Journal of Accounting and Finance
Volume 32, No. 1
October 2017-March 2018

Empirical Analysis of Stock Market Returns

Debasis Patnaik and Ram Charan

Abstract

The capital asset pricing model (CAPM) has historically proven to be a very efficient way to measure the returns of a given stock. However, the model suffers from a significant bias since it only considers one variable - The systematic risk to explain the differences in returns across different stocks. This paper seeks to find other measurable factors like the Size of the Firm, Book to Market Value, Price-Earnings Ratio, Earnings Yield and Dividend Yield to provide a statistically significant explanation for the contrasting returns exhibited by different stocks.

Keywords: *CAPM, Size Effect, Fama and French Three Factor Model*

Introduction

The single period capital asset pricing model formulated by Sharpe(1964)[1], Lintner (1965)[2] and Black (1972)[3] is a very important and widely used model in the field of finance. It explains variations in the rate of return on a security as a function of the rate of return on a portfolio consisting of all major publicly traded stocks, which is called the market portfolio. The rate of return on any investment is generally measured relative to its opportunity cost, which is the return on any asset having zero risk. The resulting difference between the return on a security and the return on a risk-free asset is called the risk premium, since it is the reward or punishment for making a risky investment. The model postulates a simple linear relationship between the expected return and systematic risk of a security. The central prediction of the model is the portfolio of invested wealth is mean-variance efficient. The efficieny of the market portfolio implies that the expected returns on securities are a positive linear function of their market risks (β). The greater the systematic risk of a security, the higher the expected return of the security. The efficiency of the market portfolio also implies that the market βs suffice to describe the cross-section of expected stock returns. The model can be summarized as follows:

$E(\mu_i) = r_f + \beta_i (\mu_m - r_f) + \varepsilon_i$

μ_i= Return of stock i

β_f=Risk free rate

Dr Debasis Patnaik, Assistant Professor, Department of Economics, BITS Pilani K K Birla Goa Campus, Goa, India
Ram Charan, Research Student, Department of Economics, BITS Pilani, K K Birla Goa Campus, Goa, India

μ_i = Systematic risk of stock i. This type of risk is non-diversifiable.

μ_m = Average market return

ε_i = Unsystematic risk of stock i. This type of risk is diversifiable.

The systematic risk of a common stock is calculated as follows:

$\beta_i = Cov(Ri, R_m) / \sigma^2(R_m)$

Moreover, the efficient market hypothesis implies that in an efficient market security prices fully reflect all available information and adjust rapidaly to reflect any new information. Given this, it is impossible to ear extra-normal returns on a consistent basis since returns are solely determined by the amount of risk one assumes. Therefore, passive management, which involves buying and holding a portfolio containing a level of risk consistent with one's goal, is cited as the most profitable investment strategy in an efficient market. In the long run, active portfolio management can gain little if anything.

Some of the problems inherent in the model are its assumptions. The model takes into account the presence of a risk-free security. In practice, it is very difficult to find a security that has no risk. Even government bonds carry a certain element of risk since there is always a possibility of default. However, for practical purposes most government issued securities are considered risk-free and their coupon rate is often considered the risk-free rate. In certain cases, the default risk is subtracted from coupon rate of the government security to arrive at the risk-free rate.

The second problematic assumption of the model involves stability of β. β are calculated based on historical data. This creates a problem since the past performance of a stock is solely used as a measure for the future risk of the stock. Since stock prices in general are quite volatile, betas change over time and do not remain stable.

The most problematic assumption of the model is that it considers only one single factor - systematic risk (β) for explaining the expected return of the stock. Various studieshave emphasized the presence of other factors like size, PE ratio, dividend yield etc. in explaining the expected return of stocks. The CAPM has also empirically proved to be inaccurate in many equity markets across the globe.

A Review of Literature

Banz (1981)[1] formulates the size effect exhibited by stocks in the American equity markets. Banz found that common stocks of small firms on an average produce a higher risk-adjusted return than common stocks of big companies. A cross-section and time series regression was performed to estimate the coefficients for systematic risk and the size of the respective common stock. The data sample consisted of all common stocks quoted on the NYSE for at least five years between 1926 and 1975.It was also observed that the size effect was not linear._ The effect is most pronounced in smallest firms in the sample which on an average earn a significantly higher risk-adjusted return than the average market index. It was also observed that the effect is not very stable over time. Banz further asserts that the size effect could be explained by the amount of information available for common stocks. Small firms in general provide investors with a lot less information when compared to large firms which in turn leads to limited diversification and subsequently higher returns for small stocks. While this theory has proven to be consistent with empirical results it nevertheless still does not account for a consistent interpretation. Though size effect does exist, Banz suggests that it should be dealt with in a cautious manner.

