Security Market Imperfections In World Wide Equity Markets

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1 Introduction

Ever since the stock market exists investors are seeking for the most profitable investments that would give abnormally high returns either in the short or the long run. Abnormally high returns are usually achieved by insider informations or by very accurate predictions of stock movements. In this seminar we will first shortly introduce the mathematical model (CAPM) which is used to predict the return on stock markets and the efficient market hypothesis (EMH). The EMH and CAPM are fundamental theories of an efficient market and since we will be discussing market imperfections (i.e. inefficiencies) it makes sense to use them as an introduction. Then, we will take a closer look at the empirical evidence of the anomalies concerning the model and show an alternative to the existing model. We will also discuss anomalies of the EMH caused by investors behavior and the last section will include my views of the issues which were covered.

1.1 Predicting the future

The most attracting area of research in financial economics generating the most excitement and attention over the last three decades concerns the predictability of stock returns. Before we introduce the Capital Asset Pricing Model (hereinafter: CAPM), let us first define an efficient market.

- Efficient Market Hypothesis

  The Efficient Market Hypothesis (hereinafter: EMH) maintains that market prices fully reflect all available information. The idea is widely used in theoretical models and empirical studies of security prices, generating some controversy as well as fundamental insights into the price discovery process. Most of the critique comes from psychologists and behavioral economists who argue that the EMH is based on counterfactual assumptions regarding human behavior, that is, rationality. What the EMH basically states, is that an investor can not outperform the market and achieve constantly above average returns, given the information available at the moment of the trade.

- Capital Asset Pricing Model

  The Capital Asset Pricing Model, given certain simplifying assumptions, states that the rate of return of any security is linearly related to that security's systematic risk called beta.

  $$R_a = R_f + \beta_a(R_m - R_f)$$

  Where:

  R_a is the Return Rate of the Asset
  R_f is the Risk Free Return Rate
  R_m is the Market Return Rate

β_a is the Security's Systematic Risk of the Asset a

If the model is correct and security markets are informationally efficient, securities should on average conform to the above equation. Departures from the relation represent violations of the joint hypothesis that both the EMH and the CAPM are correct.

- Beta - the systematic risk factor

  From the CAPM it is obvious that as the only parameter used to predict the future return of an asset is the factor beta (R_f is usually the return rate of AAA rated government bond and R_m is the return rate of the stock index). Therefore, we will take a closer look at how the factor beta is calculated.

$$\beta_a = \frac{Cov(R_a, R_m)}{Var(R_m)}$$

  Some remarks on beta:

  1. Beta is a measure of a stock's volatility in relation to the overall market.
  2. Obviously, the market has a beta of 1.0
  3. If a stock moves less than the market, the stock's beta coefficient is less than 1.0.
  4. High-beta stocks are riskier, but provide a potential for higher returns, consequently low-beta stocks pose less risk but also lower returns.

  Some negative aspects of beta:

  1. Beta does not incorporate new information.
  2. Past price movements are poor predictors of the future (this we will show later on in this paper). Betas are actually reflective pools of the past. They are based on the past and therefore will not tell us what is ahead.
  3. Betas on a single stock tend to flip over time, which makes it unreliable. Therefore it has a stronger application in day-trading than in long-term investments.

  In other words, volatility refers to the amount of uncertainty or risk about the degree of changes in a stock's value.

Since the 1980s a growing number of empirical studies suggest that betas of common stocks do not adequately explain cross-sectional differences in stock returns. Instead several other variables such as size(measured by market capitalization of the firm's common stock), ratio of book to market, earning to price ratio, which did not have any basis in existing models seem to have more significant predictive ability. These finding may be attributed as evidence of market inefficiency or on the other hand as evidence that the CAPM is an incomplete description of equilibrium price formation.

Therefore we will first take a look at the imperfections which can be explained by the incompleteness of the CAPM and then on imperfections which are caused by the psychology and behavior of traders on the market.

2 Imperfections of the CAPM

Already in the 1970s the first ad hoc alternatives to the CAPM were introduced. Researchers found that the price-to-earnings and the market capitalization of common equity(size) provided more explanatory power for future returns than the beta factor did. Later on, several other studies introduced even more predictive factors, such as ratio of book to market value, price per share and prior return performance, to the CAPM. Jointly, these studies represented a big challenge to the CAPM as they have proven to have a higher predictive ability in terms of cross-sectional return predictability.

