การกำหนดค่าอ้างอิงในโมเดลของ Black และ Litterman: การศึกษาในประเทศไทย

นางสาวอินทิพร ปภังกร

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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SETTING BLACK-LITTERMAN REFERENCE POINT EMPIRICAL EVIDENCE FROM THAILAND

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อินทิพร ปภังกร : การกำหนดค่าอ้างอิงในโมเดลของ Black และ Litterman: การศึกษาในประเทศไทย (SETTING BLACK-LITTERMAN REFERENCE POINT EMPIRICAL EVIDENCE FROM THAILAND) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: รศ.ดร. สันติ ถิรพัฒน์, 47 หน้า.

วิทยานิพนธ์นี้วิจัยเรื่องการกำหนดค่าอ้างอิงในโมเดลของ Black และ Litterman จากผลวิจัยพบว่า โดยเฉลี่ยแล้วการกำหนดค่าอ้างอิงโดยใช้ตัวแปร SMB และ HML ซึ่งเป็นตัวแปรที่อ้างอิงมาจากโมเดลของ Fama และ French สามารถอธิบายผลตอบแทนของหลักทรัพย์ได้ดีกว่าเมื่อเทียบกับการกำหนดค่าอ้างอิงโดยใช้ตัวแปรจากผลตอบแทนของตลาด ซึ่งเป็นวิธีการดั้งเดิมที่ใช้ในโมเดลของ Black และ Litterman

แต่อย่างไรก็ตามการกำหนดค่าอ้างอิงด้วยอัตราตอบแทนเงินปันผลต่อหุ้นและกำไรต่อหุ้นไม่สามารถอธิบายผลตอบแทนของหลักทรัพย์ได้อย่างมีนัยสำคัญ

ศูนย์วิทยทรัพยากร
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This paper establishes empirical evidence on in which method between setting market view based on single-factor model as in the Black-Litterman traditional paper or setting market view based on multi-factor model should be used. The results are as followings:

In general, the results show that the multi-factor model using SMB and HML factor derived based on Black-Litterman model extension of Krishnan and Mains (2005) can capture more information of stock excess return than that of the traditional model which leads to less volatility in predicted return and less portfolio weight change from time to time.

However, the multi-factor model of dividend-price ratio and earnings-price ratio can not be considered as an improvement of Black-Litterman traditional model because the predicted return derived from the model is much volatile. This leads to a significantly shift in portfolio weight which violates Black and Litterman's initial intention to reduce portfolio weight shift in each period.

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CHAPTER I

INTRODUCTION

1.1 Background and Problem Review

Black and Litterman provide a key breakthrough in estimation of stock return. Stock return derived from the model is weighted average of market view and investor point of views. Market view acts like a central of gravity or reference point. The more reasonable that point, the better of the estimators.

In the Black- Litterman traditional paper (1992), market view is the production of risk aversion coefficient multiplied by market capitalization weights and covariance of asset returns. Market view is calculated based on assumption of CAPM (single-factor model).

Setting market view based on CAPM is impractical in two major aspects, first, the risk aversion is abstract and hard to specify. Second, CAPM has been rejected in many literatures both its underlying assumptions and ability to price asset returns using single-factor. Thus, it is reasonable to believe that stock return predicted by Black-Litterman model is impractical.

This paper proposes a method in setting Black-Litterman market view by the used of multi-factor model listed as following:

(1) The multi-factor of dividend-price ratio and earnings-price ratio. Financial variables of dividend-price ratio and earnings-price ratio are used in this study because of the belief that stock price often fail to immediately reflect publicly available information or its own fundamental value. However, in the long run, stock price will reflect its own value. Thus, if we incorporate company fundamental

variables in predicting stock return, the problem of estimation error should be reduced.

Financial variables used in this study as mentioned are dividend-price ratio and earnings-price ratio which have been proved in many literatures the power in predicting stock return. In order to set new market view, financial variables are regressed against stock return as the work of Champbell and shiller (1988) and that regression model will be used as a prediction model for market view.

(2) The Black-Litterman extension model developed by Krishnan and Mains (2005) which allow the incorporation of additional uncorrelated market factor. In this paper, I focus on the three-factor model of Fama and French.

1.2 Objective of the Study

This study is aimed to evaluate the impact of different methodologies used to set Black-Litterman market view to portfolio weight and portfolio return.

1.3 Scope of the Study

The sample includes companies listed on the SET100 at the period of 1997-2007. This study divides the data into two periods. The first period is from 1997-2004 to be the in sample for regression model estimation. The second period is from 2005-2007 to be out-of the sample period used to find portfolio allocation and to measure portfolio performance

1.4 Statement of Problem/ Research Question

Black-Litterman model was developed as a method in estimation of stock return. From the model, stock return is a weighted average of market view and

investor view. Market view is derived from CAPM assumption which has been violated in many literatures. Therefore, Black-Litterman predicted return is still unintuitive.

This paper is aimed to evaluate different methodologies in setting market view, and to determine which of the methodology should be used.

1.5 Contribution

This study proposes a method in setting Black-Litterman market view by using multi-factor model and provides empirical evidence showing the impact of different methodologies used in setting Black-Litterman market view.

1.6 Organization of the Study

The remaining of this paper is organized as following. Chapter 2 reviews the theoretical background of the study and the previous relevant studies of Black-Litterman model and prediction of stock return. Chapter 3 describes the data source and research methodology. It describes the process of stock return prediction, portfolio allocation, and portfolio performance measurement. Chapter 4 shows the results of regression analysis and portfolio performance. Finally, chapter 5 provides a summary and recommendations for the future research.

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CHAPTER II

LITERATURE REVIEW

2.1 Concept and Theoretical Background

2.2.1 Black-Litterman Model

Black-Litterman model (1992) was developed to predict stock return. Stock return derived from the model is a weighted average of market view and investor view as the following model:

$$\hat{\mu} = \Pi + \tau\Sigma P'(\Omega + \tau P\Sigma P')^{-1}(Q - P\Pi)$$

Where

$\hat{\mu}$	Prediction of stock return
Π	Market view
τ	Constant represents market certainty
Σ	Covariance matrix of asset return
P	Matrix represents weight given to each view
ω	Level confidence assigned to view
Ω	Diagonal covariance matrix consists of $\omega_1^2,...,\omega_k^2$ represents the uncertainty in each view
Q	Vector that represents expected returns in each view

In the traditional Black-Litterman model market view (Π) is derived from CAPM assumption that all investors have same view and same risk aversion, then their demand for the risky assets should exactly be equal to the outstanding supply. Thus, when market is in equilibrium, representative investors would hold some proportion of the capitalization weights which leads to the following model:

$$\Pi = \delta \Sigma w$$

Where δ represents risk aversion coefficient which characterizes the expected risk-return tradeoff. It is the rate that an investor will forego expected return for less variance.

Market certainty (τ) determines weight given to market view, this value can be ranged from 0 to 1. If market certainty is set as 1, it means that investor has a strong belief in market return.

Investors often have specific views about the stock return, which is different from the market view. Black and Litterman allow such view to be incorporated in their model. The model allows investor to express both absolute and relative views.

For example,

View1: Asset 1 will have absolute return of x% (absolute view)

View2: Asset 1 will outperform asset 2 by y%" (relative view)

Matrix P represents weight given to each of investor view. The weights of each view are proportional to 1.The outperforming asset will be set as positive value and the underperforming asset will be set as a negative value.

Once matrix P is defined, one can calculate the variance of each individual view portfolio. The variance of an individual view portfolio is $p_k \Sigma p_k'$ where p_k is a single 1*N row vector from matrix P.

Diagonal matrix Ω represents the levels of confidence assigned to investor view, He and Litterman (1999) defined that the ratio of ω / τ is equal to the variance of the view portfolio ($p_k \Sigma p_k'$). By the use of He and Litterman methodology, variable τ can be easily cut off from the model.

For the numerical example of 8 assets (N=8) and investor view mentioned above, Black-Litterman model inputs can be set as following:

General Case:

$$P = \begin{bmatrix} p_{1,1} & \cdots & p_{1,n} \\ \vdots & \ddots & \vdots \\ p_{v,1} & \cdots & p_{v,n} \end{bmatrix}_{V*N}$$

$$Q = \begin{bmatrix} Q_1 \\ \vdots \\ Q_v \end{bmatrix}_{V*1}$$

$$\Omega = \begin{bmatrix} (p_1 \Sigma p_1')\tau & 0 & 0 \\ 0 & \ddots & 0 \\ 0 & 0 & (p_v \Sigma p_v')\tau \end{bmatrix}_{V*V}$$

Numerical Example:

$$P = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}_{2*8}$$

$$Q = \begin{bmatrix} X\% \\ Y\% \end{bmatrix}_{2*1}$$

Where N represents the number of assets and V represents the number of investor view.

The first row of Matrix P represents view 1(the absolute view) which involves only one asset corresponded with "1" in the first column of row1. In the case of relative view, view 2 is represented by row 2, the outperforming asset receives positive weight and the underperforming asset receives negative weight.

2.2.2 Stock Return Prediction

Several studies documented the predictability of stock returns by various financial forecasting variables and macroeconomic fundamentals. Empirical work in this field often relied on regression model in which stock return is regressed on these variables and t-statistic or F-statistic are used to interpret the predictability of stock return.

Stock return can be forecasted by financial and economic data by the following regression model:

$$\rho_{T+1} = \beta_i X_{T,i} + \varepsilon_{T+1,i}$$

Where ρ_T is stock return at time T, $X_{T,i}$ represents financial or economic data chosen by investor to predict stock return. The choice of $X_{T,i}$ to be used in the model can be based on statistical model selection criteria such as R^2.

2.2.3 Optimal Portfolio Allocation

According to Markowitz (1952), inputs used to create optimal portfolios are expected return of the assets, variance of the assets, and covariance between all of the assets. Markowitz does not state exactly how these parameters should be estimated, traditionally, the sample mean and covariance matrix have been used for this purpose.

To derive the set of attainable portfolios, several methodologies can be done:

(1) To minimize portfolio variance at a given level of expected return.

(2) To maximize portfolio expected return at a given value of risk

(3) To maximize utility function of $w'\mu - \delta / 2w'\Sigma w$ .By solving the maximization problem above we generate the formula for Markowitz optimization portfolio:

$$w^* = (\delta\Sigma)^{-1}\mu$$

(4) To maximize Sharpe ratio $\mu w / \sqrt{w'\Sigma w}$

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Where

w: Portfolio weight

σ_p^2: Variance of the portfolio

μ: Expected return

Σ: Covariance matrix

δ: Risk aversion parameter

Another immediate problem is how to estimate covariance matrix used in the optimization model. When the number of stock N is large compared to the data collection period, the estimated covariance matrix is always singular which make the inverse of covariance matrix is impossible to find.

One way to solve this problem is to impose some structure in the estimator, the factor model such as Fama-French model or Carhart model can be used as the following equation:

$$\Sigma = BCB' + D$$

Where B is the matrix of factor loading of the stocks, C is covariance matrix of the factors, and D is the diagonal matrix containing residual return variances.

2.2.4 Portfolio Performance Measurement

Portfolio performance can be measured against market performance using Jensen's alpha. To calculate Jensen's alpha, the following regression model need to be estimated:

$$R_{i,t} = \alpha_i + \beta_i(R_{m,t}) + e_{it}$$

Where $R_{i,t}$ represents return of portfolio i at time t, $R_{m,t}$ is the market return in the same period and alpha measures the degree to which portfolio can earn significant

return after accounting for market risk. If the portfolio is earning a fair return for the given period, then alpha would be zero. If alpha is more than zero, then the portfolio beats the market.