Basu(1977)[2] assesses the relationship between the performance of common stocks and their respective price-earnings ratio. Basu further uses this evidence to test the efficient market hypothesis where security prices always incorporate and reflect all available information. The price-earnings ratios of all common stocks from 1956 to 1971 were ranked and five portfolios were formed. The returns of the respective portfolios were calculated using OLS estimators on the Sharpe-Lintner version of the Capital Asset Pricing Model . It was found that portfolios having low price-earnings ratio earned 2-4.5% higher than portfolios having high price-earnings ratio. However, the higher returns on portfolios having low price-earnings ratio were not due to high levels of systematic risks. This was in stark contrast to the Capital Asset pricing model, which postulated that higher returns are due to higher risk exposures. In fact, some high price-earnings ratio had higher levels of systematic risks and still returned significantly lower the portfolios having low price-earnings ratio. Although the efficient market hypothesis denies the possibility of earning excess returns, Basu postulates that the P/E ratio due to exaggerated investor expectation can act as an accurate indicator for future investment performance.

Fama and Macbeth (1973)[3] test the relationship between average return and risk for common stocks listed in New York Stock Exchange from 1926 to 1968. This test between the average return and risk was used to measure the precision of thetwo parameter capital asset pricing model, which postulates that investors should be rewarded for taking risks.The risk of a particular common stock was calculated using the standard systematic risk . It was found that there indeed was a positive tradeoff between return and risk. This resulted in widespread recognition of CAPM as the standard model for calculation of expected returns.

Fama and French (1992)[4] analyze the impact of size and book-to-market equity on the return of common stocks from 1963 to 1990 in the New York Stock Exchange. Cross-sectional regression analysis was performed with size of the firms and the respective book-to-market equity as the independent variables. It was observed that common stocks of small firms on average produce significantly higher returns than the common stocks of large firms. Secondly, It was observed that common stocks, which had high book-to-market equity, had higher returns than common stocks that had low book-to-market equity. This led to the formulation of the famous three-factor model where the returns of a given stockcould be explained by three major factors:Systematic risk, Size (Market Capitalization), Book-to-Market Value. The

---

1 The Sharpe-Lintner CAPM assumes that all investors choose main-variance portfolio. For a given mean, investors will always choose a portfolio that has the least variance. The model can be formulated as follows:

2 The systematic risk of a common stock is calculated as follows:
$\beta_i = Cov(Ri, Rm) / \sigma^2(R_m)$

β_i = Systematic risk of stock i
R_i= Average return of stock i
R_m= Average market return

relationship between average return and systematic risk, which is the central prediction of the Capital Asset Pricing Model, was found to be weak. This was in sharp contrast to Black, Jensen and Scholes (1972) and Fama and Macbeth (1973).

Basu (1983)[5] examines the relationship between earnings yield, firm size and the returns of common stocks listed in the New York Stock Exchange form 1962 to 1978.Basudivided the common stocks into different groups based on their Earnings-Price ratio and market capitalization. The groups were further combined to form portfolios with similar Earnings-Price ratio but different market capitalization and similar market capitalization but different Earnings-Price Ratio. It was found that common stocks of high Earnings-Price firms earned a higher risk-adjusted return than common stocks of low Earnings-Price firms. This was consisted with Basu (1978). The earnings-price effect was significant even after the "Size Effect" was randomized across high and low Earnings-Price groups. It was also observed that small firms on averaged earned a significantly higher return than large firms but this effect was a lot less significant when returns were controlled for differences in systematic risk and Earning-Price ratio.

Kothari, Shanken and Sloan(1995)[6] take another look at the relationship between systematic risks, size, book-to-market equity, with the returns of common stocks. They find that although a statistically significant relationship does exist between systematic risk and average returns, it does not account for all the variation in expected returns of common stocks as implied by the Capital asset pricing model. The book-market equity does not account for a statistically significant explanation for variation in returns of stocks. They also find a very significant evidence of size effect.

Keim(1982)[7] examines the size effect on firms listed in New York Stock Exchange and the American Stock Exchange on a monthly basis. He finds the nearly fifty percent of the size effect is apparent during the month of January. Also, more than fifty percent of the size effect in January can be attributed to the first week of trading in the year and particularly the first day. This led to the formulation of "January Effect". There is no clear interpretation for such an effect.

