ESTIMATING VALUE-AT-RISK AND EXPECTED SHORTFALL ON EMERGING MARKETS: EVIDENCE FROM GHANA STOCK EXCHANGE

BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MPHIL ACTUARIAL SCIENCE DEGREE

JUNE, 2015

DECLARATION

Candidates Declaration

I certify that this thesis is the result of my own research and that; no part of it has been presented for another degree in this University or elsewhere.

SIGNATURE:…………………………… DATE:……………………………

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Supervisors' Declaration

We the undersigned hereby certify that this work was done from candidate's own research and supervised with the guidelines laid down by University of Ghana for thesis supervision.

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ABSTRACT

An important component of Value-at-Risk (VaR) and Expected Shortfall (ES) estimation is using robust volatility models, thus the need to test the relative performance of a wide range of volatility forecasting models to ascertain the one that gives the most adequate VaR and ES forecast. Risk management has become very necessary for institutions in all sectors of an economy. Stock markets represent almost all sectors of an economy; the Ghanaian stock market being no exception. With listed companies from manufacturing, financial, agricultural, mining, oil and gas and services industry, the Ghana Stock Exchange (GSE) is a good place to test risk measures basically developed for advanced and liquid economies.

This study tests the relative performance of a range of volatility models (RiskMetrics (EWMA), GARCH, EGARCH) in forecasting Value-at Risk (VaR) and Expected Shortfall (ES). Bi-weekly returns of Fan Milk Limited (FML) and GSE Composite Index (GSECI) spanning over a period of fourteen years (Jan 2000-Dec 2013) were used. Residuals of the GARCH and EGARCH models were assumed to follow a normal and student-*t* distribution. The first 215 observations were used to estimate model parameters while the last 150 observations used to verify and back-test the VaR forecasts. From the empirical results the ARMA-GARCH with normally distributed error terms was seen as the best volatility model for VaR and ES estimation for both FML stock and GSECI. Even though other models passed the Kupiec Unconditional coverage test, the number of VaR violations outnumbered that of the ARMA-GARCH model.

DEDICATION

This work is dedicated to my dear husband, Mr. Frank Mickson-Yeboah, my wonderful parents Mr & Mrs Kyei-Boadu and also to my siblings, Kweku Boadu, Nana Akyaa and Nana Sefaah.

ACKNOWLEDGEMENT

My profound gratitude goes to the Almighty God for making it possible for me to complete this research.

I would like to acknowledge my Supervisors; Dr. Kwabena Doku-Amponsah and Dr. F.O. Mettle for their help, support, assistance and constructive criticisms offered to make this work a success.

Also, to all the staff and faculty of University of Ghana Statistics Department, I say a big thank you especially to Mr. Abeku Asare-Kumi, Jonathan Agyeman and Dr. E. Okyere.

I am also grateful to UG-Carnegie for their financial support.

To my husband, parents, siblings and in-laws, I say God bless you for all the love and support you gave me.

Finally to my friends especially my colleagues (2015 Mphil Students at the Statistics Department), I say Ayekoo.

Thank you all and may the Almighty God bless you all immeasurably.

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LIST OF ABBREVIATIONS

ACF	Autocorrelation Function
AIC	Akaike Information Criteria
AR	AutoRegressive
ARCH	AutoRegressive Conditional Heteroscedasticity
ARMA	AutoRegressive Moving Average
BIC	Bayes Information Criterion
EGARCH	Exponential GARCH
EG-N	EGARCH with normal distribution
EG-S	EGARCH with Student-t Distribution
ES	Expected Shortfall
EWMA	Exponentially Weighted Moving Average
FIAPARCH	Fractionally Integrated Asymmetric Power ARCH
FML	Fan Milk Limited
GARCH	Generalized AutoRegressive Conditional Heteroscedasticity
GED	Generalized Error Distribution
GJR-GARCH	Glosten, Jagannathan & Runkle GARCH
G-N	GARCH with normal distribution
G-S	GARCH with Student-t Distribution
GSE	Ghana Stock Exchange
GSE-CI	Ghana Stock Exchange Composite Index
GSE-FSI	Ghana Stock Exchange Financial Stock Index
LM	Lagrange Multiplier
LR	Likelihood Ratio
MA	Moving Average

MAE	Mean Absolute Error
MLE	Maximum Likelihood Estimator
MSE	Mean Square Error
PACF	Partial Autocorrelation Function
POF	Proportion of Failure
RM	Risk Metrics
STD	Student-t Distribution
VaR	Value-at-Risk

CHAPTER ONE

INTRODUCTION

1.0 Background of The Study

Value-at-Risk (VaR) is becoming a standard risk measurement tool for institutions worldwide, and is enjoying rapid and wide-ranging success. Its main appeal lies in its simplicity; a single number offers information about what a firm may expect to lose over a time horizon and uncovers uncertainties of the firm (Garman, Aragones, & Blanco, 1999). It provides crucial information of the overall firm's risk exposure profile to senior management, traders, shareholders, investors, auditors, rating agencies and regulators (Garman *et al*., 1999). The uses of VaR spans from risk management, financial reporting and calculating required reserves to financial controlling.

The need to develop credible risk measurement techniques came about as a result of financial institutions' failures and responses of regulators to these crises. Even though VaR was not known as a distinct concept until late 1980's, the origin of the methodology goes back in time. The underlying concept of VaR was mainly developed in the context of Harry Markowitz's (1959) portfolio selection.

VaR gained popularity when the global financial firm JP Morgan made its risk metrics methodology available to the public in 1994. It provided data on variance and covariances across various asset classes. This gave rise to the development of software for the risk measure, which was termed Value at Risk. The VaR measure was greatly welcomed by both financial institutions and regulatory authorities. Eventually it was accepted by the

Basel Committee in 1996 and was tied to the regulatory capital requirement calculations of their banks.

VaR concept and methodology has faced many criticisms. Among them are

- VaR does not take into consideration any loss beyond the VaR level.
- VaR violates the subadditivity property (refer to page 11, section 2.2.1) and is therefore disregarded as a coherent risk measure.

To rectify these shortcomings, Artzner, Delbaen, Eber, & Heath (1999), proposed the use of expected shortfall. Expected shortfall is defined as the average loss conditional on the violation of the VaR level.

Government and the private sector require an enabling environment to thrive and flourish, thus the need for a vibrant capital market to improve access to capital. In light of this, the Ghana Stock Exchange (GSE) has enabled businesses in Ghana and the government to raise long-term capital and helped investors to obtain fair capital safety and diversity of investment.

The Ghana Stock Exchange was established in July 1989 as a private company. It was recognized as an authorized stock exchange in October 1990 and in November that same year trading on the exchange floor begun. In April 1994 it changed its status to a public company limited by guarantee. The GSE currently has 38 equities listed. This is made up of 36 companies and 2 corporate bonds. Market capitalization of listed securities as at end of December 2013 was 60.39 billion Ghana cedis.

Both GSE-Composite Index (GSE-CI) and GSE Financial Stock Index (GSE-FSI) recorded a year to date gain of 78.81% and 71.81% respectively at the end of 2013. This makes it one of the best performing Stock market in Sub-Saharan Africa. With high potential for growth, the GSE is a good destination for foreign investors.

The growing interest of foreign financial investors to invest in emerging financial markets and increased financial fragility in these markets, highlights the importance of accurate market risk quantification and prediction (Bucevska, 2013).

1.2 Problem Statement

Stock markets are the best indicators to forecast future economic activities and describe actual casual effect between future economic growth and stock prices (Shahbaz, Ahmed, & Ali, 2008). Some authors take extreme position and argue that stock markets are likely to harm economic development due to their susceptibility to market failure, which is often manifested in the volatile nature of stock markets found in many developing countries (Singh, 1997).

The need for accurate risk measurement, estimation and forecasting of market loss has greatly increased since the 2007 credit crunch and euro zone crises in 2009. Investors take positions in assets because they know the market risk associated with the asset. Getting appropriate and accurate risk measure of assets and stocks makes the market vibrant and efficient.

Less developed markets unlike developed/advanced ones, are characterized by low levels of liquidity, smaller market capitalization and high volatility. In view of the differences between advanced markets and emerging ones, it is necessary to test the VaR and ES methodology on emerging markets, since it was mainly developed for liquid and advanced markets.

Even though there has been vast research into VaR and ES estimation in most advanced markets, little research has been done on emerging markets. The few known existing research were also done on emerging stock markets in Asia, Latin America, and Europe. Only few papers investigated into African Stock markets.

Thupayagale (2010) evaluated the performance of a wide range of volatility forecasting models in estimating VaR for emerging markets with focus on some African stock markets namely; South Africa, Egypt, Nigeria and Kenya. The other works by Bonga-Bonga & Mutema (2009) and McMillan & Thupayagale (2010) researched into south African stock market, which is the largest stock market in Africa. It must be noted that these four above mentioned stock markets account for over 90% of the African market capitalization and have a lot of listed companies [Egypt (235), Kenya (61), Nigeria (188) and South Africa (322)][1] as compared to the Ghanaian Stock market. The GSE is less liquid relative to the four African markets mentioned above.

This study aims at finding the best volatility-forecasting model that accurately estimates and predicts VaR and ES in the Ghanaian Stock market.

1.3 Objectives of the study

The main aim of this study is to test the relative performance of a wide range of volatility forecasting models; from the industry standard Exponentially Weighted Moving Average (EWMA) to a range of symmetric and asymmetric Generalized Autoregressive

[1] Source world bank data indicators; Listed domestic companies, total (2013)

Conditional Heteroscedasticity (GARCH) family models in estimating and forecasting Value at Risk and Expected Shortfall in the Ghanaian Stock market.

Specific objectives are;

i. To identify the best volatility forecasting model that adequately estimates VaR and ES

ii. To estimate and forecast bi-weekly VaR value for the GSE

iii. To estimate and forecast bi-weekly ES value for the GSE

iv. To see which risk measure (i.e VaR or ES) better estimates risk on the GSE.

v. To compare the VaR of a diversified and undiversified portfolio to ascertain which one has a higher market risk.

1.4 Significance of the study

Even though there are several studies that have evaluated the performance of volatility models in estimating risk measures on emerging stock markets, few or no studies have been done on the Ghanaian stock market. Results from this study will assist risk managers, investors, shareholders, government and regulators make informed decisions and policies. Findings will also help institutions and investors successfully manage their risk exposure. Findings will be of particular importance to both foreign and local investors. It will also be relevant at both macro and micro-economic levels. It will also contribute to the limited academic literature in this area and be a basis for further and future studies into the Ghanaian stock market and financial and non-financial sectors.

1.5 Scope of Study

The study considered a sample data covering a period of fourteen years (2000 – 2013). This consisted of daily GSE composite index values and daily prices of FML stock. This long sample period was chosen because it adequately captures the period before, during and after the global financial crises. It also captures different political regimes and economic times. The data was obtained from the Ghana Stock Exchange.

1.6 Limitation of Study

The research had a few limitations, which are;

i. Prices of stocks on the GSE recorded either no change or very little change on a daily basis. Hence there was little or no volatility in the daily returns. Using bi-weekly returns instead rectified this.

ii. The Basel Committee recommends a minimum of 250 observations (number of trading days in a year) to back-test VaR but due to the usage of bi-weekly returns, a total number of 150 observations were used.

1.7 Organization of the Study

The research is grouped into five chapters. Chapter one consists of introduction and a brief overview of the study. Review of related literature and definition of related concepts is presented in chapter two. Chapter three comprises of a detailed discussion of the methodology used in the analysis. Chapter four focuses on analysis of the data and discussion of results. Finally, chapter presents the summary of findings, conclusion, recommendations and suggestions for future and further studies.

CHAPTER TWO

REVIEW OF RELATED LITERATURE.

2.0 Introduction

Even though VaR models estimation came into existence about two decades ago, academic literature on VaR estimation is limited in developing financial markets. The main reason for this is the short historical time-series data given that most of the stock markets in these countries were established in the early nineties (Bucevska, 2013). The following sub-sections reviews some related literature and defines related concepts.

2.1 Literature Review

A number of papers have researched into VaR and ES on advanced and developed financial markets. Some of these papers are by Duffie & Pan (1997), Alexander & Leigh (1997), Lopez (1998), Christoffersen, Hahn & Inoue (2001), Brooks & Persand (2003), Giot & Laurent (2004), Peracchi & Tanase (2008), McAleer & Da Veiga (2008) among others.

Alexander & Leigh (1997) found that the simple unweighted moving average gave the minimum number of VaR exceedances as compared to EWMA and GARCH volatility model. Christoffersen et al. (2001) reports that using RiskMetrics and GARCH to forecast volatility typically provides similar short-term variance forecasts but have different implications for the longer term.

Angelidis, Benos & Degiannakis (2004) concludes that the choice of sample size and leptokurtic distributions are important for adequately forecasting VaR, whiles the conditional mean specification does not improve the accuracy of the forecast. In reference to sample size, Kupiec (1995) assessed that, small sample test statistics have extremely poor power for detecting a model that habitually underestimates potential loss.

Righi & Ceretta (2015) investigated if there was a pattern between the quality of several models and methods in ES estimation. The authors found that an incorrect violation rate is a sign of risk underestimation hence correct VaR estimation is necessary and important for ES estimation.

From the results of all these works, the parametric model that adequately forecast VaR and ES differs for each work. This indicates that the volatility model that gives the most adequate VaR and ES forecast, largely depends on the portfolio and market for which the estimate is being done (Angelidis et al., 2004). Most of the few known existing research on developing financial markets were also done on emerging stock markets in Asia, Latin America, and Europe.

2.1.1 Review of literature on emerging markets outside Africa.

To answer the question of whether dual Long Memory (LM), asymmetry and structural breaks in stock market returns matter, Aloui & ben Hamida (2014) found that all the Gulf Cooperation Council (GCC) market volatilities exhibit significant structural breaks matching mainly with the 2008-2009 global financial crises and the Arab spring. Also the forecasting ability analysis shows that the FIAPARCH model under skewed student-*t* distribution turn out to improve the VaR and ES forecast substantially.

Ardia & Hoogerheide (2014) show that updating the parameter estimates of the GARCH equation at a daily or weekly frequency does not affect the forecasting power of the GARCH models. Even monthly or quarterly updates are marginally out performed. Their work concentrated on estimation frequency and not on the performance of the GARCH models in estimating VaR and ES, or which risk measure captures risk more accurately.

The results of Degiannakis, Floros & Dent (2013) suggested that despite the evidence of persistence in the volatility process, accounting for long memory in the volatility models did not improve the VaR and ES forecasting accuracy relative to the short memory specification. It must be noted that the models in the paper were estimated under the assumption of normally distributed standardized residual which is not always true since most financial time series are not normally distributed as suggested by literature.

According to Miletić & Miletić (2013), the most adequate GARCH type model for estimating and forecasting volatility in the Serbian stock market is EGARCH model with assumption that the residuals follow the normal distribution and GARCH (1, 1) model with assumption that the residuals follow the Student's t distribution.

Bucevska (2013) in her research on VaR estimation in the Macedonian Stock market found that the asymmetric EGARCH model with student’s t-distribution and the EGARCH model with normal distribution and GARCH-GJR accurately estimates volatility in the Macedonian stock market and hence can adequately estimate and forecast VaR measures in that market.

Mcmillan & Speight (2007) investigated into “value at risk in emerging equity market: Comparative evidence for symmetric, asymmetric and long memory GARCH models”. They found that both asymmetric and long memory features are important considerations in providing improved VaR estimates that minimize VaR failure rates.

Yamai & Yoshiba (2005) pointed out that since VaR disregards losses beyond the VaR level it can cause serious real – world problems. This is because information provided may mislead investors. In order to safeguard against this downside of VaR, ES should be adopted since it is a better risk measurement than VaR in terms of tail risk. Their findings implied that the use of a single risk measure should not dominate financial risk management since each measure offers its own advantages and disadvantages. The authors concluded that complementing VaR with ES represents an effective way to provide a more comprehensive risk monitoring.

2.1.2 Review of literature on emerging markets in Africa.

In comparing the industry standard volatility model (RiskMetrics) and other volatility models such as symmetric and asymmetric GARCH type models, Bonga-Bonga & Mutema (2009) concluded that, the assumptions of conditional heteroscedasticity as well as asymmetric volatility models should be taken into account when estimating the VaR in emerging markets. AR (2) – GARCH (1, 1) and AR (2) – EGARCH (1, 1) outperformed the industry standard RiskMetrics model.

Thupayagale (2010) researched on evaluation of GARCH-based models in value-at-risk estimation. His results suggest that models with long memory or asymmetric effects or both are important considerations in providing improved VaR estimates that minimize occasions when the minimum capital requirement identified by the VaR process would have fallen short of actual trading losses. The author's work focused on emerging markets including Egypt, Nigeria, Kenya and South Africa. For Nigeria the FIGARCH model delivered the most accurate VaR estimate whiles the FIEGARCH model was chosen for Egypt and South Africa. The semi-variance model gave the most adequate VaR measure for Kenya.

2.1.3 Review of literature in non-financial sectors.

Risk management has considerably evolved over the past two decades. Even though the concept originated from the insurance and financial industries, it is now being applied in various sectors such as manufacturing, health and others. In addition to market risk, risk analysis now considers a greater diversity of risk types such as product risk, strategic risk, operational risk, etc (Göb, 2011).

In the financial and insurance sectors, risk measures consider continuous data but risk measures in other sectors are concerned with discrete count data. Göb (2011) researched into measuring VaR and ES on discrete count variables. Discrete count data is of much importance in operational risk associated with manufacturing industries. The author studied the theoretical and empirical aspects of risk measures on discrete distributional assumptions. He studied numerical examples on quality control of finished products; call centre management and provision of emergency service in hospitals.

2.2 Definition of related concepts

Related concepts in VaR and ES estimations and also general time series properties are defined in the following sub-sections.

2.2.1 Coherent risk measure.

Let X and Y be the loss function of two individual positions. A risk measure *p(.)* is considered to be coherent if it satisfies the following properties.

a) $p(X+Y) \leq p(X) + p(Y)$ ………………………………………Subadditivity

This property requires that risk measures should account for risk reduction through diversification effects. That is, the risk of a total portfolio should be less or equal to the sum of the risk of individual positions in the portfolio.

b) *p(tX) = tp(X)…………………………………………….Homogeinity*

Loosely speaking this property states that if you increase your portfolio by any amount, then you increase your risk by that same amount as well.

c) *p(X+n) = p(X) – n…………………………………………Risk free condition*

This means that the addition of a sure amount, *n*, to portfolio *X* will decrease the risk by the same amount.

d) *p(X) ≥ p(Y) if X ≤ Y……………………………………….Monotonicity*

If portfolio *Y* always has better values than portfolio *X*, then all things being equal risk of *X* should always be greater than risk of *Y*.

2.2.2 Stationarity

A time series is said to be stationary if the mean and covariance is time invariant. Under strict stationarity, the joint distribution $(r_1, \dots \dots, r_k)$ is similar to that of $(r_{1+t}, \dots, r_{k+t})$ for all *t*, where *k* is an arbitrary positive integer and (1,…,*k*) is a collection of *k* positive integers. Stated otherwise the joint distribution does not depend on time. Practically the strict stationarity condition is hard to apply and verify empirically. Hence the concept of weak stationarity is assumed. A time series r_t is said to be weakly stationary if

a) $\mathbb{E}(r_t) = \mu$ a constant and

b) $cov(r_t, r_s) = \gamma_{t-s}$ which is a function of t-s (time interval) only and does not depend on the actual points in time.

2.2.3 Autocorrelation

The autocorrelation of a time series (r_t), measures the strength of linear dependence of the series across time. The correlation coefficient between two random variables *Y* and *Y* is given by

$$\rho_{xy} = \frac{Cov(x,y)}{\sqrt{Var(x)Var(y)}} = \frac{\mathbb{E}[(x-\mu_x)(y-\mu_y)]}{\sqrt{\mathbb{E}(x-\mu_x)^2\mathbb{E}(y-\mu_y)^2}} \tag{2.2a}$$

where μ_x and μ_y are the mean of *X* and *Y* respectively and the variance is assumed to exist. Assume a weakly stationary series (r_t), then the sample estimate of the autocorrelation coefficient at lag *k* is given by

$$\hat{\rho}\,(k) = \frac{\sum_{t=k+1}^{T}\{(r_t-\bar{r})(r_{t-k}-\bar{r})/T-k-1\}}{\sum_{t=1}^{T}\{(r_t-\bar{r})^2\}/(T-1)} \tag{2.2b}$$

where $\bar{r} = \frac{1}{T}\sum_{t=1}^{T} r_t$ is the sample mean. The autocorrelation coefficient $\hat{\rho}(k) \in [-1,1]$.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter concentrates on the various statistical and mathematical methods used in analysing the data. This includes preliminary analysis to check the behaviour of the data, Volatility models specification, Value-at-Risk and Expected Shortfall methodology and a diagnostic test, which determines if VaR and ES models are correctly specified.

3.1 Preliminary Analysis

This section gives the descriptive statistics of the data, which includes mean, standard deviation, skewness kurtosis, maximum return, minimum return, median and standard error of the mean. As reported in literature, most financial time series data exhibit fat tails. The Jacque-Bera normality test is conducted to see if the data validates the non-normality assumption. A number of other statistical tests are performed to check for a number of desirable properties needed in the return series in order to accurately estimate volatility using the GARCH type models. The Augmented Dickey-Fuller Test is conducted to check if the return series is stationary. The Ljung Box test and the Arch LM test are used to check for autocorrelation and ARCH effects respectively.

3.1.1 Descriptive Statistics

The sample of each selected stock price and GSE-CI were analysed with the following descriptive statistics.

The mean for each data is given by:

$$\mu_{x_i} = \frac{\Sigma x_i}{n_i} \tag{3.1a}$$

The sample standard deviation is given by:

$$\sigma_{x_i} = \sqrt{E[(x_i - \mu_{x_i})^2]} \tag{3.1b}$$

Skewness which measures the asymmetry of the probability distribution of the data series about its mean, is given by:

$$skewness = \frac{1}{n_i}\sum_{j=1}^{n}\left(\frac{x_i - \mu_{x_i}}{\sigma_{x_i}}\right)^3 \tag{3.1c}$$

The kurtosis which measures how peak or flat the distribution of a data is, relative to the normal distribution is given by:

$$kurtosis = \frac{1}{n_i}\sum_{j=1}^{n}\left(\frac{x_i - \mu_{x_i}}{\sigma_{x_i}}\right)^4 \tag{3.1d}$$

3.1.2 ARCH Effects

In order to fit GARCH-type models to the data, the presence of conditional heteroscedasticity (ARCH Effects) must be ascertained. A formal test is needed to determine this. A number of tests are available but this research uses the Lagrange Multiplier (LM) test of Engle (1982). Let $z_t = r_t - \mu_t$ be the residuals of the mean equation. Then z_t^2, the squared series is used to test for the presence of ARCH effects.

3.1.2.1 Lagrange Multiplier (LM) Test

The usual F-Statistics for testing $\alpha_i = 0, (i = 1, \dots, m)$ in linear regression is equivalent to this test.

$$z_t^2 = \alpha_0 + \alpha_1 z_{t-1}^2 + \cdots + \alpha_m z_{t-m}^2 + \varepsilon_t, \quad t = m+1, \dots T$$

where ε_t is the error term, m a pre-specified positive integer and T the sample size. The test statistic is given by

$$F = \frac{(SSR_0 - SSR_1)/m}{SSR_1/(T - 2m - 1)} \qquad (3.1e)$$

where $SSR_0 = \sum_{t=m+1}^{T}(z_t^2 - \varpi)$, $\varpi = \left({}^1/_T\right)\sum_{t=1}^{T} z_t^2$, and $SSR_1 = \sum_{t=m+1}^{T} \hat{\varepsilon}_t^2$, $\hat{\varepsilon}_t^2$ is the least squares residuals of the prior linear regression. F is asymptotically distributed as chi-squared distribution with m degrees of freedom under the null hypothesis $(H_0: \alpha_1 = \cdots = \alpha_m = 0)$. We reject the null hypothesis if the calculated F is greater than the corresponding critical value of the chi-squared distribution with m-degrees of freedom for a specified level of significance (α). Alternatively we reject the null if the p-value of F is less than α.

3.2 Volatility modeling

Accurate estimate and forecast of volatility measures are essential in producing robust VaR estimates (Thupayagale, 2010). Volatility measures compared in this study ranges from RiskMetrics EWMA to a variety of GARCH models.

3.2.1 RiskMetrics (EWMA)

In 1994 the global financial firm, JP Morgan, made its risk metrics methodology available to the public. Under this methodology volatility is expressed as an Exponentially Weighted

Moving Average (EWMA). It is an extension of the historical variance, which assigns a higher weight to recent observations. It allows more recent observations to have a stronger impact on the forecast of the volatility than older ones. The most recent observation is assigned the highest weight whiles the weights of previous ones decay exponentially. The exponentially weighted moving average model can be expressed as:

$$\sigma_{i,t}^2 = (1-\lambda)\sum_{j=0}^{T}\lambda^j\left(r_{it-j}-\bar{r}_i\right)^2 \qquad (3.2a)$$

Stated differently

$$\sigma_{i,t}^2 = \lambda\sigma_{it-1}^2 + (1-\lambda)r_{it-1}^2 \qquad (3.2b)$$

where

$$\sigma_{i,t-1}^2 = (1-\lambda)(r_{it-2}^2 + \lambda r_{it-3}^2 + \lambda^2 r_{it-4}^2 + \cdots + \lambda^{t-3}r_1^2) \qquad (3.2c)$$

where λ $(0 < \lambda < 1)$ is the decay factor. This study follows industry standards and chooses $\lambda = 0.94$.

By assuming the sample mean $\bar{r}_i$ is zero and using the recursive feature of the Exponentially Weighted Moving Average (EWMA) estimator, the *k*-day ahead forecast is given by

$$\sigma_{i,t+k|t}^2 = k\,\sigma_{i,t+1|t}^2 \qquad (3.2d)$$

and

$$\sigma_{i,t+1|t}^2 = \lambda\sigma_{i,t|t-1}^2 + (1-\lambda)\,r_{i,t}^2 \qquad (3.2e)$$

Alternatively the RiskMetrics (EWMA) is equivalent to a normal integrated GARCH (1, 1) model, where the autoregressive parameter is set to 0.94 and the coefficient of r_{it-1}^2 becomes 0.06. In specification we have that r_{it} is iid N(0,1) and σ_{it}^2 is defined as

$$\sigma_{it}^2 = 0.06r_{it-1}^2 + 0.94\sigma_{it-1}^2 \tag{3.2f}$$

3.2.2 Models of changing variance

Most regression models with autocorrelated errors are usually assumed to have error variance terms being constant. In practice this is unreal since volatility in any financial setting is hardly constant over time. Also since error variance at different times is usually unknown, models that account for heteroscedasticity are needed.

The GARCH type models successfully capture various characteristics of financial time series data, such as thick tailed returns and volatility clustering. The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model that was first developed by Bollerslev (1986) is an extension of the ARCH model proposed by Engel (1982). The GARCH model overcomes some of the limitation of the ARCH model such as the principle of parsimony.

3.2.2.1 GARCH (*p*, *q*) model

Consider the log return of an asset at time t given by;

$$r_t = \mu_t + z_t \tag{3.2g}$$

where μ_t is the conditional mean of z_t and z_t is the mean-corrected log return and is given by

$$z_t = \sigma_t \, \varepsilon_t \tag{3.2h}$$

where ε_t is an independent and identically distributed random variable with zero mean and unit variance independent of past realisation of z_{t-i} and

$$\sigma_t^2 = \alpha_0 + \alpha_1 z_{t-1}^2 + \cdots + \alpha_p z_{t-p}^2 + \phi_1 \sigma_{t-1}^2 + \cdots + \phi_q \sigma_{t-q}^2 \tag{3.2i}$$

Stated differently

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i \; z_{t-i}^2 + \sum_{j=1}^{q} \phi_j \; \sigma_{t-j}^2 \tag{3.2j}$$

where α_0, $\alpha_i (i = 1, 2, \ldots, p)$ and $\phi_j (j = 1, 2, \ldots, q)$ are the model parameters. To ensure $\sigma_t^2 > 0$, we assume $\alpha_0 > 0$, $\alpha_i \geq 0$ and $\phi_j \geq 0$.

The model for z_t with property in (3.2j) is known as the Generalized autoregressive conditional heteroscedasticity (GARCH) model of order (*p*, *q*) and denoted as GARCH (*p*, *q*). The conditional variance of the error process is not only to the squares of past errors but also to the past conditional variances. The distribution of the innovation ε_t, is assumed to be standard normal (Gaussian), standardized student-t distribution or the generalized error distribution (GED).

The GARCH model extends the ARCH model by introducing *q* new parameters for the volatility equation. It is clear that when *q* = 0 in equation (3.2j) it reduces to an ARCH (*p*) model. The parameters α_i and ϕ_j are known as the ARCH and GARCH parameters respectively.

It could be quite misleading to conclude that the conditional variance follows an ARMA (*p*, *q*) model with *p* being the AR order and *q* the MA order. In an ARMA process the associated error is a white noise process corresponding to the one – step ahead forecast error.

Let $a_t = z_t^2 - \sigma_t^2$ then $\sigma_t^2 = z_t^2 - a_t$

By substituting σ_t^2 into equation (3.2j)

$$z_t^2 - a_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \left(z_{t-i}^2 - a_{t-i}\right) + \sum_{j=1}^{q} \phi_j \, z_{t-j}^2 \qquad (3.2k)$$

$$z_t^2 = \alpha_0 + \sum_{i=1}^{r} (\alpha_i + \phi_i) \, z_{t-i}^2 - \sum_{j=1}^{p} \alpha_j \, a_{t-j}^2 + a_t \qquad (3.2l)$$

where $r = \max\ (p, q)$, $\alpha_i = 0$ for $i > p$ and $\phi_i = 0$ for $i > q$

Thus the GARCH (p, q) model in equation (3.2h) and (3.2j) implies that z_t^2 follows an ARMA (r, q) model where $r = \max(p, q)$.

3.2.2.2 Estimation of GARCH (*p*, *q*) model

This section deals with the maximum likelihood estimation of the GARCH (p, q) parameter. After identifying the orders p and q, the initial variances and the squared returns, the parameters $\alpha_0, \alpha_1, \dots, \alpha_p, \phi_1, \dots, \phi_q$, of the model can be estimated using the maximum likelihood estimation method. The estimates of the parameters are obtained through maximizing the conditional likelihood function given by;

$$L(\alpha_0, \boldsymbol{\alpha}, \boldsymbol{\phi} \mid z_t, \sigma_t^2) = \prod_{t=1}^{T} \left(\frac{1}{2\pi\sigma_t^2}\right)^{1/2} \exp\left(\frac{-z_t^2}{2\sigma_t^2}\right) \qquad (3.2m)$$

or the conditional log-likelihood function

$$\ln L(\alpha_0, \boldsymbol{\alpha}, \boldsymbol{\phi} \mid z_t, \sigma_t^2) = \sum_{t=1}^{T} \frac{1}{2} \left(-\ln(2\pi) - \ln(\sigma_t^2) - \frac{z_t^2}{\sigma_t^2}\right) \qquad (3.2n)$$

where

$$\boldsymbol{\alpha} = (\alpha_1, \dots, \alpha_p) \ \text{ and } \boldsymbol{\phi} = (\phi_1, \dots, \phi_q) \qquad (3.2o)$$

3.2.2.3 Forecasting with GARCH (*p*, *q*) model

Considering the GARCH model specified in equation (3.2h) and (3.2j), the *k*-step ahead volatility forecast can be obtained using similar methods as those used in an ARMA model. Taking a forecast origin of h and Substituting the estimates of α_i $(i = 1, \dots, p)$ and ϕ_j $(j = 1, \dots, q)$ with their actual values and assuming $z_h^2, \dots, z_{h+1-p}^2, \sigma_h^2, \dots, \sigma_{h+1-q}^2$ are known. Then the *k*-step ahead volatility forecast is given by

$$\begin{aligned} z_h^2(k) &= \mathbb{E}(z_{h+k}^2 \mid z_h) \\ &= \alpha_0 + \sum_{i=1}^{p}(\alpha_i + \phi_i)\, \mathbb{E}(z_{h+k-i}^2 \mid z_h) - \sum_{j=1}^{q} \phi_j\, \mathbb{E}\big(a_{h+k-j} \mid z_h\big) + a_h \\ &= \sigma_h^2(k) \end{aligned} \tag{3.2p}$$

Solving recursively, $\mathbb{E}(z_{h+k}^2 \mid z_h)$ for $i < k$ can be obtained. $\mathbb{E}\big(a_{h+k-j} \mid z_h\big) = 0$ for $j \geq k$ and $\mathbb{E}\big(a_{h+k-j} \mid z_h\big) = a_{h+k-j}$ for $j < k$.

3.2.3 EGARCH (*p*, *q*) model

To accommodate the asymmetric relation between many financial time series data and their volatility changes, Nelson (1991) proposed the exponential GARCH (EGARCH) model. To allow for asymmetric effects between positive and negative asset returns, he considers the weighted innovation

$$g(\varepsilon_t) = \theta + \gamma[|\varepsilon_t| - \mathbb{E}(|\varepsilon_t|)] \tag{3.2q}$$

where θ and γ are real constants. Both ε_t and $\mathbb{E}(|\varepsilon_t|)$ are independent and identically distributed sequences with continuous distributions and zero mean. By rewriting we have

$$g(\varepsilon_t) = \begin{cases} (\theta + \gamma)\varepsilon_t - \gamma\mathbb{E}(|\varepsilon_t|) & if\ \varepsilon_t \geq 0 \\ (\theta - \gamma)\varepsilon_t - \gamma\mathbb{E}(|\varepsilon_t|) & if\ \varepsilon_t < 0 \end{cases} \tag{3.2r}$$

The asymmetry of $g(\varepsilon_t)$ can easily be seen.

For $r_t = \mu_t + z_t$ an EGARCH (p, q) model can be written as

$z_t = \sigma_t \varepsilon_t$ and

$$\ln(\sigma_t^2) = \alpha_0 + \frac{1 + \phi_1 + \cdots + \phi_q \mathcal{B}^q}{1 - \alpha_1 - \cdots - \alpha_p \mathcal{B}^p} \mathcal{g}(\varepsilon_{t-1}) \tag{3.2s}$$

where α_0 is a constant, $\mathcal{B}$ is the lag operator such that $\mathcal{B}\mathcal{g}(\varepsilon_t) = \mathcal{g}(\varepsilon_{t-1})$ and $1 + \phi_1 \mathcal{B} + \cdots + \phi_q \mathcal{B}^q$ and $1 - \alpha_1 - \cdots - \alpha_p \mathcal{B}^p$ are polynomials who's zeros have absolute values greater than 1.

Some properties of the EGARCH model can be obtained in similar ways as that of the GARCH model. This is because in describing the evolution of the conditional variance of z_t, the EGARCH model uses the usual ARMA parameterization.

3.2.3.1 Forecasting EGARCH (*p*, *q*) model

Since the EGARCH model uses the usual ARMA parameterization to describe the evolution of the conditional variance, we forecast using similar methods to that of an ARMA model

3.3 Value-at-Risk (VaR)

Credit risk, model risk, liquidity risk, market risk and operational risk are a few examples of risk facing financial institutions. Value-at-Risk is one way of evaluating market risk. VaR can be defined as the worst possible loss over a given time period at a given confidence level.

The VaR of a portfolio at α $[0 \leq \alpha \leq 1]$ confidence level is the smallest number ℓ such that the probability of the worst possible loss on the portfolio (ω) being more than ℓ is at most $(1-\alpha)$. Mathematically,

$$VaR_{\alpha} = inf\{\ell \in \mathbb{R} : P(\omega > \ell) \leq 1-\alpha\} \tag{3.3a}$$

Therefore in plain terms VaR is simply the quantile of the loss distribution.

3.3.1 VaR under RiskMetrics (EWMA)

RiskMetrics assumes that $r_t|F_{t-1} \sim N(\mu_t, \sigma_t^2)$ where μ_t is the conditional mean and σ_t^2 is the conditional variance of r_t. F_{t-1} is the set of available information at time t-1. The RiskMetrics also assumes that μ_t and σ_t^2 evolve over time according to the simple model given by

$\mu_t = 0$ and

$$\sigma_t^2 = \lambda\sigma_{t-1}^2 + (1-\lambda), \quad 0 < \lambda < 1 \tag{3.3b}$$

Given the tail probability RiskMetrics EWMA uses the result of $r_t|F_{t-1}{\sim}N(0, \sigma_{t-1}^2)$ to calculate VaR. For instance if the tail probability is set at 5%, then the one-step ahead VaR is given by

$$\mathrm{VaR}(1{,}0.95) = 1.645\sigma_t(1) \tag{3.3c}$$

This gives the upper 95$^{\text{th}}$ percentile of a normal distribution with mean 0 and standard deviation σ_t. Therefore under the 5% tail probability the one-step ahead VaR for a long position is given by

$$\mathrm{VaR}(1{,}0.95) = \mathit{Amount\ of\ position} \times 1.645\sigma_t(1) \tag{3.3d}$$

3.3.2 VaR under GARCH type models

Consider a general regression model for the log return of an asset at time t denoted as r_t, which can be written as

$$r_t = \theta_0 + \sum_{i=1}^{m} \theta_i \, r_{t-i} - \sum_{j=1}^{s} \beta_j \, z_{t-j} + z_t \tag{3.3e}$$

$$z_t = \sigma_t \varepsilon_t$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i z_{t-i}^2 + \sum_{j=1}^{q} \phi_j \, \sigma_{t-j}^2 \tag{3.3f}$$

The mean and volatility equations for r_t are given by equations (3.3a) and (3.3b) respectively. Assuming all parameters are known, then the above stated equations can be used to obtain a 1-step ahead forecast of the conditional mean $(\hat{\mu}_t)$ and variance $(\hat{\sigma}_t^2)$ of r_t.

$$\hat{\mu}_t(1) = \theta_0 + \sum_{i=1}^{m} \theta_i \, r_{t+1-i} - \sum_{j=1}^{s} \beta_j \, z_{t+1-j} \tag{3.3g}$$

$$\hat{\sigma}_t^2(1) = \alpha_0 + \sum_{i=1}^{p} \alpha_i \, z_{t+1-i}^2 + \sum_{j=1}^{q} \phi_j \, \sigma_{t+1-j}^2 \tag{3.3h}$$

As stated in section (3.2.2.1) the innovation (ε_t) is assumed to have a Gaussian distribution, standardized student-*t* distribution or Generalized Error Distribution (GED). For purposes of this study we assume ε_t follows a Gaussian distribution or student-*t* distribution.

If ε_t follows a Gaussian distribution, then the distribution of r_{t+1} conditional on information available at time t is N $\left(\hat{\mu}_t(1)\,,\ \hat{\sigma}_t^2(1)\right)$. Quantiles of this conditional distribution can be obtained for a 1-step ahead VaR calculation. The quantile for the innovation in this case will be $\hat{\mu}_t(1) + N_\alpha \hat{\sigma}_t(1)$. Where N_α is the appropriate standard normal deviate. For example the 99% quantile would be $N_{0.99} = -2.326$ and therefore

$$\mathrm{VaR}(1,0.99) = \hat{\mu}_t(1) + (-2.326)\hat{\sigma}_t^2(1) \qquad (3.3i)$$

If ε_t follows a student-*t* distribution with *v* degrees of freedom, then its associated quantile used to calculate a 1-step ahead VaR is $\hat{\mu}_t(1) + t_v^*(p)\hat{\sigma}_t(1)$. Where $t_v^*(p)$ is the p^{th} quantile of a student-*t* distribution with *v* degrees of freedom.

If at time *t* we are interested in calculating a *k*-step ahead VaR then a *k*-step ahead conditional mean $\left(\hat{\mu}_t(k)\right)$ and a *k*-step ahead conditional variance $\left(\sigma_t^2(k)\right)$ is used in the quantile calculations. The Basel Accord recommends 99% confidence level but in addition this paper will also investigates 95% confidence levels for better comparison.

Since VaR does not concern itself with tail loss, it only tells us the maximum loss we expect if the tail event does not happen (Dowd, 2007), we consider a risk measure that takes into account tail loss. This is discussed in the following section.

3.4 Expected Shortfall (ES)

Closely related to VaR is Expected Shortfall (ES), which quantifies the expected value of the loss given the VaR violation has occurred. Consider the worst possible loss ω. Assume ω has a continuous function F_ω, then at $\alpha \in (0,1)$ confidence level, ES is defined as

$$\mathrm{ES}_\alpha = \mathbb{E}(\omega | \omega > \mathrm{VaR}_\alpha) \qquad (3.4a)$$

3.4.1 ES under RiskMetrics

Given a tail probability p, VaR is just the (1-p)th quantile of the loss function. Practically if the loss does actually occur, the value can be greater than the estimated VaR. In this regard we consider the expected value of the loss if the VaR amount is exceeded.

