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IN SEARCH OF MONEY ILLUSION IN CEE STOCK MARKETS: THE CAPM APPROACH

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In Search of Money Illusion in CEE Stock Markets: The CAPM Approach

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Abstract

We investigate whether the hypothesis of money illusion can explain the negative or non-existent stock returns and inflation co-movement, and lead to deviations from the CAPM-implied risk-return relation in ten Central Eastern European (CEE) markets. We employ the Cohen, Polk and Vuolteenaho (2005) methodology which allows us to test the hypothesis by utilizing the cross-sectional implications of the Modigliani and Cohn (1979) proposition, and thus avoids the need to discriminate between competing rational explanations. The hypothesis of no money illusion cannot be rejected in any of the researched CEE equity markets. Conversely, we find no significant inflationary effect on the Security Market Line (SML) in eight markets, indicating that the stock return and inflation relationship requires alternative explanations. In Lithuania and Poland inflation positively affects the SML, making safe (risky) stocks relatively underpriced (overpriced) in comparison to the market.

Keywords: behavioural finance, investor irrationalities, money illusion, inflation, stock market, Capital Asset Pricing Model (CAPM), Security Market Line (SML), Central Eastern Europe (CEE)

An economic theorist can, of course, commit no greater crime than to assume money illusion.

Tobin, 1972

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1 Introduction

The relationship between macroeconomic activity and the stock market performance has always been of significant interest for economists, investors and policy makers. One of the most important macroeconomic variables, inflation, has drawn much attention in Central and Eastern Europe (CEE) during the last decade. Ten CEE countries have joined the European Union since 2004, and most of them have been experiencing steadily growing inflation rates, an average consumer price index increase from 2004 to 2008 in these countries being 24.3% (Eurostat, 2008). While various effects of such inflationary environment are widely discussed by economists, this paper will analyze its impact on stock market yields. In particular, many CEE countries have exhibited a negative relationship between inflation and stock returns, as equity returns have decreased significantly during 2004-2008 compared to the earlier years (Bloomberg Professional, 2008). This coincides with the well-known negative co-movement of nominal stock returns and inflation rates in the world equity markets.

This robust relationship has not only been spotted in the academic spheres, but is also heavily used by investment professionals, being dubbed the “Fed model” (Asness, 2000, 2003). The Fed model states that a stock yield is approximated by a nominal bond yield plus an additional risk premium. However, as stocks represent entities that produce returns in real economy, there is no reason why a nominal macroeconomic variable, such as inflation, should have an effect on their real valuation. To date, several papers have tried to explicate the robustness of inflation and stock returns relationship on rational grounds (see, for example, Fama (1981), and Brandt and Wang (2003)). However, none of the rational hypotheses could fully explain the obscure phenomenon. Modigliani and Cohn (1979) attempted to justify this relationship from the perspective of investor irrationality. Their idea was based on the assumption that investors confuse nominal and real values of cash flows and discount factors, which leads to severe misvaluations when nominal and real values diverge. Such confusion is known as the money illusion phenomenon.

The existence of money illusion is not only of academic interest; its presence would also have implications for policy makers and stock market participants. First, investors need to know whether stocks, as a representation of real assets, are a good hedge against inflation, which, in the presence of money illusion, they would only be in the longer run, after inflation returns to the steady state (Cohen, Polk & Vuolteenaho, 2005). Second, it could help to explain the stock market inefficiencies, as most of the significant stock market returns deviations from the values implied by the Capital Asset Pricing Model (CAMP) have occurred in high-inflationary decades. Third, it would provide an additional incentive for governments to shift to inflation-indexed bonds, as the usage of the Fed model could then eliminate the money illusion effect on stock prices. Lastly, it would imply that countries should strive for low and stable inflation, as this would bring more efficiency to the stock market, which in turn would reduce the sub-optimality of firms' real investment decisions, as modeled by Stein (1996).

We believe that this paper is of especial relevance today. First, the existence of money illusion has very strong implications for economic agents, especially in the price-dynamic environment, which is a precondition for money illusion to exert its influence on investors. Second, this will be one of the first attempts to carry out an aggregate money illusion study in CEE. Third, the paper will add to the existing literature by providing evidence about the existence of the phenomenon in the new samples of equity markets. We thus formulate our research questions as:

- Does inflation affect the performance of the Capital Asset Pricing Model (CAPM) in Central and Eastern European equity markets?
- If the inflationary effect is present, can it be explained by the phenomenon of money illusion?

The paper is structured as follows. The second section provides a broad background of the phenomenon of money illusion in various economic settings, and suggests possible explanations for its prevalence. The third section reviews the existing literature on money illusion in the stock market and alternative explanations of the inverse stock returns and inflation relationship. The fourth section describes the methodology employed in this paper. Following it, empirical analysis and robustness checks are presented. The sixth section discusses the findings, while the last section concludes.

2 Background of the Study

The phenomenon of money illusion refers to a tendency to confuse nominal and real monetary values in economic transactions (Shafir, Diamond, & Tversky, 1997). When the difference between those values is small, or when the importance of a decision is relatively low, such equalization, while being a form of bounded rationality, economizes thinking by providing an effective rule of thumb. The phenomenon and its implications to economics were first thoroughly described by Fisher in his book The Money Illusion (1928). However, for a long time the concept had been disregarded by the scholars due to its direct contradiction to the prevailing theory of efficient markets and utility maximization. Irrationality of the phenomenon was seen as too costly for agents, and thus implausible. As Tobin (1972, p. 3) put it, “an economic theorist can, of course, commit no greater crime than to assume money illusion”.

In the late seventies and early eighties there were a few attempts to revive money illusion as a significant concept in economics. For example, Fischer and Modigliani (1978) investigated the effects of inflation on real economy and concluded that money illusion is an important source of them. R. J. Gordon (1983) provided convincing evidence on nominal price and wage stickiness in the US, the UK and Japan (the findings were later confirmed by Akerlof, Dickens and Perry (1996), Bernanke and Carey (1996), Bewley (1999), Card and Hyslop (1997), and Kahn (1997)). However, it was not until the work of Shafir et al. (1997) that this concept received proper consideration from economists. The attention, however, was fostered by related findings in psychology.

Shafir et al. (1997) were the first to address the existence of money illusion at the individual level. They conducted a series of surveys in order to reveal people's reactions towards changes in inflation and prices. It was concluded that people utilize both real and nominal values, and while money illusion arises from the interaction between those representations, there is a bias towards using nominal evaluation where the real evaluation is of true interest. Additionally, Fehr and Tyran (2007) concluded that money illusion is a prevalent phenomenon that leads to the selection of a Pareto-inefficient equilibrium. The study acknowledged that learning effects could eventually lead to diminished impact of money illusion; nevertheless, in reality it prevails due to uncertainty about behavior of other agents in the economy. On the other hand, as Akerlof, Dickens and Perry (2000), and Miao and Xie (2007) noted, learning can also be induced by high inflation due to its salience and nonlinearly increasing welfare cost. Most recently Svedsater, Gamble and Garling (2007) conducted a series of experiments and concluded that specifically financial decision making is also significantly affected by money illusion.

While evidence on individual money illusion has been largely supportive to the hypothesis, consensus on whether the effects of the phenomenon are corrected in the market has not been crystal clear. Since money illusion is a form of irrationality, general arguments for and against market correction of irrationalities at the aggregate level apply. On the one hand, it has been argued that markets correct individual irrationalities as (1) deviations from intrinsic value are random and thus cancel out (Bossaerts, Plott, & Zame, 2007), (2) market experience eliminates the effects of individual irrationalities (List, 2003), (3) rationality of markets is a consequence of market structure rather than personal features of individuals (Gode & Sunder, 1993; Jamal & Sunder, 1996), and (4) rational agents drive irrational agents from the market by constantly earning higher profits (Fama, 1965; Friedman, 1953). On the other hand, a great number of studies have provided convincing arguments against such market corrections: (1) deviations from fundamental value are usually systematic (Tversky & Kahneman, 1974, 1996), (2) some anomalies are robust to learning (Camerer, 1992; Ganguly, Kagel, & Moser, 2000; Kluger & Wyatt, 2004), (3) there is no reason to believe that a specific market structure can eliminate all individual irrationalities (Fehr & Falk, 1999), and (4) irrational agents prevail in the markets and can even earn higher profits than rational agents (DeLong, Shleifer, Summers, & Waldmann, 1991; Laibson & Yariv, 2004). It has also been argued that even small amounts of irrationality can lead to large aggregate deviations (Akerlof, 2002; Akerlof & Yellen, 1985; Basak & Yan, 2007; Haltiwanger & Waldman, 1985; Mankiw, 1985; Russell & Thaler, 1985).

In general, research has found that money illusion affects a variety of economic relationships, such as charity donations (Cannon & Cipriani, 2006; Kooreman, Faber, & Hofmans, 2004) and housing markets (Brunnermeier & Julliard, 2008; Genesove & Mayer, 2001). However, the phenomenon is especially widely studied in stock markets, where the concept is regarded as an important explanation of asset value deviations from rational expectations (Cohen et al., 2005; Schmeling & Schrimpf, 2008).

3 Literature Review

Empirical research on the relationship between inflation and stock returns is vast. Except for a few papers (see, for example, Gultekin (1983), and Pearce and Roley (1985)), the great majority of studies have found that correlation between the two variables is either non-existent or negative (Amihud 1996; Cohn & Lessard, 1981; Fama & Schwert, 1977; Lintner, 1975; Nelson, 1976). Only the long term co-movement is found to be positive (Boudoukh & Richardson, 1993; Jaffe & Mandelker, 1976). However, this piece of evidence contradicts the basics of economics, such as (1) one-for-one movements in expected rate of inflation and expected nominal asset returns as proposed by Fisher (1930), and (2) positive and significant correlation between actual stock returns and actual inflation due to stocks being real assets (Sharpe, S. A., 2002). To date, there have been several explanations for this anomaly, relying both on rational grounds and behavioral aspects (for a summary of the hypotheses see Appendix A).

3.1 The Rational Hypotheses

One of the first attempts to justify the inverse relationship was the hypothesis of nominal contracting (Kessel, 1956). It was argued that at the times of unanticipated inflation, net debtors benefit at the expense of net creditors. Thus, only returns of the firms that are net creditors should be negatively correlated with inflation. However, while a few papers support the hypothesis (e.g. Pearce & Roley, 1988), the majority of studies concludes that nominal contracting cannot explain the inverse relationship between stock returns and inflation (e.g. French, Ruback, & Schwert, 1983).

Feldstein (1980a, 1980b) suggested that the observed correlation can be explained by certain features of tax laws and accounting standards. Specifically, higher tax caused by historic-cost depreciation and tax on inflation-induced (and thus artificial) capital gains reduce the yield on equities. While the yield on bonds also decreases, the former effect prevails over the latter. Even though some evidence for this hypothesis was found (Summers, 1981), Ritter and Warr (2002) constructed a valuation model adjusting for this and other accounting distortions, and showed that even with all the adjustments in place the significant part of the inverse stock yield and inflation relationship could not be explained.

In 1981, Fama brought up an alternative explanation known as the proxy hypothesis. The proposition suggested that increasing inflation predicts a slowdown of real activity, thus acting as a proxy for it and leading to a spurious relationship between inflation and stock returns. The idea was later extended to inflation damaging real economy through general processes in the monetary sector (Geske & Roll, 1983), or through monetary policy that is pursued as a response to higher inflation (Boudoukh, Richardson, & Whitelaw, 1994; Kaul, 1987). While the proposition was initially confirmed (Bernard, 1986; Marshall, 1992), the most recent research has concluded that the proxy hypothesis can only explain a small fraction of the negative inflation – stock returns relationship (Bekaert & Engstrom, 2008), or even did not find any support for it (Campbell & Vuolteenaho, 2004; Schmeling & Schrimpf, 2008).

In the last decade, one more alternative hypothesis has emerged. Brandt and Wang (2003) argued that inflationary environment makes investors more risk-averse due to inflation coinciding with greater uncertainty, thus driving up the equity risk premium, and the real discount rate. Given this effect, equities should become less valuable in times of high unexpected inflation. Bekaert and Engstrom (2008) used a consumption-based external habit estimation of risk-aversion, and found that changes in risk aversion can explain the greater part of the inverse inflation – stock returns relationship, with a smaller share of the co-variance attributable to the proxy hypothesis. The robustness of the results was also demonstrated running an out-of-sample test in a panel of 20 international equity markets. However, testing for this hypothesis is inherently difficult, as one has to estimate the risk aversion index which is not directly observable, and thus has to be built upon arbitrary utility functions. To understand the problematic nature of this approach, one has to look no further than to a paper by Schmeling and Schrimpf (2008), who do not find support for the risk aversion hypothesis in explaining the inflation – stock return relationship while using a real uncertainty-based risk aversion proxy. So far, academics have not found a reliable way to estimate aggregate risk aversion, and thus any findings based on an arbitrary proxy for this variable have to be taken with a grain of salt.

