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ECONOMIC, FINANCIAL, AND FUNDAMENTAL GLOBAL RISK IN AND OUT OF THE EMU

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ABSTRACT

We explore the different factors that drive expected returns in world markets. Our research offers two innovations. First, the introduction of the Euro currency unit greatly reduces the complexity of including foreign exchange risk in asset pricing models. We use a synthetic Euro excess return along with a Yen excess return to assess country equity sensitivities to currency risk factors. Second, when combining the currency factors with a group of economic factors, we measure the incremental information in the factor proposed in Fama and French (1998). We find that a global price-to-book factor offers little additional explanatory power over and above a model that includes economic risk factors.

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1. Introduction

International asset pricing research has taken two directions. On one hand, sensitivities to economic variables are used in the framework of a traditional multibeta capital asset pricing model (CAPM) to explain both the time-series and cross-section of expected returns [see Ferson and Harvey (1993, 1994b)]. On the other hand, the fundamental characteristics approach of Fama and French (1992, 1993) and others, has been implemented in an international context [see Fama and French (1998)].

Ferson and Harvey (1998) argue that there is a link between the characteristics and the asset pricing model approaches. They hypothesize that the characteristics are likely proxying for dynamic risk functions. Ferson and Harvey offer evidence that variables, like price to book ratios, are important in explaining variation in betas.

This paper offers three insights that are relevant for asset allocation and risk analysis, in and out of the EMU. First, we implement a multiple beta international capital asset pricing model that is simplified by the introduction of the Euro. In standard specifications, like Adler and Dumas (1983), each currency unit enters the asset pricing equation. As a result, studies, such as Dumas (1994), Dumas and Solnik (1995) and De Santis, Gerard and Hillion (1998), are able to look at only a few countries at a time in conducting global asset pricing tests. We combine a synthetic Euro currency excess return with a Yen excess return to conduct asset pricing tests with two currency return factors. We present evidence that this three-factor model has advantages over a single factor CAPM, and that the Euro risk factor is an important explanatory variable.

Second, we use the model simplifications allowed by the Euro to test the incremental ability of a world price to book factor to explain the cross-sectional and time-series of expected returns. Fama and French (1998) find that the world price to book factor has the ability to explain the cross-section of average returns over and above the traditional beta from a single-factor CAPM. However, they do not test whether the price to book factor has incremental power to explain expected returns over and above a model with

additional economic factors. We find that there is little difference in explanatory power between a model using the Euro and other economic risk factors and one that includes a world price to book measure. This evidence suggests that the world price-to-book factor reflects risk that is also captured by world economic variables.

Third, we explore the sources of the explanatory power of the price to book factor. Following Ferson and Harvey (1998), we propose a model where the price to book factor is an instrument for time-varying economic risk. Griffin (1998) argues that the explanatory power of the Fama and French (1998) world price-to-book ratio is driven by domestic price-to-book ratios. We explore the relative information in both local price-to-book ratios and the world price-to-book factor. We find that, in a number of countries, there is incremental information in price to book factors, both local and world, that helps explain variation in beta.

Our paper is organized as follows. The second section details the asset pricing frameworks that we employ. The data are described in the third section. Our empirical results are presented in the fourth section and some concluding remarks are offered in the final section.

2. The asset pricing framework

2.1 The risk factors

Much of the debate about international asset pricing models concerns the specification of the relevant risk factors. We consider four groups of risk variables. The first is the world excess market return suggested by a world CAPM [Sharpe (1964) and Lintner (1965)]. Our second model adds two currency excess returns, the Euro and the Yen. This three factor model is designed to capture the theoretical framework presented in Adler and Dumas (1983) and implemented in Dumas and Solnik (1995). With the advent of the Euro, the number of currency risk factors is reduced and the model is simplified. The currency excess returns are the change in the currency value in U.S. dollar terms, plus the

foreign deposit rate minus the U.S. Treasury bill rate. The Euro is constructed with weights that represent the 1996 GDPs weight of the member countries, as described in section 3 and the Appendix B.

Our third set of factors is motivated by the price-to-book issue. This is the observation that stocks with low price-to-book ratios have earned higher returns than stocks with high ratios. A large number of US studies have tried to explain the result since Fama and French (1992) drew wide attention to it. Fama and French (1993, 1996) claim that price-to-book represents exposure to a risk factor. Lakonishok et al. (1994) claim it represents systematic pricing errors by the markets, and therefore potential profit opportunities for investors. Other suggest that the price-to-book effect is a chance or spurious relation that was mined from the data. However, out-of-sample evidence in the US [e.g. Davis (1994), Davis, Fama and French (1998)] and evidence for markets outside the US [e.g. Chan, et al. (1991), Capaul, Rowley and Sharpe (1993), Arshanapalli, Coggin and Doukas (1998), and Fama and French (1998)], reduces the likelihood of pure data mining.

The appropriate role of price-to-book in an international asset pricing model is not well understood. Fama and French (1998) find that it has explanatory power as a risk factor, relative to a CAPM that includes only the world market portfolio and assumes constant betas. Griffin (1998) argues that the factor used by Fama and French adds explanatory power only through the local country book-to-market effects. Ferson and Harvey (1998) show that local book-to-market factors contain information about time-varying exposures to a world market risk factor.