2.2 Empirical Study in Stock Return Prediction

Despite the appealing feature of Black-Litterman model to incorporate investor views with market view, in practical, market view derived from CAPM model is impractical in two major aspects, first, risk aversion used in the model is abstract and hard to specify. Second, CAPM considers only a single factor for the volatility of stock returns. One especially challenge to the efficiency of CAPM is the set of results suggesting that it is possible to use the knowledge of certain firm or security characteristics to forecast security returns and develop profitable trading strategies.

Fama and French (1992) found that value stocks tend to produce larger returns than growth stocks. Pesaran and Timmermann (1995) examined the evidence on predictability of U.S. stock return based on regression model with different model selection criteria such as R^2 or directional accuracy in forecasting asset return. In general, their findings confirm the results of stock return prediction related to financial ratios and economic variables.

Lam (2002) observed that beta was not capable of explaining the average stock returns in Hong Kong Stock Exchange. However, it seems that the three variables including the size and book-to-market ratio can explain the cross-sectional changes in the stock return. Lewllen (2004) performed another study on the companies listed in New York Stock Exchange. He obtained some evidences that dividend yield has ability in predicting stock returns. According to CAPM the prediction power of other variables and returns differentials should not occur, which

in turn lead to conclusion that there is something wrong with the way the single-factor model measures risk.

In the empirical work of Campbell and Shiller (1988), they regressed stock return on financial variables which are dividend price-ratio, earnings- price ratio. By using the data of Standard and poor Composite Index from 1871 to 1987, their model indicated the forecasting power of these variables.

2.3 Extension of the Black-Litterman model

Krishnan and Mains (2005) developed an extension of the Black-Litterman model which allows us to incorporate additional factor in setting market view.

They start from adding a new factor to the standard quadratic utility function

$$U = w^T \Pi - \left(\frac{\delta_0}{2}\right) w^T \Sigma w - \sum_{j=1}^{n} \delta_j w^T \beta_j$$

After taking the first derivative with respect to weight, we got a new market view of

$$\Pi = \delta_0 \Sigma w + \sum_{j-1}^{n} \delta_j \beta_j$$

Where

U is the investor utility function

w is the vector of weights invested in each asset

Π is the vector of equilibrium excess returns of each asset

Σ is the covariance matrix

δ_0 is the risk aversion parameter of the market

δ_j is the risk aversion parameter for the j additional factor

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β_j is the vector of exposures to the j additional factor

Given the market has no exposure to the factor $w_M \beta_j = 0$, then we can find a weight vector, w_j by perform a least squares fit of $\| f_j - w_j^T \Pi \|$ where f_j is a return from factor j. We can solve for the various values of δ by

$$w_M \Pi = \delta_M w_M^T \Sigma w_M + \sum_{j=1}^{n} \delta_j w_M^T \beta_j$$

By the assumption of market has no exposure to the factor $w_M \beta_j = 0$ and $w_0 \Pi = r_M$ so,

$$\delta_0 = \frac{r_M}{(w_0^T \Sigma w_0)}$$

For any j, we can solve for δ_j by multiply the new market view by w_j

$$w_j \Pi = \delta_M w_j^T \Sigma w_j + \sum_{j=1}^{n} \delta_j w_j^T \beta_j$$

Because of the assumption that all the factors must be independent $w_i \beta_j = 0$, we can solve for each δ_j

$$\delta_j = \frac{(r_j - \delta_0 w_j^T \Sigma w_j)}{(w_j^T \beta_j)}$$

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CHAPTER III

METHODOLOGY

3.1 Sample

The data used for this study are quarterly announced financial statement data and stock price. Data source is DATASTREAM. The sample includes 49 companies listed on the SET100 at the period of 1997-2007.

This study divides the data into two periods. The first period is from 1997-2004 to be in sample for estimation period. The second period is from 2005-2007 to be out-of the sample period.

For the in-sample period, all the financial variables will be calculated and regressed against stock excess return in order to estimate coefficients of the individual stock.

The second period is from 2005 to 2007 to be the out-of sample period used to find predicted return, to allocate portfolio and to measure portfolio return. The beginning of January 2005 is considered period t_1 for the first allocation process.

For example, at the beginning of January 2005, portfolio allocation will be calculated using the data at the beginning of that month. The performance of portfolio will be measured on monthly basis until the next portfolio allocation process at the beginning of January 2006 (t_2).

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3.2 Research Hypothesis

The hypothesis is motivated by the evidence in finance literature that the single-factor model is unintuitive to explain stock return. Thus, if we incorporate other factor into the model and use the model to set Black-Litterman market view, we

will have more practical market view which can benefit portfolio return. This study is, therefore, has the following hypothesis.

Hypothesis: Black-Litterman model that sets market view based on multi-factor model will be able to capture more information on stock excess return than that of the traditional model which uses single-factor model to set market view.

3.3 Methodology

3.3.1 Estimation of Asset Return

Step1: Set market view

This study is aimed to compare in which method between setting market view based on single-factor model and setting market view based on multi-factor model can capture more information in stock excess return. Thus, I begin by setting market view based on the alternate approaches.

First, as mentioned in previous chapter, the traditional market view is identified by:

$$\Pi_{sin\,gle} = \delta \Sigma w_M \qquad (1)$$

Where

$\Pi_{sin\,gle}$: Traditional Black-Litterman market view calculated based on single-factor model (CAPM) assumptions.

δ : Risk aversion coefficient

w_M : Market capitalization weight calculated from the stock price multiplied by the outstanding number of stock.

Second, the new market view is derived from the following regression model that regressed asset return against dividend-price ratio and earnings-price ratio as in the work of Campbell and Shiller (1988):

$$\Pi_{multi1} = a_i + b_i DP_i + b_i EP_i + \varepsilon_i \quad (2)$$

Where

Π_{multi1} : Black-Litterman market view set based on dividend-price ratio and earnings-price ratio

b_i : Coefficient of independent variables

Third, another new market view of multi-factor model is calculated based on the work of Krishnan and Mains (2005) via the following model:

$$\Pi_{multi2} = \delta \Sigma w_M + \delta_{SMB} SMB + \delta_{HML} HML \quad (3)$$

Where

Π_{multi1} : Black-Litterman market view set based on Fama and French three-factor model.

δ : Market risk aversion coefficient

δ_{SMB} : Risk aversion from SMB return

δ_{HML} : Risk aversion from HML return

SMB : Difference in return between a small cap portfolio and a large cap portfolio at time t

HML : Difference in return between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stock at time t

To construct three-factor model, stocks are sorted by size and book-to-market ratio respectively. The small firms (S) include the companies with capitalization below median; the big firms (B) include the companies with capitalization above median. Low book-to-market stocks (L) include the companies with 30% lowest of book-to-market ratio; high book-to-market stocks (H) include the companies with

30% highest of book-to-market ratio. SMB (Small minus Big) is the equal-weight average of the returns on the small stock portfolios minus the returns on the big stock portfolio:

$$SML = [(S/L - B/L) + (S/N - B/N) + (S/H + B/H)]/3 \quad (4)$$

HML (High minus Low) is the equal-weight average of the returns on the value stock portfolios minus the returns on the growth stock portfolio:

$$HML = [(S/H - S/L) + (B/H + B/L)]/2 \quad (5)$$

Step2: Identify investor view

At the beginning of each year from 2005-2007, investor view will be assigned to each of the Black-Litterman model. In order to prevent bias that could be happened from stock selected, investor view will be set as absolute views which include all of the 49 stocks.

Step3: Identify market certainty

As mentioned earlier, return derived from Black-Litterman model is the weighted average of market view and investor view. The possible value of market certainty (τ) is ranged from 0 to 1. If market certainty is set as 1 means that investor has a strong believe in market.

However, in this study, market certainty is set based on the work of He and Litterman (1999) defined that the ratio of ω/τ is equal to the variance of the view portfolio ($p_k \Sigma p_k'$).

Step4: Calculate Black-Litterman expected return

After all the input variables have been identified in step 1to 3, Black-Litterman return can be derived by the following formula:

$$\hat{\mu}_i = \Pi_i + \tau\Sigma P'(\Omega + \tau P\Sigma P')^{-1}(Q - P\Pi_i) \quad (6)$$

Where

$\hat{\mu}_i$ Estimation of asset return

($\hat{\mu}_{\text{sin gle}}$ = Black-Litterman return derived from CAPM and

$\hat{\mu}_{multi}$ = Black-Litterman return derived from multi-factor model)

Π Market view

τ Constant represents market certainty

Σ Covariance matrix of asset return

P Matrix represents investor view

ω Level confidence assigned to view

Ω Diagonal covariance matrix consists of $\omega_1^2,...,\omega_k^2$ representing the uncertainty in each view

Q Vector that represents expected returns in each view

Note that all other variables of the model are held constant in order to prevent bias that might occur, the only different aspect of each Black-Litterman model is market view derived form different methods as mentioned in step1

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3.3.2 Portfolio Construction

Portfolios will be allocated by minimizing portfolio variance by setting portfolio excess return as 10% and sum of portfolio weight is equal to 1.

Covariance used in this paper is calculate based on regression of market excess return against stock excess return and the beta coefficients and residual are used as input of the following model:

$$\Sigma = BCB' + D \tag{7}$$

Where B is the matrix of factor loading of the stocks, C is market variance, and D is the diagonal matrix containing residual return variances.

The initial portfolios will be constructed at the first of January 2005. After that, portfolios will be hold and reallocated again at January 2006 and 2007 respectively.

3.3.3 Portfolio Performance Measurement

Performance of the portfolios will be measured on monthly basis started at the end of February 2005. This study will measure portfolio performance as followings:

$$R_{i,t} = \alpha_i + \beta_i (R_{m,t}) + e_{it} \tag{8}$$

Where $R_{i,t}$ represents return of portfolio i at month t, $R_{m,t}$ is the market return in the same period and alpha measures the degree to which portfolio can earn significant returns after accounting for market risk. If the portfolio is earning a fair return for the given period, then alpha would be zero. If alpha is more than zero, then the portfolio beats the market.

3.3.4 Explanatory Power Measurement

In order to test the hypothesis of Black-Litterman model that set market view based on multi-factor model is able to capture more information on stock excess return than that of the traditional model which uses single-factor model to set market

view, the explanatory power to the actual stock excess return will be measured by running regression model that set stock excess return as independent variable and set market excess return as a dependent variable.

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CHAPTER IV

RESULTS

This chapter is contributed to the outcome of the model demonstrated in the previous chapter by comparing predicted return derived from different methodologies.

The sample includes company listed in SET100 from 1997 to 2007. All variables used in forming regression model were measured over the period of 1997 to 2004, and the data sources were as follows. Stock price was derived from SETSMART to compute stock return, all the financial statement data used in computing financial variables were taken from DATASTREAM.

This study is aimed to compare in which method between setting market view based on single-factor model and setting market view based on multi-factor model can capture more information in stock excess return. Thus, I begin by setting market view based on the alternate approaches.

4.1 Setting Market View Based on CAPM

In the Black- Litterman traditional paper (1992), market view is the production of risk aversion coefficient multiplied by market capitalization weights and covariance of asset returns which is calculated based on assumption of CAPM (single-factor model).

Covariance used in this paper is calculated based on regression of market excess return and stock excess return. Table 1 demonstrates correlation matrix derived from the mentioned covariance matrix.

Table 2 presents the predicted return derived from Black-Litterman traditional model where market risk-aversion is fixed as 2.5. We can see the predicted return of each asset is quite stable from time to time, which leads to a small shift in portfolio weight as shown in Table 3.

4.2 Setting Market View Based on Dividend-Price Ratio, Earnings-Price Ratio

Market view is derived from equation (2) which regresses asset return against dividend-price ratio and earnings-price ratio as in the work of Campbell and Shiller (1988).

Table 4 demonstrates a descriptive statistic for year 1997-2004 used to set market view. In order to set up the model, stock return is regressed against dividend-price ratio and earnings-price ratio during 1997 to 2004. All the financial variables are used with the same motivation that if stock is under priced relative to fundamental value, stock return tends to be high, and the converse holds if stocks are overpriced.