An extended model which would incorporate also other factors than beta would have the following form:

$$R_i = a_0 + a_1\beta_i + a_2 \sum_{j=1}^{n} c_{ij} + e_i$$

Where:
c_{ij} represents the characteristics j for the underlying stock i
e_i represents the error term

In the following chapter when analyzing the cross sectional return predictability using additional factors such as the above mentioned, we will use some basic summary statistics that document the finding with a common data set for the same time period using the same empirical methods. This way we will ensure that the data sets are comparable and contribute to the significants of the results. We will form portfolios based on the various factors(size, price to earnings ratio...) and reports the findings using monthly value weighted portfolio returns.

2.1 The Size Effect

First we will examine how the size of a company traded on the stock market affects the rate of return. We will form 10 portfolios based on their size and examine the weighted monthly returns of the portfolios over a fixed time period.

Portfolio	Size	Return	Beta
1	\$10	1.56	1.11
2	\$26	1.41	1.14
3	\$48	1.25	1.10
4	\$83	1.23	1.15
5	\$104	1.22	1.10
6	\$239	1.12	1.04
7	\$402	1.09	1.06
8	\$715	1.09	1.05
9	\$1,341	1,03	1.03
10	\$5,820	0,83	0,95

Table 1: Empirical evidence on the size effect

The table reports the average monthly returns for ten value weighted size portfolios of the New York Stock Exchange(hereinafter: NYSE) and American Stock Exchange(hereinafter: AMEX) stocks for the period April 1962 to December 1994, along with the beta and average market capitalization of the stocks in the portfolio. We can easily see the negative relation between size and average returns. Furthermore, we can notice that with declining market capitalization, the beta is also declining. However, after adjusting for the explanatory power of beta, the differences in estimated betas between the smallest and the largest portfolios is insufficient to explain the difference in returns between the two portfolios.

The model which would incorporate the size factor in calculating the return would have the following form:

$$R_i = a_0 + a_i b_i + a_2 S_i + e_i$$

Where S_i represents the measure of the relative market capitalization for the stock i. So far we have provided evidence on the size effect on the NYSE and AMEX, but as we intend to use an asset pricing model which would be applicable in all markets around the world we have to examine wether the size effect is also present in other markets. Following the discovery of the size effect in the US, numerous studies have provided evidence of the same effect across other countries such as Belgium, Canada, France, Ireland, Japan, Mexico, Spain, Switzerland and the UK. In all these countries, except Mexico, we did not find evidence of a relation between return and beta risk (a_1 is statistically indistinguishable from zero). On the other hand, we have found a strong negative relation between returns and size in all countries except Canada and France (a_2 is significantly less than zero). Let us now look at the monthly size premium(difference between the average monthly return on the portfolio of smallest stocks and the average monthly return on the portfolio of the largest stocks) across the countries mentioned above.

Country	Monthly Size Premium	Test Period	Number of Portfolios
Australia	1.21%	1958 – 81	10
Belgium	0.52%	1969 – 83	5
Canada	0.44%	1973 – 80	5
Finland	0.76%	1970 – 81	10
France	0.90%	1977 – 88	5
Germany	0.49%	1954 – 90	9
Ireland	0.47%	1977 – 86	5
Japan	1.20%	1965 – 87	10
Korea	−0.40%	1984 – 88	10
Mexico	4.16%	1982 – 87	6
New Zeeland	0.51%	1977 – 84	5
Singapore	0.41%	1975 – 85	3
Spain	0.56%	1963 – 82	10
Switzerland	0.52%	1973 – 88	6
Taiwan	0.57%	1979 – 86	5
UK	0.40%	1973 – 92	10
US	0.61%	1951 – 94	10

Table 2: International evidence on the size effect

From Table 2 we can see that in all countries, except Korea, the size premium is positive during the sample periods. Also, the size premium varies across markets; it is most pronounced in Australia and Mexico, and least significant in Canada and the UK. As it is the case with US, the differences in beta across size portfolios cannot explain differences in returns. However, across the fifteen observed countries there are significant differences between the size of the largest and the smallest portfolios. Due to the differences in the sample periods and different portfolios sizes we can not give any final conclusions on the size effect on other markets, whereas the beta factor is consistent across all markets.