The advent of the Euro simplifies the currency risk factors in international asset pricing models. Using the simpler models we can explore the role of both local-country and global price-to-book factors in asset-pricing models that account for currency risks. The global price-to-book factor is an excess return of low price-to-book stocks over high price-to-book stocks, similar to Fama and French (1998), as described in Section 3. We also study the aggregate price-to-book ratios for the stock markets of the individual countries as potential instruments for time-varying risk exposures.

The final group of risk factors is the set of global factors studied in Ferson and Harvey (1993, 1994). These include the weighted unexpected inflation in the G-7 countries, the change in weighted expected long-term inflation in the G-7 countries, the change in the Eurodollar-Treasury yield spread, the weighted real interest rate in the G-7 countries, the change in the oil price, and the change in G-7 industrial production. Each weighted variable uses the GDP weights for the G-7 countries.

2.2 The unconditional framework

We conduct two exercises. First, we estimate linear factor models that examine the explanatory power of the different groups of factors.

$$r_{i,t} = b_{i,0} + b_{i,1} f_{1,t} + ... + b_{i,k} f_{k,t} + e_{i,t} \quad (1)$$

Where $r_{i,t}$ represents the excess returns on country i's equity market, $f_{i,t}$ are the world risk factors, and $e_{i,t}$ are the errors. Country stock returns are measured in a common currency, the U.S. dollar, and are net of a one-month Treasury bill return. We do not study bond returns. The b_i are the country risk exposures, or betas, on the factors. The unconditional framework assumes that the betas are fixed parameters over time. We examine both the explanatory power of different groups of factors and the significance level of each factor across the countries in our sample.

Next we test global asset pricing models. A global asset pricing model using a set of risk factors, $\{f_1, ,,, f_k\}$, asserts that the expected excess returns of the countries differ only as a function of their betas on those factors, $\{b_{i1},...,b_{ik}\}$. Associated with each beta is a global risk premium, the increment to the expected return per unit beta. In an unconditional model the risk premiums, like the betas, are assumed to be fixed parameters over time. Following the framework of Ferson and Harvey (1994a), we report estimates of the unconditional betas and the unconditional risk premiums associated with each factor.

2.3 Price-to-book and conditional models

The assumption that risk exposures and risk premiums are constant parameters over time is likely to be restrictive. This motivates a *conditional model*, in which they are time varying. Many studies have found that conditional models provide a more accurate representation of expected returns in both domestic and international markets [see, for example, the review article by Ferson (1995)]. In a conditional model the betas and expected risk premiums are conditional moments, based on information that is available when prices are set at the beginning of the period, say at time t-1, before the securities' returns are realized at time t. The price-to-book ratio, using prices at time t-1 and previous book values, is available information at the beginning of each month. We are interested, in particular, in the role of the price-to-book ratio in an asset pricing model that includes the Euro as a currency risk factor. We consider price to book value both as a potential risk factor and as an instrument for risk. First, we consider the incremental power of adding a world price to book factor in the linear factor model. Second, we test whether price to book significantly impacts the time-variation in conditional betas.

The conditional beta model follows Ferson (1989) and Shanken (1990). We estimate a linear factor model with interaction terms. The one factor version is

$$r_{i,t} = b_{i,0} + (b_{i,0} + b_{i,1} Z_{i,t-1}) f_{1,t} + e_{i,t} \qquad (2)$$

where $Z_{i,t-1}$ represents conditioning information that is available at time *t-1*. In our application, the conditioning information is either the world price to book ratio or the country specific (local) price to book ratio. The conditional beta is

$$b_{i,1,t} = b_{i,0} + b_{i,1} Z_{i,t-1} \qquad (3)$$

We test whether there is significant variation in the betas that is related to the price to book value ratios, by checking for significant $b_{i,1}$ coefficients. As explained by Ferson

and Harvey (1998), the conditional model allows for time-varying factor risk premiums, but it does not restrict their functional form.

2.4 Testing conditional models

Preliminary regression diagnostics help determine the specification of the conditional models; that is, the choice of factors and lagged instruments, Z_{t-1}. We then move on to examine the empirical performance of the models. An asset pricing model should explain differences in the average returns across countries. In addition, a conditional model should explain any predictability in the returns using the lagged instruments. Ferson and Harvey (1999) find that predictability using lagged instruments provides a powerful challenge for US models based on the Fama-French (1993) factors, which include the market and a price-to-book factor. Our tests are designed to address both average returns and the predictability in returns. The details of the econometric methods are in appendix A.

To assess the ability of a model to explain differences in the average returns we introduce an average pricing error parameter, a, into the model for each country. The alpha is the difference between the average return for a country and the average return predicted by the model, using the country's betas and the global risk premiums.

To assess the ability of a model to explain the predictability in the returns we form a ratio, VR1, for each country. This measures the fraction of the predictable variance that a model explains. The numerator of the ratio is the variance of the time-varying expected return predicted by the model, using the time-varying country betas and global risk premiums. The denominator is the variance of the predictable part of the return, obtained without reference to an asset pricing model, by simply regressing the return on the lagged instruments. If the ratio is one, it implies that the model can explain all of the variation in the statistically predicted expected returns. If the ratio is zero, none of the predictability can be explained.