3.2 Money Illusion

The nature of money illusion is inherently different from all the other hypotheses described above, as it is not possible to estimate a proxy for it. Rather, one can only presume that the otherwise unexplainable relationship between stock returns and inflation might stem from the phenomenon of money illusion under certain conditions. First proposed by Modigliani and Cohn (1979), this hypothesis argues that stock prices systematically depart from their intrinsic values due to two inflation-induced judgment errors in investor decision making. First, investors fail to realize that the value of corporate liabilities decreases with increasing inflation. In aggregate, this effect offsets taxation-induced distortions. Second, investors discount real cash flows from stocks using nominal rates of return, thus undervaluing equities during the periods of high inflation.

Two types of research have dealt with money illusion. The initial studies have only explored the inverse inflation – stock returns relationship and concluded that the phenomenon is the most likely explanation (see, for example, Asness (2000, 2003)). More recently, however, scholars have attempted to actually test the hypothesis.

Ritter and Warr (2002) used a residual income model to arrive to intrinsic stock values and measure misvaluation. Changes in equity valuation over the sample period were decomposed into three parts: rational changes in economic value added and equity risk premium, and changes in valuation errors. The results of cross section regressions indicated that the extent of misvaluation is positively correlated with company's leverage and expected inflation. The authors attributed this finding to the money illusion phenomenon.

Campbell and Vuolteenaho (2004) decomposed a dividend yield into a rationally expected dividend growth, subjective market risk premium, and an irrational mispricing term. The loglinear dynamic valuation framework led to a conclusion that inflation is highly correlated with the mispricing. Such a co-movement was presented as a proof for the existence of money illusion.

However, as noted by Cohen et al. (2005), these studies did not account for time-varying equity premium, and thus suffer from aggregating the impact of risk aversion and money illusion. The authors proposed a methodology which allows accounting for changes in risk aversion without having to rely on arbitrary proxies. Their idea was that one can separate the two effects by looking at stock level data, as money illusion affects all stocks symmetrically, while changes in equity premium would be most notable in the returns of risky stocks. Based on this insight, and by employing the Sharpe-Lintner CAPM (Lintner, 1965; Sharpe, W., 1964) to estimate risk premiums, they find that the hypothesis of no money illusion can be rejected.

The most recent paper dealing with money illusion covers not only the US, but also five other major equity markets worldwide. Schmeling and Schrimpf (2008) find a positive relation between expected inflation and stock returns, and use a model-free test to discriminate between competing explanations: the rational proxy and increased risk aversion hypotheses, and money illusion. The results, according to the authors, stem from money illusion. However, as it was already mentioned, a similar study by Bekaert and Engstrom (2008) did not find evidence for the phenomenon.

The literature review indicates that currently there are two competing explanations of the inverse inflation and stock returns relationship: the risk aversion and the money illusion hypotheses. Thus, when researching money illusion, the other hypotheses can be safely left out from the scope of the paper. The most recent research suggests that the two explanations can be tested by employing either (1) a model-free risk-aversion proxy-based or (2) an asset pricing model-based technique. Given the very ambiguous nature of any risk aversion estimation model, we choose to employ the methodology by Cohen et al. (2005). We find it more reliable to base our research on the assumption that investors evaluate equity risk according to the modern portfolio theory rather than dive into the hassle of constructing different risk premium indices that are dependent on arbitrary utility functions. The methodology of Cohen et al. (2005) allows us to keep away from this issue, as it works with equity premium (and thus, risk aversion) as an exogenous variable. Finally, it should be noted that the hypothesis of money illusion has not been tested in emerging equity markets. Therefore, while our paper will be the first attempt to find evidence of its prevalence in the CEE stock markets, we will not be able to compare its results to similar studies in the same area.

4 Methodology

4.1 Theoretical Background

In order to answer our research questions, we will use the methodology based on the work by Cohen et al. (2005). This approach offers a sound way of testing the cross-sectional implications of money illusion and is built on the observation that the phenomenon has a symmetric effect on all stock yields (that is, the compensation for one unit of beta will vary depending on the level of inflation, thus affecting the slope of the Security Market Line (SML)). Conversely, changes in attitudes towards risk affect stock yields proportionally to the stock's risk, or, in other words, have an effect on the intercept of the SML. Therefore, concurrent examination of safe and risky stocks allows segregating the effects of money illusion and changing investor attitudes toward risk.

The phenomenon of money illusion arises from investors discounting real cash flows with nominal discount rates. While it is both convenient and rather realistic to assume that real growth rates of earnings and dividends do not vary substantially, illusioned investors make this assumption about nominal rates. Therefore, variations in inflation levels lead to systematic deviations of subjective expected future equity premium. When inflation is high (low), the subjective risk premium is lower (higher) than the objective one, and the market is undervalued (overvalued). This intuition can be captured by considering the dividend-price ($\frac{D}{P}$) ratio of an asset *i* from the Gordon growth model (Gordon, M., 1962), where the excess discount rate over a risk-free rate is denoted as R_i^e, and the excess growth rate of dividends – G_i^e (note that we will be working with excess values henceforth; for more detailed derivations of equations (1) to (8), see Appendix B):

$$\frac{D}{P} = R_i^e - G_i^e \tag{1}$$

In order to adapt the model to the needs of the methodology, we proceed in the following way. First, we distinguish between rational (subscript OBJ) and irrational (subscript SUBJ) investors by assuming that those illusioned by inflation use incorrect values of either the expected dividend growth rate or expected discount rate. However, expectations of both rational and irrational investors follow the Gordon model:

$$\frac{D}{P} = R_{OBJ}^e - G_{OBJ}^e = R_{SUBJ}^e - G_{SUBJ}^e \tag{2}$$

Second, the mispricing (ε_i), which arises due to investors using one of the values incorrectly, is expressed as

$$\varepsilon_i = R_{i,OBJ}^e - R_{i,SUB}^e = G_{i,OBJ}^e - G_{i,SUB}^e \tag{3}$$

Thus, equation (2) becomes

$$\frac{D}{P} = R_{i,OBJ}^e - G_{i,SUB}^e - \varepsilon_i = R_{i,SUB}^e - G_{i,OBJ}^e + \varepsilon_i \tag{4}$$

Third, following Campbell and Vuolteenaho (2004), we define the mispricing as a linear function of past smoothed inflation (π) (note that in case of $\gamma_1 = 1$, investors assume that the expected future cash flow growth is constant in nominal terms; ε_m defines market mispricing):

$$\varepsilon_i = \varepsilon_m = \gamma_0 + \gamma_1 \pi \tag{5}$$

Fourth, utilizing the Sharpe-Lintner CAPM we denote excess returns on individual assets in terms of market returns $\left(R_{m,SUBJ}\right)^e$ and the asset beta $[(\beta]_i)$:

$$R_{i,SUBJ}^e = \beta_i R_{m,SUBJ}^e \tag{6}$$

If ε_m is the market mispricing that arises from the divergence between the objective and the subjective market risk premiums, asset mispricing becomes

$$\varepsilon_i = R^e_{i,OBJ} - \beta_i R^e_{m,SUBJ} = R^e_{i,OBJ} - \beta_i \left([\![R]\!]^e_{m,OBJ} - \varepsilon_m \right) \tag{7}$$

Finally, in order to determine relative mispricing of a stock versus the market, we employ a measure of Jensen's alpha (α_i), which is a stock's excess return over its theoretically expected excess return (Jensen, 1967):

$$\alpha_i = R^e_{i,OBJ} - \beta_i R^e_{m,OBJ} = \varepsilon_i - \beta_i \varepsilon_m = \gamma_0 + \gamma_1 \pi - \beta_i (\gamma_0 + \gamma_1 \pi) \tag{8}$$

The relationship in equation (8) implies that while investors make the same absolute valuation mistake for all the stocks, under high (low) inflation risky stocks will be undervalued (overvalued) relatively more than the market, and safe stocks will be relatively overvalued (undervalued). In fact, this conclusion resembles the empirical study by Ritter and Warr (2002) who have found that leveraged firms are affected by money illusion more, as those firms tend to have higher betas (Hamada, 1969; Bowman, 1979).

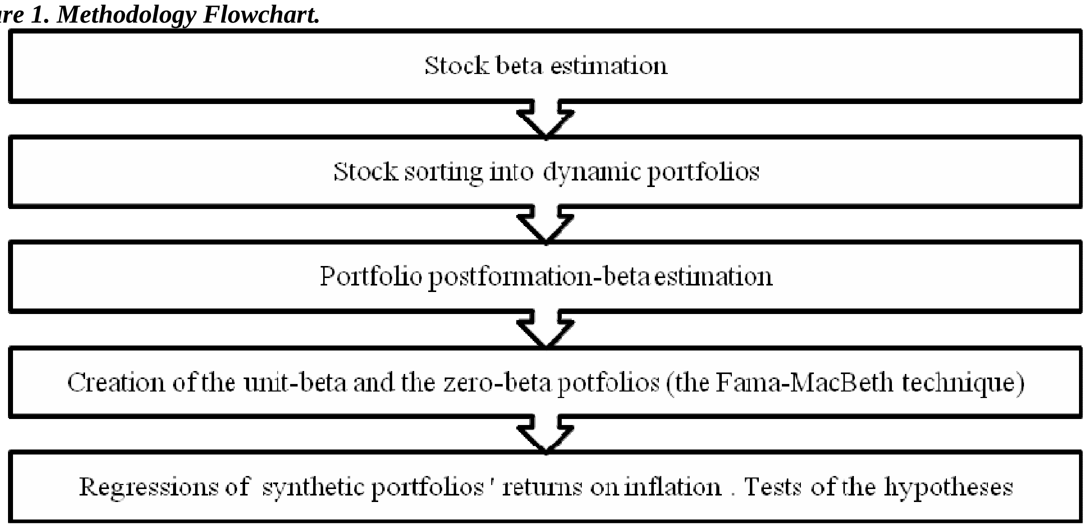
Also note that equation (8) expresses systematic deviations from the SML. In particular, it predicts that under money illusion (when tested jointly with the CAPM), both the conditional excess intercept ($\gamma_0 + \gamma_1 \pi$) and the conditional excess slope ($-(\gamma_1 0 + \gamma_1 1\ \pi$)) of the SML are functions of past inflation. Our empirical tests will focus exactly on the two terms in order to estimate the effect of inflation on stock yields.

For the model to hold, several assumptions are necessary. First, all the investors in the market are affected by money illusion. Nevertheless, the model still provides relatively accurate insights even if this assumption is violated (Cohen et al., 2005). Second, investors behave according to the modern portfolio theory when evaluating stock risk. That is, they use the Sharpe-Lintner CAPM to set the required risk premiums. However, it should be noted that we do not assume the CAPM to hold. Conversely, our methodology allows testing the model together with money illusion as the only systematic misvaluation that the market makes. Finally, both objective and subjective expectations of betas are known and equal (which we see as very probable, as betas are often readily available for investors).

4.2 Empirical Tests

Using the Fama and MacBeth's (1973) cross-sectional regression technique we construct two portfolios (one with excess intercept returns and zero-beta risk, and another with excess slope returns and unit-beta risk). Provided that betas of the two portfolios are relatively stable (and close to zero and one, correspondingly), the method will allow us to capture the relation between variations in the excess intercept and excess slope of the SML, and inflation. The empirical methodology is summarized in Figure 1 below.

Figure 1. Methodology Flowchart.



First, stock betas are estimated using a trailing window of 12 months, regressing individual excess stock returns on the corresponding market portfolio's excess returns. Then the stocks are each month sorted into dynamic portfolios (basis assets) based on their betas. This way, capitalization-weighted returns of the portfolios are obtained. Creating dynamic basis assets allows avoiding the error-in-variable problem that otherwise might arise due to the assumption that the estimated stock betas correspond to the true market betas (Gibbons, Ross, & Shanken, 1989). However, high (low) estimated betas tend to overestimate (underestimate) true betas. The same also applies to beta-sorted portfolios. Therefore, in order to obtain random errors of individual equity betas, stock betas for ranking are computed from data for one period, while portfolio betas are obtained using a subsequent period (Fama & MacBeth, 1973).

We estimate postformation betas of the basis assets using a backwards looking window of 12, 24 and 36 months, regressing their excess returns on the corresponding market portfolio's excess returns, and experiment with 5, 10 and 20 portfolios. Two portfolios, one representing excess unit-beta returns, and the other – excess zero-beta returns, are then formed from the basis assets using the Fama-MacBeth technique. In particular, for each time period t we run a cross section regression with excess returns $R^{e}_{i,t}$ of a basis asset i as the dependent variable, and its lagged postformation beta $\beta_{i,t-1}$ as the independent variable. Note that the beta is lagged due to the fact that the CAPM predicts that contemporaneous betas are related to the returns in the subsequent period (that is, expected returns):

$$R^{e}_{i,t} = \mu_t + \tau_t \beta_{i,t-1} \qquad (9)$$

The two estimates, μ_t and τ_t, are simply the excess intercept returns $(R^{e}_{intercept,t})$ and the market (slope) excess returns $(R^{e}_{slope,t})$, correspondingly.

