The Fundamental-Derived Equity Premium

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Abstract

We investigate Fama and French's (2002) fundamental-derived dividend growth model in 13 m arkets for the 1970-2011 period. We find that in most of the markets the dividend growth model produces both lower and more precise estimates of the expected equity premium than the realized average. We conclude that our results are generally consistent with expected stock returns being lower than the observed averages in the sample period. In addition, we find that the post-2000 capital gains seem to have been more in line with unconditional expectations. We see this as a r eversion of the unexpected high equity returns found by Fama and French (2002) in the 90's. Even, so we do not claim that the dividend-model alone does not fully resolve the equity premium puzzle. We think that adjustments in theoretical equilibrium models regarding risk preferences and habit persistence may be necessary to account for the outperformance of stocks over treasury bills.

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We would like to show our appreciation to our supervisor Kjell Jørgensen. He has helped us with guiding and support. Further, we would also like to express our gratitude to Ilan Cooper for initial inputs regarding the methodology.

DECLARATION

The authors emphasize that the undersigned are responsible for potential mistakes in this thesis.

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INTRODUCTION

The equity premium is an important economic variable, which is used for making investment decisions, cost of capital calculations and valuation estimations (Dimson, Marsh and Staunton (2002, 163). It has been the subject of many studies, both theoretical and empirical. Mehra and Prescott (1985, 145) discovered that the persistent outperformance of stocks over bonds violates standard economic models. Thus, the question that arose was why any long-run investor would invest in bonds rather than stocks. Nicknamed The Equity Premium Puzzle, this phenomenon has led to extensive research and debate over the nature of stock markets.

The suggested explanations of the equity premium puzzle can be separated into three categories. First, we have theoretical modifications of the standard models of risk aversion and investor preferences. These approaches imply that the required equity premium may be higher than traditionally thought, and thus state that the historical observed equity premium may not be too high after all. Secondly, researchers have looked into the expectation formation of the equity premium. This approach builds on the notion that it is the expected equity premium which has to equal the required. Thus, if the historical average equity premium has not been the expected premium, one need to find other estimates of expectations. Therefore, if the true historical expectations have been significantly lower than realized values, the equity premium puzzle may simply be a consequence of a biased estimate of market expectations. The third and final category of explanations relates to issues such as irrational investors, tax distortions, market liquidity etc. We will give a brief overview of some of the literature relating to all of the three categories in our literature review below.

This thesis focuses on the second category and our main motivation is the work of Fama and French (2002). They estimate the unconditional expected equity premium using a fundamental-derived expected stock return, called the dividend-model, for the US market from 1872 to 2000. Their findings suggest that the realized equity premium the last half of the 20th century have indeed significantly exceeded the expectations (Fama and French 2002, 657-658). Our objective is therefore to apply

this approach in various markets and explore the possibility of a generalization of their findings. Our data-series include 12 individual markets in addition to a World proxy index for the period 1969-2011. We also investigate the predictability of the equity premium and whether the forecasts can be improved significantly by means of conditional modeling. We hope our thesis can contribute to some additional insight and discussion of the equity premium puzzle.

The structure of this thesis is as follows. In ***Section I***, we shall present some important theoretical and empirical works on the topic and state our research objectives. ***Section II*** starts with explaining our methodology and our choice of estimation model for the equity premium. The section continues with a description of the data samples and their sources, and it concludes with tests of stationarity. Next, in ***Section III***, we present and discuss our findings. This involves different estimates of the equity premium, their precision, the implied Sharpe ratios and risk aversion. Moreover, we shall go through the individual markets and compare them. We shall also investigate conditional expectations and predictability. Finally, in ***Section IV***, we discuss the significance of our results. We conclude by trying to answer our research questions.

Section I – Motivation and Objective

1.1 THEORY AND LITERATURE REVIEW

Several academics have tried to come with different explanations to the equity premium puzzle, and areas of suggestions are from preference theories, incomplete markets, market imperfections and survival bias (Mehra 2008, 24-25). We will focus on some selected studies that we find of importance, and a short review will be presented in the following text.

One debate has been whether the equity premium really is constant. According to Campbell (2008, 2), the early academics in the 1960's and the 1970's interpreted the efficient market hypothesis to mean that the true equity premium was constant. This would imply that the more data history you used, the closer your estimate would be to the equity premium. If it is constant (or at least mean-reverting) then when estimating the equity premium it is wise to look at the long run, since stock returns are very volatile. Looking at the long run, therefore can give us a better estimate of the risk premium (Bekaert and Hodrick 2009, 486).

Predictability. Related to this is the question of predictability. In the 1980's multiple scholars found that valuation ratios, such as dividend-price and earnings-price ratios, could indicate over- or undervaluation of the stock market (Campbell (2008, 2). Whether these ratios can persistently predict future returns has remained disputed. Goyal and Welch (2008, 1504-1505), for example, argue that historical averages often perform just as well, if not better, than out-of-sample forecasts from valuation ratios. They conclude that the literature still have not found a variable that has a robust empirical forecasting power for the equity premium in- and out-of sample. Campbell (2008, 3), however, argue that by assuming a dividend-price ratio that follows a geometric random walk, one can use the logic from the classic Gordon Growth model to produce successful out-of-sample forecasts of the equity premium.

Time-varying predictability. Henkel, Martin and Nardari (2011, 560, 577) find that the strength of predictability is time-varying. Dividend yield and commonly used term structure variables are, in the short-horizon, effective predictors in recessions and contractions, but non-existing during expansions. Like Campbell and Cochrane (1999, 206) they also find the market risk premium to be higher during economic downturns. Henkel, Martin and Nardari (2011, 577) find a strong link between aggregate return predictability and business cycles in all of the seven countries they examine, except Germany. Their empirical model outperforms historical average in recessions, while the historical average is best during expansions. Cochrane and Piazezzi (2005, 138) also investigate time-varying risk premiums, and find that forecasting power is countercyclical.

Macroeconomic factors. If risk aversion and the equity premium vary over the business cycle, it could also be that changes in the equity premium are a response to macroeconomic factors relating to the state of the economy. In a study of the Norwegian stock market, Næs, Skjeltorp and Ødegaard (2007, 35) investigate whether different macroeconomic variables can affect the market risk premium and the risk-free interest rate, referring to research from the US that show weak evidence for macroeconomic variables affecting stock returns.

According to Cooper and Priestley (2009, 2601, 2603) the output gap is a good predictor of stock returns in the US. Since the output gap does not include market prices, it eliminates the argument that returns are forecasted due to stock mispricing. The authors are probably "the first to show that a specific macroeconomic variable can predict bond r eturns" Cooper and Priestley (2009, 2603).

Consumption-theory. Lettau and Ludvigson (2001, 815-816) look at what role fluctuations in the aggregate consumption-wealth ratio have for predicting stock returns. They find that it is a strong predictor for real stock returns and the excess return over a Treasury bill rate. Moreover, in short and intermediate horizons it is a better forecaster of future returns than the dividend payout ratio and the dividend yield, among others. They state that indicators as price to dividend, price to earnings and dividend to earnings ratios have been most successful in predicting

returns over longer horizons, while for a shorter period like a typical business cycle they are considered weak forecasters.

Fama and French (2002, 637-659) also use valuation ratios in their attempt to explain the equity premium. They then compare the estimates of the unconditional expected stock returns from fundamentals with the average stock returns. They further look at the evidence from Sharpe ratios, estimates of precision, and the behavior of book–to-market ratio and the income return on i nvestment. This enables them to choose between the estimates from fundamentals and the estimates from average stock returns. They argue that using dividend and earnings growth rates to measure expected rate of capital gain give a more precise estimate of the unconditional equity premium. Moreover, they claim the high average stock returns from 1951-2000 is due to a decline in discount rates that produces a large unexpected capital gain. Their conclusion is that the average stock return of the last half of the 20th century is a l ot higher than expected, and that the unconditional expected premium the last 50 years is most likely far below the realized premium. Hence, Fama and French claim the equity premium puzzle is not a real puzzle after all.

If the equity premium is predictable by valuation ratios, it seems possible to time the market and make arbitrage profits, in violation to the efficient market hypothesis. This may however not be the case if the risk itself or the investors risk preferences also are state-dependent. Multiple writers have explored this possibility. Campbell and Cochrane (1999, 205, 241-248) for example, give insight to how habit formation can make rational investors more averse to risk in recessions. They try to explain the short and long run equity premium by looking at representative agent preferences. They find habit formation suitable for explaining preferences, and they view the equity premium as a result of people fearing stocks since they are low during recession, and not because return are correlated with decline in wealth and consumption.

Also, Priestley and Cooper (2009, 2602) find that the output gap can predict the equity premium, thus providing direct evidence of such state-dependent risk aversion.

Cochrane (2005, 30) however states that the literature for trying to explain the equity premium puzzle is dying out, and no model has yet managed to explain the equity premium with low risk aversion.

Summary

As attested by this brief review, there are many findings on the subject of stock return and premium. We conclude by saying that the out-of-sample predictability of the equity premium remains disputed, but that valuation ratios like dividend-price ratios and also some macroeconomic factors do tend to have some predictive power. This does, however, not necessarily violate the efficient market hypothesis, as for example habit-formation provide a framework where risk aversion, and hence the equilibrium risk premium, is higher in recessions. Such theories do also have some support in the empirical literature.

We find the approach used by Fama and French (2002) particularly interesting. Their argument for using dividend and earnings growth rates to measure expected rate of capital gain more precisely will therefore be the starting point for our work.

1.2   RESEARCH QUESTIONS

The objective of our thesis is to investigate the equity premium in selected markets. The fundamental puzzle, according to Mehra and Prescott (1985, 145), is that the large long-run average spread between stock returns and riskless securities imply unreasonable high risk aversion among investors. Fama and French (2002, 643) argue, however, that the fundamentals such as dividend and earnings growth rates are superior to average stock returns in producing close and precise estimates of the unconditional expected returns on the market portfolios. Thus, if average returns are significantly higher than fundamental-derived expected returns, one may infer that the high average returns were in part unexpected (Fama and French 2002, 645). Hence, the expected equity premium may not have been as high as it seems, and therefore not so "puzzling" after all. The main focus in our paper is to pursue this proposition and its role in a resolution of the equity premium puzzle. Our primary research question can therefore be formulated as follows:

Does the fundamental-derived expected return perform better than the average
returns in estimating and explaining the equity premium?

Given Fama and French's (2002) findings in the US markets, we will investigate this issue primarily by looking at the descriptive features of the two estimates. If the conclusions of Fama and French (2002) can be generalized across markets, we think it would strengthen the evidence for this as a reasonable resolution of the equity premium puzzle. Hence, we are interested in how the estimates relates in different markets. Consequently, we have chosen 12 national markets and one World-proxy portfolio of equities to conduct our analysis. To evaluate the models, we want to know if the precision advantage of the fundamental-derived model found by Fama and French (2002, 643) has persisted in the US market post 2002, and whether the same feature is present in other markets. Again, this should increase the possibility of a generalization of Fama and French's (2002) findings.

We are also interested in how the implied Sharpe ratios compare across markets. As theory relates the Sharpe ratios to risk aversion among investors, we think this can

give more insight into the two models, and which estimate is most in compliance with theoretical assessments regarding investors and market equilibrium (Fama and French 2002, 644). Given a reasonable assumption that investors in different (developed) markets have similar risk preferences on the aggregated level, we should expect to see similar Sharpe ratios if our estimate are the true expected returns. Furthermore, we will look into the development of the estimates during the sample period. Fama and French (2002, 647 Table II, 658) find that for the US market, the main difference between the fundamental-derived expectations and the average returns are caused by unexpected capital gains, especially in the 90's. We want to investigate if this has continued in the 2000's, and also whether the same trend can be found in other markets.

Finally, we want to investigate whether the stock returns are conditional on state variables in such a way that the unconditional expected premiums are inferior estimates. Thus, we want to know if state variables can predict the stock returns. Also, we will look at whether or not future dividend growth can be predicted conditionally.

By investigating these issues, we hope to contribute with some updated results regarding the much debated topic of the equity premium, and discuss how our findings are in comparison to those of others. The questions we raise in this paper are summarized in the following table:

Questions
Descriptive features
Are the fundamental-derived estimates lower than average returns?
Are the fundamental-derived estimates more precise than average returns?
Cross-markets analysis
How do the fundamental-derived estimates and Sharpe ratios differ in different markets?
Dynamics
How have the fundamental-derived estimate and the average return developed over time?
Predictability and conditional expectations
Can state variables predict the stock returns?
Is dividend growth predictable?

Section II – Method and Data

2.1   METHODOLOGY

As Fama and French's (2002, 637-659) findings constitute the primus motor for our thesis, we will start by going through their main modeling tool, the Dividend Model. The main point of difficulty is the estimation of the unconditional expected stock returns ($E(R_t^m)$). The standard method here has been to use a simple long-run average stock returns as the expected return in the market portfolio. Fama and French's Dividend Model on the other hand, uses fundamentals to derive expected returns (Fama and French's 2002, 637-638).

Estimation of Unconditional Expected Equity Premium

We start off with the trivial expression that the expected stock return is the expected dividend yield plus the expected rate of capital gains:[1]

$$E(R_t^m) = E\left(\frac{D_{t+1}}{P_t}\right) + E\left(\frac{P_{t+1}-P_t}{P_t}\right) \tag{1}$$

This may provide some insight into the sources of stock returns. Another benefit with this split is that it makes it possible to use separate estimation techniques for the two components. Using the well-known terminology of the Gordon model (Bodie, Kane and Marcus 2009, 592) we can also take the expected capital gain to be the growth rate (g), which in Gordon's model is assumed to be a constant perpetual growth rate. Also, since P_t is known at the time t, we can write (1) as:

$$E(R_t^m) = \frac{E(D_{t+1})}{P_t} + E(g)$$

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[1] Mathematical notation: E: Expectation operator. D_t: Dividend in year t. P_t: Stock price in year t. Avg: Arithmetic mean operator. R_t^m: Stock market return in year t. (Fama and French 2002, 637).

Like in the Gordon model, we will assume that E(g) is either a constant or, at least, stationary (constant unconditional mean). Moreover, we will use two different methods of estimating the growth rate. One based on the average historical growth in prices (capital gains) and the other one based on historic growth of fundamentals (dividends). Both models, however, have the same estimate of expected dividend yield; the long-run average of realized dividend yields. Thus, the expected dividend yield is also assumed to be at least stationary. The standard approach, the realized average model, uses simple averages (arithmetic[2]) over realized returns per period:

Realized average model: $\widehat{E(R^m)} = Avg\left(\frac{D_t}{P_{t-1}}\right) + Avg\left(\frac{P_t - P_{t-1}}{P_{t-1}}\right)$ (2)

The Fama and French (2002, 638) model however is different, and can be derived by assuming that the dividend-price ratio $\frac{D_t}{P_t}$ is stationary. This implies that with a long-run sample, the compounded dividend growth should approach the compounded rate of capital gain. Thus, we can substitute the average dividend growth for the average realized capital gain as the estimator of the expected growth rate (Fama and French 2002, 638).

Dividend Growth Model (D-Model): $\widehat{E(R_t^m)} = Avg\left(\frac{D_t}{P_{t-1}}\right) + Avg\left(\frac{D_t - D_{t-1}}{D_{t-1}}\right)$ (3)

Since this model is based on growth in dividend rather than prices, it is an example of a model for fundamental-derived expected return. Fama and French (2002, 638) also use a model based on earnings growth to estimate expected returns, by assuming that earnings-price ratio is stationary. They find that this model produces similar estimates to those from the Dividend Growth Model (Fama and French 2002, 646). As we have not been able to get good time series of earnings data, we will only use the Dividend Growth Model in this thesis.

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[2] We choose to use arithmetic averages instead of geometric averages. This is because the arithmetic averages measures investors' actual change in wealth (Dimson, Marsh and Staunton 2002, 35). Also, Mehra (2008, 2) states, that the arithmetic average is the best measure if returns are uncorrelated over time.

One motive for using dividends to estimate expected returns is that fundamental-derived estimates seems to be less volatile than those derived from prices (Fama and French 2002, 639). In fact, Fama and French (2002, 639) find that the standard error of equity premium from the dividend growth model is less than half the standard error of the estimate from the average return. Moreover, as prices irrefutably cannot out-grow fundamentals in the long run, the assumption of stationary dividend-price ratio seem reasonable. All though firms can move from dividends to share repurchases, this strategy has its limitations in the long run. The problem of growth stocks, are probably not very significant as all stocks eventually have to return earnings to shareholder. Hence, a long enough time-series should insure a good estimation of the unconditional expected returns.

