The Effect of Pessimism and Doubt on the Equity Premium
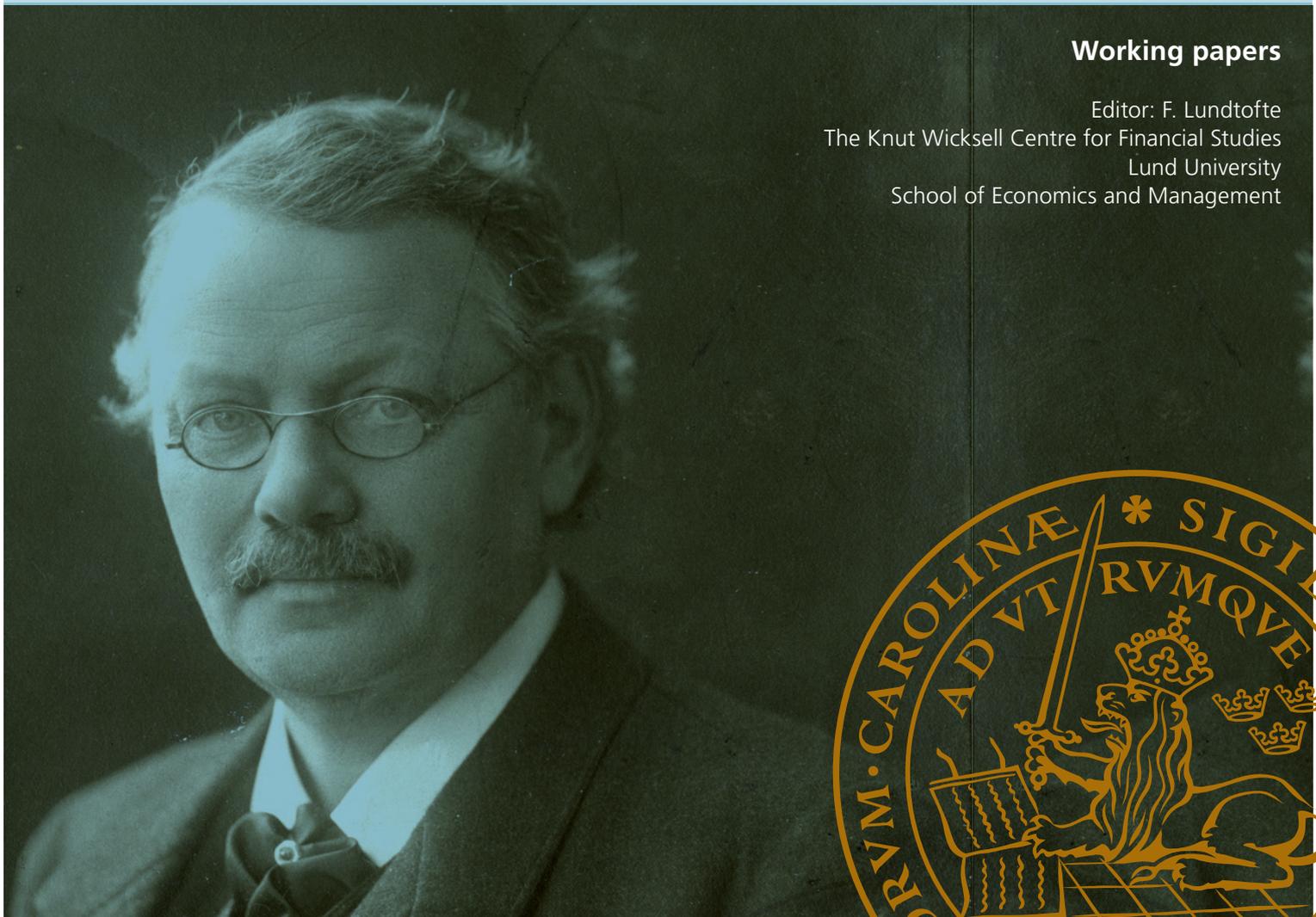
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The Effect of Pessimism and Doubt on the Equity Premium

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Abstract

This paper introduces a model to explain the equity-premium puzzle. Consumers exhibit both pessimism and doubt. Consumers are pessimistic if their beliefs about the dividend are a translation of the objective dividend by an independent and identically distributed normal random variable with negative mean. Consumers exhibit doubt if their beliefs are a translation of the objective dividend by an independent and identically distributed normal random variable with mean zero. A cross-sectional empirical study using the SHARE database explores the differences between various European countries in terms of pessimism and doubt and tests the theoretical model empirically.

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1 Introduction

The hypothesis that consumers have rational expectations about the relevant economic variables is an assumption made in the majority of asset-pricing models. According to this hypothesis, the subjective probability of outcomes should tend to the objective probability distribution of outcomes. This assumption is attractive because consumers can forecast the economic variables of interest.

As mentioned by Abel (2002), rational expectations are also attractive because they avoid the multiple modeling choices that arise in the absence of this assumption. However, the assumption of rational expectations does not necessarily hold. Abel (2002) uses the Lucas fruit-tree model with a representative agent (Lucas, 1978) to explore how two particular departures from rationality, pessimism and doubt about the dividend process, affect the means of asset returns. Abel (2002) characterizes pessimism by the first degree of stochastic dominance and doubt by the second degree of stochastic dominance. A major finding is that pessimism and doubt can help resolve some asset-pricing puzzles. In particular, pessimism and doubt increase the average equity premium and, thus, can help resolve Mehra and Prescott's (1985) equity-premium puzzle.

