Chapter 3

Data, Hypotheses and Methodology

This chapter presents the sources of data, explains the hypotheses and shows the methodology used in the study. It is organized as follows. First, data used in each test are explained in Section I. The methodology and hypotheses are described in Section II.

I. Data

The data used in this study can be divided into 5 subsets according to the test in the study, which are

- Data used to find initial returns are the 292 IPOs that listed in the Thai stock market during 1987 to 1997. The offering prices, the first day trading prices and the market returns data are taken from the I-SIM database provided by the Stock Exchange of Thailand.
- Data used to test the relationship between initial returns and proportion of shares subscribed by each type of investors are the 111 IPOs that have data available the Selling Report. The proportion of shares subscribed by each investor type is obtained from the Selling Report or "Form 81-1". This form summarizes the results of selling the newly issued stocks to investors in the primary market and reports the proportion of shares allocated to each type of investors (Form 81-1 b). In most cases, the proportion of shares subscribed is equal to the proportion of shares allocated. According to this form, investors are classified into four groups; local institutional investor, local individual investor, foreign institutional investor and foreign individual investor. Since the proportion of shares allocated to foreign individual is very small, it is summed together with proportion of shares allocated to foreign institutional investor.
- Data used to compute the aftermarket performance of IPOs are 292 IPOs during 1987 to 1996. The data on prices and returns are taken from the I-

SIM database. Ex-dividend date and amount of dividend paid data are obtained from the PACAP database.

- Data used to test the relationship between the aftermarket performance of IPOs and proportion of trading by each type of investors are 39 IPOs in 1996. The data on daily volume of trading by each investor type in the secondary market are obtained from the Market Surveillance Department, the Securities Exchange of Thailand (SET). Normally, this data are not publicly published, but are given only for academic research upon request by researchers. According to the rules for provision of data, the Market Surveillance Department cannot provide the data of latest year. Thus, this data are provided only for the year 1996. According to the data, traders in the market are categorized into 8 groups as follows:

  (1) Broker portfolio
  (2) Broker Customer traders
  (3) Broker Mutual fund traders
  (4) Broker Foreign traders
  (5) Sub- broker portfolio
  (6) Sub-broker customer
  (7) Sub-broker Mutual Funds traders
  (8) Sub-broker Foreign traders

To test the information acquisition from each trader, the portfolio and its sub-portfolio of the same traders is grouped together. Thus, there are 4 groups of traders in the test, which are the Broker portfolio, the Broker Customer, the Broker Mutual Fund and the Broker foreign traders.

- Data used to test the relationship between aftermarket performance and EPS forecast data. The data of EPS forecast from analyst following data are from the Institutional Broker Estimate System or the I/B/E/S.

II. Hypothesis and Methodology

A. Initial Return and Investor Subscription in the Primary Market

Rock (1986) suggests that underpricing arise as a compensation device for uninformed traders. In this model, a group of "informed" investors know more about the issuing firm's prospects than do "uninformed" investors. Given their information, informed investors participate only in IPOs that are underpriced. As a consequence, uninformed investors receive a disproportionate allocation of over-priced issues. Therefore, to keep uninformed investors participating in the new issues market, issuers persistently underprice to ensure them a normal rate of return. Carter and Manaster (1990) extend the Rock's model to explain the relationship between underpricing and informed investors. In their model, issuing firm maximizes offer price subject to a constraint that the expected returns to uninformed investors is equal zero. Carter and Manaster (1990) show that as the proportion of informed investors rises, the offer price must fall to maintain the equilibrium of the constraint. Implied from the Rock (1986) and Carter and Manaster (1990), it can be shown that informed investor is positively correlated with the degree of underpricing, or

$$\text{underpricing} = f(\text{informed investors}); \quad \text{and}$$

corr.(underpricing, more informed investors) > corr.(underpricing, less informed investors)

In this test, initial return of IPOs is hypothesized to correlate with investor type in primary market in the following manner. Foreign investors and institutional investors should participate more in underpriced offerings since they are claimed to be informed traders (Khantavit (1996)) and individual investors should participate more in the overpriced offerings. Thus, the hypothesis in this test is

H1: The level of underpricing is positively correlated to proportion of shares allocated to local institutions and foreign investors in the primary market.