An important consequence of the Fama and French (2002, 639-640) approach is that it focuses on the long-run unconditional expected return. Thus, we cannot infer much about the conditional point-in-time expected returns. This will vary considerably over time in the short-run, but in the long-run however, it should approach the unconditional expected return. As long as the dividend-price ratio is stationary, the Fama and French (2002) approach should be valid and provide unbiased estimates of the unconditional expected return, given a sufficient sample length (mean reversion may be slow). They also argue that reasonable forms of non-stationarity do not render their approach invalid (Fama and French 2002, 639-640).

Like Fama and French (2002, 642), we have chosen to investigate real returns rather than nominal returns. This is first of all because portfolio theory states that the ultimate goal for every investor is consumption. It follows then that the relevant concept of wealth is wealth in terms of consumption goods, which is reflected by adjusting for changes in the consumption price level. Secondly, real returns will also render our results more comparable to previous findings. However, since reliable price deflators are not available in all markets for the whole period, we have also included nominal returns.

We will in the following show how we intend to apply the Fama and French (2002) method of expected return estimates, and use it to investigate the historical equity premium. The equity premiums of the two models are obtained by subtracting a

proxy rate for a riskless asset from the expected equity return estimate. Thus, the equity premium estimates for the realized average and the dividend model are given respectively as:[3]

$$EP = Avg(R_t) - Avg(R_t^f) \qquad (4)$$

$$EPD = Avg(RD_t) - Avg(R_t^f) \qquad (5)$$

These two models, and the question of which one give a more sound estimate of the unconditional equity premium, will then be the basis our further analysis. To do this however, we also need some additional characteristics of the two models performance and theoretical feasibility. As stated in our research questions, we are interested in risk aversion and the implied Sharpe ratios resulting from the two equity premium models. We define the Sharpe ratios as follows:

$$S = \frac{AVG(EP_t)}{\sigma(R_t)} \qquad\qquad SD = \frac{AVG(EPD_t)}{\sigma(R_t)} \qquad (6)$$

As Fama and French (2002, 641 Table I), we use the standard deviation of the realized returns to compute both Sharpe ratios. That is, we associate variability and risk with the uncertainty of capital gains rather than the uncertainty of dividend growth. Consequently, the only difference between the two Sharpe ratios is the estimate of expected returns.

Finally, we look at the standard error of the estimates to discuss their precision. A lower standard error would indicate a more precise estimate given that the estimator is unbiased (Hair et al. 2010, 212). Comparing these can therefore provide evidence on whether fundamentals give better estimates of unconditional returns. The standard errors for the two models are calculated as shown by (7) (Sharpe, De Veaux and Velleman 2012, 290).

$$SE = \frac{\sigma(R_t)}{\sqrt{n}} \qquad\qquad SED = \frac{\sigma(RD_t)}{\sqrt{n}} \qquad (7)$$

[3] EP_t: Equity premium in year t. EPD_t: Equity premium implied by D-Model in year t. R_t^f: Risk free rate proxy in year t. S: Sharpe ratio, SD: Sharpe ratio implied by D-Model. σ: Standard deviation operator. SE: Standard error of average returns. SED: Standard error of D-Model. n: Number of observations. Fama and French (2002, 641 Table I).

2.2   DATA AND SAMPLES

We have used DataStream to find most of the required data. Our proxy for the various equity markets have been the national Morgan Stanley Capital International (MSCI) indices for each of the respective countries. All these time-series start in 1969 and they are the primary factor restricting our analysis with regard to longitude.

We have included 12 national markets in our study. These are Australia, Canada, Norway, The United Kingdom, Germany, Japan, Singapore, France, Italy, Sweden, Denmark and the United States. First of all we have chosen these countries because it was for those countries we could find the appropriate data. Secondly, eight of the countries are a part of G20 countries, which represent some of biggest economies in the world. We believe that this should give us a better picture of the equity premium in a world setting. In addition, we have included the MSCI World index, which provides an aggregated perspective of the most developed countries. It might also be worth mentioning that the UK, the US, Japan, Germany and France represent more than 85% of the capitalized global equity value (Mehra 2008, 7). Norway, Sweden and Denmark is included to investigate how smaller markets, in particular how countries with a Nordic style economy, perform in comparison to the larger ones.

For some markets, including the US market, we did find data going back further than 1969 using other sources. Even so, we have still chosen to use the MSCI data for all the sampled countries. First, we want to make the results as comparable as possible. Thus, operating with different sample length for different countries would not be beneficiary. Secondly, Fama and French (2002, 638) have already done this estimation for a very long period in the US market (1872-2000). In addition, it was also difficult to find appropriate data on risk-free rates and consumer prices before 1970.

Another problem we faced was the lack of access to data series on price ratios, dividends, earnings and book-value. Neither the dividend-price ratio nor the earnings-price ratio was accessible to us in the MSCI data base. We have therefore extracted annual dividends, and thus dividend-price ratios and dividend growth, by combining the MSCI total return index and the MSCI price index. The following formula shows how dividend in 1970 is extracted[4]:

$$Nominal\ dividend:\ \ D_{1970} = \left(\frac{R_{1970}}{R_{1969}}\right) P_{1969} - P_{1970}$$

$$Real\ dividend:\ \ RD_{1970} = D_{1970} \frac{CPI_{1969}}{CPI_{1970}}$$

Our proxies for the risk-free rates have varied across the markets. In countries where there has been a Treasury bill market for the whole period we have used the returns on (6 or 3 month) T-bills. Otherwise we have used interbank rates such as the LIBOR-rates.

It is important to note however, that in the unconditional dividend-model, only the average of the risk free rate, the dividend-price ratio and the dividend growth rate are relevant. That is, we want to find their long-run mean values from which they fluctuate conditionally. Furthermore, the average risk free rate appears both in the dividend model and the realized average model for the equity premium. Thus, when comparing the two estimates, the risk free rate is simply an additive constant for both estimates and does not influence the inference between the two models (Fama and French 2002, 642).

Finally, we have used standard consumer price indexes (or a producer price index) for deflating both equity returns and the risk free rates. For some markets (France, Denmark and the World) however, such an index was not available back to 1970. In these cases we have only calculated the nominal returns.

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[4] $Notation: D_t: Dividend\ in\ period\ t. R_t: Return\ index\ at\ the\ end\ of\ period\ t.$
$P_t: Price\ index\ at\ the\ end\ of\ period\ t.\ CPI_t: Deflator\ index\ at\ the\ end\ of\ period\ t.$

All prices and returns are denominated in the home country currencies. Currency and foreign exchange risk is not the subject in this thesis. We also ignore possible tax effects of dividend and capital gains, as well as issues regarding inflation expectations. Table 1 summarizes the sources for the different data series.

Table 1 – Data summary

The table displays the name of the sources for each market for the total return index, the price index, the risk-free proxy and the deflator. MSCI: Morgan Stanley Capital International.

Market	Data Source			
	Total return index	Price index	Risk-free proxy	Deflator
Norway	MSCI NORWAY - TOT RETURN IND	MSCI NORWAY - PRICE INDEX	NW SHORT-TERM INTEREST RATE SADJ	CPI
UK	MSCI NORDIC U$ - TOT RETURN IND	MSCI NORDIC U$ - PRICE INDEX	UK TREASURY BILL RATE	PPI
Australia	MSCI AUSTRALIA - TOT RETURN IND	MSCI AUSTRALIA - PRICE INDEX	AU TREASURY BILL RATE	CPI
Canada	MSCI CANADA - TOT RETURN IND	MSCI CANADA - PRICE INDEX	CN TREASURY BILL RATE	CPI
Japan	MSCI JAPAN - TOT RETURN IND	MSCI JAPAN - PRICE INDEX	JP TREASURY BILL RATE	PPI
US	MSCI USA - TOT RETURN IND	MSCI USA - PRICE INDEX	US T-BILL SEC MRK 3 M (D) MID-RATE	CPI
Singapore	MSCI SINGAPORE - TOT RETURN IND	MSCI SINGAPORE - PRICE INDEX	SP TREASURY BILL RATE	CPI
Germany	MSCI GERMANY - TOT RETURN IND	MSCI GERMANY - PRICE INDEX	BD 3-MONTH FIBOR NADJ	CPI
France*	MSCI FRANCE - TOT RETURN IND	MSCI FRANCE - PRICE INDEX	FR TREASURY BILL RATE	N/A
Italy	MSCI ITALY - TOT RETURN IND	MSCI ITALY - PRICE INDEX	IT MONEY MARKET RATE (FED. FUNDS)	CPI
Denmark*	MSCI DENMARK - TOT RETURN IND	MSCI DENMARK - PRICE INDEX	DK SHORT-TERM INTEREST RATE SADJ	N/A
Sweden	MSCI SWEDEN - TOT RETURN IND	MSCI SWEDEN - PRICE INDEX	SD TREASURY BILL RATE(DISC.)	CPI
World*	MSCI WORLD U$ - TOT RETURN IND	MSCI WORLD U$ - PRICE INDEX	Same as for US	N/A

*In these markets we have only nominal returns

2.3   DATA DIAGNOSTICS

Stationarity – dividend-price ratio

Since it is an assumption in the dividend-model, we need to investigate the stationarity of the dividend-price ratio in our constituent's sample markets. From Figure 1 the dividend-price ratios do not appear particularly stationary within our sample time period. In fact, we see a somewhat declining trend for many of the markets all the way up until around 2000, before they enter an upward trend.

Figure 1 – Dividend-price ratio
Figure 1 displays the historic development of the dividend-price ratios in the different markets from 1970 to 2011.
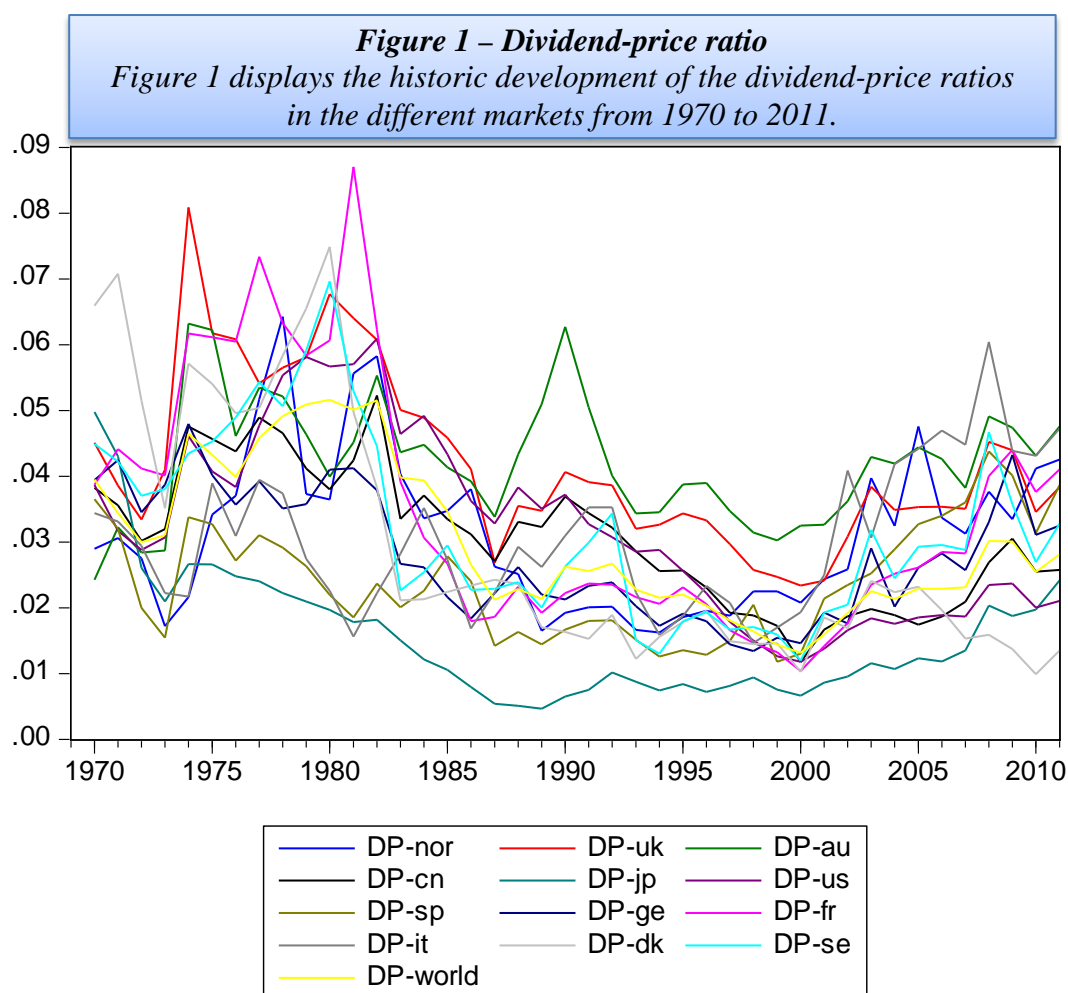
At first glance it appears that, if the dividend-price ratio is stationary, it inhabits a very long mean-reversion cycle. The pattern is however different for the different markets. A more formal test for stationarity can be conducted using the Augmented Dickey-Fuller test. Table 2 summarizes a test for a unit root for each market.

Table 2 – Augmented Dickey-Fuller test of the dividend-price ratio

Table 2 displays a summary of individual Augmented Dickey-Fuller tests of unit roots in each market from EViews. The max lag was set automatically to 9. The null hypothesis is that the dividend-price ratio has a unit root (non-stationary). H_0: Unit root.

* Indicates tests done on nominal values. N=41 for all markets.

Market	T-stats	P-value	Null Hypothesis: Unit root
Australia	-3.5687	0.0109	Rejected at 5% level
Canada	-1.7335	0.4073	Cannot reject
Denmark*	-1.9858	0.2917	Cannot reject
France*	-1.4988	0.5242	Cannot reject
Germany	-2.0248	0.2755	Cannot reject
Italy	-2.2160	0.2039	Cannot reject
Japan	-0.6812	0.8395	Cannot reject
Norway	-2.4030	0.1472	Rejected at 15% level
Sweden	-1.9911	0.2895	Cannot reject
Singapore	-2.0688	0.2578	Cannot reject
United Kingdom	-2.2006	0.2092	Cannot reject
United States	-1.0377	0.7307	Cannot reject
World*	-1.3779	0.5837	Cannot reject

We see that for almost all of the dividend-price ratios we cannot reject the hypothesis of a unit root. It is, however, obvious that the dividend-price ratio cannot trend down or up indefinitely, or have its variance grow to infinity. One explanation could be that it is in fact stationary, but that the mean reversion is very slow because of autocorrelation and persistence of shocks. Thus, our 41-year samples are simply not long enough to capture the mean-reversion cycle. In addition, our test-statistics suffer from low degrees of freedom with only 41 observations, resulting in high critical values. Other studies with more observations have also found the dividend-price ratio to be autocorrelated. Fama and French (2002, 642) find that the US dividend-price ratio behaves close to a stationary first-order autoregression (AR1). The same is true for Cochrane (1994) (referred to in Fama and French 2002, 642) who finds the dividend-price ratio to be highly autocorrelated, but slowly mean reverting.

From Figure 1, we see that that the dividend-price ratios were consistently very high in the 1970 and low in the 1990's. Post 2000, they seem to be trending upwards again. The question is then what may have caused this. Campbell and Shiller (2001, 8) argues that the dividend-price ratio can be affected by changes in corporate financial policies. According to Campbell and Shiller (2001, 13), several academics have argued that repurchases of stocks, and not excessive stock prices is a reason for the low dividend-price ratio in the late 1990s. Also, if repurchases of stocks gives lower taxes than paying dividends, corporations may choose to reduce dividends. Consequently, a shift in tax rate differentials between dividend and capital gains may give a structural break in the mean-reversion of the dividend-price ratio. However, Campbell and Shiller (2001, 14) state that corporate financial policy cannot be the only explanation for the observed abnormal valuation ratios. However, if one claims that stocks are mispriced and investors are irrational, this requires an explanation of why stocks are mispriced and a determination of what the efficient price should be.

In general, we find that the question of dividend-price ratio stationarity and mean reversion remains disputed among scholars. For our purpose however, we find it still reasonable to assume a stationary dividend-price ratio. Thus, we will simplify by disregarding any possible tax effects and structural breaks. Moreover, we will assume efficient pricing. If we did not, we may not be able to explain anything. In our analysis of the dividend-model we will therefore take our sample means to be the best estimate of the unconditional means of the dividend-price ratios. Fama and French (2002, 642) also argue that the dividend-model is still valid under reasonable non-stationarity. We will nonetheless return to the issue of stationarity when discussing the predictive power of the dividend-price ratio.

