Using VaR to Measure the Relationship Between Return and Risk of Mutual Funds in China

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Abstract

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This paper uses VaR to measure the risk of mutual funds in China and to determine the relationship between the returns. A sample of ten Chinese mutual funds over a three-year period, from 2010-2012 was examined for the significance of the continuity in funds' performances. The proposed models also indicate whether psst risk level still has an influence on the future mutual fund returns, and how long this influence will last.

From the models, conclude that past VaR of one-week lag reflects the risk level of the mutual fund. The mutual fund manager can reduce potential losses without changing asset allocation.

September 18, 2013

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Chapter 1

Introduction

1.1 Background:

In a modern portfolio theory risk is measured by the Capital asset pricing model (CAPM) which is the required rate of return of an asset. This model has enjoyed popularity and is regarded as the most significant model in the finance field. Miller and Scholes (1978) find a linear association between average beta and return, all we know from this model is the positive relationship between average returns and diversifiable risk. Under CAPM the return on an asset consists of the return on risk-free assets and a risk premium.

Studies by Haugen & Heins (1972) and Haugen & Baker (1991) show that low risk stocks consistently provide higher returns than high risk stocks. Their study covers 33 different markets from 1990 to 2011. "The fact that low-risk stocks have higher expected returns is a remarkable anomaly. The study is persistent and comprehensive, contradicting the very core of finance," says Mr. Haugen.

A mutual fund is a type of professionally managed investment vehicle that pools money from individual investors who own small and middle size funds and most of these fund are in financial assets. The inception of Chinese mutual fund happened in 1998. After that, the domestic mutual funds market has been performing well in the past couple of years. The flourishing environment in China encouraged more investors to buy into funds and foreign companies to take park in local business, which is one of the factors which has helped the mutual fund industry and has become the main driver of share price in the Chinese market. But currently, a large numbers of

investors investing in mutual funds and managers have suffered losses. The reason may not be the power of diversification and standing professional management, but something else about return and risk.

1.2 Purpose

Although not everyone is convinced by the findings, for example Antti llmanen thought a 21-year period of testing was relatively short. However, the conventional model is facing a significant crisis. Hence, to find out whether the relationship between the return and risk of mutual funds in China is negative or positive is necessary. In addition, what kind of risk management based on VaR and CVaR can improve performance will be shown by this relationship.

This paper not only uses VaR to determine the relationship between return and risk and to measure the risk of Chinese mutual funds, but also introduces a newer measure –CVaR to check and revisit the output. Moreover, it tries to find out whether the results from the previous VaR influences the return of mutual funds. Lastly, this paper will show what kinds of risk management, based on the results discussed before by VaR and CvaR, has an influence on the performance of mutual funds.

In the paper, the data is from 30 randomly selected Chinese open-end mutual funds. It is based on their weekly returns for a period of three years between January 1th, 2010 and December 31, 2012. For the model I will use in the paper, VaR is basic and it allow managers to limit the likelihood of incurring losses caused by certain types of risk - but not all risks. However, this is

not enough. There is a problem if the scope of risk assessed is limited. So, I also calculate the Conditional Value which is created to be an extension of VaR. It takes a weighted average between the value at risk and losses exceeding the value at risk, which will help to improve the reliability of the results.

1.3 Need of study

The mutual fund market of China is expected to experience increasing growth rates in this period. China will also step up the development of its mutual fund market, and help cultivate institutional investors in the securities market.

However, investors in China usually use traditional theory to invest and manage mutual funds. Theories like the CAPM model. Haugen and Baker (2010) found that the return and risk of stocks are negatively correlated. There are some discussions about that in South America, but not about this phenomenon in Asia. So the certainty of new measure and relationship between the return and risk of mutual funds is very meaningful.

Chapter 2

Literature review

2.1 The relation between risk and return

The CAPM model indicates that expected return has a positive correlation with systematic risk. The higher the systematic risk is, the higher expected return is. Fisher and Hall (1969) pointed out that the investors should have high expected returns if they suffer high risk.

Aaker and Jacobson (1987) found the systematic risk and nonsystematic risk all had positive correlations with investment returns, and this correlation varied by industry. For example, for consumer and manufacturing industries, the correlation between investment return and non-systematic risk was significantly positive. For the financial industry, this correlation became smaller and not significant.

To overcome drawbacks of using the variance of portfolio returns as a risk measure and to model non-normal distributions in portfolio returns, performance measures that incorporate higher moments or that are more concerned with the downside deviation. For example, Ang and Chua (1979) illuminate the reward-to-half-variance index is defined as the excess return per unit of the square root of the lower semi-variance). To capture nonlinearities in β resulting from market timing activities, Ferson and Schadt (1996) modify the classic CAPM performance evaluation techniques to account for time variation in risk premiums by using a conditional CAPM framework. By assuming that portfolio returns are a function of additional influences, multi-index models are also used to identify the factors that serve as proxies for the fund risk.

By using the hedge fund data from January 1995 to December 2003 as a sample, Bali (2006) found that the returns of hedge funds and VAR have significant positive correlations. And Friend (1972) uses data of 3300 stocks from the New York Stock Exchange as a sample, and calculated the β for four years. By sequencing the companies by β, they built ten investment portfolios. The results indicated that there is no significant relationship between return and risk. The additional return of those high β stocks were not matched with the high risk of them.

Betties (1981) used data of different American industries as a sample. Heused the mean of the annual net capital return to measure return, and used the variance of return as a measure of risk, and offered results that the return and risk have a significant negative correlation.

Fiegenbaum and Thomas (1988) selected 42 companies to represent different industries and found that the correlation between risk and return is based on the historical data to some extent. Fama and French (1991) used all the stocks in the New York Stock Exchange from 1941 to 1990 and found the similar results with Friend and Blume. When using β to be the only measure of risk, the correlation between risk and return is very weak, sometimes the correlation does not even exist. Only using systematic risk cannot definitely prove that the correlation between risk and return is positive.

The risk-return tradeoff implied by time-invariant conditional CAPM and ICAPM is rather weak with the two-century history of UK data from 1836 to 2010, contrary to the findings of Lundblad, Christian (2007). He develop a nonlinear ICAPM with multivariate GARCH-M based on Harvey et al. (1992) to allow for the time-varying risk-return tradeoff and hedging coefficients. He find that the risk return relation is largely positive over the time. More importantly, Lundblad show that the seemingly negative risk-return relation could be entirely

spurious because it is not statistically different from zeros with the 95% confidence bounds. He conclude that the time-varying risk-return tradeoff is the main reason for the weak relation.

Jing and Zhao (2010) used hedge fund data from 2005 to 2010 to test the correlation between VaR and return. The results showed that before financial crisis, the correlation was positive and after financial crisis, the correlation became negative.

John Y. Campbell and Luis M. Viceira (2005) expounded that expected excess returns on bonds and stocks, real interest rates, and risk shift over time in predictable ways. Furthermore, these shifts tend to persist for long periods. Changes in investment opportunities can alter the risk--return trade-off of bonds, stocks, and cash across investment horizons, thus creating a "term structure" of the risk--return trade-off. This term structure can be extracted from a parsimonious model of return dynamics, as is illustrated with data from the U.S. stock and bond markets.

Fink, Matthew P. (2008) finished his book, The Rise of Mutual Funds. There are three characteristics in the book,

1) He discusses events that have not been covered in other works and presents new theories.
2) He was personally involved in all of the major events mentioned since 1971. He writes not just as an historian, but also as a participant.
3) Paperback includes 20% new material including a new chapter on the 2008 financial crisis.