Since the primary market is composed of the three groups of investors, positive relationship between the two groups of investors and initial returns imply negative relationship between the other group and initial returns. In other words, positive correlation between institutional investors, foreign investors and initial returns automatically regulate the correation between individual investors and initial returns to be negative. To test the above hypothesis, the correlation coefficients, the cross-tabulation of data and the Ordinary Least Square method are used. High multicollinearity problem between each type of investors is expected and is solved by running the following three cross-sectional regressions instead of grouping them into one equation.

$$INITIAL_i = \alpha_0 + \alpha_1 LOINST_i + \alpha_2 LOINDL_i + \alpha_3 AGE_i + \alpha_4 SIZE_i + \alpha_5 INDRET_i + \alpha_6 HOT_i + \varepsilon_i \quad (3.1)$$

$$INITIAL_i = \alpha_0 + \alpha_1 LOINST_i + \alpha_2 FRGINST_i + \alpha_3 AGE_i + \alpha_4 SIZE_i + \alpha_5 INDRET_i + \alpha_6 HOT_i + \varepsilon_i \quad (3.2)$$

$$INITIAL_i = \alpha_0 + \alpha_1 LOINDL_i + \alpha_2 FRGINST_i + \alpha_3 AGE_i + \alpha_4 SIZE_i + \alpha_5 INDRET_i + \alpha_6 HOT_i + \varepsilon_i \quad (3.3)$$

where

$INITIAL_i$ = initial returns on each IPO firms which is measured as (first day closing price-offer price)/offer price,

$LOINST_i$ = proportion of shares allocated to institutional investor,

$LOINDL_i$ = proportion of shares allocated to individual investors ,

$FRGINST_i$ = proportion of shares allocated to foreign investors,

AGE_i = natural log of number of years since that IPO firms operate,

$SIZE_i$ = Gross proceeds of IPOs in million baht,

$INDRET_i$ = Industry index returns at the listing date of each IPOs,

HOT_i = Dummy variable which equal to 1 if the firm issues stock in the year 1993 and 1994 and equal to 0 otherwise,

ε_i = residual terms.

Equation (3.1) describes the relationship between initial returns and percentages of shares held by local institutions ($LOINST_i$) and held by local individual investors ($LOINDL_i$). Equation (3.2) attempts to test the relationship between initial returns and percentages of shares allocated to local institutions and foreign investors. Finally, equation (3.3) examine the relationship between the initial returns and the shares subscribed by local individual and foreign investors. According to the hypothesis, if investors are informed investors, we should observed the sign of its coefficient to be positive. In other words, that investors will participate more in the positive initial- return issues. Therefore, $INITIAL_i$ is expected to positively correlate with $LOINST_i$, $FRGINST_i$ and negative correlate with $LOINDL_i$

Size and ages are used as controlled variables. Both of them are proxies for company risk factor (Ritter (1984), Beatty and Ritter (1986), Tinic (1988)). In the study of Mauer and Senbet (1992), size and age are proxy for accessibility of investors. Mauer and Senbet (1992) explain that investors can exploit the information from large size and old firms easier than that from small size and young firms. Thus, large size and old firms pose less degree of incomplete spanning in the secondary market. And, in Benveniste and Spindt (1989), size and age can reduce information friction during IPO process. All of these models predict that size and age are negatively correlated with the degree of underpricing. Thus, initial returns would be expected to exhibit a negative relationship with issue size and age in equation (3.1) to (3.3). Issue size is measured by the total Baht value of the offering (gross proceeds).

$INDRET_i$ is used to control the abnormal (both high and low) initial returns that stem from abnormal industry characteristics. Variation in the initial returns observed across industries is documented by Ritter (1984) and Mauer and Senbet (1992). This variation can be explained by the incomplete market spanning in the secondary market (Mauer and Senbet (1992)). The model explains that high industry returns arise because particular industry has low degree of secondary market spanning and possibly investor accessibility. These industries should exhibit high initial returns. Thus, $INDRET_i$ is expected to be positively correlated with underpricing. Ritter (1984) finds that underpricing is substantially high for natural resource industry during 1980. He explains that underwriters exploit start-up natural resource firms during the oil and gas boom that occurred during 1980.