Under the RiskMetrics, the loss function is normally distributed so that the conditional distribution of the loss function given that the VaR is exceeded is a truncated normal distribution (truncated from below). Consider a standard normal distribution, $X \sim N(0,1)$. For a given upper tail probability p and VaR_q, where $q = 1 - p$, then,

$$\mathbb{E}(x|x > \text{VaR}_q) = f(\text{VaR}_q)/p \tag{3.4b}$$

where

$$f(x) = \left(\frac{1}{\sqrt{2\pi}}\right) exp\left(-x^2/_2\right) \tag{3.4c}$$

is the pdf of X. It follows that the ES for a return series r_t with conditional distribution $\text{N}(0, \sigma_t^2)$ is then

$$\text{ES}_q = \frac{f(\text{VaR}_q)}{p}\sigma_t \tag{3.4d}$$

Example if $p = 0.05$ then $\text{VaR}_{0.95} \approx 1.645$ and

$$\frac{f(\text{VaR}_q)}{p} = \frac{f(1.645)}{0.05} = 2.0627 \tag{3.4e}$$

∴ it follows that the one-step ahead expected shortfall under RiskMetrics at 95th percentile is

$$\text{ES}(1{,}0.95) = 2.0627\sigma_t(1) \tag{3.4f}$$

3.4.2 ES under GARCH type models with conditional normality

Following the results above, we calculate the ES when the conditional distribution of the return series is $N(\mu_t, \sigma_t^2)$. The ES at the qth quantile is

$$\mathrm{ES}_q = \mu_t + \frac{f(x_q)}{p}\sigma_t \tag{3.4g}$$

where q = 1- p and x_q is the qth quantile of the standard normal distribution. For a example if p = 0.01 then the one-step ahead ES is given by

$$\mathrm{ES}(1{,}0.99) = \mu_t(1) + 2.6652\sigma_t(1) \tag{3.4h}$$

3.5 Model selection criteria

There are several information criteria that can be used to determine the order of a model. The Akaike Information Criteria (AIC) by Akaike (1974), Bayesian Information Criterion (BIC) by Schwartz (1978) and Hannan-Quinn (HQ) by Hannan & Quinn (1979) are some of the criteria available. Any model selection criteria seek to strike a balance between the measure of goodness of fit and the parsimonious specification of the model. The AIC, BIC, HQ etc values of competing models are used in ranking the models. The model with the lowest value is chosen. In case two or more competing models have similar values, then the model with the least number of parameters is chosen. AIC and BIC would be used in this thesis.

3.5.1 Akaike Information Criteria (AIC)

The largely accepted and used information criterion proposed by Akaike (1974) is defined as

$$\mathrm{AIC} = -2\ln(likelihood) + 2(\text{number of parameters in the model}) \tag{3.5a}$$

The likelihood function is evaluated as the maximum likelihood estimates. The first term measures the goodness of fit whiles the second term is the penalty function, since it penalizes a competing model by the number of parameters used.

3.5.2 Bayesian Information Criterion (BIC)

BIC is another widely used criterion. It was proposed by Schwartz (1978) and is defined as

$$\mathrm{BIC} = \mathrm{k}\ln(n) - 2(\log \mathrm{likelihood}) \qquad (3.5b)$$

where n is the length of time series or sample size. The BIC just like the AIC can be used to compare in-sample and out-sample forecasting performance of a model.

3.5.3 Model Adequacy Checks

Any fitted model should be checked for model adequacy. An adequately fitted model has the residuals of the series behaving like a white noise (Tsay, 2005). The ACF and Ljung-Box statistics of the residuals can be used to check the closeness of the residuals to white noise. Specifically the Ljung-Box statistics of the standardized residuals can be used to check the adequacy of the mean equation and that of standardized squared residuals used to check the adequacy of the volatility equation. The Skewness, kurtosis and Q-Q plot of the standardized residuals used to check the validity of the distributional assumption.

If a fitted model is inadequate it should be refined. Example; if some of the estimated coefficients are not statistically significant, then the model should be simplified by removing the insignificant parameters. If ACF of the residuals shows additional serial correlations, the model should be extended to take care of those correlations.

3.6 Model Validation

To mimic actual industry practice, the data set was divided into two. The initialization set (in-sample) and the verification set (out-of-sample). Model parameters were estimated with the initialization set while the verification set was used to validate the model. It is necessary to know how well a model forecasts so we use the verification set to compare with the forecasted values.

3.6.1 Assessment of Forecast Accuracy

A number of measures have been proposed for assessing the predictive accuracy of GARCH-type models. Amongst them, the Mean square error (MSE) and Mean absolute error (MAE) are used.

The MSE is defined as

$$\mathrm{MSE} = \sum_{t=1}^{T} \frac{(x_t^2 - \hat{\sigma}_t^2)^2}{T} \tag{3.6a}$$

where x_t^2 is the squared time series observation and $\hat{\sigma}_t^2, t = 1, \dots, T$ is the estimated conditional variance from the fitted model. Alternatively the Mean absolute error (MAE) proposed by Lopez (1999) is defined as

$$\mathrm{MAE} = \sum_{t=1}^{T} \frac{|x_t^2 - \hat{\sigma}_t^2|^2}{T} \tag{3.6b}$$

3.7 Back-testing

Failure rate is the number of times returns exceed (in absolute value) the forecasted VaR. Back-testing is a statistical procedure that examines whether the failure rate is in line with the specified confidence level. If the model is correctly specified, the failure rate should be equal to the specified VaR level. For example if at 99% confidence level daily VaR estimates are computed for 100 trading days, then we would expect on average 1 VaR violation during this period. These types of statistical tests are known as test of unconditional coverage. This study uses the Kupiec test to back-test its VaR models.

3.7.1 Kupiec Test

Kupiec (1995) proposed the proportion of failures test (POF). This test checks whether the observed number of VaR exceedance as compared to the expected number is statistically reasonable. Simply put POF test, measures whether the number of exceedance is consistent with a given confidence level.

Let the number of exceedance be x and number of observations be *N*. Then the failure rate is given by ${x}/{N}$. It is clear that x follows a binomial distribution since an observation results in either a VaR exceedance or not. Now assuming model accuracy the observed failure rate $\hat{p} = {x}/{N}$ should be an unbiased estimate of the expected failure rate specified by the confidence level *p*. In essence the POF test just determines if $\hat{p}$ is significantly different from *p*.

The null hypothesis under the POF test is

$$\mathrm{H_o}: p = \hat{p} = {x}/{N} \tag{3.8a}$$

According to (Kupiec, 1995), the POF-test is best evaluated as a likelihood-ratio (LR) test. The test statistic takes the form

$$LR_{POF} = -2\ln\left\{\frac{(1-p)^{N-x}p^{x}}{\left[1-\frac{x}{N}\right]^{N-x}\left(\frac{x}{N}\right)^{x}}\right\} \tag{3.8b}$$

If the null hypothesis is true, the LR_{POF} statistic is asymptotically chi-squared (χ^2) with one degree of freedom. If the LR_{POF} statistic exceeds the critical value of the χ^2 distribution, the null hypothesis is rejected and the VaR model is considered to be inaccurate.

3.8 Conclusion

This chapter has given a detailed approach to methods used in analysing the data. The empirical findings based on this methodology are presented in the next chapter.

CHAPTER FOUR

ANALYSIS

4.0 Introduction

This chapter details the analysis and discussion of results obtained from the analysis. It is divided into 4 sections. Section 4.1 deals with data description, summary statistics and preliminary analysis. Volatility model estimation is presented under section 4.2. Section 4.3 deals with VaR and ES model estimation and forecasting and diagnostic test to check the volatility model which best estimates VaR and ES. Conclusions of findings are presented under section 4.4.

4.1 Summary Statistics and Data Description

The data consists of the daily closing prices of six individual stocks listed on the Ghanaian stock market and the daily closing value of the stock market index. The data under consideration, spans from January 2000 to December 2013, covering a total period of 14 years. Due to the small changes or no change at all in the day-to-day prices, bi-weekly simple returns are used instead of daily simple returns. Fanmilk Ghana Limited (FML) and the Ghana Stock Exchange Composite Index (GSE-CI) consist of 365 observations.

In July 2007, the Ghanaian cedi was redenominated; therefore the daily closing prices for FML stock before July 2007 were also redenominated. That is all daily closing prices before July 2007 were also redenominated. This was done by dividing the daily closing prices of FML stock before July 2007, by 10,000. The GSE-CI started with a base level of 100, however on 31st December 2010 it was rebased to 1,000. Therefore all daily closing values of the GSE-CI up to and including 31st December 2010 were rebased to 1000.

The data for this study was obtained from the Ghana Stock Exchange. Bi-weekly simple stock return is calculated as

$$r_t = \left(\frac{p_t - p_{t-k}}{p_{t-k}}\right)$$

Where p_t is the t-th bi-weekly price.

The first 215 observations are used for in-sample parameter estimates whiles the last 150 observations used for out-of –sample volatility forecasting as well as VaR and ES calculation and back-testing.

Table 4.1 shows the descriptive statistics for the simple returns of FML stock and GSE-CI.

4.1.1 Brief summary on FML and GSE-CI stocks.

- **Fan Milk Limited (FML)**

  FML was listed on the Ghana stock exchange on 18 October 1991. Its core business is manufacturing of dairy products such as Fanmilk and Fanyogo. They also produce Fandango and Fanice in various flavours. Market capitalization as at December 2013 was 785.86 million Ghana cedis.

- **Ghana Stock Exchange – Composite Index (GSE-CI)**

  This is the main stock index of the Ghana Stock Exchange and it is calculated from the daily closing price of all the listed stocks on the stock exchange market. As at December 2013, the market capitalization of the stock market was 60.39 billion Ghana cedis.

Table 4.A: Summary descriptive statistics for percentage bi-weekly returns of FML and GSE-CI

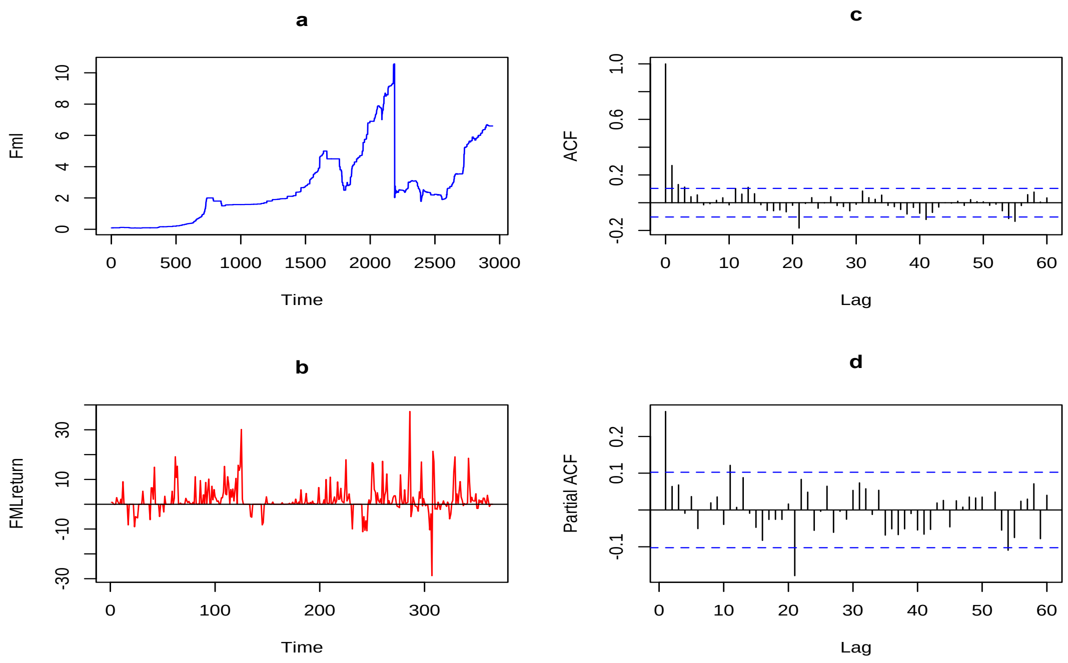
	FML	GSECI
Sample	365	365
Mean	1.693	0.781
S.E mean	0.289	0.153
Median	0.096	0.354
Std. Dev	5.539	2.932
Min	-28.80	-13.772
Max	37.389	13.818
Skewness	1.531	0.2882
Excess Kurtosis	9.829	5.5163
Jarque-Bera	1634.11	475.77
	(0.000)	(0.000)

Source: Author's calculations based on sampled data. P-value of Jarque-Bera statistic is in brackets.

From Table 4.1, the mean, median, standard deviation, skewness and excess kurtosis of bi-weekly return of FML stock and GSE-CI is shown. It can be seen that both FML stock returns and the index are right skewed. Their excess kurtosis is far in excess of the normal kurtosis of 3. This implies that, the stock returns are not normally distributed but rather fat tailed. This is confirmed by the Jarque-Bera statistics, which is significant at 1% significant level for FML and the index.

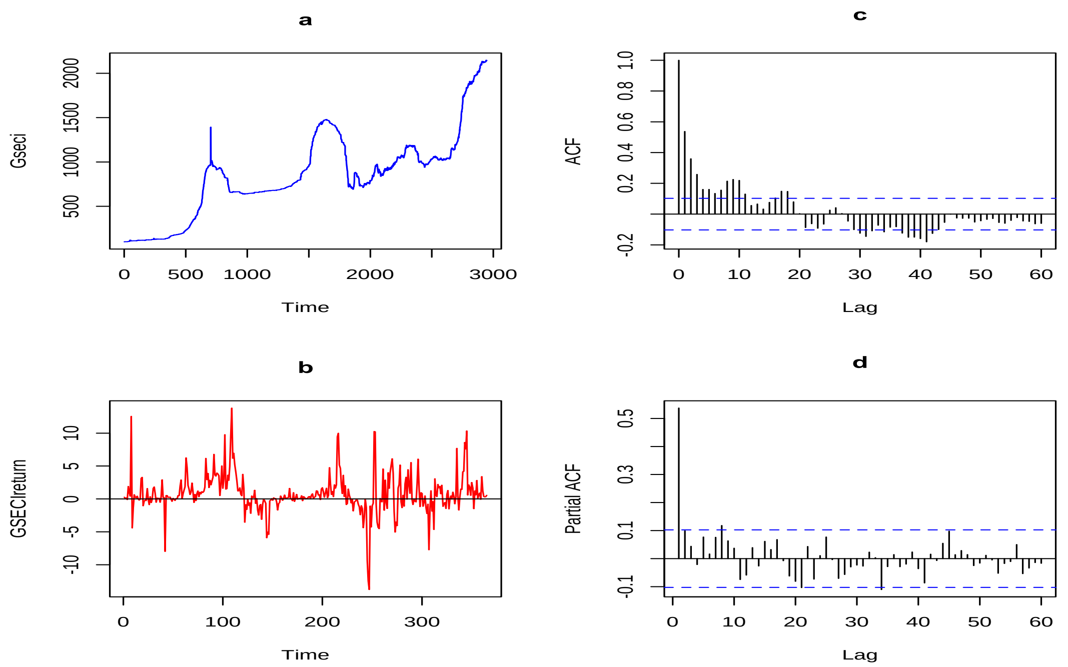
To test for serial correlation in the simple return series, the Autocorrelation function (ACF) plot and the Partial Autocorrelation function (PACF) plot of the return series was obtained. The ACF plot for FML and GSE-CI show a number of spikes indicating that there is some significant serial correlation in the return series. Their corresponding Ljung-Box statistics confirms that there is serial dependence at 5% significance level amongst the return series of the above-mentioned stock and index.

The Ljung-Box statistics at lags (1, 10 and 30) is shown in Table 4.3 (the results of all lags for FML is given in Table 1B and that of GSE-CI in Table 2B in Appendix B) whiles the ACF and PACF plots of the FML stock and index are shown in Figures 4.1 and 4.2.



a) Daily prices of FML stock for the period 3/01/00 to 27/12/13. b) Biweekly simple returns for FML stock. c) Sample Autocorrelation function plot for FML biweekly simple returns. d) Sample Partial autocorrelation function plot for FML biweekly simple returns.

Figure 4.1: FML plots



a) Daily prices of GSECI stock for the period 3/01/00 to 27/12/13. b) Biweekly simple returns for GSECI. c) Sample Autocorrelation function (ACF) plot for GSECI biweekly simple returns. d) Sample Partial ACF plot for GSECI biweekly simple returns.

Figure 4.2: GSE-CI plots

A desirable property of time series data is stationarity. To check for this property, the Augmented Dickey-Fuller (ADF) test was conducted on the return series. At 5% level of significance, the null hypothesis of unit root test is rejected for both FML and GSE-CI. It can therefore be concluded that, the simple return series of FML stock and GSE-CI are stationary over the period under consideration. The results of the ADF test are shown in Table 4.2.

Table 4.2: Augmented Dickey-Fuller Test for bi-weekly return series of FML and GSE-CI

	FML	GSECI
Nc	-9.86 (0.01)	-7.85 (0.01)
C	-10.76 (0.01)	-8.26 (0.01)
Ct	-10.75 (0.01)	-8.27 (0.01)

SOURCE: Author's own calculation based on sample data. NOTE: P-values of corresponding test statistics are in brackets. Actual P-values are smaller than printed P-values. Nc represents a time series with no constant and time trend. C is for a regression with intercept but no time trend. Ct is for a regression with an intercept (constant) and time trend.

A test for serial correlation (autocorrelation) was done to confirm the presence of serial dependence. The results of the Ljung Box (Q) test performed for lags (1,10 and 30) are shown in Table 4.3. The null hypothesis that the first *m* lags of the autocorrelation function of the series is zero, was rejected at 5% level of significance for FML and GSECI.

Table 4.3: Ljung-Box Test for autocorrelation in simple returns of FML and GSE-CI

Lags	FML	GSEC-CI
1	26.44 (0.000)	106.21 (0.000)
10	40.28 (0.000)	267.80 (0.000)
30	74.51 (0.000)	324.5 (0.000)

SOURCE: Author's own calculation based on sample data. NOTE: P-values of corresponding test statistics are in brackets.

To remove the serial dependence an Arima (1, 0, 1) was fitted to the return series. The residuals were tested for autocorrelation and it was significant at 5% level of significance. The Ljung-Box test for the residuals of fitted Arima model for selected lags is shown in

Table 4.4. The results of all lags for FML is given in Table 1B and that of GSE-CI in Table 2B in Appendix B

Table 4.4: Ljung-Box Test for serial correlation in the residuals of FML and GSEC-CI

Lags	FML	GSE-CI
1	0.015 (0.901)	0.021 (0.885)
10	4.08 (0.944)	11.22 (0.340)
30	37.74 (0.157)	39.10 (0.123)

SOURCE: Author's own calculation based on sample data. NOTE: P-values of corresponding test statistics are in brackets.

A test for Autoregressive Conditional Heteroscedasticity (ARCH effects) was done to confirm the presence of heteroscedasticy (changing variance over time), in the residuals of the fitted mean equation model. The Lagrange Multiplier (LM) test proposed by Engle (1982) was used. The results of selected lags are shown in Table 4.5 (the results of all lags for FML is given in Table 1B and that of GSE-CI in Table 2B in Appendix B). The null hypothesis that, there are no arch effects was rejected at 5% level of significance for both FML and GSE-CI at all lags.

Table 4.5: Engle's LM test for Arch effects in the residuals of the fitted ARIMA model

	FML	GSE-CI
1	45.57 (0.000)	47.41 (0.000)
10	47.86 (0.000)	41.47 (0.000)
30	93.42 (0.000)	65.15 (0.000)

SOURCE: Author's own calculation based on sample data. NOTE: P-values of corresponding test statistics are in brackets.

Since the return series for GSE-CI and FML satisfy the properties of GARCH-type volatility models, we estimate models of generalized autoregressive heteroscedasticity (GARCH) type models.

4.2 Model Estimation

Since all the desirable properties have been satisfied, we determine the order of the model. The ACF and PACF graphs of the series helps determine the Moving Average (MA) order and Autoregressive (AR) order respectively. From the ACF and PACF graphs of FML in figure 4.1, the ACF tails off at lag 2 whiles the PACF at lag 1. This suggest an ARMA (1, 2) for FML. Looking at figure 4.2, the ACF cuts off at lag 2 whiles PACF at lag 1. Therefore an ARMA (1, 2) is also suggested for GSE-CI. However to get the best fit model we build our models around the suggested model and the one with the lowest AIC and/or BIC value is selected.

4.2.1 Model selection

We build the mean equation (ARIMA model) and variance equation (GARCH) type models around the suggested ARMA model for FML and GSE-CI. The AIC and BIC values are used to select the best models. Results are shown in Tables 4.6 – 4.8.

Table 4.6: Selection criteria for mean equation

ARIMA	FML		GSECI	
	AIC	BIC	AIC	BIC
ARIMA (1,0,1)	**-1098.75**	**-1083.15**	-1661.78	**-1646.18**
ARIMA(1,0,2)	-1097.08	-1077.58	-1660.12	-1640.61
ARIMA (2,0,1)	-1097.01	-1077.51	**-1662.64**	-1643.15
ARIMA (2,0,2)	-1097.54	-1074.14	-1658.78	-1635.38

From Table 4.6 an ARIMA (1, 0, 1) is selected as the mean equation for both FML and GSECI. This model had the lowest AIC and BIC value for FML. For GSECI an ARIMA (2, 0, 1) and ARIMA (1, 0, 1) were chosen by the AIC and BIC selection criteria respectively, however an ARIMA (1, 0, 1) was chosen because of the principle of parsimony.

Table 4.7: GARCH Model Selection

		FML		GSECI	
		Normal	Student-t	Normal	Student-t
GARCH(1,1)	AIC	**-3.646**	-4.579	-4.922	**-5.762**
	BIC	**-3.552**	-4.469	-4.828	**-5.653**
GARCH(1,2)	AIC	-3.627	**-4.626**	-4.893	-5.752
	BIC	-3.517	**-4.500**	-4.784	-5.627
GARCH(2,1)	AIC	-3.638	-4.568	**-4.979**	-5.757
	BIC	-3.528	-4.442	**-4.869**	-5.632
GARCH(2,2)	AIC	-3.643	-4.616	-4.884	-5.748
	BIC	-3.518	-4.475	-4.758	-5.607

For GARCH (*p*, *q*) model with normally distributed innovations a GARCH (1, 1) is chosen for FML whiles a GARCH (2, 1) is chosen for GSECI. If innovations follow a student-*t* distribution then a GARCH (1, 2) is chosen for FML and GARCH (1, 1) for GSECI. These models were chosen because they had the lowest AIC and BIC values. Results are shown in Table 4.7.

Table 4.8: EGARCH model selection

		FML		GSECI	
		Normal	Student-t	Normal	Student-t
EGARCH(1,1)	AIC	-3.688	-4.608	-5.024	-5.795
	BIC	-3.579	-4.483	-4.915	-5.670
EGARCH(1,2)	AIC	**-3.974**	-4.598	-5.074	-5.797
	BIC	**-3.849**	-4.457	-4.949	-5.656
EGARCH(2,1)	AIC	-3.726	-4.953	**-5.488**	**-5.919**
	BIC	-3.585	**-4.796**	**-5.347**	**-5.762**
EGARCH(2,2)	AIC	-3.835	**-4.962**	-5.459	-5.899
	BIC	-3.678	-4.789	-5.310	-5.726

For FML an EGARCH (1, 2) with normal distribution and EGARCH (2, 1) with student-*t* distribution is chosen. On the other hand an EGARCH (2, 1) with both normal and student-*t* distributions are chosen for GSECI. Even though for FML EGARCH (2, 2) had the lowest AIC value, EGARCH (2, 1) was chosen because of the principle of parsimony. AIC and BIC values are given in Table 4.8.

4.2.2 Parameter Estimate of selected models

Having selected the mean and variance equation for both returns we estimate the parameters of each model with the initial set of 215 observations. The results of the parameter estimates for FML are shown in Tables 4.9 and 4.10.

Table 4.9: Parameter estimates of ARMA (1, 1)-GARCH type models for biweekly returns of FML

	Normal distribution		Student t-distribution	
	GARCH (1, 1)	EGARCH (1, 2)	GARCH (1, 2)	EGARCH (2, 1)
	Mean Equation			
mu	0.012994	0.020369	0.000319	0.000079
	(0.021)	(0.000)	(0.038)	(0.000)
ar1	0.790410	0.891754	0.867354	0.999983
	(0.000)	(0.000)	(0.000)	(0.000)
ma1	-0.513224	-0.644387	-0.860842	-0.999510
	(0.0001)	(0.000)	(0.000)	(0.000)
	Variance Equation			
α_0	0.000502	-2.486239	0.000	-0.382301
	(0.003)	(0.000)	(1.00)	(0.000)
α_1	0.239613	0.0195715	0.483626	-0.547468
	(0.011)	(0.000)	(0.0002)	(0.000)
α_2	NA	NA	NA	1.141238
				(0.000)
β_1	0.4750	-0.071532	0.000021	0.960569
	(0.0005)	(0.000)	(0.995)	(0.000)
β_2	NA	0.699326	0.515215	NA
		(0.000)	(0.000)	
γ_1	NA	0.930458	NA	0.548288
		(0.000)		(0.000)
γ_2	NA	NA	NA	-1.138072
				(0.000)
	Specifications Test			
Q(9)	4.0727	4.233454	1.68517	0.031177
	(0.6739)	(0.6355)	(0.9941)	(1.000)
Q2(9)	2.2030	1.0421	7.7280	0.038303
	(0.8794)	(0.9711)	(0.4155)	(1.000)
ARCH(7)	1.997	1.6476	0.479227	0.018535
	(0.7179)	(0.8116)	(0.9834)	(1.000)

Source: Authors own calculation based on sampled data. Note: Corresponding p-values are in brackets. Q(.) and ARCH(.) are the Ljung-Box and Arch LM test statistics for the standardized residuals. Q2(.) is the Ljung-Box test statistics for the standardized squared residuals.

Table 4.10: Parameter estimates of simplified ARMA-GARCH type models for biweekly returns of FML

	Normal distribution		Student t-distribution	
	GARCH (1, 1)	EGARCH (1, 2)	GARCH (1, 2)	EGARCH (2, 1)
		Mean Equation		
mu	0.012994 (0.021)	0.020369 (0.000)	0.00032 (0.038)	0.000079 (0.000)
ar1	0.790410 (0.000)	0.891754 (0.000)	0.86739 (0.000)	0.999983 (0.000)
ma1	-0.513224 (0.0001)	-0.644387 (0.000)	-0.86089 (0.000)	-0.999510 (0.000)
		Variance Equation		
α_0	0.000502 (0.003)	-2.486239 (0.000)	NA	-0.382301 (0.000)
α_1	0.239613 (0.011)	0.0195715 (0.000)	0.48390 (2.4e-04)	-0.547468 (0.000)
α_2	NA	NA	NA	1.141238 (0.000)
β_1	0.4750 (0.0005)	-0.071532 (0.000)	NA	0.960569 (0.000)
β_2	NA	0.699326 (0.000)	0.51510 (0.000)	NA
γ_1	NA	0.930458 (0.000)	NA	0.548288 (0.000)
γ_2	NA	NA	NA	-1.138072 (0.000)
		Specifications Test		
Q(9)	4.0727 (0.6739)	4.233454 (0.6355)	1.68505 (0.9941)	0.031177 (1.000)
Q2(9)	2.2030 (0.8794)	1.0421 (0.9711)	7.7339 (0.4148)	0.038303 (1.000)
ARCH(7)	1.997 (0.7179)	1.6476 (0.8116)	0.479035 (0.9834)	0.018535 (1.000)

Source: Authors own calculation based on sampled data. Note: Corresponding p-values are in brackets. Q(.) and ARCH(.) are the Ljung-Box and Arch LM test statistics for the standardized residuals. Q2(.) is the Ljung-Box test statistics for the standardized squared residuals.

From Table 4.9, the specifications test suggests that, the above-specified models can be adequate. Even though the parameter estimates of the above specified models meet the general requirements of their fitted models, the estimates of α_0 and β_1 for ARMA (1, 1) – GARCH (1, 2) with student-*t* distribution are not statistically significant at 5% level. Therefore this model can be simplified by dropping the non-significant parameters, since they add little explanatory power to the model. We set the non-significant parameters to zero and the resulting model parameter estimates is shown in table 4.10. In further analysis model results in table 4.10 is used.

The significance of γ_1 and γ_2 indicate that there is asymmetry. The negative coefficient of γ_2 indicates the presence of leverage effect. Therefore for FML return series, the following fitted models can be specified.

ARMA (1, 1) – GARCH (1, 1) with normally distributed innovations:

$$r_t = 0.013 + 0.790r_{t-1} - 0.513z_{t-1} + z_t$$

$$\sigma_t^2 = 0.0005 + 0.2396z_{t-1}^2 + 0.475\sigma_{t-1}^2$$

ARMA (1, 1) – GARCH (1, 2) with student-*t* distributed innovations:

$$r_t = 0.0003 + 0.867r_{t-1} - 0.861z_{t-1} + z_t$$

$$\sigma_t^2 = 0.484z_{t-1}^2 + 0.515\sigma_{t-2}^2$$

ARMA (1, 1) – EGARCH (1, 2) with normally distributed innovations:

$$r_t = 0.0152 + 0.8223r_{t-1} - 0.498z_{t-1} + z_t$$

$$\ln(\sigma_t^2) = -0.314 + 0.0196\left|\frac{z_{t-1}}{\sigma_{t-1}}\right| + 0.930\frac{z_{t-1}}{\sigma_{t-1}} - 0.072\ln(\sigma_{t-1}^2) + 0.699\ln(\sigma_{t-2}^2)$$

ARMA (1, 1) – EGARCH (2, 1) with student-*t* distributed innovations:

$$r_t = 0.00008 + 0.99998r_{t-1} - 0.9995z_{t-1} + z_t$$

$$\ln(\sigma_t^2) = -0.3823 - 0.5475\left|\frac{z_{t-1}}{\sigma_{t-1}}\right| + 1.1412\left|\frac{z_{t-2}}{\sigma_{t-2}}\right| + 0.5483\frac{z_{t-1}}{\sigma_{t-1}} - 1.1381\frac{z_{t-2}}{\sigma_{t-2}}$$
$$+ 0.9606\ln(\sigma_{t-1}^2)$$

With the initial set of 215 observations, we estimate the parameters of the mean and variance equations selected for GSE-CI. The results are shown in Tables 4.11 and 4.12.

Table 4.11: Parameter estimates of ARMA - GARCH type models for biweekly returns of GSE-CI

	Normal distribution		Student-*t* distribution	
	GARCH (2, 1)	EGARCH (2, 1)	GARCH (1, 1)	EGARCH (2, 1)
		Mean Equation		
mu	0.010380	0.008394	0.003823	0.002755
	(0.024)	(0.000)	(0.012)	(0.000)
ar1	0.842271	0.776230	0.802855	0.551837
	(0.000)	(0.000)	(0.000)	(0.000)
ma1	-0.431480	-0.353790	-0.458254	-0.025084
	(0.003)	(0.000)	(0.000)	(0.000)
		Variance Equation		
α_0	0.000333	-0.413493	0.000285	-0.439902
	(0.002)	(0.000)	(0.080)	(0.000)
α_1	0.200240	0.020070	0.860200	-0.088178
	(1e-06)	(0.000)	(0.053)	(0.000)
α_2	0.000	0.207240	NA	0.741637
	(1.000)	(0.000)		(0.000)
β_1	0.000	0.954943	0.138800	0.941011
	(1.000)	(0.000)	(0.229)	(0.000)
γ_1		0.279060		1.363281
		(0.000)		(0.000)
γ_2		-0.535055		-2.314211
		(0.000)		(0.000)
		Specification Tests		
Q(9)	3.05602	3.90864	3.6804	6.8424
	(0.8820)	(0.7122)	(0.7634)	(0.1439)
Q2(14)	0.9118	2.5899	0.69086	1.1600
	(0.9998)	(0.9746)	(0.9956)	(0.9992)
ARCH(8)	0.6423	2.1018	0.48232	0.7138
	(0.9691)	(0.7210)	(0.980)	(0.9615)

Source: Authors own calculation based on sampled data. Note: Corresponding p-values are in brackets. Q(.) and ARCH(.) are the Ljung-Box and Arch LM test statistics for the standardized residuals. Q2(.) is the Ljung-Box test statistics for the standardized squared residuals.

Table 4.12: Parameter estimates of simplified ARMA-GARCH type models for biweekly returns of GSE-CI

	Normal distribution		Student-*t* distribution	
	GARCH (1, 1)	EGARCH (2, 1)	GARCH (1, 1)	EGARCH (2, 1)
		Mean Equation		
mu	0.062927	0.008394		0.002755
	(2.e-05)	(0.000)		(0.000)
ar1	0.992384	0.776230		0.551837
	(0.000)	(0.000)		(0.000)
ma1	-0.708364	-0.353790		-0.025084
	(0.000)	(0.000)		(0.000)
		Variance Equation		
α_0	0.000041	-0.413493		-0.439902
	(0.021)	(0.000)		(0.000)
α_1	0.143970	0.020070		-0.088178
	(0.021)	(0.000)		(0.000)
α_2	NA	0.207240		0.741637
		(0.000)		(0.000)
β_1	0.779159	0.954943		0.941011
	(0.000)	(0.000)		(0.000)
γ_1		0.279060		1.363281
		(0.000)		(0.000)
γ_2		-0.535055		-2.314211
		(0.000)		(0.000)
		Specification Tests		
Q(9)	5.754	3.90864		6.8424
	(0.29883)	(0.7122)		(0.1439)
Q2(14)	1.17719	2.5899		1.1600
	(0.9777)	(0.9746)		(0.9992)
ARCH(8)	0.7694	2.1018		0.7138
	(0.9479)	(0.7210)		(0.9615)

Source: Authors own calculation based on sampled data. Note: Corresponding p-values are in brackets. Q(.) and ARCH(.) are the Ljung-Box and Arch LM test statistics for the standardized residuals. Q2(.) is the Ljung-Box test statistics for the standardized squared residuals.

Even though the specification test suggests that all the models in Table 4.11 can be adequate, the coefficient estimates of the variance equation for ARMA (1, 1) – GARCH (1, 1) with student-*t* innovations are statistically not significant at 5%. Since the whole variance equation is non-significant, we exclude it from further analysis for GSECI. Also for an ARMA (1, 1) – GARCH (2, 1) with normal distribution the estimates of α_2 and β_1 are not significant.

These models can be simplified by dropping the non-significant parameters, since they add little explanatory power to the model. In dropping the non-significant parameters we drop α_2 to get an ARMA (1, 1) – GARCH (1, 1) with normal distribution. Therefore in further analysis results in table 4.12 is used. The significance of γ_1 and γ_2 indicate that there is asymmetry. The estimate for γ_2 is negative indicating the presence of leverage effect. Therefore for GSE-CI return series, the following fitted models can be specified as follows.

ARMA (1, 1) – GARCH (1, 1) with normally distributed innovations:

$$r_t = 0.063 + 0.9924 r_{t-1} - 0.7084 z_{t-1} + z_t$$

$$\sigma_t^2 = 0.00004 + 0.144 z_{t-1}^2 + 0.779 \sigma_{t-1}^2$$

ARMA (1, 1) – EGARCH (2, 1) with normally distributed innovations:

$$r_t = 0.0084 + 0.776 r_{t-1} - 0.354 z_{t-1} + z_t$$

$$\ln(\sigma_t^2) = -0.4135 + 0.02 \left|\frac{z_{t-1}}{\sigma_{t-1}}\right| + 0.207 \left|\frac{z_{t-2}}{\sigma_{t-2}}\right| + 0.279 \frac{z_{t-1}}{\sigma_{t-1}} - 0.535 \frac{z_{t-2}}{\sigma_{t-2}} + 0.955 \ln(\sigma_{t-1}^2)$$

ARMA (1, 1) – EGARCH (2, 1) with student-*t* distributed innovations:

$$r_t = 0.0028 + 0.552 r_{t-1} - 0.025 z_{t-1} + z_t$$

$$\ln(\sigma_t^2) = -0.4399 - 0.0882 \left|\frac{z_{t-1}}{\sigma_{t-1}}\right| + 0.7416 \left|\frac{z_{t-2}}{\sigma_{t-2}}\right| + 1.3633 \frac{z_{t-1}}{\sigma_{t-1}} - 2.3142 \frac{z_{t-2}}{\sigma_{t-2}} + 0.941 \ln(\sigma_{t-1}^2)$$

4.2.3 Model Adequacy Checks

Any fitted model should be checked for model adequacy. An adequately fitted model has the residuals of the series behaving like a white noise. The ACF and Ljung-Box statistics of the residuals can be used to check the closeness of the residuals to white noise. Specifically the

Ljung-Box statistics of the standardized residuals can be used to check the adequacy of the mean equation and that of standardized squared residuals used to check the adequacy of the volatility equation. The quantile-quantile plot of the standardized residuals was used to check the validity of the distributional assumption.

The time series plot of the residuals, conditional volatility, Q-Q and ACF plot of the standardized residuals for the ARMA (1, 1) – GARCH (1, 1) for FML is displayed in Figure 4.3. That of all fitted GARCH type models are displayed in Figures 1C to 6C in Appendix C.

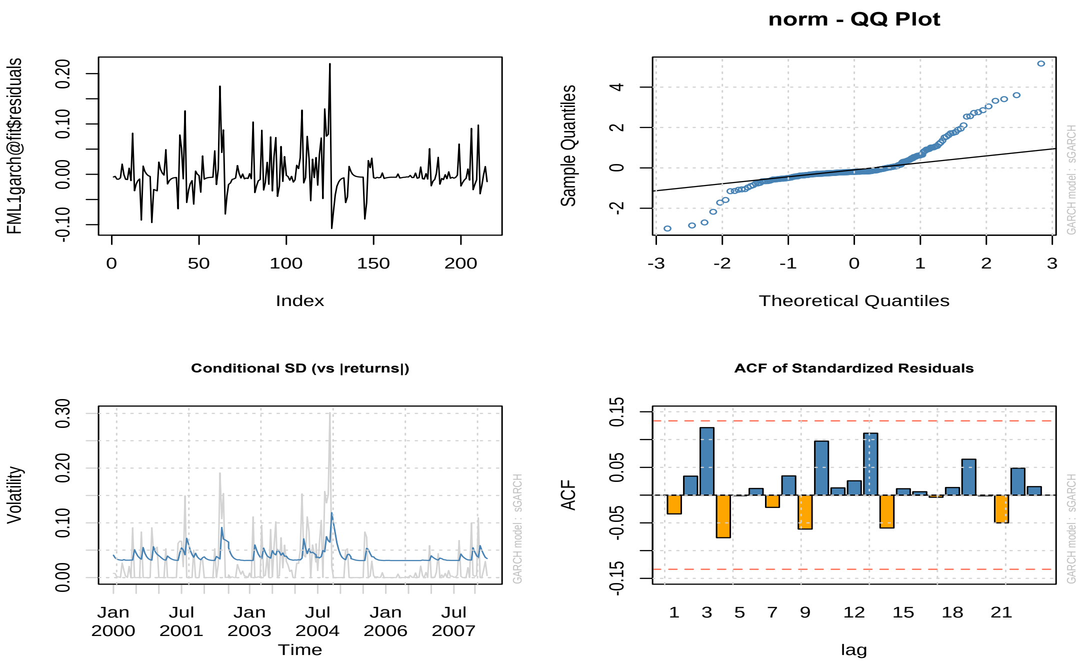


Figure 4.3: ARMA (1, 1) – GARCH (1, 1) with normally distributed error term

From the graphs autocorrelation and Arch effects have been significantly removed by fitting the ARMA-GARCH type models. This is confirmed by the specification tests indicating that both mean and volatility equations are adequate. The Q-Q plots of the standardized residuals of all the models show a deviation of the residuals from the assumed distributions. However these, deviations are at the tails. The models with normally distributed innovations seem to have a fairly stable conditional volatility whiles those with student-t distribution have periods of high and low estimated volatilities.

After fitting the RiskMetrics (EWMA) to both series, it is obvious that there is still some serial dependence in the standardized residuals. For GSECI the autocorrelation is significant up to the 12th lag whiles for FML it is significant up to the 3rd lag. The time series plot of the residuals, conditional volatility, Q-Q and ACF plot of the standardized residuals for RiskMetrics (EWMA) are shown in Figures 7C and 8C in Appendix C.

4.3 Value at Risk and Expected Shortfall

Forecasts of future returns and volatility are obtained based on the in-sample parameter estimates. These forecast are used to get one-step ahead VaR and ES estimates at 95% and 99% risk coverage. Based on the out of sample forecasting performance of the RiskMetrics and the GARCH type models, the GARCH type models outperformed the RiskMetrics for both FML and GSECI. This is shown in Table 4.13. Since the values are close we estimate VaR and ES for all the models under consideration.

Table 4.13: Out-of-sample forecasting performance

	FML		GSECI	
	MSE	MAE	MSE	MAE
RM	0.00487	0.03760	0.00121	0.02288
G-N	0.00469	0.03994	0.00087	0.02133
G-S	0.00477	0.03758	NA	NA
EG-N	**0.00474**	0.03924	0.00086	0.02102
EG-S	**0.00474**	**0.03748**	**0.00083**	**0.02056**

Based on the estimated VaR and ES values from the models under consideration, it can be said that with 95% probability, the maximum loss one can incur in a two week period for holding a long position of say 10,000 cedis in FML stock ranges between 41 to 554 cedis. This loss is for normal market conditions and movements (loss when a bad event does not occur). When market movements deviate from normal (i.e when a bad event occurs) the actual loss can be more than the estimated VaR, therefore for the same position in FML stock we expect to actually loose between 198 to 1090 cedis if a bad event occurs. For GSECI the maximum potential loss at 95% confidence level is between 60 to 557 cedis and a bad event occurs, the actual loss could be between 698 to 4122 cedis. The negative signs attached to the VaR values are ignored since it is considered as an indicator of loss. The one-step ahead VaR and ES forecast are presented in Table 4.14 to 4.16

Table 4.14: Out of sample 1-step ahead VaR and ES forecasts for FML

	Normal distribution		S. Student t-distribution	
	GARCH(1,1)	EGARCH(1,2)	GARCH(1,2)	EGARCH(2,1)
Forecasted return	0.013	0.0169	0.00117	0.0016
Forecasted C. vol	0.0335	0.0255	0.00739	0.0376
VaR(1,0.99)	-0.065	-0.0424	-0.0108	-0.0519
VaR(1,0.95)	-0.0422	-0.0250	-0.0041	-0.0216
ES (1,0.99)	0.1024	0.0848	0.0106	0.0550
ES (1,0.95)	0.0822	0.0695	0.0198	0.1090

Source: Authors own calculations.