In Abel's work, pessimism and doubt are assumed without modeling the source of the departure from complete rationality. Numerous contributions note this oversight as a weakness of Abel's work. From a theoretical perspective, Jouini and Napp (2008) show that Abel's impact of doubt on the equity premium is not correct in general. From a practical standpoint, Giordani and Soderlind (2006) evaluate the empirical plausibility of pessimism and doubt (in Abel's sense). Using data on U.S. consumption and income, they find that individual forecasters are in fact pessimistic, but they find more overconfidence than doubt.

Therefore, Abel's doubt might not be a promising explanation for the equity-premium puzzle. However, the implications of Abel's model depend on how the empirically heterogeneous beliefs are mapped into the beliefs of a representative agent. Jouini and Napp (2006) study, in a more general equilibrium setting, how more general notions of pessimism and doubt at the aggregate level result from pessimism and doubt at the individual level. They also find that pessimism and doubt positively impact the equity premium.

De Long et al. (1990) present a simple overlapping-generations model of an asset market containing irrational and rational traders. Irrational traders falsely believe that they have

special information about the future price of the risky asset. They may get their pseudo-signals from technical analysis, stock brokers, or economic consultants, and they irrationally believe that these signals carry information, giving incorrect stochastic beliefs about the price of the risky asset. Irrational traders select their portfolios on the basis of such incorrect beliefs, affecting both prices and expected returns. Prices can diverge significantly from fundamental values and irrational traders can earn higher expected returns than rational traders earn. Although this interpretation of irrationality is specific, the impact of the risk coming from irrationality on the equity premium is ambiguous.

We introduce alternative definitions of pessimism and doubt in the setting of an overlapping-generations model of two assets markets: a risky asset and a safe asset, with agents who each live for two periods. Each generation consists of a representative agent. The source of pessimism and doubt is analogous to the source of irrationality described in De Long et al. (1990). We define the subjective beliefs about the dividend of a risky asset to be pessimistic if they differ from the objective process of the dividend by a normal process with negative mean. The subjective beliefs about the dividend are said to have doubt if they differ from the objective process of the dividend by a normal process with zero mean. As did Abel (2002), we show that pessimism and doubt tend to increase the average equity premium, so they can be seen as possible explanations for the equity-premium puzzle.

We test the model empirically using the SHARE database to obtain cross-sectional measurements of risk aversion, pessimism, and doubt. Pessimism moves the equity premium in the expected direction and more pessimistic countries tend to have a higher risk premium. The variable proxying for doubt shows that countries that are on average more doubtful have a lower risk premium. The latter result contradicts our theoretical predictions, which may be due to the difficulty of adequately capturing doubt.

Our contribution is twofold. First, we introduce a very simple theoretical model replicating Abel's (2002) results on the effects of doubt and pessimism. Second, we apply the theoretical framework to a novel cross-sectional study using the SHARE data. We can partly confirm the theoretical considerations and find that pessimism indeed increases the average equity premium.

The remainder of this paper is structured as follows. In Section 2, we develop a simple model of asset pricing in which beliefs about the process of the dividend of a risky asset differ from the objective process by a normal random variable. We use this model in Section 3 to show

that pessimism reduces the equilibrium price and increases the average equity premium. In Section 4, we perform the same analysis as in Section 3 showing the effect of doubt on the equilibrium price. In light of the equity-premium puzzle discussed by Mehra and Prescott (1985), we comment in Section 5 on the effects of pessimism and doubt in reducing the equity premium puzzle. In Section 6, we present the empirical results. Section 7 concludes.

2 The model

2.1 The basic framework

In our basic overlapping-generations model (Samuelson, 1958), agents live for two periods, time is discrete, indexed by t, and there is no final period. Each generation consists of a representative agent. In each period, one agent is born and lives two periods, so at every period t there is always one young agent, called worker t, and one old agent. For simplicity, there is no consumption in the first period, worker t supplies one unit of labor inelastically to the market and receives a wage w_t. The only decision agent t makes is to choose a portfolio when young. The economy has two assets. One of the assets, the risk-free asset, is in perfectly elastic supply with unit price. The risk-free asset pays a constant dividend $r > 0$ (the constant risk-free rate). The other asset, the risky asset, is in net unit supply and its price at t is denoted p_t. The dividend process d_t is normal i.i.d.,

$$d_t \rightarrow N(d, \sigma_d^2), \tag{1}$$

where $d > r$. We denote by $c_{2,t+1}$ agent t's consumption when old. The agent's utility is

$$U_t = v(c_{2,t+1}), \tag{2}$$

where v is CARA with a coefficient of absolute risk aversion. Agent t is born with no capital, and receives pseudosignals when young about the future price of the dividend of the risky asset and falsely believes that these signals contain information, thus misperceiving the dividend process of the risky asset by an independent and identically distributed normal random variable:

$$\epsilon_t \rightarrow N(\epsilon, \sigma_\epsilon^2). \tag{3}$$

3

We assume that ϵ_t is uncorrelated with d_s for every t and s. Therefore, this agent has the erroneous belief that the next period dividend on the risky asset is $d_{t+1} + \epsilon_t$ and divides their portfolio between the risk-free asset and the risky asset to maximize expected utility. The budget constraint faced at t is

$$f_t + p_t u_t = w_t, \tag{4}$$

where f_t and u_t are, respectively, the quantities of the risk-free asset and risky asset purchased. When old, the agent retires, converts holdings in the risk-free asset to consumption goods, and lives off of the capital income from selling holdings of the risky asset for price p_{t+1} to the young generation. The budget constraint when old is

$$c_{2,t+1} = f_t(r + 1) + u_t(d_{t+1} + \epsilon_t + p_{t+1}). \tag{5}$$

At time zero, there is an old generation (agent $t - 1$) with capital stock. Thus, worker t's portfolio selection problem is

$$\max_{u_t, f_t} E_t[-\exp(-\gamma c_{2,t+1})], \tag{6}$$

subject to the above constraints.