Table 5 presents regression resulted from the period 1997 to 2004.The table report R^2 statistic, and in parentheses the p-value of the hypothesis that all coefficients are zero. The table shows that from the two independent variables, only earnings-price ratio has ability to predict stock return with a positive correlation. The forecasting power of these variables is statistically significant due to p-value in parenthesis which rejects the null hypothesis that beta coefficient is equal to zero. The coefficient of 0.277 telling us that for every unit increase in earnings-price ratio, approximately a 0.277 unit increase in stock return is predicted, holding all other variables constant.

The model captures negative correlation between dividend-price ratio and stock return but the relationship is not statistically significant due to p-value of 0.316 which is exceeding the significant level of 95%.

The R^2 of 0.138 is relatively low which indicating that 13.8% of the variance in stock return can be predicted from the variables of dividend-price ratio and earnings-price ratio.

Table 6 demonstrates market return predicted from incorporating dividend-price ratio and earnings-price ratio directly into the traditional Black-Litterman model. We can see the predicted return has shift a lot from time to time, this leads to a significantly shift in portfolio weight as shown Table 7. The result violates Black and Litterman's initial intention to reduce portfolio weight shift in each period.

4.3 Setting Market View Based on SMB and HML

In this section, I set market view based on the work of Krishnan and Mains (2005) .Table 8-10 demonstrate the factor beta for each period. Factor beta is derived from running regression model as in Fama and French .The tables report R^2 statistic, and p-value of the hypothesis that all coefficients are zero. The tables show that both of the independent variables of SMB and HML have p-value less than 0.05 in most of the period and the R^2 is relatively high indicating that the additional factors of SMB and HML have ability in explaining stock excess return than that of the Black-Litterman single-factor model.

Table 11 presents market view where market risk aversion, risk aversion from SMB factor and risk aversion from HML factor is set as 2.5, 0.28 and 0.32 respectively. We can see the predicted return of each asset is stable from time to time which leads to a small shift in portfolio weight as shown in Table 12.

After that portfolio returns are measured in monthly basis as shown in table 12-15. In each period, the Black-Litterman portfolio that set market view based on multi-factor model can yield higher return than that of the traditional one, no matter

that investor view has been considered or not. In this paper, investor view has been set in two scenarios of incorrect view and correct view due to the stock excess return known in advance.

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CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In this thesis, I propose a method in setting Black-Litterman market view by the use of multi-factor model. This paper also establishes empirical evidence on in which method between setting market view based on single-factor model as in the traditional paper or setting market view based on multi-factor model should be used. The results are as followings:

In general, the results show that the multi-factor model using SMB and HML factor derived based on Black-Litterman model extension of Krishnan and Mains (2005) can capture more information of stock excess return than that of the traditional model which leads to less volatility in predicted return and less portfolio weight change from time to time.

However, the multi-factor model of dividend-price ratio and earnings-price ratio can not be considered as an improvement of Black-Litterman traditional model because the predicted return derived from the model is much volatile. This leads to a significantly shift in portfolio weight which violates Black and Litterman's initial intention to reduce portfolio weight shift in each period.

5.2 Limitation

The limitation of this study is related to incomplete data such as stock price and financial variables during the sample period, some of the firms are excluded for this reason.

Moreover, portfolio return could be dramatically effect by financial variables and sample period selected

5.3 Recommendation

This paper establishes empirical evidence on in which method between setting market view based on CAPM as in the traditional paper of Black-Litterman or setting market view based on multi-factor model should be used. However, there are other variables that should be considered in the future research which can affect predicted return.

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APPENDICES

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Table 1
Correlation between stock return calculated based on 1997-2004 data

	ACL	ADVANC	AP	ASL	ASP	BANPU	BAY	BBL	BCP	BGH
ACL	1.00									
ADVANC	0.45	1.00								
AP	0.16	0.14	1.00							
ASL	0.48	0.43	0.15	1.00						
ASP	0.47	0.43	0.15	0.45	1.00					
BANPU	0.51	0.47	0.17	0.49	0.48	1.00				
BAY	0.57	0.52	0.18	0.55	0.54	0.59	1.00			
BBL	0.56	0.51	0.18	0.54	0.53	0.58	0.64	1.00		
BCP	0.56	0.51	0.18	0.54	0.53	0.58	0.65	0.63	1.00	
BGH	0.19	0.17	0.06	0.18	0.17	0.19	0.21	0.21	0.21	1.00
BH	0.09	0.08	0.03	0.09	0.08	0.09	0.10	0.10	0.10	0.03
BLAND	0.45	0.40	0.14	0.43	0.42	0.46	0.51	0.50	0.50	0.17
CPF	0.34	0.31	0.11	0.33	0.32	0.36	0.40	0.39	0.39	0.13
ERAWAN	0.24	0.22	0.08	0.23	0.23	0.25	0.28	0.27	0.27	0.09
HANA	0.23	0.21	0.07	0.22	0.22	0.24	0.27	0.26	0.26	0.09
HEMRAJ	0.34	0.30	0.11	0.32	0.32	0.35	0.39	0.38	0.38	0.12
ITD	0.60	0.54	0.19	0.57	0.56	0.62	0.69	0.67	0.67	0.22
JAS	0.48	0.43	0.15	0.46	0.45	0.49	0.55	0.53	0.54	0.18
KBANK	0.62	0.56	0.20	0.59	0.58	0.64	0.71	0.69	0.70	0.23
KGI	0.56	0.51	0.18	0.54	0.53	0.58	0.65	0.63	0.63	0.21
KK	0.44	0.40	0.14	0.42	0.41	0.45	0.50	0.49	0.49	0.16
KTB	0.61	0.55	0.19	0.58	0.57	0.63	0.70	0.68	0.68	0.23
LANNA	0.49	0.44	0.16	0.47	0.46	0.50	0.56	0.55	0.55	0.18
LH	0.54	0.49	0.17	0.51	0.50	0.55	0.62	0.60	0.60	0.20
LOXLEY	0.49	0.44	0.16	0.47	0.46	0.51	0.56	0.55	0.55	0.18
LPN	0.20	0.18	0.06	0.19	0.19	0.21	0.23	0.23	0.23	0.08
MAKRO	0.37	0.34	0.12	0.35	0.35	0.38	0.43	0.42	0.42	0.14
MINOR	0.15	0.14	0.05	0.15	0.15	0.16	0.18	0.17	0.17	0.06
PSL	0.09	0.09	0.03	0.09	0.09	0.10	0.11	0.11	0.11	0.03
PTTEP	0.44	0.39	0.14	0.42	0.41	0.45	0.50	0.49	0.49	0.16
RCL	0.36	0.32	0.11	0.34	0.34	0.37	0.41	0.40	0.40	0.13
ROBINS	0.47	0.42	0.15	0.45	0.44	0.48	0.54	0.52	0.52	0.17
SAMART	0.28	0.26	0.09	0.27	0.27	0.29	0.32	0.32	0.32	0.10
SCB	0.60	0.55	0.19	0.58	0.57	0.63	0.70	0.68	0.68	0.22
SCCC	0.54	0.49	0.17	0.52	0.51	0.56	0.63	0.61	0.61	0.20
SCC	0.60	0.54	0.19	0.57	0.56	0.62	0.69	0.67	0.67	0.22
SPALI	0.51	0.46	0.16	0.49	0.48	0.53	0.59	0.57	0.57	0.19
SSI	0.52	0.48	0.17	0.50	0.49	0.54	0.60	0.59	0.59	0.20
STEC	0.35	0.31	0.11	0.33	0.33	0.36	0.40	0.39	0.39	0.13
TCAP	0.63	0.57	0.20	0.61	0.60	0.65	0.73	0.71	0.71	0.24
THAI	0.44	0.40	0.14	0.43	0.42	0.46	0.51	0.50	0.50	0.17
THCOM	0.48	0.44	0.16	0.46	0.46	0.50	0.56	0.54	0.55	0.18
TISCO	0.58	0.52	0.19	0.55	0.54	0.60	0.67	0.65	0.65	0.21
TMB	0.59	0.53	0.19	0.56	0.55	0.61	0.68	0.66	0.66	0.22
TPIPL	0.54	0.49	0.17	0.52	0.51	0.56	0.62	0.61	0.61	0.20
TRUE	0.61	0.55	0.20	0.59	0.57	0.63	0.70	0.69	0.69	0.23
TT&T	0.61	0.56	0.20	0.59	0.58	0.63	0.71	0.69	0.69	0.23
TUF	0.30	0.27	0.10	0.29	0.28	0.31	0.34	0.33	0.34	0.11
TVO	0.26	0.23	0.08	0.25	0.24	0.27	0.30	0.29	0.29	0.10

Table 1
Correlation between stock return calculated based on 1997-2004 data
(Continue)

	BH	BLAND	CPF	ERAWAN	HANA	HEMRAJ	ITD	JAS	KBANK	KGI
ACL										
ADVANC										
AP										
ASL										
ASP										
BANPU										
BAY										
BBL										
BCP										
BGH										
BH	1.00									
BLAND	0.08	1.00								
CPF	0.06	0.31	1.00							
ERAWAN	0.04	0.22	0.17	1.00						
HANA	0.04	0.21	0.16	0.11	1.00					
HEMRAJ	0.06	0.30	0.23	0.16	0.16	1.00				
ITD	0.11	0.53	0.41	0.29	0.28	0.40	1.00			
JAS	0.09	0.43	0.33	0.23	0.22	0.32	0.57	1.00		
KBANK	0.11	0.55	0.43	0.30	0.29	0.42	0.74	0.59	1.00	
KGI	0.10	0.50	0.39	0.27	0.26	0.38	0.67	0.54	0.70	1.00
KK	0.08	0.39	0.30	0.21	0.20	0.29	0.52	0.42	0.54	0.50
KTB	0.11	0.54	0.42	0.30	0.28	0.41	0.72	0.58	0.75	0.68
LANNA	0.09	0.44	0.34	0.24	0.22	0.33	0.58	0.46	0.60	0.55
LH	0.10	0.48	0.37	0.26	0.25	0.36	0.64	0.51	0.66	0.61
LOXLEY	0.09	0.44	0.34	0.24	0.23	0.33	0.59	0.47	0.61	0.55
LPN	0.04	0.18	0.14	0.10	0.09	0.14	0.24	0.19	0.25	0.23
MAKRO	0.07	0.33	0.26	0.18	0.17	0.25	0.44	0.35	0.46	0.42
MINOR	0.03	0.14	0.11	0.08	0.07	0.10	0.18	0.15	0.19	0.17
PSL	0.02	0.08	0.06	0.05	0.04	0.06	0.11	0.09	0.12	0.11
PTTEP	0.08	0.39	0.30	0.21	0.20	0.29	0.52	0.42	0.54	0.49
RCL	0.06	0.32	0.25	0.17	0.17	0.24	0.43	0.34	0.44	0.40
ROBINS	0.08	0.42	0.32	0.23	0.22	0.31	0.56	0.44	0.58	0.53
SAMART	0.05	0.25	0.19	0.14	0.13	0.19	0.34	0.27	0.35	0.32
SCB	0.11	0.54	0.42	0.30	0.28	0.41	0.72	0.58	0.75	0.68
SCCC	0.10	0.49	0.37	0.26	0.25	0.37	0.65	0.52	0.67	0.61
SCC	0.11	0.54	0.41	0.29	0.28	0.40	0.72	0.57	0.74	0.68
SPALI	0.09	0.46	0.35	0.25	0.24	0.34	0.61	0.49	0.63	0.58
SSI	0.09	0.47	0.36	0.26	0.24	0.35	0.63	0.50	0.65	0.59
STEC	0.06	0.31	0.24	0.17	0.16	0.23	0.41	0.33	0.43	0.39
TCAP	0.11	0.57	0.44	0.31	0.29	0.43	0.76	0.60	0.79	0.72
THAI	0.08	0.40	0.31	0.22	0.21	0.30	0.53	0.42	0.55	0.50
THCOM	0.09	0.43	0.33	0.24	0.22	0.33	0.58	0.46	0.60	0.55
TISCO	0.10	0.52	0.40	0.28	0.27	0.39	0.69	0.55	0.72	0.65
TMB	0.11	0.53	0.41	0.29	0.27	0.40	0.70	0.56	0.73	0.67
TPIPL	0.10	0.48	0.37	0.26	0.25	0.36	0.65	0.51	0.67	0.61
TRUE	0.11	0.55	0.42	0.30	0.28	0.41	0.73	0.58	0.76	0.69
TT&T	0.11	0.55	0.42	0.30	0.28	0.41	0.73	0.58	0.76	0.69
TUF	0.05	0.27	0.21	0.15	0.14	0.20	0.36	0.28	0.37	0.34
TVO	0.05	0.23	0.18	0.13	0.12	0.17	0.31	0.25	0.32	0.29