Table 4.15: Out of sample 1-step ahead VaR and ES forecasts for GSE-CI

	Normal distribution		S. Student t-distribution	
	GARCH(1,1)	EGARCH(2,1)	GARCH(1,1)	EGARCH(2,1)
Forecasted return	0.0401	0.0473		0.0513
Forecasted C. vol	0.0329	0.0324		0.1263
VaR(1,0.99)	-0.0365	-0.0281		-0.1287
VaR(1,0.95)	-0.0141	-0.006		-0.0266
ES (1,0.99)	0.1279	0.1338		0.2307
ES (1,0.95)	0.1080	0.1142		0.4122

Source: Authors own calculations.

Table 4.16: 1-step ahead out-of sample VaR and ES forecast under RiskMetrics (EWMA)

Forecasts	**Stock**	
	FML	GSECI
Forecasted cond. volatility	0.0337	0.0339
VaR(1,0.99)	-0.0784	-0.0788
VaR(1,0.95)	-0.0554	-0.0557
ES(1,0.99)	0.0898	0.0902
ES(1,0.95)	0.0695	0.0698

Source: Authors own calculations.

The last phase of the analysis is back-testing VaR results. Comparing the 150 out-of-sample estimated VaR value to the actual realized return is done. A violation happens when the realized return is lesser than the estimated VaR. If VaR is specified at 99% then out of the 150 observations used, we expect on average a VaR violation of 1.5 times. If it is at 95% then the expected number of VaR exceedance is 7.5 times. At 95% VaR level all the models passed the kupiec test for both FML and GSE-CI. However at 99% VaR level, the null hypothesis of correct exceedance is rejected at both 99% and 95% confidence level for all the FML models except RiskMetrics (EWMA) and ARMA (1, 1) – GARCH (1, 1) with normal distribution. This means that the actual number of VaR exceedance is statistically significant from the expected number. For GSE-CI the null hypothesis is rejected for ARMA (1, 1) – EGARCH (2, 1) with student-*t* distribution at both confidence levels. ARMA (1, 1) – EGARCH (1, 1) with normal distribution fails the kupiec test at 95% confidence level when VaR is specified at 99%. Results of Kupiec test and actual number of VaR violation are shown in Table 4.17 and 4.18 respectively.

Table 4.17: Kupiec conditional coverage test

	FML		GSECI	
	1%	5%	1%	5%
RM	0.152**	0.989**	2.889**	0.036**
G-N	1.174**	3.643**	0.152**	0.989**
G-S	10.772	0.034**	NA	NA
EG-N	7.773	0.298**	5.123*	0.298**
EG-S	10.772	0.034**	10.772	1.513**

Source: Authors own calculations. * denotes significance at only 99% confidence level, ** denotes significance at both 99% and 95% confidence level.

Table 4.18: Number of actual VaR exceedance

	FML		GSECI	
	1%	5%	1%	5%
RM	2	5	4	7
G-N	3	3	2	5
G-S	7	8	NA	NA
EG-N	6	9	5	9
EG-S	7	8	7	11

Source: Authors own calculations.

From the Kupiec test and number of actual exceedance ARMA (1, 1) – GARCH (1, 1) with normal distribution is chosen for both FML and GSE-CI, since it gives the least number of actual VaR exceedance. However the RiskMetrics (EWMA) comes close as it is the second with the least number of violations for both series at both 99% and 95% risk coverage.

4.4 Findings and Discussion of Results

This section reviews the implications of our findings. The discussion will focus on results and findings from only the ARMA (1, 1) – GARCH (1, 1) with normally distributed error terms and RiskMetrics (EWMA). This is because ARMA (1, 1) – GARCH (1, 1) gives the most adequate VaR and ES forecast and it is closely followed by RiskMetrics.

The results from the ARMA (1, 1) – GARCH (1, 1) for FML and GSECI shows that current biweekly return is explained by approximately 47.5% and 77.9% of the previous biweekly return's volatility respectively. The volatility persistence (alpha1+beta1) value of 0.715 and 0.923 implies that, there is decay of the variance of the biweekly returns to its long run average. The variance of FML returns to its mean more quickly than the volatility process of GSECI. For RiskMetrics (EWMA) there is no mean reversion of volatility since its persistence is automatically 1.

From the VaR forecast given by these models it is quite clear that the ES values are always higher than the VaR values, indicating that VaR habitually underestimates risk because it fails to consider the tail risk. Even though the one-step ahead VaR estimates given by the RiskMetrics (EWMA) was higher than that given by the ARMA (1, 1) – GARCH (1, 1) model for FML and GSECI, the GARCH model had fewer VaR violations. This agrees with Bonga & Mutema (2009) that, for the Variance-Covariance method to VaR estimates, conditional heteroscedasticity (changing volatility) should be incorporated.

Findings of this research show that for the Ghanaian market symmetric models perform better than asymmetric models. This is probably due to the unchanging prices of most of the listed stocks and partly to the calmness of the stock market. Also the Ghanaian market does not react to information (such as resignation of a CEO or a listed company making losses) on the market since the stock market is now gradually picking up and most people don't understand how the stock market works. Most people hold positions for a long time and never sell when price goes up or acquire more when price comes down.

Finally this research shows that using only one risk measure isn't always the best. Complimenting VaR with ES is a superior way to estimating risk. Bank of Ghana and other supervisory bodies can take cue in implementing its required reserves since models that incorporate heteroscedasticity prove to be more adequate in estimating VaR than the industry standard RiskMetrics.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the whole research, conclusions based on findings, recommendations and direction for future works. The chapter is divided into four sections. Summary of work is presented under section 5.1. Section 5.2 looks at conclusion based on findings. Recommendations are given under section 5.3. Directions for further studies are presented under section 5.4

5.1 Summary of Research

The study sought to estimate and forecast VaR and ES on the Ghanaian Stock market, using a range of volatility models and selecting the model that adequately estimates VaR and ES. The biweekly return of FML stock and GSE-CI was used for the analysis and it was calculated from the daily closing price and daily closing value of FML stock and GSE-CI respectively.

The study revealed that, the return series for both FML and GSECI were not normal but had heavy tails. It also showed that both series were stationary and autocorrelated. The serial dependence was however removed by fitting an ARMA model to the data. The residuals of the fitted ARMA model showed evidence of ARCH effects hence ARMA-GARCH type models and RiskMetrics (EWMA) was fitted to the data. The innovations of the ARMA-GARCH type models were assumed to follow a normal and student-t distribution. The fitted models were used to estimate and forecast conditional mean and volatility and based on the forecasted values VaR and ES were calculated.

Models considered were ARMA-GARCH, ARMA-EGARCH with error terms assumed to follow normal and student-t distribution and RiskMetrics (EWMA). For GSECI the ARMA-

GARCH with student-t distributed error term, was not included because the coefficients of the variance equation parameter estimates were found to be insignificant at 5% significant level.

Based on the VaR forecast back-test, the ARMA-GARCH model with normally distributed innovations was chosen as the best volatility model for VaR and ES predictions. This was because it had the lowest violations at both 99% and 95% VaR level.

5.2 Conclusions

The study showed that in terms of relative performance of volatility models in estimating VaR and ES on the Ghanaian stock market, the ARMA (1, 1) – GARCH (1, 1) with normally distributed error term is the best for both return series. This is in line with the findings of Angelidis & Degiannakis (2007) who showed that, compared to the more parameterized distributions, the normal distribution for error terms is preferable in some cases.

The one-step ahead VaR and ES of FML was higher than that of GSECI. This might be due to the fact that if FML makes a huge loss, that loss would be hedged by another stock in the stock market, thereby reducing the impact of that loss. It is documented in several literature that diversification reduces risk (Dowd, 2007)

The back-test of VaR showed that with most of the models, the observed failure rate was consistent with the expected failure rate. This tells us that, on most days, VaR is able to adequately estimate the risk of a portfolio. But for risk managers, regulatory bodies and investors, the best model would be one that adequately covers risk on all days. This study concurs with Yamai & Yoshiba (2005) and conclude that no one risk measure is adequate since each measure has its own advantages and disadvantages. Therefore complimenting VaR with ES is the optimum way to effectively manage risk.

Choosing VaR models at lower quantiles is not the best since a model could be adequate at say 95%, but at a higher quantile (99%) the same model can be woefully inadequate.

The research shows that for the Ghanaian stock market, volatility models that incorporate heteroscedasticity should be considered. This is in line with Bonga-Bonga & Mutema (2009) who found the GARCH and EGARCH model with normal distributions to estimate VaR on the South African stock market better than the industry RiskMetrics (EWMA).

Finally the study revealed that, the volatility model that has the best out-of-sample predictive performance is not necessarily the best model that estimates VaR and ES accurately.

5.3 Recommendations

Based on the findings of the study, the following recommendations are given to risk managers, investors, regulatory authorities, academicians and all stakeholders.

a) In estimating risk on the Ghanaian stock market, models that incorporate heteroscedasticity should be used instead of the industry standard EWMA.

b) In managing risk, institutions should not let only one risk measure dominate, but rather should compliment the measures they use with another measure. Example VaR should be complimented with ES.

c) Regulatory authorities should make their institutions back-test their risk models regularly. Since from literature there has not been one accepted volatility model that adequately estimates risk for all markets.

5.4 Direction for Future Further Studies

a) Future works should compare the parametric approach to non-parametric approach in estimating VaR and ES.

b) Long memory GARCH-type models should be considered in further studies since it has been documented in some literature (D. G. McMILLAN & Speight, 2007) that long memory GARCH-type models provides improved VaR estimates that minimizes VaR failure rate.

c) Component VaR that take into account the contributions of each portfolio to the overall risk could be used to know which stocks act as hedges in the Ghanaian stock market.

d) Future works should include more volatility models in order to truly ascertain which volatility model adequately estimates VaR and ES for the Ghanaian stock market.

e) For better stress-testing higher quantiles such as 99.5% and 99.9% should be included

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APPENDICES

APPENDIX A: R packages used

All the empirical analysis presented in this research was done with R software version 3.2.0. Below are a list of packages used and a brief detail of main functions used.

1A: R packages

Package	Version
fBasics	3011.87
tseries	0.10-34
fUnitRoots	3010.78
FinTs	0.4-5
forecast	6.1
xts	0.9-7
rugarch	1.3-4

2A. Brief detail of R functions used

adfTest: A function for unit root testing. It implements the Augmented Dickey-Fuller test for testing of stationarity.

ArchTest: Computes the Lagrange Multiplier (LM) test for autoregressive conditional heteroscedasticity (ARCH) effects.

arima: Fits an ARIMA model to a univariate time series data.

basicStats: Computes basic financial time series statistics.

Box.test: It computes the Ljung-Box and Box-Pierce test statistics for checking the null hypothesis of independence in a given time series data.

normalTest: a function that computes one sample tests for testing normality of financial return series

ugarchfit: Fits a variety of univariate GARCH models using the ugarchspec object created.

ugarchroll: Creates a rolling density forecast from ARMA-GARCH models with option for refitting every n periods. Also calculates VaR values for forecast period.

ugarchspec: Creates a univariate GARCH specification object prior to fitting

VaRTest: Implements the unconditional and conditional coverage VaR exceedances test.

Appendix B: Ljung-Box and Arch LM test

Table 1B: FML

Lags	Simple Returns Q(.)	Residuals of fitted ARIMA model Q(.)	ARCH(.)
1	26.44 (2.7e-07)	0.015 (0.901)	45.57 (1.5e-11)
2	32.82 (7.5e-08)	0.317 (0.854)	46.46 (8.1e-11)
3	37.56 (3.5e-08)	0.81 (0.847)	46.46 (4.5e-10)
4	38.28 (9.8e-08)	0.886 (0.927)	46.93 (1.6e-09)
5	39.47 (1.9e-07)	1.522 (0.911)	46.78 (6.3e-09)
6	39.56 (5.6e-07)	2.156 (0.905)	47.18 (1.7e-08)
7	39.58 (1.5e-06)	2.30 (0.941)	47.22 (5.1e-08)
8	39.7 (3.6e-06)	2.341 (0.969)	47.10 (1.5e-07)
9	40.18 (7.1e-06)	2.685 (0.976)	47.27 (3.5e-07)
10	40.28 (1.5e-05)	4.08 (0.944)	47.86 (6.6e-07)
11	44.29 (6.5e-06)	7.48 (0.759)	48.08 (1.4e-06)
12	45.79 (7.5e-06)	7.607 (0.815)	49.56 (1.7e-06)
13	50.46 (2.5e-06)	10.91 (0.619)	49.61 (3.5e-06)
14	52.07 (2.7e-06)	11.91 (0.614)	50.03 (6.0e-06)
15	52.16 (5.3e-06)	12.13 (0.670)	49.92 (1.2e-05)
16	53.37 (6.6e-06)	13.06 (0.669)	49.75 (2.5e-05)
17	54.7 (7.6e-06)	13.58 (0.697)	49.86 (4.4e-05)
18	55.77 (9.7e-06)	13.75 (0.745)	50.03 (7.5e-05)
19	57.45 (9.7e-06)	14.35 (0.763)	50.51 (0.0001)
20	57.59 (1.7e-05)	15.05 (0.774)	51.83 (0.0001)
21	70.65 (2.8e-07)	30.66 (0.08)	85.86 (8.3e-10)
22	70.66 (5.2e-07)	31.12 (0.094)	88.92 (5.2e-10)
23	71.2 (7.9e-07)	32.93 (0.082)	91.44 (4.1e-10)
24	71.82 (1.6e-06)	34.01 (0.084)	91.46 (8.3e-10)
25	71.82 (2.1e-06)	34.01 (0.108)	91.33 (1.7e-09)
26	72.57 (2.8e-06)	35.53 (0.101)	93.88 (1.3e-09)
27	72.75 (4.5e-06)	35.74 (0.121)	94.21 (2.3e-09)
28	73.08 (6.8e-06)	35.88 (0.146)	93.89 (4.8e-09)
29	74.45 (7.3e-06)	37.56 (0.132)	93.68 (9.8e-09)
30	74.51 (1.2e-05)	37.74 (0.157)	93.42 (1.9e-08)

Table 2B: GSE-CI

	Simple returns Q(.)	Residuals of fitted ARIMA model Q(.)	ARCH(.)
1	106.21 (2.2e-16)	0.021 (0.885)	47.42 (5.7e-12)
2	153.85 (2.2e-16)	0.297 (0.862)	48.49 (2.9e-11)
3	178.51 (2.2e-16)	0.515 (0.916)	48.37 (1.8e-10)
4	188.1 (2.2e-16)	2.846 (0.584)	48.19 (8.6e-10)
5	197.64 (2.2e-16)	2.854 (0.723)	48.82 (2.4e-09)
6	204.33 (2.2e-16)	3.743 (0.712)	51.14 (2.8e-09)
7	213.42 (2.2e-16)	3.936 (0.787)	52.14 (5.5e-09)
8	230.69 (2.2e-16)	5.682 (0.683)	69.36 (6.6e-12)
9	249.75 (2.2e-16)	7.098 (0.627)	40.26 (6.8e-06)
10	267.8 (2.2e-16)	11.22 (0.340)	47.47 (7.8e-07)
11	274.2 (2.2e-16)	11.22 (0.425)	47.88 (1.5e-06)
12	275.38 (2.2e-16)	13.47 (0.336)	49.92 (1.4e-06)
13	277.01 (2.2e-16)	13.53 (0.408)	50.38 (2.6e-06)
14	277.42 (2.2e-16)	15.62 (0.337)	52.84 (2e-06)
15	279.67 (2.2e-16)	15.68 (0.404)	59.18 (3.5e-07)
16	283.86 (2.2e-16)	15.74 (0.471)	59.35 (6.7e-07)
17	292.32 (2.2e-16)	18.21 (0.376)	59.1 (1.5e-06)
18	300.68 (2.2e-16)	21.92 (0.236)	59.05 (2.9e-06)
19	303.16 (2.2e-16)	22.30 (0.269)	59.16 (5.3e-06)
20	303.16 (2.2e-16)	22.31 (0.324)	60.18 (6.7e-06)
21	306.12 (2.2e-16)	28.60 (0.124)	61.27 (8.2e-06)
22	307.64 (2.2e-16)	28.60 (0.157)	61.14 (1.5e-05)
23	310.93 (2.2e-16)	31.35 (0.114)	60.91 (2.8e-05)
24	312.58 (2.2e-16)	33.24 (0.099)	60.80 (4.9e-05)
25	312.84 (2.2e-16)	35.21 (0.085)	60.85 (7.9e-05)
26	313.51 (2.2e-16)	37.09 (0.073)	60.83 (1.2e-04)
27	313.52 (2.2e-16)	37.34 (0.089)	61.55 (1.6e-04)
28	314.33 (2.2e-16)	37.34 (0.112)	61.79 (2.4e-04)
29	318.36 (2.2e-16)	38.39 (0.114)	63.54 (2.2e-04)
30	324.5 (2.2e-16)	39.10 (0.123)	65.15 (2.1e-04)

Appendix C: Plots of fitted models

FML plots

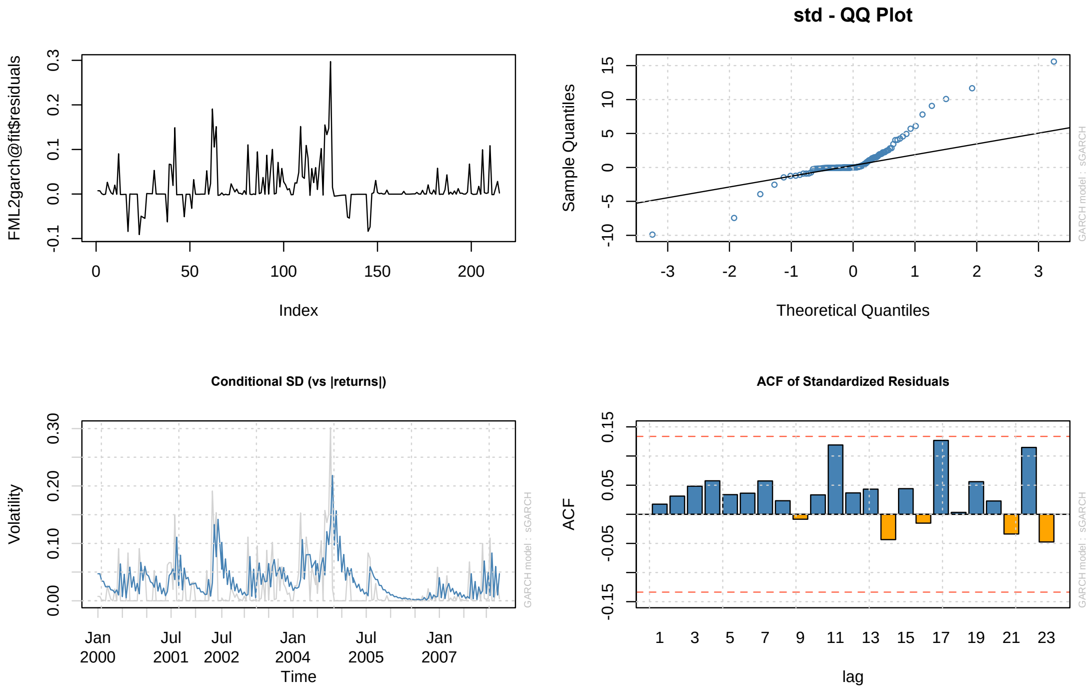

Figure 1C: ARMA(1,1)-GARCH(1,2) with std

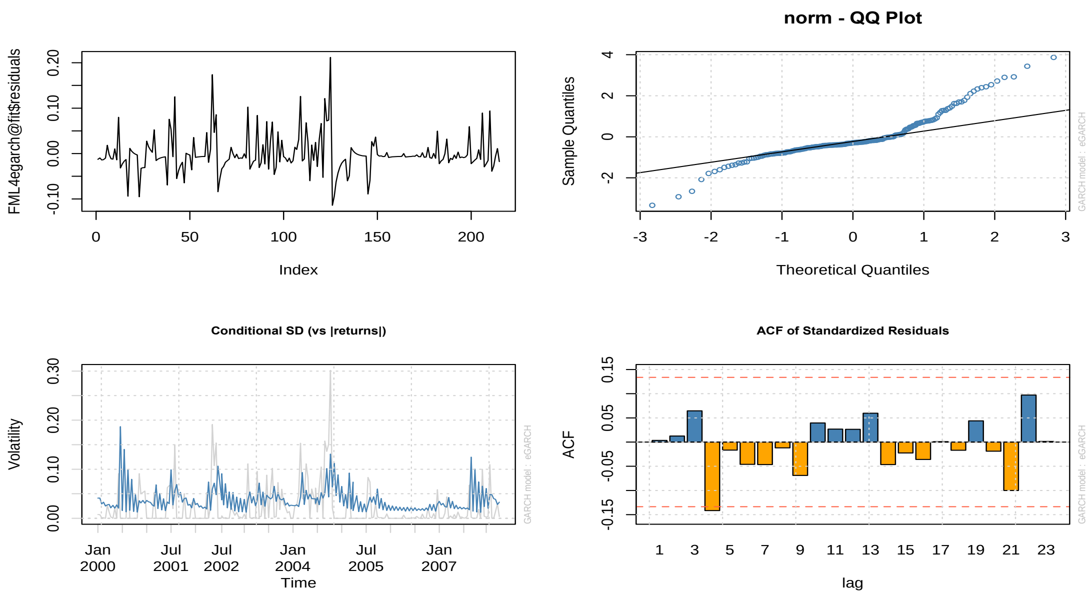

Figure 2C: ARMA(1,1)-EGARCH(1,2) with norm

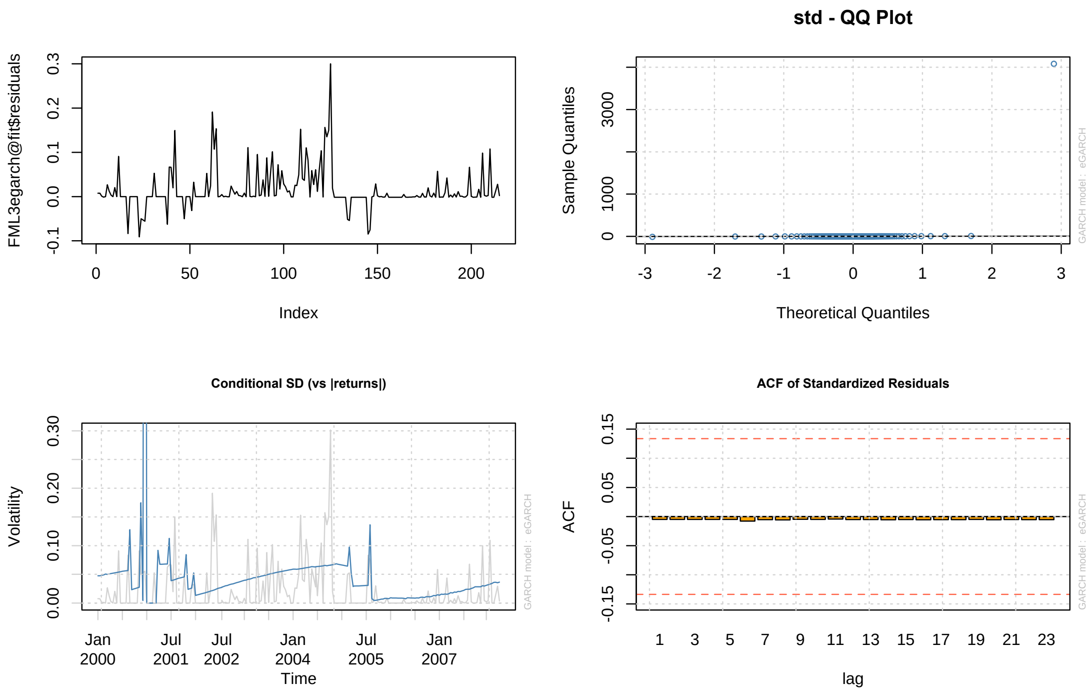

Figure 3C: ARMA(1,1)-EGARCH(2,1) with std

GSECI Plots

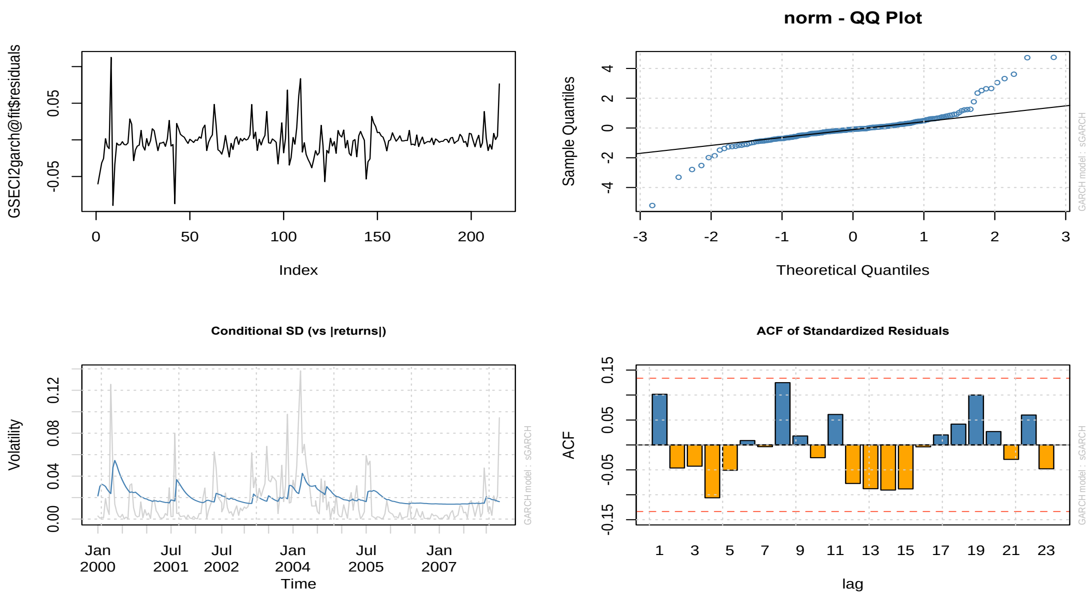

Figure 4C: ARMA(1,1)-GARCH(1,1) with norm

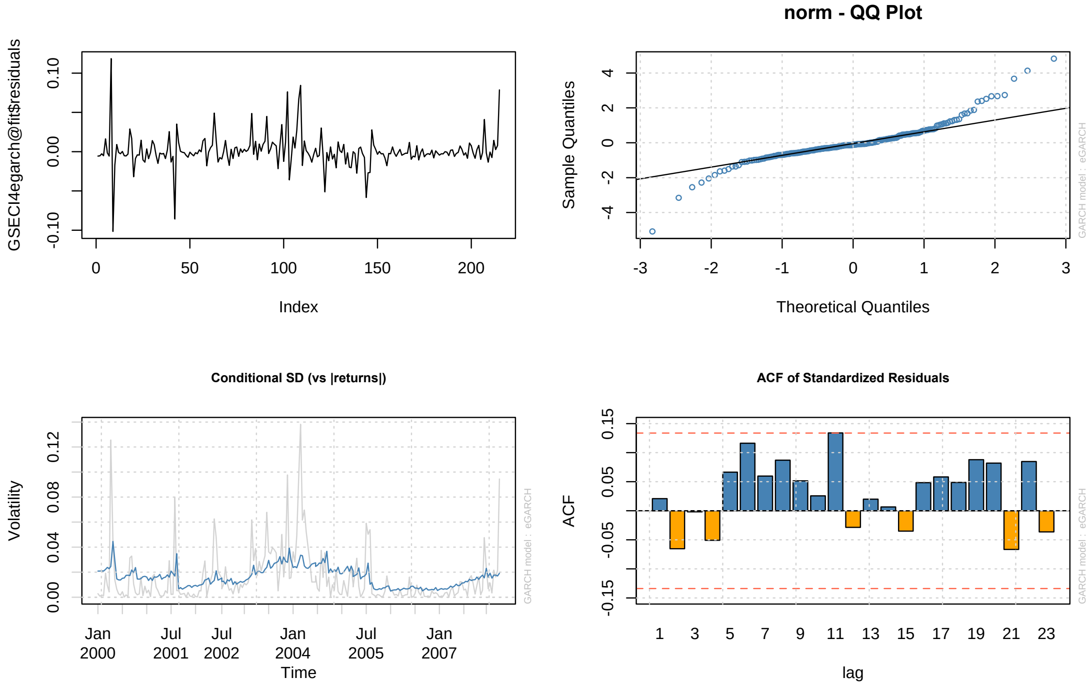

Figure 5C: ARMA(1,1)-EGARCH(2,1) with norm

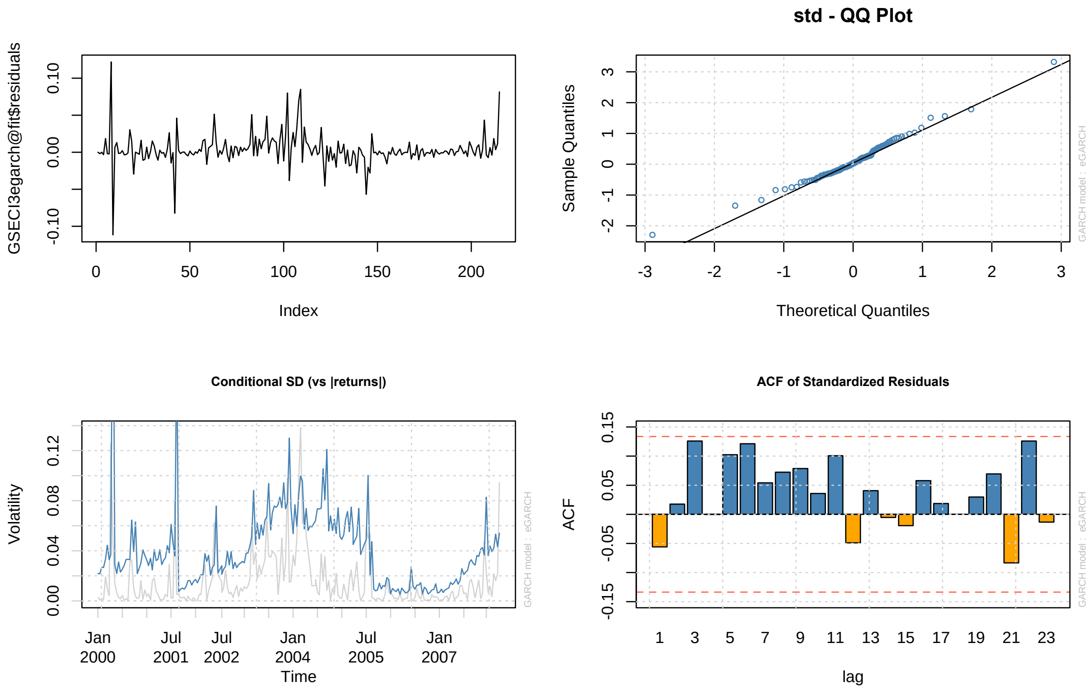

Figure 6C: ARMA(1,1)-EGARCH(2,1) with std

EWMA plots

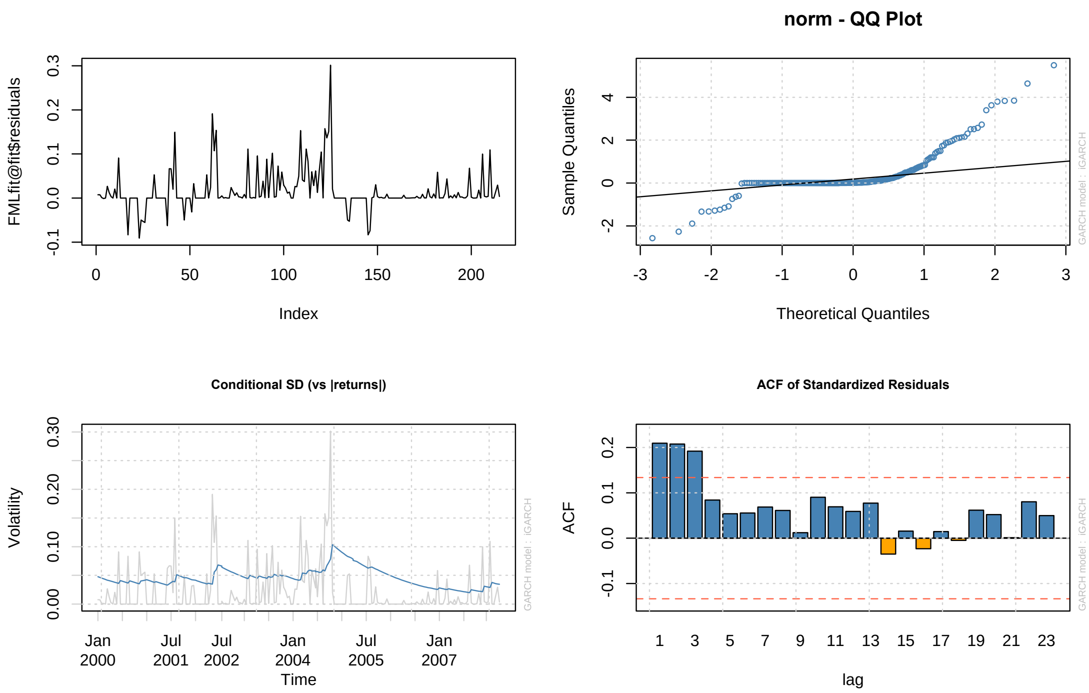

Figure 7C: FML EWMA plot

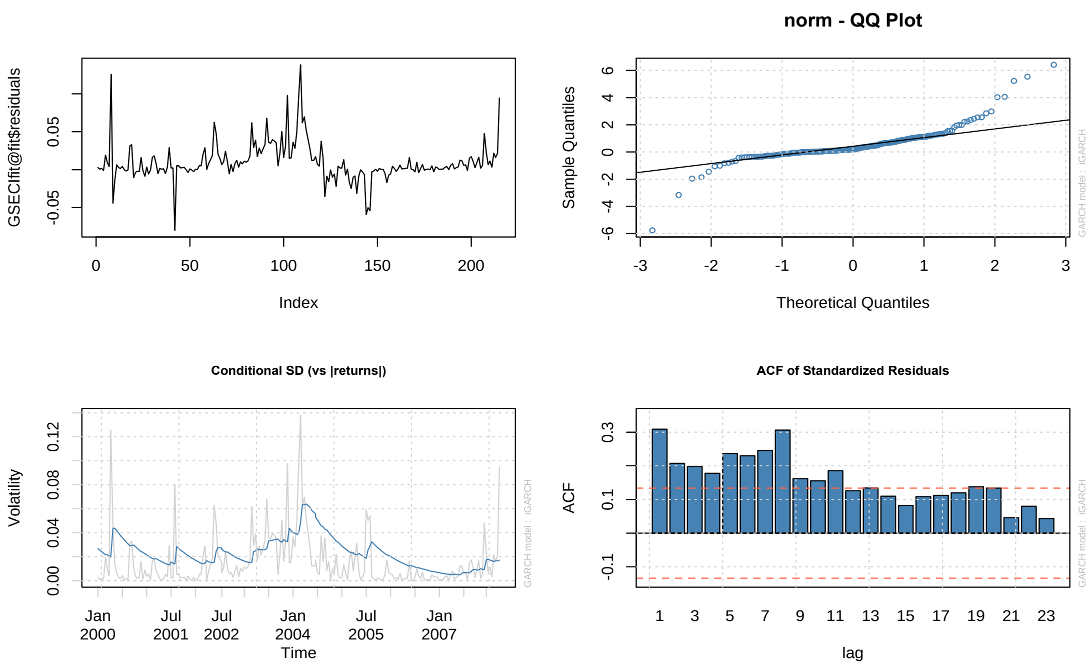

Figure 8C: GSECI EWMA plot

Appendix D: VaR and ES forecasts

Table 1D: 150 Out of sample VaR forecast for FML

99%					95%					
EWMA	G-N	G-S	EG-N	EG-S	EWMA	G-N	G-S	EG-N	EG-S	Realized
-0.07837	-0.06502	-0.01078	-0.04240	-0.05193	-0.05541	-0.04217	-0.00406	-0.02503	-0.02158	0.014035
-0.07662	-0.06161	-0.05561	-0.04108	-0.05333	-0.05417	-0.03967	-0.02370	-0.02420	-0.02218	0.089965
-0.08892	-0.07956	-0.09871	-0.21057	-0.05473	-0.06287	-0.04616	-0.04230	-0.13859	-0.02276	0.018987
-0.08710	-0.07026	-0.04363	-0.01379	-0.05629	-0.06158	-0.04216	-0.01822	-0.00109	-0.02343	0.021429
-0.08551	-0.06249	-0.07388	-0.12346	-0.05765	-0.06046	-0.03778	-0.03148	-0.07952	-0.02401	0.064153
-0.09009	-0.06002	-0.07582	-0.01309	-0.05900	-0.06370	-0.03315	-0.03220	0.00105	-0.02458	0.014286
-0.08797	-0.06134	-0.05426	-0.10162	-0.06041	-0.06220	-0.03665	-0.02282	-0.06353	-0.02519	0.008333
-0.08570	-0.06299	-0.05467	-0.02063	-0.06168	-0.06059	-0.03961	-0.02307	-0.00797	-0.02574	0.005495
-0.08342	-0.06399	-0.03899	-0.09674	-0.06291	-0.05898	-0.04147	-0.01629	-0.06310	-0.02627	0.062670
-0.08790	-0.06677	-0.07825	-0.02939	-0.06411	-0.06215	-0.03939	-0.03332	-0.01217	-0.02677	0.179487
-0.13482	-0.13023	-0.22391	-0.04695	-0.08758	-0.09532	-0.07146	-0.09707	-0.01905	-0.03643	0.012987
-0.13083	-0.11620	-0.06119	-0.11986	-0.08934	-0.09250	-0.06970	-0.02500	-0.07383	-0.03719	0.023454
-0.12747	-0.08909	-0.16205	-0.05024	-0.09056	-0.09013	-0.05375	-0.07003	-0.02631	-0.03771	0.041667
-0.12581	-0.06691	-0.06377	-0.11378	-0.09176	-0.08895	-0.03811	-0.02634	-0.07151	-0.03822	0.000000
-0.12189	-0.07505	-0.11587	-0.04924	-0.09583	-0.08618	-0.04747	-0.04981	-0.02813	-0.03999	0.000000
-0.11809	-0.07441	-0.04589	-0.10874	-0.09376	-0.08349	-0.04884	-0.01895	-0.07174	-0.03910	-0.100000
-0.12810	-0.17764	-0.15552	-0.07310	-0.24986	-0.09057	-0.13133	-0.06863	-0.05256	-0.10704	0.000000
-0.12411	-0.12696	-0.03398	-0.11144	-0.03104	-0.08775	-0.09168	-0.01465	-0.07886	-0.01188	0.000000
-0.12024	-0.09774	-0.11149	-0.05997	-0.03580	-0.08502	-0.06910	-0.04917	-0.04192	-0.01396	0.000000
-0.11649	-0.08267	-0.02433	-0.09338	-0.03497	-0.08237	-0.05749	-0.01045	-0.06516	-0.01360	0.000000
-0.11229	-0.07506	-0.08079	-0.07333	-0.03522	-0.07940	-0.05155	-0.03580	-0.05051	-0.01445	0.000000
-0.10898	-0.07190	-0.01736	-0.07223	-0.03524	-0.07705	-0.04913	-0.00753	-0.04949	-0.01449	0.000000
-0.10577	-0.07055	-0.05757	-0.06553	-0.03532	-0.07478	-0.04808	-0.02548	-0.04463	-0.01454	0.000000
-0.10265	-0.06998	-0.01233	-0.06462	-0.03544	-0.07258	-0.04764	-0.00531	-0.04392	-0.01462	0.000000
-0.09962	-0.06975	-0.04100	-0.05979	-0.03562	-0.07044	-0.04746	-0.01811	-0.04047	-0.01471	0.000000
-0.09668	-0.06965	-0.00874	-0.05888	-0.03584	-0.06836	-0.04738	-0.00373	-0.03980	-0.01483	-0.111111
-0.11263	-0.18777	-0.15039	-0.08030	-0.91937	-0.07964	-0.14087	-0.06789	-0.06292	-0.39777	-0.050000
-0.11285	-0.14733	-0.06585	-0.08055	0.00004	-0.07979	-0.11130	-0.03044	-0.06298	0.00044	-0.105263
-0.12442	-0.17854	-0.17527	-0.08850	-9.4E+66	-0.08797	-0.13789	-0.07994	-0.07251	-4.1E+66	-0.066667
-0.12640	-0.14744	-0.09844	-0.08724	0.00028	-0.08937	-0.11448	-0.04589	-0.07095	0.00028	-0.107143
-0.13764	-0.17494	-0.19198	-0.10192	-0.14910	-0.09732	-0.13919	-0.08834	-0.09000	-0.07204	0.000000
-0.13342	-0.14594	-0.07260	-0.16790	-0.09194	-0.09434	-0.11018	-0.03442	-0.12652	-0.04546	0.018182
-0.12975	-0.12318	-0.13774	-0.05622	-0.08021	-0.09174	-0.08807	-0.06300	-0.04076	-0.03846	0.000000
-0.12577	-0.11269	-0.05070	-0.12430	-0.07076	-0.08893	-0.07935	-0.02376	-0.08770	-0.03342	0.017857
-0.12234	-0.09981	-0.10016	-0.04990	-0.06292	-0.08650	-0.06788	-0.04550	-0.03256	-0.02879	0.168421
-0.15274	-0.09377	-0.23057	-0.41325	-0.13469	-0.10800	-0.04817	-0.10224	-0.27155	-0.05473	0.162162
-0.17467	-0.07750	-0.22423	0.02479	-0.34482	-0.12350	-0.02946	-0.09816	0.04592	-0.14195	0.059432
-0.17269	-0.09010	-0.17581	-0.24773	-0.34279	-0.12210	-0.04447	-0.07638	-0.15452	-0.14107	0.048780
-0.16971	-0.09571	-0.16749	-0.02026	-0.24908	-0.11999	-0.05252	-0.07266	0.00149	-0.10080	0.000000
-0.16450	-0.11531	-0.12343	-0.18825	-0.18555	-0.11631	-0.07306	-0.05337	-0.12499	-0.07488	0.046512
-0.16326	-0.10435	-0.12211	-0.09852	-0.13296	-0.11543	-0.06490	-0.05175	-0.06431	-0.05222	0.015556
-0.15823	-0.10634	-0.08393	-0.04034	-0.10698	-0.11187	-0.06868	-0.03628	-0.02480	-0.04175	0.006550
-0.15314	-0.10717	-0.08820	-0.07684	-0.08380	-0.10828	-0.07115	-0.03908	-0.05159	-0.03255	0.021692
-0.14872	-0.09878	-0.06411	-0.03890	-0.06938	-0.10515	-0.06442	-0.02724	-0.02394	-0.02653	0.002123