Here, the operator E_t denotes the expectation conditional on the information I_t available at time t, given the agent's opinion about the process of the dividend on the risky asset. Assuming that the conditional distribution of p_{t+1} given I_t is normal, $p_{t+1}|I_t \to N\left(E_t[p_{t+1}], \text{Var}_t(p_{t+1})\right)$, the future consumption, $c_{2,t+1}$, follows a normal distribution with mean $E_t[c_{2,t+1}]$ and variance $\text{Var}_t(c_{2,t+1})$. Using the moment-generating function for the conditional distribution of $c_{2,t+1}$,

$$E_t[-\exp(-\gamma c_{2,t+1})] = -\exp\left[-\gamma E_t[c_{2,t+1}] + \frac{1}{2}\gamma^2 \text{Var}_t(c_{2,t+1})\right]. \tag{7}$$

Since the real function $-\exp(-\gamma x)$ is strictly increasing in x, the previous maximization problem is equivalent to

$$\max_{u_t} E_t[c_{2,t+1}] - \frac{\gamma}{2}\text{Var}_t(c_{2,t+1}), \tag{8}$$

where

$$E_t[c_{2,t+1}] - \frac{\gamma}{2} \mathrm{Var}_t(c_{2,t+1}) =$$

$$w_t(1+r) + [E_t[p_{t+1}] + d + \epsilon_t - p_t(1+r)]u_t - \frac{\gamma}{2}(\mathrm{Var}_t(p_{t+1}) + \sigma_d^2)u_t^2.$$

The optimality condition of the previous problem is

$$E_t[p_{t+1}] + d + \epsilon_t - p_t(1+r) - \gamma(\mathrm{Var}_t(p_{t+1}) + \sigma_d^2)u_t = 0, \tag{9}$$

which means that the optimal demand for the risky asset is

$$u_t = \frac{E_t[p_{t+1}] + d + \epsilon_t - p_t(1+r)}{\gamma(\mathrm{Var}_t(p_{t+1}) + \sigma_d^2)}. \tag{10}$$

Given subjective beliefs about the dividend on the risky asset, we define the perceived excess return on the risky asset as of time t as $p_{t+1} + d_{t+1} + \epsilon_t - p_t(1+r)$. The term $p_{t+1} + d_{t+1} + \epsilon_t$ is the random payment of the risky asset at $t+1$, plus the subjective misperception, ϵ_t, of the dividend. $p_t(1+r)$ is the discounted opportunity cost of not investing in the safe asset. The true excess return on the risky asset as of time t is $p_{t+1} + d_{t+1} - p_t(1+r)$. According to Equation (10), the demand for the risky asset is proportional to the expected value of the perceived excess return and inversely proportional to its perceived variance.

2.2 The pricing function

Since the holdings of the old agent are sold, the demand from the young must be unity in equilibrium. From Equation (10) and the equilibrium condition $u_t = 1$, the equilibrium price is

$$p_t = \frac{E_t[p_{t+1}] + d + \epsilon_t - \gamma(\mathrm{Var}_t(p_{t+1}) + \sigma_d^2)}{(1+r)}. \tag{11}$$

The equilibrium price at period t of the risky asset is a function of the expected value of the perceived dividend, of its expected variability and of the parameters γ and r. We consider only steady-state equilibria by imposing the condition that the unconditional distribution of p_{t+1} be identical to the distribution of p_t. It turns out that $\mathrm{Var}_{t+j}(p_{t+j+1}) = \mathrm{Var}_t(p_{t+1})$ holds for every j.

Solving Equation (11) by forward recursion, the pricing rule for the risky asset at time t is

$$p_t = \lim_{j \to \infty} \frac{E_t[p_{t+j}]}{(1+r)^j} + \frac{d}{r} + \frac{\epsilon_t - \epsilon}{1+r} + \frac{\epsilon}{r} - \frac{\gamma(\mathrm{Var}_t(p_{t+1}) + \sigma_d^2)}{r}. \tag{12}$$

We assume that the bubble term is zero, $\lim_{j \to \infty} \frac{E_t[p_{t+j}]}{(1+r)^j} = 0$. The one-step-ahead variance of p_t takes the form

$$\mathrm{Var}_t(p_{t+1}) = \mathrm{Var}(p_{t+1}) = \frac{\sigma_{\tilde{\epsilon}}^2}{(1+r)^2}. \tag{13}$$

So, the final form of the pricing rule for the risky asset is

$$p_t = \frac{d}{r} + \frac{\epsilon_t - \epsilon}{1+r} + \frac{\epsilon}{r} - \frac{\gamma}{r}\left[\frac{\sigma_{\tilde{\epsilon}}^2}{(1+r)^2} + \sigma_d^2\right]. \tag{14}$$

The last three terms of Equation (14) show the impact of the misperception of the dividend on the random price of the risky asset. As the distribution of ϵ_t converges to a point mass at zero, the equilibrium price converges to its fundamental value of $\frac{d}{r} - \frac{\gamma}{r}\sigma_d^2$.

Only the second term depends on t; it captures the fluctuations in the price of the risky asset due to the variations in consumer opinion. The third term captures the average deviation of p_t from its fundamental value. The last term says that the real variability of the dividend process and the subjective variability of the consumer's misperception drive the price down via the consumer's coefficient of risk aversion. It is worth mentioning the equilibrium price is linear in the average dividend d, in the random opinion ϵ_t, in the mean misperception ϵ, and in the variances σ_ϵ and $\frac{\sigma_\epsilon}{(1+r)^2} + \sigma_d^2$.