2.2 The Earnings-Yield Effect

Earnings-related strategies have a long tradition in the investment community. The most popular of these strategies is the one that calls for buying stocks that sell low multiples of earnings, for example: A prudent investor should never pay as much as 20 times earnings and a suitable multiplier should be 12 or less. We will now group the portfolios like in table 1, not according to their size but E/P ratios.

Portfolio	E/P Ratio	Return	Beta
1	19.39	1.21	1.01
2	12.88	1.25	0.93
3	11.26	1.08	0.88
4	10.09	1.02	0.95
5	9.08	0.96	0.94
6	8.14	0.77	0.99
7	7.19	0.83	0.96
8	6.13	0.89	1.04
9	4.78	0.88	1.06
10	2.49	0.82	1,08

Table 3: Empirical evidence on the E/P effect

The difference in returns between the highest and lowest E/P portfolio is, 0.39% per month. In markets other than the US the E/P effect is less evident. There are several reasons for this, one of them being the lack of computerized accounting databases available for academic research. Furthermore, the evidence of the E/P effect is more varied across markets than that for the size effect. Countries in which the E/P effect has been noticed are: the UK, Japan, Singapore, Taiwan, Korea and New Zealand. In the UK, for example, researchers have reported an average monthly premium of 0.60% for the extreme portfolios(portfolios formed as in our example). When we adjust the differences for the systematic risk (i.e. beta), the conclusion remains the same. The same effect has been reported in Japan, firms with high E/P ratios outperformed firms with lower E/P ratios even after the adjustment for systematic risk. However, as it was the case with the size effect, there are markets where the E/P effect is not present at all. These countries include New Zealand(for the period 1977 to 1984) and Korea(for the period 1980 to 1988). In conclusion, there has been reported a significant E/P effect in the UK, Japan, Singapore and Taiwan and no decisive evidence of a E/P effect in New Zealand and Korea. Given the small sample periods and size, we can not draw any conclusions regarding the E/P effect.

2.3 Cash Flow to Price Ratio

As the E/P ratios can be easily manipulated by the shareholders, we will now focus on the cash flow to price ratio(hereinafter: CF/P ratio). We expect the CF/P ratio to be less biased and therefore possibly a better indicator for expected returns. Again we will first look for the CF/P effect in the US market.

The problem we are facing with the CF/P ratio is that the accounting principles vary across the markets we are analyzing. For example in Japan, firms are required to use

Portfolio	E/P Ratio	Return	Beta
1	52.08	1.47	1.00
2	27.75	1.32	0.90
3	23.02	1.17	0.91
4	19.91	0.94	0.99
5	17.37	1.14	1.01
6	15.05	0.87	0.99
7	12.96	1.12	1.03
8	10.85	1.05	1.08
9	8.40	0.89	1.06
10	4.77	0.80	1.07

Table 4: Empirical evidence on the Cash Flow to Price effect

the same depreciation schedule to calculate earning reported to shareholders and earning subject to corporate taxes. Therefore, all Japanese firms use accelerated depreciation for financial reporting which creates distortions in reported earning for firms with high capital investments. In the US, firms can use accelerated depreciation for tax purposes and straight-line depreciation for reporting purposes. Such accounting differences have to be taken into account when comparing the CF/P effect in different markets.

An example: In August 1990, the market P/CF was 7.6 in the US and 10.6 in Japan, whereas the market P/E was 15.8 in the US and 35.3 in Japan.

From the above table, we report an average difference in returns between the two extreme portfolios of 0.67% per month. This result is larger than the 0.56% obtained for the E/P effect. Finally, this amounts to 1.25% annual difference between the two effects. An alternative to the E/P and CF/P ratio would be the price to sales ratio(hereinafter: P/S ratio). The P/S ratio would probably be the least affected by shareholders manipulations or differing accounting principles.

To conclude this section, we have reported a significant CF/P effect in both the US and Japan, however in order to draw any definitive conclusion we would need to examine the effect in other countries as well and also take into account the different accounting principles.

2.4 Price to book effect

Another popular factor in predicting returns is the price-to-book ratio(hereinafter: P/B ratio). Only recently, researchers have examined the P/B ratio as one possible predictive factor in expected returns. As it is with the factors above, there is no theoretical model which would use P/B to predict the average returns on world wide equity markets. Let us look at the table which will give us some insight on the P/B effect.