Stationarity – Returns

We also need to check the stationarity of returns and equity premiums. Table 3 shows the p-values from an Augmented Dickey-Fuller test. We see that for the market returns, the realized equity premiums and the growth rates of dividend and prices, a unit root can be rejected for all markets well below even the 1 % level. The risk free rates however, we find to be generally non-stationary, with the exceptions of Japan and Singapore. A closer look at the risk-free data shows a clear

downward trend for the risk-free rates in most of the markets. But as we have discussed, the risk-free rate is not an important concern when comparing the dividend-model equity premium with the realized average equity premium, as it affects both estimates equally (Fama and French 2002, 642). However, the risk free rate is important when making inference of the level of what the expected equity premium has been.

Table 3 - Augmented Dickey-Fuller tests of risk-free rates, markets returns, realized equity premiums and growth in dividend and prices.

Table 3 displays the p-values Augmented Dickey-Fuller tests of unit roots in each market from EViews. The max lag was set automatically to 9. The null hypothesis is that the variables have unit roots (non-stationary). H_0: Unit root.

* Indicates tests done on nominal values. N=41 for all markets.

	P-values				
Market	Risk-free rate	Market Return	Realized equity premium	Dividend growth	Price growth
Australia	0.3808	0.0000	0.0000	0.0000	0.0000
Canada	0.3345	0.0000	0.0000	0.0000	0.0000
Denmark*	0.8330	0.0000	0.0000	0.0000	0.0000
France*	0.7422	0.0000	0.0000	0.0000	0.0000
Germany	0.1196	0.0000	0.0000	0.0000	0.0000
Italy	0.5251	0.0001	0.0001	0.0000	0.0001
Japan	0.0011	0.0000	0.0000	0.0000	0.0000
Norway	0.0550	0.0000	0.0000	0.0000	0.0000
Sweden	0.1668	0.0000	0.0000	0.0000	0.0000
Singapore	0.0045	0.0000	0.0000	0.0000	0.0000
United Kingdom	0.1856	0.0000	0.0000	0.0000	0.0000
United States	0.3396	0.0000	0.0000	0.0000	0.0000
World*	N/A	0.0000	N/A	0.0000	0.0000

Section III - Empirical Findings

3.1   DESCRIPTIVE RESULTS

We now come to the calculations of the dividend- and realized-model estimates of the unconditional expected equity premium. These are summarized in Table 4. Since we are most concerned with real values, we will in the following be referring to these unless we explicitly mention nominal terms (Fama and French 2002, 642). The first notion we can make, however, is that real and nominal values looks very similar when it comes to comparing the two estimation models. This is perhaps not as surprising as it simply means that inflation affects the risk free return and the expected market return in almost the same manner. Thus, whatever we inferred from the real values should also apply relatively well to the nominal terms. Another consequence of this is that in the markets for which we do not have real data (Denmark, France and the World portfolio) we can look at the nominal values with reasonable confidence.

The Expected Equity Premium

Our results are both similar and different than those of Fama and French (2002, 641 Table I). We find that the fundamental derived equity premium is lower than the average realized for most of the markets in our sample. The exceptions are Australia, Germany and Italy. The difference between the estimates, however, is in general small compared to the Fama and French results. From their 1951-2000 sample of the US market they get estimates of 2.55 % and 7.43 % from the dividend- and realized models respectively. That is, they find the realized estimate to be almost three times that of the dividend-model. Our results for the US markets on the other hand, show a multiple of just 1.7. Even so, we find that the US market is on the high-end of the spectrum when it comes to differences between the two estimates.

Table 4 – Descriptive results

Table 4 shows our descriptive findings for each market. It displays the average values of the market return, risk-free rate, equity premium (EP), standard deviations of the return estimates (STD(r)), Sharpe ratios (SR) and the standard errors (SE). We have included both nominal and real values. N=41 for all markets.

			Descriptives (means)					
			Return	Rf	EP	STD(r)	SR	SE
Norway	Nominal	Realized	16,87 %	8,52 %	8,36 %	42,21 %	0,198	6,59 %
		D-model	15,74 %	8,52 %	7,23 %	32,87 %	0,171	5,13 %
	Real	Realized	11,59 %	3,35 %	8,24 %	40,66 %	0,203	6,35 %
		D-model	10,45 %	3,35 %	7,10 %	32,16 %	0,175	5,02 %
UK	Nominal	Realized	15,06 %	7,62 %	7,44 %	29,19 %	0,255	4,56 %
		D-model	13,14 %	7,62 %	5,52 %	21,19 %	0,189	3,31 %
	Real	Realized	8,41 %	1,68 %	6,74 %	24,13 %	0,279	3,77 %
		D-model	6,63 %	1,68 %	4,95 %	17,91 %	0,205	2,80 %
Australia	Nominal	Realized	12,92 %	8,11 %	4,81 %	24,01 %	0,200	3,75 %
		D-model	14,17 %	8,11 %	6,06 %	21,50 %	0,252	3,36 %
	Real	Realized	6,74 %	2,17 %	4,57 %	22,35 %	0,204	3,49 %
		D-model	7,73 %	2,17 %	5,57 %	19,03 %	0,249	2,97 %
Canada	Nominal	Realized	11,47 %	6,62 %	4,85 %	18,05 %	0,269	2,82 %
		D-model	10,02 %	6,62 %	3,40 %	15,70 %	0,189	2,45 %
	Real	Realized	6,83 %	2,06 %	4,76 %	17,71 %	0,269	2,77 %
		D-model	5,37 %	2,06 %	3,31 %	15,30 %	0,187	2,39 %
Japan	Nominal	Realized	9,03 %	2,65 %	6,38 %	28,52 %	0,224	4,45 %
		D-model	5,62 %	2,65 %	2,97 %	19,35 %	0,104	3,02 %
	Real	Realized	7,87 %	1,24 %	6,63 %	29,57 %	0,224	4,62 %
		D-model	4,32 %	1,24 %	3,07 %	20,03 %	0,104	3,13 %
US	Nominal	Realized	11,23 %	5,40 %	5,83 %	18,20 %	0,320	2,84 %
		D-model	8,89 %	5,40 %	3,49 %	13,81 %	0,192	2,16 %
	Real	Realized	6,66 %	0,96 %	5,70 %	17,96 %	0,317	2,80 %
		D-model	4,30 %	0,96 %	3,34 %	13,09 %	0,186	2,04 %
Singapore	Nominal	Realized	16,80 %	2,58 %	14,23 %	46,31 %	0,307	7,23 %
		D-model	13,62 %	2,58 %	11,04 %	29,53 %	0,238	4,61 %
	Real	Realized	14,01 %	-0,38 %	14,38 %	46,18 %	0,311	7,21 %
		D-model	10,70 %	-0,38 %	11,07 %	29,82 %	0,240	4,66 %
Germany	Nominal	Realized	11,21 %	5,32 %	5,89 %	26,10 %	0,226	4,08 %
		D-model	11,52 %	5,32 %	6,20 %	31,69 %	0,238	4,95 %
	Real	Realized	8,20 %	2,40 %	5,80 %	25,71 %	0,225	4,01 %
		D-model	8,55 %	2,40 %	6,15 %	31,57 %	0,239	4,93 %
France	Nominal	Realized	13,14 %	6,89 %	6,26 %	26,48 %	0,236	4,14 %
		D-model	12,30 %	6,89 %	5,42 %	23,44 %	0,205	3,66 %
	Real	Realized	N/A	N/A	N/A	N/A	N/A	N/A
		D-model	N/A	N/A	N/A	N/A	N/A	N/A
Italy	Nominal	Realized	12,37 %	9,27 %	3,10 %	32,79 %	0,095	5,12 %
		D-model	12,67 %	9,27 %	3,40 %	30,35 %	0,104	4,74 %
	Real	Realized	4,87 %	1,92 %	2,95 %	29,93 %	0,099	4,67 %
		D-model	5,16 %	1,92 %	3,23 %	27,70 %	0,108	4,33 %
Denmark	Nominal	Realized	16,77 %	8,53 %	8,23 %	32,53 %	0,253	5,08 %
		D-model	11,79 %	8,53 %	3,26 %	27,88 %	0,100	4,35 %
	Real	Realized	N/A	N/A	N/A	N/A	N/A	N/A
		D-model	N/A	N/A	N/A	N/A	N/A	N/A
Sweden	Nominal	Realized	19,35 %	6,91 %	12,44 %	30,67 %	0,406	4,79 %
		D-model	18,27 %	6,91 %	11,35 %	30,89 %	0,370	4,82 %
	Real	Realized	13,72 %	1,75 %	11,96 %	29,64 %	0,404	4,63 %
		D-model	12,71 %	1,75 %	10,95 %	30,39 %	0,370	4,75 %
World*	Nominal	Realized	11,21 %	5,41 %	5,80 %	18,48 %	0,314	2,89 %
		D-model	9,62 %	5,41 %	4,21 %	14,90 %	0,228	2,33 %

For the world portfolio we have used the US risk free proxy.

The markets with the lowest absolute difference are those for which the dividend model gives a higher estimate then the average return; Australia, Germany and Italy. In fact, for these three markets the difference is less than one percentage point. This is perhaps an indication that, although the dividend model gives a higher equity premium, the difference is not significant. All the remaining markets have difference of more than one percentage point. The highest difference is found in Denmark (4.97), Japan (3.55) and Singapore (3.31).

Standard errors

As shown in Table 4, the standard error of the expected returns from the dividend model is lower than the corresponding standard errors of realized returns for all markets, except Germany and Sweden. For Sweden however, the difference is only about 0.1 pe rcentage points. In general, the differences in precision between the two models are very small, ranging from 0.5 and 1.5 pe rcentage points, with Singapore being the exception at 3.5.

Fama and French (2002, 644) find the standard error from the dividend model and the realized average stock return for the 1951-2000 period in the US market to be 0.74 and 2.43 respectively. Our corresponding results for the 1970-2011 period is 2.04 and 2.80 as shown in Table 4. Thus, the discrepancies between the two estimates have been reduced significantly. Nonetheless, we find that the dividend model still produces a more precise estimate for the US, as well as for most of the remaining markets.

Sharpe ratios

For almost all markets, the Sharpe ratio estimates from the dividend-model are lower than those from the average return model. The exceptions are Australia, Germany and Italy. Thus, if the dividend-model estimates are closer to the true expectations, the risk aversion coefficient needed in an equilibrium model will be less than what is implied simply by historical average returns in most markets. Consequently, this may be a candidate explanation of the equity premium puzzle. We will explore this further in Section IV. Next, we will go through some of the findings in the individual markets.

Market-by-Market

The United States

Since most previous studies have focused on t he US market, our US estimates serve as a reference point when comparing our findings with those of others, in particular those of Fama and French (2002). Although we find some of the same characteristics as Fama and French (2002), our results also differ. As mentioned,

Figure 2 – US Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.

our difference between the dividend-model and average returns is equal in sign but smaller in magnitude than that of Fama and French (2002, 641 Table I). Still, we find that the dividend-model produce both lower and more precise estimates in the US market.
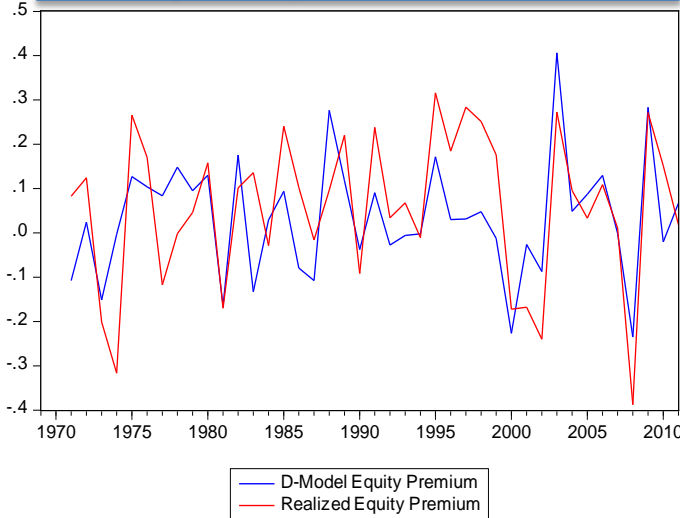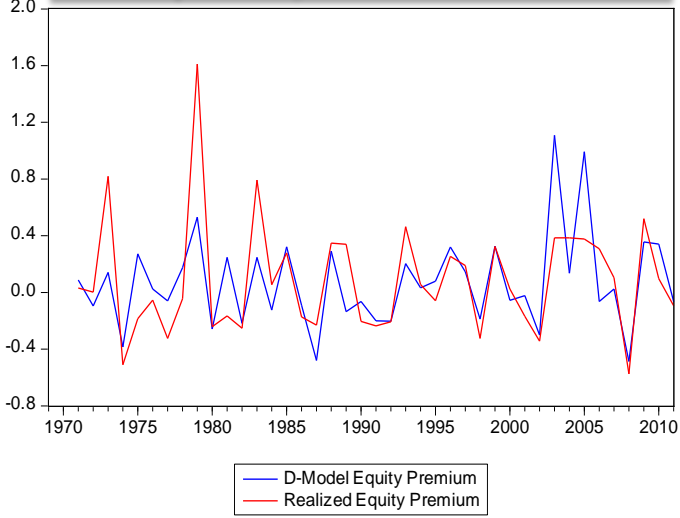
Norway

For the Norwegian equity market we find a r eal equity premium of 7.10 % from the dividend-model and 8.24 % from the realized model (see Table 4). This difference is much less than what Fama and French (2002, 641 Table I) find in the post-war US (2,55 % and 7,43 % from the dividend-model and realized estimates respectively). Our

Figure 3 – Norwegian Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.

results also indicate that the Norwegian premium has been higher than in the US. However, this does not necessarily mean that the equity premium puzzle is deeper

in Norway, or that Norwegian investors are more risk averse. This is because the market risk has also been higher, as the standard deviation of stock returns are more than twice that of the US market (see Table 4). Perhaps not so surprising since the Norwegian market is both smaller and more dependent on particular sectors (i.e. less diversified). The result of this is a Sharpe ratio well within that of most markets when derived from the dividend-model (0.175). The realized Sharpe ratio of 0.203 is in fact lower than the US realized (0.317), but closer to other markets like Japan, Australia and Germany. The standard errors indicate a slightly higher precision of the dividend-model estimate, although not as precise as the corresponding US estimate since the Norwegian market has been more volatile. In summary, the Norwegian equity market seems to be consistent with the Fama and French (2002, 657) claim that the unconditional expected equity premium is better estimated using fundamental-derived return, though not by very much.

The United Kingdom

For the British equity market our estimates are 6.74 % from the dividend-model and 4.95 % for the realized average (Table 4). That is, lower than the Norwegian market and higher than the US market. The realized standard deviation of 24.13 % on the other hand, shows that the British market has been

Figure 4 – UK Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.
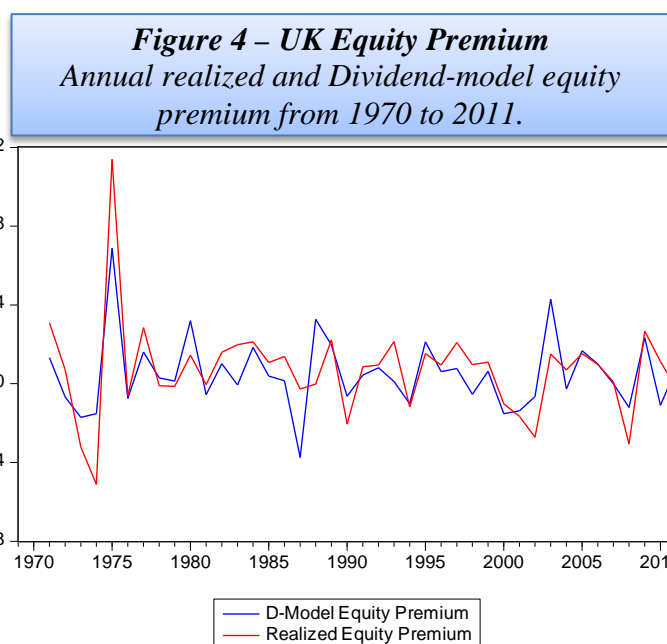
significantly less volatile than the Norwegian market, yet still more than the US market. The result is a dividend-model Sharpe ratio (0.205) relatively close to both the US and the Norwegian markets. Likewise, the standard errors of 2.80 % and 3.77 % confirm that the dividend-model estimate is more precise for the UK market as well.