We estimate the models with a number of different combinations of the world risk factors. Our goal is to determine how much the currency, price to book, and economic

factors add to the explanatory power of a simple world CAPM. In addition, we are particularly interested in how the price to book ratio should enter the asset pricing model. We conduct experiments using both world and local price to book ratios to determine whether these ratios explain variation in the conditional betas.

3. Data

We study equity returns for 18 developed markets from January 1975 through December 1997 from Morgan Stanley Capital International (MSCI). All returns are measured in U.S. dollars and are calculated in excess of the 30-day U.S. Treasury bill rate from Ibbotson Associates.

3.1 Specification of Risk Factors

Our measure of the world risk factor is the MSCI world market excess return. The Euro risk factor is constructed back in time using the countries that will be included on January 1, 1999. We use the 1996 GDP weights that Datastream has used to synthetically create a historical Euro series. In addition to the currency change we add a weighted Eurocurrency return (same weights as Euro construction). Finally, we make this an excess return by subtracting the U.S. 30-day Treasury bill rate. The excess Yen return is similarly constructed. The Euroyen return is added to the currency change minus the short-term U.S. bill return. (See Appendix B for more details.)

Our price-to-book factor is the high minus low (HML) portfolio studied by Fama and French (1998). This variable is from Fama and French (1998) for the 1975-1989 period and updated through 1997 using Morgan Stanley Capital International data. In each country, both high price to book and low price to book portfolios are constructed. Using each market's total capitalizations, a value-weighted world price to book hedge return is constructed. This is the return of the value-weighted portfolio of low price-to-book (high book-to-market) stocks minus the return of the portfolio of high price-to-book (low book-

to-market) stocks. The price-to-book factor may be related to the firm size effect [e.g. Hawawini and Keim (1997)]. However, the stocks included in the MSCI database are primarily the large firms. For this reason, we do not study firm size separately.
Finally, we consider a number of macroeconomic risk factors that were studied in Ferson and Harvey (1993, 1994). These factors include the change in the Eurodollar Treasury yield spread, unexpected G-7 inflation, change in long-term expected G-7 inflation, change in the price of oil, change in G-7 industrial production and the G-7 real interest rate. These variables are described in Appendix B.

3.2 Specification of the Instrumental Variables

We follow Ferson and Harvey (1993) and consider two types of instrumental variables, global and local. The global instrumental variables include the lagged world dividend yield, the lagged Treasury-Eurodollar spread, the lagged G-7 weighted term structure of interest rates (long-short spread), and the lagged G-7 short-term interest rate. We also include a lagged world price to book value ratio. The lagged price-to-book is used as an instrument for time-series variation in U.S. equity returns by Kothari and Shanken (1997) and Pontiff and Schall (1998). Its usefulness in a global asset pricing model context has not been widely studied. Ferson and Harvey (1998) is one exception. They study local country price-to-book ratios, not a world price-to-book ratio.

We also consider a set of local instruments that mirror the world instruments. These include: the lagged local dividend yield, the lagged local term structure, the lagged local short term interest rate and the lagged local price to book ratio.

4. Results

4.1 Summary statistics

The summary statistics are presented in Table 1. The world risk factors that are returns are reported in monthly percentage terms. Notice that the world price to book excess

return has a slightly lower mean than the world market return - but the standard deviation is almost half that of the world market return. Other notable features include the persistence, as reflected in the autocorrelations, of the change in long-term expected inflation and the G-7 real interest rate. Interestingly, there are no remarkable correlations between any of the world risk factors. The highest cross-correlation is the -61% correlation between the change in G-7 unexpected inflation and the G-7 real interest rate.

Persistence is also evident in the instrumental variables. Notice that four of the five world instrumental variables have autocorrelation coefficients greater than 0.9. The autocorrelation patterns of the world price to book ratio and the world dividend yield are very similar. Ferson et al. (1999) provide an analysis of spurious regression bias when highly persistent instruments are used. The similarity of these is also evident in the cross-correlation analysis. The world price to book ratio and the world dividend yield have a -95% correlation, indicating that there is limited information in the price to book ratio over and above the dividend yield.

4.2 Linear factor models

Table 2 presents estimates of regressions of each asset's excess return on all of the world risk factors. Interestingly, only one of the 18 intercepts is significantly different from zero (not more than one would expect by chance) and this lone intercept, for Spain, is only two standard errors from zero. When the factors are excess returns the intercepts are the alphas, which measure the average mispricing. Thus, the regressions suggest that the world risk factors we have chosen should be sufficient to capture the cross-section of average returns.

In this unconditional analysis, the world market return is by far the most important risk factor. The beta on the world market is significant in 17 of 18 countries, with the exception being Austria. There are two other risk factors that are often significant: the Euro excess return (12 of 18 countries) and the world price to book excess return (10 of 18 countries). The yen excess return is significant for five countries (Canada, France,

Japan, Norway and the United States). Only a few of the macroeconomic variables produce significant coefficients. The change in the price of oil is significant in four countries. The change in the Eurodollar-Treasury spread is significant in two countries.