Portfolio	E/P Ratio	Return	Beta
1	0.57	1.43	1.04
2	0.84	1.42	0.97
3	1.02	1.06	0.92
4	1.18	1.05	0.84
5	1.35	1.00	0.90
6	1.56	0.79	0.91
7	1.86	0.84	0.98
8	2.30	0.91	1.03
9	3.10	0.82	1.11
10	10.00	0.90	1.07

Table 5: Empirical evidence on the P/B effect

The negative relation between P/B value and stock returns is evident. The monthly difference in returns between the two extreme portfolios is 0.53%, which is higher than for the E/P(0.38%) effect but lower than that for the size effect (0.72%). Internationally, there is some evidence of the P/B effect on the Tokyo Stock Exchange, the London Stock Exchange and on stock exchanges in France, Germany and Switzerland. The reported average monthly differences between the extreme portfolios in these countries are: 0.53% in France, 0.13% in Germany, 0.50% in Japan, 0.31% in Switzerland and 0.23% in the UK.

2.5 The Prior Return Effect - Reversal vs. Momentum

Researchers have found evidence that the prior return may be a proxy for the expected return. However, two completely opposite effects have been documented - the Reversal and the Momentum effect.

- The Reversal effect

  The reversal effect states that stock which have performed good over past time horizons will eventually have poor returns in the future, and vice-versa. When analyzing the NYSE, researchers have documented that the stock which had the worst performance over a period of 3 to 5 years, eventually have the highest expected return in the future. Equally, stock which were performing best over the same time period, will eventually become losers and have the lowest return in the future. This effect, has also been documented in other markets than the US including Belgium, Japan, Brazil and the UK. The reversal effect is not evident on the Toronto Stock Exchange. The reversal strategy is generally more often used in long term investments, although there are some examples where the reversal strategy was also successful in the short run.

- The momentum effect

  The momentum effect is generally more often present in short term investment strategies, 6 - 12 months. In table 6 we have provided evidence of the momentum effect in the US market. The procedure is consistent with the tables above (portfolio grouped according to prior returns; same sample period).

Portfolio	**E/P Ratio**	**Return**	**Beta**
1	53.1%	1.18	1.13
2	24.9.1%	1.24	1.05
3	16.7%	1.09	1.02
4	11.2%	1.03	1.02
5	6.5%	0.88	0.96
6	2.3%	0.91	0.93
7	−1.9%	0.85	0.95
8	−6.6%	0.92	0.96
9	−13.1%	0.62	1.05
10	−29.6%	0.83	1.15

Table 6: Empirical evidence on the momentum effect

From the table we can see that portfolio with the highest prior returns, on average, earn higher subsequent returns. Also portfolios with the lowest prior returns, on average, earn the lowest subsequent returns. The prior return is measured over a 5 months period from the beginning of March to the end of October. The difference in monthly returns between the extreme portfolios is 0.34%.

Obviously the effects(reversal and momentum) depend on the portfolio formation date. The highest abnormal returns are most pronounced at the calendar year end. Specifically, negative abnormal returns are found when the strategy is started in June, whereas positive abnormal returns are achieved when the strategy is initiated in December.

Due to the above mentioned reasons of dependency on portfolio formation date, the prior return can not be considered a decisive factor in modeling the expected returns(unless we take into account the portfolio formation date).

2.6 One or many effects?

- Correlation of the variables
  Since E/P, CF/P and P/B are all calculated using the same common variable, i.e. price, we will take a closer look how depended(correlated) these variables are. To

check the correlation of the mentioned variables, we will use the pairwise Spearman rank correlations. The procedure will be the following:

1. Each year at the end of March, the NYSE and AMEX stocks are ranked independently on Size, P/B, E/P, CF/P, Prior Return and Price.
2. Pairwise Spearman Rank correlation are then computed
3. This is repeated for each year in the sample period 1962 - 1994. Mean rank correlations and standard errors are computed for the entire time series of values.
4. We report the average rank correlations and associated T-values(in brackets).