The time series of those two estimates are regressed on a constant, excess market returns, and lagged inflation. Our time-series seemingly unrelated regressions (SURs) are as follows:

$$R^{e}_{intercept,t} = a_1 + b_1 R^{e}_{m,t} + c_1 \pi_{t-1} + u_{1,t} \qquad (10)$$

$$R^{e}_{slope,t} = a_2 + b_2 R^{e}_{m,t} + c_2 \pi_{t-1} + u_{2,t} \qquad (11)$$

Formulas (12) and (13) are the values of Jensen's alpha for the slope (the unit-beta risk) and the intercept (zero-beta risk) portfolios as implied by equation (8), and are estimated from regressions (10) and (11) (for an extensive explanation of intermediary steps see Appendix C). The methodology thus takes the stock market as a reference point (therefore, we cannot readily conclude whether the entire market is mispriced), and captures the difference between the pricing of risky and safe stocks:

$$g_0 + g_1\pi_{t-1}, where\ g_0 = \frac{a_2}{b_2}, and\ g_1 = \frac{c_2}{b_2} \tag{12}$$

$$h_0 + h_1\pi_{t-1}, where\ h_0 = a_1 - b_1\frac{a_2}{b_2}, and\ h_1 = c_1 - b_1\frac{c_2}{b_2} \tag{13}$$

Finally, we measure the point estimates from equations (12) and (13), and apply tests of statistical significance (for a summary of coefficient interpretations see Appendix D). It is important to note that due to the market being the reference point rather than the subject of the analysis, it is only possible draw conclusions from the joint hypotheses with respect to g_0 and h_0, and g_1 and h_1. That is, while each coefficient does have an individual meaning, economically sound conclusions can only be arrived by jointly testing the estimates. In particular, a finding that $g_0 = 0$ would mean that when inflation is equal to zero, the empirical slope of the SML is consistent with the CAPM. Similarly, $h_0 = 0$ would mean that in the hypothetical case of zero inflation, the market's zero-beta rate (or, in other words, the risk-free rate) is consistent with the CAPM predictions. Thus, the market prices equities according to the CAPM under the condition of zero inflation when both g_0 and h_0 are equal to zero. Any finding that together these parameters are significantly different from zero would mean that depending on their riskiness, equities are either overpriced or underpriced relative to the market and independently of inflation.

The null hypothesis of no money illusion can be rejected if we find that g_1 and h_1 are jointly not equal to zero, g_1 being positive and h_1 negative. Individually, g_1 indicates a co-movement of the excess slope of the SML with inflation, while the estimate of h_1 leads to the same results with respect to the intercept of the SML. To sum up, the checks of g_0 and h_0 will allow us to test for any systematic relative mispricing that the market makes independently from inflation, while the estimates of g_1 and h_1 will show whether the market pricing is affected in inflationary environment, and whether its deviations from the CAPM-implied values can stem from money illusion.

Finally, as the methodology is based on estimating the mispricing of risky and safe stocks relative to the market (that is, the market is only the reference point that cannot be mispriced with respect to itself), the two pairs of the estimates must sum up to zero. That is, $g_0 + h_0$, and $g_1 + h_1$ must be equal to zero; otherwise, the results of the final regressions cannot be regarded as fully reliable. Therefore, we report test statistics for the two tests in our main analysis to demonstrate that estimation of the mispricing was indeed plausible.

4.3 Data Description

Three types of data are required in order to perform an analysis using the described methodology: stock returns and capitalization, inflation and risk-free rates. Here we provide a brief overview of the data utilized. Individual characteristics together with general descriptive statistics of each market are presented in Appendix E. The stock data are obtained from the Bloomberg Professional (2008) database, while both inflation and risk free rates are used as provided by Eurostat (2008).

In total, we obtain data for ten markets: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia. These countries, together with Albania and the Slovak Republic, are considered to be the CEE countries (OECD.Stat, 2001).

The two latter markets are not included into our sample due to insufficient number of listed companies, short-spanned market history, and, in case of Albania, unsatisfactory data quality.

The stocks-related data for all the markets contain monthly capitalizations and prices (taken as closing prices of the last trading day for each month) over the period from November 1999 to November 2008. The sample is comprised of 1096 company stocks. The stock data are adjusted for corporate actions (excluding cash dividends) of currently listed companies. However, it should be noted that the adjustment information for some of the markets is not available. To ensure a reasonable level of liquidity of the securities researched, we review company listing regulations, and consider only the equity market segments that have relatively stringent requirements (the list of the segments considered is provided in Appendix E).

Stock returns are calculated as a natural logarithm of the ratio of the current and previous month's stock prices. Returns are censored in order to avoid outliers (that are rather common in emerging markets) and account for the possibility that data are not adjusted for stock splits and merges in some markets. The limit for return censoring is chosen as the highest and the lowest 0.5% of the sample. The average critical value is 68.6% for upside censoring, and -67% for downside censoring, with Latvia, Hungary and Bulgaria having most outliers. We also experiment with censoring 5% of the observations; however, the limits appear to be more reasonable with 1% censoring (see Appendix F for all the critical values). The decision is also backed up by a study by Brooks, Faff, Fry and Newton (2004), who find that even censoring stock returns at 50% (or above) the extent to which the CAPM holds in a particular market is not materially affected.

The proxy for a market portfolio is constructed by value-weighting all the stocks in the corresponding market sample. We note that this proxy does not fully represent the true market portfolio as defined by the asset pricing theory as it should include all investment returns in the economy (Roll, 1977). However, as shown by Stambaugh (1982), inclusion of other asset classes into the market portfolio proxy should not influence the performance of the CAPM. Additionally, due to practical limitations, the creation of such a portfolio in the CEE countries is implausible.

To estimate market excess returns, we use returns on market portfolios and one month money market interest rates. One month rates are chosen as the stock portfolios are reformed on a monthly basis, hence for an investor employing our methodology in the stock market they would be of highest relevance. Nevertheless, we also provide a robustness check using long term interest rates on government bonds (the official EMU convergence criteria rates).

As the main proxy for inflation, we choose a change in monthly Harmonized Index of Consumer Prices (HICP). We use consumer price-based index as opposed to Producer Price Index (PPI) as the former indicator has a more profound impact on the wealth of investors. As a robustness check, we employ six-month inflation expectations of economic experts (provided by the Ifo Institute for Economic Research (Stallhofer, S., personal communication, December 22, 2008)). A graphical summary of all the robustness checks is provided in Appendix G.

5 Empirical Findings

Before starting the empirical analysis, we check for the correlation between the market excess returns and contemporaneous inflation. The coefficients and their p-values are reported in Appendix H. The general trend is clear: correlation is significantly negative in four markets, and non-existent in the other six. Thus, after finding the relationship that is expected yet theoretically incorrect, we proceed to the main analysis in order to answer the question whether such a relationship can stem from the existence of money illusion in the CEE markets.

5.1 The Formation of Dynamic Portfolios

The first step of the analysis is the estimation of individual stock betas. We consider 12-month and 36-month trailing windows to calculate the betas, and choose the specification based on two criteria: (1) wide cross-sectional spread among stock betas at each time period, and (2) relative stability of the betas for each stock in the sample (as it indicates less noise in their measurement). As it can be seen in Appendix I, the 12-month window specification yields wider cross-sectional spread among stock betas, while the 36-month specification naturally produces smoother betas for individual stocks. As the criteria do not lead to a clear decision, we focus on the stock betas estimated with the 12-month trailing window. This choice leaves us with a longer time span for the main analysis, and does not materially affect the results due to the stocks being only inputs to the dynamic portfolios.

The second step is dynamic stock sorting into portfolios based on the stock betas that were estimated in the first step. The main aim of this procedure is to ensure less volatile betas of the basis assets while maintaining the cross-sectional spread of portfolio betas within each time period. We consider sorting equities into 5, 10, and 20 portfolios, and estimating their postformation betas using a trailing window of 12, 24 and 36 months (for a graphical summary of all the model specifications, see Appendix G). Table 1 summarizes statistics for the 10-portfolio, 24-month window specification: while the cross-sectional spread is maintained (on average, standard deviation of portfolio betas within each time period is 58%), the asset beta volatility is significantly reduced (on average, standard deviation of portfolio betas is 19 percentage points lower than variation in stock betas).

To illustrate the cross-sectional spread, we provide summary statistics of the highest beta (the first) and the lowest beta (the tenth) portfolios for all ten markets in Appendix J. The mean beta for the first portfolio is 1.641, with the average minimum of 1.019 and the average maximum of 2.322. The corresponding statistics for the tenth portfolio are as follows: the mean of -0.122, the minimum of -0.665, and the maximum of 0.379. Furthermore, the betas of the basis assets still vary over time, although much less in comparison to individual stocks. A part of this time-series deviation naturally arises from simple sampling variation. However, it must be noted that emerging markets do exhibit high volatility (Aggarwal, Inclan & Leal, 1999; Harvey, 1995), which might have an effect on the stability of the portfolio betas. Other specifications yield similar implications; thus, we do not report their statistics here but rather provide the final regression results later in the analysis.

Table 1. Portfolio Beta Estimation Statistics.

Country	Cross-sectional spread	Portfolio-level volatility
Bulgaria	66%	48%
Croatia	58%	23%
Czech R.	60%	27%
Estonia	56%	35%
Hungary	61%	20%
Latvia	79%	50%
Lithuania	55%	25%
Poland	57%	18%
Romania	53%	25%
Slovenia	33%	15%
Average	**58%**	**29%**

Compiled by the authors. The cross-sectional spread is defined as the average sample volatility of the portfolio betas at each time period; the portfolio-level volatility is defined as the average volatility of individual portfolio betas over the sample period.

5.2 The Fama-MacBeth Regressions

In the third step of the analysis we estimate returns of the unit-beta and the zero-beta portfolios using the Fama-MacBeth technique as shown in equation (9). The process permits us to produce time series of relatively stable portfolio betas; the step is critical as the next stage of the analysis will require the two portfolios to have constant betas. It is worth noting that besides allowing us to obtain the two necessary inputs for further analysis, this approach also reveals the degree to which the CAPM holds in each of the markets when inflation is not taken into account. In particular, the CAPM predicts that the coefficient τ should be significantly positive (implying a positive risk premium), and the constant μ , should not be statistically different from zero (that is, compensation for a zero-beta investment should be equal to the risk-free rate). In Table 2 we present average τ and μ coefficients obtained by running the Fama-MacBeth regressions for each of the countries.

Table 2. Fama-Macbeth Regression Statistics.

Country	μ	τ	R^2
Bulgaria	0.013 (1.37)	0.007 (0.59)	30.66%
Croatia	**0.011 (2.10)**	0.001 (0.16)	28.91%
Czech R.	0.004 (0.92)	-0.002 (-0.23)	20.62%
Estonia	**0.015 (2.26)**	-0.012 (-1.20)	21.44%
Hungary	0.010 (1.75)	-0.114 (-1.14)	26.56%
Latvia	**0.018 (2.32)**	-0.001 (-0.16)	21.73%
Lithuania	0.009 (1.44)	0.002 (0.24)	25.63%
Poland	**0.012 (2.60)**	-0.005 (-0.66)	38.46%
Romania	0.013 (1.81)	-0.006 (-0.50)	26.38%
Slovenia	0.001 (0.16)	-0.001 (-0.08)	17.54%

Compiled by the authors. We regress excess returns of the basis assets on their lagged betas at each time period, and obtain the excess slope and the excess intercept portfolio returns (that is, time series of the constant and the coefficient from the regressions). At the same time, the averages of the two estimated time series serve as a quick glimpse at the CAPM validity in these markets, as the CAPM predicts the average intercept coefficient (μ) to be zero, and the average slope coefficient (τ) to be positive. We report the two coefficients and t-statistics in parentheses. Bolded values indicate significance at 5% level**.**

Consistent with other research on the CAMP validity in the CEE stock markets, we do not find any relationship between asset's beta and its return (see, for example, Estrada (2000, 2002)). Furthermore, a significantly positive intercept is obtained in Croatia, Estonia, Latvia and Poland. The results indicate that, on average, investors are relatively overcompensated for holding safe stocks in these markets. Finally, we note that the coefficients provided are just an average of the intercept and the slope portfolio returns, thus they can also be interpreted as summary statistics for the unit- and zero-beta investments.