-0.14390	-0.09984	-0.06160	-0.07216	-0.05923	-0.10174	-0.06687	-0.02735	-0.04863	-0.02284	0.173362
-0.17254	-0.08513	-0.23119	-0.50648	-0.13092	-0.12200	-0.03944	-0.09225	-0.34410	-0.04980	0.000000
-0.16694	-0.12307	-0.05116	-0.03258	-0.18371	-0.11804	-0.07733	-0.02139	-0.01843	-0.07422	0.036036
-0.16291	-0.11764	-0.17782	-0.30869	-0.13981	-0.11518	-0.07422	-0.07754	-0.21328	-0.05543	0.052174
-0.16058	-0.10634	-0.07012	-0.01759	-0.12078	-0.11354	-0.06486	-0.02756	-0.00625	-0.04692	0.122112
-0.17115	-0.08596	-0.19224	-3.73402	-0.13554	-0.12101	-0.04267	-0.07774	-2.62884	-0.05123	0.000000
-0.16661	-0.12016	-0.06115	-0.08073	-0.13909	-0.11780	-0.07573	-0.02559	-0.04865	-0.05349	0.014706
-0.16110	-0.12139	-0.14831	-0.06816	-0.10178	-0.11391	-0.07904	-0.06604	-0.04175	-0.03842	0.000000
-0.15555	-0.12390	-0.04514	-0.07468	-0.08397	-0.10998	-0.08336	-0.02021	-0.04847	-0.03200	0.000000
-0.15018	-0.12147	-0.10536	-0.06291	-0.06813	-0.10618	-0.08279	-0.04805	-0.04140	-0.02612	0.007246
-0.14506	-0.11450	-0.03230	-0.05802	-0.05302	-0.10257	-0.07769	-0.01402	-0.03823	-0.02008	0.027104
-0.14102	-0.10226	-0.07853	-0.06790	-0.05043	-0.09971	-0.06704	-0.03332	-0.04412	-0.01869	0.034483
-0.13774	-0.09173	-0.04419	-0.05811	-0.05568	-0.09739	-0.05796	-0.01659	-0.03608	-0.02053	0.034211
-0.13460	-0.08429	-0.06459	-0.06297	-0.06113	-0.09517	-0.05199	-0.02576	-0.03887	-0.02256	0.002545
-0.12996	-0.09011	-0.03416	-0.05377	-0.05679	-0.09189	-0.05884	-0.01458	-0.03400	-0.02146	-0.008906
-0.12559	-0.09516	-0.05345	-0.07391	-0.05385	-0.08880	-0.06477	-0.02495	-0.04993	-0.02116	-0.010270
-0.11728	-0.08741	-0.03126	-0.05766	-0.05215	-0.08292	-0.06031	-0.01551	-0.04061	-0.02121	-0.014267
-0.11301	-0.08759	-0.04357	-0.07302	-0.05103	-0.07991	-0.06145	-0.02170	-0.05236	-0.02142	0.118421
-0.13294	-0.08119	-0.17326	-0.20607	-0.10542	-0.09400	-0.04500	-0.06839	-0.13661	-0.04126	0.023529
-0.12858	-0.08538	-0.01926	-0.03427	-0.11942	-0.09091	-0.05097	-0.00417	-0.01741	-0.04755	0.000000
-0.12349	-0.09419	-0.13272	-0.18493	-0.10063	-0.08731	-0.06087	-0.06036	-0.12693	-0.04035	0.001163
-0.11860	-0.09476	-0.01855	-0.04113	-0.08158	-0.08386	-0.06299	-0.00818	-0.02672	-0.03276	0.058140
-0.11998	-0.07918	-0.11903	-0.32948	-0.08524	-0.08483	-0.04748	-0.04901	-0.22694	-0.03302	0.002186
-0.11523	-0.08579	-0.01682	-0.03074	-0.07758	-0.08148	-0.05517	-0.00630	-0.01816	-0.03050	0.005453
-0.11073	-0.08489	-0.08776	-0.23101	-0.06179	-0.07829	-0.05572	-0.03965	-0.16077	-0.02415	0.007584
-0.10645	-0.08128	-0.01447	-0.02966	-0.05168	-0.07527	-0.05356	-0.00566	-0.01877	-0.02008	0.134409
-0.13421	-0.08642	-0.17717	-0.17963	-0.09120	-0.09489	-0.04746	-0.06982	-0.11302	-0.03344	0.373887
-0.26782	-0.15814	-0.43187	-0.03746	-0.37071	-0.18936	-0.07425	-0.16486	0.01309	-0.14419	-0.050388
-0.25982	-0.23731	-0.20873	-0.18465	-0.78133	-0.18371	-0.14836	-0.09286	-0.11098	-0.32719	-0.024490
-0.25067	-0.25813	-0.37413	-0.13426	-0.60148	-0.17724	-0.17194	-0.17230	-0.08485	-0.25256	0.029289
-0.24208	-0.24462	-0.16224	-0.17719	-0.47705	-0.17116	-0.16356	-0.07192	-0.11631	-0.19951	0.012048
-0.23323	-0.23551	-0.27665	-0.12810	-0.39055	-0.16491	-0.15914	-0.12488	-0.08367	-0.16323	-0.007937
-0.22465	-0.23074	-0.12625	-0.16937	-0.33343	-0.15884	-0.15851	-0.05791	-0.11569	-0.14002	-0.007968
-0.21638	-0.22249	-0.21130	-0.13000	-0.27939	-0.15299	-0.15431	-0.09711	-0.08950	-0.11779	-0.012048
-0.20850	-0.21389	-0.09757	-0.15686	-0.23858	-0.14742	-0.14952	-0.04555	-0.10979	-0.10115	-0.028455
-0.20157	-0.20967	-0.16664	-0.13249	-0.21691	-0.14252	-0.14856	-0.07851	-0.09467	-0.09307	0.050209
-0.19656	-0.18356	-0.10028	-0.12773	-0.11072	-0.13898	-0.12475	-0.04265	-0.08744	-0.04593	0.023810
-0.18992	-0.16652	-0.12156	-0.05340	-0.09948	-0.13429	-0.11194	-0.05321	-0.03424	-0.04075	0.170543
-0.21171	-0.14913	-0.22446	-1.23663	-0.22081	-0.14969	-0.08501	-0.08931	-0.86224	-0.08863	-0.006623
-0.20398	-0.17752	-0.10074	-0.01279	-0.17602	-0.14422	-0.11484	-0.04368	-0.00064	-0.07108	0.023333
-0.19702	-0.16928	-0.18473	-0.55452	-0.14467	-0.13931	-0.11107	-0.08250	-0.38465	-0.05799	0.006494
-0.18983	-0.16519	-0.07706	-0.01196	-0.11951	-0.13422	-0.11085	-0.03430	-0.00266	-0.04797	-0.006431
-0.18290	-0.16247	-0.14266	-0.49400	-0.10792	-0.12932	-0.11155	-0.06579	-0.34537	-0.04399	0.000000
-0.17618	-0.15286	-0.05921	-0.01617	-0.08855	-0.12457	-0.10546	-0.02717	-0.00850	-0.03619	-0.003236
-0.16972	-0.14420	-0.10703	-0.37598	-0.07752	-0.12000	-0.10002	-0.04938	-0.26378	-0.03196	-0.035714
-0.16500	-0.15067	-0.07256	-0.02583	-0.09517	-0.11667	-0.10809	-0.03609	-0.01863	-0.04098	-0.103448
-0.17141	-0.19779	-0.18117	-0.23872	-0.16886	-0.12120	-0.15089	-0.09338	-0.17924	-0.07809	-0.038462
-0.16681	-0.17598	-0.07054	-0.12096	-0.10041	-0.11794	-0.13234	-0.03797	-0.09450	-0.04811	-0.288000
-0.24188	-0.38377	-0.46728	-0.41154	-0.98915	-0.17102	-0.30472	-0.24232	-0.32322	-0.44358	0.213483
-0.26873	-0.35083	-0.35567	-0.15771	-0.18437	-0.19001	-0.23859	-0.15116	-0.10836	-0.07984	0.171296

-0.28022	-0.29495	-0.34643	-0.39367	-0.24253	-0.19813	-0.18502	-0.14205	-0.25946	-0.09737	-0.020000
-0.27011	-0.32740	-0.29320	-0.12612	-0.21959	-0.19098	-0.22242	-0.13324	-0.07994	-0.09109	-0.016461
-0.26029	-0.32337	-0.29019	-0.37193	-0.18780	-0.18404	-0.22547	-0.13495	-0.25880	-0.07943	-0.020833
-0.25097	-0.31005	-0.22992	-0.14150	-0.16672	-0.17745	-0.21908	-0.10816	-0.09914	-0.07180	0.008511
-0.24171	-0.28077	-0.21791	-0.31050	-0.13265	-0.17090	-0.19654	-0.10026	-0.21762	-0.05669	-0.004237
-0.23275	-0.26161	-0.17150	-0.12686	-0.11520	-0.16457	-0.18355	-0.07942	-0.08844	-0.04946	-0.021277
-0.22429	-0.25035	-0.16403	-0.22873	-0.11156	-0.15859	-0.17757	-0.07614	-0.16111	-0.04927	0.000000
-0.21627	-0.22932	-0.12103	-0.17450	-0.08460	-0.15291	-0.16140	-0.05507	-0.12244	-0.03679	0.000000
-0.20853	-0.21198	-0.12249	-0.18006	-0.07098	-0.14744	-0.14858	-0.05555	-0.12614	-0.03057	0.013636
-0.20125	-0.19228	-0.09155	-0.14916	-0.06643	-0.14229	-0.13302	-0.04037	-0.10333	-0.02765	0.000000
-0.19405	-0.18148	-0.09301	-0.14637	-0.05711	-0.13720	-0.12605	-0.04199	-0.10149	-0.02404	0.000000
-0.18710	-0.17027	-0.07116	-0.12825	-0.04917	-0.13229	-0.11842	-0.03217	-0.08877	-0.02078	-0.009091
-0.18050	-0.16296	-0.07339	-0.12932	-0.05101	-0.12762	-0.11430	-0.03393	-0.09013	-0.02219	0.009174
-0.17413	-0.14768	-0.05465	-0.11063	-0.04317	-0.12312	-0.10210	-0.02403	-0.07626	-0.01795	0.000000
-0.16790	-0.13910	-0.05471	-0.10753	-0.03756	-0.11872	-0.09636	-0.02463	-0.07415	-0.01573	-0.059091
-0.16595	-0.16183	-0.09871	-0.13828	-0.13617	-0.11733	-0.11855	-0.04943	-0.09943	-0.06205	-0.040000
-0.15877	-0.14138	-0.05950	-0.10714	-0.06039	-0.11226	-0.10460	-0.02986	-0.07782	-0.02880	0.005208
-0.15274	-0.12103	-0.06508	-0.10895	-0.04648	-0.10799	-0.08643	-0.02923	-0.07858	-0.02047	0.015544
-0.14723	-0.10458	-0.04223	-0.09636	-0.04583	-0.10410	-0.07203	-0.01789	-0.06888	-0.01890	0.131980
-0.16468	-0.10752	-0.17090	-0.24157	-0.17614	-0.11644	-0.06191	-0.06812	-0.16698	-0.06892	0.190909
-0.19968	-0.10875	-0.22033	-0.18269	-0.18990	-0.14118	-0.05149	-0.08575	-0.11936	-0.06975	0.000000
-0.19205	-0.15298	-0.13749	-0.16602	-0.16636	-0.13579	-0.09521	-0.06078	-0.10866	-0.06766	0.041825
-0.18662	-0.14435	-0.18002	-0.12437	-0.14348	-0.13195	-0.09112	-0.07836	-0.07878	-0.05828	0.003650
-0.17951	-0.14853	-0.09992	-0.12525	-0.12041	-0.12692	-0.09860	-0.04454	-0.08028	-0.05042	0.053571
-0.17599	-0.12953	-0.14573	-0.10065	-0.12101	-0.12443	-0.08266	-0.06211	-0.06201	-0.04882	0.091525
-0.17902	-0.11162	-0.12677	-0.11725	-0.13807	-0.12658	-0.06526	-0.05066	-0.07171	-0.05365	0.029412
-0.17402	-0.12158	-0.10642	-0.12635	-0.10435	-0.12304	-0.07830	-0.04556	-0.08280	-0.04101	0.014286
-0.16793	-0.12229	-0.09689	-0.14691	-0.08722	-0.11874	-0.08175	-0.04245	-0.09967	-0.03520	-0.005634
-0.16187	-0.12444	-0.08018	-0.13091	-0.07971	-0.11445	-0.08612	-0.03621	-0.09064	-0.03357	0.002833
-0.15600	-0.11508	-0.07047	-0.12829	-0.06282	-0.11030	-0.07921	-0.03143	-0.08846	-0.02640	0.000000
-0.15033	-0.10840	-0.05698	-0.11467	-0.05338	-0.10629	-0.07473	-0.02549	-0.07903	-0.02251	0.000000
-0.14487	-0.10165	-0.05056	-0.11117	-0.04532	-0.10243	-0.07002	-0.02261	-0.07659	-0.01909	0.005650
-0.13965	-0.09306	-0.04077	-0.09712	-0.04061	-0.09874	-0.06333	-0.01786	-0.06615	-0.01679	0.185393
-0.17715	-0.10390	-0.23709	-0.23332	-0.74393	-0.12525	-0.05098	-0.09560	-0.14595	-0.31185	0.089583
-0.17956	-0.11285	-0.08846	-0.07416	-0.27834	-0.12696	-0.06343	-0.03345	-0.03890	-0.11184	0.007648
-0.17310	-0.14253	-0.18237	-0.22179	-0.21481	-0.12239	-0.09484	-0.08103	-0.15184	-0.08915	0.028409
-0.17092	-0.13611	-0.07572	-0.14792	-0.12430	-0.12085	-0.09152	-0.03152	-0.10203	-0.04952	0.014733
-0.16648	-0.13358	-0.12922	-0.16432	-0.11251	-0.11771	-0.09102	-0.05590	-0.11425	-0.04504	0.012704
-0.16211	-0.12805	-0.06520	-0.13452	-0.10268	-0.11462	-0.08741	-0.02774	-0.09347	-0.04131	0.012545
-0.15786	-0.12198	-0.10869	-0.14785	-0.09416	-0.11161	-0.08316	-0.04700	-0.10301	-0.03802	0.042403
-0.15526	-0.10780	-0.06352	-0.13718	-0.09844	-0.10978	-0.07009	-0.02534	-0.09449	-0.03953	-0.016949
-0.15133	-0.12508	-0.09592	-0.13846	-0.10766	-0.10700	-0.08814	-0.04291	-0.09705	-0.04454	-0.017241
-0.14752	-0.12182	-0.06073	-0.13251	-0.09957	-0.10430	-0.08628	-0.02755	-0.09345	-0.04182	0.017544
-0.14383	-0.10531	-0.07944	-0.13069	-0.08143	-0.10169	-0.07109	-0.03389	-0.09121	-0.03382	0.006897
-0.13998	-0.10324	-0.04867	-0.11437	-0.07328	-0.09897	-0.07046	-0.02076	-0.07968	-0.03040	0.015254
-0.13643	-0.09595	-0.06757	-0.12073	-0.06997	-0.09646	-0.06451	-0.02868	-0.08391	-0.02887	0.001669
-0.13111	-0.08856	-0.04072	-0.06863	-0.04387	-0.09270	-0.06013	-0.01759	-0.04721	-0.01743	0.025000
-0.12815	-0.07765	-0.05953	-0.11463	-0.04611	-0.09061	-0.05024	-0.02472	-0.07885	-0.01790	0.024390
-0.12526	-0.07347	-0.03762	-0.06423	-0.04627	-0.08857	-0.04719	-0.01493	-0.04310	-0.01762	0.009524
-0.12184	-0.07469	-0.05048	-0.10032	-0.03995	-0.08615	-0.04949	-0.02147	-0.06921	-0.01508	0.000000

-0.11841	-0.07508	-0.03309	-0.06115	-0.03795	-0.08372	-0.05079	-0.01429	-0.04201	-0.01467	0.036107
-0.11677	-0.06304	-0.05239	-0.12689	-0.04618	-0.08256	-0.03885	-0.02094	-0.08708	-0.01743	0.012121
-0.11367	-0.06710	-0.02704	-0.05283	-0.03972	-0.08037	-0.04381	-0.01086	-0.03547	-0.01479	-0.008982
-0.11058	-0.07330	-0.04837	-0.12392	-0.04949	-0.07819	-0.05038	-0.02158	-0.08673	-0.01981	0.000000
-0.10747	-0.06797	-0.02344	-0.05008	-0.03849	-0.07598	-0.04589	-0.01006	-0.03432	-0.01536	0.000000
-0.10444	-0.06530	-0.03921	-0.10783	-0.03433	-0.07384	-0.04395	-0.01706	-0.07511	-0.01379	0.000000

Table 2D: 150 Out of sample VaR forecast for GSECI

99%				95%				
EWMA	G-N	EG-N	EG-S	EWMA	G-N	EG-N	EG-S	Realized
-0.07875355	-0.0365021	-0.028113689	-1.29E-01	-0.05568302	-0.014062384	-0.006011114	-2.66E-02	0.09992941
-0.10461862	-0.0298199	0.011121293	-1.81E-02	-0.07397102	-0.004308656	0.025685999	2.34E-02	0.051580172
-0.10624229	-0.02277305	0.001637313	-3.29E-02	-0.07511904	0.000213469	0.014396538	2.65E-03	0.046543899
-0.10644578	-0.01816178	-0.002804969	-5.33E-02	-0.07526292	0.002728738	0.009010661	-8.06E-03	0.021596327
-0.10226247	-0.02617113	-0.025167026	-5.58E-02	-0.07230509	-0.00553784	-0.010682076	-1.66E-02	0.008129239
-0.09724348	-0.03731034	-0.028295257	-6.62E-02	-0.0687564	-0.016378617	-0.015933742	-2.54E-02	0.036099159
-0.09601032	-0.02991945	-0.018193742	-7.85E-02	-0.06788448	-0.010925814	-0.006405554	-2.24E-02	0.003641228
-0.09116589	-0.03902439	-0.030530011	-7.59E-02	-0.06445921	-0.019903246	-0.018300602	-3.08E-02	0.020398468
-0.0878094	-0.03487587	-0.017979427	-6.09E-02	-0.06208599	-0.017374847	-0.008475366	-1.95E-02	-0.008680165
-0.08358525	-0.04666578	-0.038422067	-8.82E-02	-0.05909929	-0.028417127	-0.0261914	-3.99E-02	-0.006998294
-0.07292616	-0.04343065	-0.024415234	-4.55E-02	-0.05156273	-0.03157856	-0.01758381	-2.23E-02	0.015181221
-0.06786365	-0.0313883	-0.021677808	-4.86E-02	-0.04798326	-0.01880077	-0.013329792	-1.78E-02	0.006063762
-0.06191913	-0.03160333	-0.01623455	-3.79E-02	-0.04378017	-0.02046047	-0.00973387	-1.44E-02	0.001011963
-0.05624667	-0.03308441	-0.020706182	-4.47E-02	-0.03976944	-0.022565027	-0.013593702	-1.92E-02	-0.006317259
-0.0514548	-0.03845706	-0.023770302	-5.08E-02	-0.03638133	-0.027832974	-0.016893404	-2.42E-02	-0.000199584
-0.04673423	-0.03306641	-0.01808233	-4.21E-02	-0.03304362	-0.022930061	-0.012548737	-1.89E-02	-0.018406966
-0.0460731	-0.05243976	-0.029637011	-6.42E-02	-0.03257617	-0.040064592	-0.022786803	-3.37E-02	-0.004194931
-0.04204465	-0.03938342	-0.015500921	-3.78E-02	-0.02972784	-0.028298889	-0.011836704	-1.86E-02	-0.003673011
-0.03835406	-0.03597084	-0.014969233	-3.86E-02	-0.02711839	-0.025640338	-0.011051398	-1.83E-02	-0.000898389
-0.03484605	-0.03294106	-0.014479067	-3.90E-02	-0.02463804	-0.022950797	-0.010223163	-1.76E-02	-0.001670957
-0.02741878	-0.03223834	-0.022041533	-2.71E-02	-0.01938656	-0.022708774	-0.015408652	-1.28E-02	-0.00811186
-0.02594796	-0.03787748	-0.027665189	-3.36E-02	-0.01834661	-0.02795492	-0.020356262	-1.75E-02	-0.012180319
-0.02643878	-0.04140843	-0.030102579	-3.23E-02	-0.01869365	-0.031338438	-0.022882066	-1.81E-02	-0.024150087
-0.03444548	-0.05468351	-0.041864289	-3.92E-02	-0.02435482	-0.04311729	-0.033154554	-2.45E-02	-0.01012632
-0.03257618	-0.04262685	-0.028307291	-2.05E-02	-0.02303312	-0.032053483	-0.021847028	-1.30E-02	-0.0146772
-0.0328932	-0.04425775	-0.03261365	-2.72E-02	-0.02325727	-0.033894918	-0.025236712	-1.67E-02	-0.043856508
-0.05415047	-0.08388531	-0.065793491	-4.46E-02	-0.03828731	-0.067632999	-0.053148577	-3.19E-02	-0.028326504
-0.05667469	-0.06378287	-0.042117004	-2.05E-02	-0.04007207	-0.050843937	-0.034950859	-1.83E-02	0.000088
-0.05074286	-0.04549141	-0.042093594	-5.37E-02	-0.03587794	-0.032194899	-0.030378386	-2.73E-02	-0.013072294
-0.04740791	-0.04925291	-0.045256568	-8.04E-03	-0.03351996	-0.036970108	-0.033695437	-6.69E-03	-0.093633755
-0.09956555	-0.24346307	-0.154642064	-2.43E-01	-0.07039822	-0.194108933	-0.124554646	-1.43E-01	-0.124594554
-0.14999146	-0.22128344	-0.128407875	-7.82E-02	-0.10605206	-0.181985431	-0.113539318	-7.24E-02	-0.137715039
-0.19002	-0.22029605	-0.151109755	-2.61E+00	-0.1343544	-0.183747228	-0.133147173	-1.30E+00	-0.010620231
-0.17343364	-0.16938597	-0.090128804	-8.47E-03	-0.12262695	-0.115977117	-0.07013965	-8.44E-03	-0.042816534
-0.16326631	-0.18527292	-0.144378444	Inf	-0.1154381	-0.141960607	-0.109923374	Inf	-0.010555607

-0.14910202	-0.09634476	-0.071739919	-5.51E-03	-0.10542318	-0.067979367	-0.053614687	-5.51E-03	-0.006619284
-0.13600071	-0.06223567	-0.052462829	Inf	-0.09615985	-0.045283536	-0.03840621	Inf	0.102621732
-0.15822176	-0.12757845	-0.199764567	5.51E-02	-0.11187133	-0.064323089	-0.124578166	5.51E-02	0.102123412
-0.17426407	-0.05027964	-0.375377531	#NAME?	-0.12321411	-0.015634342	-0.245406556	#NAME?	-0.008343407
-0.15898004	-0.18573704	-0.185855357	-5.12E-05	-0.11240748	-0.13728359	-0.128645264	-5.12E-05	-0.035451381
-0.14689357	-0.16175785	-0.14168182	-1.71E-01	-0.10386169	-0.121475461	-0.106306362	-7.82E-02	-0.043392348
-0.13775143	-0.15093223	-0.134575257	-1.60E-01	-0.0973977	-0.115759622	-0.10303283	-8.02E-02	-0.045266951
-0.13104728	-0.13702866	-0.123978173	-1.45E-01	-0.09265751	-0.106402917	-0.095973237	-7.70E-02	0.000861948
-0.11510829	-0.09820971	-0.102881449	-1.20E-01	-0.08138778	-0.069393143	-0.072860336	-5.79E-02	-0.003993029
-0.10120188	-0.08683592	-0.078066619	-9.06E-02	-0.0715552	-0.061943427	-0.055716611	-4.25E-02	-0.004559206
-0.08903432	-0.07599674	-0.066484794	-7.17E-02	-0.06295207	-0.054422957	-0.047651254	-3.33E-02	0.045688861
-0.09325891	-0.0525782	-0.075028712	-1.20E-01	-0.06593909	-0.027431953	-0.044744287	-4.42E-02	-0.017286265
-0.08413867	-0.1053954	-0.090119415	-1.05E-01	-0.05949059	-0.077405348	-0.066131318	-4.60E-02	0.028913512
-0.08059438	-0.07341285	-0.084557769	-9.32E-02	-0.05698458	-0.045743901	-0.054571515	-3.49E-02	-0.006099828
-0.07111368	-0.090128	-0.082350052	-8.71E-02	-0.05028121	-0.064442422	-0.058819096	-3.68E-02	-0.01460185
-0.06396796	-0.09112985	-0.090650605	-1.07E-01	-0.04522881	-0.067194896	-0.067080674	-4.84E-02	0.039930624
-0.07171257	-0.06124561	-0.08339612	-1.30E-01	-0.05070466	-0.034427712	-0.049964068	-4.81E-02	0.016100639
-0.06539547	-0.06897147	-0.066665672	-8.38E-02	-0.04623813	-0.04491008	-0.043339127	-2.92E-02	0.040194429
-0.07287718	-0.04812049	-0.059970399	-9.49E-02	-0.05152811	-0.025051064	-0.033322195	-2.92E-02	0.051531634
-0.08607804	-0.0345137	-0.041611737	-8.83E-02	-0.06086182	-0.012977565	-0.017832248	-2.20E-02	0.061105278
-0.10184982	-0.02374301	-0.031042082	-8.59E-02	-0.07201332	-0.003302211	-0.008245826	-1.71E-02	0.038966352
-0.09936819	-0.03242847	-0.031186018	-6.00E-02	-0.07025868	-0.014159912	-0.013210077	-9.00E-03	-0.019210014
-0.08972041	-0.09160044	-0.076799098	-1.25E-01	-0.06343718	-0.068453355	-0.058270185	-5.09E-02	-0.050477043
-0.09684517	-0.11776363	-0.118365913	-1.64E-01	-0.06847477	-0.093706622	-0.094575476	-8.03E-02	-0.034940944
-0.09347218	-0.09686816	-0.111730386	-1.44E-01	-0.06608988	-0.075654681	-0.086488034	-7.32E-02	-0.040709411
-0.09375453	-0.09465276	-0.099472329	-1.31E-01	-0.06628952	-0.075225699	-0.078895291	-7.45E-02	0.016660201
-0.08429852	-0.06270272	-0.084746222	-1.28E-01	-0.0596036	-0.039968338	-0.055706645	-5.98E-02	0.021784435
-0.07783218	-0.0521914	-0.057791331	-1.01E-01	-0.05503155	-0.031879287	-0.035874287	-4.18E-02	0.051613963
-0.0893818	-0.03331449	-0.045741155	-1.02E-01	-0.06319776	-0.011997501	-0.020753517	-3.36E-02	-0.00456023
-0.07854557	-0.08480038	-0.076363862	-1.12E-01	-0.05553596	-0.060995195	-0.055065077	-4.84E-02	-0.013374522
-0.07048232	-0.08146904	-0.082959767	-1.14E-01	-0.04983481	-0.060110823	-0.061325118	-5.47E-02	0.005756328
-0.06214097	-0.06080201	-0.068841149	-9.40E-02	-0.04393702	-0.041236916	-0.04704964	-4.27E-02	-0.01117132
-0.05590549	-0.06982694	-0.070832308	-9.44E-02	-0.0395282	-0.051498255	-0.052337995	-4.60E-02	0.023040118
-0.05538124	-0.04645165	-0.061810995	-9.03E-02	-0.03915753	-0.027304068	-0.038253378	-3.71E-02	0.033063581
-0.06103544	-0.03497333	-0.043082483	-7.85E-02	-0.04315535	-0.017268564	-0.023005392	-2.69E-02	-0.000597606
-0.05411299	-0.06046605	-0.062831461	-9.70E-02	-0.03826081	-0.042584885	-0.044174042	-3.95E-02	0.044599418
-0.06838289	-0.04016911	-0.061790716	-1.05E-01	-0.04835039	-0.018777049	-0.035055647	-3.51E-02	0.020857085
-0.06448485	-0.05083956	-0.053750249	-7.52E-02	-0.04559427	-0.031332652	-0.033663717	-2.41E-02	0.00845553
-0.05759402	-0.05315244	-0.054435023	-7.75E-02	-0.04072208	-0.035510776	-0.036578897	-2.88E-02	0.055354548
-0.07922152	-0.03522562	-0.055268876	-1.04E-01	-0.0560139	-0.013058192	-0.028380979	-3.16E-02	-0.0000378
-0.06982939	-0.07995589	-0.074512652	-1.02E-01	-0.04937315	-0.056283741	-0.052237631	-3.98E-02	-0.008591261
-0.06227032	-0.07772623	-0.075899822	-1.06E-01	-0.04402848	-0.056399953	-0.05505361	-4.68E-02	-0.0000285
-0.05488784	-0.06410863	-0.063397576	-8.55E-02	-0.03880867	-0.044977225	-0.044639688	-3.75E-02	-0.0037351
-0.04855432	-0.06030709	-0.056755136	-7.93E-02	-0.03433053	-0.04307402	-0.040607583	-3.57E-02	-0.00466787
-0.04310413	-0.05520712	-0.050987442	-7.19E-02	-0.03047695	-0.03965626	-0.036719784	-3.29E-02	0.022912758
-0.045633	-0.03749647	-0.041301266	-7.06E-02	-0.032265	-0.021579078	-0.02475795	-2.97E-02	0.060553409
-0.07764158	-0.02435599	-0.033417125	-8.30E-02	-0.05489679	-0.004591275	-0.011893497	-2.61E-02	0.015605477
-0.07058186	-0.05401327	-0.053983495	-6.42E-02	-0.04990519	-0.034288571	-0.034317694	-2.25E-02	-0.011681728
-0.06355411	-0.07237606	-0.074581172	-9.50E-02	-0.04493619	-0.053005547	-0.054423487	-4.52E-02	0.009684733
-0.05704886	-0.05421217	-0.063129662	-7.24E-02	-0.04033663	-0.03608108	-0.04270722	-3.26E-02	0.008328457

-0.05113649	-0.04863538	-0.051975056	-6.25E-02	-0.03615626	-0.032276436	-0.034849176	-2.75E-02	-0.011342585
-0.04678347	-0.06041247	-0.061436205	-7.82E-02	-0.03307844	-0.044537006	-0.045186403	-3.91E-02	-0.004870047
-0.04160498	-0.05134654	-0.05271712	-6.42E-02	-0.02941697	-0.036961736	-0.038046142	-3.24E-02	0.00478518
-0.03706691	-0.04077876	-0.042628101	-5.81E-02	-0.02620831	-0.027523429	-0.029063158	-2.74E-02	-0.013094125
-0.03570521	-0.05275586	-0.052506909	-6.88E-02	-0.02524551	-0.039499238	-0.039248128	-3.56E-02	-0.02224769
-0.03996308	-0.05581304	-0.057746241	-7.19E-02	-0.02825605	-0.043364045	-0.044458138	-4.17E-02	-0.00785195
-0.03633752	-0.04203703	-0.047303104	-5.56E-02	-0.02569259	-0.030594432	-0.034405117	-3.14E-02	-0.077357667
-0.09012513	-0.13976184	-0.12336881	-1.98E-01	-0.06372333	-0.113986124	-0.100932211	-1.18E-01	-0.014633712
-0.08122673	-0.09295789	-0.119228566	-1.07E-01	-0.05743169	-0.067166529	-0.086204063	-6.27E-02	0.012401082
-0.07304357	-0.07017234	-0.084096055	-9.96E-02	-0.05164575	-0.046561281	-0.056778729	-5.08E-02	-0.018662674
-0.06767463	-0.09058591	-0.093759462	-9.90E-02	-0.04784962	-0.067608068	-0.069405477	-5.41E-02	-0.003942381
-0.05996219	-0.07087218	-0.077002738	-7.95E-02	-0.04239651	-0.050215026	-0.054706823	-4.24E-02	-0.046554557
-0.07332438	-0.1110736	-0.107861963	-1.30E-01	-0.0518443	-0.087517664	-0.084374524	-7.64E-02	0.030729466
-0.07292612	-0.07276934	-0.107293044	-1.09E-01	-0.0515627	-0.044145898	-0.069659969	-5.27E-02	0.005550684
-0.06473212	-0.08583672	-0.085760502	-8.05E-02	-0.0457691	-0.059649635	-0.059439088	-3.88E-02	0.003454819
-0.05822695	-0.07286972	-0.071511316	-7.35E-02	-0.0411696	-0.050527975	-0.049730957	-3.48E-02	0.022164049
-0.05695405	-0.05707363	-0.060455593	-7.57E-02	-0.04026959	-0.035998568	-0.038773085	-3.26E-02	0.016943017
-0.0538994	-0.05314743	-0.05051769	-6.20E-02	-0.03810979	-0.033915223	-0.032520092	-2.56E-02	0.019133878
-0.05215424	-0.0466587	-0.044480127	-5.78E-02	-0.03687586	-0.028981317	-0.027907943	-2.31E-02	0.007748856
-0.04733098	-0.0488625	-0.043421055	-5.27E-02	-0.03346556	-0.0325887	-0.029068759	-2.25E-02	0.020969124
-0.04762511	-0.03851454	-0.039094954	-5.43E-02	-0.03367353	-0.023019726	-0.023844213	-2.15E-02	-0.011402326
-0.04421208	-0.06007967	-0.057417535	-7.18E-02	-0.03126033	-0.043996075	-0.042188295	-3.56E-02	-0.007106984
-0.04022263	-0.05443506	-0.051873053	-6.24E-02	-0.02843957	-0.0396638	-0.037727561	-3.20E-02	-0.005292111
-0.03638816	-0.04921102	-0.045096537	-5.59E-02	-0.0257284	-0.035612884	-0.032611416	-2.89E-02	-0.014567597
-0.03590147	-0.05288057	-0.05000125	-6.41E-02	-0.02538428	-0.039871134	-0.037633569	-3.47E-02	0.007088252
-0.03345859	-0.03849099	-0.040582243	-5.59E-02	-0.02365703	-0.02593885	-0.027492617	-2.64E-02	0.012875536
-0.03280754	-0.03196751	-0.034458448	-5.01E-02	-0.0231967	-0.020076511	-0.022088579	-2.14E-02	-0.015186826
-0.033312	-0.05084598	-0.053334793	-7.23E-02	-0.02355338	-0.037831956	-0.039759531	-3.76E-02	0.000284069
-0.02990666	-0.04096172	-0.045602474	-5.31E-02	-0.02114563	-0.0287645	-0.032101285	-2.62E-02	0.004814985
-0.02729789	-0.03501886	-0.03822357	-4.78E-02	-0.01930109	-0.023635667	-0.026063547	-2.22E-02	-0.000369524
-0.02450912	-0.03514675	-0.036697732	-4.50E-02	-0.01732927	-0.02447464	-0.025751462	-2.16E-02	0.010451983
-0.02447155	-0.02824065	-0.031471797	-4.30E-02	-0.01730271	-0.017917241	-0.020407097	-1.85E-02	0.003830272
-0.02231685	-0.02927304	-0.030585549	-3.76E-02	-0.01577922	-0.019556934	-0.020728696	-1.67E-02	-0.0075206
-0.021466	-0.03582354	-0.03746333	-4.88E-02	-0.01517762	-0.026104825	-0.027412295	-2.48E-02	0.00354001
-0.01960925	-0.02898468	-0.032132774	-3.89E-02	-0.0138648	-0.019666665	-0.022011124	-1.83E-02	0.076986856
-0.06489449	-0.02677099	-0.121003515	-2.30E-01	-0.04588391	-0.005768334	-0.073402908	-9.55E-02	0.003598568
-0.06138027	-0.06929884	-0.057905836	-7.67E-02	-0.04339916	-0.047118883	-0.039874047	-3.13E-02	-0.016998101
-0.05942542	-0.08191757	-0.071584289	-1.04E-01	-0.04201698	-0.060320672	-0.053055005	-5.03E-02	0.002695583
-0.05618882	-0.06793403	-0.06592043	-7.69E-02	-0.03972853	-0.047479174	-0.046087913	-3.59E-02	0.015138054
-0.05433016	-0.056828	-0.053562151	-7.87E-02	-0.03841436	-0.037332774	-0.035333893	-3.42E-02	0.01437002
-0.05249016	-0.05283373	-0.043621642	-7.02E-02	-0.03711338	-0.034463216	-0.028368569	-2.96E-02	0.041417403
-0.05877731	-0.03942214	-0.05052772	-9.16E-02	-0.04155873	-0.020475687	-0.029050322	-3.51E-02	0.041910247
-0.06405608	-0.03573937	-0.034908166	-7.86E-02	-0.04529111	-0.01744958	-0.017812765	-2.74E-02	0.085908668
-0.0891262	-0.02509469	-0.063532852	-1.29E-01	-0.06301704	-0.00256886	-0.031209514	-4.33E-02	0.075905752
-0.10214498	-0.02692004	-0.029013173	-9.43E-02	-0.07222202	-0.004968892	-0.008165894	-2.63E-02	0.103443471
-0.12872368	-0.01343464	-0.037963197	-1.60E-01	-0.09101459	0.010417659	-0.008700148	-4.42E-02	0.005856171
-0.12103955	-0.08249221	-0.07907484	-1.77E-01	-0.0855815	-0.055390534	-0.054247682	-7.04E-02	0.021403829
-0.11499937	-0.07207531	-0.079826856	-1.38E-01	-0.08131077	-0.046559483	-0.052564145	-5.43E-02	0.017842373
-0.1089841	-0.06833983	-0.064963337	-1.31E-01	-0.07705765	-0.04443936	-0.042602928	-5.24E-02	0.005362413
-0.10249123	-0.07119282	-0.061028083	-1.28E-01	-0.07246684	-0.04871498	-0.041957728	-5.35E-02	0.025112888

-0.09835537	-0.0568773	-0.054756205	-1.30E-01	-0.06954256	-0.035254742	-0.034219149	-5.11E-02	0.016509823
-0.09334563	-0.05666074	-0.044799057	-1.15E-01	-0.0660004	-0.036375769	-0.028556245	-4.54E-02	-0.01493632
-0.0885108	-0.07586099	-0.063645357	-1.46E-01	-0.06258192	-0.055638986	-0.047266763	-6.58E-02	0.012370009
-0.08374656	-0.05855494	-0.061406274	-1.17E-01	-0.05921334	-0.038983229	-0.041178929	-4.91E-02	0.006074021
-0.07883735	-0.05721089	-0.049658663	-1.03E-01	-0.05574227	-0.038814295	-0.033826321	-4.32E-02	0.028281261
-0.07666384	-0.0418363	-0.046242526	-1.10E-01	-0.05420548	-0.024280422	-0.027908922	-4.13E-02	0.00048092
-0.07177463	-0.05455444	-0.048481369	-1.03E-01	-0.05074854	-0.037540142	-0.033823488	-4.24E-02	0.006611361
-0.06741326	-0.04850814	-0.045110054	-8.84E-02	-0.04766482	-0.032633505	-0.030603684	-3.60E-02	0.009101652
-0.06355021	-0.04341696	-0.038172537	-8.45E-02	-0.04493343	-0.028566451	-0.025271877	-3.38E-02	-0.000734553
-0.05949945	-0.04612948	-0.038424293	-8.43E-02	-0.04206932	-0.032066208	-0.027009964	-3.55E-02	0.034082977
-0.06228487	-0.03282706	-0.048803484	-1.05E-01	-0.04403877	-0.017054884	-0.028828013	-3.80E-02	0.012328349
-0.05917649	-0.04044615	-0.037174533	-7.56E-02	-0.04184097	-0.025533114	-0.023902778	-2.80E-02	0.003589318
-0.05547936	-0.04345158	-0.038645274	-7.88E-02	-0.0392269	-0.029375994	-0.026451904	-3.18E-02	0.003029817
-0.05199943	-0.04132268	-0.034517077	-7.05E-02	-0.03676641	-0.028116179	-0.023673167	-2.89E-02	0.003385632
-0.04876108	-0.03850986	-0.030138543	-6.47E-02	-0.03447672	-0.02609051	-0.02052505	-2.65E-02	0.005593959