Canada

We find that the Canadian market heavily resembles the US market. Although the average realized equity premium has been about a percentage point lower, the dividend-model estimate of 3.31 % is virtually the same as in the US market (3.34 %). Also the dividend-model Sharpe ratio of 0.187 is practically identical to the

Figure 5 – Canadian Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.

US (0.186). The standard errors are very close to those in the US market as well with the dividend-model being a bit more precise, although the difference in precision is somewhat smaller.
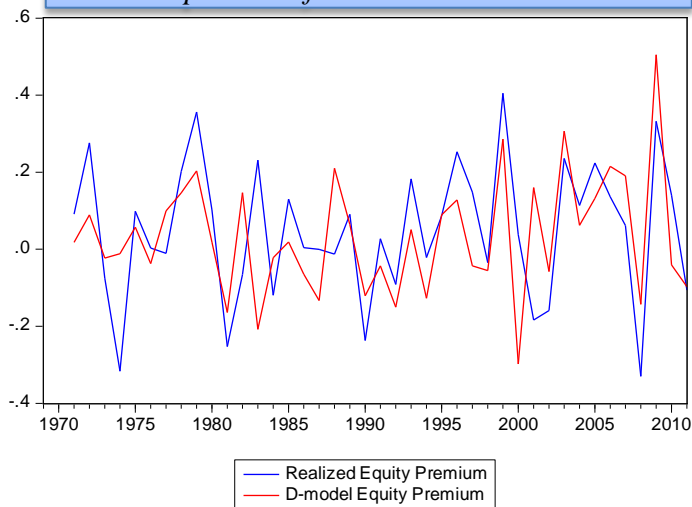
Singapore

As expected, Singapore has the characteristics of an emerging market with a high equity premium to compensate for high risk. The realized equity premium of 14.38 % is close to three times that of the US, while the dividend model estimate of 11.07 % is almost four times higher. An interesting feature of the

Figure 6 – Singaporean Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.

Singapore market is that our calculation of the average real risk-free rate is negative during the sample period, as inflation has been higher than the interest rate. The standard deviation of realized stock returns is 46.18 % and the highest in our sample, resulting in a dividend-model Sharpe ratio of 0.240, the third highest. As a consequence of the high volatility, the precision of both estimates are somewhat
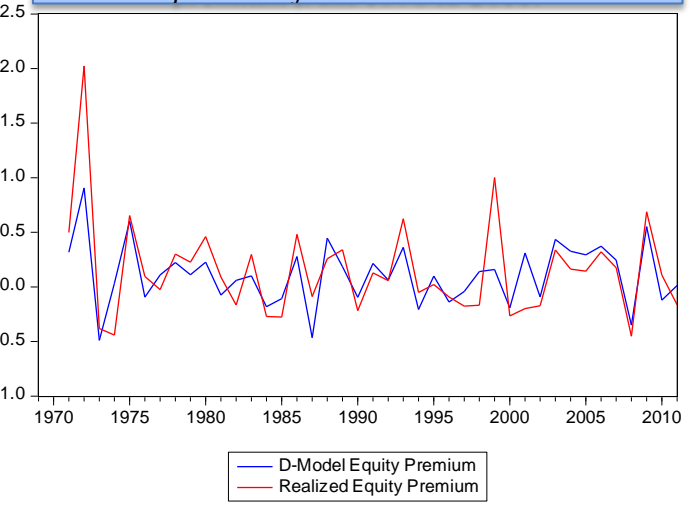
low. Even so, the standard errors of 4.66 % and 7.21 % from the dividend-model and the realized values respectively, indicate that the dividend model is more precise in the Singapore market as well.

Japan

With a dividend-model estimate of 3.07 % and an average realized estimate of 6.63 %, the Japanese equity premium looks very much like the US market. The standard deviation of returns on the other hand, is nearly twice as high. Consequently, the dividend-model Sharpe ratio, at only 0.104, is about half that of the US (0.186). This is the second lowest in the sample.
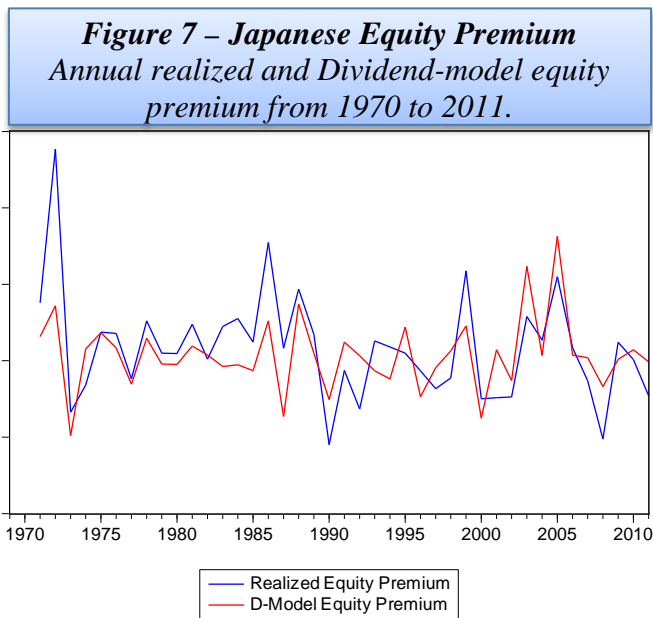
Figure 7 – Japanese Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.

Sweden

The Swedish market displays somewhat odd features. First, the stock returns and the equity premium have been exceptionally high. According to our calculations the dividend-model expected equity premium is 10.95 %, about as high as in Singapore (11.07 %). With a relatively normal standard deviation of about 30 %, this gives a very high dividend-model Sharpe ratio of 0.370. The second oddity is that the variance of dividend growth has been higher than the variance of capital gains. That is, fundamentals have in fact been more volatile than

Figure 8 – Swedish Equity Premium
Annual realized and Dividend-model equity premium from 1970 to 2011.
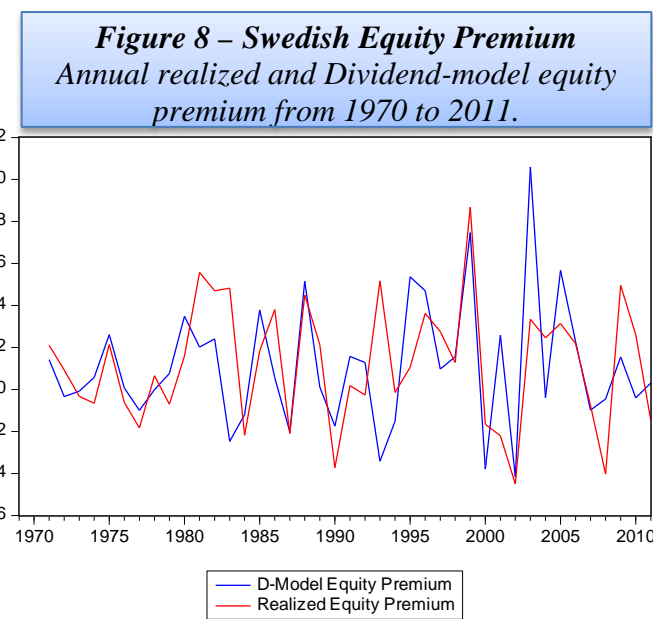
prices, although just slightly. As a result the dividend model provides a less precise estimate of the expected return than the realized average returns for the Swedish market.

Australia, Germany and Italy

In all these markets, average dividend-model return exceeds realized returns. The estimations for Australia and Germany are similar to each other. Their dividend-model premium are somewhat higher than the US and Canada, but lower than Norway, while their volatility is on the UK level. The Italian market, however, is very similar to the Japanese market, and has a very low dividend-model Sharpe ratio. In both the Australian and Italian markets the standard errors of the two models are almost identical, making them just as precise. In the German market the dividend-model is actually significantly less precise than the realized estimate.

France, Denmark, World

These are the markets for which we have only got nominal returns. But since the nominal and real estimates for the other markets give more or less the same conclusions, this should not bias our inference significantly. We find France, to be very similar to the UK with respect to return and the Sharpe ratio. Denmark, however, is more similar to Japan and Italy. That is, we find a relatively low return and relatively high standard deviation, giving the lowest dividend-model Sharpe ratio of all the markets. The realized Sharpe ratio is on the other hand more in line with the other markets. Denmark also has the highest difference between the estimation models, with the dividend-model giving roughly twice the realized equity premium. For the World market we have used the US risk free rate, as we do not have a reliable global risk free asset, and perhaps not too surprisingly the world portfolio look much like the US as well. Since this portfolio includes most developed markets, it provides an aggregated version of the dividend-model. We find that indeed the dividend-model is more precise for the world as well, although like in the US market, the difference is very small.

Cross-market analysis

Figure 9 shows a scatterplot of the dividend-model equity premium and standard deviation for the different markets, and Figure 10 displays the distribution of dividend-model Sharpe ratios of the different markets. Since, theory relates Sharpe ratios to aggregated risk aversion this can also be seen as a "distribution of risk aversion". Like all our findings, these estimates are of course limited to our relative short sample. It does however look as if a reasonable estimate for the average long term Sharpe ratio (price of risk per unit of risk) is around 0.2. Fama and French (2002, 641 Table I) also find an average Sharpe ratio of 0.2 in their long-run study of the US market (1872-2000).

An interesting observation is also that, with some exceptions, the dividend-model Sharpe ratios across the markets are somewhat more in line with both each other, as well as with Fama and French's (2002, 641 Table I) long run findings for the US market (1872-2000). The realized Sharpe ratios, on the other hand, we find to vary a bit more between the markets. Similar Sharpe ratios would be expected if one believes aggregated risk aversion to be stationary around a common mean for all markets. First of all, it would be unreasonable if investors in some countries where much more risk averse than others for very long periods. This can however still be the case in countries where wealth and consumption is very different (e.g. poor countries), given that the aggregated risk aversion is related to such variables. Moreover, countries which have experienced especially sever downturns in the sample period may bias our estimations towards a too high risk aversion. Even so, if one assumes a more or less free capital flow across the markets, such effects should cancel out due to the law of one price of risk[5] (disregarding currency and transaction risks). That is, any rational investor would allocate his/her investments to the market that gives the highest expected premium for a given risk. Thus, the only equilibrium is a common price of risk.

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[5] "Law of one price states that if two assets are equivivalent in all economically relevant respects, then they should have the same market price" (Bodie, Kane and Marcus 2009, 325).

Figure 9 – Dividend-Model Equity Premiums and realized standard deviation of market returns
The figure shows the dividend-model estimate of the unconditional Equity Premiums in each market and the standard deviation market returns from 1970 to 2011. For Denmark, France and World it displays nominal values instead of real.
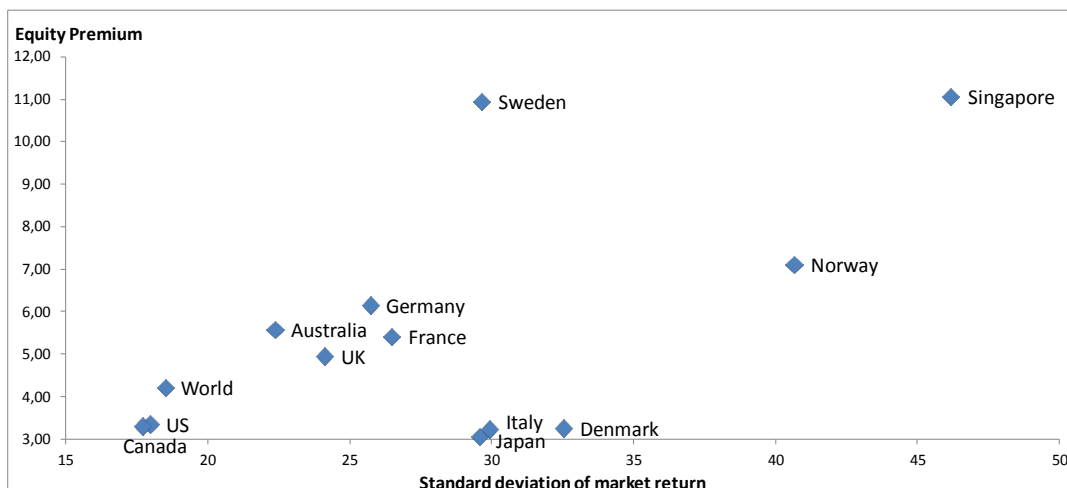
Figure 10 – Distribution of Sharpe ratios
The figure shows the distribution of average Sharpe ratios from 1970 to 2011 for the Dividend-Model and realized returns respectively. For Denmark, France and World it displays nominal values instead of real.
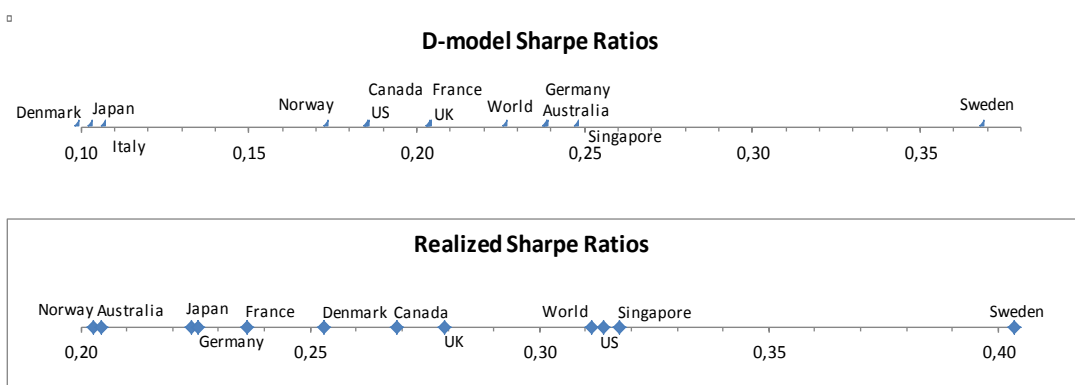
In light of the historical evolution of globalization and world-wide market integration, one may argue that capital flow across markets have increased with time. Reductions in protectionist policies and regulation on foreign capital, coupled with increased protection of property rights in many countries, are likely to have contributed to reduced required equity premiums and thus the price of risk in these countries. However, since our portfolio of countries consists of more or less established markets with relatively open capital markets during the sample period,

and since the emerging countries still constitutes a relatively small fraction of the world portfolio, this time development of the equity premium is probably not a major concern in our study. Nevertheless, it might be an explanation to why the price of risk (Sharpe ratios) is not equalized across markets.

Another point is the choice of the risk free proxy. As discussed, what one chooses to be the risk free rate has a major effect on the equity premium estimates, but not on the difference between the two models (Fama and French 2002, 642). The same is true for the Sharpe ratios. However, when making cross-markets comparisons based on the dividend-model, it will still influence our inference. For this reason, and because there are different thoughts of which assets should be considered risk free, we should be careful with our conclusions in this regard.

10-year periods

To look at the development of the equity premium estimates, we have constructed 10-year periods of both models. The following figure shows the movement of the 10-year cross-market average equity premium.

Figure 11 – 10 year averages
The figure graphs the 10 year moving average Equity Premium of the cross-market mean. This is equivalent to a portfolio of equal weights in all markets (including the World index), disregarding currency and other risk factors.
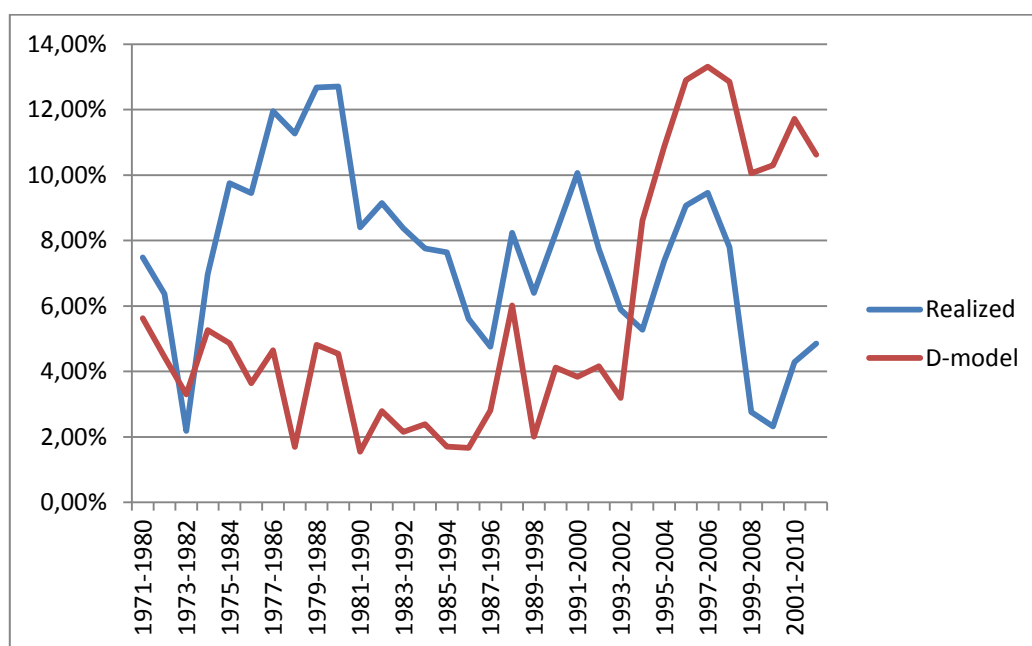
This indicates a significant change in the dividend-model average post 2002. From this point, the dividend-model exceeds the realized estimates, a result of the average dividend growing faster than prices. Thus, the unexpected capital gains that Fama and French argues occurred, especially in the 80's and 90's, are no longer observed, or even reversed. This is also the main reason that the differences between the dividend-model estimates and the realized average estimates are less than compared to what Fama and French (2002, 647 Table II) discovered in their 2002 paper. Because of the same shift, the precision advantage of the dividend-model has also been reduced.