Blume(1970)[8] analyzes the effect of dividend yield on returns of stocks listed in NYSE and AMEX. A three variable regression model is constructed with the beta and dividend yield as the dependent variables and the return of the stock as the independent variable. A cross-sectional regression analysis is then performed on 164 stocks for the 1936-1967 period. For the 40-year time period ending in 1967, the risk-adjusted return of stocks was found to increase with increase in dividend yields. However, no such relationship was found for the 30-year period ending in 1967. Blume further postulates that the inconclusive result could be due to the restrictive nature of CAPM where dividend yield could be acting as a proxy for some other variable omitted from the model.

Fama and French(1988)[9] study the effect of dividend yield on the return of stocks listed in

---

3 Black,Jensen and Scholes found a significant positive relationship between systematics risk and average returns. This led to widespread acceptance of Capital asset pricing model in the investment community.

4 Common stocks of small firms on an average earn significantly higher than common stocks of large firms. This unexplained phenomenon is commonly known as "Size Effect"

NYSE for the time period 1927-1986. A regression model is formulated to find the magnitude of returns explained by the dividend yield of the stock. A cross-sectional regression analysis is then performed on various stocks listed in NYSE across different time periods. It was observed that dividend yields on an average explained 5% of the stock returns. In case of smaller time periods like two to four years, dividend yields could explain over 25% of the stock returns.

Kothari and Shanken(1997)[10] conduct a time series analysis to test the effect of book-to-market value and dividend yield on the expected return of stocks. Both book-to-market value and dividend yield are found to be very reliable indicators for explaining variation in returns of stocks during time period 1926-1991 and sub-period 1941-1991. The book-to-market value is significant over the full period while the dividend yield is stronger during the sub-period. A change in one standard deviation of book-to-market value resulted in over a 20 percent change for stock returns.

Connor and Sehgal (2001)[11] test the relevance of Fama-French three-factor model of stock returns in the Indian equity markets. Stocks of small companies in general are found to earn a significantly higher return when controlled for risk and book-to market value. Also, stocks with high book-to-market value earn a significantly higher return. The findings are in general consistent with the prediction of Fama-French model.

Rosenberg, Reid and Lanstein(1985)[12] examine the effects of book-to-market value on the expected returns of stocks. A hedged portfolio is created where stocks having high book-to-market value are long and those having low book-to-market value are short. The portfolio was found to have an average monthly return of 0.36% during the 12-year span of 1972-1984. A strong seasonality is witnessed in the returns with January having an average return of 1.7%. The net positive monthly return of the portfolio was attributed to higher risk-adjusted returns of stocks having high book-to-market.

Lakonishok, Shleifer and Vishny(1994)[13] evaluate the performance of several value investing strategies based on book-to-market value, cash flow to price, earnings to price, growth of sales. Equal weighted portfolios were formed to analyze the one-dimensional as well as two-dimensional effects of value investment strategies. For portfolios form on book-to-market value alone, a high book-to-market value led to a higher risk-adjusted return. A similar result was observed for portfolios formed based on cash flow to price and earning to price. In case of growth of sales, a negative effect was observed where high growth to sales led to lower risk-adjusted returns. Portfolio returns were also observed to be higher when portfolios were formed based on two dimensions. Investment strategies that involved buying out of favor value stocks outperformed other glamour stocks, which where characterized by exorbitant valuations, low cash and abnormally high expected growth rates.

French and Fama(1998)[14] analyze the performance of value and growth stocks in thriteen major global stock markets. Cross sectional regressions were performed on stocks of major global equity markets to calculate the effect of book-to-market value, earnings to price on returns. Value stocks, which are characterized by high ratios of book-to-market, earnings to price, cash flow to price are found to outperform growth stocks by an average of 7.68 percent in twelve of the thirteen major global equity markets during the 1975-1995 period. The relevance of value investing principles in international markets coupled with globalization led to widespread institutional investments in these markets.

French and Fama(1996)[15] study the anomalies related to the multi-factor asset pricing model in which the average returns on common stocks are related to characteristics of the firm life size, price/earnings, cash flow/price, book-to-market equity. Many of the CAPM average-return anomalies are found have strong autocorrelations. This leads to distorted results during multi-dimensional analysis. The Fama and French three-factor model captures most of the anomalies and is very useful in explaining the excess returns of stocks. The three-factor model postulates that the returns of stocks aredependenton their respective systematic risks, size and book-to-market value. The results of the three-factor model are also consistent with those observed by Lakonishok,Shleifer and Vishny(1994).