Table 1
Correlation between stock return calculated based on 1997-2004 data
(Continue)

	KK	KTB	LANNA	LH	LOXLEY	LPN	MAKRO	MINOR	PSL	PTTEP
ACL										
ADVANC										
AP										
ASL										
ASP										
BANPU										
BAY										
BBL										
BCP										
BGH										
BH										
BLAND										
CPF										
ERAWAN										
HANA										
HEMRAJ										
ITD										
JAS										
KBANK										
KGI										
KK	1.00									
KTB	0.53	1.00								
LANNA	0.43	0.59	1.00							
LH	0.47	0.65	0.52	1.00						
LOXLEY	0.43	0.59	0.48	0.53	1.00					
LPN	0.18	0.25	0.20	0.22	0.20	1.00				
MAKRO	0.33	0.45	0.36	0.40	0.36	0.15	1.00			
MINOR	0.14	0.19	0.15	0.17	0.15	0.06	0.11	1.00		
PSL	0.08	0.11	0.09	0.10	0.09	0.04	0.07	0.03	1.00	
PTTEP	0.38	0.53	0.43	0.47	0.43	0.18	0.32	0.14	0.08	1.00
RCL	0.31	0.44	0.35	0.39	0.35	0.15	0.27	0.11	0.07	0.31
ROBINS	0.41	0.57	0.45	0.50	0.46	0.19	0.35	0.14	0.09	0.41
SAMART	0.25	0.34	0.28	0.30	0.28	0.11	0.21	0.09	0.05	0.25
SCB	0.53	0.74	0.59	0.65	0.59	0.25	0.45	0.19	0.11	0.53
SCCC	0.48	0.66	0.53	0.58	0.53	0.22	0.40	0.17	0.10	0.47
SCC	0.53	0.73	0.58	0.64	0.59	0.24	0.44	0.19	0.11	0.52
SPALI	0.45	0.62	0.50	0.55	0.50	0.21	0.38	0.16	0.10	0.45
SSI	0.46	0.64	0.51	0.56	0.52	0.21	0.39	0.16	0.10	0.46
STEC	0.31	0.42	0.34	0.37	0.34	0.14	0.26	0.11	0.07	0.30
TCAP	0.56	0.77	0.62	0.68	0.62	0.26	0.47	0.20	0.12	0.55
THAI	0.39	0.54	0.43	0.48	0.44	0.18	0.33	0.14	0.08	0.39
THCOM	0.43	0.59	0.47	0.52	0.48	0.20	0.36	0.15	0.09	0.42
TISCO	0.51	0.70	0.56	0.62	0.57	0.24	0.43	0.18	0.11	0.50
TMB	0.52	0.72	0.58	0.63	0.58	0.24	0.44	0.18	0.11	0.51
TPIPL	0.47	0.66	0.53	0.58	0.53	0.22	0.40	0.17	0.10	0.47
TRUE	0.54	0.74	0.60	0.66	0.60	0.25	0.45	0.19	0.12	0.53
TT&T	0.54	0.74	0.60	0.66	0.60	0.25	0.46	0.19	0.12	0.54
TUF	0.26	0.36	0.29	0.32	0.29	0.12	0.22	0.09	0.06	0.26
TVO	0.23	0.31	0.25	0.28	0.25	0.11	0.19	0.08	0.05	0.23

Table 1
Correlation between stock return calculated based on 1997-2004 data
(Continue)

	RCL	ROBINS	SAMART	SCB	SCCC	SCC	SPALI	SSI	STEC	TCAP
ACL										
ADVANC										
AP										
ASL										
ASP										
BANPU										
BAY										
BBL										
BCP										
BGH										
BH										
BLAND										
CPF										
ERAWAN										
HANA										
HEMRAJ										
ITD										
JAS										
KBANK										
KGI										
KK										
KTB										
LANNA										
LH										
LOXLEY										
LPN										
MAKRO										
MINOR										
PSL										
PTTEP										
RCL	1.00									
ROBINS	0.33	1.00								
SAMART	0.20	0.26	1.00							
SCB	0.43	0.57	0.34	1.00						
SCCC	0.39	0.51	0.31	0.66	1.00					
SCC	0.43	0.56	0.34	0.73	0.65	1.00				
SPALI	0.37	0.48	0.29	0.62	0.56	0.61	1.00			
SSI	0.38	0.49	0.30	0.64	0.57	0.63	0.54	1.00		
STEC	0.25	0.32	0.20	0.42	0.38	0.42	0.35	0.37	1.00	
TCAP	0.46	0.59	0.36	0.77	0.69	0.76	0.65	0.67	0.44	1.00
THAI	0.32	0.41	0.25	0.54	0.48	0.53	0.45	0.47	0.31	0.56
THCOM	0.35	0.45	0.27	0.59	0.53	0.58	0.50	0.51	0.34	0.62
TISCO	0.42	0.54	0.33	0.70	0.63	0.69	0.59	0.61	0.40	0.73
TMB	0.42	0.55	0.33	0.72	0.64	0.71	0.60	0.62	0.41	0.75
TPIPL	0.39	0.50	0.30	0.66	0.59	0.65	0.55	0.57	0.38	0.69
TRUE	0.44	0.57	0.35	0.74	0.67	0.73	0.62	0.64	0.43	0.78
TT&T	0.44	0.57	0.35	0.74	0.67	0.74	0.63	0.65	0.43	0.78
TUF	0.21	0.28	0.17	0.36	0.32	0.36	0.30	0.31	0.21	0.38
TVO	0.19	0.24	0.15	0.31	0.28	0.31	0.27	0.27	0.18	0.33

Table 1
Correlation between stock return calculated based on 1997-2004 data
(Continue)

	THAI	THCOM	TISCO	TMB	TPIPL	TRUE	TT&T	TUF	TVO
ACL									
ADVANC									
AP									
ASL									
ASP									
BANPU									
BAY									
BBL									
BCP									
BGH									
BH									
BLAND									
CPF									
ERAWAN									
HANA									
HEMRAJ									
ITD									
JAS									
KBANK									
KGI									
KK									
KTB									
LANNA									
LH									
LOXLEY									
LPN									
MAKRO									
MINOR									
PSL									
PTTEP									
RCL									
ROBINS									
SAMART									
SCB									
SCCC									
SCC									
SPALI									
SSI									
STEC									
TCAP									
THAI	1.00								
THCOM	0.43	1.00							
TISCO	0.52	0.56	1.00						
TMB	0.53	0.57	0.68	1.00					
TPIPL	0.48	0.52	0.63	0.64	1.00				
TRUE	0.54	0.59	0.71	0.72	0.66	1.00			
TT&T	0.55	0.60	0.71	0.72	0.66	0.75	1.00		
TUF	0.27	0.29	0.35	0.35	0.32	0.36	0.37	1.00	
TVO	0.23	0.25	0.30	0.31	0.28	0.32	0.32	0.15	1.00

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Table 2
Traditional Black-Litterman Market View Comparison

Traditional Black-Litterman market view is identified by: $\Pi_{\sin gle} = \delta \Sigma w_M$ where market risk aversion is set as 2.5. Σ is covariance matrix and w_M is market capitalization weight measured at Jan 1st 2005, Jan 1st 2006 and Jan 1st 2007.

Stock	Jan05	Jan06	Jan07
ACL	0.0740	0.0734	0.0661
ADVANC	0.0426	0.0423	0.0379
AP	0.0407	0.0404	0.0365
ASL	0.0831	0.0824	0.0743
ASP	0.0693	0.0673	0.0606
BANPU	0.0633	0.0627	0.0569
BAY	0.0911	0.0905	0.0819
BBL	0.0614	0.0610	0.0558
BCP	0.0916	0.0909	0.0814
BGH	0.0159	0.0158	0.0143
BH	0.0732	0.0778	0.0740
BLAND	0.1802	0.1787	0.1615
CPF	0.0324	0.0322	0.0290
ERAWAN	0.0384	0.0380	0.0344
HANA	0.0223	0.0222	0.0200
HEMRAJ	0.0574	0.0569	0.0513
ITD	0.1123	0.1114	0.1004
JAS	0.0960	0.0953	0.0859
KBANK	0.0697	0.0698	0.0629
KGI	0.1396	0.1385	0.1249
KK	0.0828	0.0820	0.0740
KTB	0.0833	0.0829	0.0750
LANNA	0.0561	0.0557	0.0503
LH	0.0801	0.0794	0.0716
LOXLEY	0.0901	0.0894	0.0806
LPN	0.0432	0.0433	0.0411
MAKRO	0.0292	0.0292	0.0269
MINOR	0.0112	0.0112	0.0101
PSL	0.0122	0.0119	0.0108
PTTEP	0.0404	0.0365	0.0331
RCL	0.0379	0.0376	0.0339
ROBINS	0.0916	0.0911	0.0823
SAMART	0.0472	0.0469	0.0423
SCB	0.0924	0.0918	0.0831
SCCC	0.0739	0.0745	0.0666
SCC	0.0664	0.0659	0.0596
SPALI	0.1209	0.1200	0.1082
SSI	0.1016	0.1005	0.0907
STEC	0.0546	0.0542	0.0488
TCAP	0.1097	0.1088	0.0982
THAI	0.0454	0.0447	0.0408
THCOM	0.1078	0.1066	0.0953
TISCO	0.0952	0.0947	0.0852
TMB	0.0841	0.0834	0.0752
TPIPL	0.1050	0.1039	0.0932
TRUE	0.1036	0.1034	0.0923
TT&T	0.1098	0.1086	0.0978
TUF	0.0258	0.0260	0.0233
TVO	0.0250	0.0248	0.0224

Figure 1 **Traditional Black-Litterman Market View Comparison**

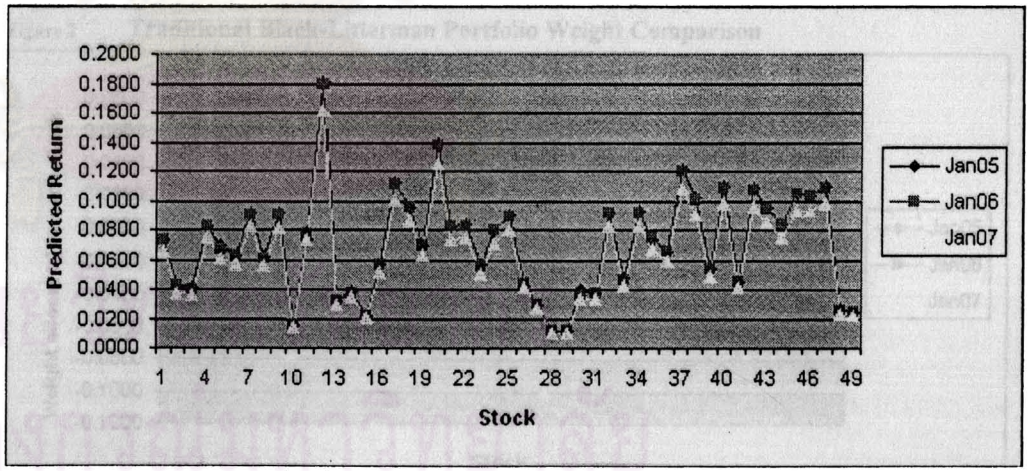

Table 3
Traditional Black-Litterman Portfolio Weight Comparison

This table demonstrates weight assigned to each asset during year 2005-2007. Portfolios are allocated based on minimizing portfolio variance by setting portfolio excess return=10%. Portfolios are allocated based on traditional Black-Litterman market view which is identified by: $\Pi_{\text{sin gle}} = \delta \Sigma w_M$ where market risk aversion is set as 2.5. Σ is covariance matrix and w_M is market capitalization weight measured at Jan 1st 2005, Jan 1st 2006 and Jan 1st 2007.