Variable	**Market Cap.**	**E/Price**	**CF/Price**	**Price/Book**	**Prior Ret.**
E/Price	$-0.1(-4.14)$				
CF/Price	$-0.11(-4.72)$	$0.68(45.00)$			
Price/Book	$0.32(17.31)$	$-0.43(-25.23)$	$-0.48(-24.32)$		
Prior Return	$0.06(1.72)$	$-0.13(-6.42)$	$-0.14(-7.27)$	$0.16(7.54)$	
Price/Share	$0.78(104.21)$	$-0.07(-3.80)$	$-0.15(-6.44)$	$0.34(19.49)$	$0.16(5.01)$

Table 7: Correlation of the variables

The estimated rank correlations are generally large and significant. Since the pairwise correlations among the Size, E/P, CF/P, P/B, prior return and price are significantly different from zero, we can conclude that there are some commonalities among the effects. As expected, the rank correlation between market capitalization and price was by far the strongest.

- Correlation of the risk premia
  In the previous sections we have noticed that there are significant differences in returns between the two extreme portfolios(portfolios grouped by size, E/P, CF/P ...). These differences in returns can be interpreted as risk premia, if these variables are sorting out securities based on risks that are not covered by beta. Under the assumption that these five variables are proxies for five different risks, the premia should be uncorrelated across variables.

  From the table 8 it is obvious that the premia associated with the five variables are correlated(coefficient significantly different from zero). Interestingly, the premia for prior return is negatively correlated to the other four variables, suggesting that the prior return is capturing a stock characteristics different from the other variables.

  To sum up, we can conclude that there is a high degree of commonality among the reported effects.

Variable	E/P	CF/P	P/B	Prior return
Size	0.265	0.444	0.472	−0.017
E/P		0.727	0.590	−0.230
CF/P			0.760	−0.212
P/B				−0.172

Table 8: Correlation of the risk premia

2.7 Possible explanations

Researchers have been publishing many different papers trying to explain the relation between the variables such as Size, Prior Return, Price to Earnings Ratio, Price to Book Ratio and Cash Flow to Price ratio. Many argue that these variables are actually proxies for risks which are not covered by the existing asset pricing models (i.e. covered by beta). The papers arguing that theory fall into 4 different categories:

1. Market inefficiency
   Several studies suggest that the excess returns are evidence of market inefficiency. For example, it is argued that investors are irrational because they avoid buying value stocks that are mistakenly considered too risky. Institutional investors avoid buying value stocks because the investors' performance is measured against indexes of large, glamour stocks. Again, investors who buy these neglected value stock outperform the indexes of large, glamour stocks.

2. Statistical biases
   Many argue that the reported results may be affected by biases in samples. Usual statistics which are used include stocks in their files only after the stock has proven a successful track record. Therefore, small firms with low P/B ratios that perform poorly will not be included in the sample.

3. Additional risk factors
   Some papers have emphasized the need to include other variables into the model as well, such as human capital and the systematic variability of beta-risk over the business cycle.

4. January effect
   Much of the effects described above disappear if the month of January is excluded from the sample period.

3 The Three Factor Model

The CAPM is an ex-ante, static (one-period) model which assumes a linear relationship between the expected return in a risky asset and its beta. So far we have discussed how other factors than beta can predict future return and the results were significant. Therefore, in this section we will take a closer look at the Fama-Franch Three Factor Model which also incorporates variables such as size, book to market and beta. It has the following form:

$$R_i = R_f + \beta_i(R_m - R_i) + b_s(SMB) + b_v(HML) + \alpha$$

Where:

R_i is the expected return of the stock i
R_f is the risk free return rate
R_m is the return rate of the market
SMB stands for the historic excess returns of small capitalization minus big capitalization stocks
HML stands for the historic excess returns of high book to market value stocks minus low book to market value stocks
α represents the error term

Once the variables HML and SMB are defined, we can determine the factors b_s and b_v by linear regression. We also have to keep in mind that the value of β in the three factor model does not identically correspond to the β from the CAPM, since now we have also other factors (SMB and HML) to cover for risk. The Fama-French three factor model explains over 90% of the diversified portfolio returns, compared to the average 70% given by the CAPM.