5.3 The Final Regressions

The fourth step is to regress the zero-beta and the unit-beta portfolio returns on a constant, excess market returns, and lagged inflation (for a summary of the regression coefficients, see Table 3). The precision of the portfolio betas is captured by coefficients b_1 and b_2. The betas of the intercept (that is, the theoretical zero-beta) portfolio are rather low, yet statistically different from zero in most cases. While the coefficient deviations from their theoretical values are partially accounted for when adjusting the point estimates (see equations (12) and (13)), the construction imprecision could induce higher standard errors and thus make statistical tests less powerful. On the other hand, the betas of the slope (that is, the theoretical unit-beta) portfolio are significantly different from zero but not from one (with an exception of Romania and Slovenia, where b_2 is different from 1 at the 5% significance level). The variation of the Jensen's alpha with respect to lagged inflation is captured by c_1 for the intercept portfolio, and c_2 for the slope portfolio. Money illusion as proposed by Modigliani and Cohn requires c_1 being positive, and c_2 – negative. Such a setting would imply that the conditional alpha of the intercept portfolio is positively correlated with inflation, while the alpha of the slope portfolio varies with inflation in an opposite fashion. However, the results indicate that this condition is fulfilled in Bulgaria and the Czech Republic only. Moreover, none of these estimates are significant. On the other hand, the rest of the countries demonstrate the effects of the phenomenon that is opposite to money illusion. That is, the Jensen's alpha commoves positively with lagged inflation for the slope portfolio, and negatively for the intercept portfolio. The results seem to be especially strong in Lithuania and Poland, where both coefficients are statistically different from zero at the 5%

significance level. In yet another two cases (Romania and Latvia), only the coefficient for the intercept portfolio (c_1) is negative and significant.

Table 3. Time-Series Regressions of the Excess Intercept and the Excess Slope Portfolios.

Country	a_1	b_1	c_1	a_2	b_2	c_2	$R^2_{intercept}$	R^2_{slope}
The USA	0.0008 (0.36)	0.0041 (0.14)	**1.5048** **(2.41)**	-0.0009 (-0.40)	**1.0205** **(34.38)**	**-1.4784** **(-2.35)**	0.44%	58.03%
Bulgaria	0.001 (0.08)	**0.255** **(2.36)**	1.147 (0.96)	-0.05 (-0.41)	**0.873** **(8.44)**	-1.108 (-0.97)	8.01%	49.41%
Croatia	**0.015** **(2.50)**	0.129 (1.79)	-2.005 (-1.67)	-0.012 (-1.84)	**0.918** **(12.63)**	1.093 (0.90)	7.63%	68.35%
Czech R.	0.001 (0.13)	**0.222** **(3.15)**	0.594 (0.73)	-0.008 (-1.31)	**0.834** **(9.04)**	-1.404 (-1.32)	12.84%	52.59%
Estonia	**0.022** **(2.51)**	0.166 (1.91)	-1.443 (-1.02)	-0.011 (-1.27)	**0.919** **(10.42)**	0.611 (0.43)	7.78%	60.93%
Hungary	**0.017** **(2.22)**	0.048 (0.59)	-1.568 (-1.35)	**-0.019** **(-2.15)**	**0.904** **(10.02)**	1.483 (1.15)	2.67%	58.67%
Latvia	**0.035** **(3.16)**	**0.279** **(2.02)**	**-2.880** **(-2.33)**	-0.013 (-1.17)	**0.753** **(5.42)**	0.953 (0.77)	15.08%	28.81%
Lithuania	**0.017** **(2.55)**	**0.188** **(2.53)**	**-3.063** **(-2.76)**	**-0.018** **(-2.49)**	**0.949** **(11.94)**	**2.607** **(2.19)**	20.90%	66.08%
Poland	**0.019** **(3.65)**	0.102 (1.63)	**-3.488** **(-2.53)**	**-0.015** **(-2.90)**	**0.918** **(14.34)**	**2.802** **(1.98)**	13.05%	73.59%
Romania	**0.033** **(2.77)**	0.109 (1.67)	**-2.837** **(-2.09)**	**-0.026** **(-1.99)**	**0.842** **(11.99)**	2.291 (1.56)	8.20%	67.01%
Slovenia	0.004 (0.58)	**0.273** **(2.80)**	-1.294 (-1.09)	-0.007 (-1.15)	**0.719** **(8.02)**	1.235 (1.13)	10.05%	48.82%

Compiled by the authors. The figures for the USA are taken from the work by Cohen et al. (2005), and represent coefficients for the main specification of the study (20 beta sorted portfolios with postformation betas estimated using a window of 36 months). The figures for the ten CEE countries represent the specification of 10 beta sorted portfolios with postformation betas estimated using a window of 24 months. The t-statistics are reported in parentheses, bolded values indicate significance at the 5% level. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

Finally, the adjusted $R^2_{intercept}$ and R^2_{slope} are reported. The figures are expected to be low for the intercept portfolio, and approaching 100% for the slope portfolio: while theoretically equation (10) captures the relation between the intercept portfolio's mispricing, the excess market returns, and inflation, equation (11) relates the excess market return with the returns of the unit-beta portfolio (that is, the theoretical market portfolio), and inflation. In other words, the zero-beta portfolio's mispricing is expected not to be correlated with excess market returns, while the unit-beta portfolio returns should commove one-to-one with the excess market returns.

The figures for the slope portfolio are rather reasonable. On the other hand, the values of the adjusted R-squared for the intercept portfolio could raise some concerns. In particular, the average value of 11% across the ten markets indicates that either inflation has effect on the returns of the zero-beta portfolio, or the returns of this portfolio are estimated with some error. Lastly, the Latvian equity market demonstrates rather unreliable results, having the adjusted R-squared of 15.08% and 28.81% for the intercept and the slope portfolios, respectively.

Additionally, as it was noted before, the regression coefficients would only be exact if the betas of the basis assets were perfect forecasts of their future betas. In such a case, b_1 would be equal to exactly zero, and b_2 would be precisely one. However, this is rarely the case, and especially so in the CEE equity markets. Therefore, after checking that $b_2 \neq 0$, and $b_1 \neq b_2$, we proceed with adjusting the estimates to arrive at the final coefficients g_0, g_1, h_0 and h_1.

The final step of the analysis is computing coefficients as described in equations (12) and (13), and running statistical checks to test two hypotheses (for a summary of the adjusted coefficients and statistical tests, see Table 4). The adjustments also provide a corrective measure with respect to beta estimation in the Fama-MacBeth stage. Therefore, the final estimates are consistent despite potential measurement errors in the previous parts of the analysis.

The estimates of g_0 and h_0 show the extent to which the empirical SML is consistent with the CAPM predictions independently of inflation. We find that g_0 is negative, and h_0 is positive in all the markets. As noted in the description of the methodology, the two coefficients should always exhibit opposite signs; thus, such results confirm that the methodology was employed properly (see Table 4 for the results of the test that $g_0 + h_0 = 0$).. The interpretation of the two coefficients is that risky stocks are comparatively undervalued, while safe stocks perform relatively better than the market (in other words, the SML slope is flatter than predicted by the CAPM) when there is no inflationary (or deflationary) pressure. However, the coefficients are statistically significant from zero in some but not all the markets. In six markets from the sample, the joint hypothesis of g_0 and h_0 being equal to zero is rejected against a two-sided alternative at the 5% significance level. That is, the SML in these markets is shallower than expected even in the hypothetical case of zero inflation. Results in the other four markets rather clearly indicate that the two values jointly do not differ from zero. In other words, equities in Bulgaria, the Czech Republic, Hungary and Slovenia are priced according to the CAPM when inflation is zero. Finally, we note that this finding coincides with and adds to the results of the initial Fama-MacBeth regressions, where a significantly positive intercept was found in half of the sample.

The estimates of g_1 and h_1 capture the co-movement of inflation and the steepness of the SML. Again, the two coefficients should have opposite signs, and add up to zero, as the market cannot be mispriced relatively to itself. We report the results of testing the hypothesis that $g_1 + h_1 = 0$ in the second last column of Table 4. The test statistics show that the hypothesis cannot be rejected in any of the markets, indicating that there are no significant problems with the estimation of the coefficients. In addition to the estimates having opposite signs, the concept of money illusion predicts that g_1 should be negative, while h_1 should be positive. We find that this holds true only in two markets of the sample (Bulgaria and the Czech Republic). However, none of the coefficients are significant (t-statistics are -0.96 and -1.32 for Bulgaria, and 0.99 and 0.95 for the Czech Republic for g_1 and h_1, respectively), thus the hypothesis of no money illusion cannot be rejected. In the other four markets (Croatia, Estonia, Hungary, and Slovenia), none of the estimates are significant; this again leads to not rejecting the hypothesis of no money illusion. In Latvia and Romania g_1 is insignificant, while h_1 is different from zero at the 5%

significance level. Nevertheless, the joint hypothesis of g_1 and h_1 being equal to zero cannot be rejected in neither of the markets, implying that inflation again does not have a significant impact on the SML. Finally, in Lithuania and Poland both coefficients are significantly different from zero individually and jointly (with p-values for the joint hypothesis being 0.017 for Lithuania and 0.038 for Poland).

Table 4. Adjusted Coefficients of the Excess Slope and the Excess Intercept of the SML.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$g_1+h_1=0$	$[g_0, h_0]'=0$	$g_0+h_0=0$
The USA	-0.0009 (-0.40)	**-1.4487** **(-2.35)**	0.0008 (0.36)	**1.5108** **(2.40)**	**5.82** **[0.05]**	0.00 [0.96]	N/A	N/A
Bulgaria	-0.005 (-0.41)	-1.269 (-0.96)	0.002 (0.16)	1.471 (0.99)	0.52 [0.597]	0.07 [0.795]	0.15 [0.861]	0.15 [0.697]
Croatia	-0.013 (-1.86)	1.191 (0.90)	**0.017** **(2.49)**	-2.158 (-1.60)	1.79 [0.171]	2.02 [0.157]	**3.29** **[0.040]**	1.71 [0.193]
Czech R.	-0.009 (-1.32)	-1.684 (-1.32)	0.003 (0.47)	0.968 (0.95)	0.89 [0.413]	0.88 [0.349]	1.35 [0.262]	2.48 [0.117]
Estonia	-0.012 (-1.28)	0.665 (0.43)	**0.024** **(2.38)**	-1.553 (-0.95)	0.96 [0.385]	1.61 [0.206]	**4.95** **[0.008]**	**7.49** **[0.007]**
Hungary	**-0.021** **(-2.08)**	1.641 (1.13)	**0.018** **(2.15)**	-1.647 (-1.32)	0.91 [0.405]	0.00 [0.991]	2.33 [0.101]	0.38 [0.539]
Latvia	-0.018 (-1.23)	1.265 (0.79)	**0.040** **(3.36)**	**-3.232** **(-2.41)**	2.98 [0.054]	1.64 [0.202]	**5.70** **[0.004]**	2.73 [0.101]
Lithuania	**-0.019** **(-2.59)**	**2.745** **(2.27)**	**0.021** **(2.70)**	**-3.578** **(-2.81)**	**4.17** **[0.017]**	2.39 [0.125]	**3.70** **[0.027]**	0.31 [0.581]
Poland	**-0.017** **(-2.94)**	**3.051** **(2.01)**	**0.020** **(3.72)**	**-3.799** **(-2.59)**	**3.34** **[0.038]**	0.55 [0.460]	**6.91** **[0.001]**	0.98 [0.323]
Romania	-0.030 (-1.95)	2.719 (1.53)	**0.036** **(2.72)**	**-3.132** **(-2.06)**	2.13 [0.122]	0.11 [0.745]	**3.71** **[0.027]**	0.28 [0.595]
Slovenia	-0.010 (-1.14)	1.717 (1.10)	0.007 (0.72)	-1.764 (-1.08)	0.60 [0.550]	0.02 [0.887]	2.48 [0.087]	3.13 [0.079]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 10 beta-sorted portfolios with a 24-month estimation window for the calculation of the postformation betas. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

However, the hypothesis of no money illusion is not rejected in these two markets either: while we find an inflationary effect on the empirical SML, the effect is opposite to the Modigliani and Cohn predictions. Contrary to their proposed phenomenon, we find that in times of high inflation, safe Polish and Lithuanian stocks are relatively undervalued, while risky stocks are overvalued with respect to the market, resulting in the SML slope steeper than predicted by the CAPM.

To sum up, we find that the empirical slope of the SML significantly differs from (is flatter than) the line predicted by the CAPM, even when inflation is zero, in six markets from our sample (Croatia, Estonia, Latvia, Lithuania, Poland, and Romania). Second, we confidently reject the possibility of money illusion hypothesis in all the markets, as the effect predicted by the concept is only found in two markets (Bulgaria and the Czech Republic), yet is insignificant in both cases. Third, we do not find any inflationary effect on the SML in the other six markets (Croatia, Estonia, Hungary, Latvia, Romania, and Slovakia), implying that there is no relative mispricing of risky and safe stocks related to expected price changes. Fourth, in Poland and Lithuania inflation affects the slope of the Security Market Line positively, and the intercept negatively, indicating that risky (safe) stocks become relatively overvalued (undervalued) compared to the market when changes in CPI are observed. This is a direct contradiction to the implications stemming from the money illusion concept.

In Appendix K we also provide the final regression outputs for the other four specifications: 24-month postformation beta estimation window and 20 (5) dynamic portfolios, and 10 dynamic portfolios and 12-month (36-month) postformation beta estimation window. The results do not vary significantly from one specification to another. Some differences, however, arise in the level of significance of the coefficients.