Sehgal and Tripathi(2005)[16] analyze the size effect in the Indian stock market for the top 482companies during the period 1990-2003. A strong evidence of size effect is found when using market capitalization, enterprise value, net fixed assets, net annual sales, total assets & net working capital as proxies for size. Size based investment strategies are found to be economically feasible as it provides a higher risk-adjusted return. However, frequent rebalancing of size-based portfolio is found to be undesirable.

Rationale of the Study

Financial sector reforms constitute the core of the New Economic policy initiated in Indian in the early 1990s. As a result of this, Indian stock market has witnessed great changes and transition from a dull to an emerging stock market in the international arena. Improved market surveillance, trading mechanism and introduction of new financial instruments have made it a center of attraction for Foreign Institutional investors. Entry of FIIs and at the domestic level spectacular growth of the corporate sector and mutual fund industry have further added to the depth and with of the Indian stock market. With a market capitalization of about Rs 800,000 crores, Indian stock market has been witnessing developments compatible with those of developed countries and has witnessed superior returns. Over the years, the market has witnessed substantial increase in the number of listed companies, greater reliance on market for resource mobilization, remarkable increase in number of brokers as well as investor population. There is a move towards greater transparence and market efficiency.

In such an emerging market, security analysts, institutional investors, fund managers and other market players continuously search for trading strategies that can outperform the market. One such strategy based on company size has its genesis in the most strongly documented CAPM anomaly i.e.. the "size effect". Other strategies include value-investing strategies, which aim to select pick stocks based on their relative market valuation using parameters such as P/E, P/B, P/S etc., As said earlier a number of research studies have comprehensively examined the existence and possible causes of size effect. However, most of these studies relate to the United States and other mature stock markets. Studies on emerging stock markets including India is limited and relatively more recent in origin.

Objective

The primary objectives of the study are:

- To check if CAPM is empirically valid in the Indian stock market.

- To test whether the size effect exists in the Indian stock market and identifies the causes for the presence (or absence) of the size effect in Indian stock market.
- To test performance of value stocks and validate the presence or absence of value investing.
- To test the performance of growth stocks and validate the presence or absence of growth investing strategies.
- To compare value and growth investing strategies.
- To test the validity of multi-factor CAPM in India.

Data and Their Sources

- **Company Specific Data**

  The sample for the purpose of study consists of 100 companies listed in Bombay stock exchange. These companies represent a broad spectrum as they belong to all major sectors of the economy and represent a very significant percentage of the total market capitalization on Bombay Stock Exchange.

  The basic data for the study consists of month-end closing adjusted share prices of the sample companies for the period January 1995 to April 2014. The adjusted closing share prices have been converted into monthly return data for further analysis. Besides this, the study also employs annual accounting data regarding market capitalization, Price/Sales and annual revenue growth rate.

  The relevant data for the study have been primarily collected from the Bombay Stock Exchange Website. The data regarding accounting and financial information for the sample companies have also been collected form the same source.

- **Market-Proxy**

  BSE-Sensex has been used as a proxy for market. Sensex is a free-float market-weighted stock market index of 30 well-established and financially sound companies listed on Bombay Stock Exchange. The 30 component companies, which are some of the largest and most actively traded stocks, are representative of various industrial sectors of the Indian economy. The idea for choosing it as the market proxy is also warranted by the fact of its continuous availability since 1990.

- **The Sample Period**

  The sample period for the study stretches from March 1995 till April 2014. This 19 year period has witnessed metamorphic changes in the Indian economy especially transformation of Indian stock market from a rather dull to highly buoyant market in international arena. For the purpose of meaningful analysis the entire sample period of 19 years is further divided into two sub-periods -

  I. First Sub-Period (March 1995 to December 1999) : This period has been used for the calculation of pre-ranking beta for testing the empirical relevance of CAPM.

  II. Second Sub-Period (January 2000 to December 2012) : This period has been used for calculating the effect of various parameters on stock returns. All the panel data regressions have been carried out in this time period.

Methodology

Calculation of Stock Beta :

$$R_i = \sigma+\beta\,(Rm) + \varepsilon$$

R_i = Monthly Return of stock i.

R_m= Monthly return of a stock market index like Sensex/Nifty.

ξ = Disturbance Term.

A regression is performed with monthly market return as the independent variable and the monthly stock return as the dependent variable to obtain the beta of the stock. This beta is termed as the pre-market beta as it is used to analyze the future stock returns.

The stocks are then sorted into equally weighted portfolios based on their pre-market betas. This is done to reduce the heteroscedasticity and errors in variables.

