	4.662	7.69	4.4725
Sun-Create Electronics	15.237	7.69	19.655

The return of the portfolio is simply the return provided by each of the contributing stock multiplied by its proportion in the stock. Therefore, for this portfolio of 13 stocks:

Portfolio Mean Return = **12.58%**

The method for calculating standard deviation (SD) of portfolio is simply taking its returns. It is not the sum of standard deviations of individual stocks in the portfolio. The standard deviation of portfolio takes into account the effect of covariance among securities. In other words, in order to reduce the risk and increase the return, one should select the stocks that supplement each other. So here the importance of standard deviation is highlighted as it helps to measures how two variables complement each other which is also known as covariance. Whether two stocks are moving in the same direction (+ ve covariance) or in opposite directions (-ve covariance). Therefore, this study has computed the standard deviation of each stock and for every selected year to analyze the movement of different stocks in different combinations. That is to say, this study doesn't allow the stocks to move in the same direction.

The SD of the portfolio is determined as follows:

SD portfolio = $$\sigma_p = \sqrt{\left(\sum_{i=1}^{N} X_i^2 \sigma_i^2 + \sum_{i=1}^{N} \sum_{\substack{j=1 \\ j \neq i}}^{N} X_i X_j \sigma_{ij} \right)}$$

Table 3 - Standard Deviation of Portfolio, yearly and Stock wise

NAME	Pudong Development Bank	Minsheng Bank	CITIC Securities	Poly Real Estate	Oriental Pearl TV Tower	China Shipbuilding Industry	China Shenhua	Kangmei Pharmaceutical	China Unicom	Fosun Pharmaceutical	Inner Mongolia Baotou Steel	Guangzhou Baiyunshan	Sun-Create Electronics	Portfolio annual returns
2012-13	1.43	1.97	3.65	3.6	0.28	-0.34	0.02	1.92	-1.74	1.95	32.23	5	2.16	3.96188
2013-14	-0.49	-0.14	9.39	-5.35	4.21	0.84	10.47	4.86	-0.29	8.6	-1.09	2	11.93	3.41544
2014-15	6.26	3.16	11.15	2.57	4.07	3.6	24.47	-2.28	1.74	2.01	21.57	0.11	29.74	8.22092
2016-17	2.58	-1.24	25.45	-0.18	3.23	0.19	89.71	0.71	1.23	197.09	8.95	10.78	34.79	28.37004
SD	2.841	1.992	9.264	4.005	1.830	1.753	40.29	2.956	1.574	96.502	14.547	4.662	15.237	11.083
Annual returns	2.45	0.94	12.41	0.16	2.95	1.07	31.17	1.30	0.24	52.41	15.42	4.47	19.66	12.58

The SD of this portfolio is calculated to be 11.08%. Thus, this is the portfolio with a standard deviation of 11.08 % and return of 12.58%.

There are two types of investors some investors are risk averse or they avoid risk while others are more interested in high profits and are ready to take risk for achieving their targets. Thus, on the basis of this any portfolio can be optimized in two directions:

- First is to minimize risk for the same return
- Second is to maximize return for same risk

Minimize risk for return

This will be the case for a risk adverse investor who will opt for low level of return but he will want that the risk should be reduced. Thus, the portfolio model will be to

$$\text{Min} \sqrt{\left(\sum_{i=1}^{N} X_i^2 \sigma_i^2 + \sum_{\substack{i=1 \\ j \neq i}}^{N} \sum_{j=1}^{N} X_i X_j \sigma_{ij} \right)}$$

Subject to
$0 \leq X \leq 100$
$\sum X_i \mu_i = \mu_p$ where i= stock 1,2.....N
X=proportion of stock in portfolio
μ_p=return on portfolio

The calculations performed on this model yielded a portfolio with following results:

Standard deviation of portfolio = 10.02
Return on portfolio=12.58%

These results were generated by changing the proportions of different stocks in the portfolio to create an optimal combination for minimization of risk. The model has constraints regarding the weights of the stocks as they should not be less than zero or more than 100.

Maximization of return with same risk

The other direction in which any portfolio can be optimized is by maximizing the return while keeping risk same as before. This is the group for investors who want more return and are ready to take risk for that.

The calculations for this showed following results

Standard deviation of portfolio is 17.62 %
Return on portfolio is 12.58 %

This was achieved by changing the weights of different stocks in the portfolio.

These analysis through the application of portfolio theory indicates return at a certain risk level can be achieved by portfolio optimization with the help of diversification. Thus, by applying the portfolio optimization

techniques of diversification and by looking at the covariance and standard deviation among the securities any investor can decrease the risk of his portfolio and can amplify the return on his investment.

Conclusion

The analysis made on the stocks and the physical assets portfolio show that by applying the quantitative techniques of portfolio theory, investor can get better risk return trade off about the business activities that Chinese investors are perusing in Europe. The results of the stock portfolio show that Chinese investors can achieve a 13 to 17 percent increase in the average return for the portfolios current position that was based on equal composition of each stock. This improvement in the direction of reducing risk for same return or maximizing return for same risk is according to the portfolio theory as no rational investor will select a portfolio with return for which the risk is not the least possible. Thus, with the help of diversification the return was maximized while lowering the risk to the minimum level. This study has been conducted on a limited scale with selective and limited stocks. The results of the same give a positive direction for Chinese indulgence in European Markets. If Chinese investors continue to grow and enhance the bilateral trades with European markets, the prospects as per Modern Portfolio theory are positive.

While concluding it is established that China has a very strong and wide potential if it captures the European markets. However, the diversification needs to be taken into account as risk and return payoff of individual stocks and the covariance increases with the diversity and ultimately reduces the risks.