The R^2s reported in the far column suggest that most of the explanatory power is driven by the world market factor. The currency factors add explanatory power in all but one country and sizable explanatory power in a number of countries. Interestingly, neither the world price to book excess return nor the macroeconomic variables add a lot of explanatory power to these regressions. This is also evident from Figure 1.

The unconditional asset pricing tests are presented in Table 3. Three models are presented: the world CAPM, a world CAPM with two currency factors, and a seven factor model that nests the CAPM with two currency factors and adds the world price to book excess return as well as the three most important economic factors.

None of these models is rejected at standard significance levels. By far, the dominant risk premium is the world market return. The currency excess returns enter with positive coefficients but are not significant at traditional levels (the yen excess return is more than one standard error from zero and the Euro excess return is less than one standard error from zero). In the extended model, the world price to book return enters with a positive coefficient that is slightly greater than one standard error from zero. The real G-7 short term interest rate is close to two standard errors from zero. The insignificant risk premiums in the unconditional models is similar to previous studies, and suggests a lack of statistical power in these models [see Ferson and Harvey (1994a) for discussion].

To augment the unconditional asset pricing tests, we report the average pricing errors and and the standard deviations of these errors. These average error decreases for 12 of 18 countries when one moves from a one factor model to a three factor model. The errors are further reduced in all but two countries when the seven factor model is considered.

One weakness of this analysis is that the coefficients are held constant over the 1975-1997 period. This is partially addressed by repeating the regression analysis using 60-month rolling regression estimates. We test whether the beta coefficients are individually equal to zero and whether the beta coefficients taken jointly *across countries* are equal to zero. In both of these cases, it is unlikely that the risk factor will be useful in explaining the cross-sectional variation in asset returns. These tests confirm that the two most important factors are the world market return and the Euro excess return. The yen excess return is the third most important, closely followed by the world price to book excess return. Of the economic variables, the most significant are: the change in the price of oil, the change in the G-7 unexpected inflation and the G-7 real short-term interest rate.

4.3 Time-varying risk

Table 4 examines a model that allows, in a simple way, for risk to shift through time. The rolling estimates of the betas for the three factor model are presented in Figure 2. These figures also highlight five important dates for our analysis:

- 1986 Single European Act
- July 1990, Stage one of EMU begins
- February 1992, Ratification of Maastricht
- January 1993, Establishment of the Single Market
- January 1994, Creation of the European Monetary Institute (forerunner of the European Central Bank)
- May 1998, Announcement of participating countries and target fixed rates specified.

Of course, another important date for our analysis is January 1999 when the irrevocable fixed rates take effect, the Euro begins. However, this date lies outside of our sample period.[1] Surprisingly, the figures present no evidence that any of these events are associated with shifts in the structure of equity markets' systematic risks.

[1] Another relevant date is January 2002 when Euro notes and coins are introduced.

While Figure 2 presents no evidence that any of the discrete events associated with EMU cause jumps in the risk exposures, the time-series plots do suggest some patterns. The betas on the Euro risk factor falls for all of the EMU countries (except Spain) from near unity in the early 1990s, to near zero at the end of the sample in 1998. For the European countries that have remained outside the EMU there is little systematic change, and the Euro betas remain sizeable in some cases (e.g. Sweden and Norway in 1998, the beta is about 0.5). These patterns suggest that anticipation of the EMU and its membership has influenced equity risks in European markets. For countries outside of Europe, such as the US and Canada, the Euro beta is close to zero for much of the period.

Table 5 explores the variation in betas more formally. In particular, we investigate the role of the price to book ratios as instruments for the time-varying betas. We use three different definitions of price to book. The first is the world price to book excess return (which we also use as a risk factor in the seven-factor model). The second is the world price to book ratio. As mentioned earlier, this is a highly persistent measure and has some similarity to dividend yields. The final version is the local price to book ratio. All three of these measures are lagged.

The first panel of Table 5 examines the world price to book return. We assume that each of the conditional betas in the three-factor model is a linear function of the lagged price-to-book factor's excess return. In the far right columns, we report the adjusted R^2s of these regressions along with the R^2 from Table 2 for the three-factor model. The increments to the R^2s may be evaluated, as in a step-down F test, for the significance of the additional variables. Since the power of the test may vary with the number of factors, we compare the alternative specifications for price-to-book using the three-factor model. The world price-to-book return contributes little to the explanatory power of the factor model. In only four countries do the adjusted R^2s increase. Even the magnitudes of the increases are very small. For example, Hong Kong increases from 0.235 to 0.244.

The second panel examines the world price to book ratio. This ratio may have some advantages as an instrumental variable for risk, because a ratio of market price to the

magnitude of earnings potential is related to risk in most [e.g. Berk (1995)]. It is analogous to using a yield to maturity as an instrumental variable rather than a bond return. Indeed, using the world price-to-book ratio as an instrument for time-varying betas increases the explanatory power of all the country factor regressions except for Norway.