Fama-Macbeth regression are then performed on variables like Price-to-Sales Ratio, Market Value to test the significance of the variable in measuring the cross-section of expected stock market returns. Both univariate and multivariate regression analysis on these respective variables are performed.

The regressions performed are as follows:

Two independent variables -

$$Ri = \sigma1 + \beta\,(Rm)+ \gamma(ME) + \varepsilon$$

$$Ri = \sigma2 + \beta\,(Rm) + \Phi(growth) + \varepsilon$$

$$Ri = \sigma3 +\beta\,(Rm) + \psi(P/S) + \varepsilon$$

Three independent variables -

$$Ri = \sigma + \beta\,(Rm) + \gamma(ME) + \Phi(growth) + \varepsilon$$

$$Ri = \sigma + \beta\,(Rm) + \gamma(ME) + \psi\,(P/S) + \varepsilon$$

$$Ri = \sigma + \beta\,(Rm) + \psi\,(P/S) + \Phi(growth) + \varepsilon$$

$$Ri = \sigma + \beta\,(Rm) + \gamma(ME) + \Phi(growth) + ?(P/S) + \varepsilon$$

Panel data regression is performed to determine the necessary coefficients. The significance of the each of the coefficients is tested using t-test and the accuracy of the regression equation is measured using Pearson's r coefficient.

Results

The capital asset pricing model is found to be relevant in the Indian equity markets. The systematic risk is found to be very significant in explaining the returns of stocks. However, it is found to explain only 30% of the returns. This suggests that there are perhaps other factors, which can explain the stock returns. The fact that systematic risk is a significant factor in explaining stock market returns in India empirically validates the relevance of CAPM in India albeit to a much smaller extent than suggested by the model.

The size effect is found to exist in the Indian equity markets but explains only 2.5% of the respective stock's return. This is significantly below the levels witnessed by Fama & French(1992) in their multi-factor model in US equity market. We can therefore conclude that even though the size effect is significant, it does not account for an accurate explanation of stock returns. There is precise reason as such for the presence of size effect. One explanation could be the fact that the vast majority of institutional investors are barred from investing in small capitalization stocks due to liquidity concerns and this artificially reduces the demand for stocks. Another reason could be the higher risk in general for smaller stocks.

The effect of growth (Growth in Revenues) on stock returns is found to be insignificant. This suggests that growth alone has no effect on stock returns. Growth investing strategies were very famous in India around the time of dot-com bubble before 2000. The performance of those stocks since then could perhaps be one of the reasons for the insignificant effect of growth on stock returns. Growth alone has no explanation for stock returns.

The Price-to-sales ratio measures the valuation of a stock. Usually growth stocks have high values of P/S ratio and value stocks have low values. The price to sales ratio is found to have a very significant and positive effect on stock returns. The price-sales ratio is significant in independently explaining 3% of stock returns.

When the stock returns are regressed with systematic risk and market value as independent variables, the systematic risk is found to be very significant and market value is found to be insignificant. This suggests that both systematic risk and market value are not useful in explaining stock market returns together. The systematic risk perhaps captures the effect of Market Value due to correlation between the respective variables. This is contrary to the predictions of multi-factor model proposed by Fama &French (1992) where market value is found to be significant in explaining stock returns.

The systematic risk and price-to-sales ratio together account for a marginally better explanation of stock returns then systematic risk alone. This is partially in line with multi-factor CAPM where the Book-to-Market valuation ratio is found to have a significant effect on stock returns. The systematic risk and price-to-sales ratio together explain about 32% of a stock's return. This is considerably lower than the levels witnessed in the Multi-factor CAPM.

The fact that only 32% of stock's return can be measured by the proposed factor suggests that there are either other factors that efficiently measure a stock's return or the returns are random with no other factors having any definitive effect. This result is quite poor by the Multi-Factor model standard as it efficiently captures more than 80% of the stock's return. This can perhaps by attributed to the less developed nature of the Indian equity markets when compared to US equity markets. Also, the trading volumes are a lot lower in Indian equity markets, which could be responsible for the unexplained returns of stocks.

References

"The Relationship between return and market value of common stock", Rolf W. Banz, Journal of Financial Economics 9 (1981) 3-18.

"Investment performance of common stocks in relation to their price-earnings ratios: A test of the efficient market hypothesis", S.Basu, The Journal of Finance Volume 32, No.3.

"Risk, Return, and Equilibrium: Empirical Tests", Eugene F. Fama, James D. Macbeth, The Journal of Political Economy, Vol 31, No.3.

"The Cross-Section of Expected Stock Returns", Eugene F. Fama, Kenneth R. French, The Journal of Finance, Vol 57, No.2.