Since, in the long-run, the two models should indeed revolve around the same mean, a reversion of unexpected capital gains should have been inevitable. Hence, the recent decline in realized returns is consistent with Fama and French (2002, 657) hypothesis that the fundamental-derived expected equity premiums are closer to the true unconditional expectations. However, the increase in dividend growth is left unexplained. A closer look at the individual markets show that it were mainly the years 2003, 2005 and 2009 which experienced very high dividend growth in most markets, making the 2000s with a very high 10-year average. (Table 5 shows all the ten-year periods of the dividend-model and realized equity premiums in the 13 markets.) Whether this was expected growth, random events or structural change we think is better left for future research which includes good earnings data. But we will however look at the predictability of dividend growth in the last subsection.

Table 5 - 10-year periods of Equity Premium estimates

This table shows the evolution of the 10-year average equity premiums in each market. The * indicates nominal values, and as before the risk-free rate for the "World" market is the US proxy.

Periode	Norway Realized	D-model	UK Realized	D-model	Australia Realized	D-model	Canada Realized	D-model	Japan Realized	D-model	US Realized	D-model	Singapore Realized	D-model	Germany Realized	D-model	France* Realized	D-model	Italy Realized	D-model	Denmark* Realized	D-model	Sweden Realized	D-model	World* Realized	D-model
1971-1980	11,03 %	4,33 %	10,31 %	8,80 %	5,83 %	10,38 %	7,27 %	5,60 %	14,99 %	2,54 %	2,11 %	4,50 %	34,13 %	19,47 %	-0,44 %	-0,15 %	2,18 %	5,29 %	0,06 %	-3,72 %	1,58 %	1,77 %	3,28 %	7,50 %	4,87 %	6,79 %
1972-1981	9,07 %	5,93 %	7,18 %	6,92 %	4,00 %	6,68 %	3,83 %	3,78 %	13,87 %	2,04 %	-0,42 %	3,93 %	30,05 %	15,55 %	-1,73 %	-2,17 %	0,73 %	6,16 %	1,85 %	-4,61 %	6,01 %	0,62 %	6,74 %	8,09 %	1,61 %	4,76 %
1973-1982	6,52 %	4,71 %	8,06 %	8,60 %	0,68 %	6,33 %	0,41 %	4,35 %	2,88 %	-0,54 %	-0,65 %	5,45 %	8,15 %	7,07 %	-1,96 %	-1,28 %	-1,16 %	2,01 %	-1,21 %	-3,22 %	-3,43 %	-6,11 %	10,51 %	10,85 %	-0,39 %	4,59 %
1974-1983	6,26 %	5,78 %	13,26 %	10,25 %	8,97 %	11,41 %	3,48 %	2,50 %	7,36 %	3,08 %	2,72 %	5,63 %	14,93 %	12,98 %	4,49 %	0,34 %	5,05 %	2,59 %	-1,42 %	1,94 %	6,76 %	-1,71 %	15,66 %	8,46 %	3,10 %	5,11 %
1975-1984	11,92 %	8,38 %	20,50 %	13,61 %	10,33 %	5,55 %	5,45 %	2,40 %	10,85 %	2,26 %	5,60 %	5,95 %	16,63 %	10,84 %	5,36 %	-1,23 %	10,24 %	1,65 %	3,23 %	9,47 %	6,48 %	-6,63 %	14,13 %	6,69 %	5,98 %	4,27 %
1976-1985	16,56 %	8,88 %	10,18 %	7,12 %	8,93 %	3,35 %	5,77 %	2,01 %	10,33 %	0,28 %	5,35 %	5,62 %	7,34 %	3,73 %	9,66 %	2,09 %	9,77 %	-0,48 %	12,55 %	8,45 %	5,99 %	-5,80 %	13,83 %	7,86 %	6,60 %	4,14 %
1977-1986	15,38 %	7,73 %	12,17 %	8,02 %	12,22 %	8,24 %	5,78 %	1,73 %	15,09 %	1,70 %	4,67 %	3,79 %	11,20 %	7,46 %	10,70 %	2,54 %	16,28 %	1,19 %	19,59 %	11,09 %	4,81 %	-5,84 %	18,26 %	8,35 %	9,22 %	4,37 %
1978-1987	16,31 %	3,54 %	9,05 %	2,66 %	11,34 %	4,68 %	5,88 %	-0,59 %	16,69 %	0,00 %	5,68 %	1,87 %	10,56 %	1,71 %	5,70 %	-2,24 %	13,56 %	-3,26 %	18,31 %	10,05 %	4,75 %	-5,70 %	17,99 %	7,33 %	10,59 %	1,99 %
1979-1988	20,24 %	4,70 %	9,15 %	5,64 %	10,63 %	7,17 %	3,74 %	0,04 %	18,35 %	1,81 %	6,67 %	3,16 %	10,14 %	3,95 %	8,41 %	3,90 %	13,90 %	2,83 %	17,23 %	13,25 %	13,27 %	0,90 %	21,84 %	12,49 %	11,19 %	2,70 %
1980-1989	7,53 %	-1,97 %	11,51 %	7,48 %	7,20 %	7,05 %	1,08 %	-1,35 %	19,34 %	2,37 %	8,41 %	3,38 %	11,28 %	4,69 %	13,16 %	6,34 %	14,54 %	2,19 %	17,42 %	14,89 %	17,30 %	-0,02 %	19,35 %	11,85 %	11,75 %	2,13 %
1981-1990	7,90 %	-0,02 %	8,00 %	3,63 %	1,45 %	4,79 %	-2,31 %	-2,74 %	14,56 %	0,54 %	5,91 %	1,70 %	4,51 %	1,47 %	11,21 %	2,77 %	11,33 %	-0,26 %	6,11 %	7,77 %	13,43 %	-6,02 %	19,35 %	6,62 %	7,78 %	-0,15 %
1982-1991	7,21 %	-4,50 %	8,90 %	4,63 %	7,20 %	7,15 %	0,48 %	-1,53 %	12,14 %	0,74 %	9,99 %	4,26 %	4,88 %	4,37 %	12,20 %	4,74 %	14,97 %	0,56 %	5,39 %	11,33 %	10,72 %	-4,62 %	13,97 %	6,18 %	10,82 %	2,88 %
1983-1992	7,66 %	-4,35 %	8,26 %	4,42 %	8,81 %	5,09 %	0,23 %	-4,50 %	9,53 %	0,70 %	9,32 %	2,23 %	7,11 %	4,41 %	10,16 %	3,79 %	15,06 %	3,61 %	6,51 %	9,14 %	7,17 %	-3,76 %	9,00 %	5,05 %	9,98 %	2,15 %
1984-1993	4,37 %	-4,81 %	8,41 %	4,59 %	6,75 %	4,29 %	-0,26 %	-1,91 %	8,77 %	0,48 %	8,64 %	3,50 %	10,38 %	7,02 %	10,38 %	5,88 %	12,03 %	5,41 %	9,67 %	4,31 %	1,91 %	-5,32 %	9,35 %	4,10 %	10,46 %	3,53 %
1985-1994	4,38 %	-3,24 %	5,10 %	1,73 %	7,04 %	4,39 %	0,71 %	-2,96 %	7,28 %	-0,27 %	8,82 %	3,19 %	12,58 %	6,76 %	8,90 %	3,28 %	9,11 %	4,67 %	8,54 %	-2,49 %	4,44 %	-0,35 %	11,39 %	3,78 %	11,03 %	3,66 %
1986-1995	1,01 %	-5,67 %	5,55 %	3,48 %	5,04 %	4,72 %	0,28 %	-2,26 %	6,70 %	2,01 %	9,57 %	3,97 %	15,55 %	8,82 %	1,48 %	0,05 %	5,61 %	4,21 %	-0,59 %	-5,87 %	2,89 %	-1,00 %	10,60 %	5,36 %	9,20 %	3,75 %
1987-1996	5,27 %	-1,56 %	5,12 %	3,93 %	2,41 %	2,81 %	2,77 %	-0,32 %	-0,02 %	-1,97 %	10,40 %	5,06 %	9,81 %	4,64 %	3,15 %	2,60 %	3,68 %	5,81 %	-5,79 %	-2,56 %	8,08 %	5,08 %	10,42 %	9,49 %	6,52 %	3,46 %
1988-1997	9,47 %	4,68 %	7,48 %	8,45 %	3,94 %	4,44 %	4,26 %	0,58 %	-2,13 %	0,59 %	13,39 %	6,45 %	8,94 %	8,88 %	11,57 %	7,00 %	9,97 %	9,36 %	3,38 %	2,83 %	14,95 %	7,94 %	15,28 %	12,49 %	6,52 %	4,48 %
1989-1998	2,75 %	-0,11 %	8,46 %	4,63 %	4,39 %	0,91 %	4,04 %	-2,08 %	-6,78 %	-1,86 %	14,94 %	4,16 %	4,68 %	5,81 %	10,07 %	2,31 %	7,91 %	2,02 %	5,68 %	-2,56 %	8,23 %	1,39 %	12,05 %	8,90 %	6,67 %	2,59 %
1990-1999	2,59 %	4,50 %	7,33 %	3,30 %	4,74 %	-1,01 %	7,18 %	0,14 %	-3,46 %	-0,42 %	14,50 %	2,86 %	11,29 %	5,55 %	10,65 %	7,13 %	10,71 %	5,56 %	6,73 %	1,40 %	8,11 %	5,18 %	18,61 %	16,25 %	7,87 %	3,03 %
1991-2000	4,88 %	4,58 %	8,37 %	2,42 %	7,47 %	0,73 %	9,93 %	-1,63 %	-1,06 %	-1,39 %	13,69 %	0,97 %	10,79 %	4,60 %	11,98 %	8,24 %	13,90 %	5,41 %	10,60 %	5,47 %	11,06 %	5,20 %	20,69 %	14,20 %	8,46 %	1,03 %
1992-2001	5,54 %	6,36 %	5,85 %	0,61 %	5,41 %	1,19 %	7,81 %	0,41 %	-2,48 %	-1,80 %	9,64 %	-0,20 %	7,52 %	5,55 %	9,71 %	7,48 %	10,59 %	4,24 %	9,06 %	4,80 %	8,59 %	10,64 %	18,30 %	15,20 %	5,04 %	-0,41 %
1993-2002	4,18 %	5,38 %	2,18 %	-0,86 %	4,39 %	3,38 %	7,14 %	1,33 %	-1,86 %	-3,10 %	6,89 %	-0,79 %	5,22 %	4,00 %	6,41 %	3,48 %	7,03 %	2,40 %	7,99 %	8,48 %	8,85 %	8,49 %	14,07 %	9,75 %	3,77 %	-0,46 %
1994-2003	3,40 %	14,44 %	1,55 %	3,33 %	2,21 %	4,71 %	7,67 %	3,89 %	-0,58 %	2,37 %	8,94 %	3,32 %	2,37 %	4,73 %	6,12 %	13,86 %	6,38 %	6,59 %	5,48 %	8,37 %	7,72 %	17,64 %	12,25 %	23,77 %	5,02 %	4,86 %
1995-2004	6,68 %	15,48 %	3,43 %	4,07 %	5,52 %	7,70 %	9,02 %	5,78 %	-0,23 %	3,59 %	10,00 %	3,83 %	4,51 %	10,06 %	7,85 %	13,73 %	9,22 %	10,58 %	7,86 %	17,95 %	10,98 %	17,52 %	14,85 %	24,90 %	6,21 %	6,02 %
1996-2005	11,04 %	24,62 %	3,43 %	3,61 %	6,55 %	8,10 %	10,40 %	6,21 %	3,78 %	8,35 %	7,17 %	2,99 %	5,74 %	12,01 %	9,99 %	18,36 %	11,90 %	12,47 %	10,55 %	19,57 %	14,98 %	20,52 %	16,93 %	25,21 %	5,42 %	5,71 %
1997-2006	11,58 %	20,79 %	3,46 %	3,99 %	7,89 %	8,93 %	9,22 %	7,08 %	4,98 %	10,53 %	6,41 %	3,99 %	9,87 %	17,12 %	9,95 %	20,01 %	11,16 %	14,19 %	12,20 %	19,42 %	14,50 %	16,92 %	15,49 %	22,79 %	6,18 %	7,33 %
1998-2007	10,72 %	19,58 %	1,47 %	3,23 %	8,36 %	9,42 %	8,36 %	9,41 %	5,39 %	11,05 %	3,68 %	3,66 %	13,41 %	20,00 %	7,57 %	19,31 %	8,39 %	13,81 %	6,39 %	14,89 %	10,14 %	13,76 %	11,97 %	20,83 %	5,52 %	8,07 %
1999-2008	8,21 %	16,59 %	-2,56 %	2,57 %	3,26 %	6,99 %	5,41 %	8,53 %	2,20 %	9,17 %	-2,71 %	0,83 %	10,57 %	15,09 %	1,30 %	15,42 %	1,21 %	10,56 %	-2,28 %	11,97 %	5,43 %	9,56 %	6,66 %	18,81 %	-0,78 %	4,64 %
2000-2009	10,17 %	16,90 %	-0,99 %	4,27 %	5,93 %	9,61 %	4,68 %	10,72 %	-1,55 %	7,41 %	-1,75 %	3,79 %	7,43 %	19,02 %	-0,37 %	15,28 %	-0,87 %	11,18 %	-1,44 %	7,78 %	5,74 %	7,93 %	2,93 %	12,90 %	0,19 %	7,08 %
2001-2010	10,90 %	20,86 %	1,15 %	4,69 %	5,45 %	7,55 %	5,71 %	13,30 %	0,51 %	10,99 %	1,48 %	5,85 %	11,18 %	19,72 %	2,59 %	15,57 %	-0,38 %	12,40 %	-2,49 %	5,19 %	9,09 %	10,72 %	7,19 %	16,29 %	3,24 %	9,18 %
2002-2011	11,64 %	20,43 %	2,60 %	6,82 %	3,33 %	6,24 %	6,49 %	10,72 %	0,61 %	10,36 %	3,34 %	6,79 %	11,53 %	16,75 %	3,18 %	13,99 %	0,45 %	11,06 %	-2,10 %	4,13 %	9,14 %	6,73 %	7,93 %	14,01 %	4,90 %	10,10 %

3.2   PREDICTABILITY

So far we have been concentrating on the unconditional expected equity premium. However, if investors form their expectations based on point-in-time variables connected to the state of the market and the economy, the unconditional expectations would be inferior. That is, one could use state-variables to make superior predictions of next year's equity premium. To investigate this, we will in the following look at how a possible state-variable does in predicting the premium.

Following the uncertainty of our risk free proxies, we have chosen to use market returns as the dependent variable in the regressions. Since the risk free rate by definition is known when the investment decision is made, this should not affect the inference with respect to predictability. In other words, if a variable can predict next period market returns, it should have equally predictive power of the next period equity premium.

Consistent with other researchers, we use the dividend-price price ratio to predict the stock returns. All though it does not appear to be a unilateral agreement among scholars, many hold the dividend-price ratio as the best candidate for a predictive variable of stock returns. If the dividend-price ratio can predict returns and premiums, we can think of three plausible explanations for this. 1) The dividend-price ratio is related to additional risk factor(s). 2) The markets are mispriced and dividend-price can be used to time the market. 3) The equity premium, risk aversion and the dividend-price ratio are time-varying and correlated with the business cycle. These refer back to some of what we discussed in the literature review.