Variable in the supply side of the pricing determination is the HOT_i. HOT_i represent the periods that many IPOs enter the market, which are the year 1993 and 1994. During these years, which large number of IPOs are offered to investors, issuing firms cannot set the offering prices too high because they are afraid of being failed by investors. HOT_i is used to control the changes in regulation scheme that may affect degree of underpricing (Stoughton and Zecner (1998), Kritsernvong (1998)). According to Stoughton and Zecner (1998), level of underpricing declines as regulation reduces degree of strategic allocation, the allocation which issuers and underwriters can allocate discretionary. Hence, we should observe high initial returns for the hot period. And, the expected signed of the HOT_i is expected to be positive. Taken all together, formal relationship can be structure as follow:

$$\begin{matrix} & + & - & + & - & - & + & + \\ INITIAL_i = f(LOINST_i, & LOINDL_i, & FRGINST_i, & AGE_i, & SIZE_i, & INDRET_i, & HOT_i) \end{matrix}$$

The results of the regressions are present in Chapter 4.

B. After Market Performance of IPOs and Investor Trading in the Secondary Market

Field (1997) demonstrates that institutional investors may have some ability to predict the quality of IPO: IPO with larger institutional shareholdings within one quarter of the IPO date performs better over a three-year period than those with little or no institutional shareholdings at the end of the first quarter. Krigman, Shaw and Womack (1999) show that IPOs which are heavily 'flipped' by institutional investors have the worst aftermarket performance. Krigman, Shaw and Womack (1999) argue that institutional investors have superior information regarding the IPO quality.

This study tests the superior information of each investor type in the Thai stock market regarding the long-term performance of IPOs. First, the level of subscription in the primary market is examined with the long-run performance of IPOs. Informed investors will subscribe in IPO, which they forecast its performance is

good in the future. Accordingly, we should observe positive correlation between the level of subscription from informed investors and the future performance of IPOs. Thus, the formal hypothesis is

H2: Aftermarket performance of firms is positively correlated with level of subscription by informed investors.

Second, the superior ability of informed investors is tested using the level of trading on the IPO stocks in the secondary market which this approach is similar to the Field (1997). However, level of investor participation in the IPOs is different from the Field (1997). Field (1997) employs the percentage of institutional shareholdings at the end of the quarter to represent institutional interest in IPOs. Krigman, Shaw and Womack (1999) use large block selling at the first day trading of IPOs to represent the information institutional investors produce in the secondary market. In this study, change in cumulative net investment is used to measure the superior information of each investor type. The cumulative net investment is measured by cumulating the net investment of each investor type during the first trading month (21 days), or

$$CNI_i = \sum_{t=1}^{21} NIt \qquad (3.4)$$

where CNI_i is the cumulative net investment during the first 21 days. NI_{it} is the percentage of number of shares traded by each investor group (net buy-sell) for IPO firm 'i' beginning on the first trading day (t=0). The long-run performance of IPOs is measured by the benchmark adjusted returns which the SET index is used as benchmark.

Change in the cumulative net investment, CNI_i, reflects information investors received during the first month (21 trading days) for IPO i. Informed investors gradually study and know the true performance of IPO since ample information flow into the market. Investors (informed investors) will increase the percentage of their holding of IPOs when they acquire good news about that IPO and they believe the good news is sustained. Thus, change in the CNI_i is positive in this case. On the contrary, informed investors will decrease their trading of IPOs with relatively poor performance in the future. Investors will diverge from the trading mentioned above,

if they are uninformed or less informed investors. Uninformed investors or relatively less informed investors are investors who trade based on the insufficient information of the IPOs. Thus, their change in the cumulative net trading is not (to a lesser degree) correlate with the aftermarket performance of IPOs. Therefore, the formal hypothesis can be set as follow:

H3: Change in cumulative net investment (CNI_i) by informed investors is positively correlated with the aftermarket performance of IPO.

Next section illustrates the methodology used to compute the aftermarket performance of IPOs, which are the monthly benchmark-adjusted returns and the three-year buy-and-hold returns.

B.1 Monthly Benchmark-Adjusted Returns

Monthly benchmark-adjusted returns are defined as the monthly raw return on a stock minus the monthly benchmark return for the corresponding period and are calculated for each IPO for 36 consecutive months. Month, in this case, is defined as successive 21-trading-day periods relative to the IPO date. Month 0 is defined as the initial return period, Month 1 consists of event days 2- 22, month 2 consists of event days 23-43,etc.