"The relationship between earnings yield, market value and return for NYSE Common stocks", SanjoyBasu, Journal of Financial Economics 12(1983) 129-156.

"Another Look at the Cross-section of Expected Stock Reutrns", S.P. Kothari, Jay Shanken and Richard G. Sloan,The Journal of Finance Vol 50,No.1

"Size-related anomalies and stock return seasonality", Donald B Keim , Journal of Financial Economics 12(1983) 13-32.

"Portfolio Theory : A step towards its practical application". Marshell E Blume, Jounral of Business Vol 43, No. 2.

"Dividends and Expected stock returns", Jounral of Financial Economics, Vol 22, Issue 1.

"Book -to-market, dividend yield, and expected market returns: A time-series analysis", Journal of Financial Economics, Vol44 , Issue 2.

"Tests of French and Fama Model in India", LSE Online Library, Identification 379.

"Persuasive evidence of market efficiency", Journal of Portfolio Management, Vol 11, No.3

"Contrarian Investment, Extrapolation and Risk", Journal of Finance, Vol 49, Issue 5.

"Value versus growth: International Evidence", Journal of Finance, Vol 53, Issue 6.

"Multifactor explanation of asset pricing anomalies", Journal of Finance, Vol 51, Issue 1.

"Size Effect in Indian Stock Market: Some Empirical Evidence", Journal of Business Perspective, Vol 9, Issue 4.

Calculations

Calculation of Pre-Market Beta:

Month	Close Price	No.of Shares	No. of Trade	Total Turnov	mv	p/s	growth	return		sensex		
Jan-92	340	0	0	0	0	#DIV/0!				20.6	56.7786893	beta
Feb-92	360	0	0	0	0	#DIV/0!	#DIV/0!	5.88235294		31.1	98.8196252	0.57460385
Mar-92	440	0	0	0	0	#DIV/0!	#DIV/0!	22.2222222		42		
Apr-92	425	0	0	0	0	#DIV/0!	#DIV/0!	-3.4090909		-9.3		
May-92	430	0	0	0	0	#DIV/0!	#DIV/0!	1.17647059		-22.7		
Jun-92	490	0	0	0	0	#DIV/0!	#DIV/0!	13.9534884		2.5		
Jul-92	430	0	0	0	0	#DIV/0!	#DIV/0!	-12.244898		-11.5		
Aug-92	280	0	0	0	0	#DIV/0!	#DIV/0!	-34.883721		11.2		
Sep-92	300	0	0	0	0	#DIV/0!	#DIV/0!	7.14285714		8.7		
Oct-92	290	0	0	0	0	#DIV/0!	#DIV/0!	-3.3333333		-14		
Nov-92	287.5	0	0	0	0	#DIV/0!	#DIV/0!	-0.862069		-11.1		
Dec-92	295	0	0	0	0	#DIV/0!	#DIV/0!	2.60869565		3.9		
Jan-93	290	0	0	0	0	#DIV/0!	#DIV/0!	-1.6949153		2.5		
Feb-93	290	0	0	0	0	#DIV/0!	#DIV/0!	0		-1.1		
Mar-93	290	0	0	0	0	#DIV/0!	#DIV/0!	0		-14		
Apr-93	280	0	0	0	0	#DIV/0!	#DIV/0!	-3.4482759		-6.9		
May-93	280	0	0	0	0	#DIV/0!	#DIV/0!	0		3.3		
Jun-93	290	0	0	0	0	#DIV/0!	#DIV/0!	3.57142857		1.6		
Jul-93	275	0	0	0	0	#DIV/0!	#DIV/0!	-5.1724138		4.5		
Aug-93	350	0	0	0	0	#DIV/0!	#DIV/0!	27.2727273		13.1		
Sep-93	342.5	0	0	0	0	#DIV/0!	#DIV/0!	-2.1428571		2.9		
Oct-93	337.5	0	0	0	0	#DIV/0!	#DIV/0!	-1.459854		-1.3		
Nov-93	355	0	0	0	0	#DIV/0!	#DIV/0!	5.18518519		20.9		
Dec-93	415	0	0	0	0	#DIV/0!	#DIV/0!	16.9014085		3.5		
Jan-94	425	0	0	0	0	#DIV/0!	#DIV/0!	2.40963855		19.4		
Feb-94	490	0	0	0	0	#DIV/0!	#DIV/0!	15.2941177		8.3		
Mar-94	490	0	0	0	0	#DIV/0!	#DIV/0!	0		-12.8		
Apr-94	500	0	0	0	0	#DIV/0!	#DIV/0!	2.04081633		-2.2		
May-94	485	0	0	0	0	#DIV/0!	#DIV/0!	-3		3.2		
Jun-94	530	0	0	0	0	#DIV/0!	#DIV/0!	9.27835052		5.2		
Jul-94	580	0	0	0	0	#DIV/0!	#DIV/0!	9.43396226		2.3		