Table 3D: 150 Out of sample ES forecast for FML

		99%					95%		
EWMA	G-N	G-S	EG-N	EG-S	EWMA	G-N	G-S	EG-N	EG-S
0.0897896	0.10237169	0.010561161	0.08481729	5.44E-01	0.06949166	0.08216651	0.01976929	0.06946188	1.09E-01
0.08777534	0.09908044	0.045730303	0.08260004	5.59E-01	0.06793274	0.07968468	0.08945915	0.06767124	1.12E-01
0.10186824	0.16513073	0.080429366	0.31662025	5.73E-01	0.07883979	0.135595	0.15773051	0.25298649	1.15E-01
0.0997876	0.13559793	0.037049445	0.07917532	5.89E-01	0.0772295	0.11074995	0.07186348	0.06795464	1.18E-01
0.09797008	0.11845869	0.060753056	0.19838868	6.03E-01	0.07582285	0.09661766	0.11884783	0.1595405	1.21E-01
0.10320964	0.13681523	0.062722556	0.09046944	6.17E-01	0.07987795	0.11305641	0.12250594	0.07796988	1.23E-01
0.1007881	0.11954659	0.045585865	0.17737192	6.31E-01	0.07800382	0.09771226	0.08867094	0.14369652	1.26E-01
0.0981806	0.10825206	0.045667001	0.07206264	6.44E-01	0.07598578	0.08758219	0.08896277	0.06087444	1.29E-01
0.09556935	0.10093603	0.033112102	0.14968741	6.57E-01	0.07396483	0.08102939	0.06422576	0.11994248	1.31E-01
0.10070165	0.13379352	0.064409402	0.09669923	6.69E-01	0.07793692	0.10958466	0.12596626	0.08148009	1.34E-01
0.15445289	0.30019821	0.146929549	0.15737881	7.68E-01	0.11953709	0.24824388	0.28038904	0.1327153	1.65E-01
0.14988418	0.22433271	0.044598858	0.21728677	7.83E-01	0.11600119	0.18322952	0.08266978	0.17659136	1.68E-01
0.14603575	0.16978502	0.106992525	0.12504243	7.93E-01	0.11302274	0.13853768	0.20381624	0.10388518	1.70E-01
0.1441336	0.14401371	0.045669898	0.19584872	8.04E-01	0.11155059	0.11855421	0.08505504	0.15847498	1.72E-01
0.13964107	0.12693917	0.077253689	0.10543034	8.38E-01	0.10807365	0.10255848	0.14675377	0.08676052	1.80E-01
0.13528857	0.11293124	0.032865959	0.16223947	8.20E-01	0.10470508	0.09031803	0.06120863	0.1295314	1.76E-01
0.14676141	0.16160084	0.098509165	0.0773364	2.14E+00	0.11358436	0.12065274	0.18992897	0.0591781	4.54E-01
0.14218698	0.131437	0.022541223	0.12715168	2.89E-01	0.11004403	0.1002474	0.04288228	0.09835323	6.34E-02
0.13775513	0.11199579	0.07072144	0.07225294	3.29E-01	0.10661404	0.08668003	0.13629541	0.05629282	7.19E-02
0.13346141	0.101795	0.016243512	0.11332971	3.22E-01	0.10329097	0.07952929	0.03084363	0.08837845	7.04E-02
0.12864714	0.09712462	0.049360844	0.09382609	3.63E-01	0.09956501	0.07634121	0.09483023	0.07364935	7.36E-02
0.12485411	0.09490939	0.01107223	0.09428901	3.63E-01	0.09662945	0.07477481	0.02100513	0.07419002	7.35E-02
0.12117292	0.09399798	0.035271686	0.08754387	3.63E-01	0.09378043	0.07413643	0.06770564	0.0690675	7.35E-02
0.11760027	0.09363674	0.007966478	0.08699888	3.64E-01	0.09101542	0.07388718	0.01505625	0.06869816	7.37E-02
0.11413295	0.09349784	0.025225354	0.08173761	3.65E-01	0.08833193	0.0737934	0.04836139	0.06465438	7.39E-02

0.11076787	0.09344613	0.005754411	0.08083275	3.67E-01	0.08572755	0.07375959	0.01081682	0.06396916	7.42E-02
0.1290414	0.15574906	0.088310112	0.04698234	9.08E+00	0.09987015	0.11428542	0.17170272	0.03161866	1.81E+00
0.1292903	0.11654909	0.036594054	0.04811415	7.67E-03	0.10006279	0.08469819	0.072383	0.03258379	2.13E-03
0.14253985	0.11920372	0.100549354	0.02859207	9.23E+67	0.11031713	0.08326509	0.19690956	0.01445871	1.84E+67
0.14481501	0.09396558	0.053581865	0.03211473	2.80E-04	0.11207796	0.06482718	0.10669081	0.01770761	2.80E-04
0.15768783	0.08693379	0.104833422	-0.01462086	1.36E+00	0.12204074	0.05532418	0.20534984	-0.02515787	2.59E-01
0.1528555	0.11598619	0.036743012	0.13518083	8.21E-01	0.11830081	0.08437088	0.07377303	0.09859825	1.54E-01
0.1486487	0.13394652	0.076306787	0.05703326	7.40E-01	0.115045	0.10291071	0.14879489	0.04336254	1.41E-01
0.14409337	0.13154136	0.026453388	0.143723	6.63E-01	0.11151946	0.10206125	0.05258327	0.11137196	1.27E-01
0.14016613	0.13401267	0.056385511	0.07710935	6.07E-01	0.10848001	0.10578965	0.10939898	0.06177932	1.18E-01
0.17498866	0.24023962	0.136970441	0.62459636	1.44E+00	0.13543052	0.19992361	0.26143738	0.49932469	2.89E-01
0.20011546	0.27434376	0.136835974	0.17955884	3.64E+00	0.15487713	0.23187518	0.25911337	0.16087751	7.30E-01
0.19784735	0.24412259	0.108947316	0.43504247	3.62E+00	0.15312175	0.20378103	0.20538011	0.35262859	7.26E-01
0.19442561	0.22063211	0.104098369	0.13900567	2.66E+00	0.15047353	0.18244859	0.19607202	0.1197821	5.37E-01
0.18846745	0.19415037	0.077223938	0.27509539	1.99E+00	0.14586228	0.15679756	0.1451743	0.2191679	4.01E-01
0.18704263	0.18460587	0.07426367	0.15202481	1.45E+00	0.14475956	0.14972735	0.13477076	0.12178331	2.95E-01
0.18127497	0.16950758	0.049052941	0.07353328	1.17E+00	0.14029574	0.13621173	0.0900272	0.05978782	2.39E-01
0.17544697	0.15662402	0.048898429	0.10809712	9.23E-01	0.13578523	0.12478322	0.09114147	0.08577409	1.88E-01
0.17038018	0.15289479	0.038791918	0.07068425	7.72E-01	0.13186384	0.1225171	0.07049866	0.05745673	1.58E-01
0.16485651	0.14167006	0.033994787	0.10021035	6.56E-01	0.12758886	0.11251852	0.06344886	0.07940473	1.34E-01
0.19767421	0.24948737	0.156607715	0.68286139	1.46E+00	0.15298775	0.20909811	0.27609787	0.53930341	2.99E-01
0.19125848	0.21197056	0.031927913	0.07107279	1.97E+00	0.14802237	0.17152977	0.05752802	0.05856138	3.97E-01
0.18663581	0.20035369	0.10207151	0.39014972	1.52E+00	0.1444447	0.16197085	0.18831268	0.30579711	3.07E-01
0.18396555	0.19745126	0.048668234	0.06546678	1.33E+00	0.14237809	0.16078304	0.08526919	0.05544171	2.71E-01
0.19607682	0.23113767	0.127356024	4.36077884	1.52E+00	0.15175147	0.19286256	0.22583191	3.3837044	3.11E-01
0.19087601	0.20528443	0.036252008	0.15419103	1.54E+00	0.14772636	0.16600178	0.06353024	0.12583554	3.15E-01
0.1845719	0.18877087	0.077037394	0.12527788	1.14E+00	0.14284736	0.15133341	0.14014577	0.1019293	2.34E-01
0.17820287	0.17305702	0.023146663	0.11726405	9.37E-01	0.13791812	0.13721308	0.04227044	0.09409571	1.91E-01
0.17205361	0.16180754	0.051617365	0.09458064	7.57E-01	0.13315897	0.12761472	0.09557799	0.07557145	1.55E-01
0.16619268	0.15511205	0.017773302	0.08690406	5.94E-01	0.12862297	0.12256823	0.03179515	0.06941148	1.22E-01
0.16155696	0.15576003	0.04530432	0.10626779	5.73E-01	0.12503521	0.12461551	0.07998478	0.08524466	1.18E-01
0.15780772	0.15561004	0.031410054	0.10326703	6.35E-01	0.12213352	0.12575479	0.05258149	0.08378802	1.31E-01
0.15420149	0.15231924	0.041778664	0.11358688	6.96E-01	0.11934253	0.12375921	0.07156676	0.09227564	1.43E-01
0.14889093	0.13889839	0.019471098	0.09108752	6.37E-01	0.11523247	0.1112567	0.03448957	0.07360227	1.30E-01
0.14388599	0.12742486	0.024607933	0.10170368	5.88E-01	0.11135895	0.10055774	0.04646832	0.08050701	1.19E-01
0.1343625	0.11106727	0.011477669	0.06722163	5.56E-01	0.10398836	0.08711035	0.02265686	0.05214804	1.12E-01
0.1294752	0.10388197	0.015791657	0.07824803	5.31E-01	0.10020589	0.08077066	0.03132151	0.0599898	1.06E-01
0.15230439	0.18382932	0.11141569	0.30267279	1.16E+00	0.11787428	0.15184076	0.18588461	0.24126536	2.35E-01
0.14731228	0.16670897	0.021690572	0.08925435	1.29E+00	0.11401069	0.13628032	0.03240188	0.07434417	2.62E-01
0.14147782	0.14983978	0.063720521	0.23988297	1.08E+00	0.10949518	0.12038486	0.11510933	0.18860647	2.19E-01
0.1358772	0.13798739	0.009600482	0.06440182	8.77E-01	0.10516064	0.1098935	0.01696409	0.05166415	1.77E-01
0.13745325	0.15300518	0.071038921	0.42157282	9.40E-01	0.10638041	0.12497914	0.12075895	0.33091736	1.92E-01
0.13201925	0.13845588	0.011731279	0.06141814	8.47E-01	0.10217483	0.1113889	0.01920013	0.05029451	1.72E-01
0.12685515	0.12874513	0.042830784	0.28343794	6.77E-01	0.09817812	0.10295868	0.07699329	0.22134245	1.38E-01
0.12196104	0.12178976	0.009439606	0.05013055	5.69E-01	0.09439039	0.09727785	0.01569507	0.04049905	1.16E-01
0.15375995	0.19895052	0.117587021	0.30826554	1.04E+00	0.11900079	0.16450471	0.20135644	0.24937488	2.15E-01
0.30682832	0.456261	0.301311927	0.33279272	4.08E+00	0.23746636	0.38210077	0.50968503	0.28810144	8.30E-01
0.29767122	0.41417957	0.109443097	0.35496996	8.14E+00	0.23037932	0.33554234	0.19986961	0.28983533	1.63E+00
0.28718191	0.37319514	0.180074171	0.22762967	6.25E+00	0.22226123	0.29699174	0.33758143	0.1839487	1.25E+00
0.27734141	0.34907179	0.085761244	0.26871002	4.97E+00	0.21464529	0.27741131	0.15624274	0.21488822	9.94E-01

0.26720576	0.32382331	0.140103408	0.1973786	4.07E+00	0.20680091	0.25631013	0.25854665	0.15809147	8.14E-01
0.2573685	0.29833202	0.061419355	0.22384234	3.47E+00	0.19918748	0.23447093	0.11475588	0.17637969	6.92E-01
0.24789868	0.27690001	0.102240913	0.16660631	2.89E+00	0.19185842	0.21662112	0.19134974	0.13080472	5.77E-01
0.23887059	0.25759953	0.045274864	0.18786102	2.46E+00	0.18487123	0.20068876	0.08587224	0.14625241	4.90E-01
0.2309275	0.23794572	0.075357463	0.14452976	2.22E+00	0.17872377	0.18391615	0.14413344	0.11109284	4.39E-01
0.22519422	0.24720368	0.056756596	0.16740317	1.16E+00	0.17428655	0.19520882	0.09914131	0.13177951	2.33E-01
0.21759011	0.2332537	0.06467741	0.08694995	1.05E+00	0.16840144	0.18499936	0.11494224	0.07000882	2.12E-01
0.24255089	0.32051469	0.143770991	1.50553033	2.38E+00	0.18771956	0.26382644	0.24315507	1.1745409	4.80E-01
0.2336889	0.28158883	0.054729675	0.07622305	1.89E+00	0.18086091	0.2261728	0.09668967	0.06547858	3.80E-01
0.22572304	0.25709432	0.093821587	0.68968778	1.56E+00	0.17469583	0.20562946	0.16900293	0.53950672	3.15E-01
0.21748081	0.23277068	0.039464271	0.05614534	1.29E+00	0.16831684	0.18473564	0.0709149	0.04792433	2.60E-01
0.20954224	0.21046986	0.066794907	0.59463376	1.15E+00	0.16217288	0.16545507	0.12332736	0.4632318	2.31E-01
0.20184473	0.19427407	0.028086744	0.0400271	9.40E-01	0.15621548	0.15237387	0.05164767	0.03324415	1.89E-01
0.19444379	0.17941529	0.050041475	0.4458291	8.18E-01	0.1504876	0.14035343	0.09243513	0.34663352	1.64E-01
0.18903723	0.16121721	0.026804281	0.02690028	9.69E-01	0.14630326	0.12357093	0.05362316	0.02053565	1.92E-01
0.19638224	0.14573861	0.057236442	0.19687171	1.61E+00	0.15198784	0.10427369	0.11983328	0.14429466	3.12E-01
0.19110591	0.14362815	0.017915336	0.07281201	9.27E-01	0.14790429	0.10505052	0.04114052	0.04942298	1.77E-01
0.27711432	0.19522901	0.143639504	0.23538395	9.73E+00	0.21446954	0.12534105	0.30404359	0.15729721	1.90E+00
0.30787416	0.47123126	0.199703764	0.20373435	1.87E+00	0.23827577	0.37200573	0.34552364	0.16010629	3.70E-01
0.32104111	0.51019112	0.208596916	0.58933505	2.61E+00	0.24846619	0.41300737	0.35432593	0.47068276	5.27E-01
0.3094579	0.44150571	0.141188857	0.21211837	2.30E+00	0.23950149	0.34869577	0.25524084	0.17129173	4.62E-01
0.29820523	0.39373264	0.131383122	0.45665019	1.94E+00	0.23079261	0.30717495	0.24207098	0.3566377	3.87E-01
0.28752597	0.35629781	0.100744034	0.16880886	1.70E+00	0.22252752	0.27586643	0.18756322	0.1313531	3.36E-01
0.27691993	0.33622198	0.101604523	0.36981486	1.36E+00	0.21431909	0.26174813	0.18549733	0.28769806	2.70E-01
0.26665734	0.31007517	0.078550451	0.1545452	1.18E+00	0.20637647	0.24107102	0.14420393	0.12057894	2.33E-01
0.25696233	0.28275305	0.07905006	0.26651152	1.11E+00	0.19887313	0.21840505	0.15087244	0.20673442	2.19E-01
0.2477693	0.26816017	0.061411061	0.20680415	8.54E-01	0.19175829	0.20811209	0.11531604	0.16077938	1.69E-01
0.23890516	0.25244145	0.062664147	0.21485921	7.23E-01	0.18489798	0.19638343	0.11737166	0.16719072	1.43E-01
0.23055952	0.24177275	0.050012124	0.18652216	6.95E-01	0.17843897	0.18938106	0.09183948	0.14600442	1.39E-01
0.22231108	0.22449192	0.048103565	0.18234206	5.92E-01	0.17205518	0.17548993	0.08979697	0.14266572	1.18E-01
0.21435773	0.20951583	0.036675564	0.1609041	5.08E-01	0.16589977	0.16367391	0.0685373	0.12600203	1.01E-01
0.20678868	0.19347432	0.035758632	0.15772463	5.15E-01	0.16004179	0.15045104	0.0680087	0.12307683	1.02E-01
0.19949598	0.1861519	0.030027659	0.14114458	4.52E-01	0.15439769	0.14585686	0.05504772	0.11075442	9.05E-02
0.19235886	0.17397057	0.028483169	0.13699057	3.91E-01	0.14887399	0.1361814	0.05306412	0.10747566	7.81E-02
0.19011759	0.1552227	0.037582629	0.14622775	1.32E+00	0.14713939	0.1169526	0.07785296	0.11188673	2.57E-01
0.18189348	0.12800234	0.023108166	0.10758989	5.60E-01	0.14077443	0.09548668	0.04840918	0.08167108	1.07E-01
0.17498494	0.13245139	0.034838058	0.11347084	4.64E-01	0.13542764	0.10185463	0.06543916	0.08662429	9.14E-02
0.16868085	0.13387908	0.025598353	0.10491772	4.83E-01	0.13054866	0.10509564	0.04637171	0.08062312	9.69E-02
0.18866614	0.22648123	0.115563316	0.30479404	1.93E+00	0.14601605	0.18616654	0.20329889	0.23884524	3.92E-01
0.2287628	0.3106501	0.154789618	0.28114414	2.17E+00	0.17704841	0.26002643	0.26967958	0.22515794	4.47E-01
0.22002219	0.27018801	0.076308717	0.25411853	1.77E+00	0.17028372	0.21910979	0.14178897	0.20340599	3.57E-01
0.21380497	0.24553275	0.103348637	0.20960924	1.53E+00	0.16547197	0.19847181	0.19013787	0.16929605	3.08E-01
0.20565312	0.21718769	0.054432776	0.20413195	1.25E+00	0.15916294	0.1730444	0.10170672	0.16437477	2.51E-01
0.20162121	0.21379127	0.087342689	0.18241537	1.30E+00	0.15604249	0.17235062	0.15872658	0.14824776	2.62E-01
0.20509577	0.22795683	0.085379938	0.21635253	1.52E+00	0.15873158	0.18696814	0.15035617	0.17608478	3.09E-01
0.19936627	0.19547795	0.064794736	0.19261761	1.14E+00	0.1542973	0.15720741	0.11925424	0.15411734	2.31E-01
0.19239161	0.17469439	0.056251638	0.19908497	9.35E-01	0.14889934	0.13884673	0.10496153	0.15732179	1.88E-01
0.18544474	0.15617764	0.043528176	0.16407166	8.27E-01	0.14352289	0.12230652	0.08287779	0.12846566	1.65E-01
0.17871829	0.14762496	0.039347822	0.16342866	6.53E-01	0.13831702	0.11591536	0.07427944	0.12821752	1.30E-01
0.17222485	0.1381563	0.03160089	0.14640563	5.53E-01	0.1332915	0.10839647	0.0597752	0.11489245	1.10E-01

0.16596734	0.13002053	0.0280679	0.14210682	4.70E-01	0.12844857	0.1020572	0.05307752	0.1115358	9.37E-02
0.15998774	0.12466354	0.023666263	0.12973324	4.27E-01	0.12382073	0.09838385	0.04416089	0.10235141	8.56E-02
0.20295069	0.28370058	0.160942822	0.40665492	7.74E+00	0.15707143	0.23691518	0.28754785	0.32940694	1.55E+00
0.20571208	0.24915398	0.066302424	0.18410218	2.99E+00	0.15920857	0.2054584	0.11552975	0.1529295	6.04E-01
0.19831262	0.2067568	0.102723438	0.29054765	2.25E+00	0.15348184	0.16459623	0.19340489	0.22870647	4.51E-01
0.19581906	0.19049167	0.056465879	0.18816677	1.34E+00	0.15155197	0.1510698	0.10687454	0.14760005	2.72E-01
0.19072608	0.17815118	0.090072621	0.20243285	1.21E+00	0.14761032	0.14052383	0.17370032	0.15816415	2.45E-01
0.18572002	0.16962159	0.046826859	0.16615307	1.10E+00	0.14373594	0.13369184	0.08954869	0.12986051	2.23E-01
0.18084991	0.16239994	0.075835979	0.18061445	1.01E+00	0.13996677	0.12807375	0.14620808	0.14096714	2.03E-01
0.17787733	0.16844323	0.050664878	0.17547632	1.06E+00	0.13766617	0.1350991	0.0942099	0.13773765	2.14E-01
0.17336956	0.14548093	0.062640237	0.16483118	1.13E+00	0.13417744	0.1128231	0.1231091	0.12822242	2.27E-01
0.16900342	0.13848081	0.03849603	0.15355545	1.03E+00	0.13079831	0.10706149	0.07633528	0.11902659	2.07E-01
0.16477642	0.14532627	0.056807913	0.15847149	8.54E-01	0.12752687	0.11507306	0.10876622	0.12356817	1.71E-01
0.16036513	0.136831	0.034806078	0.13966218	7.69E-01	0.1241128	0.10785349	0.06664031	0.10899985	1.54E-01
0.15630018	0.13428277	0.048751883	0.1489854	7.37E-01	0.12096678	0.10649325	0.09311111	0.11642925	1.48E-01
0.15021045	0.11967581	0.026655416	0.08827296	4.76E-01	0.1162537	0.09454106	0.05064111	0.06933415	9.63E-02
0.14682178	0.12311553	0.041849482	0.14739633	5.08E-01	0.11363108	0.09888244	0.07793935	0.11576892	1.03E-01
0.14350649	0.11897534	0.028461122	0.09054648	5.17E-01	0.11106525	0.09574651	0.05198406	0.07186411	1.06E-01
0.13959279	0.1098615	0.034012153	0.12754836	4.49E-01	0.10803628	0.08758532	0.06409079	0.10004386	9.19E-02
0.13566108	0.10283615	0.021644035	0.07907765	4.19E-01	0.10499338	0.08136043	0.04112768	0.06215117	8.54E-02
0.13377642	0.1141762	0.03921237	0.16468812	5.18E-01	0.10353477	0.0927849	0.07182247	0.12949404	1.06E-01
0.13023127	0.10349073	0.020085086	0.07432381	4.50E-01	0.10079103	0.08290014	0.03686103	0.05897547	9.24E-02
0.12668891	0.09457552	0.02964634	0.14847409	5.34E-01	0.09804947	0.07431185	0.0574183	0.11559468	1.08E-01
0.12312065	0.09375706	0.015531399	0.06537274	4.16E-01	0.09528785	0.07423586	0.02940534	0.05143692	8.41E-02
0.11965289	0.0910508	0.025313951	0.13177794	3.69E-01	0.09260402	0.0721792	0.04828515	0.10285677	7.45E-02

Table 4D: 150 Out of sample ES forecast for GSECI

99%				95%			
EWMA	G-N	EG-N	EG-S	EWMA	G-N	EG-N	EG-S
0.09022515	0.12785621	0.13377524	2.31E-01	0.06982875	0.1080175	0.114234606	4.12E-01
0.11985784	0.15703561	0.11779957	1.28E-01	0.09276264	0.1344814	0.104923076	2.02E-01
0.12171802	0.14559025	0.09509146	9.23E-02	0.09420231	0.12526813	0.083811176	1.55E-01
0.12195115	0.13484949	0.08373787	1.06E-01	0.09438274	0.11638042	0.073291806	1.87E-01
0.11715849	0.12495607	0.08092709	8.21E-02	0.0906735	0.10671441	0.068121104	1.52E-01
0.11140841	0.11600275	0.06224589	7.77E-02	0.0862233	0.09749725	0.051317214	1.50E-01
0.10999562	0.10919827	0.0681481	1.19E-01	0.08512988	0.0924062	0.057726299	2.19E-01
0.10444552	0.10102722	0.05904354	8.30E-02	0.08083445	0.08412243	0.048231654	1.63E-01
0.10060012	0.09330931	0.05163247	8.48E-02	0.07785834	0.07783685	0.043230039	1.58E-01
0.09576065	0.08699536	0.05116069	8.19E-02	0.07411289	0.07086192	0.040347696	1.68E-01
0.08354891	0.04337923	0.02562111	1.84E-02	0.06466175	0.03290093	0.01958152	3.65E-02
0.07774897	0.06080825	0.03946671	3.58E-02	0.06017295	0.04967976	0.032086326	5.98E-02
0.07093855	0.05001183	0.03137928	2.64E-02	0.0549021	0.04016056	0.025632097	4.47E-02
0.06443982	0.04396418	0.03138873	2.54E-02	0.04987248	0.03466411	0.025100666	4.54E-02
0.05894994	0.0393584	0.02659911	2.23E-02	0.04562365	0.02996576	0.020519323	4.31E-02

0.05354174	0.04117662	0.02244813	2.16E-02	0.04143804	0.03221519	0.017555939	3.97E-02
0.05278431	0.0382014	0.02053691	1.96E-02	0.04085183	0.02726065	0.01448072	4.34E-02
0.04816906	0.04180457	0.01133741	1.51E-02	0.03727991	0.03200485	0.008097917	3.01E-02
0.04394088	0.03969429	0.01372671	1.72E-02	0.03400756	0.03056121	0.010262991	3.30E-02
0.03992188	0.04023202	0.01669304	1.97E-02	0.03089709	0.03139974	0.012930441	3.63E-02
0.03141273	0.03756038	0.02654059	1.15E-02	0.02431153	0.0291354	0.020676533	1.95E-02
0.02972766	0.03479971	0.02586859	1.01E-02	0.02300739	0.02602729	0.019406848	1.92E-02
0.03028997	0.03234862	0.02278362	6.08E-03	0.02344259	0.02344585	0.016400041	1.40E-02
0.03946297	0.03003257	0.02192962	5.21E-04	0.03054193	0.019807	0.014229438	8.74E-03
0.03732138	0.0348171	0.0190105	-2.46E-04	0.02888446	0.02546931	0.013299057	3.94E-03
0.03768457	0.03164416	0.02141827	1.25E-03	0.02916556	0.0224825	0.014896405	7.15E-03
0.06203827	0.03515376	0.0268234	-1.03E-02	0.04801383	0.02078527	0.01564417	-3.15E-03
0.06493018	0.03098752	0.01037098	-1.47E-02	0.05025199	0.01954836	0.004035467	-1.36E-02
0.05813429	0.05189808	0.04371371	1.76E-02	0.04499239	0.04014278	0.033356429	3.24E-02
0.05431356	0.04071172	0.03942222	-4.37E-03	0.04203538	0.02985263	0.02920115	-3.61E-03
0.11406871	0.11802823	0.06573135	2.94E-02	0.08828221	0.07439479	0.039131403	8.45E-02
0.17183989	0.06655235	-0.01950406	-6.25E-02	0.13299356	0.03180943	-0.03264918	-5.93E-02
0.21769917	0.04740349	-0.01954395	9.37E-01	0.16848584	0.01509109	-0.035424464	1.65E+00
0.19869677	0.22180382	0.05628051	-8.38E-03	0.15377915	0.17458566	0.038608319	-8.36E-03
0.18704842	0.1319654	0.10798556	Inf	0.14476404	0.09367347	0.077524222	Inf
0.17082089	0.1114158	0.06101721	-5.51E-03	0.13220492	0.08633827	0.044992898	-5.51E-03
0.15581119	0.06192917	0.050494	Inf	0.12058833	0.04694198	0.038066703	Inf
0.18126905	0.33573147	0.35093354	5.51E-02	0.14029116	0.27980812	0.284462087	5.51E-02
0.19964816	0.2034777	0.57658677	Inf	0.15451547	0.17284818	0.461680885	Inf
0.1821378	0.16915721	0.2331764	-5.12E-05	0.14096351	0.12632006	0.182597597	-5.12E-05
0.16829075	0.13328798	0.11742352	1.03E-01	0.13024675	0.09767477	0.086148471	2.03E-01
0.15781692	0.10668735	0.09645528	7.45E-02	0.12214065	0.07559164	0.068568976	1.60E-01
0.15013622	0.08728769	0.08114223	5.56E-02	0.11619625	0.06021182	0.056383382	1.29E-01
0.13187548	0.11285545	0.11700632	6.28E-02	0.10206356	0.08737905	0.090464988	1.30E-01
0.11594341	0.09548759	0.08563462	5.09E-02	0.08973311	0.07348041	0.065875228	1.03E-01
0.10200346	0.08201911	0.0714603	4.14E-02	0.07894444	0.06294597	0.054809775	8.28E-02
0.10684342	0.13160395	0.14678767	1.03E-01	0.08269027	0.10937243	0.120013551	1.85E-01
0.09639469	0.09961599	0.0855799	6.89E-02	0.0746036	0.0748703	0.064372297	1.33E-01
0.09233412	0.12924666	0.13507467	7.86E-02	0.07146096	0.10478485	0.108564161	1.42E-01
0.08147242	0.09800443	0.09000097	6.11E-02	0.06305467	0.07529609	0.069197513	1.15E-01
0.07328583	0.08418024	0.08198589	9.94E-02	0.05671875	0.06301962	0.061147976	2.04E-01
0.08215855	0.13518043	0.16147486	1.57E-01	0.06358569	0.11147103	0.131917961	3.02E-01
0.07492127	0.10726467	0.10418815	1.08E-01	0.05798448	0.08599227	0.083565415	2.06E-01
0.08349281	0.12085006	0.13521271	1.36E-01	0.06461832	0.10045465	0.111653332	2.53E-01
0.09861655	0.12322636	0.13255965	1.45E-01	0.07632318	0.10418651	0.111536469	2.63E-01
0.11668572	0.12597438	0.13592767	1.56E-01	0.09030761	0.10790289	0.11577376	2.79E-01
0.11384261	0.10137847	0.10047765	1.20E-01	0.08810722	0.08522744	0.084585318	2.10E-01
0.10278949	0.07793894	0.05891477	1.36E-01	0.07955278	0.05747486	0.042533562	2.68E-01
0.11095208	0.05844042	0.05588566	1.32E-01	0.08587012	0.03717189	0.034852797	2.81E-01
0.10708776	0.05850867	0.07315565	1.05E-01	0.08287938	0.03975407	0.050839167	2.31E-01
0.10741124	0.04763954	0.0512429	2.23E-02	0.08312973	0.03046429	0.033050972	5.95E-02
0.09657782	0.10381387	0.12795234	5.54E-02	0.07474532	0.08371465	0.102278779	9.98E-02
0.08916956	0.09658342	0.10273869	5.87E-02	0.06901179	0.0786257	0.083362076	9.74E-02
0.10240155	0.12282048	0.13727924	8.31E-02	0.07925254	0.10397437	0.115187949	1.28E-01
0.08998688	0.08955922	0.07963776	5.99E-02	0.06964434	0.06851332	0.060807746	1.02E-01

0.08074909	0.07496786	0.07550187	4.59E-02	0.06249486	0.0560853	0.056374921	8.47E-02
0.0711927	0.08250129	0.0907694	4.44E-02	0.0550988	0.06520402	0.07150377	7.79E-02
0.06404894	0.06442039	0.06462813	3.63E-02	0.04956996	0.0482162	0.048277518	6.79E-02
0.06344832	0.09379363	0.1107353	5.33E-02	0.04910512	0.07686546	0.089908275	8.81E-02
0.06992613	0.0947041	0.10397092	6.08E-02	0.05411855	0.07905152	0.086220985	9.45E-02
0.06199533	0.07050344	0.07382364	6.96E-02	0.0479806	0.0546949	0.057328826	1.28E-01
0.07834385	0.11651568	0.13402863	9.75E-02	0.06063335	0.09760321	0.110392456	1.68E-01
0.073878	0.0920376	0.0933723	7.27E-02	0.05717706	0.07479176	0.075614024	1.24E-01
0.06598343	0.07606283	0.07635106	6.35E-02	0.05106714	0.06046604	0.060564659	1.13E-01
0.09076129	0.12713829	0.14166985	1.06E-01	0.07024369	0.10754032	0.117898562	1.80E-01
0.08000105	0.09342925	0.08863935	7.91E-02	0.06191592	0.07250098	0.068946256	1.43E-01
0.07134089	0.07847675	0.07678696	6.61E-02	0.05521349	0.05962243	0.058357054	1.26E-01
0.06288305	0.07601817	0.0739934	5.33E-02	0.04866763	0.05910431	0.057409764	1.02E-01
0.05562696	0.06591544	0.06151661	4.71E-02	0.04305186	0.05067988	0.047240737	9.13E-02
0.04938287	0.05869417	0.05351513	4.11E-02	0.03821932	0.04494583	0.040901252	8.06E-02
0.05228011	0.07908948	0.07986921	4.06E-02	0.04046161	0.06501709	0.065243455	6.22E-02
0.08895121	0.12040946	0.12423135	7.19E-02	0.06884279	0.10293569	0.105202548	1.02E-01
0.08086314	0.09045903	0.09005744	4.92E-02	0.06258312	0.07302065	0.072671125	7.12E-02
0.07281169	0.06950202	0.07306254	4.06E-02	0.0563518	0.05237678	0.055241354	6.69E-02
0.06535886	0.07858788	0.08645324	3.59E-02	0.05058376	0.06255838	0.068397987	5.69E-02
0.05858526	0.07118469	0.07346238	3.28E-02	0.04534141	0.05672193	0.058321584	5.13E-02
0.05359816	0.0558664	0.05758446	2.84E-02	0.0414817	0.04183108	0.043218189	4.90E-02
0.04766535	0.05401403	0.05473954	2.25E-02	0.03689007	0.04129659	0.041769094	3.93E-02
0.04246625	0.05630906	0.05672748	2.54E-02	0.03286628	0.04459017	0.044734862	4.15E-02
0.04090619	0.04434142	0.0446062	2.16E-02	0.03165889	0.03262139	0.032884265	3.91E-02
0.04578428	0.03536885	0.03958164	1.41E-02	0.03543423	0.02436283	0.027833779	2.76E-02
0.04163061	0.04177354	0.0471674	1.34E-02	0.03221954	0.03165727	0.035764432	2.42E-02
0.10325316	0.04903076	0.04096666	3.11E-02	0.07991163	0.02624274	0.021130713	6.69E-02
0.09305859	0.09594932	0.12265735	1.92E-02	0.07202165	0.07314747	0.093460757	3.89E-02
0.08368343	0.10276539	0.115988	3.92E-02	0.06476585	0.08189112	0.091837058	6.10E-02
0.07753242	0.07771388	0.08461978	2.88E-02	0.06000535	0.05739942	0.063088695	4.88E-02
0.06869655	0.08042985	0.0863023	2.62E-02	0.05316693	0.06216709	0.066590733	4.28E-02
0.08400514	0.06146038	0.06417032	2.35E-02	0.06501484	0.04063484	0.043405335	4.75E-02
0.08354886	0.1368813	0.16834806	5.19E-02	0.06466171	0.11157563	0.135077085	7.70E-02
0.07416129	0.10596893	0.10702906	3.82E-02	0.0573963	0.08281722	0.08375859	5.68E-02
0.06670855	0.090771	0.08801756	3.32E-02	0.05162833	0.07101891	0.068761788	5.24E-02
0.06525024	0.09728936	0.09835659	4.31E-02	0.05049969	0.07865713	0.079187327	6.46E-02
0.06175063	0.08771765	0.0813046	3.82E-02	0.04779121	0.07071468	0.065393123	5.63E-02
0.05975126	0.08281821	0.0769018	3.79E-02	0.04624382	0.06718983	0.062250515	5.52E-02
0.05422542	0.07033394	0.06170144	3.05E-02	0.04196716	0.05594645	0.049012736	4.55E-02
0.0545624	0.07497629	0.07260815	3.60E-02	0.04222796	0.06127749	0.059125136	5.23E-02
0.05065221	0.05772362	0.05412808	2.79E-02	0.03920171	0.0435043	0.040664084	4.59E-02
0.04608164	0.05375608	0.05173472	2.12E-02	0.03566437	0.04069698	0.039228853	3.63E-02
0.04168863	0.05038765	0.04634995	1.86E-02	0.03226445	0.0383657	0.035311993	3.21E-02
0.04113104	0.04240625	0.04058506	1.70E-02	0.03183291	0.03090475	0.02965093	3.17E-02
0.03833232	0.05344635	0.05529191	2.47E-02	0.02966687	0.04234915	0.043719516	4.00E-02
0.03758643	0.05512739	0.05614388	2.84E-02	0.0290896	0.04461469	0.045207822	4.32E-02
0.03816437	0.04447445	0.04609637	2.26E-02	0.02953689	0.0329689	0.034094631	4.05E-02
0.034263	0.04837606	0.05328614	2.04E-02	0.02651747	0.03759263	0.041349894	3.42E-02
0.03127423	0.04835664	0.05084175	2.22E-02	0.02420434	0.03829288	0.040091216	3.54E-02

0.02807923	0.04302047	0.04347753	1.90E-02	0.0217316	0.03358538	0.033800061	3.11E-02
0.02803619	0.04737251	0.04957091	2.39E-02	0.0216983	0.0382457	0.039788729	3.65E-02
0.02556762	0.04189195	0.04161035	1.94E-02	0.01978778	0.03330205	0.032896019	3.01E-02
0.02459283	0.03536055	0.03615485	1.67E-02	0.01903335	0.02676835	0.027268843	2.91E-02
0.02246562	0.03926453	0.04200262	1.75E-02	0.01738702	0.03102658	0.033054179	2.81E-02
0.07434731	0.12706168	0.22764416	1.32E-01	0.05754027	0.10849346	0.185560997	2.15E-01
0.07032119	0.09315685	0.07416688	4.57E-02	0.0544243	0.0735478	0.058225175	7.35E-02
0.06808159	0.07626754	0.0641323	4.12E-02	0.05269099	0.05717397	0.047750764	7.42E-02
0.06437354	0.08188627	0.0793416	3.36E-02	0.04982118	0.06380237	0.061807895	5.86E-02
0.06224413	0.08596357	0.07994958	4.10E-02	0.04817315	0.06872806	0.063834186	6.82E-02
0.06013611	0.08171992	0.06809854	3.92E-02	0.04654167	0.06547876	0.054613474	6.40E-02
0.06733908	0.09934999	0.10678214	6.08E-02	0.05211633	0.08259964	0.087794213	9.54E-02
0.07338678	0.09822303	0.09030604	5.94E-02	0.05679688	0.08205324	0.075192183	9.08E-02
0.10210872	0.13989438	0.17321742	1.01E-01	0.07902591	0.11997954	0.144640718	1.54E-01
0.11702388	0.1338598	0.12368142	8.89E-02	0.09056933	0.11445303	0.105250576	1.30E-01
0.14747415	0.16127001	0.17637218	1.91E-01	0.11413597	0.14018247	0.150501048	3.29E-01
0.13867072	0.11601234	0.10277013	1.46E-01	0.10732265	0.09205205	0.080820718	2.74E-01
0.1317507	0.11481379	0.11985717	1.16E-01	0.10196698	0.09225553	0.095754515	2.16E-01
0.12485922	0.10671766	0.09881409	1.08E-01	0.0966334	0.08558752	0.079045501	2.02E-01
0.11742057	0.09344471	0.07865155	9.70E-02	0.09087634	0.0735723	0.061791658	1.85E-01
0.11268226	0.10149579	0.09566618	1.09E-01	0.08720918	0.08237953	0.077509599	2.03E-01
0.10694277	0.09191524	0.07417041	9.54E-02	0.08276717	0.07398153	0.059810323	1.78E-01
0.10140368	0.07225383	0.05631863	9.69E-02	0.07848025	0.05437578	0.041838501	1.92E-01
0.09594546	0.08479681	0.08674765	8.92E-02	0.07425592	0.06749368	0.068864881	1.70E-01
0.09032116	0.07753385	0.06630434	7.83E-02	0.06990305	0.06126962	0.052307143	1.50E-01
0.08783104	0.08675063	0.08804081	1.33E-01	0.06797585	0.07122968	0.071832277	2.56E-01
0.08222964	0.07006572	0.05887937	1.10E-01	0.06364071	0.05502357	0.045920498	2.18E-01
0.07723298	0.06776461	0.06114095	9.61E-02	0.0597736	0.05373002	0.048316029	1.89E-01
0.07280722	0.06535464	0.05631755	9.40E-02	0.05634833	0.05222547	0.044912219	1.84E-01
0.06816641	0.05687605	0.04517925	8.75E-02	0.05275663	0.04444288	0.035087967	1.74E-01
0.07135757	0.08269526	0.0975056	1.30E-01	0.05522639	0.06875126	0.079845515	2.49E-01
0.0677964	0.06878342	0.06003361	9.22E-02	0.05247027	0.05559898	0.048300204	1.77E-01
0.06356073	0.05964418	0.0506643	8.69E-02	0.04919212	0.04720011	0.039884281	1.71E-01
0.0595739	0.0554075	0.04490847	7.59E-02	0.04610656	0.04373178	0.035321486	1.50E-01
0.05586384	0.05245491	0.04027488	6.96E-02	0.04323519	0.0414751	0.031775704	1.37E-01