Monthly benchmark-adjusted returns are calculated as the monthly raw return on a stock minus the monthly benchmark return for the corresponding 21-trading-day period. The benchmarks used are (1) the SET index, (2) listed firms matched by industry and size, (3) the industry index in the same industry index of each IPO and (4) the created size matched portfolio. The benchmark adjusted return for stock i in event month t is defined as

$$ar_{it} = r_{it} - r_{mt} \qquad (3.5)$$

The average benchmark-adjusted return on a portfolio of n stocks for event month t is the equally weighted arithmetic average of the benchmark-adjusted returns:

$$ARt = \frac{1}{n}\sum_{i=1}^{n} ar_{it} \qquad (3.6)$$

The cumulative benchmark-adjusted after market performance from event month q to event month s is the summation of the average benchmark-adjusted returns;

$$CAR_{q,s} = \sum_{t=q}^{s} ARt \qquad (3.7)$$

B.2 Three-year buy- and- hold returns

As an alternative to the use of cumulative average benchmark-adjusted returns, the 3-year holding period return is computed which measure the total return from a buy-and-hold strategy in which a stock is purchased at the month 1 and held for a period of three years. The three-year buy-and-hold returns are calculated as follows:

$$R_i = \prod_{t=1}^{36}(1 + r_{it}) \qquad (3.8)$$

where r_{it} is the raw return on firm i in event month t. This equation measures the total return from a buy and hold strategy where a stock is purchased at the first closing market price after going public and held until 3- year anniversary. The wealth relatives are used to measure the performance of IPOs relative to benchmarks. It can be computed as

$$WR = \frac{1 + \text{average 3 - year total return on IPOs}}{1 + \text{average 3 - year total return on matching firms}} \qquad (3.9)$$

A wealth relative of greater than 1.00 can be interpreted as IPOs outperforming a portfolio of matching firms; a wealth relative of less than 1.00 indicates that the IPOs underperformed.

B.3 Benchmarks

The benchmarks used to examine the performance of IPOs are not identical among the studies. Ritter (1991) employs matching firm benchmark matched by firms closest in size and is in the same industry to IPO stocks. Loughran and Ritter (1995) and Field (1997) use matching firm benchmark matched by size only. To enhance the robustness of the results in this study, four benchmarks are used in measuring the adjusted returns. The first benchmark is the matching firm benchmark. This benchmark is a firm which is listed at least 3 years before the IPO and closest in size (market value) with each IPO. The matching firm also has to exist in the same industrial sector to each IPO. The second benchmark is the SET index returns. The third benchmark is industry index of the same industry to the IPO. These benchmarks could be argued of being inappropriate for this market. For example, the closest size-matched firm in the same industry may have its size not close to the IPOs since few listed firms exist in that industry. Thus, we can not find the matching firms having their size really 'match' to the size of IPOs. Therefore, this study constructs the size-match portfolios which are the portfolio of listed stocks having the market value close to the IPO stocks and measure its returns for the corresponding period to IPOs' return. The size-match portfolio is constructed as follows. In the first step, all listed firms are ranked by their market value and classified into 5 quintiles. The quintile portfolio whose market value covers the market value of the IPO is selected and computed its daily index. Daily index is constructed by summation the IPOs' closing price in the portfolio together and divided by number of stocks in the portfolio. The daily index selected is computed both equally weight and value weight. Then, this daily index is used to compute the monthly returns for the corresponding period to the IPOs' returns. Results of the aftermarket performance and the results of testing the hypothesis are shown in Chapter 4.

C. Co-Movement between Aftermarket Performance of IPOs and Cumulative Net Investment

Previous test examines the relation between cumulative net investment during the first month of IPOs and the aftermarket performance of IPOs to see predictability power from each investor group. This section investigates the relationship between cumulative net investment and contemporaneous cumulative adjusted return (CARs),

the objective is to find whether informed investors have superior information in monthly trading of IPOs stocks. High and positive correlation between cumulative net investment and cumulative benchmark-adjusted returns imply that investors can expect the changes in monthly information and monthly prices with high accuracy. Thus, the hypothesis is that cumulative net investment of informed investors is positively correlated with the cumulative adjusted returns. To test this hypothesis, the correlation coefficients between each group of investor and the CARs are examined. Further, this section also uses the OLS method to examine whether the cumulative net investment from each investor group can explain the contemporaneous cumulative adjusted returns of IPOs.