	Jan05	Jan06	Jan07
ACL	0.0324	0.0327	0.0366
ADVANC	0.0137	0.0135	0.0065
AP	0.0051	0.0051	0.0048
ASL	0.0318	0.0321	0.0366
ASP	0.0300	0.0291	0.0320
BANPU	0.0418	0.0421	0.0463
BAY	0.0399	0.0405	0.0470
BBL	0.0524	0.0532	0.0593
BCP	0.0430	0.0435	0.0496
BGH	-0.0541	-0.0550	-0.0777
BH	0.0010	0.0012	0.0015
BLAND	0.0151	0.0153	0.0184
CPF	0.0047	0.0046	-0.0038
ERAWAN	0.0031	0.0030	0.0008
HANA	-0.0147	-0.0151	-0.0275
HEMRAJ	0.0141	0.0142	0.0149
ITD	0.0370	0.0374	0.0439
JAS	0.0251	0.0253	0.0294
KBANK	0.0544	0.0560	0.0619
KGI	0.0307	0.0311	0.0368
KK	0.0248	0.0251	0.0286
KTB	0.0442	0.0449	0.0515
LANNA	0.0266	0.0269	0.0274
LH	0.0374	0.0377	0.0429
LOXLEY	0.0265	0.0268	0.0309
LPN	0.0055	0.0057	0.0062
MAKRO	-0.0244	-0.0242	-0.0402
MINOR	-0.0675	-0.0690	-0.1000
PSL	-0.0231	-0.0238	-0.0342
PTTEP	0.0197	0.0098	0.0006
RCL	0.0167	0.0168	0.0125
ROBINS	0.0231	0.0234	0.0272
SAMART	0.0061	0.0061	0.0050
SCB	0.0461	0.0467	0.0544
SCCC	0.0407	0.0422	0.0466
SCC	0.0501	0.0507	0.0558
SPALI	0.0266	0.0269	0.0318
SSI	0.0312	0.0315	0.0367
STEC	0.0141	0.0142	0.0143
TCAP	0.0463	0.0468	0.0548
THAI	0.0258	0.0249	0.0227
THCOM	0.0259	0.0260	0.0301
TISCO	0.0416	0.0423	0.0488
TMB	0.0417	0.0422	0.0482
TPIPL	0.0352	0.0355	0.0411
TRUE	0.0449	0.0459	0.0527
TT&T	0.0429	0.0433	0.0505
TUF	-0.0212	-0.0207	-0.0380
TVO	-0.0138	-0.0142	-0.0262

Figure 2 **Traditional Black-Litterman Portfolio Weight Comparison**

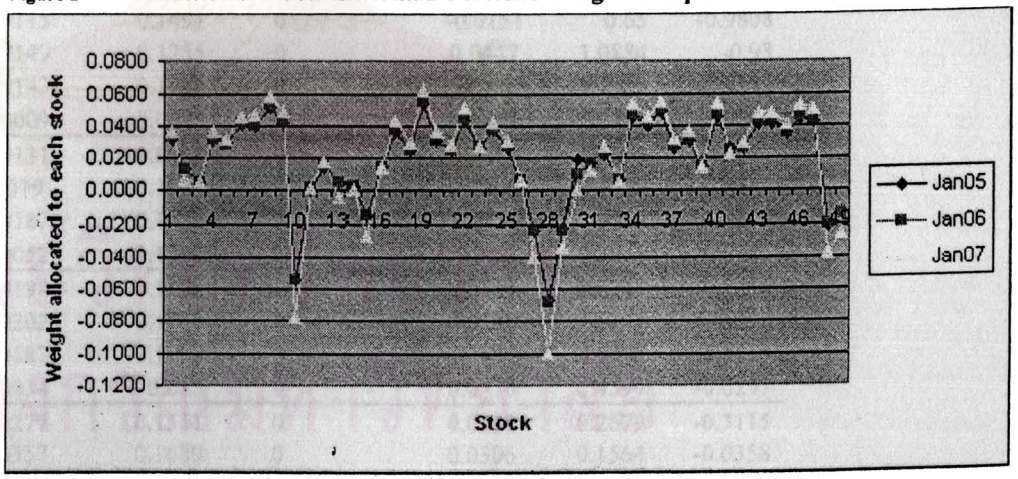

Table 4

Descriptive Statistic for Dividend-Price Ratio and Earnings-Price Ratio

This table demonstrates descriptive statistic of dividend-price ratio and earning-price ratio used to set Black-Litterman market view during 1997-2004.

		Dividend-Price Ratio			Earning-Price Ratio		
Year	Quarter	Average	Max	Min	Average	Max	Min
1997	1	0	0	0	-0.018	0.0827	-0.6756
1997	2	0	0	0	-0.4618	0.1395	-3.7741
1997	3	0	0	0	-2.7919	0.267	-40.63
1997	4	0	0	0	0.4165	5.2323	-2.4539
1998	1	0	0	0	-0.8718	5.6929	-6.9364
1998	2	0	0	0	-0.0617	2.3355	-3.2611
1998	3	0	0	0	-0.1238	1.7486	-2.5476
1998	4	0.0006	0.0295	0	-0.2821	0.5	-2.0643
1999	1	0.0059	0.1664	0	-0.0178	0.2514	-0.7723
1999	2	0.0065	0.1736	0	-0.2945	0.1538	-3.6706
1999	3	0.0079	0.1497	0	-0.1643	1.556	-5.6158
1999	4	0.0016	0.0455	0	-0.024	1.0475	-1.3314
2000	1	0.0224	0.3714	0	-0.3811	0.8085	-12.1577
2000	2	0.0232	0.3514	0	-0.0922	1.6638	-3.6731
2000	3	0.0265	0.3824	0	0.1406	12.3031	-2.0462
2000	4	0.0057	0.2254	0	0.0217	2.2072	-1.4846
2001	1	0.0115	0.1491	0	-0.0151	0.65	-0.9808
2001	2	0.0149	0.1255	0	0.0447	1.0884	-0.93
2001	3	0.0143	0.1269	0	0.0339	1.1382	-0.4149
2001	4	0.0009	0.0225	0	0.0438	0.2731	-0.2566
2002	1	0.0131	0.0919	0	0.0613	0.6862	-0.6647
2002	2	0.019	0.1011	0	0.7796	38.4577	-0.5664
2002	3	0.0187	0.1484	0	-0.5099	0.3	-19.6607
2002	4	0.0052	0.1792	0	0.059	0.3915	-0.0943
2003	1	0.0198	0.1509	0	0.0605	0.6737	-0.2258
2003	2	0.0202	0.1068	0	0.0269	0.6151	-1.6292
2003	3	0.0187	0.1033	0	-0.0493	0.5298	-2.0753
2003	4	0.0034	0.085	0	0.0376	0.4599	-0.0297
2004	1	0.0277	0.1551	0	0.0222	0.2679	-0.3115
2004	2	0.0357	0.1689	0	0.0306	0.1564	-0.0358
2004	3	0.0357	0.1866	0	0.0074	0.125	-0.9549

Table 5
Regression Model Used in Setting Multi-Factor Black-Litterman Market View

Table 5 presents the predictive model that regress market excess return against dividend-price ratio, earnings-price ratio during the period of 1997 to 2004. The table report R^2 statistic, and in parentheses the p-value of all coefficients.

	Coefficient			
	Constant	DP Ratio	EP Ratio	R-Sqr
Regression Model	0.2000	-6.997	0.277	0.138
	(0.087)	(0.316)	(0.049)	

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Table 6
Market View Comparison
(Market View Setting Based on Dividend-Price Ratio and Earnings-Price Ratio)

Table 6 presents market view setting based on predictive model that regresses market excess return against dividend-price ratio and earnings-price ratio $\Pi_{multi} = a_i + b_i DP_i + b_i EP_i + \varepsilon_i$ calculated at Jan 1st 2005, Jan 1st 2006 and Jan 1st 2007.

	Jan05	Jan06	Jan07
ACL	0.1886	0.2217	0.2065
ADVANC	-0.0735	-0.1587	-0.3672
AP	-0.1674	-0.2130	-0.0020
ASL	0.2052	0.1936	0.1885
ASP	-0.1699	-0.3542	-0.3220
BANPU	-0.0113	-0.4224	-0.0725
BAY	0.2058	0.0209	0.0880
BBL	0.1535	0.0879	0.0602
BCP	0.2044	0.1964	0.0185
BGH	0.0919	0.0544	0.1011
BH	0.0693	0.0366	0.0600
BLAND	0.2040	0.2181	0.2028
CPF	-0.0573	-0.2504	-0.1117
ERAWAN	-0.1380	-0.2629	0.1055
HANA	-0.1511	-0.2110	-0.1408
HEMRAJ	-0.2121	-0.3769	-0.2661
ITD	0.1650	0.2033	0.1101
JAS	0.2342	0.2116	0.1160
KBANK	0.2045	0.1020	0.0074
KGI	-0.0187	-0.1173	0.1947
KK	-0.4270	-0.3180	-0.3732
KTB	-0.1645	-0.0978	-0.0937
LANNA	-0.1333	-0.5932	-0.0134
LH	-0.4497	-0.2441	-0.2421
LOXLEY	-0.0046	0.0077	0.1981
LPN	-0.2731	-0.1591	-0.1694
MAKRO	-0.1138	-0.4739	-0.1886
MINOR	-0.3163	0.1029	0.1746
PSL	-0.0928	-0.4398	-0.2636
PTTEP	0.0444	-0.0089	-0.0346
RCL	-0.0004	-0.4441	-0.4501
ROBINS	0.1444	0.1842	0.1928
SAMART	0.2053	0.1188	-0.1013
SCB	-0.1667	-0.2632	-0.4523
SCCC	-0.0985	-0.0652	-0.1601
SCC	-0.0496	-0.2831	-0.2296
SPALI	-1.0988	-0.3546	-0.5851
SSI	-0.3079	-0.1865	0.2102
STEC	-0.0475	0.1680	-0.1445
TCAP	-0.2540	-0.1575	-0.2234
THAI	0.2188	0.2137	0.2144
THCOM	0.1078	0.2042	0.2293
TISCO	-0.1577	-0.3303	-0.7728
TMB	0.1753	0.2073	0.0717
TPIPL	0.2138	0.2038	0.0487
TRUE	0.2116	0.1760	0.1751
TT&T	0.2107	0.1896	0.1580
TUF	-0.1705	-0.1249	-0.0981
TVO	-0.4751	-0.2075	-0.1942

Figure 3 **Market View Comparison**
(Market View Setting Based on Dividend-Price Ratio and Earnings-Price Ratio)