2.3 The standard setting

We take as the standard setting the case when the consumer has rational expectations about the dividend process d_t. In this case, the next period dividend on the risky asset is accurately perceived: d_{t+1}. The pricing formula (14) becomes

$$p_t^B = \frac{d}{r} - \frac{\gamma}{r}\sigma_d^2. \tag{15}$$

The expected excess return R_{t+1}^B on the risky asset is

$$R_{t+1}^B = E_t[p_{t+1}^B + d_{t+1} - p_t^B(1+r)] = \gamma\sigma_d^2. \tag{16}$$

At this point, we observe that all the agents earn a constant return of r on their investment in the risk-free asset. Therefore, the average equity premium is equal to the expected return on the risky asset minus r.

3 Pessimism's effect on financial equilibrium

We say that consumer beliefs about the future dividend on the risky asset are pessimistic if

$$\epsilon_t \to N(\epsilon, \sigma_\epsilon^2), \tag{17}$$

where $\epsilon < 0$. On average, consumers underestimate the dividends on the risky asset. It follows that the subjective beliefs $d_{t+1} + \epsilon_t$ are dominated by the true process d_{t+1} in the sense of first-degree stochastic dominance.

The equilibrium price of the risky asset that prevails under pessimism is

$$p_t^P = \frac{d}{r} + \frac{\epsilon_t - \epsilon}{1+r} + \frac{\epsilon}{r} - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2} + \sigma_d^2\right] = p_t^B + \frac{\epsilon_t - \epsilon}{1+r} + \frac{\epsilon}{r} - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2}\right], \tag{18}$$

with $\epsilon < 0$. When one generation of consumers is more pessimistic than the average generation, the second term in (18) is strictly negative, so, the risky asset is priced below the value that it would have under rational expectations. In general, since ϵ_t tends to cluster around its mean ϵ, the third term in (18) tends to dominate the second one, leading pessimistic consumers to underprice the risky asset.

Taking the unconditional expectation of (18) yields

$$E[p_t^P] = p_t^B + \frac{\epsilon}{r} - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2}\right]. \tag{19}$$

On average, there is a bias towards a price of the risky asset lower than that of the standard setting. The subjective expected return on the risky asset as of time t is defined by

$$R_{t+1}^P = E_t[p_{t+1}^P + d_{t+1} + \epsilon_t - p_t^P(1+r)] = \gamma\left[\frac{\sigma_\epsilon^2}{(1+r)^2} + \sigma_d^2\right], \tag{20}$$

and the average return on the risky asset is defined by

$$E[p_{t+1}^P + d_{t+1} - p_t^P(1+r)] = \gamma\left[\frac{\sigma_\epsilon^2}{(1+r)^2} + \sigma_d^2\right] - \epsilon. \tag{21}$$

Equations (20) and (21) show that the return subjectively expected by consumers is biased downwards because the perceived excess return incorporates the misperception ϵ_t of the dividend, realized at the price formation. Pessimistic consumers require a larger expected return (20) than they would in a rational-expectation equilibrium (16), due to the volatility of their opinions. Comparing Equations (16) and (20), pessimism increases the average return by $\left[\frac{\sigma_\epsilon^2}{(1+r)^2}\right] - \epsilon$. Bearing a disproportionate amount of risk derived from pessimism enables pessimistic consumers to earn a higher expected return than rational consumers earn.

4 Doubt's effect on financial equilibrium

We say that consumers have doubt about the future dividend on the risky asset, if

$$\epsilon_t \rightarrow N(0, \sigma_\epsilon^2), \tag{22}$$

Doubtful consumers overestimate the uncertainty of the future dividend on the risky asset because their predictions are more volatile. From (22), subjective beliefs are a mean-preserving spread of the objective dividend; they are second-order stochastically dominated by the true dividend process. In the presence of doubt, pricing formula (14) becomes

$$p_t^D = \frac{d}{r} + \frac{\epsilon_t}{1+r} - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2} + \sigma_d^2\right] = p_t^B + \frac{\epsilon_t}{1+r} - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2}\right]. \tag{23}$$

When one generation of consumers underestimates the future dividend of the risky asset, p_t^D is below p_t^B. The average price is

$$E[p_t^D] = p_t^B - \frac{\gamma}{r}\left[\frac{\sigma_\epsilon^2}{(1+r)^2}\right]. \tag{24}$$

On average, doubtful consumers buy the risky asset at a price lower than p_t^B and above the price determined by pessimistic consumers (18). The subjective expected return on the risky asset as of time t is

$$E[p_{t+1}^D + d_{t+1} - p_t^D(1+r)] = \gamma\left[\frac{\sigma_\epsilon^2}{(1+r)^2} + \sigma_d^2\right] \tag{25}$$

because, on average, the consumer beliefs about the dividend are not biased. The rewards from holding the risky asset are increasing in the variance of the consumer opinion about the

dividend process. Doubt increases the average excess return by $\gamma \left[\frac{\sigma_\epsilon^2}{(1+r)^2} \right]$ over the average excess return in the standard setting.

5 The Mehra–Prescott puzzle

Mehra and Prescott (1985) show that the realized average return on U.S. equities over the last 60 years has been around 8%, and the realized real return on safe bonds only around zero. In order to reconcile the much higher returns of stocks compared to government bonds in the United States, individuals must have a very large coefficient of risk aversion according to the standard representative consumer applied to U.S. data. If we interpret the risky asset in our model as the aggregate stock market and the risk-free asset as short-term bonds, the fact that pessimism and doubt tend to increase the average excess return on the risky asset can help resolve the Mehra–Prescott puzzle, also called the equity-premium puzzle. Since the risk derived from doubt and pessimism can drive the average price of the risky asset down significantly, the return on equities is greater than the constant return on the risk-free asset, leading to a large value for the equity premium. The following empirical section will shed light on the plausibility of our reasoning.