In order to reduce the multicollinearity problem occurred among the variables of net investment of each investor type. The cumulative net investment variables (CNI) of every investor type are centering or subtract the variables with its mean. However, after subtraction completed, the problem of multicollinearity is still existing in some variables. Further correction is made by separating the estimation into two following cross sectional regression:.

$$CAR_i = \alpha_0 + \alpha_1 BROK_i + \alpha_2 CUST_i + \alpha_3 MUFU_i + \alpha_4 SIZE_i + \alpha_5 BV/MV_i + \varepsilon_i \quad (3.10)$$

$$CAR_i = \alpha_0 + \alpha_1 BROK_i + \alpha_2 FRGN_i + \alpha_3 MUFU_i + \alpha_4 SIZE_i + \alpha_5 BV/MV_i + \varepsilon_i \quad (3.11)$$

Where

CAR_i = monthly cumulative adjusted returns for 39 IPOs in the year 1996,

$BROK_i$ = monthly cumulative net investment for broker portfolio investors,

$CUST_i$ = monthly cumulative net investment for customer portfolio investors,

$MUFU_i$ = monthly cumulative net investment for mutual fund portfolio investors,

$FRGN_i$ = monthly cumulative net investment for foreign portfolio investors,

$SIZE_i$ = monthly log of market value of the IPO firm,

BV/MV_i = log of book to market value of firms.

It is expected that the sign of coefficients of *SIZE* and *BV/MV* are negatively correlated with the CAR_i (Banz (1981), Keim (1983), Fama and French (1992) and others). The coefficients' signs of $BROK_i$, $FRGN_i$, and $MUFU_i$ are expected to be

positive since they are informed investors according to the hypothesis. $CUST_i$ on the other hand, is often claimed as the traders who trade base on noises. Thus, the sign of its regression coefficient is expected to be negative. Regression results of this section are revealed in section VI of Chapter 4.

D. Analyst Forecast Information and Aftermarket Performance of IPOs

D.1 Forecast Accuracy

Forecast value reflects quality of information and also reflects future perception of forecaster. Previous studies indicate that EPS forecast made by financial analyst have systematic error. For example, Allen, Cho and Jung (1997) find that the magnitude of forecast errors is related to the development status of the capital market. Rajan and Servaes (1997) show that analysts systematically overestimate the earning of IPO firms. The Thai stock market is in developing stage which in this stage, information may not disseminate equally to all participants and the quality of information disseminated is not good as in developed country. Thus, the forecast error of this market is expected to be high relative to developed market. Furthermore, the error of forecast made by the Thai analyst is expected to be different from the error of forecast made by foreign analyst since both groups are different in their ability to acquire and exploit information. In this section, I measure the accuracy of EPS forecast made by analyst on the IPO stocks and compare the error of forecast between the Thai analyst and foreign analyst.

EPS forecast for IPO stocks is defined as the average value of EPS forecast made by analyst over the one-year, two-year and three-year subsequent to listing date. The one-year forecast window is defined as the period which the different number of days from issuing date to forecast end date is between 6 to 18 months (180 to 540 days). Two-year forecast window is defined as the period which the different number of days from issuing date to forecast end date is between 19 to 30 months (541 to 900 days). Three-year forecast window is the length of 31 to 40 months' time from the first trading day of IPOs. Actual EPS is the actual value of EPS provided by the I/B/E/S in corresponding date to the forecast end date.

Two types of forecast error are examined; absolute forecast error and signed forecast error. The absolute value measures the accuracy of the forecast error, and the signed forecast error examines whether there is a systematic over- or under-estimation of earnings for IPO firms. The absolute forecast error is calculated as the absolute value of forecast error deflated by actual earnings per share: forecast error is defined as the difference between actual and forecasted EPS, or

$$FE_{jt} = \left|(A_{jt} - F_{jt})/A_{jt}\right| \qquad (3.12)$$

where

FE_{jt} is percentage-forecast error of firm j for year t (t =1,2 and 3),

A_{jt} is actual earnings per share of firm j reported at the end of year t, and

F_{jt} is mean forecasted earnings per share of firm j which forecast end date is at the end of year t and is reported as t-year forecast in the I/B/E/S database.

The signed forecast error is computed by allowing the sign of the forecast error (numerator of Equation (1):

$$FE_{jt} = (A_{jt} - F_{jt})/\left|A_{jt}\right| \qquad (3.13)$$

The signed forecast error represents the direction and degree of bias in the market. For example, if the signed forecast is negative, it means that the forecast value from analysts is higher than the actual value of EPS, no matter the actual EPS is positive or negative.

D.2 Forecast error and the aftermarket performance of IPOs

Earning forecasts are subject to error and so the aftermarket performance of IPOs will depend, in part, on how accurate the profit forecasts are. Subsequent to listing, investors will be constantly evaluating how accurate they believe the forecasts to be and consequently will revise stock prices. In general, investors revise their forecasts of profits in the correct direction and the releases of the actual earnings numbers will likely lead to further adjustments in stock prices. Thus, forecast error (or accuracy) is an important determinant of aftermarket stock performance. Firth (1997) evidences the positive correlation between the error in EPS forecast obtained from prospectus and the aftermarket performance of IPOs.