In 1940 few Americans had heard of mutual funds. Today U.S. mutual funds are the largest financial industry in the world, with over 88 million shareholders and over $11 trillion in assets.

The Rise of Mutual Funds describes the developments that have produced mutual funds' long history of success. Among these developments are:

1) formation of the first mutual funds in the roaring 20s
2) how the 1929 stock market crash, a disaster for most financial institutions, spurred the growth of mutual funds
3) establishment in 1934, over FDR's objection, of the United States Securities and Exchange Commission, the federal agency that regulates mutual funds
4) enactment of the Revenue Act of 1936, the tax law that saved mutual funds from extinction
5) passage of the Investment Company Act of 1940, the "constitution" of the mutual fund industry
6) the creation in 1972 of money market funds, which totally changed the mutual fund industry and the entire U.S. financial system
7) *enactment of the Employee Retirement Income Security Act of 1974, which created Individual Retirement Accounts
8) the accidental development of 401(k) plans, which have revolutionized the way Americans save for retirement
9) the 2003 trading abuses, the greatest scandal ever in the history of the mutual fund industry

Many events have never been discussed in detail; others have been discussed in works on other subjects. He is the first person that pulls together the many strands of mutual funds' unique history, written by an expert who draws on forty years of personal experience in the fund industry.

2.2 The methods to measure risk of mutual fund

The risk of investment is uncertain, so investors and portfolio managers have introduced plenty of methods to estimate it. Generally, the definition of risk is the possibility that investors suffer an uncertain loss. In other words, it is the deviation value between the expected return and actual return. In 1952, Markowitz is the first person who advanced the use of variance or standard deviation to measure risk. But his model is too complex, especially when using it to measure the risk of a large portfolio of securities.

Although it is a huge disadvantage, plenty of researchers have committed themselves to simplify the security portfolio analysis and work out classical models after Markowitz' advance. The most famous model should be CAPM, which introduced by Treynor, Sharpe, Lintner and Mossin independently. Jack Treynor (1965) created the famous performance measurement model, Treynor ratio, which reflects the excess return of equity portfolio per unit of the systematic risk (β). This model was first introduced in his article Can Mutual Funds Outguess the Market (Jack Treynor, 1965). This ratio can be used for evaluating the performance of funds managers by comparing the Treynor ratio of fund (Tf) with the market ratio (Tm). Treynor selected 57 U.S. mutual funds in the period 1953-1962 as his sample. The empirical study showed that there is no significant evidence for managers of mutual funds outperforming the market.

In recent decades, with the financial engineering develop rapidly; new financial derivatives have appeared in the market. And the traditional financial risk measures are not applicable so well. A risk measure which has been widely accepted since the 1990s is value-at-risk (VaR). It was first popularized by J.P. Morgan and later by RiskMetrics Group in its risk management software. VaR became so popular that it was approved by bank regulators as a valid approach for

calculating risk charges. For example, Jordon (2000) first used VAR to analyze the risk of investment portfolios. It was found out, however, that VaR has an important disadvantage: it is not always sub-additive. This means that VaR may be incapable of identifying diversification opportunities. Although there has been a good deal of criticism of VaR in the literature due to this shortcoming, it remains a widely used method for risk measurement by practitioners mainly because it has an intuitive interpretation, it can be easily back-tested, and it is required by regulation. In some cases, when the return distribution is fat-tailed and VaR is calculated very deep in the tail, VaR is sub-additive.

Pearson, Neil (2002) told about risk budgeting under portfolio problem solving with Value-at-Risk. He uses quantitative risks measurements, including VaR, to solve the problem.is a concept first introduced by bank dealers to establish parameters for their market short-term risk exposure. He introduces VaR, extreme VaR, and stress-testing risk measurement techniques to major institutional investors, and shows them how they can implement formal risk budgeting to more efficiently management their investment portfolios.

Holton, Glyn (2003) wrote Value-at-Risk: Theory and Practice. This is the first advanced book published on VaR. It describes how to design, implement, and use scalable production VaR measures on actual trading floors. It takes readers from the basics of VaR to the most advanced techniques, many of which have never been published in book form.

Paul Glasserman (2004) develops the use of Monte Carlo methods in finance and uses simulation as a vehicle for presenting models and ideas from financial engineering. He develops the fundamentals of Monte Carlo methods, the foundations of derivatives pricing and the

implementation of several of the most important models used in financial engineering, and describes techniques for improving simulation accuracy and efficiency.

Gupta and Liang (2005) used both traditional standard variance and VAR to measure the risk of hedge funds, and found that VAR is better than standard variance in measuring risk. Because the distribution of hedge fund is left biased with a sharp peak and heavy tail that is underestimated by standard variance.

Kaiser (2006) indicates that VaR is very sensitive to changes in the return process, and can be used to predict future volatility of hedge fund returns. Bali (2006) calculated the VaR of hedge funds from 1995 to 2003 and found that the VaR has appositive correlation with the returns. In the same year, Philippe Jorion (2006) provides the most current information needed to understand and implement VAR-as well as manage newer dimensions of financial risk.

Julia L. Wirch and Mary R. HardyIn (2012) proved that a concave distortion function is a necessary and sufficient condition for coherence, and a strictly concave distortion function is a necessary and sufficient condition for strict consistency with second order stochastic dominance. Their jobs improve the theory of VaR to reach a mutual phase.

Artzner et al. (1998) defined axiomatically the family of coherent risk measures. A representative of coherent risk measures which gained popularity is conditional value-at-risk (CVaR), also known as average valueat-risk or expected tail loss. CVaR is more informative than VaR about extreme losses and is always sub-additive, implying it can always identify diversification opportunities. Even though CVaR has been discussed a good deal in the academic literature, it is not as widely used as VaR until that Mansini et al. (2007) provide additional discussion of CVaR properties and extensions of the concept.

2.3 Risk management of mutual fund

Evaluation of mutual fund managers starts with a question: "Are mutual fund managers successfully anticipating major turns in the stock market?" (Treynor and Mazuy, 1966). They assume the beta of the fund is not fixed, but it is non-stationary. This type of beta is following a quadratic process which is one of the earliest models designed to test the market timing activities of mutual fund managers (TM Model). In their paper, Treynor and Mazuy use 57 open-end mutual funds which were obtained from Investment Companies 1963 by Arthur Wiesenberger Company to test the performance of fund managers. Applying the test to the performance of those 57 funds, they found there was no significant evidence to support the positive market timing ability. Moreover, their study period is from the beginning of 1953 to the end of 1962, and they did not think the result would be different if they used the different time period for the study.

In the same year,William Sharpe (1966) used reward-to-variability ratio and Treynor index to assess persistence performance of mutual fund. The author examined 34 US well-diversified open-ended mutual funds' data from 1954 to 1963. The findings indicated that there was no persistence in mutual fund performance.

Michael C. Jensen (1968) suggested the use of the Jensenindex. He compared the fund performance with a randomly selected portfolio performance from 1945 to 1964. He found the performance of the fund was worse than that of the portfolio. He then conducted that performance persistence of mutual fund did not exist.

Thomas M. Krueger and Richard E. Callaway (1995) chose 41 aggressive growth (AG) funds, 229 growth funds (G) and 34 equity-income (EI) funds in two consecutive three-year periods as

a sample to analyze performance persistence. They used a number of performance methods. According to their study, AG funds were the riskiest and EI funds were the least risky. The performance persistence of these funds was discovered to change by the time. The results showed the performance of first three years was ineffective for predicting next three years' performance.