3.1 CAPM vs. The three factor model

A model for expected returns basically, as any other model, needs two features: it has to be simple enough to be understood and applied and complex enough to be as accurate as possible. The CAPM is a very simple(linear) model and therefor definitely fulfills the first requirement but as we have seen, the model has flaws. The good aspects of the model are that it collapses everything(all risk factors) into one factor and that it is simple. On the other hand, the negative aspect is that it does not allow for any other factors and it requires accurate measurement of the market risk premium $(R_m - R_f)$. Another issue of the CAPM which we did not discuss so far, is the fact that low beta firms tend to perform better than the CAPM would predict and vice versa, high beta firms tend to perform worse than predicted.

Disproving the CAPM is difficult to do conclusively, can you disprove if you haven't made the right assumptions? So far, no conclusive evidence was found against the CAPM or in favor of another model but there have been some alternative models developed.

3.2 Alternative Models

As the topic of this paper is market inefficiencies, we will only mention the alternative models but not discuss them in depth.

- Merton's intertemporal CAPM
  The Intertemporal CAPM is a linear factor model with wealth and state variable that forecast changes in the distribution of future returns or income. The main difference between the ICAPM and the CAPM is that investors hedge against shortfalls in consumption or against changes in the future investment opportunity set.

- Breeden's consumption CAPM
  The CCAPM implies that the expected risk premium on a risky asset, is proportional to the covariance of its returns and consumption in the period of the return. Basically the only difference is that the beta from the CCAPM does not correspond to the beta of the CAPM, since it is calculated differently.

- Ross's Arbitrage Pricing Theory
  The arbitrage pricing theory states that the expected return of a financial asset can be modeled as a linear function of various macro economic factors or theoretical market indices. In this theory, sensitivity to changes in each factor in represented by a different specific beta coefficient.

4 Market Imperfections caused by Investor's Behavior

4.1 Introduction

The stock movement is naturally affected by fundamentals of the stock/company, but another aspect which must not be ignored is the investors sentiment which can influence the direction of the stock movement. Wherever you go these days, people discuss the latest news and twists in world wide equity markets. Whether it's the disappointing IPO of Facebook, the housing bubble or the recent insider trading accusations on the Wall street, investors regularly discuss their views and opinions with others hoping to stumble across some new information. Who is to blame for the housing bubble? The people who tried to buy their own homes although they could not afford them or the banks who made it possible and ignored the risk of such businesses. Many people agree that the biggest twists and changes in stock prices, elude easy interpretation. However, economists often approach the problems differently than other people do. Economists stress the rationality of markets, whereas many others, like journalists, money managers or politicians stress the foolishness of traders.

A centerpiece of modern finance, which we have already mentioned before, is the efficient market hypothesis in which prices do not deviate from intrinsic values. Finance theory almost completely ignores the complex behavioral and cognitive factors that

guide investors decisions. Therefore, we will discuss why psychology matters and why the behavior approach should not be ignored when thinking of asset pricing.

Three main responses have arrived on the question 'What are the links between stock prices and new information?'.

1. The price is right.
   Meaning that stock prices correctly represent the current value of a stock and all information of the company. The theory would suggest that an indexing strategy is the best because no matter how you invest, you can not beat the market.

2. The prices of stocks are driven by animal spirits.
   These are the words of John Maynard Keynes which figuratively say that the stock prices do not mean very much in terms of real value of a stock company. This perspective is very much in contract to the first one. The 'animal spirits' theory states that investors should rely on technical analysis rather than on fundamental analysis when investing in stocks.

3. What goes up, must come down.
   The recently most popular theory which basically states that stock markets which grow over time, eventually have to fall. This theory can be related to the reversal investment strategy.

4.2 Reference class forecasting

Reference forecasting predicts the outcome of a planned action based on actual outcomes in a reference class of similar actions. Human judgement is optimistic due to overconfidence and insufficient consideration of distributional information about outcomes. Therefore, people tend to underestimate the costs and risks of action, whereas they tend to overestimate the benefits.

- Example:
  The American Association of Individual Investors has asked a random sample of investors for a stock forecast every week.

- Result:
  The data showed that, most individuals are upbeat in bull markets and loomy in bear markets. However, the forecasts had little predictive power.

4.3 Reaction to news on stock markets

How stock prices react to news depends (partly) on how investor's perceptions of company values and future earnings are influenced by the new information. We differentiate between two effects. The first has to do with short-term impact of new in light of the information already priced into the stock prices. The second effect has a more cognitive aspect, i.e. how the news changes the investors' perception of the company.