In this section, the signed forecast error and analyst forecast revision of the EPS forecast provided by the I/B/E/S database are used to represent the information disseminated in the market. Signed forecast error can represent degree of bias in forecasting. If analyst bias upward (shown as negative signed forecast error), subsequent price should adjust downward to correct the forecast (represented by negative CARs). Thus, the positive relationship between signed forecast error and cumulative benchmark adjusted returns is expected. Therefore, the formal hypothesis is

H4: There is a positive relationship between the signed forecast error and the CARs

The same intuitive explanation can apply with forecast revision data. Analysts revise their forecast to reflect new information they receive on IPOs. The direction of revision reflects whether analyst receive good news or bad news about firms. When new information about firm is good, analysts adjust the forecast upward. On the other hand, when the new information is bad, analysts forecast EPS downward in subsequent period. If the EPS revision from analyst base on reliable information about future performance of IPO firms, we should observe the positive correlation between EPS revision and the aftermarket performance of IPOs. In the study, cumulative adjusted returns (CARs) is hypothesized to positive correlate with the revision of EPS forecast from financial analyst, or

H5: There is a positive relationship between the analyst forecast revision and the cumulative adjusted returns (CARs)

To test the above hypothesis, CARs for the 1 month, 6 months and 12 months subsequent to listing are modeled as

$$CAR_i = \beta_0 + \beta_1 IR_i + \beta_2 log\ SIZE_i + \beta_3 log\ AGE_i + \beta_4 log\ BV/MV_i + \beta_5 FE_i \quad (3.14)$$

$$CAR_i = \beta_0 + \beta_1 IR_i + \beta_2 log\ SIZE_i + \beta_3 log\ AGE_i + \beta_4 log\ BV/MV_i + \beta_5 REV_i \quad (3.15)$$

Where

CAR_i = the cumulative benchmark-adjusted returns (CARs) at different period (1, 6, 12, 24 and 36 months),

IR_i = market-adjusted initial return on the first day trading,

$SIZE_i$ = gross proceeds raised by the new issue of shares,

AGE_i = (1+ the age of the IPO at the date of listing),

BV/MV_i = book value per share of the IPO divided by the market price of the IPO at the end of the first month's trading,

FE_i = signed forecast error for the corresponding period of CARs,

REV_i = analysts' revision of EPS forecasts during one year period.

The overreaction hypothesis requires that present period return be negatively correlated with previous period return (DeBondt and Thaler (1985)). Therefore a negative coefficient on *IR* is expected in both equations. The *SIZE* is expected to be positive since it is a proxy for company risk factor (Banz (1981), Ritter (1984), Tinic (1988) and Mauer and Senbet (1992)). AGE and BV/MV are hypothesized to be positive (Ritter (1991), Loughran and Ritter (1995)).

According to Firth (1997), investors are hypothesized to use profit forecasts in pricing IPOs. If the forecasts turn out to be erroneous, stock prices should react accordingly. Since the positive (negative) signed-forecast is proxy for systematic under-estimation (over-estimation), the increasing (decreasing) cumulative abnormal returns should be observed to adjust for the prediction error. Therefore, a positive sign is expected for coefficient of the *FE*.

The one year after issuing of analyst forecast revision (*REV*) is defined as the first estimation of the mean of EPS and the last estimation of the mean of EPS for the one year forecast error, or

$$REV_i = AF_{i,tl} - AF_{i,tf} \qquad (3.16)$$

Where REV_i is the analysts' revision of EPS forecasts during one year subsequent to issuing of firm i.

$AF_{i,tl}$ is the mean forecast of earnings and it is the last estimation of EPS forecast in the one year period subsequent to trading of IPOs. The number is deflated by price at the beginning period.

$AF_{i,tf}$ is the mean forecast of earnings and it is the first estimation of EPS forecast in the one year period subsequent to trading of IPOs. The number is deflated by price at the beginning period.

If analyst forecast revisions provide informative signals to the market of IPO, the positive sign is expected between the analyst forecast revision (REV_i) and the aftermarket performance (CARs) of IPOs should be observed. The results of this test are shown in section VII and VIII of Chapter 4.