First, the results of the joint hypothesis of $[g_0, h_0]' = 0$ are highly robust in seven countries, allowing us to confidently conclude that in Bulgaria and Slovenia the CAPM holds when inflation is zero, while in Estonia, Latvia, Lithuania, Poland and Romania the model never holds.

Second, the hypothesis of $[g_1, h_1]' = 0$ also yields similar level of robustness under different specifications. More specifically, we can certainly conclude that the two coefficients are not different from zero in all the markets, with an exception of Lithuania and Poland. Finally, no significant differences are observed when the signs of g_1 and h_1 are considered. That is, the two coefficients keep their signs and the level of significance across different specifications in all but one market. In the case of Latvia, all three specifications with 10 dynamic portfolios yield the same results. However, when either 5 or 20 portfolios are used, the market's results become rather distorted and unrealistic (yet insignificant). Therefore, a strong conclusion for the Latvian equity market is not possible.

5.4 Additional Robustness Checks

In addition to providing the final regression results for five different specifications, we perform two robustness checks by (1) using long-term government bonds yield as a risk-free rate, and (2) employing different inflation proxies (the expected inflation measure and different lags of HICP). The analysis is replicated using the main 24-month 10-portfolio specification.

The first test is expected to account for the differences in proxies for expected inflation. In particular, the fact that our previous analyses employ lagged HICP relies on an assumption that investors use the latest available inflation figures as the best forecasts for future inflation. However, there are a few theoretical and practical considerations that require an additional check of reliability. First, it might take more than one month for the most recent inflation data to reach the investors. We circumvent this issue by running the regressions (10) and (11) with more than one lag of inflation. In most of the cases, the first lag is the most significant one. However, either the second or the third lag is more significant in a few markets. As these differences might arise due to market specifics with respect to information absorption, we run the final regressions with the most significant lag of inflation for each market. The outcomes are as follows: (1) the significant results gain even more significance, (2) the insignificant results with positive g_1 and negative h_1 become more significant, and (3) the insignificant results that weakly point toward money illusion change the coefficients to positive g_1 and negative h_1. In short, when the most significant inflations lags are used in the analysis, the general results support our main finding of no money illusion in even more countries. Second, genuine expectations about changes in prices might be more precisely captured by expected inflation obtained by surveying professionals as shown in the paper by Ang, Bekaert and Wei (2007). Thus, the bias that could arise by using past data as a proxy for anticipated inflation, is avoided.

The second test is carried out to ensure that our results are not primarily driven by volatility in short-term interest rates, which is, on average, 15% higher than the standard deviation of long-term interest rates during the sample period.

In order to utilize the expected inflation rate (π_t^e), and following the approach of Schmeling and Schrimpf (2008), we adjust equations (10) and (11) to take into account the 6-month inflation forecasting horizon:

$$R^e_{intercept,t+6} = a_1 + b_1 R^e_{m,t+6} + c_1 \pi^e_t + u_{1,t} \quad (14)$$

$$R^e_{slope,t+6} = a_2 + b_2 R^e_{m,t+6} + c_2 \pi^e_t + u_{2,t} \quad (15)$$

Other than that, the methodology and the data span remain unchanged. Therefore, we can proceed straight to the interpretation of the final regression results (see Table 5).

Table 5. Adjusted Coefficients of the Excess Slope and the Excess Intercept of the SML.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009 (-0.40)	**-1.4487** **(-2.35)**	0.0008 (0.36)	**1.5108** **(2.40)**	**5.82** **[0.05]**	N/A
Bulgaria	0.018 (0.41)	-0.544 (-0.73)	0.007 (0.15)	0.066 (0.08)	0.84 [0.435]	0.58 [0.562]

Croatia	0.044 (1.26)	-1.788 (-1.55)	-0.020 (-0.57)	1.049 (0.90)	1.67 [0.192]	1.43 [0.243]
Czech R.	-0.044 (-1.78)	1.049 (1.29)	0.036 (1.89)	-1.090 (-1.70)	1.45 [0.238]	1.92 [0.151]
Estonia	0.011 (0.36)	-0.523 (-0.68)	0.021 (0.64)	-0.086 (-0.11)	1.78 [0.172]	2.86 [0.061]
Hungary	**-0.096** **(-3.12)**	**1.491** **(2.79)**	**0.084** **(3.17)**	**-1.320** **(-2.86)**	**4.16** **[0.018]**	**5.15** **[0.007]**
Latvia	-0.029 (-1.35)	0.343 (1.03)	**0.076** **(4.43)**	**-0.974** **(-3.69)**	**6.86** **[0.001]**	**9.83** **[0.000]**
Lithuania	**-0.031** **(-2.65)**	**0.777** **(2.13)**	**0.045** **(3.90)**	**-1.303** **(-3.65)**	**9.78** **[0.000]**	**9.31** **[0.000]**
Poland	**-0.049** **(-3.09)**	**1.504** **(2.57)**	**0.063** **(4.07)**	**-1.907** **(-3.41)**	**5.82** **[0.004]**	**8.26** **[0.000]**
Romania	-0.022 (-1.13)	0.109 (0.65)	0.017 (1.05)	-0.038 (-0.26)	0.25 [0.776]	0.70 [0.499]
Slovenia	0.007 (0.31)	-0.288 (-0.57)	-0.009 (-0.40)	0.258 (0.49)	0.22 [0.803]	0.16 [0.849]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 10 beta-sorted portfolios with a 24-month estimation window for the calculation of the postformation betas, and employing expected inflation as a robustness check. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

The coefficients obtained are similar to the main specification; however some of them occasionally lose or gain significance. The largest change is observed in Hungary, where the relative mispricing due to inflation becomes significant, with g_1 being 1.491 and h_1 -1.320 (both significant at the 5% level). The joint hypothesis of the two estimates being equal to zero is also rejected. This makes Hungary the third market (together with Lithuania and Poland) where the SML is materially affected by inflation (that is, in times of high inflation risky (safe) stocks are overvalued (undervalued) relative to the market). Apart from this finding, the general trend of results does not differ from the main specification, although in absolute terms g_1 and h_1 become smaller. However, this only captures the effect of employing yearly rather than monthly data of expected inflation. Thus, we conclude that the proxy of expected inflation used in the main specification is reliable.

Table 6 summarizes the results of the analysis performed with long-term interest rates. It should be noted that long term rates were used throughout the entire analysis, starting from the very first step of stock-level beta estimation in order to keep the results consistent. Additionally, not all countries are included in this robustness check, as the long term government bond yields (or equivalent rates) are not available for Bulgaria, Croatia and Romania over the desired time period. For the other seven countries, the analysis is run starting no later than March 2001, depending on the availability of the data for each individual country.

Table 6. Adjusted Coefficients of the Excess Slope and the Excess Intercept of the SML.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009 (-0.40)	**-1.4487** **(-2.35)**	0.0008 (0.36)	**1.5108** **(2.40)**	**5.82** **[0.05]**	N/A
Czech R.	-0.007 (-0.80)	-1.720 (-1.18)	0.001 (0.16)	0.953 (0.91)	0.70 [0.499]	0.62 [0.537]
Estonia	-0.010 (-1.08)	0.588 (0.38)	**0.022** **(2.20)**	-1.485 (-0.91)	0.95 [0.391]	**4.68** **[0.010]**
Hungary	**-0.022** **(-2.11)**	1.345 (0.91)	**0.018** **(2.04)**	-1.219 (-0.93)	0.44 [0.647]	2.24 [0.110]
Latvia	-0.001 (-0.04)	0.573 (0.18)	**0.037** **(3.28)**	**-3.079** **(-2.52)**	**3.42** **[0.035]**	**6.00** **[0.003]**
Lithuania	**-0.021** **(-2.90)**	**3.090** **(2.60)**	**0.022** **(2.76)**	**-3.759** **(-2.94)**	**4.35** **[0.015]**	**4.24** **[0.016]**
Poland	**-0.016** **(-2.90)**	**3.111** **(2.07)**	**0.020** **(3.71)**	**-3.885** **(-2.66)**	**3.53** **[0.032]**	**6.89** **[0.001]**
Slovenia	-0.008 (-0.66)	2.223 (1.00)	0.006 (0.46)	-2.358 (-1.06)	0.59 [0.554]	1.00 [0.372]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 10 beta-sorted portfolios with a 24-month estimation window for the calculation of the postformation betas and employing long term government bond yields as a robustness check. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

The results are virtually unchanged when the long-term rates are used, as all the coefficients maintain their signs and significance, and the values obtained are very close to those from the main specification. The only notable difference is that in case of Latvia we can now confidently reject the joint hypothesis of g_1 and h_1 being equal to zero, as the p-value drops to 3.5% in comparison to 5.4% in the analysis with short-term interest rates. In general, we conclude that short-term interest rate volatility does not have a profound impact on our results.

6 Interpretation and Discussion of the Results

In the nutshell, this paper analyses the performance of the CAPM in ten CEE equity markets with respect to inflation. It looks both into the validity of the model in the hypothetical inflation-free environment, and any mispricing related to changes in a country's price index. Consistently with vast literature written on the general CAPM strength in emerging markets (see, for example, Estrada (2002)), we do not find a significantly positive relationship between an asset's beta and its expected return in none of the sample markets. Nevertheless, there are four markets (namely, Bulgaria, Hungary, Slovenia and the Czech Republic) where we do not find any systematic deviations from the CAPM-implied SML in non-inflationary environment. However, we note that under different specifications the results are robust only in Bulgaria and Slovenia's cases, indicating that the validity of the CAPM is still questionable in the Czech Republic and Hungary. Furthermore, the Czech Republic and Slovenia's samples consist of only 22 and 26 shares, respectively. That minimizes the extent to which we are able to reduce noise in beta calculations by employing the dynamic portfolio formation technique. Thus, the inability to find significant mispricing in these two markets should be taken with caution, as it can be primarily driven by large standard errors of the estimates. In general, such problems as thin trading, small number of stocks, dominance of few large-capitalization companies, and excessive volatility apply to all the CEE markets to a smaller or larger extent, and thus we can never be completely sure about the CAPM-related studies. In fact, the post-estimation parameter stability tests (not reported) indicate that inflation had stronger effect on the SML in the more recent part of the sample in most of the markets, indicating that the development of the markets could have minimized excessive noise in the data. At the same time, the cross-country differences might arise simply due to differences in the market microstructure, transaction costs, the legal system, or the number and type of the investors. Furthermore, the CAPM does not seem to be affected by inflation in most of the markets, thus leading to a conclusion that there are other factors that undermine its performance. The only two markets where the SML is found to be affected by inflation are Poland and Lithuania. In both cases risky stocks are relatively overvalued, and safe stocks are undervalued in the presence of inflation. However, the money illusion concept does not help to explain the results, as the predicted effect is opposite to the findings. We suggest two main alternatives that could help to explain the discovered relationship.

First, the relationship could stem from a misspecified model of risk and inflation acting as a proxy for changes in risk aversion. In particular, such a result could be obtained if (1) inflation spikes coincided with risk aversion increases, which is found to be the case in many developed markets (Bekaert & Engstrom (2008)), and (2) there is a nonlinear relationship between expected returns and risk, with risky (safe) stocks bearing disproportionally high (low) risk premium. In other words, the hypothetical risk model should include a squared term of systematic risk ($\beta\uparrow 2$) . Such a model specification can be backed up by the availability heuristic bias (Tversky & Kahneman, 1974), which in this case would imply that investors attribute disproportionally high (low) risk to already highly risky (safe) stocks.

Second, such a relationship could still arise from the confusion of nominal and real values, just contrary to the Modigliani and Cohn hypothesis investors should use nominal cash flows and real discount rates for their equity valuation. While at the first glance improbable, such an explanation has some grounds, too. Growing prices was a common feature during the sample period in Lithuania and Poland, so it is likely that investors were correctly expecting increasing cash flows, taking inflation into account. On the other hand, due to the performance of the real economy (the average real growth in GDP during the sample period was 7% in Lithuania and 4% in Poland (Eurostat, 2008)) the need to increase the discount rate might have been neglected. First, the ever-increasing cash flows might have provided substantially high rates of return, so that changes in the required rate could have been overlooked. Second, the proper calculation of a correct discount rate requires endeavor from the investor, while cash flows are observable as they are received. Thus, in order to avoid making additional effort to re-estimate the discount rate, the agents could have simply used a constant discount rate by applying a rule of thumb. In such a way, an “inverse money illusion” could explain the results in these two markets.