***Stock returns - *** *Variable: The dividend-price ratio*

Table 6 shows the regression results. Our estimations show that for most of the markets, the dividend-price ratios have very little predictive power. The coefficient is insignificant (5 % lvl) in 7 out of 13 countries, and it explains less

than 10 % of the variance in all but 4 markets. We can also see that the World dividend-price ratio is not a significant predictor in any markets.

Table 6 – Univariate OLS prediction of stock returns with one lagged dividend-price ratios

*The regression table shows the p-values of the dividend-price coefficients and the R-squared adjusted for degrees of freedom for each regression. A constant term was included in the regressions. * Denotes markets where nominal values have been used.*

Prediction table for Stock Return - Univariate regressions				
Variable	D/P ratio (t-1)		World D/P ratio (t-1)	
	P-value	Adj R²	P-value	Adj R²
Norway	1,33 %	12,52 %	54,68 %	-1,60 %
UK	4,90 %	16,46 %	11,42 %	3,87 %
Australia	0,53 %	16,21 %	37,46 %	-0,49 %
Canada	49,47 %	-1,33 %	66,52 %	-2,07 %
Japan	2,64 %	9,75 %	11,17 %	3,96 %
US	0,17 %	-0,17 %	65,01 %	-2,02 %
Singapore	1,52 %	11,99 %	29,14 %	0,36 %
Germany	97,77 %	-2,56 %	58,24 %	-1,76 %
France*	37,18 %	-0,46 %	16,87 %	2,36 %
Italy	71,02 %	-2,20 %	58,53 %	-1,77 %
Denmark*	7,95 %	5,31 %	23,24 %	1,17 %
Sweden	31,95 %	0,04 %	39,94 %	0,69 %
World*	9,60 %	4,56 %		

Nevertheless, especially in the UK and Australia, the dividend-price does seem to give some indication of the future return (in-sample). We should however be cautious in our inference. As we discussed earlier, the dividend-price ratios appear generally non-stationary and highly autocorrelated. Since this can lead to spurious and unreliable coefficients, the variance explained by the model may be overstated. For Australia, however, we could reject a unit root of the dividend-price ratio on the 5 % level. Thus, there appears to be most evidence of predictability in the Australian market. In general however, we conclude that our evidence for predictability is relatively weak. Hence, we do not find much indication of either predictable abnormal return and/or a time-varying risk premium.

Dividend growth – *Multivariate regression*

As, Fama and French (2002, 648-649 Table III), we also want to investigate whether the growth in dividends are predictable. If so, the dividend growth estimate of the dividend-model should be made conditional, and the unconditional mean growth would no l onger be the best estimator. Here we use a panel of different explanatory variables related to the stock market with up to three lags, all of which are known at time t. These multivariate regressions are very similar to those done by Fama and French (2002, 648-649 Table III). First, we use the dividend-price ratio lagged once. As mentioned, the dividend-price ratio is by some considered to contain information about either mispricing, risk or risk aversion, and thus may be an indicator of the state of the economy. Thus, we think it constitutes a possible indicator of growth of fundamentals. Moreover, we include the World dividend-price ratio for all the individual markets, in case it may indicate the state of the world economy and because of the high level of market integration across capital markets. To account for possible autocorrelation, we also include three lags of previous dividend growth and previous returns. As before, we evaluate the significance of the individual variables with p-value (t-statistics) and their combined explanatory power using the R-squared adjusted for degrees of freedom. Table 7 shows our results:

Table 7 – Multivariate OLS prediction of dividend growth

*The regression table shows the p-values of the coefficients and the R-squared adjusted for degrees of freedom for each regression. A constant term was included in the regressions. * Denotes markets where nominal values have been used. Green and yellow are used to highlight p-values lower than 5 and 10 percent respectively.*

Prediction table for Dividend growth - Multivariate regressions									
Variable	D/P (t-1)	World D/P (t-1)	Div growth (t-1)	Div growth (t-2)	Div growth (t-3)	Returns (t-1)	Returns (t-2)	Returns (t-3)	
	P-value	P-value	P-value	P-value	P-value	P-value	P-value	P-value	Adj R²
Norway	93,09 %	97,73 %	86,02 %	28,97 %	71,96 %	16,84 %	28,34 %	43,43 %	4,30 %
UK	84,21 %	86,55 %	58,44 %	78,37 %	68,77 %	16,62 %	62,71 %	79,36 %	3,52 %
Australia	20,02 %	56,85 %	22,67 %	54,27 %	83,77 %	0,22 %	82,44 %	80,56 %	25,75 %
Canada	4,97 %	17,03 %	34,96 %	87,11 %	87,81 %	10,95 %	42,98 %	62,30 %	10,04 %
Japan	36,03 %	52,45 %	65,75 %	41,26 %	55,18 %	39,85 %	31,29 %	78,49 %	-7,52 %
US	15,76 %	9,91 %	71,31 %	96,26 %	47,72 %	8,20 %	45,85 %	15,37 %	7,77 %
Singapore	88,34 %	89,83 %	91,38 %	49,49 %	7,83 %	2,16 %	13,01 %	13,65 %	21,09 %
Germany	27,13 %	91,15 %	58,51 %	81,02 %	46,17 %	12,58 %	70,42 %	97,56 %	18,54 %
France*	9,94 %	15,78 %	46,93 %	29,48 %	89,71 %	0,36 %	43,78 %	50,54 %	22,44 %
Italy	4,09 %	46,39 %	23,45 %	19,18 %	32,25 %	1,60 %	96,95 %	87,47 %	10,43 %
Denmark*	55,97 %	46,11 %	24,64 %	62,10 %	97,71 %	18,83 %	23,88 %	55,93 %	11,60 %
Sweden	22,28 %	50,80 %	67,96 %	82,39 %	60,06 %	3,64 %	97,71 %	54,53 %	7,18 %
World*		60,73 %	39,58 %	72,12 %	56,79 %	1,80 %	45,56 %	77,37 %	5,54 %

As shown, the most frequently significant variable is the one-lag returns, which is significant in half of the markets. The one-lag D/P ratio is significant in two markets at the 5 % level plus one market at the 10 % level. The explained variance is over 10 % in about half of the markets, but the World-aggregate regression explains only 5 % of its variation.

Since the dividend-price ratios are not entirely stationary, we turn our focus to the lagged returns which are stationary in all the markets. Our findings suggest that last periods stock returns have an influence on the growth in dividends. This predictive power however does not reach beyond one period. This is relatively consistent with Fama and French (2002, 648-649 Table III), findings in the US market. We conclude that although the next period expected dividend growth may be somewhat predicted conditionally, it appears to quickly revert back to the unconditional mean.

Section IV – Discussion and Conclusion

4.1   DISCUSSION

Given our findings above, we will now try to answer each of the research questions we have stated. This includes a discussion of their significance and consistency with other research papers, as well as possible implications for future theoretical or empirical works.

Are the fundamental-derived estimates lower than average returns?

From Table 4 we found that in most markets (10 out of 13), the fundamental-derived estimate of the dividend growth model is lower than the average return estimate. Thus, if the dividend model is closer to true unconditional expectations, the general picture is that the observed historical equity premium has exceeded expectations in the period from 1970 to 2011, resulting from unexpected capital gains. The difference, however, is not very large in most markets, and significant lower than found by Fama and French (2002, 641 Table I) in the US market.

We have no indications as to why the two models differ more in some markets than in others. Given our limited longitude and number of observations, however, it could very well be that much of this is simply random. The high premium observed in Sweden for example, could be due to a disproportional high unexpected growth in the 1970 to 2011 period and thus just a random outperformance. Another explanation could be that the starting value in 1970 was especially low in the Swedish market. For similar reasons, the fact that the dividend-model estimates are higher than average returns in three of the markets, may simply be the result of random events, and not necessarily evidence against the dividend-model. What we find most important is therefore, not the characteristics of each of the markets, but the fact that in 10 out of 12 of the individual markets, as well as the World portfolio, the dividend-model does

provide a lower estimate of expected premiums. Hence, we conclude that, in general, the dividend-model gives lower equity premium estimates for the 1970-2011 period.

Are the fundamental-derived estimates more precise than average returns?

Again, this is the case for most of the markets (11 out of 13), resulting from a lower volatility in dividend than in prices, as shown in Table 4. However, the differences are not particularly large. The standard errors of the dividend model only range from about -1% to 2.5% higher than the realized average model. Also, Fama and French (2002, 641 Table I) find a much higher precision advantage in the US market in their 1951-2001 sample than we do in our 1970-2011. Combined with our findings regarding the recent "jump" in dividend growth, we think that the small precision differences are mostly due to the 2000's. Even so, the dividend-model is more precise in so many of the markets, that we think this alone, rather than the magnitude of the precision, suggests that the dividend model is in general a more precise estimator of the long run expectations.

How have the fundamental-derived estimate and the average return developed over time?

The dynamics of the dividend model is determined by the growth in dividend, while the average return depends on growth in prices. Although the individual markets differ in this respect, we find the differences to be such that the general picture should be reasonably described by a simple cross-market average. We find that the ten year cross-market average dividend growth was much less than the growth in prices up unt il around 2002. In the 2000's however, the situation reversed and dividend growth have been higher. As discussed, this is related to the growth in the dividend-price ratio from its historic low around 2000.

Can state variables predict the stock returns?

Here our results are mixed. We find that the dividend-price ratio have some predictive power in certain markets, but due to non-stationary of the dividend-price ratio, we do not feel confident enough to make a general conclusion. That

would require a more comprehensive study with more observations, robustness checks and out-of-sample analysis. We therefore leave this task to future researchers. Also, our main focus with regard to predictability was to look for evidence of a strongly time-varying equity premium that would make our two unconditional estimates inferior. Even with an explained variance of 16 % like in Australia, however, we still think that the unconditional dividend-model estimates should be valid.

Is dividend growth predictable?

Like with stock returns, the predictability of dividend-growth is also mixed. The difference with dividend-growth is however, that the most frequently significant variable is the one-lagged stock market return, which we find to be stationary. It is significant in half of the markets. Thus, we see this as weak evidence for the need to include conditional dividend-growth estimate in the dividend-model.

Even so, the results are not entirely conclusive. We find that the explained variance varies from 0 to 25 %, while in the World-proxy it is only 5 %, as shown in Table 7. Moreover, we find that the one-lagged return cannot predict dividend growth beyond one period in any of the markets. Thus, the conditional estimate of dividend-growth appears to quickly return to the unconditional mean. Also, since we find the rate of dividend growth to be mean reverting and because this paper focuses primary on the long-run estimates, we have chosen not to make a conditional dividend-model in this thesis. Still, we think such a model may be necessary to both investors and researcher interested in the point-in-time estimates of the next periods expected returns. Blanchard (1993, 75-76) explores one such model and investigates the movement of the equity premium.

The dividend-model vs. realized average

We now seek to answer our primary research question.

Is the fundamental-derived expected return a better estimate?

We have found that the dividend-model in general produces lower and more precise estimates. As stated however, the two models should converge in the very long run. If not, the dividend-model estimate would be biased, making its precision advantage irrelevant. This is why we require the dividend-price ratio to be mean reverting for a sufficiently large period. For our sample however, we cannot reject a unit root in the dividend-price ratio. As discussed before, there can be several explanations for this, for example structural breaks caused by shifts in taxes, corporate policy or liquidity. Given such structural breaks, the dividend-model and the realized average may not completely converge. We think however, that there should still be a tendency of convergence of the long-run mean. Since we indeed find a lesser difference between the two models than Fama and French (2002, 641 Table I) do, we see this as evidence supporting this convergence, and thus supporting the dividend-model in general. We think this support is enhanced by the fact that the precision of the dividend-model is higher in 11 of the 13 markets, and that the equity premium is lower in 10 of 13 markets.

We stress once again that we feel more confident on the differences between the models than on the actual level of the equity premium, due to both the uncertainty of the choice of risk-free rate proxies and their somewhat non-stationary behavior. Thus, we are only evaluating the two models against each other, and hence do not claim that any of them reflect the exact level of the expected equity premium. Moreover, we also believe that making a comparison between different countries is important. Also, some researchers have argued that some of the high equity premiums are due to survivorship bias resulting from only looking at the most successful stock markets, such as the US. Studying several markets can reduce this survival bias (Dimson, Marsh and Staunton 2002, 174). This is why we focus

on general findings across markets and not so much on the individual markets, and we think this strengthens our results.

We conclude that the dividend-model do appear to have some important attributes in determining the true unconditional expectation of the equity premium in markets with limited data series available. For markets with very long and reliable data series available like the US however, the best estimate of the long-term future equity premium might be the long-run historical realized mean. That is, unless one has good reasons to believe there have been structural breaks in either capital markets and/or investor behavior. If so, we think that the dividend-model gives the most precise unconditional estimate within the regimes in these markets as well. But then the final question is whether it gives estimates more consistent with theory and thus whether it helps to explain the equity premium puzzle.

Can the fundamental-derived expected returns resolve the equity premium puzzle?

Since we have already concluded that the dividend-model gives in general lower and more precise estimates of the equity premium, the remaining question is whether it is "low enough". To answer this, we need to assess the required equity premium. Since economic and financial theory state a relationship between equilibrium risk, return, and aggregated risk aversion, one can, by imposing reasonable restrictions on risk preferences, use these models to calculate a plausible level of the required premium. One consumption-based model, with no habit persistence, gives the following expression for the expected-required relationship[6]:

$$\frac{E(r_{m,t}) - r_{f,t}}{\sigma_m} = A \cdot \sigma_{\Delta c} \qquad (8)$$

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[6] This particular model is taken from the lecture notes of Mr. Richard Priestley in the BI Business School course "Introduction to Financial Economics" taught in the fall of 2010. There are however different versions of this relationship. $E(r_{m,t})$: Expected market return at time t. $r_{f,t}$: Risk-free rate at time t. σ_m: Standard deviation of market returns. A: Equilibrium coefficient of aggregated risk aversion. $\sigma_{\Delta c}$: Standard deviation of consumption growth.

More specifically, this equates the expected Share ratio (LHS) and the required Sharpe ratios (RHS). An important note is also that since (8) only involves time dependency in expected market return and the risk free rate, it implies a constant equity premium, both expected and required. It implies that any movement in the expected market returns would give an identical movement in risk-free rate, and vice versa, leaving the difference unchanged. As discussed in the literature review, this used to be regarded as a requirement of the efficient market hypothesis by some scholars. However, if one accepts a time-varying risk aversion (A) (or time-varying volatility of consumption or market return) conditional on the state of the economy for example, the equity premium would also vary. Even so, it should be reasonable to assume that both risk preferences and the equity premium is stationary. That is, we would not expect risk aversion or volatility to be permanently increasing or decreasing. Indeed, our results show a mean-reversion in the equity premium estimates for both of our estimation models, and as discussed, our results from predictability of stock returns and dividend growth indicates that the conditional expectations quickly returns to the unconditional mean. Consequently, one can take (8) to be a model of the long-run unconditional equity premium ($\overline{EP}$) and Sharpe ratio($\overline{SR}$):

$$\overline{SR} = \bar{A} \cdot \bar{\sigma}_c \qquad or \qquad \overline{EP} = \bar{A} \cdot \bar{\sigma}_c \cdot \bar{\sigma}_m$$

Here, the bar indicates the long-run mean. Since both σ_m and $\sigma_{\Delta c}$ are observables, the difficulty is mainly the calibration of A. For our purpose, we will simply limit A to be small. Mehra (2008, 20) discuss a similar parameter and conclude that it should be less than 10 and closer to 3. We will therefore set this to a maximal value of 5. Since we do not have consumption data in this thesis, we will also simplify by assuming the standard deviation of consumption growth to be equal across markets. Mehra and Prescott (1985, 154) find a standard deviation of consumption growth (per capita) of 0.036 in US for the period 1889-1978. Since our data series starts in 1970, we think this should give a relatively good approximation of the ex-ante variation of consumption. Thus, we derive a theoretical upper limit of the required Sharpe ratio of roughly $A \cdot \sigma_{\Delta c} = 5 \cdot 0.036 = 0.18$. Table 8 and Figure 12 compare this value with both of our estimated Sharpe ratios.