Lucy F. Ackert and John Ramseyer (1996) found that there was little evidence of performance persistence in winners, which meant that winners did not repeat their historical performance. However, for losers, there was some persistence. However, the results are sensitive to benchmark used. When the data compared with TSE300 index, it suggests that losers continued to lose. When the data compared to US mutual funds, Canadian mutual funds show weak performance persistence.

Mark M Carhart (1997) used a sample of survivor bias to illustrate common factors in equity returns and investment fees. The one-year momentum effect of Jegadeesh and Titman (1993) largely influenced Patel, Hendricks and Zeckhauser's (1993) result. However, the funds, which followed the momentum strategy in equity, did not have higher returns.

Qifang Wu, Shou Chen and Hui lei (2003) chose 15 funds' performance between 1999 and 2001 to examine persistence. The results showed that performance persistence was insignificant in the short term, but persistence was significant in the long term. These authors continued to research performance persistence from 40 close-ended funds between 1999 and 2003. The results showed that following short-term benefit did not have persistence.

Crystal Lin and Kenneth Yung (2004) analyzed real estate mutual funds' performance from 1993 to 2001. This study used capital asset pricing model and Jensen's alpha index to analyze the

performance persistence. The results showed that real estate mutual fund did not provide positive abnormal returns. The performance persistence existed only in the short term. Furthermore, risk-adjusted real estate fund returns were influenced by size of the fund.

Zetong Zhou and Benshan Shi (2004) analyzed 16 open-ended funds' performance persistence. The results demonstrated that Chinese open-ended fund performance did not show persistence. In addition, Hui Wang (2005) used contingency table method and regression method to analyze performance persistence in Chinese open-ended fund. The author chose a sample including quarterly returns, semiannual returns and annual returns. The outcome showed that the funds' persistence was insignificant in quarterly returns and annual returns.

Koedijk Bauer and Otten (2005) analyzed performance persistence of ethical and conventional mutual funds. They used CAPM single factor model, Fama and French three factors model and Carhart four factors model. The sample included 103 open-ended equity funds and 4384 conventional mutual funds with monthly returns between 1990 and 2001. The results showed that ethical mutual funds were less sensitive to market than conventional mutual funds.

Mingxia Zhang (2010) analyzed performance persistence of Chinese mutual fund in the short term and long term. This paper used Hurst index test to analyze performance persistence. The author use a sample of Chinese open-ended funds between 2001 and 2008, included 152 stock funds, 33 bond funds and 51 currency funds. The time horizon was from January, 2003 to December, 2008. The results demonstrated that currency funds had strong performance persistence in the short run. Meanwhile, stock funds and bond funds had significant performance persistence in the long run.

Chapter 3

Methodology

3.1 The introduction of the model

In order to evaluate the performance of a mutual fund, it is important to choose an appropriate risk measure that is able to capture the behavior of its derivatives. The point is, that the risk associated with a portfolio is not only sensitive to the riskiness of its individual constituent assets, but also to the correlation between them. It is reasonable that we compute the risk of a mutual fund using the standard deviation as a risk measure since with mutual funds returns are typically assumed to be a normal distribution. But sometimes, if the mutual fund in question consists of derivatives, because of the returns of derivatives showing are not sample normal distributions, it is no longer appropriate to use many risk measures since the return distributions of derivatives are typically not normal. In these situations, the risk measure is equally unsuitable for both negative and positive returns, and it is difficult to justify how the potential for large positive returns could result in an increase in the risk associated with the mutual fund. Hence, we consider a more appropriate risk measure for a mutual fund of derivatives in this paper to be value at risk which is a kind of downside risk measure.

The VaR of a mutual fund is the loss in the market value over the time horizon t which is exceeded with probability under a given confidence level β and time horizon $t > 0$. Different analysts choose different confidence levels, like 90%, 95% and 99% or other time horizons. As a measurement of capital adequacy and for the purpose of risk reporting, VaR has become a kind of popular risk measure used in modern risk management. It is very suitable for this paper to help us analyze the performance of mutual fund. However, although its wide acceptance, it has been

noted that VaR is not a coherent risk measure. It is also a method that lacks convexity and subadditivity. For example, the VaR of the combination of two stocks may be different from the sum of the VaR of the individual stock. In addition, VaR faces the problem what we mentioned before, that it only works based on the standard deviation of normal distributions. Moreover, it lacks convexity which limits the use of it as a risk measure in selecting an optimal portfolio for investment and risk management purposes.

Hence, in this paper, an alternative method, value at risk (CVaR), is considered, this in comparison to VaR. CVaR is also known as mean shortfall, expected shortfall, and tail VaR. CVaR is the conditional expectation of continuous distribution, which is conditional on the portfolio loss being at least as large as the VaR of the loss above VaR for the time horizon t and the confidence level β. Another benefit for the CVaR risk measure is also applicable to distributions with jumps. Difference from VaR, CVaR can provide more information from the model. However, the CVaR values would obviously be different, conveying the mutual fund for highly larger losses implied by the latter distribution which is also shown to be that CVaR is a coherent risk measure.

3.2 Overview

There are several approaches to computing VaR and CVaR values for derivative portfolios. In general, there are no closed-form formulas available for the VaR and CVaR of mutual funds, but the most commonly used techniques are simulation-based. The VaR is defined in this paper equivalently to be minimal portfolio return for an accurate confidence level $\alpha \times 100\%$. Under an

assumption that the return of mutual fund at the end of the holding period is R and R is a random variable with the distribution function being $F: F(u) = P\{R \leq u\}$. Then

$$VaR(\alpha) = \min\{u: F(u) \geq 1 - \alpha\} = min\{u: P\{R \leq u\} \geq 1 - \alpha\}.$$

That is, VaR (α) is the (1-α) ×100% percentile of the return distribution.

Usually, there are mainly three ways for computing VaR: the Monte Carlo simulation method, the historical simulation method and the analytical method. In these ways, because of the frequent adoption of the normal distribution for describing random it is not a simple job for them to consider the skewness and kurtosis of the fund return distribution. Hence the stable distributions which include leptokurtic and asymmetric distributions are utilized to properly compute VaR and CVaR of the mutual funds listed in the paper.

In the second model, I like to calculate CVaR. By definition, CVaR equals the average VaR beyond a given VaR level. Formally,

$$CVaR_{\beta}(1 - \alpha) = -\left\{\mu - \frac{\sigma}{\alpha} f[c(\alpha)]\right\},$$

where β denotes the tail probability and $VaR_{\alpha}(X)$ is defined in the first model. CVaR, being an average of high quartiles, is by definition more sensitive to the tail behavior of X. We study the relative importance of the distribution characteristics for CVaR when X follows a Student's t distribution or a stable distribution. For both assumptions, there are expressions for CVaR which are suitable for numerical work.

3.3 The calculation of VaR

In those three approaches, the historical simulation is chose in the paper and the results is used to analyze the performance. Although the results are not significant different using different processes, the reason for choosing this method is due to the result of using the analytical method is more exact compared with other two ways and reflects the change of VaR during each week.

The data used following are all available Chinese mutual funds return from Bloomberg mutual fund database covering a period of January 1st, 2010 to December 30th, 2012. All of 10 open-end mutual funds in this paper are selected randomly. The details of selected Chinese mutual funds are available on following tables.