Lets take an example: Take the Nasdaq Composite Index in 2009. Just as the economy began to recover, after the crisis peak, the Comp rose 43.9% that year. Amounting to 0.14% for each of the 252 trading days in 2009. So, this was the average daily gain. One could think that the Index made about 0.14% a day for at least half of the 252 trading days. Or maybe just at 25 out of the 252 trading days the index rose for roughly 0.14%. The answer is 'No', the Index rose for about 0.14% only on 13 days out of the 252 days in the year. Even if you include the days where the Index fell by less than -0.14%, its only 28 days out of the 252. The natural question arising would be: 'How did the Index perform on other days during the year?'. The remaining 224 days were a rough and wild ride. Let us look at the biggest jumps(up and down) during the year:

1. January 20: -5.8% - The Inauguration Day
2. March 10: +7.0% - Big public announcement

And during the rest of the year it was not far from that. Either the stock goes up a lot or it looses a lot, but at the end of the year the daily return does not fit the average daily return calculated on a yearly basis (on most of the days of the year).

The exaggerated optimism in the stock market for firms with high P/E Ratios and exaggerated pessimism for firms with low P/E Ratios is especially significant. This is why we are going to take a closer look at the market reactions to earnings announcements.

4.4 Overreaction to news - The Reversal Strategy

The Contrarian/Reversal Strategy or Overreaction Hypothesis implies simultaneously buying previous losers and selling previous winners. The theory behind the strategy is that extreme previous losers are undervalued due to investors overreaction which are possibly instigated by some adverse news (among other earnings announcements). Given enough time, previous losers will outperform the market and generate substantial returns.

We will examine all companies listed on the NYSE since December 1925 and use returns over a two to five year period. Lets us look at the figures:

The above table shows that for the NYSE stocks(50 stocks were picked) which did the worst over an initial period of 5 years, eventually performed the best in the coming years with an annualized return rate of 8.0%. Generally, an arbitrage portfolio that finances its purchases of past losers by selling past winners earns positive returns in almost every case.

Let us make another experiment. Take the NYSE stock market, the period $1976-1984$ and about 100000 stock analyst forecasts. An arbitrage strategy that buys 20% of the companies for which the analysts were most pessimistic and finances the purchases by selling the 20% of companies for which analysts are most optimistic, earns substantial profits.

The market overreaction effect can be compared to the effect of voters approving or disapproving politicians depending on the current state of the economy.

Country	**Period**	**Lenght of Rank & Test Period**	**Arbitrage Portfolio Losers Minus Winners**
Australia	$1958-1987$	3 Years	3.6%
Belgium	$1970-1988$	2 Years	18.9%
Canada	$1950-1988$	5 Years	6.4%
Germany	$1961-1990$	5 Years	6.0%
Malaysia	$1986-1996$	3 Years	13.2%
The Netherlands	$1985-1990$	2 Years	4.4%
Spain	$1967-1984$	3 Years	12.3%
Sweden	$1983-1996$	3 Years	$-1.8\%(1983-1990)$ $3.2\%(1990-1996)$
Switzerland	$1973-1996$	5 Years	3.4%
The United Kingdom	$1975-1993$	5 Years	7.6%
The United States	$1926-1982$	5 Years	8.0%

Table 9: Evidence of the reversal effect

4.5 Underreaction to news - The Momentum Strategy

Companies which have good earnings news are much better in subsequent returns than are companies that report bad news. This effect lasts for several months which is a typical underreaction to the news. This investment strategy has proven to paid off consistently for over 25 years. The market behaves as the earnings news were discounted - especially at turning points. Around the announcements in the next quarters of the year, the market believes that earnings should be mirrored by what they were for the corresponding quarter from the previous announcement. This slow reaction to earnings announcements is very much related to the stock price momentum strategy.

The effect on the NYSE:

- For the period $1926-1982$ one-year past winners outperformed one-year past losers by 7.6% per year.
- From $1965-1989$, a strategy which buys stocks based on their past six-months returns and holds them for six months, earns an average annualized return of 12.0%.