The third panel examines the importance of the local price to book ratio. Compared to the constant beta regression, explanatory power increases in 13 of 18 countries. Compared to the world price to book ratio, the local version produces a smaller improvement in the explanatory power for 13 of 18 countries. We conclude that a lagged price-to-book factor may be a good instrument for time-varying, systematic risk. Of the three specifications, the lagged world price-to-book ratio appears the most promising, but this result varies across countries.

4.4 Predictability

Regressions of the asset returns over time on the instrumental variables are presented in Table 6. The explanatory power ranges from less than one percent (Austria, Denmark, France, Hong Kong and Sweden) to more than nine percent (Singapore). In general, the degree of predictability is less than reported in Ferson and Harvey (1993). This is likely explained by the different sample. Their sample began in 1970 and ended in 1989. It is also the case that we use a slightly different instrument set. We do not include a dummy variable for January. In addition, we replace the lagged world return in their study with the lagged world price to book ratio.

Table 7 examines the incremental information contained in the local instrumental variables as well as the role of the price to book variable in the regressions. The first two columns show the impact of including the world price to book variable in the prediction regression. There is no country where the adjusted R^2 decreases when the world price to book ratio is added. However, the improvement in explanatory power is minor. The

average adjusted R^2 increases from 0.032 to 0.035. The weak additional explanatory power is also reflected in the F-test reported in the final column of Table 7.

The third and fourth columns investigate the role of the local price to book ratio in the predictability regressions. In each country, the explanatory power of the regressions increases. However, in contrast to the world price to book ratio, the change in R^2 is more substantial. The R^2 increases from 0.026 to 0.035. This is also evident in the F-tests where we are able to reject the null hypothesis that the coefficient on the local price to book ratio is zero in 10 countries at the 5% level of significance.

4.5 Conditional asset pricing models

A number of different asset pricing specification are examined in Table 8: the one factor world CAPM (panel A), a three-factor model with the world return plus the two currency factors (panel B), a two factor model (world return plus price to book return), a four factor model (three factors plus the world price to book return), a six factor model (three factor model plus three macroeconomic, factor mimicking portfolios) and a seven factor model (six factor model plus the world price to book return).

The first panel, the world CAPM, presents more detail than the other panels. In particular, we conduct tests on the specification of the conditional beta functions. We examine a beta that is a function of local information, the local information plus the world price to book return and the local information plus the local price to book ratio. χ^2 tests of whether the coefficients on the non-constant part of the beta function are zero are presented. In addition, we present the analysis of variance ratios (how much of the predictability is accounted for by the asset pricing model) and average pricing errors.

With respect to the conditional beta function, the evidence in panel A supports the first specification with the “local information”. The addition of the world price to book return increases the variance ratio in only two of 18 countries. The specification that adds the local price to book ratio increases the explanatory power in only four of 18 countries.

Now consider the one factor model versus the three factor model. The variance ratios dramatically increase with the three factor model. The average variance ratio for the world CAPM is 0.506 and it increases to 0.822 with the addition of the two currency factors. The variance ratio increases in each of the 18 countries which is evident in Figure 3.

The next columns show the impact of the world book to market return as an additional factor in the world CAPM. The variance ratios increase from 0.506 with the one factor model to 0.598 when the world price to book return is added as an additional factor. The marginal explanatory power is small compared to the increase associated with the currency factors.

The next question is whether the information in the world price to book return is subsumed by the two currency risk factors. When a four factor model is estimated, the average variance ratio increases to 0.895 from the three factor base case of 0.822. Hence, the incremental information in the world price to book return is small. Given the standard errors, the difference is not significant.

Our final tests ask how well the macroeconomic risk factors fare. Including these factors, the average variance ratio is 0.913 compared to 0.822 for the three-factor model. Again, we can test whether the information in the world price to book return is accounted for by the economic factors. When the world price to book return is added to the specification, the variance ratio increases to 0.938 (compared to 0.913). While the variance ratios increase in all but one country, the increment (0.025) is economically small. This suggests that most of the information in the world price to book return is being captured by other economic variables.

The conditional tests show that most of the explanatory power is driven by the world market return and the two currency factors. The extra information in the world price to book return and other economic factors is small. The analysis of average pricing errors in

Table 3 and Figure 4 also supports this analysis. The pricing errors decrease moving from one to three factors. The incremental reduction in pricing errors when going to additional factors is limited.

5. Conclusions

We study the global forces that determine both the cross-section and time-series of average returns as well as the predictability in returns. We assess the importance of two world currency factors, a Euro and a yen-based factor, relative to a simple CAPM. We also study a model that includes a world price to book return and a model that includes additional world economic risk factors. With the advent of the Euro, currency risk modeling is simplified. This allows us, for the first time, to explore the role of book-to-market in a model that accounts for currency risks in and out of the EMU.

Our results suggest that most of the improvement over the CAPM comes from the model that includes the world market portfolio and the two currency excess returns. After the world market factor, the Euro currency risk factor is the next most important source of global risk in the world equity markets. While the price to book return offers some incremental explanatory power, our results suggest that the information in the world price to book return is mostly captured by world economic risk variables.