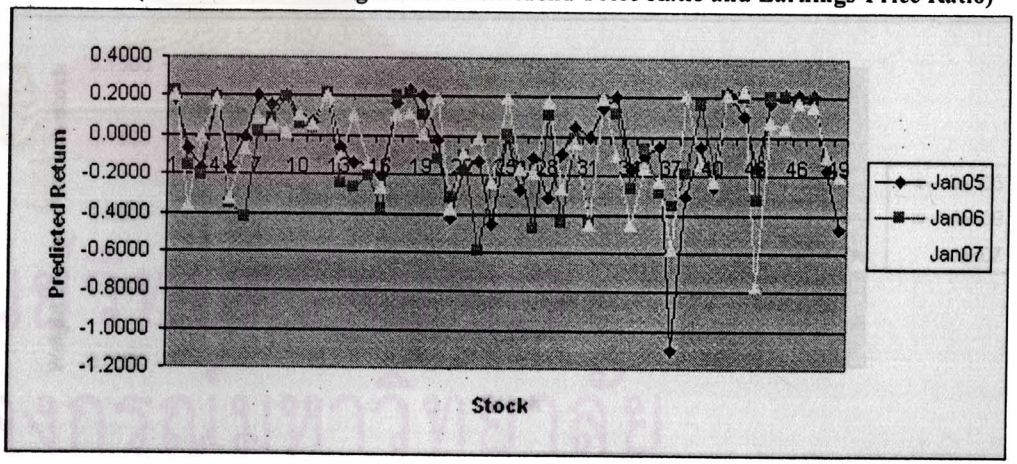

Table 7
Portfolio Weight Comparison
(Market View Setting Based on Dividend-Price Ratio and Earnings-Price Ratio)

This table demonstrates weight assigned to each asset during year 2005-2007. Portfolios are allocated based on minimizing portfolio variance by setting portfolio excess return=10%. Portfolios are allocated based on traditional Black-Litterman market view which is identified by: $\Pi_{multi1} = a_i + b_i DP_i + b_i EP_i + \varepsilon_i$.

	Jan05	Jan06	Jan07
ACL	0.0294	0.0348	0.0328
ADVANC	0.0357	0.0299	-0.0128
AP	0.0047	0.0048	0.0085
ASL	0.0237	0.0257	0.0246
ASP	0.0090	0.0004	-0.0007
BANPU	0.0301	-0.0022	0.0261
BAY	0.0264	0.0197	0.0218
BBL	0.0624	0.0613	0.0540
BCP	0.0277	0.0303	0.0196
BGH	0.0686	0.0716	0.0755
BH	0.0008	0.0008	0.0008
BLAND	0.0036	0.0042	0.0039
CPF	0.0420	0.0209	0.0359
ERAWAN	0.0092	0.0052	0.0233
HANA	0.0271	0.0255	0.0299
HEMRAJ	0.0046	-0.0008	0.0021
ITD	0.0161	0.0196	0.0152
JAS	0.0162	0.0174	0.0135
KBANK	0.0561	0.0513	0.0377
KGI	0.0063	0.0053	0.0115
KK	-0.0039	0.0017	-0.0023
KTB	0.0086	0.0168	0.0144
LANNA	0.0161	-0.0255	0.0298
LH	-0.0072	0.0072	0.0047
LOXLEY	0.0102	0.0127	0.0194
LPN	0.0022	0.0074	0.0057
MAKRO	0.0405	-0.0314	0.0247
MINOR	0.0053	0.1207	0.1333
PSL	0.0192	-0.0057	0.0051
PTTEP	0.0722	0.0723	0.0604
RCL	0.0430	-0.0044	-0.0121
ROBINS	0.0134	0.0167	0.0163
SAMART	0.0228	0.0214	0.0092
SCB	0.0086	0.0057	-0.0086
SCCC	0.0159	0.0222	0.0118
SCC	0.0297	0.0094	0.0104
SPALI	-0.0182	-0.0003	-0.0072
SSI	-0.0002	0.0056	0.0189
STEC	0.0136	0.0277	0.0090
TCAP	0.0034	0.0097	0.0048
THAI	0.0830	0.0915	0.0886
THCOM	0.0105	0.0147	0.0149
TISCO	0.0079	0.0017	-0.0243
TMB	0.0299	0.0357	0.0251
TPIPL	0.0189	0.0207	0.0141
TRUE	0.0246	0.0256	0.0246
TT&T	0.0215	0.0231	0.0208
TUF	0.0290	0.0478	0.0457
TVO	-0.0199	0.0236	0.0195

Figure 4 **Portfolio Weight Comparison**
(Market view setting based on DP and EP)

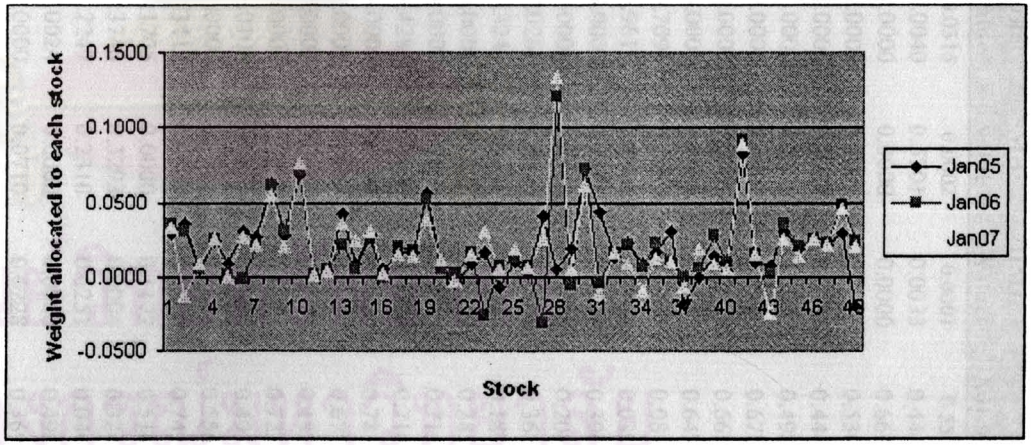

Table 8
Factor Beta during 1997-2005

Factor beta of $R_{i,t} = \alpha_i + \beta_{1,i}R_{m,t} + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + e_{it}$ derived from 1997-2005 data.

	Market Coefficient	SMB Coefficient	HML Coefficient	Market p-value	SMB p-value	HML p-value	Adj-R
ACL	0.3888	0.5997	0.7337	0.0315	0.0002	0.0001	0.5526
ADVANC	0.3644	-0.0604	0.3673	0.0040	0.5701	0.0033	0.4440
AP	1.2028	1.6034	-1.6863	0.0000	0.0000	0.0000	0.6699
ASL	1.1114	0.6665	-0.1860	0.0000	0.0004	0.3776	0.5367
ASP	0.6901	0.4504	0.2190	0.0006	0.0078	0.2558	0.4446
BANPU	0.7605	0.1535	0.1399	0.0000	0.2505	0.3639	0.4988
BAY	1.6801	-0.5607	-0.3040	0.0000	0.0001	0.0570	0.6787
BBL	1.2580	-0.3617	-0.5158	0.0000	0.0001	0.0000	0.6653
BCP	0.9150	0.5331	0.3160	0.0000	0.0004	0.0645	0.6428
BGH	-0.0566	0.1945	0.3386	0.7093	0.1359	0.0254	0.0819
BH	-0.0642	2.4345	0.4244	0.9615	0.0341	0.7464	0.0393
BLAND	3.5541	-0.7196	-1.1047	0.0000	0.1351	0.0478	0.3969
CPF	0.6022	-0.0611	-0.1763	0.0001	0.6413	0.2455	0.2089
ERAWAN	0.5091	0.8923	-0.3582	0.0261	0.0000	0.1106	0.3655
HANA	0.1579	0.4431	0.0343	0.3243	0.0015	0.8277	0.1821
HEMRAJ	1.1434	0.2390	-0.5906	0.0000	0.2835	0.0229	0.2853
ITD	1.0759	0.3792	0.6351	0.0000	0.0153	0.0005	0.7154
JAS	-0.1549	1.6221	1.5534	0.4281	0.0000	0.0000	0.7109
KBANK	1.3679	-0.4573	-0.3685	0.0000	0.0000	0.0001	0.7874
KGI	1.5879	0.2423	0.5285	0.0000	0.3005	0.0518	0.6226
KK	1.5687	0.3489	-0.7469	0.0000	0.0946	0.0023	0.4827
KTB	1.4324	-0.3541	-0.2028	0.0000	0.0017	0.1134	0.7235
LANNA	0.3878	0.2737	0.4973	0.0101	0.0327	0.0009	0.4911
LH	1.0602	0.2531	0.0192	0.0000	0.1007	0.9136	0.5561
LOXLEY	0.1602	1.5709	0.9740	0.3412	0.0000	0.0000	0.7424
LPN	0.3463	1.5999	-0.3912	0.1705	0.0000	0.1172	0.5180
MAKRO	0.1031	0.0969	0.4135	0.3746	0.3293	0.0004	0.3242
MINOR	0.1605	0.1354	-0.0636	0.2247	0.2310	0.6251	0.0461
PSL	0.5001	0.6488	-0.8049	0.0024	0.0000	0.0000	0.4962
PTTEP	0.5241	-0.1831	0.0572	0.0000	0.0710	0.6228	0.3697
RCL	0.6232	0.4826	-0.3463	0.0000	0.0001	0.0141	0.4633
ROBINS	0.3958	0.8577	0.9864	0.1136	0.0001	0.0001	0.5035
SAMART	0.6248	0.9909	-0.3898	0.0069	0.0000	0.0847	0.4294
SCB	1.9007	-0.6561	-0.5817	0.0000	0.0000	0.0000	0.7812
SCCC	0.7347	-0.0678	0.4694	0.0000	0.5878	0.0015	0.6191
SCC	1.1069	-0.2645	-0.1299	0.0000	0.0059	0.2340	0.6902
SPALI	1.7045	0.9262	-0.3757	0.0000	0.0001	0.1456	0.6262
SSI	1.2650	0.7095	-0.0393	0.0000	0.0003	0.8564	0.6007
STEC	0.6537	0.6006	-0.0836	0.0065	0.0035	0.7197	0.3067
TCAP	1.6745	-0.2786	-0.0127	0.0000	0.0251	0.9285	0.7860
THAI	0.7752	-0.1916	-0.2000	0.0000	0.0921	0.1272	0.3709
THCOM	0.2800	0.7418	1.5238	0.2646	0.0007	0.0000	0.5904
TISCO	1.1352	0.5125	0.0797	0.0000	0.0004	0.6205	0.6870
TMB	1.4488	-0.3646	-0.1891	0.0000	0.0039	0.1882	0.6823
TPIPL	1.2102	0.6546	0.1162	0.0000	0.0005	0.5845	0.6105
TRUE	1.1512	0.0417	0.4358	0.0000	0.7477	0.0042	0.7401
TT&T	1.1873	0.4478	0.3707	0.0000	0.0015	0.0212	0.7474
TUF	0.1415	-0.0070	0.3135	0.2918	0.9514	0.0192	0.2012
TVO	-0.0149	0.4513	0.3490	0.9251	0.0012	0.0274	0.1876

Table 9
Factor Beta during 1997-2006

Factor beta of $R_{i,t} = \alpha_i + \beta_{1,i}R_{m,t} + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + e_{it}$ derived from 1997-2006 data.