Appendix E: Data

Table 1E: Daily values of FML and GSE-CI

Date	FML	GSECI	Date	FML	GSECI	Date	FML	GSECI
03-Jan-00	916	737.16	6-Feb-2006	15,800	4,736.24	16-Oct-2008	5.75	5,476.25
04-Jan-00	917	738.16	7-Feb-2006	15,800	4,736.25	17-Oct-2008	5.75	5,476.25
05-Jan-00	918	739.16	8-Feb-2006	15,800	4,736.33	20-Oct-2008	5.75	5,590.91
06-Jan-00	919	740.16	9-Feb-2006	15,800	4,731.17	21-Oct-2008	5.80	5,594.99
07-Jan-00	920	741.16	10-Feb-2006	15,800	4,728.13	22-Oct-2008	5.80	5,590.25
08-Jan-00	921	742.16	11-Feb-2006	15,800	4,728.63	23-Oct-2008	6.00	5,618.00
09-Jan-00	922	743.16	12-Feb-2006	15,800	4,728.76	24-Oct-2008	6.05	5,625.42
10-Jan-00	923	744.16	13-Feb-2006	15,800	4,728.77	27-Oct-2008	6.06	5,647.70
11-Jan-00	924	745.16	14-Feb-2006	15,800	4,728.77	28-Oct-2008	6.06	5,641.21
12-Jan-00	925	746.16	15-Feb-2006	15,800	4,725.99	29-Oct-2008	6.06	5,644.00
13-Jan-00	926	747.16	16-Feb-2006	15,800	4,725.93	30-Oct-2008	6.06	5,648.91
14-Jan-00	927	748.16	17-Feb-2006	15,800	4,726.01	31-Oct-2008	6.06	5,648.91
15-Jan-00	928	749.16	18-Feb-2006	15,800	4,726.01	3-Nov-2008	6.06	5,652.69
16-Jan-00	929	750.16	19-Feb-2006	15,800	4,730.07	4-Nov-2008	6.06	5,677.54
17-Jan-00	930	751.16	20-Feb-2006	15,800	4,729.98	5-Nov-2008	6.70	5,592.70
18-Jan-00	931	752.16	21-Feb-2006	15,800	4,730.11	6-Nov-2008	6.80	5,613.25
19-Jan-00	932	753.16	22-Feb-2006	15,800	4,730.17	7-Nov-2008	6.80	5,613.25
20-Jan-00	933	754.16	23-Feb-2006	15,800	4,730.17	10-Nov-2008	6.80	5,623.26
21-Jan-00	934	755.16	24-Feb-2006	15,800	4,730.17	11-Nov-2008	6.80	5,629.78
22-Jan-00	935	756.16	25-Feb-2006	15,800	4,730.54	12-Nov-2008	6.80	5,633.62
23-Jan-00	936	757.16	26-Feb-2006	15,800	4,730.56	13-Nov-2008	6.80	5,634.34
24-Jan-00	937	758.16	27-Feb-2006	15,800	4,731.87	14-Nov-2008	6.80	5,659.37
25-Jan-00	938	759.16	28-Feb-2006	15,800	4,736.75	17-Nov-2008	6.80	5,643.71
26-Jan-00	939	760.16	1-Mar-2006	15,800	4,736.87	18-Nov-2008	6.80	5,640.56
27-Jan-00	940	761.16	2-Mar-2006	15,800	4,739.81	19-Nov-2008	6.80	5,644.37
28-Jan-00	941	762.16	3-Mar-2006	15,800	4,740.83	20-Nov-2008	6.80	5,654.88
29-Jan-00	942	763.16	4-Mar-2006	15,800	4,748.80	21-Nov-2008	6.80	5,541.15
30-Jan-00	943	764.16	5-Mar-2006	15,800	4,749.00	24-Nov-2008	6.80	5,558.14
31-Jan-00	944	765.16	6-Mar-2006	15,800	4,759.15	25-Nov-2008	6.80	5,595.18
01-Feb-00	945	766.16	7-Mar-2006	15,800	4,759.15	26-Nov-2008	6.80	5,704.54
02-Feb-00	946	767.16	8-Mar-2006	15,800	4,759.67	27-Nov-2008	6.80	5,708.01
03-Feb-00	947	768.16	9-Mar-2006	15,800	4,760.03	28-Nov-2008	6.90	5,838.65
04-Feb-00	948	769.16	10-Mar-2006	15,800	4,760.14	2-Dec-2008	6.90	5,747.02
05-Feb-00	949	770.16	11-Mar-2006	15,800	4,760.61	3-Dec-2008	6.90	5,773.77
06-Feb-00	950	771.16	12-Mar-2006	15,800	4,761.16	4-Dec-2008	6.90	5,780.08
07-Feb-00	951	772.16	13-Mar-2006	15,800	4,762.33	5-Dec-2008	6.90	5,780.08
08-Feb-00	952	773.16	14-Mar-2006	15,800	4,762.34	8-Dec-2008	6.90	5,788.59
09-Feb-00	953	774.16	15-Mar-2006	15,800	4,763.48	9-Dec-2008	6.90	5,796.82
10-Feb-00	954	775.16	16-Mar-2006	15,800	4,764.07	10-Dec-2008	6.90	5,816.57
11-Feb-00	955	776.16	17-Mar-2006	15,800	4,764.13	11-Dec-2008	6.90	5,834.89
12-Feb-00	956	777.16	18-Mar-2006	15,800	4,767.34	12-Dec-2008	6.90	5,826.05
13-Feb-00	957	778.16	19-Mar-2006	15,800	4,767.48	15-Dec-2008	6.90	5,841.71
14-Feb-00	958	779.16	20-Mar-2006	15,800	4,767.61	16-Dec-2008	6.90	5,840.85
15-Feb-00	959	780.16	21-Mar-2006	15,800	4,767.90	17-Dec-2008	6.90	5,847.71
16-Feb-00	960	781.16	22-Mar-2006	15,800	4,768.57	18-Dec-2008	6.90	5,860.16

17-Feb-00	961	782.16	23-Mar-2006	15,800	4,769.39	19-Dec-2008	6.90	5,881.79
18-Feb-00	962	783.16	24-Mar-2006	15,800	4,769.64	22-Dec-2008	6.90	5,892.11
19-Feb-00	963	784.16	25-Mar-2006	15,900	4,769.64	23-Dec-2008	6.90	6,027.28
20-Feb-00	964	785.16	26-Mar-2006	15,900	4,769.64	24-Dec-2008	6.90	6,014.34
21-Feb-00	965	786.16	27-Mar-2006	15,900	4,771.00	25-Dec-2008	6.90	6,041.18
22-Feb-00	966	787.16	28-Mar-2006	15,900	4,771.00	30-Dec-2008	6.90	6,041.18
23-Feb-00	967	788.16	29-Mar-2006	15,900	4,771.11	31-Dec-2008	6.90	6,277.62
24-Feb-00	968	789.16	30-Mar-2006	15,900	4,771.18	1-Jan-2009	6.90	6,116.77
25-Feb-00	969	790.16	31-Mar-2006	15,900	4,771.18	2-Jan-2009	6.90	6,128.94
26-Feb-00	970	791.16	1-Apr-2006	15,901	4,771.25	5-Jan-2009	6.90	6,133.32
27-Feb-00	971	792.16	2-Apr-2006	15,901	4,771.33	6-Jan-2009	6.90	6,155.03
28-Feb-00	972	793.16	3-Apr-2006	15,901	4,770.21	7-Jan-2009	6.90	6,155.03
29-Feb-00	973	794.16	4-Apr-2006	15,902	4,780.03	8-Jan-2009	6.90	6,175.73
01-Mar-00	974	795.16	5-Apr-2006	15,902	4,780.16	9-Jan-2009	6.90	6,163.87
02-Mar-00	975	796.16	6-Apr-2006	15,902	4,780.16	12-Jan-2009	6.90	6,163.09
03-Mar-00	976	797.16	7-Apr-2006	15,902	4,780.16	13-Jan-2009	6.90	6,176.87
04-Mar-00	977	798.16	8-Apr-2006	15,902	4,780.79	14-Jan-2009	6.90	6,207.26
05-Mar-00	978	799.16	9-Apr-2006	15,902	4,780.79	15-Jan-2009	6.90	6,243.64
06-Mar-00	979	800.16	10-Apr-2006	15,902	4,782.46	16-Jan-2009	6.95	6,449.38
07-Mar-00	980	801.16	11-Apr-2006	15,902	4,788.72	19-Jan-2009	7.01	6,457.38
08-Mar-00	981	802.16	12-Apr-2006	15,902	4,788.72	20-Jan-2009	7.05	6,469.36
09-Mar-00	982	803.16	13-Apr-2006	15,902	4,789.42	21-Jan-2009	7.10	6,462.41
10-Mar-00	983	804.16	14-Apr-2006	15,902	4,789.82	22-Jan-2009	7.08	6,493.29
11-Mar-00	984	805.16	15-Apr-2006	15,902	4,767.26	23-Jan-2009	7.10	6,518.88
12-Mar-00	985	806.16	16-Apr-2006	15,902	4,768.68	27-Jan-2009	7.10	6,568.61
13-Mar-00	986	807.16	17-Apr-2006	15,902	4,768.68	28-Jan-2009	7.11	6,709.68
14-Mar-00	987	808.16	18-Apr-2006	15,902	4,768.47	29-Jan-2009	7.15	6,833.61
15-Mar-00	988	809.16	19-Apr-2006	15,902	4,782.78	30-Jan-2009	7.20	6,851.96
16-Mar-00	989	810.16	20-Apr-2006	15,902	4,785.91	2-Feb-2009	7.25	6,869.26
17-Mar-00	990	811.16	21-Apr-2006	15,903	4,813.91	3-Feb-2009	7.29	7,007.38
18-Mar-00	991	812.16	22-Apr-2006	15,903	4,814.37	4-Feb-2009	7.33	7,028.61
19-Mar-00	992	813.16	23-Apr-2006	15,904	4,843.78	5-Feb-2009	7.33	7,064.81
20-Mar-00	993	814.16	24-Apr-2006	15,904	4,843.79	6-Feb-2009	7.33	7,085.78
21-Mar-00	994	815.16	25-Apr-2006	15,904	4,843.79	9-Feb-2009	7.34	7,072.71
22-Mar-00	995	816.16	26-Apr-2006	15,905	4,843.80	10-Feb-2009	7.39	7,037.66
23-Mar-00	996	817.16	27-Apr-2006	15,905	4,846.48	11-Feb-2009	7.39	6,995.61
24-Mar-00	997	818.16	28-Apr-2006	15,906	4,843.73	12-Feb-2009	7.39	7,083.58
25-Mar-00	998	819.16	29-Apr-2006	15,907	4,845.14	13-Feb-2009	7.50	7,136.93
26-Mar-00	999	820.16	30-Apr-2006	15,907	4,846.37	16-Feb-2009	7.60	7,134.30
27-Mar-00	1000	821.16	1-May-2006	15,907	4,846.37	18-Feb-2009	7.63	7,143.73
28-Mar-00	1001	822.16	2-May-2006	15,907	4,846.37	19-Feb-2009	7.64	7,070.80
29-Mar-00	1002	823.16	3-May-2006	15,908	4,846.38	20-Feb-2009	7.65	7,130.15
30-Mar-00	1003	824.16	4-May-2006	15,909	4,846.39	23-Feb-2009	7.68	7,172.08
31-Mar-00	1004	825.16	5-May-2006	15,909	4,846.39	24-Feb-2009	7.69	7,185.05
01-Apr-00	1005	826.16	6-May-2006	15,910	4,847.19	25-Feb-2009	7.78	7,093.02
02-Apr-00	1006	827.16	7-May-2006	15,910	4,847.18	26-Feb-2009	7.86	7,095.50
03-Apr-00	1007	828.16	8-May-2006	15,911	4,846.56	27-Feb-2009	7.86	6,997.25
04-Apr-00	1008	829.16	9-May-2006	15,915	4,846.59	2-Mar-2009	7.86	6,967.92
05-Apr-00	1009	830.16	10-May-2006	15,916	4,846.60	3-Mar-2009	7.87	6,801.78
06-Apr-00	1010	831.16	11-May-2006	15,916	4,846.60	4-Mar-2009	7.87	6,647.69

07-Apr-00	1011	832.16	12-May-2006	15,916	4,846.60	5-Mar-2009	7.89	6,635.17
08-Apr-00	1012	833.16	13-May-2006	15,920	4,846.63	6-Mar-2009	7.89	6,598.97
09-Apr-00	1013	834.16	14-May-2006	15,930	4,846.65	9-Mar-2009	7.89	6,513.45
10-Apr-00	1014	835.16	15-May-2006	15,931	4,846.65	10-Mar-2009	7.89	6,476.54
11-Apr-00	1015	836.16	16-May-2006	15,931	4,835.84	11-Mar-2009	7.89	6,433.91
12-Apr-00	1016	837.16	17-May-2006	15,935	4,833.02	12-Mar-2009	7.89	6,530.15
13-Apr-00	1017	838.16	18-May-2006	15,940	4,833.33	13-Mar-2009	7.88	6,616.20
14-Apr-00	1018	839.16	19-May-2006	15,940	4,832.83	16-Mar-2009	7.86	6,780.87
15-Apr-00	1019	840.16	20-May-2006	15,940	4,832.83	17-Mar-2009	7.86	6,709.76
16-Apr-00	1020	841.16	21-May-2006	15,940	4,832.83	18-Mar-2009	7.86	6,705.50
17-Apr-00	1021	842.16	22-May-2006	15,940	4,832.85	19-Mar-2009	7.85	6,709.13
18-Apr-00	1022	843.16	23-May-2006	15,940	4,832.87	20-Mar-2009	7.80	6,600.59
19-Apr-00	1023	844.16	24-May-2006	15,940	4,832.89	23-Mar-2009	7.80	6,595.11
20-Apr-00	1024	845.16	25-May-2006	15,945	4,832.92	24-Mar-2009	7.80	6,591.16
21-Apr-00	1025	846.16	26-May-2006	15,946	4,833.86	25-Mar-2009	7.80	6,591.10
22-Apr-00	1026	847.16	27-May-2006	15,946	4,837.12	27-Mar-2009	7.79	6,543.94
23-Apr-00	1027	848.16	28-May-2006	15,946	4,844.67	30-Mar-2009	7.79	6,558.68
24-Apr-00	1028	849.16	29-May-2006	15,946	4,881.23	31-Mar-2009	7.79	6,545.50
25-Apr-00	1029	850.16	30-May-2006	15,946	4,881.28	1-Apr-2009	7.76	6,528.28
26-Apr-00	1030	851.16	31-May-2006	16,001	4,879.58	2-Apr-2009	7.76	6,445.07
27-Apr-00	1031	852.16	1-Jun-2006	16,002	4,879.43	3-Apr-2009	7.76	6,522.01
28-Apr-00	1032	853.16	2-Jun-2006	16,002	4,891.10	6-Apr-2009	7.76	6,413.78
29-Apr-00	1033	854.16	3-Jun-2006	16,002	4,891.69	7-Apr-2009	7.76	6,279.00
30-Apr-00	1034	855.16	4-Jun-2006	16,004	4,892.18	8-Apr-2009	7.76	6,167.95
01-May-00	1035	856.16	5-Jun-2006	16,004	4,892.14	9-Apr-2009	7.71	6,173.10
02-May-00	1036	857.16	6-Jun-2006	16,005	4,891.60	10-Apr-2009	7.71	6,291.68
03-May-00	1037	858.16	7-Jun-2006	16,005	4,885.34	13-Apr-2009	7.71	6,289.24
04-May-00	1038	859.16	8-Jun-2006	16,007	4,885.36	14-Apr-2009	7.50	6,265.33
05-May-00	1039	860.16	9-Jun-2006	16,009	4,885.32	15-Apr-2009	7.19	6,260.60
06-May-00	1040	861.16	10-Jun-2006	16,009	4,887.89	16-Apr-2009	7.00	6,245.77
07-May-00	1041	862.16	11-Jun-2006	16,009	4,872.17	17-Apr-2009	7.33	6,246.91
08-May-00	1042	863.16	12-Jun-2006	16,010	4,872.18	20-Apr-2009	7.35	6,287.71
09-May-00	1043	864.16	13-Jun-2006	16,010	4,872.78	21-Apr-2009	7.38	6,366.21
10-May-00	1044	865.16	14-Jun-2006	16,010	4,874.18	22-Apr-2009	7.50	6,386.52
11-May-00	1045	866.16	15-Jun-2006	16,010	4,874.54	23-Apr-2009	7.60	6,388.59
12-May-00	1046	867.16	16-Jun-2006	16,011	4,874.60	24-Apr-2009	7.60	6,394.02
13-May-00	1047	868.16	17-Jun-2006	16,011	4,874.12	27-Apr-2009	7.60	6,290.73
14-May-00	1048	869.16	18-Jun-2006	16,011	4,876.41	28-Apr-2009	7.61	6,281.84
15-May-00	1049	870.16	19-Jun-2006	16,011	4,876.52	29-Apr-2009	7.65	6,296.11
16-May-00	1050	871.16	20-Jun-2006	16,012	4,878.95	30-Apr-2009	7.80	6,243.26
17-May-00	1051	872.16	21-Jun-2006	16,012	4,879.38	1-May-2009	7.85	6,254.03
18-May-00	1052	873.16	22-Jun-2006	16,012	4,879.61	4-May-2009	8.00	6,255.44
19-May-00	1053	874.16	23-Jun-2006	16,014	4,891.22	5-May-2009	8.00	6,265.32
20-May-00	1054	875.16	24-Jun-2006	16,014	4,891.84	6-May-2009	8.01	6,389.98
21-May-00	1055	876.16	25-Jun-2006	16,014	4,909.25	7-May-2009	8.02	6,385.97
22-May-00	1056	877.16	26-Jun-2006	16,015	4,909.29	8-May-2009	8.50	6,427.77
23-May-00	1057	878.16	27-Jun-2006	16,015	4,909.29	11-May-2009	8.50	6,455.23
24-May-00	1058	879.16	28-Jun-2006	16,015	4,910.85	12-May-2009	8.50	6,454.01
25-May-00	1059	880.16	29-Jun-2006	16,017	4,913.25	13-May-2009	8.50	6,497.10
26-May-00	1060	881.16	30-Jun-2006	16,150	4,913.25	14-May-2009	8.50	6,628.41

27-May-00	1061	882.16	1-Jul-2006	16,150	4,913.48	15-May-2009	8.51	6,650.56
28-May-00	1062	883.16	2-Jul-2006	16,150	4,914.43	18-May-2009	8.51	6,548.39
29-May-00	1063	884.16	3-Jul-2006	16,150	4,906.01	19-May-2009	8.60	6,656.82
30-May-00	1064	885.16	4-Jul-2006	16,150	4,906.14	20-May-2009	8.70	6,676.41
31-May-00	1065	886.16	5-Jul-2006	16,151	4,906.22	21-May-2009	8.70	6,575.76
01-Jun-00	1066	887.16	6-Jul-2006	16,151	4,901.22	22-May-2009	8.70	6,788.41
02-Jun-00	1067	888.16	7-Jul-2006	16,151	4,906.45	25-May-2009	8.60	6,795.71
03-Jun-00	1068	889.16	8-Jul-2006	16,151	4,911.85	26-May-2009	8.60	6,821.80
04-Jun-00	1069	890.16	9-Jul-2006	16,151	4,904.18	27-May-2009	8.60	6,737.75
05-Jun-00	1070	891.16	10-Jul-2006	16,155	4,900.97	28-May-2009	8.60	6,767.65
06-Jun-00	1071	892.16	11-Jul-2006	16,155	4,911.50	29-May-2009	8.60	6,665.36
07-Jun-00	1072	893.16	12-Jul-2006	16,155	4,946.53	1-Jun-2009	8.50	6,734.72
08-Jun-00	1073	894.16	13-Jul-2006	16,158	4,953.52	2-Jun-2009	8.60	6,791.69
09-Jun-00	1074	895.16	14-Jul-2006	16,159	4,958.82	3-Jun-2009	8.60	6,779.26
10-Jun-00	1075	896.16	15-Jul-2006	16,160	4,960.21	4-Jun-2009	8.60	6,764.72
11-Jun-00	1076	897.16	16-Jul-2006	16,160	4,958.88	8-Jun-2009	8.60	6,759.12
12-Jun-00	1077	898.16	17-Jul-2006	16,160	4,960.37	9-Jun-2009	8.60	6,782.48
13-Jun-00	1078	899.16	18-Jul-2006	16,160	4,961.24	10-Jun-2009	8.60	6,680.18
14-Jun-00	1079	900.16	19-Jul-2006	16,160	4,961.42	11-Jun-2009	8.60	6,780.82
15-Jun-00	1080	901.16	20-Jul-2006	16,160	4,948.27	12-Jun-2009	8.60	6,793.86
16-Jun-00	1081	902.16	21-Jul-2006	16,160	4,948.27	15-Jun-2009	8.60	6,810.67
17-Jun-00	1082	903.16	22-Jul-2006	16,160	4,943.57	17-Jun-2009	8.60	6,807.57
18-Jun-00	1083	904.16	23-Jul-2006	16,160	4,944.05	18-Jun-2009	8.60	6,844.01
19-Jun-00	1084	905.16	24-Jul-2006	16,160	4,944.13	19-Jun-2009	8.61	6,668.72
20-Jun-00	1085	906.16	25-Jul-2006	16,231	4,944.46	22-Jun-2009	8.60	6,651.81
21-Jun-00	1086	907.16	26-Jul-2006	16,232	4,944.99	23-Jun-2009	8.60	6,653.57
22-Jun-00	1087	908.16	27-Jul-2006	16,233	4,944.99	24-Jun-2009	9.00	6,781.43
23-Jun-00	1088	909.16	28-Jul-2006	16,233	4,945.24	25-Jun-2009	9.01	6,835.71
24-Jun-00	1089	910.16	29-Jul-2006	16,235	4,945.29	26-Jun-2009	9.01	6,947.69
25-Jun-00	1090	911.16	30-Jul-2006	16,235	4,945.29	29-Jun-2009	9.10	6,799.37
26-Jun-00	1091	912.16	31-Jul-2006	16,500	4,948.09	30-Jun-2009	9.10	6,811.31
27-Jun-00	1092	913.16	1-Aug-2006	16,501	4,963.23	1-Jul-2009	9.10	6,817.87
28-Jun-00	1093	914.16	2-Aug-2006	16,501	4,963.23	2-Jul-2009	9.09	6,695.22
29-Jun-00	1094	915.16	3-Aug-2006	16,501	4,963.29	3-Jul-2009	9.10	6,690.10
30-Jun-00	1095	916.16	4-Aug-2006	16,550	4,963.63	6-Jul-2009	9.15	6,831.78
01-Jul-00	1096	917.16	5-Aug-2006	16,552	4,963.69	7-Jul-2009	9.15	6,871.91
02-Jul-00	1097	918.16	6-Aug-2006	16,552	4,963.69	8-Jul-2009	9.15	6,862.74
03-Jul-00	1098	919.16	7-Aug-2006	16,552	4,963.72	9-Jul-2009	9.15	6,756.37
04-Jul-00	1099	920.16	8-Aug-2006	16,553	4,962.26	10-Jul-2009	9.15	6,730.90
05-Jul-00	1100	921.16	9-Aug-2006	16,554	4,962.33	13-Jul-2009	9.15	6,734.16
06-Jul-00	1101	922.16	10-Aug-2006	16,554	4,962.73	14-Jul-2009	9.15	6,864.69
07-Jul-00	1102	923.16	11-Aug-2006	16,555	4,962.84	15-Jul-2009	9.15	6,862.27
08-Jul-00	1103	924.16	12-Aug-2006	16,555	4,973.33	16-Jul-2009	9.15	6,865.85
09-Jul-00	1104	925.16	13-Aug-2006	16,555	4,977.52	17-Jul-2009	9.17	6,755.46
10-Jul-00	1105	926.16	14-Aug-2006	16,560	4,977.56	20-Jul-2009	9.17	6,759.08
11-Jul-00	1106	927.16	15-Aug-2006	16,560	4,977.62	21-Jul-2009	9.17	6,756.37
12-Jul-00	1107	928.16	16-Aug-2006	16,560	4,977.98	22-Jul-2009	9.17	6,876.55
13-Jul-00	1108	929.16	17-Aug-2006	16,561	4,983.34	23-Jul-2009	9.17	6,820.04
14-Jul-00	1109	930.16	18-Aug-2006	16,561	4,984.64	24-Jul-2009	9.17	6,886.31
15-Jul-00	1110	931.16	19-Aug-2006	16,561	4,985.02	27-Jul-2009	9.17	6,744.65

16-Jul-00	1111	932.16	20-Aug-2006	16,561	4,987.58	28-Jul-2009	9.17	6,752.74
17-Jul-00	1112	933.16	21-Aug-2006	16,850	4,988.54	29-Jul-2009	9.18	6,896.52
18-Jul-00	1113	934.16	22-Aug-2006	17,000	4,990.42	30-Jul-2009	9.19	6,907.88
19-Jul-00	1114	935.16	23-Aug-2006	17,001	4,988.87	31-Jul-2009	9.22	6,914.81
20-Jul-00	1115	936.16	24-Aug-2006	17,001	4,990.58	3-Aug-2009	9.23	6,779.06
21-Jul-00	1116	937.16	25-Aug-2006	17,001	4,974.71	4-Aug-2009	9.25	6,900.34
22-Jul-00	1117	938.16	26-Aug-2006	17,004	4,976.08	5-Aug-2009	9.26	6,807.39
23-Jul-00	1118	939.16	27-Aug-2006	17,004	4,973.59	6-Aug-2009	9.26	6,818.69
24-Jul-00	1119	940.16	28-Aug-2006	17,005	4,973.60	7-Aug-2009	9.26	6,806.13
25-Jul-00	1120	941.16	29-Aug-2006	17,007	4,974.19	10-Aug-2009	9.30	6,808.32
26-Jul-00	1121	942.16	30-Aug-2006	17,008	4,974.26	12-Aug-2009	9.30	6,823.82
27-Jul-00	1122	943.16	31-Aug-2006	17,008	4,975.08	13-Aug-2009	9.30	6,949.69
28-Jul-00	1123	944.16	1-Sep-2006	17,008	4,993.10	14-Aug-2009	9.30	7,003.20
29-Jul-00	1124	945.16	2-Sep-2006	17,008	4,992.95	17-Aug-2009	9.30	6,994.57
30-Jul-00	1125	946.16	3-Sep-2006	17,008	4,992.95	18-Aug-2009	9.30	7,023.54
31-Jul-00	1126	947.16	4-Sep-2006	17,008	4,992.95	19-Aug-2009	9.30	7,021.37
01-Aug-00	1127	948.16	5-Sep-2006	17,008	4,992.95	20-Aug-2009	9.37	6,936.67
02-Aug-00	1128	949.16	6-Sep-2006	17,008	4,992.95	21-Aug-2009	9.51	6,948.06
03-Aug-00	1129	950.16	7-Sep-2006	17,008	4,992.98	24-Aug-2009	9.54	7,058.01
04-Aug-00	1130	951.16	8-Sep-2006	17,008	4,992.98	25-Aug-2009	10.50	7,101.23
05-Aug-00	1131	952.16	9-Sep-2006	17,008	4,993.59	26-Aug-2009	10.55	7,090.89
06-Aug-00	1132	953.16	10-Sep-2006	17,008	4,997.54	27-Aug-2009	10.55	6,990.39
07-Aug-00	1133	954.16	11-Sep-2006	17,009	4,997.59	31-Aug-2009	10.55	6,976.10
08-Aug-00	1134	955.16	12-Sep-2006	18,000	5,003.51	1-Sep-2009	10.55	7,082.84
09-Aug-00	1135	956.16	13-Sep-2006	18,000	5,005.51	2-Sep-2009	10.57	7,122.96
10-Aug-00	1136	957.16	14-Sep-2006	18,000	5,005.73	3-Sep-2009	10.57	7,136.19
11-Aug-00	1137	958.16	15-Sep-2006	18,002	5,005.86	4-Sep-2009	10.57	7,238.03
12-Aug-00	1138	959.16	16-Sep-2006	18,002	5,005.86	7-Sep-2009	10.57	7,196.01
13-Aug-00	1139	960.16	17-Sep-2006	18,002	5,005.88	8-Sep-2009	2.02	7,116.29
14-Aug-00	1140	961.16	18-Sep-2006	18,002	5,005.91	9-Sep-2009	2.32	7,078.57
15-Aug-00	1141	962.16	19-Sep-2006	18,002	5,005.97	10-Sep-2009	2.66	7,281.71
16-Aug-00	1142	963.16	20-Sep-2006	18,002	5,005.99	11-Sep-2009	2.77	7,287.23
17-Aug-00	1143	964.16	21-Sep-2006	18,002	5,006.02	14-Sep-2009	2.58	7,218.65
18-Aug-00	1144	965.16	22-Sep-2006	18,002	5,006.05	15-Sep-2009	2.53	7,186.51
19-Aug-00	1145	966.16	23-Sep-2006	18,002	5,006.46	16-Sep-2009	2.40	7,176.40
20-Aug-00	1146	967.16	24-Sep-2006	18,002	5,005.22	17-Sep-2009	2.30	7,175.39
21-Aug-00	1147	968.16	25-Sep-2006	18,010	5,006.63	18-Sep-2009	2.30	7,155.30
22-Aug-00	1148	969.16	26-Sep-2006	18,010	5,006.66	23-Sep-2009	2.46	7,200.81
23-Aug-00	1149	970.16	27-Sep-2006	18,011	5,001.15	24-Sep-2009	2.47	7,223.71
24-Aug-00	1150	971.16	28-Sep-2006	18,011	5,007.18	25-Sep-2009	2.45	7,369.21
25-Aug-00	1151	972.16	29-Sep-2006	18,011	5,007.20	29-Sep-2009	2.45	992.25
26-Aug-00	1152	973.16	30-Sep-2006	18,011	5,007.26	30-Sep-2009	2.44	991.08
27-Aug-00	1153	974.16	1-Oct-2006	18,011	5,008.07	1-Oct-2009	2.44	993.89
28-Aug-00	1154	975.16	2-Oct-2006	18,011	5,008.04	2-Oct-2009	2.40	995.50
29-Aug-00	1155	976.16	3-Oct-2006	18,011	5,009.58	5-Oct-2009	2.40	1,001.63
30-Aug-00	1156	977.16	4-Oct-2006	18,011	5,009.64	6-Oct-2009	2.40	1,004.15
31-Aug-00	1157	978.16	5-Oct-2006	18,011	5,009.64	7-Oct-2009	2.35	998.37
01-Sep-00	1158	979.16	6-Oct-2006	18,011	5,009.69	8-Oct-2009	2.36	998.05
02-Sep-00	1159	980.16	7-Oct-2006	18,011	5,010.26	9-Oct-2009	2.39	1,000.64
03-Sep-00	1160	981.16	8-Oct-2006	18,011	5,010.27	12-Oct-2009	2.39	997.75

04-Sep-00	1161	982.16	9-Oct-2006	18,012	5,010.38	13-Oct-2009	2.40	1,001.24
05-Sep-00	1162	983.16	10-Oct-2006	18,013	5,012.10	14-Oct-2009	2.38	1,004.80
06-Sep-00	1163	984.16	11-Oct-2006	18,014	5,012.16	15-Oct-2009	2.40	1,007.72
07-Sep-00	1164	985.16	12-Oct-2006	18,014	5,012.60	16-Oct-2009	2.40	1,016.50
08-Sep-00	1165	986.16	13-Oct-2006	18,015	5,013.20	19-Oct-2009	2.36	1,019.52
09-Sep-00	1166	987.16	14-Oct-2006	18,015	5,014.18	20-Oct-2009	2.36	1,022.35
10-Sep-00	1167	988.16	15-Oct-2006	18,066	5,014.56	21-Oct-2009	2.36	1,024.19
11-Sep-00	1168	989.16	16-Oct-2006	18,100	5,014.73	22-Oct-2009	2.41	1,044.90
12-Sep-00	1169	990.16	17-Oct-2006	18,100	5,029.88	23-Oct-2009	2.46	1,052.98
13-Sep-00	1170	991.16	18-Oct-2006	18,100	5,025.33	26-Oct-2009	2.49	1,057.14
14-Sep-00	1171	992.16	19-Oct-2006	18,100	5,025.44	27-Oct-2009	2.50	1,049.66
15-Sep-00	1172	993.16	20-Oct-2006	18,200	5,029.68	28-Oct-2009	2.51	1,051.25
16-Sep-00	1173	994.16	21-Oct-2006	18,200	5,030.91	29-Oct-2009	2.53	1,059.28
17-Sep-00	1174	995.16	22-Oct-2006	18,200	5,031.25	30-Oct-2009	2.50	1,059.38
18-Sep-00	1175	996.16	23-Oct-2006	18,205	5,041.79	2-Nov-2009	2.51	1,050.35
19-Sep-00	1176	997.16	24-Oct-2006	18,205	5,041.90	3-Nov-2009	2.51	1,049.11
20-Sep-00	1177	998.16	25-Oct-2006	19,000	5,042.16	4-Nov-2009	2.51	1,052.14
21-Sep-00	1178	999.16	26-Oct-2006	19,000	5,042.66	5-Nov-2009	2.51	1,056.02
22-Sep-00	1179	1,000.16	27-Oct-2006	19,000	5,044.05	6-Nov-2009	2.52	1,057.10
23-Sep-00	1180	1,001.16	28-Oct-2006	19,000	5,044.65	9-Nov-2009	2.52	1,054.56
24-Sep-00	1181	1,002.16	29-Oct-2006	19,000	5,044.79	10-Nov-2009	2.52	1,052.62
25-Sep-00	1182	1,003.16	30-Oct-2006	19,000	5,044.89	11-Nov-2009	2.52	1,049.64
26-Sep-00	1183	1,004.16	31-Oct-2006	19,000	5,055.25	12-Nov-2009	2.50	1,048.78
27-Sep-00	1184	1,005.16	1-Nov-2006	19,000	5,061.39	13-Nov-2009	2.50	1,052.06
28-Sep-00	1185	1,006.16	2-Nov-2006	19,001	5,061.50	16-Nov-2009	2.50	1,044.40
29-Sep-00	1186	1,007.16	3-Nov-2006	19,001	5,062.05	17-Nov-2009	2.50	1,044.58
30-Sep-00	1187	1,008.16	4-Nov-2006	19,001	5,061.70	18-Nov-2009	2.50	1,042.35
01-Oct-00	1188	1,009.16	5-Nov-2006	19,004	5,061.85	19-Nov-2009	2.50	1,045.74
02-Oct-00	1189	1,010.16	6-Nov-2006	19,005	5,061.95	20-Nov-2009	2.50	1,045.50
03-Oct-00	1190	1,011.16	7-Nov-2006	19,005	5,062.00	23-Nov-2009	2.51	1,051.83
04-Oct-00	1191	1,012.16	8-Nov-2006	19,005	5,062.11	24-Nov-2009	2.51	1,049.63
05-Oct-00	1192	1,013.16	9-Nov-2006	19,005	5,062.17	25-Nov-2009	2.51	1,042.00
06-Oct-00	1193	1,014.16	10-Nov-2006	19,005	5,063.54	26-Nov-2009	2.51	1,040.51
07-Oct-00	1194	1,015.16	11-Nov-2006	19,005	5,063.63	27-Nov-2009	2.51	1,054.11
08-Oct-00	1195	1,016.16	12-Nov-2006	19,005	5,067.90	1-Dec-2009	2.50	1,058.81
09-Oct-00	1196	1,017.16	13-Nov-2006	19,005	5,070.53	2-Dec-2009	2.50	1,059.89
10-Oct-00	1197	1,018.16	14-Nov-2006	19,005	5,072.75	3-Dec-2009	2.50	1,053.10
11-Oct-00	1198	1,019.16	15-Nov-2006	19,005	5,073.22	4-Dec-2009	2.49	1,051.80
12-Oct-00	1199	1,020.16	16-Nov-2006	19,005	5,081.81	7-Dec-2009	2.49	1,062.89
13-Oct-00	1200	1,021.16	17-Nov-2006	19,005	5,082.29	8-Dec-2009	2.49	1,066.23
14-Oct-00	1201	1,022.16	18-Nov-2006	19,005	5,090.24	9-Dec-2009	2.49	1,070.78
15-Oct-00	1202	1,023.16	19-Nov-2006	19,100	5,092.25	10-Dec-2009	2.49	1,077.57
16-Oct-00	1203	1,024.16	20-Nov-2006	19,100	5,094.13	11-Dec-2009	2.49	1,076.36
17-Oct-00	1204	1,025.16	21-Nov-2006	19,101	5,095.49	14-Dec-2009	2.49	1,064.83
18-Oct-00	1205	1,026.16	22-Nov-2006	19,101	5,095.87	15-Dec-2009	2.48	1,065.46
19-Oct-00	1206	1,027.16	23-Nov-2006	19,101	5,097.24	16-Dec-2009	2.46	1,074.12
20-Oct-00	1207	1,028.16	24-Nov-2006	19,102	5,098.25	17-Dec-2009	2.47	1,057.68
21-Oct-00	1208	1,029.16	25-Nov-2006	19,103	5,098.52	18-Dec-2009	2.46	1,058.92
22-Oct-00	1209	1,030.16	26-Nov-2006	19,104	5,134.04	21-Dec-2009	2.46	1,069.01
23-Oct-00	1210	1,031.16	27-Nov-2006	19,104	5,134.21	22-Dec-2009	2.45	1,069.02

24-Oct-00	1211	1,032.16	28-Nov-2006	19,104	5,134.29	23-Dec-2009	2.45	1,059.07
25-Oct-00	1212	1,033.16	29-Nov-2006	19,106	5,134.71	24-Dec-2009	2.45	1,071.50
26-Oct-00	1213	1,034.16	30-Nov-2006	19,107	5,135.11	25-Dec-2009	2.45	1,067.91
27-Oct-00	1214	1,035.16	1-Dec-2006	19,108	5,135.24	28-Dec-2009	2.41	1,068.20
28-Oct-00	1215	1,036.16	2-Dec-2006	19,108	5,135.37	29-Dec-2009	2.40	1,063.51
29-Oct-00	1216	1,037.16	3-Dec-2006	19,109	5,135.48	30-Dec-2009	2.35	1,063.05
30-Oct-00	1217	1,038.16	4-Dec-2006	19,110	5,135.57	31-Dec-2009	2.39	1,064.16
31-Oct-00	1218	1,039.16	5-Dec-2006	19,110	5,137.13	1-Jan-2010	2.39	1,064.02
01-Nov-00	1219	1,040.16	6-Dec-2006	19,250	5,138.06	4-Jan-2010	2.39	1,050.07
02-Nov-00	1220	1,041.16	7-Dec-2006	19,250	5,139.59	5-Jan-2010	2.38	1,053.15
03-Nov-00	1221	1,042.16	8-Dec-2006	19,251	5,139.65	6-Jan-2010	2.38	1,046.08
04-Nov-00	1222	1,043.16	9-Dec-2006	19,250	5,139.06	7-Jan-2010	2.44	1,058.88
05-Nov-00	1223	1,044.16	10-Dec-2006	19,250	5,140.14	8-Jan-2010	2.49	1,061.90
06-Nov-00	1224	1,045.16	11-Dec-2006	19,251	5,142.80	11-Jan-2010	2.48	1,063.54
07-Nov-00	1225	1,046.16	12-Dec-2006	19,251	5,146.28	12-Jan-2010	2.51	1,075.96
08-Nov-00	1226	1,047.16	13-Dec-2006	19,251	5,148.93	13-Jan-2010	2.51	1,074.13
09-Nov-00	1227	1,048.16	14-Dec-2006	19,251	5,149.61	14-Jan-2010	2.52	1,082.02
10-Nov-00	1228	1,049.16	15-Dec-2006	19,252	5,149.62	19-Jan-2010	2.55	1,089.83
11-Nov-00	1229	1,050.16	16-Dec-2006	19,260	5,152.65	20-Jan-2010	2.56	1,090.76
12-Nov-00	1230	1,051.16	17-Dec-2006	19,261	5,152.91	21-Jan-2010	2.56	1,098.88
13-Nov-00	1231	1,052.16	18-Dec-2006	19,300	5,154.20	22-Jan-2010	2.56	1,100.38
14-Nov-00	1232	1,053.16	19-Dec-2006	19,305	5,162.45	26-Jan-2010	2.57	1,114.85
15-Nov-00	1233	1,054.16	20-Dec-2006	19,305	5,163.88	27-Jan-2010	2.57	1,139.63
16-Nov-00	1234	1,055.16	21-Dec-2006	19,306	5,165.09	28-Jan-2010	2.58	1,141.15
17-Nov-00	1235	1,056.16	22-Dec-2006	19,306	5,165.94	29-Jan-2010	2.58	1,147.54
18-Nov-00	1236	1,057.16	23-Dec-2006	19,500	5,167.07	1-Feb-2010	2.58	1,160.49
19-Nov-00	1237	1,058.16	24-Dec-2006	19,505	5,171.02	2-Feb-2010	2.58	1,151.70
20-Nov-00	1238	1,059.16	25-Dec-2006	19,506	5,172.07	3-Feb-2010	2.60	1,151.07
21-Nov-00	1239	1,060.16	26-Dec-2006	19,506	5,173.02	4-Feb-2010	2.60	1,151.98
22-Nov-00	1240	1,061.16	27-Dec-2006	19,507	5,173.02	5-Feb-2010	2.62	1,155.60
23-Nov-00	1241	1,062.16	28-Dec-2006	19,507	5,224.47	8-Feb-2010	2.63	1,167.99
24-Nov-00	1242	1,063.16	29-Dec-2006	19,508	5,225.80	9-Feb-2010	2.63	1,176.24
25-Nov-00	1243	1,064.16	30-Dec-2006	19,509	5,226.04	10-Feb-2010	3.00	1,189.77
26-Nov-00	1244	1,065.16	31-Dec-2006	19,509	5,226.40	11-Feb-2010	3.00	1,178.53
27-Nov-00	1245	1,066.16	1-Jan-2007	19,550	5,226.76	12-Feb-2010	3.02	1,178.60
28-Nov-00	1246	1,067.16	2-Jan-2007	19,551	5,226.92	15-Feb-2010	3.02	1,179.62
29-Nov-00	1247	1,068.16	3-Jan-2007	19,551	5,237.24	16-Feb-2010	3.02	1,178.94
30-Nov-00	1248	1,069.16	4-Jan-2007	19,551	5,237.74	18-Feb-2010	3.01	1,168.80
01-Dec-00	1249	1,070.16	5-Jan-2007	19,552	5,238.90	19-Feb-2010	3.01	1,162.67
02-Dec-00	1250	1,071.16	6-Jan-2007	19,552	5,238.99	22-Feb-2010	3.02	1,162.73
03-Dec-00	1251	1,072.16	7-Jan-2007	19,553	5,250.31	23-Feb-2010	3.02	1,162.78
04-Dec-00	1252	1,073.16	8-Jan-2007	19,553	5,258.52	24-Feb-2010	3.01	1,162.91
05-Dec-00	1253	1,074.16	9-Jan-2007	19,555	5,263.37	25-Feb-2010	3.00	1,163.15
06-Dec-00	1254	1,075.16	10-Jan-2007	19,600	5,263.58	26-Feb-2010	3.00	1,165.84
07-Dec-00	1255	1,076.16	11-Jan-2007	19,600	5,264.00	1-Mar-2010	3.00	1,168.85
08-Dec-00	1256	1,077.16	12-Jan-2007	19,600	5,264.55	2-Mar-2010	3.00	1,170.53
09-Dec-00	1257	1,078.16	13-Jan-2007	19,600	5,300.75	3-Mar-2010	3.00	1,169.27
10-Dec-00	1258	1,079.16	14-Jan-2007	19,600	5,292.68	4-Mar-2010	3.01	1,170.16
11-Dec-00	1259	1,080.16	15-Jan-2007	19,601	5,292.68	5-Mar-2010	3.05	1,178.87
12-Dec-00	1260	1,081.16	16-Jan-2007	19,601	5,293.67	8-Mar-2010	3.06	1,181.19