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Appendix A: Econometric methods

A. Unconditional Models

We estimate the unconditional asset pricing models by the Generalized Method of Moments [GMM, see Hansen (1982)]. This allows for nonnormality and conditional heteroskedasticity, both likely features of the country stock return data. The unconditional models follow the econometric framework set out in Ferson and Harvey (1994a). There are two formulations. One is used when the risk factors are excess returns on traded assets. The second is used when the factors are macroeconomic variables.

When the world risk factors are excess returns, we estimate a system of equations, each representing a country. For example, with the world CAPM, we estimate with the generalized method of moments the following:

$$u_{i,t} = r_{i,t} - b_i r_{m,t} \tag{A.1}$$

where $u_{i,t}$ is a disturbance term. When the factors are not traded assets, we estimate

$$u_{i,t} = r_{i,t} - b_{1,i} r_{m,t} - b_{2,i}(f_{j,t} + l_j) \tag{A.2}$$

where $f_{j,t}$ is the demeaned value of the factor and λ_j is the risk premium associated with the factor. We report estimates of the unconditional risk exposures, the unconditional risk premiums associated with each factor as well as a test of the overidentifying conditions. The regression models are overidentified because the intercepts, or alphas, are restricted to be zero according to the asset pricing models.

B. Conditional Models

Our conditional asset pricing tests focus on the following system. For simplicity, we present the one-factor version of the set of equations:

$$
\begin{aligned}
u_{1,t} &= r_t - a - (b_0 + b_1 Z_{t-1}) r_{m,t} \\
u_{2,t} &= (b_0 + b_1 Z_{t-1}) r_{m,t} - d' Z_{t-1} \\
u_{3,t} &= r_t - d_r Z_{t-1} \\
u_{4,t} &= d_r Z_{t-1} - c_0 - c_1 d' Z_{t-1} \\
u_{5,t} &= r_t - m \\
u_{6,t} &= s_u^2 - u_{4,t}^2 \\
u_{7,t} &= s_r^2 - (d_r Z_{t-1} - m)^2
\end{aligned}
\qquad \text{(A3)}
$$

The system is estimated by the GMM. The first equation defines the linear factor model with time-varying betas. We make $u_{1,t}$ orthogonal to a vector of ones, Z_{t-1} and $r_{m,t}$. The second equation defines the asset pricing model's expected return. We impose that $u_{2,t}$ is orthogonal to Z_{t-1} which includes a vector of ones. The third equation tells us the statistically expected returns by regressing the asset returns on the information variables. We impose that $u_{3,t}$ is orthogonal to Z_{t-1}. The fourth equation measures the relation between the statistically fitted returns and the expected returns from the asset pricing restrictions. We impose that $u_{4,t}$ is orthogonal to the fitted values from the asset pricing model and a constant. The fifth equation simply measures the unconditional mean return. The disturbance is orthogonal to a vector of ones. The sixth equation defines the variance of the part of the statistical expected returns that cannot be explained by the model. This disturbance, $u_{6,t}$, is also orthogonal to a vector of ones. Finally, the last equation defines the variance of the statistical model predictions. As with the previous equation, this disturbance, $u_{6,t}$, is also orthogonal to a vector of ones. Interestingly, each of these

equations is exactly identified. Hence, we can estimate this system of equations sequentially.

We are interested in the variance ratio:

$$VR1 = 1 - \frac{\sigma_u^2}{\sigma_r^2} \tag{A4}$$

This tells us what fraction of the variance in the statistical expected returns the model expected returns are explaining. We calculate a standard error for the variance ratio using the delta method. Ratios similar to VR1 are presented in Ferson and Harvey (1993). Our formulation insures that $0 \leq VR1 \leq 1$. Ferson and Harvey found estimates of $VR1 > 1$, which are difficult to interpret.

Appendix B: Data sources

A. WORLD RISK FACTORS:

WDRET is the arithmetic return on the MSCI world equity index less the Ibbotson Associates one-month US Treasury bill rate.

dTED is the difference between the 90-day Euro dollar yield (from Federal Reserve Bank of St. Louis, FRED) and the 90-day T-bill yield (from FRED, secondary market, converted from discount to true yield to maturity)