However, the work of Mehra and Prescott has sparked an intense debate on how to explain the equity premium puzzle and whether it is a puzzle at all. Mehra (2008) gives an extensive overview of possible explanations of the equity-premium puzzle. Idiosyncratic and uninsurable income risk is one possible way to resolve it (Constantinides and Duffie, 1996; Heaton and Lucas, 1996). Consumers face major risks such as job loss or other personal disasters and those disasters cannot be hedged or insured against. As equities are procyclical towards these risks, investors request a higher return to take on such risks. Other possible explanations are a survivor- or disaster-state bias (Brown et al., 1995; Rietz, 1988; Barro, 2006). Rietz (1988) suggests that including an event leading to a significant drop in consumption with a low probability could resolve the puzzle. Likewise, Brown et al. (1995) propose a model accounting for the survivorship bias of the U.S. stock market and attempt to solve the puzzle. Bansal and Coleman (1996) explain the puzzle by arguing that money yields transaction-service returns. These returns of money compared to interest-bearing checking accounts should be the interest rate paid on these accounts. They further argue that all assets include such transaction-service components, and these transaction-service components differ

substantially between equities and bonds. McGrattan and Prescott (2001) attempt to explain the equity-premium puzzle by changes in tax rates. In the United States the personal tax rate substantially declined compared to the relatively stable corporate tax rates and McGrattan and Prescott show that these changes can explain the puzzle. Finally, borrowing constraints may offer a solution to the equity-premium puzzle (Davis and Willen, 2000). Borrowing constraints as well as transaction costs may force investors to hold an inventory of bonds and explain the observed high equity premium.

The following empirical analysis will focus on finding evidence for whether pessimism and doubt can help explain the equity-premium puzzle building upon the model described in Sections 2, 3 and 4.

6 Empirical analysis

To empirically test our explanation of the equity-premium puzzle, we perform a cross-sectional exercise. If the theory holds, pessimism and doubt have an effect on the equity premium in addition to risk aversion. A cross-section of 14 European countries allows us to test the theory.

6.1 Data

We assume that the risk-free rate is the same across the whole sample as all countries are European, thus avoiding a noisy estimate of the risk-free rate and taking returns directly. We calculate the weekly returns using the MSCI indexes of each country and extract the information from Datastream Advance. The sample of weekly returns starts with January 1996 and ends on November 19, 2010. To find measures for pessimism and doubt, we use the database of the Survey of Health, Ageing and Retirement in Europe (SHARE). This survey of people aged 50 and older living in 20 European countries gathers data from more than 85,000 people across Europe. It covers economic, health and social factors related to older people's living conditions. We use the data from Waves 1 (2004–2005) and 2 (2006–2007) and pool the observations where applicable. We construct the variable for doubt using individual evaluations of the trust of strangers, ranging from 1 to 10, with 10 being the most trusting. We believe it is reasonable to assume that the measures taken from the SHARE database remain relatively stable over the investigated period.

We apply several variables from the SHARE data and use their first principal component to represent optimism as depicted in Table 1. The variables we use are the following.

- The probability of a better life variable is constructed by subtracting the indicated chance of having a better standard of living in the future from the chance of having a worse standard of living in the future.
- The "wish to be dead" dummy is unity if a respondent expressed a feeling that one would rather be dead, zero otherwise.
- The "enjoyment" dummy is unity if a respondent could mention any activity they enjoyed, and zero otherwise.
- The "hopes" dummy is unity if the individual mentions any hopes for the future and zero otherwise.

We perform the principle-component analysis on the individual level data. The first principal component represents optimism quite well. It correlates negatively with the dummy indicating the desire to be dead, and positively with the dummies measuring whether individuals enjoy life or have any hopes for the future. The first principal component also correlates positively with the indicated probability of having a better life.

[INSERT TABLE 1 HERE]

Table 2 tabulates all the key variables for the cross-sectional analysis. All the variables have sufficient variability to allow for a meaningful analysis. The variable for optimism is the first principle component as shown in Table 1. Trust is derived from the average of individuals' level of trust in people; 0 indicates very low or no trust in people and 10 is the maximum trust level. Mean weekly returns are calculated from the respective MSCI indexes using weekly returns from January 1996 until November 2010. As the sample is already quite limited, we prefilter the returns to avoid including additional variables in the regression. We use the following variables to prefilter returns.

- Risk Aversion is the simple country average of the variable indicating risk aversion (1 indicates low risk aversion and 4 very high risk aversion). This direct measure of risk aversion adjusts for the cross-sectional differences in risk aversion that have an obvious impact on the equity premium. The data are taken from the SHARE database.
- "ASSP" is the average share of stocks in the portfolio taken from the SHARE database. We use this variable as an additional measure for risk aversion as it shows

the percentage of risk-bearing assets in each individual's portfolio. The data are taken from the SHARE database.

- GDP growth is the simple average of the past 10 yearly real GDP growth rates taken from the World Bank database. We use this variable to account for countries' economic output growth.

Some results are notable by themselves. For example, Sweden and Denmark exhibit comparatively high levels of trust and optimism combined with comparatively low levels of risk aversion. Except for Spain, the level of trust is relatively low in countries with Mediterranean cultural influences (Italy, Greece, and France).