Portfolio Parameters:

Portfolio	mv	ps	growth	return	Market			
2	136241477	0.8620848	2.71581264	2.83772487		3.98	35.3419703	0.68308752
2	93605130.7	0.84962706	2.08240969	-10.94527		4.65	51.7385685	
2	81328600.6	0.95900905	-28.655872	-7.5700534		-8.19		
2	42794685.9	0.87342367	-20.167252	-4.3137866		-6.87		
2	64490236	0.92734885	81.9435791	-0.4871757		-4.81		
2	53479220.9	0.91152658	44.5971185	-2.8547471		7.11		
2	47665295.2	0.85025043	-7.2347879	-6.9276664		-9.87		
2	34819948	0.88203381	-47.1268	-5.976097		4.61		
2	32358121.3	0.87762957	99.7365165	-5.2237777		-8.64		
2	42310093.8	0.88570038	0.05453086	-2.7818666		-9.27		
2	73531400.4	0.91813573	41.0131371	4.80522012		7.73		
2	69636013.8	0.90242936	29.4782533	5.97742535		-0.65		
2	65556713.4	0.90227367	1173.94761	-1.4096654		8.93		
2	112423618	0.86986431	43.7096083	-1.9801355		-1.84		
2	65212029.4	0.860025	-45.642154	-10.426581		-15.13		
2	37751430.5	0.89422515	-21.852717	-3.8886126		-2.36		
2	61077430	0.90213984	-29.87209	-0.1969577		3.2		
2	37801296.1	0.87162783	-18.695174	-4.759254		-4.82		
2	24161335.9	0.88014817	-20.608033	-4.2236659		-3.69		
2	16825891	0.88489728	-41.529553	-6.9229098		-2.53		
2	30201489.9	0.885606	5.08984372	-5.9548924		-13.35		
2	39448066.8	0.90019801	-21.780448	-1.7552213		6.32		
2	25429159.6	0.90951044	46.2136369	5.07697957		9.98		
2	28230454.1	0.90194493	-28.246802	-0.6968006		-0.77		
2	49307992.3	0.8725254	31.0595097	-2.668072		1.49		
2	254542813	0.86851474	495.688292	5.01606536		7.59		
2	144769889	0.88683388	2.06540086	4.54229779		-2.61		
2	184970199	0.87393741	-6.1903355	0.03848897		-3.78		
2	289025801	0.87670832	-49.25382	-3.1965244		-6.36		