Table 3.1 Basic information of mutual funds

Name	Volume:	Inception Date:	Assets (M) (on 2013-06-28)
China Southern Active Allocation Fund	20,000	2004-12-20	1,511.6680
China AMC Core Bluechip fund	163,035	2007-05-28	8,325.6641
INVESCO Great Wall Resources Monopoly Equity Fund	143,237	2006-04-07	6,027.4720
Rongtong Leading Growth Fund	95,240	2007-04-30	2,320.4440
Guangfa Small Cap Growth Equity Fund	159,200	2005-04-29	7,177.8829
Great Wall Jiufu Core Value Equity Fund	90,004	2007-05-18	2,294.2210

Lombarda China New Trends Equity Fund	55,232	2007-04-23	2,028.0580
Manulife Teda Efficiency Select Fund	202,508	2006-07-21	3,254.1260
Bank of China Investment Management China Opportunities Fund	406,301	2005-02-23	3,698.9900
Morgan Stanley Huaxin Resources Selected Fund	226,969	2007-07-05	3,542.2160

In the paper, there are 1564 observations for these 10 mutual funds. The weekly returns are used to calculate the volatility and mean of the weekly return. Specially, the returns for 52 weeks are utilized from the first week of the first year to the last week of the first year to forecast the annual volatility and mean of the first week of the second year. The next step is similar, and the second week of the first year to the first week of the second year is utilized to forecast the volatility and mean of the second week of the second week. The following steps just are repeated to calculate all data until we obtain all historical volatility and means for all weeks in the first and second year. This process can using Microsoft Excel to get the volatility substituted by σ and the mean substituted by μ of week return for each individual week when period $t \geq 53$.

Then we calculate the VaR by setting the confidence level. In this paper, we choose confidence level$\alpha = 5\%$. Using the previously mentioned method, the weekly σ_t and μ_t can be received, formally,

$$VaR = (1 + \mu) \times 2.33\sigma - \mu$$

We can get all weekly VaR of each mutual from this model. There is a 5% of probability that the potential loss will exceed the calculated VaR under the confidence level. It is the regression model to calculate returns using the VaR.

$$return_t = \alpha + \beta_1 VaR_t + \beta_2 VaR_{t-1} + \beta_3 VaR_{-2t} + \beta_4 VaR_{t-3} + e$$

where $return_t$ =the weekly return of period t

$\alpha =$ Intercept of the equation,

$\beta_t =$ sensitive coefficient of the VaR_t

$VaR_t =$ The VAR of period t,

$VaR_{t-1} =$ The VAR of period t-1,

$VaR_{t-2} =$ The VaR of period t-2,

$VaR_{t=3} =$ The VaR of period t-3.

$e =$ The error term.

$$\Delta return_t = return_t - return_{t-1}$$

Where is the difference between mutual fund returns of two weeks.

$$\Delta VaR_t = VaR_t - VaR_{t-1}$$

Where is the difference between mutual fund VARs of two weeks

For coefficientβ_t, the following part will show by hypothesis. The former model gives a certain correlation between the potential loss and the return of mutual. And the latter expose whether the risk of previous period still impact on the mutual fund returns of next period.

In this paper, the t-test is used to test the equation above by significant of β_t. The process is taking hypothesis measure.

At first, we set hull hypothesis H_0: $\beta_t = 0$, β_t is not significant.

It means that there is no linear relationship between $\Delta\mathrm{return}_t$ and $\Delta\mathrm{VaR}_t$.

Then, we set hypothesis H_1: $\beta_t \neq 0$ β_t is significant.

It means that there is linear relationship between $\Delta\mathrm{return}_t$ and $\Delta\mathrm{VaR}_t$, and the linear relationship is either positive or negative between variables.

This model is suitable to be based on t-statistic.

The hypothesis is that, under the 1% confidence level for the test, if we do not reject the null hypothesis, it is said that the factor had not influence in the dependent variable. But if we do reject the null hypothesis, the conclusion is that the independent factor is correlational with the dependent variable and there is statistically significant.

3.4 Data sources

This study randomly chooses the weekly performance of 10 Chinese mutual funds from a period between January 1th, 2010 and December 30th, 2012. The database is from Bloomberg. The

reason for choosing these data is that the data are current and can meet the recent economic research and forecasting needs.

Chapter 4

Analysis of results

4.1 Overview

This section is about the results. And they are used them to analyze and explain the situation of the models drove from former Chapter. The data collected in the paper is run in STATA to get these results.

4.2 The results analysis of VaR

The VaR model is sufficient to derive a linear correlation between VaR and the returns of mutual fund. The following table I the output of regression of the VaR model equation.

Under the T-test, we set the null hypothesis of $\beta_n = 0$ and the alternative hypothesis of $\beta_n \neq 0$. The P-value makes a decision whether we reject the null hypothesis or not. When the hull hypothesis is true, the probability is even extremer than the sample statistic, that is P_value $< \alpha$. Hence, we can estimate the result after the cooperation of the calculated P-value and α. The P-value exceeds 0.05; we do not reject the null hypothesis. But if the value is less than 0.05, the null hypothesis should be rejected.

Table 4.1

```
. gen varA=var[_n-1]
(1 missing value generated)

. gen varB=var[_n-2]
(2 missing values generated)

. gen varC=var[_n-3]
(3 missing values generated)

. gen varD=var[_n-4]
(4 missing values generated)

. drop if varA==.
(1 observation deleted)

. drop if varB==.
(1 observation deleted)

. drop if varC==.
(1 observation deleted)

. drop if varD==.
(1 observation deleted)
```

From the table 4.2, we can know that the P-value of VaR_t is less than 0.05, so null hypothesis should be rejected. Hence, we can make a conclusion that the null hypothesis should be rejected and the factor of current VaR in this model is statistic significant correlation with the returns of mutual funds.

Table 4.2

```
. reg return var varA varB varC
```

Source	SS	df	MS		
Model	.34422592	4	.08605648	Number of obs =	1566
Residual	13.8717716	1561	.008886465	F(4, 1561) =	9.68
				Prob > F =	0.0000
				R-squared =	0.0242
				Adj R-squared =	0.0217
Total	14.2159975	1565	.009083704	Root MSE =	.09427

return	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
var	.5541991	.1496517	3.70	0.000	.2606597	.8477386
varA	-.1309635	.22088	-0.59	0.553	-.5642163	.3022892
varB	-.0899784	.2208869	-0.41	0.684	-.5232446	.3432878
varC	-.3609701	.149676	-2.41	0.016	-.6545572	-.067383
_cons	-.0579289	.009556	-6.06	0.000	-.0766728	-.0391849

.

α is the intercept of the model, and β_t is the correlation between return and VaR of manual fund. From the output, we can see the α is -0.0579289, $\beta_1 = 0.5541991,\ \beta_2 = -0.1309635,\ \beta_3 = -0.899784,\ \beta_4 = -0.3609701$. The smaller of the absolute value of $\beta_t\ is$, the less sensitive the return to the VaR will be. Hence, the outputs show that there is a positive correlation relationship between return with the current VaR. It means that the larger the potential loss in undertaking mutual fund is, the lower return for it will be. In addition, for$\beta_2,\ \beta_3,\ \beta_4$, are the correlations of $\text{return}_2,\ \text{return}_3,\ \text{return}_4$, and $\text{VaR}_2,\ \text{VaR}_3,\ \text{VaR}_4$ respectively. The values of them are defined as that the VaR of previous periods has a negative impaction on mutual funds for the returns. It means that the lower historical risks are, the higher current return of mutual fund would be, which different relationship with the current VaR and returns is. The VaR of one, two and three weeks ago reflect the historical risk of analyzing mutual fund.