Table 8 and Figure 12 – Expected and Required Sharpe ratios

*This table displays the estimated expected Sharpe ratios from both realized returns and the dividend model and our simplified upper limit of the required Sharpe ratio. It also shows the differences between the expected and the required estimates, and which is also what is plotted in the figure. The * indicates nominal values, and as before the risk-free rate for the "World" market is the US proxy.*

Market	Sharpe Ratios				
	Realized	D-model	Required	Realized - Requried	D-model - Required
Norway	0,203	0,175	0,18	0,023	-0,005
UK	0,279	0,205	0,18	0,099	0,025
Australia	0,204	0,249	0,18	0,024	0,069
Canada	0,269	0,187	0,18	0,089	0,007
Japan	0,224	0,104	0,18	0,044	-0,076
US	0,317	0,186	0,18	0,137	0,006
Singapore	0,311	0,240	0,18	0,131	0,060
Germany	0,225	0,239	0,18	0,045	0,059
France*	0,236	0,205	0,18	0,056	0,025
Italy	0,099	0,108	0,18	-0,081	-0,072
Denmark*	0,253	0,100	0,18	0,073	-0,080
Sweden	0,404	0,370	0,18	0,224	0,190
World*	0,314	0,228	0,18	0,134	0,048
Average difference				0,08	0,02
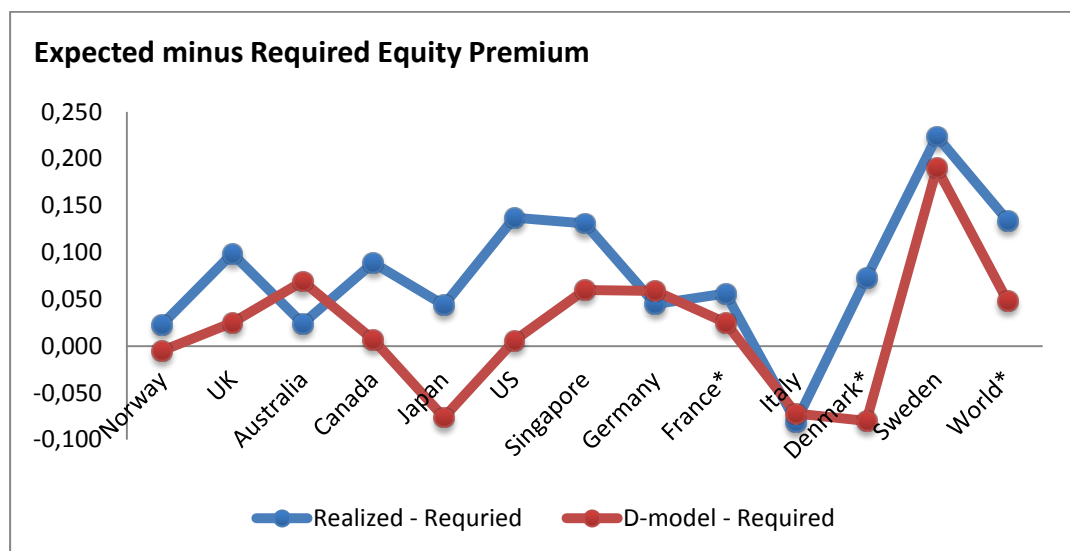
Here, we are interested in which one of the models that is generally closest to the theoretical value. Of the realized Sharpe ratios, only one, Italy, has a Sharpe ratio less than 0.18. The dividend-model clearly has a better fit, although still a slightly higher average than 0.18.

We conclude that the dividend-model do s eem to be closer to the theoretical prediction. Thus, if the dividend-model is a more correct estimate, it c an in fact explain some of the observed outperformance of equity returns. Even so, 0.18 is a highly uncertain number that might indeed vary from market to market, depending on consumption growth. Moreover, it is only an upper bound with respect to risk aversion. This coupled with our uncertainty of the risk free proxy, we conclude that we do find a closer fit with the theoretical value using the dividend-model as opposed to realized returns, but not that this solves the puzzle entirely. Consequently, we still think the ultimate resolution of the puzzle may involve model modifications of investor preference and behavior, like for example habit formation. Nonetheless, it looks like fundamental-derived expected returns could indeed be an important factor.

4.2   CONCLUSION

In general, our descriptive seems to match those of Fama and French (2002) reasonably well. Our findings suggest that the fundamental-derived estimate may indeed be a better estimate of the expected equity premium. In all the markets except Australia, Germany and Italy, we find that the dividend-model gives lower estimates than the average realized returns. The differences between the models, however, are generally smaller than Fama and French found in 2002. W e conclude that this is because of a reversion of the long term decline of the Dividend-Price ratio, as the growth in dividends has been higher than the growth in prices the last decade. Thus, the unexpected capital gains of the 80's and 90's have been replaced by capital gains more in line with the long-run unconditional mean. Even so, we find that in all markets except Germany and Sweden, the dividend-model is more precise than the average realized.

We also find some evidence suggesting that the dividend-price has some in-sample predictive power of stock returns in certain markets. Due to the non-stationarity of the in-sample dividend-price ratio however, we do not find this evidence particular persuasive. The possible exception is Australia, where the dividend-price ratio is both stationary, and explains 16 % of the variance. But even so, we see no reason for the Australian market to be any less rational than the others. Furthermore, we find that the growth in dividend is somewhat predictable in some of the markets. Again, Australia tops the list with 25 % of the variance explained. The only two significant predictors of the growth in dividend are the lagged dividend-price ratio and the lagged returns. Despite that some markets have explained variance exceeding 20 %, we find the world portfolio to only explain about 5 %. For all markets, we are unable to predict dividend growth beyond one year into the future. Thus, despite some predictability, the true expected return seems to revert back to the unconditional mean relatively quickly.

We conclude that our thesis has provided support for the dividend-model, even though it may not entirely resolve the equity premium puzzle. Thus, we suggest that a final resolution may involve modifications of investor preferences and

behavior. Nonetheless, we think both past and future expected equity premiums are lower than the historical observed average. We also hope future studies will continue to explore the nature and dynamics of the equity premium.

REFERENCES

Bekaert, Geert and Robert J.Hodrick. 2009. *International Financial Management.* Upper Saddle River, New Jersey 07458: Pearson Prentice Hall.

Blanchard, Oliver J. 1993. " Movements in the Equity Premium". *Brookings Papers on Economic Activity* (2): 75-138. Access date 27.08.12. http://web.ebscohost.com/ehost/detail?vid=9&hid=14&sid=16caa309-e32f-43a1-9030-cfdbfcf0ba6c%40sessionmgr15&bdata=JnNpd GU9ZWhvc3Qtb Gl2ZQ%3d %3d#db=bth&AN=2436009

Bodie, Zvi, Alex Kane and Alan J. Marcus. 2009. *Investments.* 8th ed. New York, NY 10020: McGraw-Hill/Irwin.

Campbell, John Y. 2008. "Viewpoint: Estimating the equity premium". *Canadian Journal of Economics* 41 (1): 1-21. doi: 10.1111/j.1365-2966.2008.00453.x.

Campbell, John Y. and John H. Cochrane. 1999. "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior". *Journal of Political Economy* 107 (2): 205-251. Access date 25.08.12. http://web.ebscohost.com/ehost/detail?vid=19&hid=7&sid=045862f5-d 6 5d-48cb-b0da-a9f1474d2525%40sessionmgr13&bdata=JnNpd GU9Z W h vc 3QtbGl2ZQ%3d%3d#db=bth&AN=1792007

Campbell, John Y. and Robert J. Shiller. 2001. *Valuation ratios and the long-run stock market outlook: An update.* NBER Working Paper No. 8221: 1-30. Cambridge, MA 02138: National Bureau of Economic Research. JEL No. G12. Access date 26.08.12. http://www.nber.org/papers/w8221

Cochrane, John H. 1994. " Permanent and transitory components of GNP and stock prices". *The Quarterly Journal of Economics* 109 (1): 241-265. Access date 27.08.12
 http://web.ebscohost.com/ehost/detail?vid=3&hid=14&sid=16caa 309-e32f-43a1-9030-cfdbfcf0ba6c%40sessionmgr15&bdata=JnNpd GU9ZWhvc3 QtbGl2ZQ%3d%3d#db=bth&AN=9411075824
Reffered to in Fama and French (2002, 642)."The Equity Premium". *The Journal of Finance* 57 (2): 637-659.

Cochrane, John H. 2005. "Financial Markets and the Real Economy". *Foundations & Trends in Finance*. 1 (1): 1-101. Access date 25.08.12. http://web.ebscohost.com/ehost/detail?vid=5&hid=123&sid=1f161886-15e7-4602-8b10-b6debfb29331%40sessionmgr115&bdata =JnNpdGU9ZW hvc3QtbGl2ZQ%3d%3d#db=bth&AN=26025358

Cochrane, John H. and Monika Piazzesi. 2005. "Bond Risk Premia". *The American Economic Review* 95 (1): 138-160. Access date 25.08.12. http://web.ebscohost.com/ehost/detail?vid=6&hid=7&sid=045862f5-d65d-48cb-b0da-a9f1474d2525%40sessionmgr13&bdata=JnNpdGU9ZWhvc 3QtbGl2ZQ%3d%3d#db=bth&AN=17018345

Cooper, Ilan and Richard Priestley. 2009. "Time-Varying Risk Premiums and the Output Gap". *The Review of Financial Studies*. 22 (7): 2601-2633. doi:10.1093/rfs/hhn087

Dimson, Elroy, Paul R. Marsh and Michael Staunton. 2002. *Triumph of the Optimists: 101 Years of Global Investment Returns*. 1st ed. Princeton, NJ: Princeton University Press.

Fama, Eugene F. and Kenneth R. French. 2002. "The Equity Premium". *The Journal of Finance* 57 (2): 637-659. Access date 26.08.12. http://web.ebscohost.com/ehost/detail?vid=3&hid=123&sid=1f161886-15e7-4602-8b10-b6debfb29331%40sessionmgr115&bdata=J nNpdGU9ZWhvc 3QtbGl2ZQ%3d%3d#db=bth&AN=6327536

Hair, Joseph F. Jr., William C. Black, Barry J. Babin and Rolph E. Anderson. 2010. *Multivariate Data Analysis*. Upper Saddle River, New Jersey 07458: Pearson Education, Inc.

Henkel, Sam J., J. Spencer Martin and Federico Nardari. 2011. "Time-varying short-horizon predictability". *Journal of Financial Economics* 99 (3): 560-580. Access date 26.08.12. http://dx.doi.org/10.1016/j.jfineco.2010.09.008

Lettau, Martin and Sydney Ludvigson. 2001. "Consumption, Aggregate Wealth and Expected Stock Returns". *The Journal of Finance* 56 (3): 815-849. Access date 25.08.12 http://web.ebscohost.com/ehost/detail?vid=15&hid=7&sid=045862f5-d65d-48cb-b0da-a9f1474d2525%40sessionmgr13&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=bth&AN=4673636

Mehra, Rajnish. 2008. *Handbook of the equity risk premium.* 1st ed. Oxford OX2 8DP, UK: Elsevier B.V

Mehra, Rajnish and Edward C. Prescott. 1985. "The equity premium: A Puzzle". *Journal of Monetary Economics* 15 (2): 145-161. Access date 26.08.12 http://dx.doi.org/10.1016/0304-3932(85)90061-3

MSCI: Morgan Stanley Capital International. 2012. (See page 15 for data source details).

Næs, Randi, Johannes A. Skjeltorp and Bernt Arne Ødegaard. 2007. "Hvilke faktorer driver kursutviklingen på Oslo Børs?" *Norges Bank*: *Working Papers* 12/12/2007 (8): 1-68 JEL kode: G12; E44. Access date 26.08.12 http://web.ebscohost.com/ehost/detail?vid=15&hid=8&sid=1e7f91f5-ef92-45c4-8098-2e3df56444a5%40sessionmgr15&bdata=JnNpdGU9ZWhvc3Q tbGl2ZQ%3d%3d#db=bth&AN=28860507

Sharpe, Norean R., Richard D. De Veaux and Paul F. Velleman. 2012. *Business Statistics.* 2nd ed. Boston, MA 02116, USA: Pearson Education, Inc.

Welch, Ivo and Amit Goyal. 2008. "A Comprehensive Look at The Empirical Performance of Equity Premium Prediction". *The Review of Financial Studies* 21 (4): 1455-1508. Access date 25.08.12 doi:10.1093/rfs/hhm014

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GRA 19003 PRELIMINARY THESIS REPORT

BI NORWEGIAN SCHOOL OF MANAGEMENT

The Equity Premium Puzzle

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Date of submission: 16.01.2012

Campus:

BI Norwegian School of Management

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Program:

Master of Science in Business and Economics

Department of Financial Economics

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Introduction

This master thesis will investigate the equity premium puzzle, a subject that has troubled many researchers over the previous three decades.

The expected equity premium (EP) is defined as the aggregated stock return in excess of the risk-free rate. Because of its use in pricing assets, evaluating fund performance, capital structure, investment and risk aversion, the EP is one of the most important quantities in finance. The term "**Equity Premium Puzzle**" originates from an article of Mehra and Prescott (1985) where they claim that historical excess returns on risky assets in the US were too large to comply with standard economic theory.

Suggested solutions to the puzzle have been numerous, but it is still subjected to debate among scholars. Our approach to the issue is that of Fama & French (2002) which use fundamentals to estimate expected returns. Instead of data from the US, data from Norway and England will be applied. Further, we will compare our findings with the findings of Fama & French (2002) which used US data.

In our preliminary thesis report we will first give a review on earlier research performed on the equity premium. We will continue by elaborating our research questions, our choice of methodology and provide a plan for data collection. Finally, we will give a brief outlook on the further progress with the thesis.

We stress that all aspects of this preliminary report are of a work-in-process nature.

Literature Review

The Equity Premium has been the subject of many studies, both theoretical and empirical. Mehra and Prescott (1985) discovered that the persistent outperformance of stocks to bonds seems to have been too high according to standard economic models. Thus, the question that arose was why any long-run investor would invest in bonds rather than stocks. Nicknamed The Equity Premium Puzzle, this phenomenon has led to e1xtensive research and debate over the nature of stock markets.

One debate has been whether the equity premium really is constant. According to Campbell (2007), the early academics in the 1960's and the 1970's interpreted the efficient market hypothesis to mean that the true equity premium was constant. This would imply that the more data history you used, the closer your estimate would be to the equity premium.

Related to this is the question of predictability. In the 1980's multiple scholars found that valuation ratios, such as dividend-price and earnings-price ratios, could indicate over- or undervaluation of the stock market (Fama and French (1988), referred to in Campbell (2007)). Whether these ratios can persistently predict future returns has remained disputed. Goyal and Welch (2008), for example, argue that historical averages often preform just as well, if not better, than out-of-sample forecasts form valuation ratios. Campbell (2007), however, argues that by assuming a stationary dividend price ratio that follows a geometric random walk, one can use the logic from the classic Gordon Growth model to produce successful out-of-sample forecasts of the equity premium.

Fama & French (2002) also use valuation ratios in their attempt to explain the equity premium. Then they compare the estimates of the unconditional expected stock returns from fundamentals with the average stock returns. They further look at the evidence from Sharpe ratios, estimates of precision, and the behavior of book –to-market ratio and the income return on investment. This enables them to choose between the estimates from fundamentals and the estimates from average stock returns. They argue that using dividend and earnings growth rates to measure expected rate of capital gain gives a more precise estimate of the equity premium. Moreover, they claim the high average stock returns from 1951-2000 is due to a

decline in discount rates that produces a large unexpected capital gain. Their conclusion is that the average stock return of the last half-century is a lot higher than expected, and that the unconditional expected premium the last 50 years is probably far below the realized premium. Hence, Fama and French claim the equity premium puzzle is not a real puzzle after all.

If the equity premium is predictable by using valuation ratios, this would imply that the equity premium is unknown and that it must be interpreted in each time period based on the observable data (Campbell, 2007). However, this seems to violate the efficient market hypothesis, that is, unless investors risk preferences also where state-dependent. Multiple writers have explored this problem and tried to explain it. Campbell and Cochrane (1999) (referred to in Campbell (2007)), for example, gives insight to how habit formation can make rational investors more averse to risk in recessions.

If risk aversion and the equity premium vary over the business cycle, it could also be that changes in the equity premium are a response to macroeconomic factors relating to the state of the economy. In a study of the Norwegian stock market, Næs, Skjeltorp and Ødegaard (2007) investigate whether different macroeconomic variables can affect the market risk premium and the risk-free interest rate, referring to research from the US that show weak evidence for macroeconomic variables affecting stock returns. Næs, Skjeltorp and Ødegaard (2007) find that the Norwegian stock market can be influenced by oil prices. Other examples are the dividend yield, term spread, consumption, unemployment, import, export, inflation and the money stock. Further they find that it is mainly nominal macro variables which are related to stock returns. They investigate if the macro variables have a risk premium, and find that few of the risk premiums are significant. They say that an explanation of this might be that the stock market is a leading indicator for the macro economy than the other way around.