Regressions:

```
. xtreg return market,re

Random-effects GLS regression                   Number of obs      =      1560
Group variable: portfolio                       Number of groups   =        10

R-sq:  within  = 0.0000                         Obs per group: min =       156
       between = 0.0000                                        avg =     156.0
       overall = 0.3081                                        max =       156

                                                Wald chi2(1)       =    808.73
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      market |   .8017014   .0281911    28.44   0.000     .7464478    .8569549
       _cons |   .3207781   1.141547     0.28   0.779    -1.916614     2.55817
-------------+----------------------------------------------------------------
     sigma_u |  3.5471467
     sigma_e |  8.2710196
         rho |  .15535173   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. xtreg return mv,re

Random-effects GLS regression                   Number of obs      =      1560
Group variable: portfolio                       Number of groups   =        10

R-sq:  within  = 0.0026                         Obs per group: min =       156
       between = 0.3341                                        avg =     156.0
       overall = 0.0247                                        max =       156

                                                Wald chi2(0)       =         .
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =         .

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          mv |   4.31e-10   1.80e-10     2.40   0.016     7.92e-11    7.83e-10
       _cons |   .3565603   1.054857     0.34   0.735    -1.710021    2.424042
-------------+----------------------------------------------------------------
     sigma_u |  3.0147075
     sigma_e |   10.19094
         rho |  .08046894   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. xtreg return growth, re

Random-effects GLS regression                   Number of obs      =      1560
Group variable: portfolio                       Number of groups   =        10

R-sq:  within  = 0.0000                         Obs per group: min =       156
       between = 0.0014                                        avg =     156.0
       overall = 0.0001                                        max =       156

                                                Wald chi2(1)       =      0.03
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.8664

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      growth |   8.80e-10   5.23e-09     0.17   0.866    -9.37e-09    1.11e-08
       _cons |   1.232724   1.210793     1.02   0.309    -1.140387    3.605834
-------------+----------------------------------------------------------------
     sigma_u |  3.7363872
     sigma_e |  10.204147
         rho |  .11822471   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. xtreg return ps, re

Random-effects GLS regression                   Number of obs      =      1560
Group variable: portfolio                       Number of groups   =        10

R-sq:  within  = 0.0132                         Obs per group: min =       156
       between = 0.1832                                        avg =     156.0
       overall = 0.0297                                        max =       156

                                                Wald chi2(1)       =     22.37
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ps |   7.60e-08   1.61e-08     4.73   0.000     4.45e-08    1.08e-07
       _cons |   .8527835   1.096678     0.78   0.437    -1.296666    3.002234
-------------+----------------------------------------------------------------
     sigma_u |  3.3625569
     sigma_e |  10.136751
         rho |  .09912974   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Portfolio Construction:

1	Ranbaxy	0.135	-0.8696662	0.3105
2	ICICI	0.14	-0.853872	
3	State Bank of Mysore	0.15	-0.8239087	
4	OBC	0.29	-0.537602	
5	Chambal Fertilizers	0.36	-0.4436975	
6	UB Holdings	0.37	-0.4317983	
7	Lupin	0.4	-0.39794	
8	Borosil	0.41	-0.3872161	
9	State Trading Corporat	0.42	-0.3767507	
10	ABB	0.43	-0.3665315	0.50181818
11	State Bank of Travancc	0.44	-0.3565473	
12	Bharat Electronics	0.46	-0.3372422	
13	Dena Bank	0.46	-0.3372422	
14	Kirloskar	0.47	-0.3379021	
15	National Fertilizer	0.5	-0.30103	
16	Indian Oil	0.52	-0.2839967	
17	LIC Housing Finance	0.52	-0.2839967	
18	Asian Paints	0.57	-0.2441251	
19	Manglore Refinery	0.57	-0.2441251	
20	Britania	0.58	-0.236572	
21	IDBI	0.58	-0.236572	0.648
22	State Bank of Bikaner I	0.62	-0.2076083	
23	Tata Communication	0.62	-0.2076083	
24	Wipro	0.63	-0.2006595	
25	Balmer Lawrie	0.64	-0.19382	
26	J&K Bank	0.64	-0.19382	
27	Jain Irrigation	0.65	-0.1870866	
28	Birla Corporation	0.7	-0.154902	
29	Gujurat State Fertilizer	0.7	-0.154902	
30	Kotak Mahindra	0.7	-0.154902	
31	Gujurat State Financial	0.71	-0.1487417	0.745
[illegible]	[illegible]	[illegible]	[illegible]	

40	Hindalco	0.79	-0.1023729	
41	Nestle	0.79	-0.1023729	0.832
42	Adani Enterprises	0.8	-0.09691	
43	Raymond	0.82	-0.0861861	
44	Tata Power	0.82	-0.0861861	
45	Cipla	0.84	-0.0757207	
46	Engineers India	0.84	-0.0757207	
47	Aurobindo Pharma	0.85	-0.0705811	
48	Bharat Gears	0.85	-0.0705811	
49	Housing Development Fi	0.85	-0.0705811	
50	Chennai Petroleum	0.86	-0.0655015	
51	Gail	0.87	-0.0604807	0.908
52	HPCL	0.87	-0.0604807	
53	Sun Pharma	0.87	-0.0604807	
54	Bharat Forge	0.89	-0.05061	
55	GlaxoSmithKline	0.89	-0.05061	
56	Hero	0.89	-0.05061	
57	Bombay Dying	0.94	-0.0268721	
58	Bajaj Hindustan	0.95	-0.0222764	
59	MTNL	0.95	-0.0222764	
60	SAIL	0.96	-0.0177288	
61	Aditya Birla Chemical	1.004	0.00173371	1.0266
62	Tata Motors	1.01	0.00432137	
63	ACC	1.02	0.00860017	
64	Sesa Sterlite	1.02	0.00860017	
65	Apollo Hospitals	1.022	0.0094509	
66	BPCL	1.03	0.01283722	
67	Tata Global Beverages	1.03	0.01283722	
68	Corporation Bank	1.04	0.01703334	
69	Idea	1.04	0.01703334	
70	Birla Power Solution	1.05	0.0211893	
71	Container Corporation	1.05	0.0211893	1.1063
[illegible]	[illegible]	[illegible]	[illegible]	