13-Dec-00	1261	1,082.16	17-Jan-2007	19,601	5,294.23	9-Mar-2010	3.06	1,174.89
14-Dec-00	1262	1,083.16	18-Jan-2007	19,601	5,294.58	10-Mar-2010	3.06	1,175.90
15-Dec-00	1263	1,084.16	19-Jan-2007	1.9605	5,294.83	11-Mar-2010	3.07	1,175.30
16-Dec-00	1264	1,085.16	20-Jan-2007	1.9607	5,293.21	12-Mar-2010	3.07	1,180.17
17-Dec-00	1265	1,086.16	21-Jan-2007	1.9607	5,311.85	15-Mar-2010	3.08	1,179.09
18-Dec-00	1266	1,087.16	22-Jan-2007	1.9607	5,322.92	16-Mar-2010	3.08	1,188.23
19-Dec-00	1267	1,088.16	23-Jan-2007	1.9607	5,324.60	17-Mar-2010	3.08	1,186.57
20-Dec-00	1268	1,089.16	24-Jan-2007	1.9608	5,326.05	18-Mar-2010	3.08	1,185.75
21-Dec-00	1269	1,090.16	25-Jan-2007	1.9608	5,333.81	19-Mar-2010	3.08	1,178.99
22-Dec-00	1270	1,091.16	26-Jan-2007	1.9610	5,334.34	22-Mar-2010	3.11	1,179.39
23-Dec-00	1271	1,092.16	27-Jan-2007	1.9610	5,340.20	23-Mar-2010	3.09	1,179.05
24-Dec-00	1272	1,093.16	28-Jan-2007	1.9610	5,341.26	24-Mar-2010	3.09	1,181.10
25-Dec-00	1273	1,094.16	29-Jan-2007	1.9610	5,350.66	25-Mar-2010	3.10	1,188.91
26-Dec-00	1274	1,095.16	30-Jan-2007	1.9620	5,357.03	29-Mar-2010	3.11	1,187.56
27-Dec-00	1275	1,096.16	31-Jan-2007	1.9620	5,358.56	30-Mar-2010	3.10	1,186.93
28-Dec-00	1276	1,097.16	1-Feb-2007	1.9620	5,358.95	31-Mar-2010	3.10	1,187.13
29-Dec-00	1277	1,098.16	2-Feb-2007	1.9620	5,359.25	1-Apr-2010	3.10	1,186.25
30-Dec-00	1278	1,099.16	3-Feb-2007	1.9650	5,361.87	2-Apr-2010	3.10	1,185.50
31-Dec-00	1279	1,100.16	4-Feb-2007	1.9650	5,361.93	5-Apr-2010	3.09	1,182.77
01-Jan-01	1280	1,101.16	5-Feb-2007	1.9650	5,362.18	6-Apr-2010	3.09	1,182.39
02-Jan-01	1281	1,102.16	6-Feb-2007	1.9650	5,355.39	7-Apr-2010	3.08	1,181.37
03-Jan-01	1282	1,103.16	7-Feb-2007	1.9660	5,363.74	8-Apr-2010	3.09	1,175.04
04-Jan-01	1283	1,104.16	8-Feb-2007	1.9712	5,341.76	9-Apr-2010	3.09	1,174.09
05-Jan-01	1284	1,105.16	9-Feb-2007	1.9715	5,350.43	12-Apr-2010	3.08	1,176.58
06-Jan-01	1285	1,106.16	10-Feb-2007	1.9715	5,351.77	13-Apr-2010	3.08	1,177.34
07-Jan-01	1286	1,107.16	11-Feb-2007	1.9716	5,354.00	14-Apr-2010	3.08	1,176.37
08-Jan-01	1287	1,108.16	12-Feb-2007	1.9720	5,354.01	15-Apr-2010	3.08	1,183.06
09-Jan-01	1288	1,109.16	13-Feb-2007	1.9730	5,354.83	16-Apr-2010	3.08	1,178.15
10-Jan-01	1289	1,110.16	14-Feb-2007	1.9730	5,358.25	19-Apr-2010	3.08	1,186.72
11-Jan-01	1290	1,111.16	15-Feb-2007	1.9730	5,360.07	20-Apr-2010	3.08	1,177.89
12-Jan-01	1291	1,112.16	16-Feb-2007	1.9730	5,374.60	21-Apr-2010	3.08	1,180.56
13-Jan-01	1292	1,113.16	17-Feb-2007	2.1000	5,405.35	22-Apr-2010	3.08	1,166.24
14-Jan-01	1293	1,114.16	18-Feb-2007	2.1050	5,407.18	23-Apr-2010	3.08	1,170.85
15-Jan-01	1294	1,115.16	19-Feb-2007	2.1050	5,412.59	26-Apr-2010	3.09	1,170.28
16-Jan-01	1295	1,116.16	20-Feb-2007	2.1050	5,413.16	27-Apr-2010	3.10	1,172.92
17-Jan-01	1296	1,117.16	21-Feb-2007	2.1055	5,434.86	28-Apr-2010	3.10	1,174.71
18-Jan-01	1297	1,118.16	22-Feb-2007	2.1055	5,463.99	29-Apr-2010	3.10	1,176.25
19-Jan-01	1298	1,119.16	23-Feb-2007	2.1055	5,486.95	30-Apr-2010	3.10	1,185.34
20-Jan-01	1299	1,120.16	24-Feb-2007	2.1056	5,487.22	3-May-2010	3.10	1,176.17
21-Jan-01	1300	1,121.16	25-Feb-2007	2.1056	5,489.81	4-May-2010	3.10	1,182.05
22-Jan-01	1301	1,122.16	26-Feb-2007	2.1100	5,490.40	5-May-2010	3.09	1,174.82
23-Jan-01	1302	1,123.16	27-Feb-2007	2.1101	5,508.26	6-May-2010	3.09	1,176.44
24-Jan-01	1303	1,124.16	28-Feb-2007	2.1102	5,534.98	7-May-2010	3.08	1,175.88
25-Jan-01	1304	1,125.16	1-Mar-2007	2.1102	5,557.11	10-May-2010	3.08	1,176.10
26-Jan-01	1305	1,126.16	2-Mar-2007	2.1102	5,557.31	11-May-2010	3.08	1,178.26
27-Jan-01	1306	1,127.16	3-Mar-2007	2.1102	5,557.38	12-May-2010	3.08	1,178.40
28-Jan-01	1307	1,128.16	4-Mar-2007	2.1102	5,566.56	13-May-2010	3.02	1,177.89
29-Jan-01	1308	1,129.16	5-Mar-2007	2.1102	5,566.66	14-May-2010	3.00	1,185.08
30-Jan-01	1309	1,130.16	6-Mar-2007	2.1102	5,570.00	17-May-2010	2.99	1,177.24
31-Jan-01	1310	1,131.16	7-Mar-2007	2.1102	5,584.13	18-May-2010	2.99	1,177.15

01-Feb-01	1311	1,132.16	8-Mar-2007	2.1102	5,589.57	19-May-2010	2.99	1,163.46
02-Feb-01	1312	1,133.16	9-Mar-2007	2.1102	5,605.98	20-May-2010	2.99	1,160.95
03-Feb-01	1313	1,134.16	10-Mar-2007	2.1102	5,606.01	21-May-2010	2.97	1,160.70
04-Feb-01	1314	1,135.16	11-Mar-2007	2.1102	5,606.01	24-May-2010	2.90	1,143.04
05-Feb-01	1315	1,136.16	12-Mar-2007	2.1103	5,627.82	25-May-2010	2.80	1,145.12
06-Feb-01	1316	1,137.16	13-Mar-2007	2.1103	5,627.85	27-May-2010	2.80	1,137.13
07-Feb-01	1317	1,138.16	14-Mar-2007	2.1103	5,662.60	28-May-2010	2.74	1,125.36
08-Feb-01	1318	1,139.16	15-Mar-2007	2.1105	5,662.63	31-May-2010	2.73	1,131.68
09-Feb-01	1319	1,140.16	16-Mar-2007	2.1105	5,663.02	1-Jun-2010	2.73	1,128.26
10-Feb-01	1320	1,141.16	17-Mar-2007	2.1106	5,663.10	2-Jun-2010	2.72	1,128.56
11-Feb-01	1321	1,142.16	18-Mar-2007	2.1106	5,663.20	3-Jun-2010	2.72	1,127.60
12-Feb-01	1322	1,143.16	19-Mar-2007	2.1106	5,663.23	4-Jun-2010	2.60	1,117.61
13-Feb-01	1323	1,144.16	20-Mar-2007	2.1106	5,663.23	7-Jun-2010	2.60	1,116.92
14-Feb-01	1324	1,145.16	21-Mar-2007	2.1106	5,668.31	8-Jun-2010	2.60	1,114.07
15-Feb-01	1325	1,146.16	22-Mar-2007	2.1106	5,671.37	9-Jun-2010	2.60	1,114.11
16-Feb-01	1326	1,147.16	23-Mar-2007	2.1106	5,676.77	10-Jun-2010	2.60	1,118.68
17-Feb-01	1327	1,148.16	24-Mar-2007	2.1106	5,691.30	11-Jun-2010	2.58	1,113.91
18-Feb-01	1328	1,149.16	25-Mar-2007	2.1106	5,720.70	14-Jun-2010	2.58	1,110.98
19-Feb-01	1329	1,150.16	26-Mar-2007	2.1120	5,719.89	15-Jun-2010	2.57	1,109.93
20-Feb-01	1330	1,151.16	27-Mar-2007	2.1120	5,698.71	17-Jun-2010	2.52	1,114.51
21-Feb-01	1331	1,152.16	28-Mar-2007	2.1120	5,697.95	18-Jun-2010	2.50	1,108.15
22-Feb-01	1332	1,153.16	29-Mar-2007	2.1120	5,699.62	21-Jun-2010	2.50	1,099.18
23-Feb-01	1333	1,154.16	30-Mar-2007	2.1120	5,703.60	22-Jun-2010	2.38	1,093.43
24-Feb-01	1334	1,155.16	31-Mar-2007	2.1120	5,708.77	23-Jun-2010	2.38	1,086.23
25-Feb-01	1335	1,156.16	1-Apr-2007	2.1120	5,708.88	24-Jun-2010	2.38	1,077.05
26-Feb-01	1336	1,157.16	2-Apr-2007	2.1120	5,745.17	25-Jun-2010	2.38	1,098.38
27-Feb-01	1337	1,158.16	3-Apr-2007	2.1120	5,745.45	28-Jun-2010	2.38	1,095.87
28-Feb-01	1338	1,159.16	4-Apr-2007	2.1120	5,758.95	29-Jun-2010	2.33	1,066.62
01-Mar-01	1339	1,160.16	5-Apr-2007	2.1500	5,785.82	30-Jun-2010	2.00	1,040.74
02-Mar-01	1340	1,161.16	6-Apr-2007	2.1500	5,814.36	1-Jul-2010	1.79	1,022.81
03-Mar-01	1341	1,162.16	7-Apr-2007	2.1500	5,836.04	2-Jul-2010	1.78	1,014.15
04-Mar-01	1342	1,163.16	8-Apr-2007	2.1500	5,836.15	5-Jul-2010	1.78	1,010.68
05-Mar-01	1343	1,164.16	9-Apr-2007	2.1500	5,836.15	6-Jul-2010	1.78	1,000.30
06-Mar-01	1344	1,165.16	10-Apr-2007	2.1501	5,836.26	7-Jul-2010	1.85	1,002.71
07-Mar-01	1345	1,166.16	11-Apr-2007	2.1501	5,839.30	8-Jul-2010	1.88	997.65
08-Mar-01	1346	1,167.16	12-Apr-2007	2.1501	5,839.42	9-Jul-2010	1.94	995.49
09-Mar-01	1347	1,168.16	13-Apr-2007	2.1501	5,839.43	12-Jul-2010	1.99	992.12
10-Mar-01	1348	1,169.16	14-Apr-2007	2.1501	5,839.62	13-Jul-2010	2.03	997.31
11-Mar-01	1349	1,170.16	15-Apr-2007	2.1501	5,846.72	14-Jul-2010	2.11	998.63
12-Mar-01	1350	1,171.16	16-Apr-2007	2.1501	5,849.53	15-Jul-2010	2.11	995.73
13-Mar-01	1351	1,172.16	17-Apr-2007	2.1501	5,849.67	16-Jul-2010	2.16	995.89
14-Mar-01	1352	1,173.16	18-Apr-2007	2.1501	5,849.72	19-Jul-2010	2.16	998.30
15-Mar-01	1353	1,174.16	19-Apr-2007	2.1501	5,850.06	20-Jul-2010	2.18	999.23
16-Mar-01	1354	1,175.16	20-Apr-2007	2.1501	5,850.30	21-Jul-2010	2.19	1,007.71
17-Mar-01	1355	1,176.16	21-Apr-2007	2.1502	5,850.45	22-Jul-2010	2.21	1,006.69
18-Mar-01	1356	1,177.16	22-Apr-2007	2.1502	5,850.93	23-Jul-2010	2.22	1,003.51
19-Mar-01	1357	1,178.16	23-Apr-2007	2.1502	5,851.06	26-Jul-2010	2.40	1,007.86
20-Mar-01	1358	1,179.16	24-Apr-2007	2.1503	5,851.14	27-Jul-2010	2.44	1,003.54
21-Mar-01	1359	1,180.16	25-Apr-2007	2.3650	5,858.84	28-Jul-2010	2.52	1,006.39
22-Mar-01	1360	1,181.16	26-Apr-2007	2.3650	5,867.43	29-Jul-2010	2.53	1,010.31

23-Mar-01	1361	1,182.16	27-Apr-2007	2.3650	5,867.68	30-Jul-2010	2.53	1,010.68
24-Mar-01	1362	1,183.16	28-Apr-2007	2.3650	5,877.52	3-Aug-2010	2.50	1,008.43
25-Mar-01	1363	1,184.16	29-Apr-2007	2.3650	5,882.68	4-Aug-2010	2.49	1,007.91
26-Mar-01	1364	1,185.16	30-Apr-2007	2.3650	5,882.82	5-Aug-2010	2.49	998.28
27-Mar-01	1365	1,186.16	1-May-2007	2.3650	5,883.61	6-Aug-2010	2.49	997.42
28-Mar-01	1366	1,187.16	2-May-2007	2.3650	6,126.74	9-Aug-2010	2.46	995.47
29-Mar-01	1367	1,188.16	3-May-2007	2.3650	6,130.27	10-Aug-2010	2.46	994.02
30-Mar-01	1368	1,189.16	4-May-2007	2.3750	6,131.58	11-Aug-2010	2.45	992.92
31-Mar-01	1369	1,190.16	5-May-2007	2.3751	6,131.29	12-Aug-2010	2.45	989.32
01-Apr-01	1370	1,191.16	6-May-2007	2.3751	6,387.16	13-Aug-2010	2.45	989.61
02-Apr-01	1371	1,192.16	7-May-2007	2.3752	6,390.66	16-Aug-2010	2.43	989.25
03-Apr-01	1372	1,193.16	8-May-2007	2.3752	6,417.66	17-Aug-2010	2.43	984.76
04-Apr-01	1373	1,194.16	9-May-2007	2.3752	6,411.80	18-Aug-2010	2.41	985.04
05-Apr-01	1374	1,195.16	10-May-2007	2.3752	6,418.60	19-Aug-2010	2.40	982.87
06-Apr-01	1375	1,196.16	11-May-2007	2.3752	6,420.04	20-Aug-2010	2.40	982.17
07-Apr-01	1376	1,197.16	12-May-2007	2.3752	6,420.32	23-Aug-2010	2.40	983.62
08-Apr-01	1377	1,198.16	13-May-2007	2.3752	6,467.72	24-Aug-2010	2.40	985.83
09-Apr-01	1378	1,199.16	14-May-2007	2.3752	6,467.92	25-Aug-2010	2.40	987.26
10-Apr-01	1379	1,200.16	15-May-2007	2.3800	6,472.17	26-Aug-2010	2.39	985.35
11-Apr-01	1380	1,201.16	16-May-2007	2.3800	6,521.75	30-Aug-2010	2.40	985.94
12-Apr-01	1381	1,202.16	17-May-2007	2.3800	6,532.31	31-Aug-2010	2.40	978.85
13-Apr-01	1382	1,203.16	18-May-2007	2.3810	6,539.45	1-Sep-2010	2.40	975.45
14-Apr-01	1383	1,204.16	19-May-2007	2.3810	6,566.53	2-Sep-2010	2.40	975.38
15-Apr-01	1384	1,205.16	20-May-2007	2.3810	6,569.58	3-Sep-2010	2.40	972.50
16-Apr-01	1385	1,206.16	21-May-2007	2.3900	6,570.67	6-Sep-2010	2.40	964.59
17-Apr-01	1386	1,207.16	22-May-2007	2.3900	6,599.77	7-Sep-2010	2.40	964.14
18-Apr-01	1387	1,208.16	23-May-2007	2.3900	6,600.07	8-Sep-2010	2.35	964.20
19-Apr-01	1388	1,209.16	24-May-2007	2.3900	6,600.14	9-Sep-2010	2.35	964.21
20-Apr-01	1389	1,210.16	25-May-2007	2.3900	6,613.60	10-Sep-2010	2.35	940.04
21-Apr-01	1390	1,211.16	26-May-2007	2.4000	6,620.59	13-Sep-2010	2.35	940.14
22-Apr-01	1391	1,212.16	27-May-2007	2.4000	6,624.32	14-Sep-2010	2.38	940.62
23-Apr-01	1392	1,213.16	28-May-2007	2.4000	6,621.09	15-Sep-2010	2.38	941.11
24-Apr-01	1393	1,214.16	29-May-2007	2.4000	6,651.39	16-Sep-2010	2.37	966.40
25-Apr-01	1394	1,215.16	30-May-2007	2.4200	6,655.90	17-Sep-2010	2.37	967.01
26-Apr-01	1395	1,216.16	31-May-2007	2.4200	6,663.46	22-Sep-2010	2.37	967.01
27-Apr-01	1396	1,217.16	1-Jun-2007	2.4200	6,664.34	23-Sep-2010	2.37	970.03
28-Apr-01	1397	1,218.16	2-Jun-2007	2.4200	6,664.34	24-Sep-2010	2.37	969.03
29-Apr-01	1398	1,219.16	3-Jun-2007	2.6622	6,680.12	28-Sep-2010	2.36	969.25
30-Apr-01	1399	1,220.16	4-Jun-2007	2.6622	6,696.00	29-Sep-2010	2.35	969.24
01-May-01	1400	1,221.16	5-Jun-2007	2.6622	6,696.56	30-Sep-2010	2.35	968.08
02-May-01	1401	1,222.16	6-Jun-2007	2.6625	6,698.86	1-Oct-2010	2.35	980.27
03-May-01	1402	1,223.16	7-Jun-2007	2.6625	6,706.03	4-Oct-2010	2.35	978.48
04-May-01	1403	1,224.16	8-Jun-2007	2.6626	6,706.12	5-Oct-2010	2.35	970.71
05-May-01	1404	1,225.16	9-Jun-2007	2.6627	6,715.44	6-Oct-2010	2.35	975.42
06-May-01	1405	1,226.16	10-Jun-2007	2.6627	6,716.63	7-Oct-2010	2.35	975.15
07-May-01	1406	1,227.16	11-Jun-2007	2.6628	6,716.75	8-Oct-2010	2.35	974.63
08-May-01	1407	1,228.16	12-Jun-2007	2.6628	6,718.62	11-Oct-2010	2.35	969.66
09-May-01	1408	1,229.16	13-Jun-2007	2.6628	6,718.88	12-Oct-2010	2.35	970.81
10-May-01	1409	1,230.16	14-Jun-2007	2.6628	6,718.96	13-Oct-2010	2.35	970.35
11-May-01	1410	1,231.16	15-Jun-2007	2.6628	6,722.31	14-Oct-2010	2.35	971.33

12-May-01	1411	1,232.16	16-Jun-2007	2.6628	6,722.18	15-Oct-2010	2.35	976.97
13-May-01	1412	1,233.16	17-Jun-2007	2.6628	6,732.53	18-Oct-2010	2.35	977.87
14-May-01	1413	1,234.16	18-Jun-2007	2.6629	6,732.84	19-Oct-2010	2.35	974.43
15-May-01	1414	1,235.16	19-Jun-2007	2.66	6,745.87	20-Oct-2010	2.30	969.73
16-May-01	1415	1,236.16	20-Jun-2007	2.66	6,779.43	21-Oct-2010	2.30	974.48
17-May-01	1416	1,237.16	21-Jun-2007	2.66	6,818.15	22-Oct-2010	2.30	973.01
18-May-01	1417	1,238.16	22-Jun-2007	2.68	6,851.91	25-Oct-2010	2.20	974.10
19-May-01	1418	1,239.16	23-Jun-2007	2.66	6,855.67	26-Oct-2010	2.20	974.53
20-May-01	1419	1,240.16	24-Jun-2007	2.66	6,867.92	27-Oct-2010	2.20	981.65
21-May-01	1420	1,241.16	25-Jun-2007	2.66	6,893.75	28-Oct-2010	2.20	978.15
22-May-01	1421	1,242.16	26-Jun-2007	2.66	6,893.75	29-Oct-2010	2.20	980.14
23-May-01	1422	1,243.16	27-Jun-2007	2.69	6,909.48	1-Nov-2010	2.20	979.73
24-May-01	1423	1,244.16	28-Jun-2007	2.69	6,907.93	2-Nov-2010	2.20	991.69
25-May-01	1424	1,245.16	29-Jun-2007	2.69	6,913.11	3-Nov-2010	2.20	993.80
26-May-01	1425	1,246.16	30-Jun-2007	2.69	6,915.75	4-Nov-2010	2.20	994.34
27-May-01	1426	1,247.16	1-Jul-2007	2.69	6,983.53	5-Nov-2010	2.20	995.69
28-May-01	1427	1,248.16	2-Jul-2007	2.70	6,995.32	8-Nov-2010	2.20	994.51
29-May-01	1428	1,249.16	3-Jul-2007	2.70	6,999.25	9-Nov-2010	2.20	997.03
30-May-01	1429	1,250.16	4-Jul-2007	2.70	7,005.29	10-Nov-2010	2.20	998.45
31-May-01	1430	1,251.16	5-Jul-2007	2.71	7,013.54	11-Nov-2010	2.20	998.46
01-Jun-01	1431	1,252.16	6-Jul-2007	2.75	7,016.53	12-Nov-2010	2.20	1,006.44
02-Jun-01	1432	1,253.16	7-Jul-2007	2.76	7,014.54	15-Nov-2010	2.19	1,008.07
03-Jun-01	1433	1,254.16	8-Jul-2007	2.76	7,054.94	16-Nov-2010	2.20	1,009.89
04-Jun-01	1434	1,255.16	9-Jul-2007	2.77	7,060.69	17-Nov-2010	2.20	1,009.51
05-Jun-01	1435	1,256.16	10-Jul-2007	2.77	7,129.71	18-Nov-2010	2.20	1,010.33
06-Jun-01	1436	1,257.16	11-Jul-2007	2.77	7,135.94	19-Nov-2010	2.20	1,011.36
07-Jun-01	1437	1,258.16	12-Jul-2007	2.78	7,146.00	22-Nov-2010	2.20	1,010.25
08-Jun-01	1438	1,259.16	13-Jul-2007	2.79	7,164.15	23-Nov-2010	2.20	1,015.61
09-Jun-01	1439	1,260.16	14-Jul-2007	2.79	7,160.90	24-Nov-2010	2.20	1,016.47
10-Jun-01	1440	1,261.16	15-Jul-2007	2.79	7,161.46	25-Nov-2010	2.19	1,028.11
11-Jun-01	1441	1,262.16	16-Jul-2007	2.80	7,167.43	26-Nov-2010	2.19	1,030.76
12-Jun-01	1442	1,263.16	17-Jul-2007	2.80	7,208.42	29-Nov-2010	2.19	1,026.84
13-Jun-01	1443	1,264.16	18-Jul-2007	2.80	7,220.63	30-Nov-2010	2.19	1,026.84
14-Jun-01	1444	1,265.16	19-Jul-2007	2.80	7,604.45	1-Dec-2010	2.20	1,027.28
15-Jun-01	1445	1,266.16	20-Jul-2007	2.80	7,615.65	2-Dec-2010	2.20	1,028.69
16-Jun-01	1446	1,267.16	21-Jul-2007	2.80	7,837.13	3-Dec-2010	2.23	1,029.58
17-Jun-01	1447	1,268.16	22-Jul-2007	2.85	7,848.14	6-Dec-2010	2.23	1,031.12
18-Jun-01	1448	1,269.16	23-Jul-2007	2.86	7,844.78	7-Dec-2010	2.23	1,029.02
19-Jun-01	1449	1,270.16	24-Jul-2007	2.87	8,065.58	8-Dec-2010	2.23	1,028.22
20-Jun-01	1450	1,271.16	25-Jul-2007	2.88	8,395.47	9-Dec-2010	2.23	1,035.68
21-Jun-01	1451	1,272.16	26-Jul-2007	2.88	8,400.70	10-Dec-2010	2.23	1,032.99
22-Jun-01	1452	1,273.16	27-Jul-2007	2.88	8,390.68	13-Dec-2010	2.23	1,039.61
23-Jun-01	1453	1,274.16	28-Jul-2007	2.89	8,405.79	14-Dec-2010	2.23	1,040.84
24-Jun-01	1454	1,275.16	29-Jul-2007	2.89	8,432.20	15-Dec-2010	2.23	1,038.58
25-Jun-01	1455	1,276.16	30-Jul-2007	2.89	8,630.48	16-Dec-2010	2.23	1,038.00
26-Jun-01	1456	1,277.16	31-Jul-2007	2.89	8,632.40	17-Dec-2010	2.23	1,039.11
27-Jun-01	1457	1,278.16	1-Aug-2007	2.89	8,649.06	20-Dec-2010	2.23	1,038.67
28-Jun-01	1458	1,279.16	2-Aug-2007	2.89	8,675.34	21-Dec-2010	2.23	1,040.06
29-Jun-01	1459	1,280.16	3-Aug-2007	2.89	8,709.12	22-Dec-2010	2.23	1,045.51
30-Jun-01	1460	1,281.16	4-Aug-2007	2.90	8,745.90	23-Dec-2010	2.23	1,045.55

01-Jul-01	1461	1,282.16	5-Aug-2007	2.90	8,833.32	24-Dec-2010	2.23	1,046.88
02-Jul-01	1462	1,283.16	6-Aug-2007	2.90	9,061.00	27-Dec-2010	2.23	1,048.72
03-Jul-01	1463	1,284.16	7-Aug-2007	2.90	9,070.25	28-Dec-2010	2.23	1,055.57
04-Jul-01	1464	1,285.16	8-Aug-2007	2.90	9,077.09	29-Dec-2010	2.23	1,055.25
05-Jul-01	1465	1,286.16	9-Aug-2007	2.90	9,079.68	30-Dec-2010	2.23	1,060.45
06-Jul-01	1466	1,287.16	10-Aug-2007	3.15	9,095.18	4-Jan-2011	2.20	1,060.31
07-Jul-01	1467	1,288.16	11-Aug-2007	3.16	9,108.82	5-Jan-2011	2.20	1,060.31
08-Jul-01	1468	1,289.16	12-Aug-2007	3.17	9,217.89	6-Jan-2011	2.20	1,059.82
09-Jul-01	1469	1,290.16	13-Aug-2007	3.18	9,349.59	7-Jan-2011	2.20	1,061.21
10-Jul-01	1470	1,291.16	14-Aug-2007	3.19	9,362.79	10-Jan-2011	2.20	1,061.21
11-Jul-01	1471	1,292.16	15-Aug-2007	3.19	9,378.81	11-Jan-2011	2.20	1,060.69
12-Jul-01	1472	1,293.16	16-Aug-2007	3.19	9,385.33	12-Jan-2011	2.20	1,056.41
13-Jul-01	1473	1,294.16	17-Aug-2007	3.20	9,394.55	13-Jan-2011	2.20	1,049.82
14-Jul-01	1474	1,295.16	18-Aug-2007	3.22	9,452.81	14-Jan-2011	2.18	1,048.22
15-Jul-01	1475	1,296.16	19-Aug-2007	3.22	9,532.78	17-Jan-2011	2.18	1,055.30
16-Jul-01	1476	1,297.16	20-Aug-2007	3.22	9,547.92	18-Jan-2011	2.22	1,056.74
17-Jul-01	1477	1,298.16	21-Aug-2007	3.23	9,559.32	19-Jan-2011	2.22	1,065.57
18-Jul-01	1478	1,299.16	22-Aug-2007	3.26	9,569.56	20-Jan-2011	2.22	1,055.89
19-Jul-01	1479	1,300.16	23-Aug-2007	3.27	9,578.60	21-Jan-2011	2.22	1,055.79
20-Jul-01	1480	1,301.16	24-Aug-2007	3.28	9,584.50	24-Jan-2011	2.20	1,056.10
21-Jul-01	1481	1,302.16	25-Aug-2007	3.28	9,600.06	26-Jan-2011	2.20	1,055.23
22-Jul-01	1482	1,303.16	26-Aug-2007	3.28	9,607.80	27-Jan-2011	2.20	1,047.80
23-Jul-01	1483	1,304.16	27-Aug-2007	3.28	9,616.29	28-Jan-2011	2.20	1,047.80
24-Jul-01	1484	1,305.16	28-Aug-2007	3.29	9,633.34	31-Jan-2011	2.20	1,052.51
25-Jul-01	1485	1,306.16	29-Aug-2007	3.29	9,754.12	1-Feb-2011	2.20	1,059.64
26-Jul-01	1486	1,307.16	30-Aug-2007	3.29	9,844.71	2-Feb-2011	2.18	1,053.61
27-Jul-01	1487	1,308.16	31-Aug-2007	3.30	9,889.94	3-Feb-2011	2.20	1,053.65
28-Jul-01	1488	1,309.16	1-Sep-2007	3.30	9,906.64	4-Feb-2011	2.20	1,050.34
29-Jul-01	1489	1,310.16	2-Sep-2007	3.32	9,815.22	7-Feb-2011	2.20	1,048.38
30-Jul-01	1490	1,311.16	3-Sep-2007	3.32	9,826.90	8-Feb-2011	2.20	1,048.50
31-Jul-01	1491	1,312.16	4-Sep-2007	3.33	9,839.36	9-Feb-2011	2.20	1,042.51
01-Aug-01	1492	1,313.16	5-Sep-2007	3.34	9,895.92	10-Feb-2011	2.20	1,041.30
02-Aug-01	1493	1,314.16	6-Sep-2007	3.50	9,916.74	11-Feb-2011	2.20	1,046.94
03-Aug-01	1494	1,315.16	7-Sep-2007	3.50	9,924.74	14-Feb-2011	2.20	1,037.92
04-Aug-01	1495	1,316.16	8-Sep-2007	3.50	9,942.06	15-Feb-2011	2.20	1,039.28
05-Aug-01	1496	1,317.16	9-Sep-2007	3.51	10,038.50	16-Feb-2011	2.15	1,038.29
06-Aug-01	1497	1,318.16	10-Sep-2007	3.52	10,067.66	17-Feb-2011	2.15	1,035.37
07-Aug-01	1498	1,319.16	11-Sep-2007	3.53	10,068.97	21-Feb-2011	2.09	1,029.56
08-Aug-01	1499	1,320.16	12-Sep-2007	3.53	10,167.55	22-Feb-2011	2.09	1,031.38
09-Aug-01	1500	1,321.16	13-Sep-2007	3.53	10,238.64	23-Feb-2011	2.09	1,023.49
10-Aug-01	1501	1,322.16	14-Sep-2007	3.53	10,239.94	24-Feb-2011	2.09	1,022.95
11-Aug-01	1502	1,323.16	15-Sep-2007	3.53	10,262.23	25-Feb-2011	2.07	1,022.80
12-Aug-01	1503	1,324.16	16-Sep-2007	3.53	10,289.21	28-Feb-2011	2.00	1,024.23
13-Aug-01	1504	1,325.16	17-Sep-2007	3.55	10,300.96	1-Mar-2011	1.90	1,023.43
14-Aug-01	1505	1,326.16	18-Sep-2007	3.60	10,315.20	2-Mar-2011	1.90	1,023.50
15-Aug-01	1506	1,327.16	19-Sep-2007	3.60	10,328.59	3-Mar-2011	1.90	1,020.31
16-Aug-01	1507	1,328.16	20-Sep-2007	3.60	10,337.25	4-Mar-2011	1.90	1,018.84
17-Aug-01	1508	1,329.16	21-Sep-2007	3.60	10,342.54	7-Mar-2011	1.90	1,027.33
18-Aug-01	1509	1,330.16	22-Sep-2007	3.60	10,345.12	8-Mar-2011	1.90	1,029.90
19-Aug-01	1510	1,331.16	23-Sep-2007	3.60	10,346.30	9-Mar-2011	1.92	1,027.31

20-Aug-01	1511	1,332.16	24-Sep-2007	3.62	10,352.17	10-Mar-2011	1.92	1,030.45
21-Aug-01	1512	1,333.16	25-Sep-2007	3.63	10,352.76	11-Mar-2011	1.92	1,031.49
22-Aug-01	1513	1,334.16	26-Sep-2007	3.63	10,352.76	14-Mar-2011	1.92	1,032.19
23-Aug-01	1514	1,335.16	27-Sep-2007	3.64	10,356.66	15-Mar-2011	1.92	1,024.03
24-Aug-01	1515	1,336.16	28-Sep-2007	3.64	10,366.48	16-Mar-2011	1.93	1,025.80
25-Aug-01	1516	1,337.16	29-Sep-2007	3.64	10,510.51	17-Mar-2011	1.93	1,034.59
26-Aug-01	1517	1,338.16	30-Sep-2007	3.64	10,518.25	18-Mar-2011	1.93	1,032.83
27-Aug-01	1518	1,339.16	1-Oct-2007	3.64	10,534.30	21-Mar-2011	1.93	1,032.99
28-Aug-01	1519	1,340.16	2-Oct-2007	3.66	10,542.86	22-Mar-2011	1.93	1,033.26
29-Aug-01	1520	1,341.16	3-Oct-2007	3.66	10,548.01	23-Mar-2011	1.93	1,035.25
30-Aug-01	1521	1,342.16	4-Oct-2007	3.66	10,555.72	24-Mar-2011	1.93	1,041.64
31-Aug-01	1522	1,343.16	5-Oct-2007	3.66	10,564.27	25-Mar-2011	1.93	1,045.48
01-Sep-01	1523	1,344.16	6-Oct-2007	3.66	10,567.92	29-Mar-2011	1.93	1,038.40
02-Sep-01	1524	1,345.16	7-Oct-2007	3.67	10,572.38	30-Mar-2011	1.95	1,040.70
03-Sep-01	1525	1,346.16	8-Oct-2007	3.68	10,579.33	31-Mar-2011	1.95	1,030.66
04-Sep-01	1526	1,347.16	9-Oct-2007	3.70	10,606.19	1-Apr-2011	1.96	1,032.13
05-Sep-01	1527	1,348.16	10-Oct-2007	3.70	10,613.00	4-Apr-2011	1.96	1,028.01
06-Sep-01	1528	1,349.16	11-Oct-2007	3.75	10,624.93	5-Apr-2011	1.96	1,033.68
07-Sep-01	1529	1,350.16	12-Oct-2007	3.76	10,633.24	6-Apr-2011	1.96	1,025.37
08-Sep-01	1530	1,351.16	13-Oct-2007	3.78	10,638.43	7-Apr-2011	1.96	1,025.77
09-Sep-01	1531	1,352.16	14-Oct-2007	3.79	10,642.60	8-Apr-2011	1.96	1,022.63
10-Sep-01	1532	1,353.16	15-Oct-2007	3.79	10,650.72	11-Apr-2011	1.97	1,020.88
11-Sep-01	1533	1,354.16	16-Oct-2007	3.90	10,480.61	12-Apr-2011	1.99	1,021.52
12-Sep-01	1534	1,355.16	17-Oct-2007	3.90	10,701.18	13-Apr-2011	2.00	1,024.84
13-Sep-01	1535	1,356.16	18-Oct-2007	3.90	10,704.54	14-Apr-2011	2.01	1,019.00
14-Sep-01	1536	1,357.16	19-Oct-2007	3.90	10,708.12	15-Apr-2011	2.01	1,016.70
15-Sep-01	1537	1,358.16	20-Oct-2007	3.91	10,497.53	18-Apr-2011	2.01	1,016.89
16-Sep-01	1538	1,359.16	21-Oct-2007	3.91	10,515.86	19-Apr-2011	2.06	1,018.10
17-Sep-01	1539	1,360.16	22-Oct-2007	3.91	10,517.45	20-Apr-2011	2.07	1,018.16
18-Sep-01	1540	1,361.16	23-Oct-2007	3.91	10,518.61	21-Apr-2011	2.23	1,022.04
19-Sep-01	1541	1,362.16	24-Oct-2007	3.91	10,519.61	22-Apr-2011	2.23	1,021.17
20-Sep-01	1542	1,363.16	25-Oct-2007	4.30	10,591.45	25-Apr-2011	2.20	1,021.81
21-Sep-01	1543	1,364.16	26-Oct-2007	4.60	10,626.29	26-Apr-2011	2.42	1,027.78
22-Sep-01	1544	1,365.16	27-Oct-2007	4.62	10,629.58	27-Apr-2011	2.44	1,030.89
23-Sep-01	1545	1,366.16	28-Oct-2007	4.62	10,655.67	28-Apr-2011	2.59	1,034.21
24-Sep-01	1546	1,367.16	29-Oct-2007	4.64	10,699.74	29-Apr-2011	2.59	1,036.23
25-Sep-01	1547	1,368.16	30-Oct-2007	4.65	10,702.68	2-May-2011	2.60	1,037.51
26-Sep-01	1548	1,369.16	31-Oct-2007	4.67	10,717.88	3-May-2011	2.61	1,033.60
27-Sep-01	1549	1,370.16	1-Nov-2007	4.68	10,763.20	4-May-2011	2.61	1,026.95
28-Sep-01	1550	1,371.16	2-Nov-2007	4.68	10,785.40	5-May-2011	2.62	1,026.73
29-Sep-01	1551	1,372.16	3-Nov-2007	4.68	10,786.48	9-May-2011	2.63	1,028.35
30-Sep-01	1552	1,373.16	4-Nov-2007	4.68	10,786.48	10-May-2011	2.63	1,029.37
01-Oct-01	1553	1,374.16	5-Nov-2007	4.68	10,790.95	11-May-2011	2.63	1,030.58
02-Oct-01	1554	1,375.16	6-Nov-2007	4.69	10,793.63	12-May-2011	2.63	1,030.47
03-Oct-01	1555	1,376.16	7-Nov-2007	4.69	10,798.13	13-May-2011	2.63	1,030.50
04-Oct-01	1556	1,377.16	8-Nov-2007	4.69	10,836.73	17-May-2011	2.63	1,023.45
05-Oct-01	1557	1,378.16	9-Nov-2007	4.70	10,837.05	18-May-2011	2.63	1,024.43
06-Oct-01	1558	1,379.16	10-Nov-2007	4.70	10,838.04	19-May-2011	2.63	1,028.23
07-Oct-01	1559	1,380.16	11-Nov-2007	4.70	10,838.27	20-May-2011	2.63	1,027.97
08-Oct-01	1560	1,381.16	12-Nov-2007	4.71	10,839.58	23-May-2011	2.63	1,032.34