R-squared is widely used in linear regression. Given a set of data points, a linear regression gives a formula for the line most closely matching those points. It also gives an R-squared value to measure how well the resulting line matches the original data points. The higher R-squared value means stocks are the better to match the model equation, which refers that the security

performance patterns have been in line with the index. However, in the output, R-squared is 0.0242 and adjusted R-squared is 0.0217. The value is relatively low. The movement of return in the sample does not follow VAR and previous VAR's very well. We cannot only use these factors to make an accurate prediction of mutual fund returns.

Chapter 5

Conclusion

5.1 Conclusion

The purpose of this paper is to find the relationship between the return and risk of mutual funds in Chinese market, and whether the previously calculated VaR still has influence on the current return of the fund, and what kind risk management based on VaR can improve the performance of the fund .

The outputs showed following results:

(1) the correlation between the risk based on current VAR and return of mutual fund is positive. The larger potential loss the mutual fund currently is undertaking, the higher return of mutual fund will be.

(2) the VaR of previous periods has a negative impaction on mutual funds for the returns.

. The VAR from two weeks ago has an influence on mutual fund returns. The VAR of one week ago has a higher correlation with the returns of mutual funds.

(3) the mutual fund managers can do some adjusting to reduce VAR and this adjustment can improve the performance of the mutual funds.

The results show that the pervious VaR of one week ago reflects the risk level of the mutual fund that is determined by asset allocation and may not be allowed to change. The higher risk level generally comes with higher return, but the current potential loss has a high negative influence on the returns of mutual funds. The high current VaR will lower the return. The mutual

fund manager can do some adjusting to reduce potential losses without widely changing asset allocation. This adjustment can improve the performance of the funds.

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Appendix A: List of mutual fund:

China Southern Active Allocation Fund

China AMC Core Bluechip fund

INVESCO Great Wall Resources Monopoly Equity Fund

Equity (Rongtong Leading Growth Fund

Guangfa Small Cap Growth Equity Fund

Great Wall Jiufu Core Value Equity Fund

Lombarda China New Trends Equity Fund

China Nature Core Growth Equity Fund

Lombarda China New Trends Equity Fund

Manulife Teda Efficiency Select Fund

Appendix B: the VaR of Companies in the Period

Date	160105 CH Equity (China Southern Active Allocation Fund)	160311 CH Equity (China AMC Core Bluechip fund)	162607 CH Equity (INVESCO Great Wall Resources Monopoly Equity Fund)	161610 CH Equity (Rongtong Leading Growth Fund)	162703 CH Equity (Guangfa Small Cap Growth Equity Fund)
03-Jan-2010	0.3838	0.3969	0.4206	0.4809	0.6148
10-Jan-2010	0.3836	0.3984	0.4220	0.4821	0.6095
17-Jan-2010	0.3817	0.4037	0.4250	0.4856	0.6091
24-Jan-2010	0.3805	0.4105	0.4278	0.4887	0.6093
31-Jan-2010	0.3813	0.4163	0.4302	0.4914	0.6104
07-Feb-2010	0.3898	0.4255	0.4340	0.4955	0.6096
14-Feb-2010	0.3980	0.4300	0.4358	0.4994	0.6131
21-Feb-2010	0.4034	0.4337	0.4360	0.5009	0.6135
28-Feb-2010	0.4066	0.4337	0.4342	0.5007	0.6060
07-Mar-2010	0.4051	0.4386	0.4345	0.5023	0.6036
14-Mar-2010	0.4116	0.4461	0.4359	0.5041	0.5968
21-Mar-2010	0.4248	0.4543	0.4384	0.5066	0.5984
28-Mar-2010	0.4367	0.4602	0.4401	0.5078	0.5998
04-Apr-2010	0.4339	0.4657	0.4422	0.5097	0.6016
11-Apr-2010	0.4248	0.4679	0.4436	0.5104	0.6018
18-Apr-2010	0.4186	0.4711	0.4459	0.5114	0.6018
25-Apr-2010	0.4167	0.4762	0.4480	0.5133	0.6028
02-May-2010	0.4201	0.4806	0.4495	0.5142	0.6017
09-May-2010	0.4216	0.4810	0.4499	0.5153	0.5996
16-May-2010	0.4163	0.4777	0.4494	0.5159	0.5986
23-May-2010	0.4077	0.4735	0.4479	0.5155	0.5967
30-May-2010	0.3980	0.4695	0.4448	0.5137	0.5949
06-Jun-2010	0.3949	0.4666	0.4422	0.5116	0.5946
13-Jun-2010	0.3945	0.4647	0.4410	0.5111	0.5970
20-Jun-2010	0.3934	0.4621	0.4397	0.5098	0.5989
27-Jun-2010	0.3954	0.4592	0.4381	0.5087	0.5991
04-Jul-2010	0.3897	0.4547	0.4357	0.5067	0.6000
11-Jul-2010	0.3860	0.4513	0.4324	0.5044	0.5945
18-Jul-2010	0.3823	0.4479	0.4277	0.5006	0.5839
25-Jul-2010	0.3742	0.4437	0.4226	0.4970	0.5705
01-Aug-2010	0.3673	0.4389	0.4170	0.4925	0.5590

08-Aug-2010	0.3594	0.4340	0.4125	0.4885	0.5470
15-Aug-2010	0.3520	0.4285	0.4086	0.4845	0.5414
22-Aug-2010	0.3472	0.4247	0.4053	0.4815	0.5372
29-Aug-2010	0.3485	0.4209	0.4021	0.4786	0.5287
05-Sep-2010	0.3526	0.4206	0.3990	0.4766	0.5256
12-Sep-2010	0.3569	0.4199	0.3970	0.4745	0.5282
19-Sep-2010	0.3619	0.4279	0.3969	0.4745	0.4917
26-Sep-2010	0.3650	0.4294	0.3958	0.4751	0.4195
03-Oct-2010	0.3677	0.4314	0.3938	0.4745	0.3461
10-Oct-2010	0.3678	0.4343	0.3922	0.4743	0.2675
17-Oct-2010	0.3695	0.4362	0.3916	0.4745	0.2186
24-Oct-2010	0.3706	0.4396	0.3912	0.4758	0.2137
31-Oct-2010	0.3681	0.4414	0.3910	0.4766	0.2099
07-Nov-2010	0.3665	0.4424	0.3914	0.4778	0.2201
14-Nov-2010	0.3659	0.4426	0.3911	0.4788	0.2395
21-Nov-2010	0.3653	0.4438	0.3916	0.4811	0.2592
28-Nov-2010	0.3622	0.4426	0.3914	0.4826	0.2733
05-Dec-2010	0.3607	0.4408	0.3914	0.4838	0.2807
12-Dec-2010	0.3571	0.4379	0.3911	0.4847	0.2822
19-Dec-2010	0.3534	0.4355	0.3920	0.4858	0.2849
26-Dec-2010	0.3512	0.4330	0.3922	0.4865	0.2925
02-Jan-2011	0.3513	0.4325	0.3936	0.4882	0.3017
09-Jan-2011	0.3561	0.4325	0.3946	0.4902	0.3079
16-Jan-2011	0.3670	0.4355	0.3970	0.4921	0.3143
23-Jan-2011	0.3775	0.4390	0.4000	0.4939	0.3207
30-Jan-2011	0.3926	0.4435	0.4029	0.4959	0.3345
06-Feb-2011	0.3893	0.4413	0.4020	0.4954	0.3360
13-Feb-2011	0.3958	0.4448	0.4038	0.4960	0.3497
20-Feb-2011	0.3953	0.4486	0.4057	0.4966	0.3639
27-Feb-2011	0.3910	0.4525	0.4084	0.4974	0.3693
06-Mar-2011	0.3888	0.4537	0.4098	0.4980	0.3682
13-Mar-2011	0.3799	0.4533	0.4107	0.4982	0.3737
20-Mar-2011	0.3751	0.4543	0.4125	0.4988	0.3788
27-Mar-2011	0.3724	0.4527	0.4147	0.4998	0.3853
03-Apr-2011	0.3785	0.4504	0.4164	0.5009	0.3931
10-Apr-2011	0.3920	0.4519	0.4189	0.5029	0.4013
17-Apr-2011	0.3947	0.4524	0.4209	0.5044	0.4067
24-Apr-2011	0.4008	0.4532	0.4230	0.5055	0.4135
01-May-2011	0.4069	0.4537	0.4247	0.5066	0.4227
08-May-2011	0.4119	0.4582	0.4271	0.5074	0.4315
15-May-2011	0.4181	0.4646	0.4297	0.5085	0.4365
22-May-2011	0.4262	0.4690	0.4325	0.5098	0.4419