Euroret is the Euro currency excess return based on the synthetic Euro to US$ exchange rate created by Datastream. Documentation for the construction of their synthetic Euro is available on-line at www.datastream.com. The synthetic Euro/US exchange rate is constructed as follows: The EMU-in national currencies are weighted by 1996 national GDP levels, and then expressed in Deutschmark terms using the bilateral rates set by the EU (implicitly taken as the best approximation to the fixed bilateral rates that will prevail on December 31, 1998). The individual components are each converted to Deutschmarks at current exchange rates using the Reuters Closing Spot Rates. Finally, by multiplying the series by the fixed Deutschmark/Euro rate, we have a Deutschemark/Euro exchange rate that reflects both the changing relative strengths of the EMU-in countries over time and the presumed fixed local to Euro bilateral rates. By converting the series using the appropriate US/Deutschmark rate, also taken from Reuters, we have a synthetic Euro/US rate. To construct a currency return, we take the change in the US/Euro exchange rate, and add it to an appropriately (as above) weighted average of the EMU-in countries' local one-month rates, and then convert it to an excess return by the subtracting the one-month Ibbotson and Associates US Treasury bill rate. The one-month local rates used in the construction of the appropriately weighted "Euro" interest rate are as follows: Austria Treasury bill (IFS 60C), Belgium Treasury bill (IFS 60C) 1975-1981 and Datastream London Euro-currency 1981-1997, Finland Treasury bill 1975-1987 and HELIBOR rate (1987-1997), France Lombard Odier & Cie 1975-1979 and Datastream London Euro-currency 1980-1997, Germany France Lombard Odier & Cie 1975-1979 and Datastream London Euro-currency 1980-1997, Ireland Treasury bill (IFS 60C) 1975-1979 and Datastream London Euro-currency 1980-1997, Italy Treasury bill (IFS 60C) 1975-1992) and Datastream London Euro-currency 1992-1997, Netherlands Lombard Odier & Cie 1975-1979 and Datastream London Euro-currency 1980-1997, Portugal Treasury bill (IFS 60C) 1975-1992 and Datastream London Euro-currency 1992-1997, Spain Treasury bill (IFS 60C).

Yenret is the currency return based on the Yen/US exchange rate from Reuters. As above, the change in the US/Yen exchange rate is added to the one-month Euro-yen interest rate (Lombard Odier & Cie 1975-1979 and Datastream London Euro-currency 1980-1997), and then converted to an excess return by the subtracting the one-month Ibbotson and Associates US Treasury bill rate.

dG7UI is derived from a time-series model applied to the log difference of the G-7 weighted CPI's. The time-series model is a VAR on the G-7 weighted CPI's, the G7 weighted real bill rates (G7RTB), and the log change in the G-7 weighted industrial production index (dG7IP, specified below) The residuals from the first equation in this estimation structure are taken as unanticipated inflation (dG7UI). From OECD.

dG7ELT is the result of projecting the four-year moving average of the G-7 inflation on the lagged global information variables specified below.

G7RTB is calculated by aggregating individual countries' short-term interest rates (same as those in

country-specific information variables-- weighted by using countries' previous quarters share in G-7 GDP, then subtract the G-7 inflation rate to get a real rate). The following interest rates are employed: Canada 90-day Treasury bill (IFS 60C), France 90-day bill (IFS 60C), Germany 90-day bill (IFS 60C), Italy 180-day bill (IFS 60B), Japan commercial paper from 1975-1976 (IFS 60B) and the Gensaki rate from 1977-1997 (IFS GBD3M), United Kingdom 90-day bill (IFS 60C), and the United States 90-day bill (IFS 60C).

dOil is the log change in the price (US$) per barrel at the well head, from Datastream.

dG7IP is the log difference in the G-7 aggregate industrial production index. From OECD.

WRPBRET is the return from a portfolio long in the first fractile (low b/m assets) and short in the third fractile (high b/m assets) from Fama for the period 1975-90 and updated using FACTSET for the period 1990-97.

B. GLOBAL INSTRUMENTS:

LTED is the lagged spread between the Eurodollar and Treasury yield used in the construction of dTED above.

LTERM is the lagged spread (slope of the term structure) between the US 10-year Treasury bond yield and the 90-day-bill yield. From FRED.

TB1 is the US Treasury bill one-month yield. This variable is not lagged, because the nominal one-month yield is known at the end of the previous month.

LWRDIVY is the lagged dividend yield on the MSCI world index. The numerator is a 12-month moving sum of the dividends, and the denominator is the current index level.

LWRPB is the lagged price to book ratio on the MSCI world index.

LDELTB3 is the lagged difference between the three-month T-bill rate. From FRED.

C. LOCAL INSTRUMENTS (country specific):

LDIVY is the lagged local MSCI dividend yield. The numerator is a 12-month moving sum of the dividends, and the denominator is the current index level.

LSHORT is the lagged local short interest rate. The short-term interest rates for the various countries are listed together with their series codes from IFS. These are as follows: Australia 13-week T-bill (IFS 60C), Austria money market rate (IFS 60B), Belgium 3-month bill (IFS 60C), Canada 3-month bill (IFS 60C), Denmark call money rate (IFS 60B), France 3-month interbank (IFS 60B), Germany Frankfurt 90-day rate (IFS 60B), Hong Kong, no data, US 3-month bill used, Italy 6-month bill (IFS 60C), Japan commercial paper from 1975-1976 (IFS 60B) and the Gensaki rate from 1977-1997 (IFS GBD3M), Netherlands call money rate 1975-1978 (IFS 60B) and 3-month bill 1978-1997 (IFS 60C), Norway call money rate (IFS 60B), Singapore, no data, US 3-month bill used, Spain call money rate (IFS 60B), Sweden 3-month bill (IFS 60C), Switzerland call money rate (IFS 60B), United Kingdom 3-month bill (IFS 60C), United States 3-month bill (IFS 60C).