	Market Coefficient	SMB Coefficient	HML Coefficient	Market p-value	SMB p-value	HML p-value	Adj-R
ACL	-0.0149	0.4513	0.3490	0.9251	0.0012	0.0274	0.1876
ADVANC	0.3613	-0.0598	0.3700	0.0044	0.5747	0.0032	0.4421
AP	1.2039	1.6032	-1.6873	0.0000	0.0000	0.0000	0.6704
ASL	1.1149	0.6659	-0.1889	0.0000	0.0004	0.3693	0.5383
ASP	0.6906	0.4503	0.2186	0.0006	0.0078	0.2565	0.4448
BANPU	0.7645	0.1529	0.1366	0.0000	0.2515	0.3741	0.5009
BAY	1.6813	-0.5609	-0.3050	0.0000	0.0001	0.0560	0.6793
BBL	1.2544	-0.3611	-0.5128	0.0000	0.0001	0.0000	0.6609
BCP	0.9174	0.5327	0.3140	0.0000	0.0004	0.0657	0.6439
BGH	-0.0512	0.1936	0.3341	0.7357	0.1373	0.0272	0.0822
BH	-0.0672	2.4351	0.4269	0.9597	0.0341	0.7449	0.0393
BLAND	3.5552	-0.7198	-1.1056	0.0000	0.1350	0.0475	0.3971
CPF	0.6048	-0.0615	-0.1785	0.0001	0.6384	0.2390	0.2104
ERAWAN	0.5306	0.8886	-0.3762	0.0203	0.0000	0.0934	0.3711
HANA	0.1634	0.4421	0.0297	0.3068	0.0016	0.8503	0.1843
HEMRAJ	1.1460	0.2386	-0.5928	0.0000	0.2839	0.0223	0.2863
ITD	1.0743	0.3794	0.6364	0.0000	0.0154	0.0005	0.7148
JAS	-0.1504	1.6213	1.5497	0.4408	0.0000	0.0000	0.7117
KBANK	1.3690	-0.4575	-0.3695	0.0000	0.0000	0.0001	0.7885
KGI	1.5876	0.2423	0.5287	0.0000	0.3004	0.0518	0.6226
KK	1.5621	0.3500	-0.7414	0.0000	0.0950	0.0025	0.4790
KTB	1.4245	-0.3527	-0.1962	0.0000	0.0020	0.1305	0.7171
LANNA	0.3920	0.2730	0.4938	0.0092	0.0329	0.0010	0.4925
LH	1.0546	0.2541	0.0239	0.0000	0.1012	0.8931	0.5525
LOXLEY	0.1643	1.5702	0.9706	0.3277	0.0000	0.0000	0.7436
LPN	0.3459	1.6000	-0.3908	0.1710	0.0000	0.1175	0.5178
MAKRO	0.1070	0.0962	0.4103	0.3565	0.3321	0.0005	0.3250
MINOR	0.1759	0.1328	-0.0764	0.1847	0.2410	0.5579	0.0509
PSL	0.4915	0.6503	-0.7977	0.0031	0.0000	0.0000	0.4887
PTTEP	0.5309	-0.1842	0.0515	0.0000	0.0685	0.6568	0.3730
RCL	0.6177	0.4835	-0.3416	0.0000	0.0001	0.0162	0.4577
ROBINS	0.4008	0.8568	0.9822	0.1088	0.0001	0.0001	0.5044
SAMART	0.6249	0.9909	-0.3899	0.0069	0.0000	0.0846	0.4294
SCB	1.9012	-0.6562	-0.5822	0.0000	0.0000	0.0000	0.7815
SCCC	0.7289	-0.0668	0.4743	0.0000	0.5955	0.0014	0.6157
SCC	1.1074	-0.2646	-0.1303	0.0000	0.0058	0.2323	0.6906
SPALI	1.7052	0.9260	-0.3763	0.0000	0.0001	0.1449	0.6265
SSI	1.2704	0.7086	-0.0438	0.0000	0.0003	0.8397	0.6030
STEC	0.6446	0.6022	-0.0760	0.0075	0.0036	0.7454	0.3025
TCAP	1.6839	-0.2802	-0.0206	0.0000	0.0232	0.8837	0.7895
THAI	0.7844	-0.1931	-0.2076	0.0000	0.0882	0.1120	0.3762
THCOM	0.2729	0.7430	1.5297	0.2781	0.0007	0.0000	0.5889
TISCO	1.1356	0.5124	0.0793	0.0000	0.0004	0.6219	0.6872
TMB	1.4621	-0.3669	-0.2003	0.0000	0.0036	0.1615	0.6865
TPIPL	1.2065	0.6552	0.1193	0.0000	0.0006	0.5756	0.6087
TRUE	1.1547	0.0411	0.4329	0.0000	0.7506	0.0044	0.7413
TT&T	1.1869	0.4478	0.3710	0.0000	0.0015	0.0211	0.7472
TUF	0.1447	-0.0075	0.3108	0.2804	0.9475	0.0201	0.2019
TVO	-0.0188	0.4520	0.3523	0.9058	0.0012	0.0264	0.1862

Table 10
Factor Beta during 1997-2007

Factor beta of $R_{i,t} = \alpha_i + \beta_{1,i} R_{m,t} + \beta_{2,i} SMB_t + \beta_{3,i} HML_t + e_{it}$ derived from 1997-2007 data.

	Market Coefficient	SMB Coefficient	HML Coefficient	Market p-value	SMB p-value	HML p-value	Adj-R
ACL	0.3784	0.6049	0.7368	0.0358	0.0001	0.0001	0.5511
ADVANC	0.3696	-0.0617	0.3622	0.0036	0.5625	0.0039	0.4440
AP	1.2127	1.6036	-1.7005	0.0000	0.0000	0.0000	0.6737
ASL	1.1159	0.6675	-0.1938	0.0000	0.0004	0.3566	0.5404
ASP	0.6951	0.4501	0.2122	0.0005	0.0077	0.2705	0.4473
BANPU	0.7391	0.1635	0.1476	0.0000	0.2254	0.3432	0.4889
BAY	1.6531	-0.5485	-0.2949	0.0000	0.0001	0.0694	0.6677
BBL	1.2462	-0.3559	-0.5138	0.0000	0.0001	0.0000	0.6580
BCP	0.9076	0.5380	0.3155	0.0000	0.0004	0.0652	0.6426
BGH	-0.0451	0.1915	0.3314	0.7653	0.1414	0.0287	0.0835
BH	-0.0532	2.4327	0.4095	0.9680	0.0341	0.7551	0.0395
BLAND	3.5239	-0.7045	-1.1016	0.0000	0.1440	0.0490	0.3942
CPF	0.6007	-0.0590	-0.1779	0.0001	0.6523	0.2407	0.2102
ERAWAN	0.5309	0.8883	-0.3724	0.0200	0.0000	0.0975	0.3701
HANA	0.1639	0.4426	0.0292	0.3036	0.0015	0.8528	0.1852
HEMRAJ	1.1381	0.2435	-0.5927	0.0000	0.2740	0.0225	0.2858
ITD	1.0548	0.3887	0.6405	0.0000	0.0139	0.0005	0.7094
JAS	-0.1662	1.6281	1.5562	0.3943	0.0000	0.0000	0.7100
KBANK	1.3542	-0.4503	-0.3655	0.0000	0.0000	0.0001	0.7816
KGI	1.5736	0.2497	0.5290	0.0000	0.2869	0.0524	0.6207
KK	1.5629	0.3531	-0.7516	0.0000	0.0911	0.0022	0.4818
KTB	1.4075	-0.3437	-0.1947	0.0000	0.0030	0.1392	0.7088
LANNA	0.3814	0.2776	0.4988	0.0110	0.0302	0.0009	0.4910
LH	1.0409	0.2617	0.0237	0.0000	0.0929	0.8946	0.5475
LOXLEY	0.1637	1.5718	0.9684	0.3276	0.0000	0.0000	0.7443
LPN	0.3534	1.5998	-0.4006	0.1597	0.0000	0.1082	0.5201
MAKRO	0.0987	0.0997	0.4153	0.3929	0.3143	0.0004	0.3245
MINOR	0.1702	0.1344	-0.0693	0.1979	0.2352	0.5955	0.0497
PSL	0.5270	0.6399	-0.8242	0.0015	0.0000	0.0000	0.4948
PTTEP	0.5296	-0.1834	0.0528	0.0000	0.0692	0.6486	0.3758
RCL	0.6216	0.4845	-0.3500	0.0000	0.0001	0.0135	0.4624
ROBINS	0.3821	0.8647	0.9902	0.1258	0.0001	0.0001	0.5019
SAMART	0.6342	0.9897	-0.3993	0.0059	0.0000	0.0770	0.4326
SCB	1.8798	-0.6461	-0.5765	0.0000	0.0000	0.0000	0.7731
SCCC	0.7207	-0.0619	0.4728	0.0000	0.6243	0.0016	0.6114
SCC	1.0929	-0.2576	-0.1269	0.0000	0.0078	0.2505	0.6830
SPALI	1.6982	0.9317	-0.3814	0.0000	0.0001	0.1398	0.6269
SSI	1.2636	0.7130	-0.0453	0.0000	0.0002	0.8341	0.6030
STEC	0.6526	0.6020	-0.0883	0.0066	0.0035	0.7056	0.3054
TCAP	1.6394	-0.2624	0.0004	0.0000	0.0410	0.9981	0.7710
THAI	0.7741	-0.1889	-0.2017	0.0000	0.0957	0.1235	0.3736
THCOM	0.2667	0.7471	1.5268	0.2888	0.0007	0.0000	0.5869
TISCO	1.1277	0.5174	0.0785	0.0000	0.0003	0.6259	0.6867
TMB	1.4442	-0.3598	-0.1896	0.0000	0.0044	0.1871	0.6835
TPIPL	1.1963	0.6617	0.1167	0.0000	0.0005	0.5849	0.6070
TRUE	1.1420	0.0471	0.4371	0.0000	0.7165	0.0042	0.7396
TT&T	1.1660	0.4577	0.3766	0.0000	0.0013	0.0207	0.7415
TUF	0.1502	-0.0092	0.3073	0.2614	0.9361	0.0216	0.2041
TVO	-0.0092	0.4498	0.3439	0.9536	0.0012	0.0302	0.1876

Table 11
Market View Comparison
(Market View Setting Based on SMB and HML Factor)

Table 11 presents market view setting based on predictive model of $\Pi_{multi2} = \delta \Sigma w_M + \delta_{SMB} SMB + \delta_{HML} HML$. Where δ is market risk aversion coefficient setting as 2.5, δ_{SMB} is risk aversion from SMB return setting as 0.28, δ_{HML} is risk aversion from HML return setting as 0.32,SMB is difference in return between a small cap portfolio and a large cap portfolio at time t and HML is difference in return between a portfolio of high book-to-market stocks and a portfolio of low book-to-market stock at time t .