29-May-2011	0.4344	0.4736	0.4357	0.5115	0.4463
05-Jun-2011	0.4401	0.4783	0.4391	0.5136	0.4540
12-Jun-2011	0.4399	0.4803	0.4418	0.5146	0.4546
19-Jun-2011	0.4433	0.4836	0.4451	0.5159	0.4544
26-Jun-2011	0.4464	0.4864	0.4477	0.5165	0.4541
03-Jul-2011	0.4525	0.4903	0.4511	0.5174	0.4537
10-Jul-2011	0.4606	0.4939	0.4554	0.5191	0.4603
17-Jul-2011	0.4662	0.4977	0.4605	0.5216	0.4688
24-Jul-2011	0.4742	0.5013	0.4659	0.5242	0.4793
31-Jul-2011	0.4803	0.5056	0.4717	0.5278	0.4848
07-Aug-2011	0.4815	0.5092	0.4763	0.5314	0.4867
14-Aug-2011	0.4852	0.5141	0.4797	0.5351	0.4871
21-Aug-2011	0.4855	0.5167	0.4819	0.5377	0.4863
28-Aug-2011	0.4843	0.5188	0.4839	0.5406	0.4926
04-Sep-2011	0.4819	0.5186	0.4865	0.5429	0.4975
11-Sep-2011	0.4772	0.5178	0.4887	0.5456	0.4997
18-Sep-2011	0.4791	0.5159	0.4912	0.5476	0.4984
25-Sep-2011	0.4826	0.5164	0.4937	0.5490	0.4992
02-Oct-2011	0.4850	0.5165	0.4965	0.5504	0.5008
09-Oct-2011	0.4888	0.5169	0.4987	0.5517	0.5067
16-Oct-2011	0.4888	0.5169	0.4987	0.5517	0.5067
23-Oct-2011	0.4879	0.5165	0.5004	0.5522	0.5165
30-Oct-2011	0.4860	0.5157	0.5011	0.5523	0.5230
06-Nov-2011	0.4855	0.5154	0.5016	0.5520	0.5222
13-Nov-2011	0.4862	0.5158	0.5020	0.5517	0.5140
20-Nov-2011	0.4863	0.5152	0.5021	0.5512	0.5051
27-Nov-2011	0.4878	0.5138	0.5021	0.5506	0.4988
04-Dec-2011	0.4885	0.5142	0.5029	0.5502	0.4954
11-Dec-2011	0.4891	0.5148	0.5036	0.5502	0.4954
18-Dec-2011	0.4894	0.5156	0.5037	0.5498	0.4924
25-Dec-2011	0.4918	0.5165	0.5035	0.5492	0.4863
01-Jan-2012	0.4924	0.5167	0.5023	0.5477	0.4822
08-Jan-2012	0.4912	0.5153	0.5012	0.5456	0.4797
15-Jan-2012	0.4868	0.5136	0.5008	0.5446	0.4779
22-Jan-2012	0.4821	0.5121	0.5004	0.5433	0.4754
29-Jan-2012	0.4749	0.5099	0.4996	0.5424	0.4666
05-Feb-2012	0.4749	0.5099	0.4996	0.5424	0.4666
12-Feb-2012	0.4669	0.5072	0.4993	0.5413	0.4584
19-Feb-2012	0.4664	0.5047	0.4999	0.5413	0.4502
26-Feb-2012	0.4692	0.5022	0.5003	0.5415	0.4488
04-Mar-2012	0.4723	0.4996	0.5010	0.5413	0.4539
11-Mar-2012	0.4757	0.4972	0.5017	0.5417	0.4564

18-Mar-2012	0.4752	0.4932	0.5017	0.5418	0.4591
25-Mar-2012	0.4709	0.4920	0.5014	0.5418	0.4590
01-Apr-2012	0.4657	0.4915	0.5013	0.5419	0.4582
08-Apr-2012	0.4576	0.4889	0.5008	0.5414	0.4583
15-Apr-2012	0.4590	0.4862	0.4997	0.5405	0.4601
22-Apr-2012	0.4552	0.4826	0.4987	0.5394	0.4605
29-Apr-2012	0.4508	0.4793	0.4981	0.5389	0.4581
06-May-2012	0.4478	0.4751	0.4974	0.5385	0.4565
13-May-2012	0.4456	0.4711	0.4966	0.5379	0.4602
20-May-2012	0.4450	0.4700	0.4964	0.5379	0.4654
27-May-2012	0.4440	0.4694	0.4962	0.5381	0.4710
03-Jun-2012	0.4446	0.4684	0.4958	0.5380	0.4714
10-Jun-2012	0.4483	0.4690	0.4949	0.5379	0.4734
17-Jun-2012	0.4463	0.4687	0.4938	0.5383	0.4771
24-Jun-2012	0.4412	0.4681	0.4935	0.5393	0.4818
01-Jul-2012	0.4334	0.4660	0.4925	0.5401	0.4857
08-Jul-2012	0.4206	0.4630	0.4906	0.5404	0.4889
15-Jul-2012	0.4103	0.4595	0.4887	0.5410	0.4900
22-Jul-2012	0.4022	0.4553	0.4858	0.5410	0.4896
29-Jul-2012	0.4004	0.4508	0.4826	0.5407	0.4959
05-Aug-2012	0.4032	0.4449	0.4788	0.5394	0.5010
12-Aug-2012	0.4041	0.4370	0.4756	0.5368	0.5090
19-Aug-2012	0.4071	0.4309	0.4733	0.5354	0.5187
26-Aug-2012	0.4085	0.4268	0.4717	0.5335	0.5224
02-Sep-2012	0.4144	0.4272	0.4697	0.5324	0.5277
09-Sep-2012	0.4280	0.4312	0.4686	0.5306	0.5296
16-Sep-2012	0.4161	0.4274	0.4624	0.5275	0.5317
23-Sep-2012	0.4034	0.4232	0.4577	0.5244	0.5247
30-Sep-2012	0.3919	0.4202	0.4533	0.5224	0.5159
07-Oct-2012	0.3817	0.4154	0.4503	0.5196	0.5031
14-Oct-2012	0.3817	0.4154	0.4503	0.5196	0.5031
21-Oct-2012	0.3878	0.4119	0.4488	0.5171	0.4867
28-Oct-2012	0.4000	0.4091	0.4483	0.5153	0.4837
04-Nov-2012	0.4050	0.4068	0.4481	0.5154	0.4834
11-Nov-2012	0.4097	0.4015	0.4488	0.5140	0.4843
18-Nov-2012	0.4152	0.4038	0.4535	0.5147	0.4856
25-Nov-2012	0.4232	0.4157	0.4548	0.5139	0.4593
02-Dec-2012	0.4260	0.4164	0.4498	0.5091	0.4294
09-Dec-2012	0.4311	0.4177	0.4443	0.5023	0.3915
16-Dec-2012	0.4558	0.4188	0.4352	0.4940	0.4235
23-Dec-2012	0.4462	0.4078	0.4251	0.4848	0.4779
30-Dec-2012	0.4226	0.3764	0.4216	0.4769	0.4613