Finally, we provide several possible reasons why no evidence of money illusion was found in this study as opposed to the original research by Cohen et al. (2005). First, we point to volatility of the sample stock markets, which, as in most of the emerging markets, is substantially higher in comparison to the developed ones (De Santis, 1997). Such market conditions make it difficult to apply empirical models; thus, it is possible that the effect was not captured due to excessive noise in the data. On the other hand, the Fama-MacBeth regressions provided us with quite precisely estimated zero- and unit-beta portfolios[1]. This ensures the reliability of the analysis, and implies that the effect may simply be not present in the CEE equity markets. As

[1] We have also performed the main analysis without forming the dynamic portfolios to ensure that the Fama-MacBeth regression results are not affected by artificial sorting of the assets. The estimates of the zero-beta and the unit-beta portfolios were very imprecise, and thus could not be used in further analysis.

discussed by Miao and Xie (2007), money illusion can disappear if a learning effect takes place due to the salience of high inflation and nonlinearly increasing welfare costs. We believe that this hypothesis is very compelling, as all the researched CEE countries experienced a highly dynamic inflationary environment during the decade before our sample period (Eurostat, 2008). Hence, even if money illusion was present before, investors might have learnt how to use nominal and real values correctly. Even further, the Modigliani and Cohn (1979) hypothesis assumes that the valuation mistakes are made due to economic agents being used to low or non-inflationary environment, and thus sticking to their old behavior in times of significant price changes. This assumption might not realistic in the countries researched in this paper, as the price changes were substantial during the last two decades.

Moreover, the choice of inflationary data can be crucial for the research. Cohen et al. (2005) use exponentially smoothed inflation with a monthly decay of 0.9806. After applying the same smoothing we noticed that the smoothed time series of inflation exhibit negative correlation with the original time series for 4 out of 10 countries. Using such a proxy might have allowed rejecting the hypothesis of no money illusion in Lithuania and Poland. However, we do not believe that such a proxy would depict the real picture of inflationary expectations from investors’ perspective in the CEE markets, as such smoothing assumes that investors take into account inflationary data from as much as 3 years ago. Second, our time series data do not suffer from excessive noise (while Cohen et al. (2005) employ smoothing particularly to adjust for this problem); we thus do not use the same smoothing approach.

Finally, the findings in Lithuania and Poland present a possibility that money illusion could still exist in other markets. The crucial assumption our study relies on is that the market does not make any other systematic mistake but money illusion. However, consider the case when the results in Poland and Lithuania are driven by some other mispricing related to inflation. Then a joint effect of this mispricing and money illusion would bring the SML to its theoretical slope in all the other markets, as the two deviations from expected value would cancel each other out. However, this is a very hypothetical case, and unless the roots of the systematic mistake found in Lithuania and Poland are properly analyzed, such a proposition remains completely theoretical.

7 Conclusion

This paper provides one of the first insights about the negative (and non-existent) inflation and stock returns relationship in Central Eastern European equity markets. In particular, we employ the Cohen et al. (2005) methodology that allows us to discriminate between the irrational hypothesis of money illusion and the rational hypotheses by utilizing the Capital Asset Pricing Model and the cross-sectional implications of the Modigliani and Cohn proposition. In essence, we provide empirical tests for the validity of the CAPM while accounting for the possibility of money illusion.

By employing the Fama-MacBeth technique we show that there is no expected return and asset beta relationship (as predicted the CAPM) in the CEE stock markets. Second, we find that the empirical estimate of the SML is consistent with the CAPM predictions in Bulgaria, the Czech Republic, Slovenia and Hungary when inflation is zero. Third, we provide evidence that the performance of the CAPM is not affected by inflation in most of the countries researched. In two countries – Lithuania and Poland – however, an excessively steep Security Market Line is observed when inflation is high, indicating that the CAPM performs worse in the environment of rapidly changing prices. The money illusion phenomenon is not able to explain the mispricing, thus leaving space for alternative explanations, such as an “inverse” money illusion or joint misspecification of the risk model employed, and the effect of changing risk aversion. We note that while the research could be subject to various biases due to inherent difficulties in analyzing the emerging stock markets, the fact that inflation-related mispricing was found in the largest and the most developed CEE market, Poland, gives additional strength to the reliability of our results.

Besides its academic contribution to the already large body of stock return – inflation relationship studies, this paper is also one of the first attempts to analyze aggregate money illusion in CEE. Our finding that money illusion is not present in the stock markets lays grounds for further studies of the phenomenon. In particular, one has to realize that the persistent inflationary environment in the region could have made investors less likely to confuse real and nominal values, and thus other related phenomena (such as wage stickiness) can also prevail to a lesser extent.

Furthermore, we show that the Fama-MacBeth methodology for testing the CAPM validity is applicable in CEE stock markets despite their small size, excessive volatility or other undesirable properties. The precision of estimating the unit-beta and the zero-beta portfolios is sufficient for the whole family of similar CAPM performance tests to be applied in this region.

Apart from the theoretical contribution, the paper also has several practical implications. First, policy makers should nevertheless strive for controlled inflation, as the example of Poland and Lithuania proves that the stock market might still be systematically mispriced due to significant changes in the country's price index. Such a misvaluation, of course, reduces the overall efficiency in the economy and thus should be avoided. Second, we show that the performance of the CAPM is questionable; hence, it should not be used as the main corporate valuation tool. Third, as the methodology employed in this paper can be exercised in the real world, we conclude that risky stocks are the best hedge against inflation in Lithuania and Poland,

and high risk trading strategies there should yield best risk-adjusted results during inflationary times.

Finally, we rule out one possibility – the money illusion hypothesis – out of the list of possible explanations for the negative stock returns and inflation co-movement in CEE equity markets. We believe that various alternatives, such as risk aversion, can help to explain the relationship. At the same time, increasing market integration in CEE countries might change the riskiness of assets as perceived by investors, thus possibly requiring another proxy for the market portfolio. We therefore encourage further research in these areas.

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Appendix A

Table 7. A Summary of the Hypotheses Explaining the Inverse Inflation and Stock Returns Relation.

Hypothesis	Author(s)	Propositions and findings
Nominal contracting	Kessel (1956) Pearce and Roley (1988)	At the times of unanticipated inflation, net debtors benefit at the expense of net creditors; thus, only returns of the firms that are net creditors should be negatively correlated with inflation.
Tax- and accounting standards-induced distortions	Feldstein (1980a), (1980b) Summers (1981)	Higher tax caused by historic-cost depreciation and tax on inflation-induced (and thus artificial) capital gains reduce the yield on equities.
Proxy hypothesis	Fama (1981)	Inflation acts as a proxy for real economic activity. This leads to a spurious relationship between inflation and stock returns.
	Geske and Roll (1983)	The effects of monetary policy (pursued as a response to higher inflation) damage real economy.
	Boudoukh, Richardson and Whitelaw (1994) Kaul (1987)	Processes in the monetary sector damage real economy.
	Bernard (1986), Marshall (1992)	Inflation is correlated with expected real activity.
	Bekaert and Engstrom (2008)	Proxy hypothesis can only explain a small fraction of the negative correlation between inflation and stock returns.
Changes in risk aversion	Brandt and Wang (2003)	Inflationary environment makes investors more risk-averse, driving up the risk equity premium, and thus the real discount rate.
	Bekaert and Engstrom (2008)	Changes in risk aversion can explain the majority of the inverse inflation-stock returns relationship.
Money illusion	Modigliani and Cohn (1979)	First, investors fail to realize that the value of corporate liabilities decreases with increasing inflation. Second, investors discount real cash flows from stocks using nominal rates of return.
	Asness (2000), (2003) Campbell and Vuolteenaho (2004)	Support the money illusion hypothesis, yet do not account for time-varying equity premium.
	Cohen et al. (2005)	Support the money illusion hypothesis.

Compiled by the authors.

Appendix B

Explicit Derivation of the Theoretical Framework

$$\frac{D}{P} = R - G$$

$$R^e = R - R_f$$

$$G^e = G - R_f$$

$$\frac{D}{P} = R_i^e - G_i^e$$

$$\frac{D}{P} = R^e_{OBJ} - G^e_{OBJ} = R^e_{SUBJ} - G^e_{SUBJ}$$

$$\varepsilon_i = R^e_{i,OBJ} - R^e_{i,SUB} = G^e_{i,OBJ} - G^e_{i,SUB}$$

$$G^e_{i,SUB} = G^e_{i,OBJ} - \varepsilon_i$$

$$G^e_{i,OBJ} = G^e_{i,SUB} + \varepsilon_i$$

$$\frac{D}{P} = R^e_{i,OBJ} - G^e_{i,SUB} - \varepsilon_i = R^e_{i,SUB} - G^e_{i,OBJ} + \varepsilon_i$$

$$\varepsilon_i = \varepsilon_m = \gamma_0 + \gamma_1 \pi$$

$$R^e_{i,SUBJ} = \beta_i R^e_{m,SUBJ}$$

$$\varepsilon_i = R^e_{i,OBJ} - \beta_i R^e_{m,SUBJ} = R^e_{i,OBJ} - \beta_i \llbracket(R\rrbracket^e_{m,OBJ} - \varepsilon_m)$$

$$\varepsilon_i = R^e_{i,OBJ} - \beta_i R^e_{m,SUBJ}$$

$$R^e_{i,OBJ} = \beta_i R^e_{m,SUBJ} + \varepsilon_i$$

$$\varepsilon_i = R^e_{i,OBJ} - \beta_i \llbracket(R\rrbracket^e_{m,OBJ} - \varepsilon_m) = R^e_{i,OBJ} - \beta_i R^e_{m,OBJ} + \beta_i \varepsilon_m$$

$$\beta_i R^e_{m,OBJ} = R^e_{i,OBJ} + \beta_i \varepsilon_m - \varepsilon_i$$

$$\alpha_i = \beta_i R^e_{m,SUBJ} + \varepsilon_i - \left(R^e_{i,OBJ} + \beta_i \varepsilon_m - \varepsilon_i\right) = [-\left(R^e_{i,OBJ} - \beta]_i R^e_{m,SUBJ}\right) - \beta_i \varepsilon_m + 2\varepsilon_i = -\varepsilon_i - \beta_i \varepsilon_m + 2\varepsilon_i = \varepsilon$$

$$\alpha_i = R^e_{i,OBJ} - \beta_i R^e_{m,OBJ} = \varepsilon_i - \beta_i \varepsilon_m = \gamma_0 + \gamma_1 \pi - \beta_i(\gamma_0 + \gamma_1 \pi)$$

Appendix C

Explicit Derivation of the Adjusted Coefficients for the Final Regressions

$$\alpha_i = R^e_{i,OBJ} - \beta_i R^e_{m,OBJ} = \varepsilon_i - \beta_i \varepsilon_m = \gamma_0 + \gamma_1 \pi - \beta_i(\gamma_0 + \gamma_1 \pi) \quad (8)$$

$$R^e_{intercept,t} = a_1 + b_1 R^e_{m,t} + c_1 \pi_{t-1} + u_{1,t} \quad (10)$$

$$R^e_{slope,t} = a_2 + b_2 R^e_{m,t} + c_2 \pi_{t-1} + u_{2,t} \quad (11)$$

As it is demonstrated in equation (8), Jensen's alpha is the excess return of a portfolio over the CAPM-predicted return. Note that both market and portfolio returns are excess returns calculated as the difference between the actual portfolio return and the contemporary risk free rate. By combining the equation (8) with (10) and (11) respectively, the conditional alphas for the excess slope and excess intercept of the SML are obtained:

$$R^e_{intercept,t} - b_1 R^e_{m,t} = a_1 + c_1 \pi_{t-1} + u_{1,t} \quad (11.1)$$

$$R^e_{slope,t} - b_2 R^e_{m,t} = a_2 + c_2 \pi_{t-1} + u_{2,t} \quad (11.2)$$

If postformation betas of the dynamic portfolios are accurate forecasts for future betas of the basis assets, the excess intercept and the excess slope of the SML can be expressed as:

$$R^e_{intercept,t} = a_1 + c_1 \pi_{t-1} + u_{1,t} \quad (11.3)$$

$$R^e_{slope,t} - R^e_{m,t} = a_2 + c_2 \pi_{t-1} + u_{2,t} \quad (11.4)$$

In this case, $b_1 = 0$ and $b_2 = 1$: when the estimation of the security market line perfectly corresponds to its true function, b_1 is zero so that the estimated line starts at the point where both excess return of an asset and its market beta is zero. At the same time, the market is theoretically expected to have a beta (b_2) of one. However, as we cannot assume our postformation betas to be perfect forecasts of future betas, an adjustment is needed. The adjustment will additionally correct for potential beta measurement problems from the Fama-MacBeth estimation stage. After ruling out the possibility that $b_2 = 0$ and $b_1 = b_2$, we can proceed to the adjustment derivation.