Country	Period	Lenght of Rank & Test Period	Arbitrage Portfolio Losers Minus Winners
Austria	1980 – 1995	6 Months	11.2%
Belgium	1980 – 1995	6 Months	13.2%
Canada	1950 – 1988	1 Year	17.5%
Denmark	1980 – 1995	6 Months	13.1%
France	1980 – 1995	6 Months	11.6%
Germany	1961 – 1991	1 Year	7.9%
Italy	1980 – 1995	6 Months	11.2%
The Netherlands	1980 – 1995	6 Months	15.1%
Spain	1980 – 1995	6 Months	15.8%
Sweden	1980 – 1995	6 Months	1.9%
Switzerland	1973 – 1997	6 Months	7.7%
The United Kingdom	1980 – 1995	6 Months	10.7%

Table 10: Evidence of the momentum effect

4.6 Are these effect contradictory?

When looking at the tables which provide evidence on the Overreaction and Underreaction effect, one obvious question arises: 'Can both effects be logically true?'. One possible explanation would be the investors mental frames. Investors usually talk about 'growth firms' and 'declining industries' although there is little evidence in terms of annual earnings which would form a basis for such assertions. Eventually, when an earnings surprise hits, many investors refuse to believe it. The momentum effect is usually concentrated around earning announcements, therefore mental frames take time to adjust to the new information available.

Another possible reasons is that investors usually react stronger to private information and weaker to publicly available information. Lastly, the substantial differences between the two investment strategies, is that the momentum strategy is applicable for investments up to 1 year whereas the reversal strategy is applicable for long-term investments up to 5 years.

To sum up, people are human and the psychology will for sure play a major role in the behavior of international financial markets. The stock markets are rather a voting machine than a weighing machine, meaning that individuals will make their choices partly of reason and partly of emotion. Future research will have to throw more light on the voting machine aspect and on the links between market and decision-making anomalies. The behavioral approach once more proves that good judgement is critical, in money management as well as in every other aspect of life. Luckily, in the financial

arena it is impossible to get rich quick and there is no perfect receipt where and how to invest but one could improve his chances by following one of the strategies we have just discussed. The theory which will probably for sure be always true is the one that states that any stock which is growing and has been growing in the past will eventually have to fall. Therefore, buying glamour stock with high P/E ratios and substantial prior returns may not be the best investment strategy, neither on the long nor the short run.

5 The future of predicting returns

Predicting the return of investments will never be an easy task and naturally we will never be able to make perfect predictions no matter how sophisticated the model is. 100% accurate predictions wouldn't make sense since they would allow arbitrage opportunity in the equity markets. However, in this seminar we have provided some empirical evidence that the current CAPM model (i.e. beta) has less predictive power than some other predictive variables. The results were somewhat significant and I do not want to repeat the things already stated before, but also give a different view on the problem. If we recall how the CAPM looks like we notice that the returns are determined by beta, the risk premium $R_m - R_f$ and the risk free rate R_f. Beta determines how volatile the stock we are examining is, but the stocks movement is only compared to the markets movement. In the past this was probably the best measure of the risk the stock is exposed, however times have changed and stocks are not only affected by the market they operate in but also by other markets across the world. This was especially evident in the last financial crisis where the crisis which started in the US immediately affected stocks in other markets across the world. For example, money managers across europe are also concerned with the happenings in the US; who will be the next president, what are his political plans or even the earnings announcements of big stock companies which operate with their subsidiaries in Europe are factors which also affect others than the 'home' markets. So how much sense does it make to take into account only the risk premium of the market $R_m - R_f$ (R_m is the return of the market index) for predicting returns. These and other questions have not been answered in this seminar, but represent an interesting topic for future research. All in all, developing models for predicting returns of stocks will be a continuous task for researchers across the world. It does not make sense to stick by an old model such as the CAPM which was developed under completely different economic circumstances (more than 30 years ago), but we should at least adjust the models to the time we live in.

References

[1] Donald B. Keim and William T. Ziemba: *Securtiy Market Imperfections in World Wide Equity Markets.*

[2] Jonathan C. Mun, Geraldo M. Vasconcellos and Richard Kish: *The Contrarian/Overreaction Hypothesis.*

[3] Richard Thaler and Nicholas Barberis : *A survey of Behavioral Finance.*

[4] Werner De Bondt and Richard Thaler : *Does the Stock Market Overreact.*

[5] Kengo Okada: *Size effect and firm size -new relationship within the value effect.*