Date	162006 CH Equity (Great Wall Jiufu Core Value Equity Fund)	166001 CH Equity (Lombarda China New Trends Equity Fund)	163503 CH Equity (China Nature Core Growth Equity Fund)	166001 CS Equity (Lombarda China New Trends Equity Fund)	162207 CH Equity (Manulife Teda Efficiency Select Fund)
03-Jan-2010	0.7646	0.7930	0.6921	0.3607	0.4689
10-Jan-2010	0.7564	0.8088	0.6992	0.3648	0.4669
17-Jan-2010	0.7509	0.8246	0.7069	0.3760	0.4665
24-Jan-2010	0.7462	0.8404	0.7146	0.3874	0.4662
31-Jan-2010	0.7416	0.8562	0.7223	0.3990	0.4666
07-Feb-2010	0.7377	0.8718	0.7297	0.4081	0.4667
14-Feb-2010	0.7331	0.8863	0.7366	0.4167	0.4660
21-Feb-2010	0.7318	0.9003	0.7426	0.4254	0.4640
28-Feb-2010	0.7224	0.9090	0.7456	0.4273	0.4622
07-Mar-2010	0.7209	0.9222	0.7510	0.4234	0.4597
14-Mar-2010	0.7200	0.9353	0.7567	0.4201	0.4580
21-Mar-2010	0.7192	0.9487	0.7629	0.4226	0.4568
28-Mar-2010	0.7200	0.9622	0.7684	0.4233	0.4547
04-Apr-2010	0.7201	0.9756	0.7744	0.4272	0.4533
11-Apr-2010	0.7192	0.9831	0.7799	0.4309	0.4514
18-Apr-2010	0.7183	0.9780	0.7857	0.4331	0.4501
25-Apr-2010	0.7205	0.9730	0.7914	0.4383	0.4488
02-May-2010	0.7210	0.9678	0.7969	0.4395	0.4475
09-May-2010	0.7236	0.9632	0.8022	0.4395	0.4470
16-May-2010	0.7224	0.9582	0.8073	0.4406	0.4455
23-May-2010	0.7205	0.9533	0.8120	0.4438	0.4437
30-May-2010	0.7170	0.9483	0.8164	0.4450	0.4406
06-Jun-2010	0.7138	0.9438	0.8205	0.4433	0.4383
13-Jun-2010	0.7138	0.9403	0.8253	0.4445	0.4368
20-Jun-2010	0.7149	0.9375	0.8296	0.4462	0.4347
27-Jun-2010	0.7145	0.9347	0.8344	0.4516	0.4333
04-Jul-2010	0.7145	0.9320	0.8392	0.4567	0.4311
11-Jul-2010	0.7144	0.9299	0.8439	0.4605	0.4286
18-Jul-2010	0.7124	0.9279	0.8481	0.4578	0.4250
25-Jul-2010	0.7086	0.9254	0.8527	0.4529	0.4218
01-Aug-2010	0.7061	0.9234	0.8570	0.4454	0.4175
08-Aug-2010	0.7015	0.9208	0.8615	0.4334	0.4137

15-Aug-2010	0.6943	0.9185	0.8660	0.4288	0.4100
22-Aug-2010	0.6881	0.9160	0.8706	0.4244	0.4068
29-Aug-2010	0.6815	0.9136	0.8756	0.4194	0.4040
05-Sep-2010	0.6766	0.9114	0.8807	0.4279	0.4022
12-Sep-2010	0.6727	0.9101	0.8857	0.4367	0.4010
19-Sep-2010	0.6517	0.8996	0.8874	0.4431	0.4009
26-Sep-2010	0.6124	0.8820	0.8854	0.4478	0.4016
03-Oct-2010	0.5715	0.8643	0.8833	0.4452	0.4018
10-Oct-2010	0.5311	0.8467	0.8812	0.4428	0.4025
17-Oct-2010	0.4927	0.8374	0.8801	0.4493	0.4027
24-Oct-2010	0.4532	0.8201	0.8783	0.4516	0.4051
31-Oct-2010	0.4137	0.8028	0.8764	0.4567	0.4069
07-Nov-2010	0.3758	0.7863	0.8747	0.4606	0.4092
14-Nov-2010	0.3413	0.7709	0.8733	0.4666	0.4112
21-Nov-2010	0.3211	0.7559	0.8720	0.4721	0.4141
28-Nov-2010	0.3280	0.7407	0.8706	0.4706	0.4165
05-Dec-2010	0.3345	0.7257	0.8693	0.4711	0.4193
12-Dec-2010	0.3425	0.7105	0.8681	0.4681	0.4223
19-Dec-2010	0.3510	0.6958	0.8672	0.4673	0.4260
26-Dec-2010	0.3599	0.6811	0.8664	0.4685	0.4295
02-Jan-2011	0.3693	0.6670	0.8657	0.4696	0.4335
09-Jan-2011	0.3767	0.6525	0.8652	0.4715	0.4383
16-Jan-2011	0.3810	0.6383	0.8646	0.4727	0.4424
23-Jan-2011	0.3857	0.6247	0.8641	0.4743	0.4462
30-Jan-2011	0.3938	0.6111	0.8637	0.4730	0.4491
06-Feb-2011	0.3945	0.5966	0.8626	0.4692	0.4493
13-Feb-2011	0.4032	0.5823	0.8621	0.4662	0.4519
20-Feb-2011	0.4116	0.5691	0.8617	0.4635	0.4548
27-Feb-2011	0.4196	0.5564	0.8614	0.4618	0.4578
06-Mar-2011	0.4262	0.5431	0.8611	0.4640	0.4608
13-Mar-2011	0.4337	0.5300	0.8608	0.4677	0.4630
20-Mar-2011	0.4409	0.5170	0.8607	0.4716	0.4653
27-Mar-2011	0.4484	0.5042	0.8607	0.4762	0.4676
03-Apr-2011	0.4527	0.4921	0.8607	0.4805	0.4695
10-Apr-2011	0.4566	0.4851	0.8611	0.4808	0.4717
17-Apr-2011	0.4611	0.4891	0.8613	0.4842	0.4736
24-Apr-2011	0.4654	0.4933	0.8614	0.4899	0.4752
01-May-2011	0.4722	0.4974	0.8616	0.4961	0.4761
08-May-2011	0.4758	0.5011	0.8616	0.5029	0.4769
15-May-2011	0.4820	0.5059	0.8618	0.5033	0.4777
22-May-2011	0.4867	0.5102	0.8621	0.5056	0.4782
29-May-2011	0.4917	0.5148	0.8623	0.5103	0.4788