[INSERT TABLE 2 HERE]

6.2 Empirical model

The empirical model is

$$Y_i^* = \beta_0 + \beta_1 O_i + \beta_2 T_i + \varepsilon_i, \tag{26}$$

where Y_i^* is the filtered mean weakly return for country i and O_i and T_i are variables measuring optimism and trust in country i, respectively. We prefilter the mean weekly returns to avoid including too many variables, as we effectively have only 14 observations. We filter according to the following procedure. We first estimate a simple OLS of mean returns for country i, Y_i, on the respective filter variables:

$$Y_i = \gamma_0 + \sum_{k=1}^{K} \gamma_k X_{ik} + u_i, \tag{27}$$

where X_{ik} is the filter variable k for country i (see section 3.6.1). In the next step, we calculate the filtered mean return to use it as the dependent variable in our regressions outlined in equation (26):

$$Y_i^* = Y_i - \sum_{k=1}^{K} \gamma_k X_{ik}. \tag{28}$$

We use simple OLS. The obvious hypothesis is that lower levels of optimism and greater doubt increase the mean weekly returns.

6.3 Empirical results

Initially, we explore the simple correlation between returns and the variables for trust and optimism. The correlation of expected mean realized returns using a moving average with 10-year historical data is consistently negative with optimism, and consistently positive with trust. The former is the expected sign, whereas the latter sign is opposed to the theoretical model. Figure 1 shows the analysis.

[INSERT FIGURE 1 HERE]

Subsequently, we apply the model outlined in Equation (26) using different filter variables for the mean weekly returns. We orthogonalize returns with respect to the different filter variables. The results displayed in Table 3 show that our hypothesis can be only partly confirmed. We first filter by risk aversion and GDP growth. The estimate of the variable proxying for optimism is negative and significant at the 1% significance level. Conversely, the estimate of the variable proxying for doubt, the trust variable, is positive and significant at the 1% level. The results are exactly equal when filtering the returns by risk aversion only. We subsequently filter by GDP growth and the average share of the stocks in the portfolio (ASSP) and by ASSP only. The resultant estimates are in line with the previous outcomes, but are at lower statistical significance levels. The sign of the variable for trust is not as expected. Higher average levels of trust lead to a higher adjusted equity premium. This result can relate to the findings in Giordani and Soderlind (2006). They show that consumers tend to be overconfident instead of doubtful, so the reversed sign might be connected to their finding. Higher average levels of pessimism do lead to a significantly higher adjusted risk premium. Comparing Equations (21) and (25) shows that the effect of pessimism should, theoretically, be stronger as it increases additionally the risk premium with the deviation from the objective dividend ϵ.

[INSERT TABLE 3 HERE]

Overall, the analysis shows that the equity premium decreases with increasing optimism, which is consistent with the theoretical findings. The effect of doubt on the equity premium is not as consistently visible, and the analysis shows rather the opposite effect. This is possibly due to the difficulty of measuring doubt, which might not be adequately captured by the trust variable in the SHARE data.

6.4 Robustness

As the sample obtained from the SHARE data is relatively small, we also sought alternative measures for the variables of interest. For data availability because only the variable for optimism confirms our theoretical model, we focus on this variable. We obtain our measure from a Gallup 2011 survey asking people to rate their lives today and in five years on a scale from 0 to 10. Our measure for pessimism is the percentage of respondents in each country that rates their current lives higher than their future lives. We obtain data for GDP growth from the World Bank database and take the simple average over the past 10 years. It is very difficult to obtain precise data for some of the countries; so, to not further reduce the sample, we use the average risk premia from Fernandez et al. (2011). The risk premia face the difficulties of not being homogeneous in terms of methodology as each survey participant has a different method for obtaining the risk premium. The survey does, however, average over all respondents and we assume that those differences in methodology even out. Finally, we refer to Rieger et al. (2011) to obtain a measure of risk aversion. We use the coefficient obtained for the risk attitudes for gains that Rieger et al. (2011) use as an input for their measurement of prospect theory. We match all three databases and obtain 29 observations. We additionally create a dummy variable for all emerging markets according to the Standard & Poor's classification list and also add Nigeria as an emerging market. In our initial sample only two countries would qualify as emerging markets so, due to the low number of observations, we do not include such a dummy variable in our regression. The robustness sample is much more heterogeneous and the inclusion of the emerging-markets dummy accounts for this.

[INSERT TABLE 4 HERE]

We slightly modify Equation (26):

$$Y_i^* = \beta_0 + \beta_1 P_i + \varepsilon_i, \tag{29}$$

where P_i is the level of pessimism for country i. We use real GDP growth and risk aversion to filter returns and run a simple OLS regression including a constant, our variable proxying for pessimism and a dummy variable for emerging markets. We include a dummy for emerging markets as risk premia for emerging markets are historically higher and cannot solely be explained by pessimism.

The results show that both the emerging-market dummy and the variable proxying for pessimism are significant and have the expected sign. Emerging markets have a higher filtered risk premium and more pessimistic countries have a higher filtered risk premium as well. This result confirms our previous theoretical and empirical findings. Table 5 shows the respective results.