	Jan05	Jan06	Jan07
ACL	0.4767	0.3114	0.4713
ADVANC	0.1433	0.1440	0.1365
AP	-0.0499	-0.0506	-0.0587
ASL	0.2102	0.2084	0.1991
ASP	0.2655	0.2633	0.2546
BANPU	0.1511	0.1492	0.1499
BAY	-0.1632	-0.1641	-0.1660
BBL	-0.2050	-0.2042	-0.2083
BCP	0.3420	0.3406	0.3330
BGH	0.1787	0.1769	0.1740
BH	0.8907	0.8963	0.8862
BLAND	-0.3749	-0.3767	-0.3883
CPF	-0.0411	-0.0421	-0.0444
ERAWAN	0.1736	0.1665	0.1639
HANA	0.1574	0.1555	0.1533
HEMRAJ	-0.0647	-0.0660	-0.0701
ITD	0.4217	0.4213	0.4142
JAS	1.0473	1.0451	1.0398
KBANK	-0.1762	-0.1766	-0.1802
KGI	0.3766	0.3755	0.3641
KK	-0.0586	-0.0573	-0.0677
KTB	-0.0807	-0.0787	-0.0836
LANNA	0.2919	0.2902	0.2877
LH	0.1571	0.1582	0.1525
LOXLEY	0.8416	0.8396	0.8306
LPN	0.3660	0.3662	0.3608
MAKRO	0.1886	0.1875	0.1877
MINOR	0.0288	0.0239	0.0255

	Jan05	Jan06	Jan07
PSL	-0.0637	-0.0613	-0.0737
PTTEP	0.0074	0.0014	-0.0013
RCL	0.0622	0.0637	0.0576
ROBINS	0.6474	0.6453	0.6413
SAMART	0.1999	0.1995	0.1916
SCB	-0.2775	-0.2782	-0.2823
SCCC	0.2052	0.2076	0.2006
SCC	-0.0492	-0.0498	-0.0531
SPALI	0.2600	0.2589	0.2471
SSI	0.2877	0.2850	0.2758
STEC	0.1960	0.1985	0.1891

	Jan05	Jan06	Jan07
TCAP	0.0276	0.0238	0.0248
THAI	-0.0722	-0.0759	-0.0767
THCOM	0.8032	0.8042	0.7931
TISCO	0.2642	0.2636	0.2552
TMB	-0.0785	-0.0834	-0.0862
TPIPL	0.3255	0.3255	0.3158
TRUE	0.2547	0.2535	0.2453
TT&T	0.3537	0.3528	0.3464
TUF	0.1241	0.1233	0.1190
TVO	0.2631	0.2641	0.2583

Figure 5 **Market View Comparison**
(Market View Setting Based on SMB and HML factor)

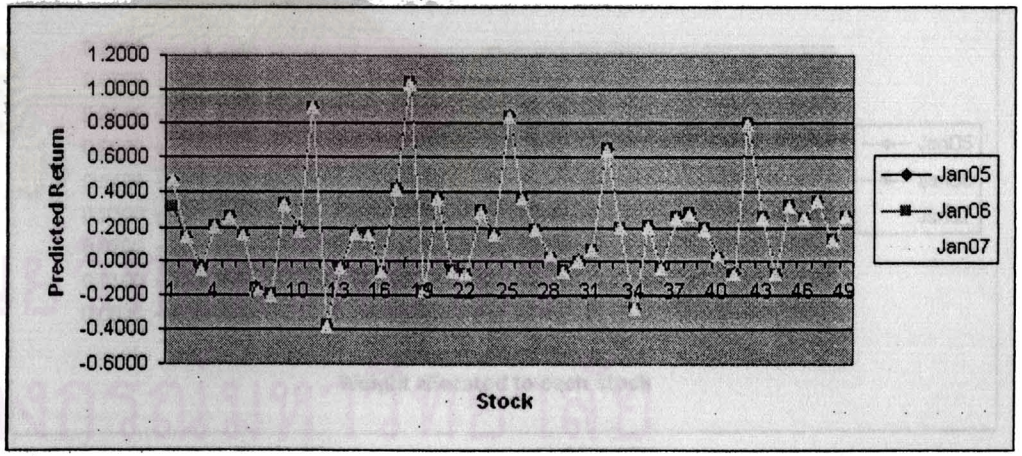

Table 12
Portfolio Weight Comparison
(Market View Setting Based on SMB and HML)

This table demonstrates weight assigned to each asset during year 2005-2007. Portfolios are allocated based on minimizing portfolio variance by setting portfolio excess return=10%. Portfolios are allocated based on traditional Black-Litterman market view which is identified by: $\Pi_{multi2} = \delta \Sigma w_M + \delta_{SMB} SMB + \delta_{HML} HML$.

	Jan05	Jan06	Jan07
ACL	0.0133	0.0144	0.0140
ADVANC	0.0390	0.0390	0.0391
AP	0.0065	0.0065	0.0065
ASL	0.0116	0.0117	0.0118
ASP	0.0151	0.0153	0.0154
BANPU	0.0245	0.0246	0.0246
BAY	0.0143	0.0140	0.0138
BBL	0.0381	0.0372	0.0368
BCP	0.0130	0.0132	0.0134
BGH	0.0428	0.0429	0.0429
BH	0.0004	0.0004	0.0004
BLAND	0.0021	0.0020	0.0019
CPF	0.0423	0.0418	0.0416
ERAWAN	0.0131	0.0132	0.0132
HANA	0.0379	0.0381	0.0382
HEMRAJ	0.0120	0.0118	0.0117
ITD	0.0076	0.0078	0.0079
JAS	0.0050	0.0055	0.0059
KBANK	0.0307	0.0300	0.0297
KGI	0.0050	0.0051	0.0052
KK	0.0101	0.0099	0.0099
KTB	0.0181	0.0178	0.0176
LANNA	0.0228	0.0231	0.0233
LH	0.0149	0.0149	0.0150
LOXLEY	0.0065	0.0070	0.0073
LPN	0.0080	0.0081	0.0082
MAKRO	0.0538	0.0539	0.0540
MINOR	0.0678	0.0675	0.0672
PSL	0.0230	0.0226	0.0225
PTTEP	0.0536	0.0532	0.0529
RCL	0.0346	0.0345	0.0345
ROBINS	0.0059	0.0062	0.0064
SAMART	0.0109	0.0109	0.0110
SCB	0.0167	0.0162	0.0160
SCCC	0.0186	0.0187	0.0187
SCC	0.0301	0.0297	0.0295
SPALI	0.0053	0.0054	0.0054
SSI	0.0081	0.0082	0.0083
STEC	0.0128	0.0129	0.0130
TCAP	0.0119	0.0118	0.0117
THAI	0.0428	0.0422	0.0419
THCOM	0.0048	0.0052	0.0054
TISCO	0.0121	0.0122	0.0123
TMB	0.0168	0.0165	0.0163
TPIPL	0.0087	0.0088	0.0090
TRUE	0.0115	0.0116	0.0117
TT&T	0.0098	0.0100	0.0101
TUF	0.0508	0.0507	0.0508
TVO	0.0352	0.0356	0.0359

Figure 5 **Portfolio Weight Comparison**
(Market view setting based on SMB and HML)

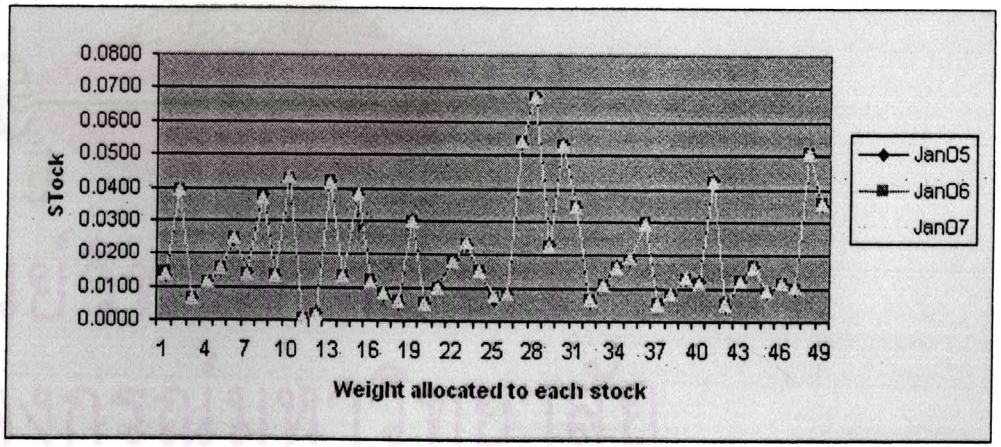

Table 13
Portfolio Return Comparison during 2005
This table presents portfolio return measured on monthly basis during 2005.

Market View	Investor View	Portfolio Return Measurement Period											Average Return	SD
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Single Factor	N	0.0708	0.0005	-0.1117	-0.1451	0.0080	-0.0313	-0.0747	0.0727	-0.0329	-0.0853	-0.1016	-0.0391	0.0723
Multiple Factor	N	0.0758	0.0098	-0.0531	-0.0816	0.0009	-0.0208	-0.0264	0.0626	-0.0075	-0.0477	-0.0658	-0.0140	0.0499
Single Factor	Incorrect	-0.2615	-0.2484	-0.1215	-0.1116	-0.2410	-0.2088	-0.1599	-0.2849	-0.1940	-0.1429	-0.1364	-0.1919	0.0611
Multiple Factor	Incorrect	0.0279	0.0046	-0.0610	-0.0843	-0.0054	-0.0313	-0.0289	0.0241	-0.0150	-0.0580	-0.0718	-0.0272	0.0383
Single Factor	Correct	0.1583	-0.0471	0.0329	0.0870	0.1029	-0.0362	0.0115	0.0271	0.0288	-0.0215	0.1693	0.0466	0.0740
Multiple Factor	Correct	0.1162	-0.0431	0.0108	0.0671	0.0976	-0.0157	0.0391	-0.0321	0.0482	0.0426	0.2279	0.0508	0.0775

ศูนย์วิทยทรัพยากร
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Table 14
Portfolio Return Comparison during 2006
This table presents portfolio return measured on monthly basis during 2006.

Market View	Investor View	Portfolio Return Measurement Period											Average Return	SD
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Single Factor	N	0.0658	-0.0634	-0.0617	-0.0628	-0.1751	-0.1097	-0.0635	-0.0030	-0.0786	0.0330	-0.0312	-0.0500	0.0660
Multiple Factor	N	-0.0001	-0.0390	-0.0266	0.0071	-0.1339	-0.1048	-0.0398	-0.0220	-0.0497	0.0303	-0.0151	-0.0358	0.0477
Single Factor	Incorrect	-0.2565	-0.1567	-0.1660	-0.1887	-0.1137	-0.1204	-0.1472	-0.2256	-0.1355	-0.2487	-0.2075	-0.1788	0.0502
Multiple Factor	Incorrect	-0.0318	-0.0343	-0.0372	-0.0277	-0.1330	-0.1060	-0.0447	-0.0298	-0.0501	0.0217	-0.0207	-0.0449	0.0417
Single Factor	Correct	-0.0583	0.0468	0.0130	0.1335	-0.0922	-0.1238	0.0056	-0.0111	-0.0496	0.0788	0.1619	0.0095	0.0902
Multiple Factor	Correct	-0.0519	0.0551	0.0183	0.1803	-0.0785	-0.1090	0.0033	-0.0557	-0.0753	0.0882	0.2540	0.0208	0.1153

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Table 15
Portfolio Return Comparison during 2007
This table presents portfolio return measured on monthly basis during 2007.

Market View	Investor View	Portfolio Return Measurement Period											Average Return	SD
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Single Factor	N	-0.0778	-0.0089	-0.0242	-0.0284	0.0632	0.0639	0.0262	-0.0658	-0.0109	0.0000	-0.1184	-0.0165	0.0564
Multiple Factor	N	-0.1028	-0.0067	-0.0507	-0.0133	0.0548	0.0528	0.0110	-0.0521	0.0072	-0.0006	-0.1030	-0.0185	0.0537
Single Factor	Incorrect	-0.1247	-0.2197	-0.1792	-0.2077	-0.2785	-0.2944	-0.2404	-0.1424	-0.2663	-0.2435	-0.1147	-0.2101	0.0625
Multiple Factor	Incorrect	-0.1031	-0.0101	-0.0502	-0.0213	0.0201	0.0088	-0.0165	-0.0554	-0.0034	-0.0164	-0.1043	-0.0320	0.0417
Single Factor	Correct	-0.0187	-0.0257	-0.0923	-0.0340	0.0579	0.0439	0.0698	0.0146	0.0521	0.0570	-0.0134	0.0101	0.0511
Multiple Factor	Correct	-0.0156	-0.0435	-0.1025	0.0309	0.0668	-0.0508	0.0735	0.0277	0.0413	0.0386	0.1010	0.0152	0.0614

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Biography

Miss Inthiporn Paphangkorn was born on October 8, 1983 in Bangkok. At the graduate level, she graduated from the Faculty of Commerce and Accountancy, Chulalongkorn University in May 2006 with a Bachelor of Science in Statistics, majoring in Business Information Technology. She joined the Master of Science in Finance Program, Chulalongkorn University in June 2006.

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