05-Jun-2011	0.4978	0.5185	0.8628	0.5148	0.4792
12-Jun-2011	0.5003	0.5207	0.8630	0.5150	0.4787
19-Jun-2011	0.5016	0.5233	0.8601	0.5117	0.4782
26-Jun-2011	0.5028	0.5250	0.8520	0.5077	0.4770
03-Jul-2011	0.5034	0.5264	0.8442	0.5037	0.4763
10-Jul-2011	0.5043	0.5284	0.8366	0.5012	0.4758
17-Jul-2011	0.5051	0.5311	0.8295	0.4993	0.4758
24-Jul-2011	0.5061	0.5339	0.8224	0.4980	0.4757
31-Jul-2011	0.5059	0.5363	0.8159	0.4980	0.4760
07-Aug-2011	0.5059	0.5382	0.8093	0.4951	0.4758
14-Aug-2011	0.5081	0.5399	0.8029	0.4929	0.4762
21-Aug-2011	0.5094	0.5402	0.7961	0.4919	0.4756
28-Aug-2011	0.5115	0.5402	0.7893	0.4923	0.4749
04-Sep-2011	0.5111	0.5397	0.7825	0.4860	0.4744
11-Sep-2011	0.5106	0.5395	0.7760	0.4801	0.4736
18-Sep-2011	0.5077	0.5384	0.7690	0.4733	0.4724
25-Sep-2011	0.5065	0.5378	0.7621	0.4777	0.4703
02-Oct-2011	0.5068	0.5361	0.7551	0.4872	0.4681
09-Oct-2011	0.5076	0.5345	0.7484	0.4969	0.4659
16-Oct-2011	0.5076	0.5345	0.7484	0.4969	0.4659
23-Oct-2011	0.5076	0.5320	0.7411	0.5020	0.4625
30-Oct-2011	0.5073	0.5300	0.7337	0.4994	0.4592
06-Nov-2011	0.5051	0.5269	0.7257	0.4958	0.4545
13-Nov-2011	0.5006	0.5231	0.7179	0.4897	0.4507
20-Nov-2011	0.4959	0.5196	0.7097	0.4830	0.4461
27-Nov-2011	0.4931	0.5160	0.7014	0.4787	0.4427
04-Dec-2011	0.4892	0.5132	0.6935	0.4746	0.4401
11-Dec-2011	0.4849	0.5099	0.6854	0.4727	0.4376
18-Dec-2011	0.4797	0.5063	0.6771	0.4681	0.4350
25-Dec-2011	0.4734	0.5026	0.6684	0.4704	0.4320
01-Jan-2012	0.4681	0.4980	0.6593	0.4701	0.4288
08-Jan-2012	0.4637	0.4937	0.6499	0.4656	0.4248
15-Jan-2012	0.4614	0.4911	0.6444	0.4624	0.4216
22-Jan-2012	0.4594	0.4875	0.6387	0.4580	0.4184
29-Jan-2012	0.4537	0.4839	0.6325	0.4558	0.4151
05-Feb-2012	0.4537	0.4839	0.6325	0.4558	0.4151
12-Feb-2012	0.4480	0.4809	0.6265	0.4554	0.4122
19-Feb-2012	0.4430	0.4773	0.6204	0.4562	0.4095
26-Feb-2012	0.4377	0.4736	0.6142	0.4572	0.4071
04-Mar-2012	0.4337	0.4704	0.6077	0.4609	0.4044
11-Mar-2012	0.4285	0.4667	0.6008	0.4622	0.4018
18-Mar-2012	0.4235	0.4631	0.5934	0.4635	0.3993

25-Mar-2012	0.4183	0.4591	0.5858	0.4639	0.3969
01-Apr-2012	0.4176	0.4540	0.5778	0.4627	0.3947
08-Apr-2012	0.4176	0.4495	0.5688	0.4675	0.3922
15-Apr-2012	0.4155	0.4451	0.5590	0.4656	0.3895
22-Apr-2012	0.4137	0.4405	0.5487	0.4588	0.3868
29-Apr-2012	0.4118	0.4358	0.5382	0.4506	0.3845
06-May-2012	0.4103	0.4307	0.5273	0.4412	0.3816
13-May-2012	0.4080	0.4257	0.5155	0.4437	0.3795
20-May-2012	0.4089	0.4206	0.5034	0.4467	0.3774
27-May-2012	0.4103	0.4154	0.4912	0.4460	0.3757
03-Jun-2012	0.4098	0.4111	0.4780	0.4452	0.3740
10-Jun-2012	0.4092	0.4079	0.4637	0.4431	0.3723
17-Jun-2012	0.4110	0.4054	0.4544	0.4466	0.3714
24-Jun-2012	0.4132	0.4033	0.4547	0.4495	0.3709
01-Jul-2012	0.4158	0.4010	0.4549	0.4514	0.3706
08-Jul-2012	0.4180	0.3986	0.4549	0.4540	0.3706
15-Jul-2012	0.4212	0.3971	0.4553	0.4578	0.3710
22-Jul-2012	0.4251	0.3962	0.4555	0.4616	0.3710
29-Jul-2012	0.4301	0.3946	0.4551	0.4696	0.3713
05-Aug-2012	0.4345	0.3915	0.4537	0.4820	0.3713
12-Aug-2012	0.4386	0.3884	0.4514	0.4893	0.3692
19-Aug-2012	0.4424	0.3881	0.4496	0.4933	0.3685
26-Aug-2012	0.4461	0.3894	0.4490	0.4982	0.3688
02-Sep-2012	0.4545	0.3916	0.4479	0.5022	0.3680
09-Sep-2012	0.4621	0.3919	0.4462	0.5083	0.3668
16-Sep-2012	0.4718	0.3915	0.4450	0.5159	0.3650
23-Sep-2012	0.4738	0.3889	0.4429	0.4876	0.3649
30-Sep-2012	0.4751	0.3916	0.4419	0.4605	0.3651
07-Oct-2012	0.4751	0.3938	0.4390	0.4269	0.3654
14-Oct-2012	0.4751	0.3938	0.4390	0.4269	0.3654
21-Oct-2012	0.4752	0.3959	0.4374	0.4004	0.3669
28-Oct-2012	0.4747	0.3973	0.4362	0.3971	0.3691
04-Nov-2012	0.4796	0.4027	0.4382	0.3996	0.3777
11-Nov-2012	0.4812	0.4070	0.4382	0.4007	0.3831
18-Nov-2012	0.4847	0.4107	0.4410	0.4079	0.3965
25-Nov-2012	0.4776	0.4109	0.4405	0.4134	0.4028
02-Dec-2012	0.4770	0.4086	0.4375	0.4149	0.4014
09-Dec-2012	0.4800	0.4040	0.4333	0.4171	0.4002
16-Dec-2012	0.4896	0.4031	0.4262	0.4914	0.3950
23-Dec-2012	0.5077	0.3870	0.4224	0.4455	0.3899
30-Dec-2012	0.5000	0.3724	0.4157	0.4088	0.3781