[INSERT TABLE 5 HERE]

7 Conclusions

We use a simple overlapping-generations model to define pessimism and doubt as two departures from the hypothesis of rational expectations. The source of these concepts is also explained. We explore the effects of pessimism and doubt on the equilibrium price and average return of a risky asset in our model. The model explains how both pessimism and doubt reduce the equilibrium price of a risky asset and can help resolve the equity-premium puzzle by increasing the average equity premium at equilibrium. Under pessimism, young consumers underestimate the average dividend on the risky asset and overestimate its variability. Thus, they respond to the fear of getting low dividends by underpricing the risky asset, compared to the rational-expectations equilibrium. Pessimistic consumers require a subjective expected return that is greater than the average return under rational expectations. The average return turns out to be larger than consumers expect and, hence, equity returns are biased downwards under pessimism. Doubt reduces the equilibrium price by increasing the perceived risk associated with future dividends, thereby driving consumers to pay less for the risky asset than rational consumers would. Since doubtful consumers perceive a higher degree of risk associated with the dividend payments, and thus with the equity, they require a higher expected return. The average equity premium tends to increase under pessimism and doubt because the certain return on the safe asset is constant. Therefore, they can be seen as possible explanations of the equity-premium puzzle because they move the average equity premium in the right direction.

Empirically testing the model using the SHARE database to obtain cross-sectional measurements of risk aversion, pessimism, and doubt, we can only partly confirm this theory. Pessimism moves the equity premium in the expected direction. That is to say, more pessimistic countries tend to have a higher risk premium. The variable proxying for doubt

shows that countries that are on average more doubtful, have a lower risk premium. This result contradicts our theoretical predictions, but this might be partly due to the difficulty of adequately capturing doubt. We can further confirm the theoretical and empirical findings concerning the effect of pessimism when using a wider sample with alternative measures for pessimism.

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Figure 1

Simple correlations

Ten-year average mean weekly returns are calculated from the respective MSCI indexes using weekly returns from January 1996 until November 2010. Stock market data are from Datastream Advance and the variables for optimism and trust are constructed using the SHARE database. Waves 1 (2004–2005) and 2 (2006–2007) are pooled where applicable. The figure displays the simple correlation of the moving 10-year average of the respective country index with the variables for optimism and trust.
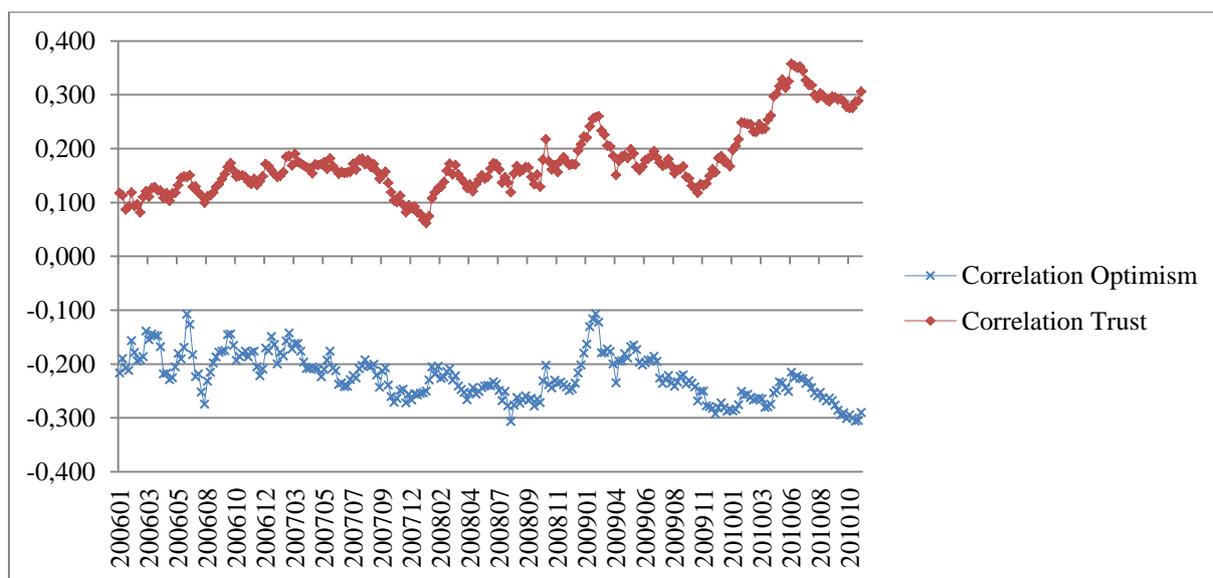
Table 1

Principal component analysis to obtain a measurement for optimism

All variables are taken from the SHARE database and prefiltered according to four reliability criteria. The probability of a better life variable ("probability better life") is constructed by subtracting the indicated chance of having a better standard of living in the future from the chance of having a worse standard of living in the future. Both variables can take on values between 0% and 100% and thus the variable "probability better life" ranges from −100 to 100. The "wish be to dead" dummy, "enjoyment" dummy, and the "hopes" dummy are taken directly from the SHARE data.

	Wish to be dead dummy	Enjoyment dummy	Hopes dummy	Probability better life
Wish to be dead dummy	1	−0.127	−0.189	−0.068
Enjoyment dummy		1	0.214	0.047
Hopes dummy			1	0.086
Probability better life				1
Correl PC1	−0.59	0.61	0.69	0.40

Table 2

Statistics for main variables

The table is constructed using Datastream Advance and the SHARE database. Waves 1 (2004–2005) and 2 (2006–2007) are pooled where applicable. Mean weekly returns are calculated from the respective MSCI indexes using weekly returns for January 1996 through November 2010. Risk aversion is the simple country average of the variable indicating risk aversion where 1 indicates low risk aversion and 4 very high risk aversion. Doubt is derived from the average of individuals' level of trust in people where 0 indicates very low or no trust in people and 10 is the maximum trust level. The variable for optimism is the first principle component as shown in Table 1. ASSP is the average share of stocks in the portfolio taken from the SHARE database. The data taken from the SHARE database are filtered by four different reliability criteria.