09-Oct-01	1561	1,382.16	13-Nov-2007	4.75	10,837.05	24-May-2011	2.63	1,025.18
10-Oct-01	1562	1,383.16	14-Nov-2007	4.80	10,842.06	25-May-2011	2.63	1,027.35
11-Oct-01	1563	1,384.16	15-Nov-2007	4.80	10,859.08	26-May-2011	2.63	1,034.82
12-Oct-01	1564	1,385.16	16-Nov-2007	4.80	10,860.08	27-May-2011	2.63	1,025.90
13-Oct-01	1565	1,386.16	17-Nov-2007	4.80	10,855.33	30-May-2011	2.74	1,028.83
14-Oct-01	1566	1,387.16	18-Nov-2007	4.81	10,859.63	31-May-2011	2.74	1,035.81
15-Oct-01	1567	1,388.16	19-Nov-2007	4.81	10,860.62	1-Jun-2011	2.74	1,036.20
16-Oct-01	1568	1,389.16	20-Nov-2007	4.81	10,862.62	2-Jun-2011	2.74	1,043.13
17-Oct-01	1569	1,390.16	21-Nov-2007	4.85	10,874.84	3-Jun-2011	2.74	1,043.13
18-Oct-01	1570	1,391.16	22-Nov-2007	4.85	10,868.60	6-Jun-2011	2.74	1,036.48
19-Oct-01	1571	1,392.16	23-Nov-2007	4.90	10,871.07	7-Jun-2011	2.74	1,035.31
20-Oct-01	1572	1,393.16	24-Nov-2007	5.00	10,870.87	8-Jun-2011	2.74	1,036.78
21-Oct-01	1573	1,394.16	25-Nov-2007	5.00	10,871.07	9-Jun-2011	2.74	1,036.39
22-Oct-01	1574	1,395.16	26-Nov-2007	5.00	10,890.80	10-Jun-2011	2.74	1,036.39
23-Oct-01	1575	1,396.16	27-Nov-2007	5.00	10,895.79	13-Jun-2011	2.74	1,036.39
24-Oct-01	1576	1,397.16	28-Nov-2007	5.00	10,895.79	14-Jun-2011	2.74	1,042.76
25-Oct-01	1577	1,398.16	29-Nov-2007	5.00	10,900.77	15-Jun-2011	2.73	1,040.45
26-Oct-01	1578	1,399.16	30-Nov-2007	5.00	10,900.77	16-Jun-2011	2.75	1,040.45
27-Oct-01	1579	1,400.16	1-Dec-2007	5.00	10,822.00	20-Jun-2011	2.80	1,042.47
28-Oct-01	1580	1,401.16	2-Dec-2007	5.00	10,822.00	21-Jun-2011	2.85	1,040.02
29-Oct-01	1581	1,402.16	3-Dec-2007	5.00	10,822.00	22-Jun-2011	2.85	1,041.61
30-Oct-01	1582	1,403.16	4-Dec-2007	5.00	10,822.00	23-Jun-2011	2.85	1,043.84
31-Oct-01	1583	1,404.16	5-Dec-2007	5.00	10,822.52	24-Jun-2011	2.86	1,043.84
01-Nov-01	1584	1,405.16	6-Dec-2007	5.00	10,822.52	27-Jun-2011	2.89	1,044.27
02-Nov-01	1585	1,406.16	7-Dec-2007	5.00	10,822.52	28-Jun-2011	2.90	1,044.43
03-Nov-01	1586	1,407.16	8-Dec-2007	5.00	10,822.52	29-Jun-2011	2.90	1,043.18
04-Nov-01	1587	1,408.16	9-Dec-2007	5.00	10,822.52	30-Jun-2011	2.95	1,038.28
05-Nov-01	1588	1,409.16	10-Dec-2007	5.00	10,822.52	1-Jul-2011	2.95	1,034.63
06-Nov-01	1589	1,410.16	11-Dec-2007	5.00	10,822.52	4-Jul-2011	2.95	1,042.37
07-Nov-01	1590	1,411.16	12-Dec-2007	5.00	10,822.52	5-Jul-2011	2.95	1,042.55
08-Nov-01	1591	1,412.16	13-Dec-2007	5.00	10,820.45	6-Jul-2011	3.00	1,044.12
09-Nov-01	1592	1,413.16	14-Dec-2007	5.00	10,820.36	7-Jul-2011	3.00	1,034.43
10-Nov-01	1593	1,414.16	15-Dec-2007	5.00	10,820.36	8-Jul-2011	3.01	1,036.16
11-Nov-01	1594	1,415.16	16-Dec-2007	5.00	10,815.10	11-Jul-2011	3.01	1,035.03
12-Nov-01	1595	1,416.16	17-Dec-2007	5.00	10,794.76	12-Jul-2011	3.04	1,038.21
13-Nov-01	1596	1,417.16	18-Dec-2007	5.00	10,788.29	13-Jul-2011	3.20	1,041.49
14-Nov-01	1597	1,418.16	19-Dec-2007	5.00	10,781.02	14-Jul-2011	3.20	1,049.71
15-Nov-01	1598	1,419.16	20-Dec-2007	4.50	10,752.34	15-Jul-2011	3.22	1,046.06
16-Nov-01	1599	1,420.16	21-Dec-2007	4.50	10,733.09	18-Jul-2011	3.40	1,061.35
17-Nov-01	1600	1,421.16	22-Dec-2007	4.50	10,733.09	19-Jul-2011	3.40	1,053.81
18-Nov-01	1601	1,422.16	23-Dec-2007	4.50	10,728.90	20-Jul-2011	3.40	1,067.11
19-Nov-01	1602	1,423.16	24-Dec-2007	4.50	10,621.19	21-Jul-2011	3.40	1,069.95
20-Nov-01	1603	1,424.16	25-Dec-2007	4.50	10,608.04	25-Jul-2011	3.40	1,079.92
21-Nov-01	1604	1,425.16	26-Dec-2007	4.50	10,608.04	26-Jul-2011	3.45	1,109.50
22-Nov-01	1605	1,426.16	27-Dec-2007	4.50	10,608.04	27-Jul-2011	3.50	1,116.27
23-Nov-01	1606	1,427.16	28-Dec-2007	4.50	10,608.04	28-Jul-2011	3.51	1,131.16
24-Nov-01	1607	1,428.16	29-Dec-2007	4.50	10,608.04	29-Jul-2011	3.50	1,143.06
25-Nov-01	1608	1,429.16	30-Dec-2007	4.50	10,572.79	1-Aug-2011	3.50	1,144.90
26-Nov-01	1609	1,430.16	31-Dec-2007	4.50	10,572.79	2-Aug-2011	3.50	1,146.94
27-Nov-01	1610	1,431.16	1-Jan-2008	4.50	10,572.79	3-Aug-2011	3.50	1,148.85

28-Nov-01	1611	1,432.16	2-Jan-2008	4.50	10,569.16	4-Aug-2011	3.55	1,155.65
29-Nov-01	1612	1,433.16	3-Jan-2008	4.50	10,563.54	5-Aug-2011	3.54	1,152.88
30-Nov-01	1613	1,434.16	4-Jan-2008	4.50	10,563.54	8-Aug-2011	3.55	1,155.16
01-Dec-01	1614	1,435.16	5-Jan-2008	4.50	10,573.43	9-Aug-2011	3.55	1,149.02
02-Dec-01	1615	1,436.16	6-Jan-2008	4.50	10,573.43	10-Aug-2011	3.55	1,151.69
03-Dec-01	1616	1,437.16	7-Jan-2008	4.50	10,573.43	11-Aug-2011	3.55	1,154.36
04-Dec-01	1617	1,438.16	8-Jan-2008	4.50	10,573.43	12-Aug-2011	3.55	1,149.02
05-Dec-01	1618	1,439.16	9-Jan-2008	4.50	10,570.37	15-Aug-2011	3.55	1,153.07
06-Dec-01	1619	1,440.16	10-Jan-2008	4.50	10,531.27	16-Aug-2011	3.55	1,152.68
07-Dec-01	1620	1,441.16	11-Jan-2008	4.50	10,531.27	17-Aug-2011	3.55	1,146.10
08-Dec-01	1621	1,442.16	12-Jan-2008	4.50	10,524.74	18-Aug-2011	3.53	1,144.66
09-Dec-01	1622	1,443.16	13-Jan-2008	4.50	10,474.31	19-Aug-2011	3.52	1,139.67
10-Dec-01	1623	1,444.16	14-Jan-2008	4.50	10,474.31	22-Aug-2011	3.52	1,137.29
11-Dec-01	1624	1,445.16	15-Jan-2008	4.50	10,474.31	23-Aug-2011	3.55	1,139.74
12-Dec-01	1625	1,446.16	16-Jan-2008	4.50	10,468.19	24-Aug-2011	3.55	1,138.97
13-Dec-01	1626	1,447.16	17-Jan-2008	4.50	10,468.19	25-Aug-2011	3.53	1,139.19
14-Dec-01	1627	1,448.16	18-Jan-2008	4.50	10,464.90	26-Aug-2011	3.53	1,133.47
15-Dec-01	1628	1,449.16	19-Jan-2008	4.50	10,464.90	29-Aug-2011	3.53	1,142.61
16-Dec-01	1629	1,450.16	20-Jan-2008	4.50	10,464.90	30-Aug-2011	3.53	1,140.77
17-Dec-01	1630	1,451.16	21-Jan-2008	4.50	10,464.90	31-Aug-2011	3.53	1,141.08
18-Dec-01	1631	1,452.16	22-Jan-2008	4.50	10,449.10	1-Sep-2011	3.53	1,139.69
19-Dec-01	1632	1,453.16	23-Jan-2008	4.50	10,446.93	5-Sep-2011	3.53	1,139.69
20-Dec-01	1633	1,454.16	24-Jan-2008	4.50	10,435.58	6-Sep-2011	3.53	1,138.98
21-Dec-01	1634	1,455.16	25-Jan-2008	4.50	10,434.93	7-Sep-2011	3.53	1,140.93
22-Dec-01	1635	1,456.16	26-Jan-2008	4.50	10,431.64	8-Sep-2011	3.53	1,141.14
23-Dec-01	1636	1,457.16	27-Jan-2008	4.50	10,431.64	9-Sep-2011	3.54	1,145.69
24-Dec-01	1637	1,458.16	28-Jan-2008	4.50	10,431.64	12-Sep-2011	3.54	1,170.56
25-Dec-01	1638	1,459.16	29-Jan-2008	4.50	10,431.64	13-Sep-2011	3.54	1,191.16
26-Dec-01	1639	1,460.16	30-Jan-2008	4.50	10,431.64	14-Sep-2011	3.54	1,195.57
27-Dec-01	1640	1,461.16	31-Jan-2008	4.50	10,431.64	15-Sep-2011	3.55	1,190.03
28-Dec-01	1641	1,462.16	1-Feb-2008	4.50	10,428.34	16-Sep-2011	3.55	1,197.29
29-Dec-01	1642	1,463.16	2-Feb-2008	4.50	10,428.34	24-Dec-2012	3.54	1,186.72
30-Dec-01	1643	1,464.16	3-Feb-2008	4.50	10,424.20	27-Dec-2012	3.54	1,187.89
31-Dec-01	1644	1,465.16	4-Feb-2008	4.50	10,422.60	28-Dec-2012	3.54	1,188.28
01-Jan-02	1645	1,466.16	5-Feb-2008	4.50	10,385.30	31-Dec-2012	3.54	1,199.72
02-Jan-02	1646	1,467.16	6-Feb-2008	4.50	10,350.32	2-Jan-2013	3.54	1,198.34
03-Jan-02	1647	1,468.16	7-Feb-2008	4.50	10,347.02	3-Jan-2013	3.54	1,198.29
04-Jan-02	1648	1,469.16	8-Feb-2008	4.50	10,347.02	4-Jan-2013	3.54	1,199.32
05-Jan-02	1649	1,470.16	9-Feb-2008	4.50	10,347.02	7-Jan-2013	3.54	1,198.95
06-Jan-02	1650	1,471.16	10-Feb-2008	4.50	10,271.58	8-Jan-2013	3.54	1,205.74
07-Jan-02	1651	1,472.16	11-Feb-2008	4.50	10,262.17	9-Jan-2013	3.54	1,209.12
08-Jan-02	1652	1,473.16	12-Feb-2008	4.50	10,253.88	10-Jan-2013	3.54	1,212.31
09-Jan-02	1653	1,474.16	13-Feb-2008	4.50	10,253.88	11-Jan-2013	3.54	1,216.96
10-Jan-02	1654	1,475.16	14-Feb-2008	4.50	10,253.88	14-Jan-2013	3.54	1,220.26
11-Jan-02	1655	1,476.16	15-Feb-2008	4.50	10,252.72	15-Jan-2013	3.54	1,223.13
12-Jan-02	1656	1,477.16	16-Feb-2008	4.50	10,220.99	16-Jan-2013	3.54	1,226.37
13-Jan-02	1657	1,478.16	17-Feb-2008	4.50	10,220.99	17-Jan-2013	3.54	1,227.49
14-Jan-02	1658	1,479.16	18-Feb-2008	4.50	10,183.40	18-Jan-2013	3.54	1,231.93
15-Jan-02	1659	1,480.16	19-Feb-2008	4.50	10,183.40	21-Jan-2013	3.54	1,234.27
16-Jan-02	1660	1,481.16	20-Feb-2008	4.50	10,088.08	22-Jan-2013	3.54	1,235.98

17-Jan-02	1661	1,482.16	21-Feb-2008	4.50	10,088.08	23-Jan-2013	3.54	1,240.57
18-Jan-02	1662	1,483.16	22-Feb-2008	4.50	10,088.08	24-Jan-2013	3.56	1,254.68
19-Jan-02	1663	1,484.16	23-Feb-2008	4.50	10,088.08	25-Jan-2013	3.56	1,270.80
20-Jan-02	1664	1,485.16	24-Feb-2008	4.50	10,088.08	28-Jan-2013	3.56	1,274.39
21-Jan-02	1665	1,486.16	25-Feb-2008	4.50	9,995.10	29-Jan-2013	3.72	1,282.52
22-Jan-02	1666	1,487.16	26-Feb-2008	4.50	9,995.10	30-Jan-2013	3.72	1,283.39
23-Jan-02	1667	1,488.16	27-Feb-2008	4.50	9,937.47	31-Jan-2013	3.77	1,270.72
24-Jan-02	1668	1,489.16	28-Feb-2008	4.50	9,937.47	1-Feb-2013	3.77	1,281.34
25-Jan-02	1669	1,490.16	29-Feb-2008	4.50	9,934.86	4-Feb-2013	3.95	1,292.02
26-Jan-02	1670	1,491.16	1-Mar-2008	4.50	9,934.86	5-Feb-2013	3.95	1,312.42
27-Jan-02	1671	1,492.16	2-Mar-2008	4.50	9,934.86	6-Feb-2013	3.96	1,312.58
28-Jan-02	1672	1,493.16	3-Mar-2008	4.50	9,934.86	7-Feb-2013	4.00	1,319.89
29-Jan-02	1673	1,494.16	4-Mar-2008	4.50	9,930.21	8-Feb-2013	4.22	1,327.80
30-Jan-02	1674	1,495.16	5-Mar-2008	4.50	9,927.52	11-Feb-2013	4.80	1,333.16
31-Jan-02	1675	1,496.16	6-Mar-2008	4.50	9,926.17	12-Feb-2013	4.80	1,361.12
01-Feb-02	1676	1,497.16	7-Mar-2008	4.50	9,923.28	13-Feb-2013	4.80	1,359.08
02-Feb-02	1677	1,498.16	8-Mar-2008	4.50	9,836.84	14-Feb-2013	5.21	1,385.40
03-Feb-02	1678	1,499.16	9-Mar-2008	4.50	9,828.85	15-Feb-2013	5.21	1,396.93
04-Feb-02	1679	1,500.16	10-Mar-2008	4.50	9,828.85	18-Feb-2013	5.21	1,401.55
05-Feb-02	1680	1,501.16	11-Mar-2008	4.50	9,828.85	19-Feb-2013	5.23	1,413.72
06-Feb-02	1681	1,502.16	12-Mar-2008	4.50	9,792.65	20-Feb-2013	5.25	1,426.28
07-Feb-02	1682	1,503.16	13-Mar-2008	4.50	9,715.24	21-Feb-2013	5.22	1,433.01
08-Feb-02	1683	1,504.16	14-Mar-2008	4.50	9,715.24	22-Feb-2013	5.23	1,447.69
09-Feb-02	1684	1,505.16	15-Mar-2008	4.50	9,711.59	25-Feb-2013	5.23	1,454.04
10-Feb-02	1685	1,506.16	16-Mar-2008	4.50	9,695.29	26-Feb-2013	5.23	1,455.49
11-Feb-02	1686	1,507.16	17-Mar-2008	4.50	9,684.59	27-Feb-2013	5.23	1,458.60
12-Feb-02	1687	1,508.16	18-Mar-2008	4.50	9,662.42	28-Feb-2013	5.23	1,482.26
13-Feb-02	1688	1,509.16	19-Mar-2008	4.50	9,662.42	1-Mar-2013	5.25	1,513.44
14-Feb-02	1689	1,510.16	20-Mar-2008	4.50	9,662.42	4-Feb-2013	5.25	1,532.53
15-Feb-02	1690	1,511.16	21-Mar-2008	4.50	9,651.49	5-Mar-2013	5.25	1,555.23
16-Feb-02	1691	1,512.16	22-Mar-2008	4.50	9,651.49	7-Mar-2013	5.27	1,567.96
17-Feb-02	1692	1,513.16	23-Mar-2008	4.50	9,531.64	8-Mar-2013	5.27	1,564.41
18-Feb-02	1693	1,514.16	24-Mar-2008	4.50	9,531.64	11-Mar-2013	5.28	1,578.93
19-Feb-02	1694	1,515.16	25-Mar-2008	4.50	9,291.93	12-Mar-2013	5.28	1,589.21
20-Feb-02	1695	1,516.16	26-Mar-2008	4.00	9,242.51	13-Mar-2013	5.30	1,597.56
21-Feb-02	1696	1,517.16	27-Mar-2008	4.00	9,238.66	14-Mar-2013	5.30	1,608.49
22-Feb-02	1697	1,518.16	28-Mar-2008	4.00	9,247.17	15-Mar-2013	5.42	1,641.03
23-Feb-02	1698	1,519.16	29-Mar-2008	4.00	9,247.17	18-Mar-2013	5.42	1,644.23
24-Feb-02	1699	1,520.16	30-Mar-2008	4.00	9,174.10	19-Mar-2013	5.43	1,662.60
25-Feb-02	1700	1,521.16	31-Mar-2008	3.80	9,168.67	20-Mar-2013	5.43	1,686.04
26-Feb-02	1701	1,522.16	1-Apr-2008	3.80	9,024.23	21-Mar-2013	5.43	1,723.93
27-Feb-02	1702	1,523.16	2-Apr-2008	3.80	8,991.01	22-Mar-2013	5.43	1,742.26
28-Feb-02	1703	1,524.16	3-Apr-2008	3.80	8,991.01	25-Mar-2013	5.43	1,743.46
01-Mar-02	1704	1,525.16	4-Apr-2008	3.80	8,991.01	26-Mar-2013	5.45	1,727.68
02-Mar-02	1705	1,526.16	5-Apr-2008	3.80	8,985.23	27-Mar-2013	5.45	1,741.33
03-Mar-02	1706	1,527.16	6-Apr-2008	3.80	8,979.85	28-Mar-2013	5.45	1,733.47
04-Mar-02	1707	1,528.16	7-Apr-2008	3.80	8,979.85	2-Apr-2013	5.45	1,737.16
05-Mar-02	1708	1,529.16	8-Apr-2008	3.80	8,990.77	3-Apr-2013	5.47	1,739.55
06-Mar-02	1709	1,530.16	9-Apr-2008	3.70	8,993.84	4-Apr-2013	5.49	1,756.04
07-Mar-02	1710	1,531.16	10-Apr-2008	3.70	8,982.47	5-Apr-2013	5.51	1,753.67

08-Mar-02	1711	1,532.16	11-Apr-2008	3.70	8,977.10	8-Apr-2013	5.51	1,740.81
09-Mar-02	1712	1,533.16	12-Apr-2008	3.70	8,996.67	9-Apr-2013	5.56	1,743.21
10-Mar-02	1713	1,534.16	13-Apr-2008	3.40	8,982.03	10-Apr-2013	5.60	1,758.92
11-Mar-02	1714	1,535.16	14-Apr-2008	3.40	8,980.64	11-Apr-2013	5.62	1,762.17
12-Mar-02	1715	1,536.16	15-Apr-2008	3.00	8,864.55	12-Apr-2013	5.62	1,763.50
13-Mar-02	1716	1,537.16	16-Apr-2008	3.00	8,865.62	15-Apr-2013	5.62	1,769.46
14-Mar-02	1717	1,538.16	17-Apr-2008	3.00	8,840.71	16-Apr-2013	5.64	1,770.56
15-Mar-02	1718	1,539.16	18-Apr-2008	3.00	8,822.91	17-Apr-2013	5.64	1,772.59
16-Mar-02	1719	1,540.16	19-Apr-2008	3.00	8,815.63	18-Apr-2013	5.58	1,768.23
17-Mar-02	1720	1,541.16	20-Apr-2008	3.00	8,815.63	19-Apr-2013	5.58	1,778.07
18-Mar-02	1721	1,542.16	21-Apr-2008	2.80	8,810.20	22-Apr-2013	5.58	1,777.23
19-Mar-02	1722	1,543.16	22-Apr-2008	2.80	8,748.67	23-Apr-2013	5.58	1,787.68
20-Mar-02	1723	1,544.16	23-Apr-2008	2.80	8,748.67	24-Apr-2013	5.58	1,782.98
21-Mar-02	1724	1,545.16	24-Apr-2008	2.80	8,745.03	25-Apr-2013	5.60	1,795.03
22-Mar-02	1725	1,546.16	25-Apr-2008	2.80	8,715.08	26-Apr-2013	5.60	1,797.03
23-Mar-02	1726	1,547.16	26-Apr-2008	2.80	8,715.08	29-Apr-2013	5.63	1,800.98
24-Mar-02	1727	1,548.16	27-Apr-2008	2.80	8,682.97	30-Apr-2013	5.65	1,800.66
25-Mar-02	1728	1,549.16	28-Apr-2008	2.50	7,955.18	2-May-2013	5.65	1,799.91
26-Mar-02	1729	1,550.16	29-Apr-2008	2.50	7,945.63	3-May-2013	5.65	1,808.94
27-Mar-02	1730	1,551.16	30-Apr-2008	2.50	7,941.71	6-May-2013	5.66	1,833.13
28-Mar-02	1731	1,552.16	1-May-2008	2.50	7,937.12	7-May-2013	5.66	1,839.55
29-Mar-02	1732	1,553.16	2-May-2008	2.50	7,928.46	8-May-2013	5.66	1,827.33
30-Mar-02	1733	1,554.16	3-May-2008	2.50	7,926.20	9-May-2013	5.66	1,828.43
31-Mar-02	1734	1,555.16	4-May-2008	2.50	7,849.38	10-May-2013	5.66	1,830.48
01-Apr-02	1735	1,556.16	5-May-2008	2.50	7,855.34	13-May-2013	5.66	1,832.49
02-Apr-02	1736	1,557.16	6-May-2008	2.50	7,496.02	14-May-2013	5.66	1,832.10
03-Apr-02	1737	1,558.16	7-May-2008	2.50	7,496.02	15-May-2013	5.67	1,835.76
04-Apr-02	1738	1,559.16	8-May-2008	2.50	7,237.36	16-May-2013	5.90	1,839.41
05-Apr-02	1739	1,560.16	9-May-2008	2.50	7,113.19	17-May-2013	5.90	1,842.96
06-Apr-02	1740	1,561.16	10-May-2008	2.50	7,107.75	20-May-2013	5.90	1,838.10
07-Apr-02	1741	1,562.16	11-May-2008	2.50	6,994.22	21-May-2013	5.90	1,848.12
08-Apr-02	1742	1,563.16	12-May-2008	2.50	6,871.39	22-May-2013	5.90	1,851.04
09-Apr-02	1743	1,564.16	13-May-2008	2.75	6,754.60	23-May-2013	5.90	1,852.36
10-Apr-02	1744	1,565.16	14-May-2008	2.75	6,754.60	24-May-2013	5.90	1,859.33
11-Apr-02	1745	1,566.16	15-May-2008	2.75	6,623.63	28-May-2013	5.90	1,871.12
12-Apr-02	1746	1,567.16	16-May-2008	2.75	6,626.48	29-May-2013	5.80	1,867.31
13-Apr-02	1747	1,568.16	17-May-2008	2.76	6,283.66	30-May-2013	5.80	1,866.71
14-Apr-02	1748	1,569.16	18-May-2008	2.80	6,284.75	31-May-2013	5.80	1,884.26
15-Apr-02	1749	1,570.16	19-May-2008	2.80	6,086.16	3-Jun-2013	5.80	1,877.67
16-Apr-02	1750	1,571.16	20-May-2008	2.80	6,023.95	4-Jun-2013	5.80	1,877.69
17-Apr-02	1751	1,572.16	21-May-2008	2.80	5,961.75	5-Jun-2013	5.81	1,874.78
18-Apr-02	1752	1,573.16	22-May-2008	2.80	5,824.39	6-Jun-2013	5.81	1,868.05
19-Apr-02	1753	1,574.16	23-May-2008	2.80	5,481.99	7-Jun-2013	5.81	1,883.88
20-Apr-02	1754	1,575.16	24-May-2008	3.00	5,319.60	10-Jun-2013	5.81	1,882.11
21-Apr-02	1755	1,576.16	25-May-2008	3.00	5,315.50	11-Jun-2013	5.81	1,892.62
22-Apr-02	1756	1,577.16	26-May-2008	2.80	5,296.13	12-Jun-2013	5.81	1,898.98
23-Apr-02	1757	1,578.16	27-May-2008	2.80	5,299.03	13-Jun-2013	5.81	1,909.04
24-Apr-02	1758	1,579.16	28-May-2008	2.80	5,423.03	14-Jun-2013	5.70	1,908.67
25-Apr-02	1759	1,580.16	29-May-2008	2.80	5,423.98	17-Jun-2013	5.70	1,908.77
26-Apr-02	1760	1,581.16	30-May-2008	2.80	5,427.20	18-Jun-2013	5.70	1,904.70

27-Apr-02	1761	1,582.16	31-May-2008	2.80	5,423.77	19-Jun-2013	5.70	1,906.81
28-Apr-02	1762	1,583.16	1-Jun-2008	2.80	5,533.61	20-Jun-2013	5.70	1,893.02
29-Apr-02	1763	1,584.16	2-Jun-2008	2.80	5,529.02	21-Jun-2013	5.70	1,892.52
30-Apr-02	1764	1,585.16	3-Jun-2008	2.80	5,525.52	24-Jun-2013	5.70	1,900.10
01-May-02	1765	1,586.16	4-Jun-2008	2.80	5,536.44	25-Jun-2013	5.75	1,891.94
02-May-02	1766	1,587.16	5-Jun-2008	2.80	5,416.69	26-Jun-2013	5.75	1,874.67
03-May-02	1767	1,588.16	6-Jun-2008	2.80	5,392.78	27-Jun-2013	5.80	1,877.65
04-May-02	1768	1,589.16	7-Jun-2008	2.80	5,387.96	28-Jun-2013	5.80	1,880.26
05-May-02	1769	1,590.16	8-Jun-2008	2.85	5,399.17	2-Jul-2013	5.80	1,887.63
06-May-02	1770	1,591.16	9-Jun-2008	2.85	5,406.45	3-Jul-2013	5.80	1,884.20
07-May-02	1771	1,592.16	10-Jun-2008	2.85	5,296.68	4-Jul-2013	5.83	1,887.90
08-May-02	1772	1,593.16	11-Jun-2008	2.85	5,286.29	5-Jul-2013	5.84	1,884.93
09-May-02	1773	1,594.16	12-Jun-2008	2.85	5,295.83	8-Jul-2013	5.84	1,883.77
10-May-02	1774	1,595.16	13-Jun-2008	2.85	5,309.28	9-Jul-2013	5.84	1,880.95
11-May-02	1775	1,596.16	14-Jun-2008	2.85	5,313.05	10-Jul-2013	5.84	1,888.25
12-May-02	1776	1,597.16	15-Jun-2008	2.85	5,321.84	11-Jul-2013	5.84	1,897.66
13-May-02	1777	1,598.16	16-Jun-2008	2.85	5,324.72	12-Jul-2013	5.84	1,910.98
14-May-02	1778	1,599.16	17-Jun-2008	2.85	5,201.25	15-Jul-2013	5.90	1,906.48
15-May-02	1779	1,600.16	18-Jun-2008	3.00	5,224.93	16-Jul-2013	5.90	1,907.79
16-May-02	1780	1,601.16	19-Jun-2008	3.33	5,242.12	17-Jul-2013	5.90	1,900.64
17-May-02	1781	1,602.16	20-Jun-2008	3.33	5,230.49	18-Jul-2013	5.90	1,904.38
18-May-02	1782	1,603.16	21-Jun-2008	3.33	5,245.28	19-Jul-2013	5.90	1,908.21
19-May-02	1783	1,604.16	22-Jun-2008	3.36	5,238.44	22-Jul-2013	5.90	1,903.29
20-May-02	1784	1,605.16	23-Jun-2008	3.37	5,257.81	23-Jul-2013	6.00	1,905.64
21-May-02	1785	1,606.16	24-Jun-2008	3.37	5,150.68	24-Jul-2013	5.90	1,907.00
22-May-02	1786	1,607.16	25-Jun-2008	3.37	5,150.86	25-Jul-2013	5.99	1,904.01
23-May-02	1787	1,608.16	26-Jun-2008	3.43	5,161.34	26-Jul-2013	5.99	1,918.06
24-May-02	1788	1,609.16	27-Jun-2008	3.52	5,170.25	29-Jul-2013	5.99	1,921.06
25-May-02	1789	1,610.16	28-Jun-2008	3.56	5,190.22	30-Jul-2013	6.00	1,931.22
26-May-02	1790	1,611.16	29-Jun-2008	3.85	5,205.40	31-Jul-2013	6.00	1,936.29
27-May-02	1791	1,612.16	30-Jun-2008	3.87	5,210.56	1-Aug-2013	6.00	1,942.20
28-May-02	1792	1,613.16	1-Jul-2008	3.87	5,098.92	2-Aug-2013	6.00	1,944.92
29-May-02	1793	1,614.16	2-Jul-2008	4.00	5,232.48	5-Aug-2013	6.00	1,953.29
30-May-02	1794	1,615.16	3-Jul-2008	4.03	5,230.49	6-Aug-2013	6.00	1,959.84
31-May-02	1795	1,616.16	4-Jul-2008	4.03	5,240.55	7-Aug-2013	6.00	1,965.55
01-Jun-02	1796	1,617.16	5-Jul-2008	4.03	5,255.14	9-Aug-2013	6.00	1,975.39
02-Jun-02	1797	1,618.16	6-Jul-2008	4.03	5,296.90	12-Aug-2013	6.00	1,975.38
03-Jun-02	1798	1,619.16	7-Jul-2008	4.03	5,327.27	13-Aug-2013	6.00	1,973.07
04-Jun-02	1799	1,620.16	8-Jul-2008	4.10	5,345.77	14-Aug-2013	6.00	1,974.28
05-Jun-02	1800	1,621.16	9-Jul-2008	4.10	5,499.72	15-Aug-2013	6.00	1,969.22
06-Jun-02	1801	1,622.16	10-Jul-2008	4.10	5,622.18	16-Aug-2013	6.00	1,972.10
07-Jun-02	1802	1,623.16	11-Jul-2008	4.10	5,900.41	19-Aug-2013	6.10	1,970.74
08-Jun-02	1803	1,624.16	12-Jul-2008	4.10	6,170.33	20-Aug-2013	6.10	1,970.67
09-Jun-02	1804	1,625.16	13-Jul-2008	4.10	6,443.11	21-Aug-2013	6.11	1,973.30
10-Jun-02	1805	1,626.16	14-Jul-2008	4.10	6,469.64	22-Aug-2013	6.11	1,973.19
11-Jun-02	1806	1,627.16	15-Jul-2008	4.15	6,476.74	23-Aug-2013	6.15	1,976.33
12-Jun-02	1807	1,628.16	16-Jul-2008	4.15	6,481.89	26-Aug-2013	6.15	1,976.90
13-Jun-02	1808	1,629.16	17-Jul-2008	4.15	6,481.07	27-Aug-2013	6.15	1,980.75
14-Jun-02	1809	1,630.16	18-Jul-2008	4.15	6,489.54	28-Aug-2013	6.15	1,981.32
15-Jun-02	1810	1,631.16	19-Jul-2008	4.15	6,491.40	29-Aug-2013	6.15	1,987.69

16-Jun-02	1811	1,632.16	20-Jul-2008	4.30	6,502.98	30-Aug-2013	6.15	1,989.55
17-Jun-02	1812	1,633.16	21-Jul-2008	4.30	6,485.36	2-Sep-2013	6.15	1,982.12
18-Jun-02	1813	1,634.16	22-Jul-2008	4.30	6,477.70	3-Sep-2013	6.15	1,981.79
19-Jun-02	1814	1,635.16	23-Jul-2008	4.30	6,464.28	4-Sep-2013	6.15	1,979.02
20-Jun-02	1815	1,636.16	24-Jul-2008	4.30	6,445.25	5-Sep-2013	6.15	1,982.40
21-Jun-02	1816	1,637.16	25-Jul-2008	4.30	6,441.83	6-Sep-2013	6.30	1,989.97
22-Jun-02	1817	1,638.16	26-Jul-2008	4.30	6,432.14	9-Sep-2013	6.30	1,988.65
23-Jun-02	1818	1,639.16	27-Jul-2008	4.30	6,429.45	10-Sep-2013	6.30	1,986.51
24-Jun-02	1819	1,640.16	28-Jul-2008	4.30	6,427.61	11-Sep-2013	6.34	1,990.57
25-Jun-02	1820	1,641.16	29-Jul-2008	4.30	6,431.25	12-Sep-2013	6.35	2,018.68
26-Jun-02	1821	1,642.16	30-Jul-2008	4.30	6,411.88	13-Sep-2013	6.35	2,012.38
27-Jun-02	1822	1,643.16	31-Jul-2008	4.30	6,291.94	16-Sep-2013	6.36	2,011.55
28-Jun-02	1823	1,644.16	1-Aug-2008	4.30	6,292.14	17-Sep-2013	6.36	2,004.75
29-Jun-02	1824	1,645.16	2-Aug-2008	4.30	6,151.63	18-Sep-2013	6.36	2,006.01
30-Jun-02	1825	1,646.16	3-Aug-2008	4.32	6,131.70	19-Sep-2013	6.36	2,007.15
01-Jul-02	1826	1,647.16	4-Aug-2008	4.32	6,122.65	20-Sep-2013	6.36	2,006.75
02-Jul-02	1827	1,648.16	5-Aug-2008	4.32	6,156.72	24-Sep-2013	6.37	2,014.83
03-Jul-02	1828	1,649.16	6-Aug-2008	4.50	6,172.77	25-Sep-2013	6.37	2,012.65
04-Jul-02	1829	1,650.16	7-Aug-2008	4.50	6,176.74	26-Sep-2013	6.37	2,014.53
05-Jul-02	1830	1,651.16	8-Aug-2008	4.50	6,184.57	27-Sep-2013	6.37	2,020.26
06-Jul-02	1831	1,652.16	9-Aug-2008	4.50	6,174.13	30-Sep-2013	6.37	2,030.96
07-Jul-02	1832	1,653.16	10-Aug-2008	4.50	6,181.96	1-Oct-2013	6.37	2,024.19
08-Jul-02	1833	1,654.16	11-Aug-2008	4.50	6,181.96	2-Oct-2013	6.37	2,024.67
09-Jul-02	1834	1,655.16	12-Aug-2008	4.50	6,078.73	3-Oct-2013	6.37	2,015.77
10-Jul-02	1835	1,656.16	13-Aug-2008	4.50	6,086.45	4-Oct-2013	6.37	2,013.35
11-Jul-02	1836	1,657.16	14-Aug-2008	4.53	6,070.03	7-Oct-2013	6.37	2,020.07
12-Jul-02	1837	1,658.16	15-Aug-2008	4.53	6,057.93	8-Oct-2013	6.38	2,045.36
13-Jul-02	1838	1,659.16	16-Aug-2008	4.56	6,036.48	9-Oct-2013	6.50	2,050.82
14-Jul-02	1839	1,660.16	17-Aug-2008	4.55	6,025.60	10-Oct-2013	6.50	2,052.68
15-Jul-02	1840	1,661.16	18-Aug-2008	4.57	5,906.22	11-Oct-2013	6.50	2,056.27
16-Jul-02	1841	1,662.16	19-Aug-2008	4.58	5,652.91	14-Oct-2013	6.50	2,058.54
17-Jul-02	1842	1,663.16	20-Aug-2008	4.58	5,654.55	16-Oct-2013	6.50	2,084.16
18-Jul-02	1843	1,664.16	21-Aug-2008	4.60	5,505.77	17-Oct-2013	6.50	2,085.74
19-Jul-02	1844	1,665.16	22-Aug-2008	4.61	5,500.20	18-Oct-2013	6.60	2,088.92
20-Jul-02	1845	1,666.16	23-Aug-2008	4.61	5,378.72	21-Oct-2013	6.60	2,094.36
21-Jul-02	1846	1,667.16	24-Aug-2008	4.61	5,378.72	22-Oct-2013	6.60	2,090.06
22-Jul-02	1847	1,668.16	25-Aug-2008	4.61	5,408.65	23-Oct-2013	6.60	2,087.33
23-Jul-02	1848	1,669.16	26-Aug-2008	4.61	5,528.57	24-Oct-2013	6.67	2,104.51
24-Jul-02	1849	1,670.16	27-Aug-2008	4.61	5,408.65	25-Oct-2013	6.67	2,094.70
25-Jul-02	1850	1,671.16	28-Aug-2008	4.61	5,397.02	28-Oct-2013	6.68	2,094.37
26-Jul-02	1851	1,672.16	29-Aug-2008	4.61	5,394.76	29-Oct-2013	6.67	2,095.28
27-Jul-02	1852	1,673.16	30-Aug-2008	4.70	5,397.20	30-Oct-2013	6.68	2,093.49
28-Jul-02	1853	1,674.16	31-Aug-2008	4.70	5,394.12	31-Oct-2013	6.68	2,099.88
29-Jul-02	1854	1,675.16	1-Sep-2008	4.70	5,388.34	1-Nov-2013	6.68	2,120.18
30-Jul-02	1855	1,676.16	2-Sep-2008	4.70	5,387.60	2-Nov-2013	6.68	2,120.18
31-Jul-02	1856	1,677.16	3-Sep-2008	4.70	5,387.60	3-Nov-2013	6.68	2,120.18
01-Aug-02	1857	1,678.16	4-Sep-2008	4.70	5,408.49	4-Nov-2013	6.68	2,127.52
02-Aug-02	1858	1,679.16	5-Sep-2008	4.70	5,404.37	5-Nov-2013	6.63	2,135.51
03-Aug-02	1859	1,680.16	6-Sep-2008	4.71	5,403.67	6-Nov-2013	6.63	2,132.40
04-Aug-02	1860	1,681.16	7-Sep-2008	4.71	5,399.41	7-Nov-2013	6.63	2,131.59

05-Aug-02	1861	1,682.16	8-Sep-2008	4.71	5,399.41	8-Nov-2013	6.63	2,126.58
06-Aug-02	1862	1,683.16	9-Sep-2008	4.71	5,399.41	11-Nov-2013	6.63	2,129.72
07-Aug-02	1863	1,684.16	10-Sep-2008	4.71	5,400.81	12-Nov-2013	6.63	2,126.93
08-Aug-02	1864	1,685.16	11-Sep-2008	4.72	5,398.82	13-Nov-2013	6.63	2,131.74
09-Aug-02	1865	1,686.16	12-Sep-2008	4.72	5,386.48	14-Nov-2013	6.63	2,132.10
10-Aug-02	1866	1,687.16	13-Sep-2008	4.72	5,383.52	15-Nov-2013	6.62	2,127.79
11-Aug-02	1867	1,688.16	14-Sep-2008	4.72	5,377.85	18-Nov-2013	6.60	2,118.94
12-Aug-02	1868	1,689.16	15-Sep-2008	4.72	5,377.85	19-Nov-2013	6.60	2,117.49
13-Aug-02	1869	1,690.16	16-Sep-2008	4.73	5,378.13	20-Nov-2013	6.60	2,121.52
14-Aug-02	1870	1,691.16	17-Sep-2008	4.80	5,361.83	21-Nov-2013	6.60	2,121.52
15-Aug-02	1871	1,692.16	18-Sep-2008	5.00	5,364.38	22-Nov-2013	6.60	2,121.52
16-Aug-02	1872	1,693.16	19-Sep-2008	5.00	5,364.38	25-Nov-2013	6.60	2,132.01
17-Aug-02	1873	1,694.16	20-Sep-2008	5.00	5,244.46	26-Nov-2013	6.60	2,126.40
18-Aug-02	1874	1,695.16	21-Sep-2008	5.00	5,237.28	27-Nov-2013	6.60	2,123.67
19-Aug-02	1875	1,696.16	22-Sep-2008	5.00	5,342.64	28-Nov-2013	6.60	2,125.36
20-Aug-02	1876	1,697.16	23-Sep-2008	5.00	5,342.64	29-Nov-2013	6.60	2,125.36
21-Aug-02	1877	1,698.16	24-Sep-2008	5.00	5,340.21	2-Dec-2013	6.60	2,123.68
22-Aug-02	1878	1,699.16	25-Sep-2008	5.55	5,353.61	3-Dec-2013	6.60	2,123.47
23-Aug-02	1879	1,700.16	26-Sep-2008	5.55	5,328.87	4-Dec-2013	6.60	2,124.36
24-Aug-02	1880	1,701.16	27-Sep-2008	5.55	5,446.28	5-Dec-2013	6.60	2,124.36
25-Aug-02	1881	1,702.16	28-Sep-2008	5.55	5,436.80	9-Dec-2013	6.60	2,125.71
26-Aug-02	1882	1,703.16	29-Sep-2008	5.55	5,438.00	10-Dec-2013	6.60	2,125.71
27-Aug-02	1883	1,704.16	30-Sep-2008	5.55	5,440.21	11-Dec-2013	6.60	2,126.01
28-Aug-02	1884	1,705.16	1-Oct-2008	5.55	5,445.79	12-Dec-2013	6.60	2,125.80
29-Aug-02	1885	1,706.16	2-Oct-2008	5.55	5,572.34	13-Dec-2013	6.60	2,130.87
30-Aug-02	1886	1,707.16	3-Oct-2008	5.55	5,569.74	16-Dec-2013	6.60	2,130.87
31-Aug-02	1887	1,708.16	4-Oct-2008	5.55	5,569.74	17-Dec-2013	6.60	2,134.77
01-Sep-02	1888	1,709.16	5-Oct-2008	5.55	5,572.34	18-Dec-2013	6.60	2,134.79
02-Sep-02	1889	1,710.16	6-Oct-2008	5.75	5,578.52	19-Dec-2013	6.60	2,135.18
03-Sep-02	1890	1,711.16	7-Oct-2008	5.75	5,578.52	20-Dec-2013	6.60	2,146.91
04-Sep-02	1891	1,712.16	8-Oct-2008	5.75	5,572.41	23-Dec-2013	6.60	2,138.25
05-Sep-02	1892	1,713.16	9-Oct-2008	5.75	5,572.41	24-Dec-2013	6.60	2,146.02
06-Sep-02	1893	1,714.16	10-Oct-2008	5.75	5,575.00	27-Dec-2013	6.60	2,142.79
07-Sep-02	1894	1,715.16	11-Oct-2008	5.75	5,465.35	30-Dec-2013	6.60	2,143.14
08-Sep-02	1895	1,716.16	12-Oct-2008	5.75	5,473.46	31-Dec-2013	6.60	2,145.20
09-Sep-02	1896	1,717.16	13-Oct-2008	5.75	5,467.34			
10-Sep-02	1897	1,718.16	14-Oct-2008	5.75	5,467.09			
11-Sep-02	1898	1,719.16	15-Oct-2008	5.75	5,467.09			