The excess slope portfolio regression is corrected by dividing the coefficients by b_2 . This way, the slope of the estimated security market line will be adjusted to correspond to the slope of the theoretically implied SML (that is, to unity):

$$Excess\ slope\ of\ the\ SML: \frac{a_2}{b_2} + \frac{c_2}{b_2}\pi_{t-1} \tag{11.5}$$

$$g_0 + g_1\pi_{t-1}, where\ g_0 = \frac{a_2}{b_2}, and\ g_1 = \frac{c_2}{b_2} \tag{12}$$

Similar adjustments have to be made with respect to the intercept portfolio excess returns. First, the market excess return is at the intercept of the SML is equal to $b_1R^e_{m,t}$. Thus, in order adjust the SML to have its initial point at (0; 0), $b_1R^e_{m,t}$ has to be subtracted from its current intercept returns. However, this could only be done if the slope of the SML was equal to one, which we assumed not to be the case previously. Thus, we use the same adjustment as in the first case as our second step:

$$Excess\ intercept\ of\ the\ SML: a_1 - b_1\frac{a_2}{b_2} + c_1 - b_1\frac{c_2}{b_2}\pi_{t-1} \tag{12.1}$$

$$h_0 + h_1\pi_{t-1}, where\ h_0 = a_1 - b_1\frac{a_2}{b_2}, and\ h_1 = c_1 - b_1\frac{c_2}{b_2} \tag{13}$$

Appendix D

Table 8.A Summary of Implications of the Final Regression Coefficients.

Coefficient	Implication
$g_0 = 0$	When inflation is equal to zero, the empirical slope of the SML is consistent with the CAPM.
$h_0 = 0$	When inflation is equal to zero, the market's zero-beta rate is consistent with the CAPM.
$h_0 = g_0 = 0$	When inflation is equal to zero, the market prices equities according to the CAPM.
$h_0 \neq g_0 \neq 0$	Depending on their riskiness, equities are either overpriced or underpriced relative to the market and independently of inflation.
$g_1 < 0\ (> 0)$	The excess slope of the SML commoves negatively (positively) with inflation.
$h_1 < 0\ (> 0)$	The excess intercept of the SML commoves negatively (positively) with inflation.
$h_1 \neq g_1 \neq 0$ $g_1 > 0$ $h_1 < 0$	The null hypothesis of no money illusion can be rejected.
$h_0 + g_0 = 0$ $h_1 + g_1 = 0$	Regression results are reliable.

Compiled by the authors. Note that while the implications stemming from each coefficient are provided both for individual estimates and when taken jointly, only the joint analysis yields statistically meaningful results.

Appendix E

Summary of Sample Data

Table 9. Sample Data Statistics for the Period from November 1999 to November 2008.

Country	Number of equities	Market capitalization (billion EUR) as of November 28, 2008	Mean monthly return	Median monthly return	Standard deviation of monthly returns
Bulgaria	160	4.47	1.82%	2.09%	8.95%
Croatia	251	17.98	1.48%	2.03%	7.02%
Czech R.	26	42.08	0.82%	2.12%	7.86%
Estonia	18	1.38	0.11%	1.00%	7.90%
Hungary	41	14.09	0.39%	1.18%	7.65%
Latvia	36	1.30	1.64%	1.56%	7.85%
Lithuania	41	2.82	0.71%	0.80%	7.08%
Poland	334	114.81	0.57%	1.14%	7.17%
Romania	85	13.15	2.09%	2.38%	11.04%
Slovenia	22	6.36	1.01%	1.33%	5.72%

Compiled by the authors. Bulgaria's, Croatia's, the Czech Republic's, Hungary's, Latvia's, Lithuania's, Poland's, and Romania's market capitalizations are converted to EUR using the official exchange rate as of 2008-11-28 (the exchange rates data are taken from Yahoo! Finance (2009)).

Table 10. Equity Market Statistics as of November 28, 2008.

Country	Total equity market capitalization, billion EUR	Equity submarkets researched (number of shares, fraction of total market capitalization)
Bulgaria	5.547	The official market (22, 33.1%) The unofficial market, Segment A (148, 62.3%)
Croatia	19.307	The official market (16, 36.7%) The regular market (244, 51.3%)
Czech R.	43.189	The main market (13, 97.1%) The free market (13, 2.9%)
Estonia	1.384	The main market (18, 100%)
Hungary	14.336	The spot market (43, 100%)
Latvia	1.313	The main list (5, 32.7%) The secondary list (32, 67.3%)
Lithuania	2.882	The main list (17, 39.1%) The secondary list (24, 60.9%)
Poland	122.409	The main market (336, 99.5%)
Romania	16.648	The main market (69, 79.2%) RASDAQ Tier 1 and Tier 2 (16, 1.8%)
Slovenia	11.126	The prime market (7, 43.9%) The standard market (18, 31.9%)

Compiled by the authors using data from the Bucharest Stock Exchange (2008), the Budapest Stock Exchange (2008), the Bulgarian Stock Exchange – Sofia (2008b), the Ljubljana Stock Exchange (2008), NASDAQ OMX Baltic (2008a, 2008b, 2008c), the Prague Stock Exchange (2008), the Warsaw Stock Exchange (2008), and the

Zagreb Stock Exchange (2008). Bulgaria's and Croatia's market capitalizations are converted to EUR using the official exchange rate as of 2008-11-28 (the exchange rates data are taken from Yahoo! Finance (2009)).

Table 11. Summary Statistics of Inflation Proxies.

	Monthly HICP			Annualized Inflation Expectations		
Country	**Mean**	**Median**	**Standard Deviation**	**Mean**	**Median**	**Standard Deviation**
Bulgaria	0.57%	0.60%	0.90%	6.17%	5.78%	1.62%
Croatia	0.25%	0.21%	0.47%	3.68%	3.17%	1.30%
Czech R.	0.23%	0.10%	0.55%	3.33%	3.00%	1.01%
Estonia	0.41%	0.30%	0.45%	4.36%	4.30%	1.11%
Hungary	0.50%	0.50%	0.52%	6.39%	6.40%	1.76%
Lithuania	0.27%	0.20%	0.51%	2.89%	2.63%	1.65%
Latvia	0.50%	0.50%	0.62%	5.22%	4.85%	2.92%
Poland	0.28%	0.30%	0.41%	3.86%	2.85%	2.25%
Romania	1.22%	0.90%	1.03%	15.70%	9.85%	11.03%
Slovenia	0.42%	0.40%	0.52%	4.98%	4.83%	2.13%
Average	**0.46%**	**0.40%**	**0.60%**	**5.66%**	**4.77%**	**2.68%**

Compiled by the authors. The subsections represent summary statistics for the Harmonized Consumer Prices Index changes (data taken from Eurostat (2009)), and 6-month annualized expert inflation expectations provided by Ifo (Stallhofer, S., personal communication, December 22, 2008).

Table 12. Summary Statistics of Risk-free Rate Proxies.

	1-month interest rates			Long-term interest rates		
Country	**Mean**	**Median**	**Standard Deviation**	**Mean**	**Median**	**Standard Deviation**
Bulgaria	0.33%	0.31%	0.10%			
Croatia	0.30%	0.23%	0.22%			
Czech R.	0.27%	0.23%	0.10%	0.37%	0.37%	0.12%
Estonia	0.32%	0.30%	0.11%	0.56%	0.49%	0.19%
Hungary	0.70%	0.71%	0.23%	0.60%	0.60%	0.07%
Lithuania	0.34%	0.28%	0.21%	0.37%	0.37%	0.18%
Latvia	0.39%	0.34%	0.14%	0.37%	0.40%	0.17%
Poland	0.69%	0.51%	0.40%	0.58%	0.50%	0.19%
Romania	1.61%	1.40%	1.07%	0.31%	0.35%	0.21%
Slovenia	0.45%	0.40%	0.14%	0.37%	0.37%	0.12%
Average	**0.54%**	**0.47%**	**0.27%**	0.45%	0.44%	0.16%

Compiled by the authors. The subsections represent summary statistics for 1-month money market interest rates, and long term interest rates on government bonds (the official EMU convergence criteria rates) (data taken from Eurostat (2009)).

Appendix F

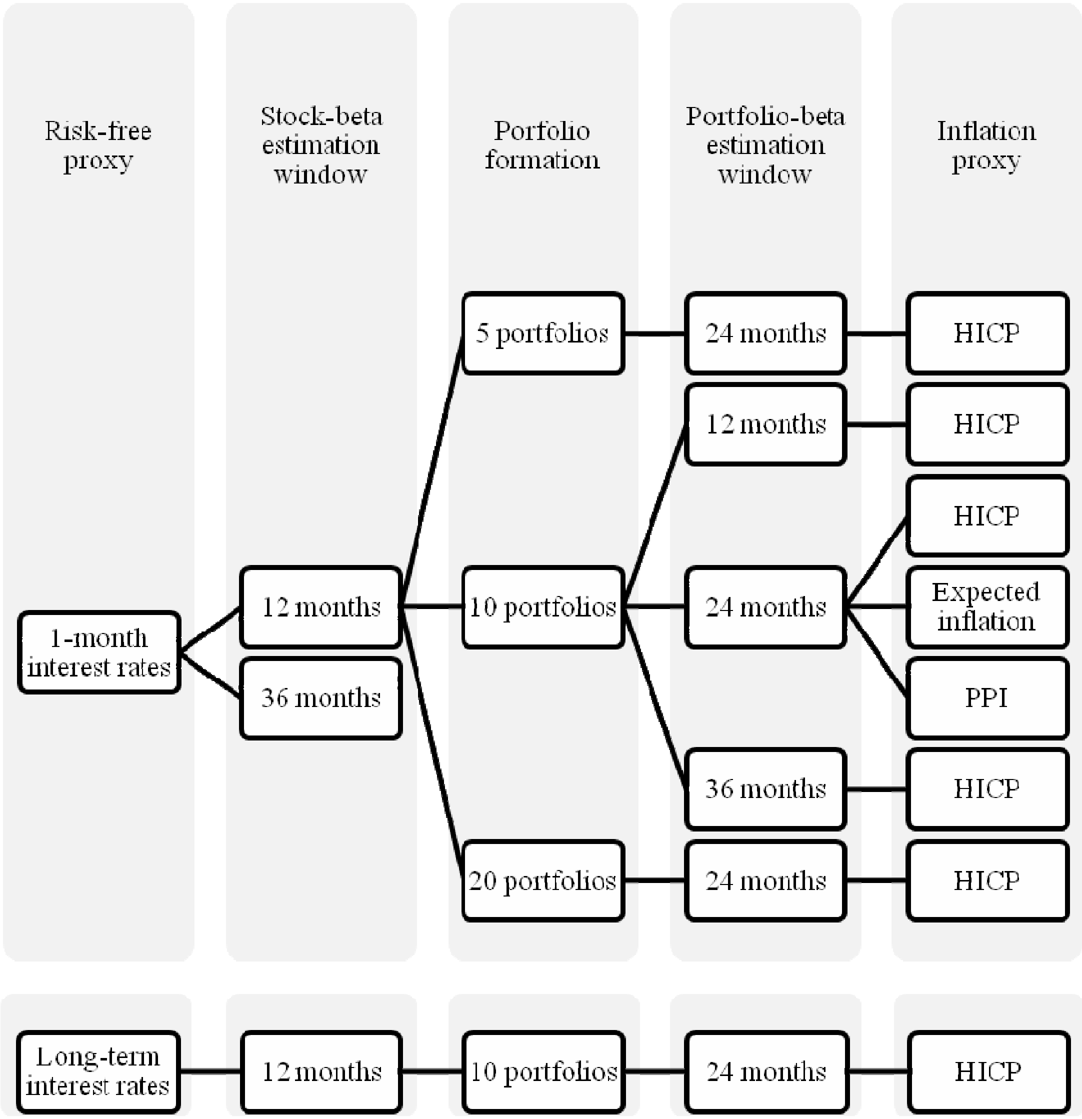
Table 13. Upside and Downside Censoring Limits for 1% and 5% of Sample Observations.

Country	Censoring 1% of observations		Censoring 5% of observations	
	upside limit	**downside limit**	**upside limit**	**downside limit**
Bulgaria	81.8%	-109.9%	42.8%	-42.8%
Croatia	67.5%	-68.0%	36.0%	-34.0%
Czech R.	44.6%	-51.6%	25.9%	-28.7%
Estonia	43.4%	-57.3%	24.1%	-31.0%
Hungary	98.0%	-90.6%	39.9%	-35.9%
Latvia	132.7%	-69.3%	51.1%	-34.2%
Lithuania	57.0%	-62.5%	31.9%	-28.8%
Poland	61.2%	-54.1%	34.4%	-33.4%
Romania	73.6%	-75.6%	43.2%	-36.9%
Slovenia	26.2%	-31.2%	15.8%	-18.8%
Average	**68.6%**	**-67%**	**35%**	**-32%**

Compiled by the authors.

Appendix G

Figure 2. A Graphical Representation of All Model Specifications and Robustness Checks.



Appendix H

Table 14. Correlation between Monthly Excess Stock Returns and Monthly Inflation.

Country	$\rho(R^e_{m,}\,\pi)$	p-value
Bulgaria	-0.1277	0.275
Croatia	0.0126	0.914
Czech R.	**-0.2721**	**0.018**
Estonia	**-0.2438**	**0.035**
Hungary	-0.1285	0.272
Latvia	-0.2184	0.059
Lithuania	**-0.3437**	**0.003**
Poland	**-0.3087**	**0.007**
Romania	-0.0729	0.534
Slovenia	-0.0219	0.852

Compiled by the authors. Bolded values indicate significance at the 5% level.\

Appendix I

Table 15. Stock Beta Estimation Statistics.