	Mean weekly return	Real GDP growth (annual)	PC1 (optimism)	Trust	Risk aversion	ASSP
Austria	0.0012	0.021	2.849	5.676	3.787	0.968
Belgium	0.0010	0.043	2.898	5.392	3.630	0.931
Czech Rep.	0.0028	0.018	2.840	5.878	3.644	0.977
Denmark	0.0025	0.044	3.313	7.435	3.378	0.819
France	0.0016	0.016	2.544	4.736	3.706	0.932
Germany	0.0017	0.018	2.969	5.468	3.665	0.933
Greece	0.0012	0.007	3.092	4.793	3.722	0.955
Ireland	0.0001	0.026	3.346	6.293	3.625	0.926
Italy	0.0012	0.013	2.854	4.941	3.784	0.975
Netherlands	0.0014	0.013	3.073	6.418	3.667	0.931
Poland	0.0024	0.024	2.047	5.257	3.861	0.968
Spain	0.0023	0.016	2.792	5.786	3.883	0.974
Sweden	0.0027	0.027	3.099	6.615	3.282	0.835
Switzerland	0.0019	0.020	3.168	6.520	3.602	0.903

Table 3

Cross-sectional analysis

The regression applies the data illustrated in Table 2 using Equation (26). The returns are orthogonalized with respect to the filter variables.

	Coefficient	Standard error	t statistics
Mean weekly return, filtered by risk aversion and GDP			
Constant	0.009**	0.001	5.955
Optimism	−0.002**	0.001	−3.253
Trust	0.001*	0.000	2.450
Mean weekly returns, filtered by ASSP and GDP			
Constant	0.008**	0.002	5.632
Optimism	−0.002*	0.001	−3.032
Trust	0.001*	0.000	2.241
Mean weekly returns, filtered by risk aversion			
Constant	0.009**	0.001	5.894
Optimism	−0.002**	0.001	−3.186
Trust	0.001*	0.000	2.338
Mean weekly returns, filtered by ASSP			
Constant	0.009**	0.002	5.515
Optimism	−0.002*	0.001	−2.899
Trust	0.001	0.000	2.014

** and * indicate statistical significance at the 1% and 5% levels, respectively.

Table 4

Statistics for main variables: Robustness

The measure for pessimism is taken from a Gallup 2011 survey asking people to rate their lives today and in five years on a scale from 0 to 10. The measure for pessimism is the percentage of respondents in the respective country that rate their current lives higher than their future lives. Data for GDP growth are taken from the World Bank database and are the simple average over the past 10 years. The average risk premia are from Fernandez et al. (2011). The measure of risk aversion is from Rieger et al. (2011) reflecting the risk attitudes for gains. The emerging-market dummy is created according to the Standard & Poor's classification list and also adds Nigeria.

	Pessimism	Average risk premium	Risk aversion	Average GDP-growth	Filtered risk premium	Emerging-market dummy
Australia	12	5.8	0.6	3.1	5.7	0
Austria	15	6	0.4	1.7	6.1	0
Canada	12	5.9	0.5	2	6	0
Chile	18	5.7	0.55	4.1	5.3	1
China	2	9.4	0.6	10.6	7.2	1
Colombia	7	7.5	0.4	4.6	6.7	1
Czech Republic	33	6.1	0.6	3.3	6	1
Denmark	11	5.4	0.5	0.7	5.9	0
Germany	19	5.4	0.45	1.2	5.7	0
Greece	42	7.4	0.65	1	8	1
Hungary	28	8	0.5	1.8	8.2	1
Ireland	14	6	0.5	2.4	6	0
Israel	12	5.6	0.58	3.7	5.3	0
Italy	14	5.5	0.45	0.2	6.1	0
Japan	30	5	0.45	0.7	5.4	0
Malaysia	8	4.5	0.58	5.1	3.8	1
Mexico	23	7.3	0.4	2.3	7.2	1
New Zealand	12	6	0.65	2.1	6.3	0
Nigeria	0	6.9	0.75	9.4	5.2	1
Portugal	32	6.5	0.5	0.4	7.1	0
Russia	15	7.5	0.53	4.9	6.8	1
South Korea	13	6.4	0.6	4.1	6	1
Spain	21	5.9	0.45	1.7	6	0
Sweden	10	5.9	0.5	2.4	5.9	0
Taiwan	21	8.9	0.55	4.4	8.4	1
Thailand	4	7.9	0.65	4.2	7.6	1
Turkey	16	8.1	0.6	5.5	7.3	1
United Kingdom	15	5.3	0.5	1.6	5.5	0
United States	15	5.5	0.58	1.7	5.8	0

Table 5

Cross-sectional analysis: Robustness

The regression applies the data illustrated in Table 4 using Equation (27). The dependent variable is the average equity premium according to Fernandez et al. (2011) filtered by the simple average of the past 10 years of real GDP growth and the coefficient for risk attitudes of gains according to Rieger et al. (2011). The equity premium is orthogonalized with respect to the filter variables.

	Coefficient	Standard error	t-statistics
Constant	5.331**	0.371	14.39
Pessimism	0.036*	0.018	2.05
Emerging-market dummy	0.762*	0.334	2.28

** and * indicate statistical significance at the 1% and 5% levels, respectively.

The Effect of Pessimism and Doubt on the Equity Premium

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This paper introduces a model to explain the equity-premium puzzle. Consumers exhibit both pessimism and doubt. Consumers are pessimistic if their beliefs about the dividend are a translation of the objective dividend by an independent and identically distributed normal random variable with negative mean. Consumers exhibit doubt if their beliefs are a translation of the objective dividend by an independent and identically distributed normal random variable with mean zero. A cross-sectional empirical study using the SHARE database explores the differences between various European countries in terms of pessimism and doubt and tests the theoretical model empirically.

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