Lettau and Ludvigson (2001a) look at what role fluctuations in the aggregate consumption-wealth ratio has for predicting stock returns, and they find that it is a strong predictor for real stock returns and the excess return over a Treasury bill rate. Moreover, in short and intermediate horizons it is a better forecaster of future returns than the dividend yield and the dividend payout ratio, among others. They

state that indicators as price to dividend, price to earnings and dividend to earnings ratios have been most successful in predicting returns over longer horizons, while for a shorter length like a typical business cycle they are viewed as weakly forecasters.

An implication of their results is that huge swings in financial assets do not have to be followed by huge movements in consumption. Investors will try to smooth their consumption and when the equity premium is expected to be higher (lower) in the future, they will increase (decrease) current consumption. They will isolate future consumption from fluctuations, and in this way the labor income can be a predictor of excess stock returns. They conclude that in this respect the investor's own behavior should reveal expectations of future return to aggregate wealth, which gives a good proxy of expected returns to the market portfolio.

Lettau and Ludvigson (2001b) also say that weaknesses in CAPM and (C)CAPM since the 1980's made researchers look for other models to explain the pattern of returns on portfolios according to size and book-to-market equity ratios. Lettau and Ludvigson (2001b) use the (C)CAPM to explain the cross section of average stock returns. Essential to their method is the use of the log consumption-aggregate wealth ratio as a conditioning variable. They find this to explain much of the cross-sectional variation in portfolio returns. And this can account for the difference in returns between low and high book-to-market firms. Their results are also supporting the theory of the habit-formation-version of the (C)CAPM, and they find that this method preforms better than those originating from dividend-price ratios, default spread and term spread.

Goyal and Welch (2008) looked at variables suggested by previous literature to be good predictors for the equity premium. They conclude that these models have predicted badly in-sample and out-of sample the last 30-years, and therefore seems unstable. They conclude that the literature still have not found a variable that has a robust empirical and meaningful forecasting power for the equity premium in- and out-of sample.

Henkel, Martin and Nardari (2011) signify that the strength of predictability is that it is distinctively time-varying. Dividend yield and commonly used term structure

variables are, in the short-horizon, effective predictors in recessions and contractions, but non-existing during expansions. Like Campbell and Cochrane (1999) they also find the market risk premium to be higher during recessions. They find a strong link between aggregate return predictability and business cycles in all of the seven countries they examine, except Germany. Their empirical model outperforms historical average in recessions, while the historical average is best during expansions.

Summary

As attested by this brief review, there are many findings on the subject of stock return and premium. We conclude by saying that the out-of-sample predictability of the equity premium remains disputed, but that valuation ratios like dividend-price ratios and also some macroeconomic factors do tend to have some predictive power. This does, however, not nessseraily violate the efficient market hypothesis, as for example the habit-formation version of the Consumption-CAPM provide a framework where risk aversion, and hence the equilibrium risk premium, is higher in recessions.

We find the approach used by Fama and French (FF) (2002) particularly interesting. Their argument for using dividend and earnings growth rates to measure expected rate of capital gain more precisely will therefore be the starting point for our work.

Research questions

The objective of our thesis is to investigate the equity premium in the Norwegian and British stock markets. In this regard, we have established the following preliminary research question:

Have the average stock returns in Norway and the UK been too high?

This question addresses implicitly the existence of the Equity Premium Puzzle in the two markets. In order to answer it however, we need to specify what is meant by "too high". Recall that Mehra and Prescott (1985) state that the average return was too high given the observed volatility of consumption. FF (2002) argue, however, that the fundamentals such as dividend and earnings growth rates are superior to average stock returns in producing estimates for the expected returns on the market portfolios. Thus, if average returns are significantly higher than fundamental-derived expected returns, one may infer that the high average returns were unexpected. Hence, the equity premium may not be as high as it seems. Following this line of thought, our main focus is the history of the fundamental-derived expected returns and its components:

Does the fundamental-derived expected return perform better than the average

returns in estimating and explaining the equity premium?

Given FF's findings in the US markets, we hypothesize that the fundamental-derived returns are lower than average returns in the Norwegian and British markets as well. But if this is the case, we are left with the explanation of why they are different. FF list three potential explanations from valuation theory; 1) Dividend and earnings growth have been unexpectedly high. 2) The end-of-sample expected future growth rates of dividends and earnings are unexpectedly high. 3) The expected stock return is unexpectedly low at the end-of-the sample period. Hence, we will also address the following questions in our paper:

Have dividend and earnings growth been as expected?

Are the end-of-period expected growth rates unusually high?

Have expected returns fallen during the sample period?

As a conclusion to our inquiry, we will intend to sum up the results by asking the more important underlying economic question:

Is the Equity Premium Puzzle really a puzzle?

Methodology

As Fama and French's findings constitute the primus motor for our thesis, we will start by applying their approach and methodology to address the research questions. This should also render our results comparable with those of FF in the US market.

The FF approach to investigating the equity premium, is simple and not very deep. The main point of difficulty is the estimation of the unconditional expected stock return $E(R_t^m)$. The standard method here has been to use a simple long-run average stock returns as the expected return for a long-horizon investment in the market portfolio. FF however argue that fundamental-derived expected returns are better estimates as they find them more precise and more in line with reasonable assumption of risk preferences.

Estimation of Unconditional Expected Stock Return

We start off with the trivial expression that the expected stock return is the expected dividend yield plus the expected rate of capital gains:

$$E(R_t^m) = E\left(\frac{D_{t+1}}{P_t}\right) + E\left(\frac{P_{t+1}-P_t}{P_t}\right) \tag{1}$$

This is essentially equivalent to the solution for the expected return in the Gordon (1962) valuation model;

$$E(P) = \frac{E(D)}{E(r)-E(g)} \tag{2}$$

The principal focus here is the estimation of the latter term in (1), the expected growth rate (capital gains). As mentioned, the standard approach is to use simple averages over realized values:

$$\widehat{E(R_t^m)} = Avg(R_t) = Avg\left(\frac{D_t}{P_{t-1}}\right) + Avg\left(\frac{P_t-P_{t-1}}{P_{t-1}}\right) \tag{3}$$

Another approach can be derived by assuming that the dividend-price ratio $\frac{D_t}{P_t}$ is stationary. This implies that with a long-run sample, the compounded dividend growth should approach the compounded rate of capital gain (FF, 2002). Thus, we can substitute the average dividend growth for the average realized capital gain as the estimator of the expected growth rate:

$$\widehat{E(R_t^m)} = Avg(RD_t) = Avg\left(\frac{D_t}{P_{t-1}}\right) + Avg\left(\frac{D_t-D_{t-1}}{D_{t-1}}\right) \tag{4}$$

This is called the **Dividend Growth Model**. A problem with the dividend growth model is that some stocks, especially growth stocks, may not pay dividend for long periods of time. We can get around this, by assuming that the earnings-price ratio is

also stationary, and that in the long-run at least, the Modigliani–Miller (1958) theorem of dividend policy irrelevance holds. Consequently, we can replace the average dividend growth with the average earnings growth. We then get the **Earnings Growth Model:**

$$Avg(RE_t) = Avg\left(\frac{D_t}{P_{t-1}}\right) + Avg\left(\frac{E_t - E_{t-1}}{E_{t-1}}\right) \qquad (5)$$

One motive for using dividends and earnings to estimate expected returns is that fundamental-derived estimates are less volatile then those derived from prices. In fact, FF (2002) find that the standard error of equity premium from the dividend growth model is less than half the standard error of the estimate from the average return. Moreover, as prices irrefutably cannot out-grow fundamentals, the assumption of stationary dividend- and earnings-price ratios seems highly reasonable. All though firms can move from dividends to share repurchases, this strategy has its limitations. The problem of growth stocks, are probably not very significant as all stocks eventually have to return earnings to shareholder. That is, (4) and (5) should converge in the long-run.

An important consequence of the FF approach is that it focuses on the long-run unconditional expected return. Thus, we cannot infer much about the conditional point-in-time expected returns. This will vary considerably over time in the short-run, but in the long-run however, it should approach the unconditional expected return. As long as the dividend-price and earnings-price are stationary the FF approach should be valid and provide unbiased estimates of the unconditional expected return, given a sufficient sample length (mean reversion may be slow) (FF, 2002). FF (2002) also argue that reasonable forms of non-stationary does not render their approach invalid.

Estimation of the Equity Premium

The fundamental-derived expected return will be used to estimate the historical equity premium for Norway and the UK, and we will investigate whether it has been too high. In this we seek to answer the remaining research questions above. The equity premium estimates by models (3), (4) and (5) are given respectively as

$$Avg(EP_t) = Avg(R_t) - Avg\left(R_t^f\right) \qquad (6)$$

$$Avg(EPD_t) = Avg(RD_t) - Avg\left(R_t^f\right) \qquad (7)$$

$$Avg(EPE_t) = Avg(RE_t) - Avg\left(R_t^f\right) \qquad (8)$$

It then follows that the associated Sharpe Ratios are

$$S_t = \frac{EP_t}{\sigma(R_t)} \qquad SD_t = \frac{EPD_t}{\sigma(R_t)} \qquad SE_t = \frac{EPE_t}{\sigma(R_t)} \qquad (9)$$

Explaining the Equity Premium

After having developed an estimate of the expected equity premiums we can move on to the subject of trying to explain our findings. As we do not have our estimates yet, it is difficult to state the procedures needed to explain them. However, if our estimates make sense, as well as line up with similar research, we can give a preliminary synopsis.

First, we will compare and discuss the estimates of the expected return from the different models.

- *Which of the estimates is more precise, e.g. which have the lowest standard error, and how much do they differ?*
- *Do the Sharpe Ratios differ significantly?*

Both of these questions address which of the models that produces the best estimates of the expected returns. Obviously, the lower the standard error of any estimate, the better it is. The second question is important because of the link between the Sharpe ratio and the level of risk aversion. All though it may vary with the business cycle, a reasonable assumption about risk aversion is that it should be relatively stationary. FF (2002) use two sub-samples (1872-1950 and 1951-2000) to investigate whether the estimated Sharpe ratios indeed have constant unconditional means, and whether they are in line with asset pricing theory. We intend to do similar tests with our estimates, and see if fundamental-derived estimates perform better, as FF (2002) find them to do.

Predictability of the growth rates

If growth rates are unpredictable, the historical (unconditional) average growth rate must be the best forecast of future growth rates FF (2002). If, however, autocorrelation of growth rates are high and mean reversion slow, it might be possible to improve the predictive power beyond that of the historical average. By exploring predictability of growth rates, we might therefore be able to say something about whether the end-of-sample expected growth rates are unusually

high. Like FF (2002) we intend to test forecasting power by a series of OLS regressions using lagged values know at time t:

Forecast of real growth in dividends:

$$RGD_t = \alpha + \beta_1\left(\frac{D_{t-1}}{E_{t-1}}\right) + \beta_2\left(\frac{D_{t-1}}{P_{t-1}}\right) + \beta_3(RGD_{t-1}) + \beta_4(R_{t-1}) + \varepsilon_t \tag{10}$$

Forecast of real growth in earnings:

$$RGE_t = \alpha + \beta_1\left(\frac{E_{t-1}}{B_{t-2}}\right) + \beta_2\left(\frac{D_{t-1}}{E_{t-1}}\right) + \beta_3\left(\frac{E_{t-1}}{P_{t-1}}\right) + \beta_4(RGE_{t-1}) + \beta_5(R_{t-1}) + \varepsilon_t \tag{11}$$

We will also look at changes in predictability when more lags are added and at different times (t-2 etc.). Estimation will be conducted independently of Norwegian and British markets. Level of predictability will be addressed by standard measurements of fit and explanatory power (e.g. R-squared, RMSEA etc.). T-statistics of each variable will also be addressed. Finally, we seek to discuss our results in context of other findings on predictability.

Discussion

Rearranging the Gordon valuation model (2) yields,

$$\frac{D}{P} = E(r) - E(g) \tag{12}$$

According to (12) the dividend-price ratio is driven by the expected future returns (equity discount rate) and the expected future growth rate of fundamentals (dividend and earnings). We can also use the Gordon valuation model to look at capital gains.

$$\Delta P = \frac{\Delta D}{\Delta\big(E(r) - E(g)\big)} \tag{13}$$

The point of (13) is simply to show that capital gains can come from either an increase in dividend or a decline in the required return. Thus, an unexpected decline in the required return would lead to unexpectedly high capital gains, and hence unexpectedly high realized return. Hence, a persistent decline in the discount rate could explain the high equity premium observed. This possibility, as well as other once, will be discussed in great detail in our thesis.

Additional Tests and Issues

Since, our framework implicitly assumes that the dividend-price and earnings-price ratios are at least reasonably stationary, we intend to test the mean-reversion and autocorrelation properties of these to variables. Moreover, we need to address the

unbiasness of our sample and estimates, as survivor bias in the data may invalidate our results. Other issues include repurchases of stocks, structural changes, investments horizons, liquidity and taxes. We are also considering using consumption growth as another estimate for expected future growth.

Plan for data collection

Given the above approach to expected return estimation, we need variables from fundamentals as well as stock price histories. Summing up all required variables yields this list:

Stock market data	*Other*
Dividends	*Consumer Price index*
Stock prices	*Six-month commercial paper or T-bills*
Earnings	
Nominal values of book equity	

All variables are needed for both the Norwegian and the British equity markets. In addition, a deflator (price index) is needed to investigate the development of real values, and the short-term commercial paper is our estimate of the risk free interest rate.

All of our required variables should be available in DataStream on annual basis. The proxy for the Norwegian and British equity markets will be the OSX and the FTSE respectively. Since we need a reasonably long sample period to estimate unconditional means, we intend to use the largest time period of which there is reliable and uninterrupted data points.

We will also have to address the quality of the available data. For instance, the historical data on earnings might be of lower quality, especially those dating back many decades.

Thesis progression plan

In the first part of January our main focus will be on our preliminary thesis report, and in this respect work on how to formulate more specific research questions and place it according to previous literature by doing a literature review.

After the submission of the preliminary report we will continue to study earlier literature and further make plans for our data collection. Further, we will make preparations for the master thesis presentation, and in this respect do some more research on the topic, and further sharpen our selection of previous research which is relevant for our studies.

In March we will continue our collection of data, and set up a more precise plan for methodology applied. Then, we will start with running test, and revaluate as we carry on. In April, May and June we will primarily be running tests and document our findings.

July will consist of wrapping up our findings and evaluate the results.
In august our goal is to have the final draft ready, and use the time left to make the last adjustments.

Concluding remarks

In this preliminary report we have laid out the purpose and motivation for our master thesis. We have gone through some of the relevant literature on the topic, and found that The Equity Premium Puzzle remains a disputed issue in Finance. We hope to investigate this further by using Fama and French's approach of deriving unconditional expected returns from fundamentals in the Norwegian and the British stock markets.

References

Campbell, John Y., and Robert J. Shiller.1998. "Valuation ratios and the long-run stock market outlook", *Journal of Portfolio Management* 24(2): 11—26.

Campbell, John Y., and John H. Cochrane. 1999. "By force of habit: A consumption-based explanation of aggregate stock market behavior", *Journal of Political Economy*, 107: 205-251.

Campbell, John Y. (2007): "Estimating the equity premium," *Working paper 13423*.

Fama, Eugene F., and Kenneth R. French. 1988. "Dividend yields and expected stock returns". *Journal of Financial Economics*. 22: 3-25.

Fama, Eugene F., and Kenneth R. French. 2002. "The equity premium", *The Journal of Finance,* 57(2): 637-659.

Gordon, Myron. (1962). "The Investment Financing and Valuation of the Corporation", (Irwin Homewood, IL)

Goyal, Amit and Ivo Welch. 2008. "A comprehensive look at the empirical performance of equity premium prediction". *The Review of Financial Studies*, 21(4): 1455-1508.

Henkel, Sam J., Spencer Martin, J. and Federico Nardari. 2011. "Time-varying short-horizon predictability". *Journal of Financial Economics*, 99: 560-580.

Lettau, Martin and Sydney Ludvigson. 2001a. "Consumption, aggregate wealth and expected stock returns". *The Journal of Finance*, 56(3): 815-849.

Lettau, Martin and Sydney Ludvigson. 2001b. "Resurrecting the (C)CAPM: A cross-sectional test when risk premia are time-varying". *Journal of Political Economy,* 109(6): 1238-1287.

Mehra, Rajnish and Edward C. Prescott. 1985. *Journal of Monetary Economics*, 15: 145-161.

Modigliani, Franco and Merton H. Miller. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment". *The American Economic Review*, 48(3): 261-297.

Næs, Randi, Johannes A. Skjeldtorp and Bernt Arne Ødegaard. 2007. "Hvilke faktorer driver kursutviklingen på Oslo Børs?". *Norges Bank*. JEL kode: G12; E44.