	12-month trailing window specification	
Country	**Cross-sectional spread**	**Stock-level volatility**
Bulgaria	81%	54%
Croatia	76%	34%
Czech R.	61%	36%
Estonia	56%	38%
Hungary	78%	55%
Latvia	95%	86%
Lithuania	64%	54%
Poland	74%	48%
Romania	60%	51%
Slovenia	38%	19%
Average	**68%**	**48%**
	36-month trailing window specification	
Country	**Cross-sectional spread**	**Stock-level volatility**
Bulgaria	61%	35%
Croatia	57%	23%
Czech R.	51%	27%
Estonia	43%	28%
Hungary	57%	27%
Latvia	59%	48%
Lithuania	47%	32%
Poland	51%	27%
Romania	40%	28%
Slovenia	30%	12%
Average	**50%**	**29%**

Compiled by the authors. The cross-sectional spread is defined as the average sample volatility of the stock betas at each time period; the stock-level volatility is defined as the average volatility of individual stock betas over the sample period; the average market beta is defined as the average beta of the market portfolio over the sample period, where the portfolio beta is calculated as the value-weighted average of all the stock betas.

Appendix J

Table 16. Summary Statistics of the Postformation Betas for the Lowest- and Highest-beta Portfolios.

	Highest-beta portfolio statistics				Lowest-beta portfolio statistics			
Country	**Average beta**	**Minimum beta**	**Maximum beta**	**Standard deviation**	**Average beta**	**Minimum beta**	**Maximum beta**	**Standard deviation**
Bulgaria	2.103	1.069	3.257	0.681	0.248	-0.639	0.773	0.359
Croatia	1.720	0.689	2.527	0.404	-0.190	-0.636	0.103	0.192
Czech R.	1.712	1.277	2.291	0.219	-0.152	-0.472	0.006	0.116
Estonia	1.475	1.100	1.961	0.244	0.411	0.185	0.824	0.215
Hungary	1.355	1.088	1.779	0.162	-0.589	-1.564	0.119	0.383
Latvia	1.919	0.935	3.521	0.591	-0.215	-1.044	0.885	0.510
Lithuania	1.646	0.675	2.227	0.345	-0.277	-0.795	0.121	0.194
Poland	1.737	1.309	2.094	0.224	-0.275	-0.563	0.306	0.196
Romania	1.364	0.904	1.978	0.253	-0.512	-1.152	-0.033	0.257
Slovenia	1.383	1.145	1.591	0.133	0.329	0.031	0.685	0.154
Average	**1.641**	**1.019**	**2.323**	**0.326**	**-0.122**	**-0.665**	**0.379**	**0.258**

Compiled by the authors. The postformation betas are obtained by regressing the portfolio excess returns on the corresponding market excess returns with a 24-month trailing estimation window.

Appendix K

Coefficients of the SML Excess Slope and Excess Intercept for Alternative Specifications

Table 17. Adjusted Coefficients for the 24-month 5-portfolio Specification.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009	**-1.4487**	0.0008	**1.5108**	**5.82**	N/A
	(-0.40)	**(-2.35)**	(0.36)	**(2.40)**	**[0.05]**	
Bulgaria	0.005	-1.749	-0.07	1.577	0.87	0.18
	(0.35)	(-1.30)	(-0.53)	(1.26)	[0.422]	[0.836]
Croatia	**-0.021**	3.014	**0.019**	**-3.391**	2.27	**3.27**
	(-2.54)	(1.88)	**(2.32)**	**(-2.11)**	[0.107]	**[0.041]**
Czech R.	**-0.018**	1.099	**0.013**	-0.918	0.49	**3.87**
	(-2.73)	(0.98)	**(2.20)**	(-0.92)	[0.616]	**[0.023]**
Estonia	-0.012	0.142	**0.022**	-0.929	1.06	**5.36**
	(-1.65)	(0.12)	**(2.67)**	(-0.70)	[0.348]	**[0.006]**
Hungary	**-0.023**	1.197	**0.019**	-1.182	0.43	**3.40**
	(-2.52)	(0.89)	**(2.20)**	(-0.92)	[0.653]	**[0.036]**
Latvia	-0.013	-0.249	**0.035**	-1.756	1.08	**4.38**
	(-0.84)	(-0.14)	**(2.93)**	(-1.27)	[0.341]	**[0.014]**
Lithuania	**-0.025**	**3.888**	**0.026**	**-4.414**	**5.94**	**6.32**
	(-3.55)	**(3.39)**	**(3.25)**	**(-3.39)**	**[0.003]**	**[0.002]**
Poland	**-0.021**	**3.874**	**0.022**	**-4.254**	**4.70**	**9.55**
	(-4.19)	**(2.91)**	**(4.19)**	**(-2.97)**	**[0.011]**	**[0.000]**
Romania	-0.031	2.476	**0.032**	-2.410	0.97	2.15
	(-1.84)	(1.29)	**(2.07)**	(-1.38)	[0.383]	[0.119]
Slovenia	-0.012	2.292	0.009	-2.062	1.31	2.12
	(-1.23)	(1.33)	(0.98)	(-1.18)	[0.272]	[0.124]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 5 beta-sorted portfolios with a 24-month estimation window for the calculation of the postformation betas. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

Table 18. Adjusted Coefficients for the 24-month 20-portfolio Specification.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009	**-1.4487**	0.0008	**1.5108**	**5.82**	N/A
	(-0.40)	**(-2.35)**	(0.36)	**(2.40)**	**[0.05]**	
Bulgaria	0.003	-1.747	-0.004	1.269	0.88	0.04
	(0.21)	(-1.24)	(-0.27)	(0.79)	[0.417]	[0.963]
Croatia	**-0.016**	**2.785**	**0.018**	**-3.173**	**3.05**	**3.65**
	(-2.19)	**(1.97)**	**(2.70)**	**(-2.47)**	**[0.050]**	**[0.029]**
Czech R.	**-0.014**	-0.781	0.005	-0.094	1.00	**4.88**
	(-2.34)	(-0.74)	(0.75)	(-0.08)	[0.369]	**[0.009]**
Estonia	-0.002	-3.349	0.012	2.928	1.39	1.87
	(-0.14)	(-1.35)	(0.70)	(1.00)	[0.251]	[0.158]
Hungary	-0.023	4.087	0.014	-2.758	1.46	1.25
	(-1.44)	(1.66)	(1.10)	(-1.39)	[0.235]	[0.289]
Latvia	0.006	-0.998	**0.034**	-2.472	2.61	**4.99**
	(0.35)	(-0.56)	**(2.57)**	(-1.67)	[0.0767]	**[0.008]**
Lithuania	**-0.015**	**2.885**	**0.017**	**-4.087**	**6.85**	**3.37**
	(-2.63)	**(2.79)**	**(2.56)**	**(-3.67)**	**[0.001]**	**[0.037]**
Poland	**-0.012**	1.515	**0.019**	**-3.197**	2.39	**5.33**
	(-2.04)	(0.99)	**(3.21)**	**(-2.03)**	[0.095]	**[0.006]**
Romania	-0.026	1.989	**0.031**	-2.675	1.78	**3.06**
	(-1.75)	(1.20)	**(2.46)**	(-1.89)	[0.173]	**[0.050]**
Slovenia	-0.011	3.253	0.008	-3.343	1.31	2.10
	(-0.96)	(1.62)	(0.66)	(-1.61)	[0.273]	[0.126]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 20 beta-sorted portfolios with a 24-month estimation window for the calculation of the postformation betas. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

Table 19. Adjusted Coefficients for the 36-month 10-portfolio Specification.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009	**-1.4487**	0.0008	**1.5108**	**5.82**	N/A
	(-0.40)	**(-2.35)**	(0.36)	**(2.40)**	**[0.05]**	
Bulgaria	-0.011	-0.235	0.009	0.449	0.05	0.43
	(-0.92)	(-0.19)	(0.66)	(0.32)	[0.948]	[0.652]
Croatia	-0.013	1.068	**0.016**	-1.891	1.37	2.78
	(-1.95)	(0.87)	**(2.35)**	(-1.47)	[0.258]	[0.066]
Czech R.	-0.009	-1.451	0.003	0.689	1.42	1.88
	(-1.67)	(-1.60)	(0.52)	(0.78)	[0.246]	[0.157]
Estonia	-0.009	0.535	0.022	-1.529	0.77	**3.23**
	(-0.78)	(0.29)	(1.76)	(-0.79)	[0.464]	**[0.043]**
Hungary	-0.023	1.783	**0.022**	-1.927	0.86	2.02
	(-1.91)	(1.06)	**(2.01)**	(-1.26)	[0.426]	[0.138]
Latvia	**-0.020**	1.962	**0.032**	**-2.994**	**3.31**	**4.14**
	(-2.15)	(1.95)	**(2.79)**	**(-2.48)**	**[0.040]**	**[0.018]**
Lithuania	**-0.029**	**4.097**	**0.026**	**-4.357**	**4.52**	**6.13**
	(-3.31)	**(2.94)**	**(2.72)**	**(-2.98)**	**[0.013]**	**[0.003]**
Poland	**-0.021**	**3.792**	**0.020**	-3.403	2.32	**4.91**
	(-3.00)	**(2.12)**	**(2.97)**	(-1.93)	[0.103]	**[0.009]**
Romania	-0.026	2.800	**0.039**	**-4.218**	2.28	**3.18**
	(-1.52)	(1.32)	**(2.50)**	**(-2.12)**	[0.107]	**[0.045]**
Slovenia	-0.009	1.447	0.005	-1.585	-0.36	**3.19**
	(-0.94)	(0.83)	(0.46)	(-0.85)	[0.697]	**[0.045]**

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 10 beta-sorted portfolios with a 36-month estimation window for the calculation of the postformation betas. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.

Table 20. Adjusted Coefficients for the 12-month 10-portfolio Specification.

Country	g_0	g_1	h_0	h_1	$[g_1, h_1]'=0$	$[g_0, h_0]'=0$
The USA	-0.0009	**-1.4487**	0.0008	**1.5108**	**5.82**	N/A
	(-0.40)	**(-2.35)**	(0.36)	**(2.40)**	**[0.05]**	
Bulgaria	-0.006	-2.017	0.014	1.566	0.70	1.03
	(-0.35)	(-1.17)	(0.94)	(1.11)	[0.500]	[0.360]
Croatia	-0.009	0.709	0.011	-1.027	0.30	1.15
	(-1.34)	(0.50)	(1.52)	(-0.71)	[0.738]	[0.319]
Czech R.	-0.012	-2.101	0.006	1.479	0.97	1.26
	(-1.44)	(-1.39)	(0.92)	(1.18)	[0.380]	[0.286]
Estonia	-0.001	-0.482	0.012	-0.385	0.84	**3.89**
	(-0.11)	(-0.29)	(1.18)	(-0.22)	[0.431]	**[0.022]**
Hungary	**-0.026**	1.526	**0.018**	-1.386	0.75	2.72
	(-2.33)	(0.94)	**(2.17)**	(-1.17)	[0.473]	[0.069]
Latvia	-0.015	1.596	**0.034**	**-2.888**	2.70	**5.03**
	(-1.58)	(1.46)	**(3.16)**	**(-2.32)**	[0.070]	**[0.008]**
Lithuania	**-0.024**	**4.131**	**0.020**	**-4.169**	**6.65**	**5.42**
	(-3.28)	**(3.37)**	**(2.99)**	**(-3.61)**	**[0.002]**	**[0.005]**
Poland	-0.009	**3.156**	**0.013**	**-3.511**	**3.14**	**3.14**
	(-1.70)	**(2.18)**	**(2.37)**	**(-2.50)**	**[0.046]**	**[0.046]**
Romania	**-0.029**	2.007	0.024	-1.787	1.36	2.51
	(-2.16)	(1.53)	(1.95)	(-1.52)	[0.259]	[0.084]
Slovenia	-0.003	-0.389	0.001	0.114	0.38	0.28
	(-0.28)	(-0.26)	(0.13)	(0.08)	[0.684]	[0.758]

Compiled by the authors. The coefficients are obtained by adjusting the estimates from the time series regressions (10) and (11). Coefficient g_0 represents a part of the SML excess slope that is independent of inflation, while h_0 represents a part of the SML excess intercept in the same setting. Similarly, g_1 represents the effect of inflation on the SML slope, while h_1 captures the effect of inflation on the SML excess intercept. Money illusion predicts that inflation should have a positive effect on the excess slope of the SML and an inverse effect on the excess intercept. The table presents the results of the specification using 10 beta-sorted portfolios with a 12-month estimation window for the calculation of the postformation betas. Data for the USA are taken from the paper by Cohen et al. (2005). Bolded values indicate significance at the 5% level.