LTERMLOC is the lagged local term premium: the difference between the long-term interest rates and the above short-term interest rates. These are as follows: Australia 15-year Treasury bond (IFS 61), Austria government bond (IFS 61), Belgium government bond (IFS 61), Canada government bond (IFS 61), Denmark government bond (IFS 61), France government bond (IFS 61), Germany government bond (IFS

61), Hong Kong, no data, US Treasury bond used, Italy government bond (IFS 61), Japan government bond (IFS 61), Netherlands government bond (IFS 61), Norway call money rate (IFS 61), Singapore, no data, US Treasury bond used, Spain government bond (IFS 61), Sweden government bond (IFS 61), Switzerland government bond (IFS 60B), United Kingdom government bond (IFS 61), United States Treasury bond (IFS 61).

D. Euro construction

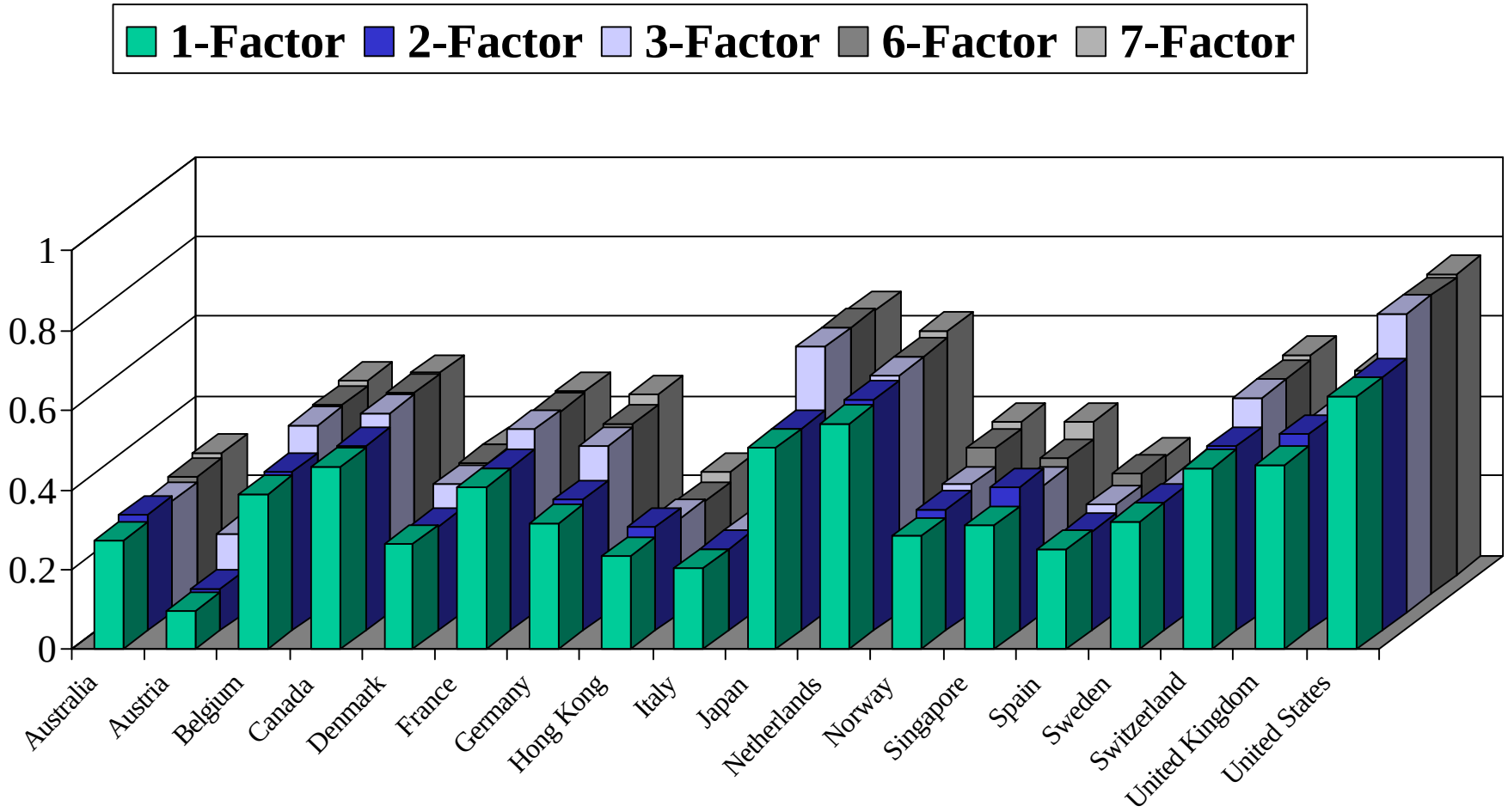
DATASTREAM uses the following formula is for the Euro.

DM/Euro = (.03139*7.03552*DM/AUSTSCH + .03866*20.6255*DM/BELGLUX +
.02339*3.04001*DM/FINMARK + .22064*3.35386*DM/FRENFRA +
.01132*.0402676*DM/IPUNTER+.20039*990.002*DM/ITALIRE +
.05596*1.12674*DM/GUILDER + .01255*102.505*DM/PORTESC +
.09257*85.07722*DM/SPANPES + .31315)*1.97738

For each currency item, the first figure is the 1996 GDP EMU-in country weighting (percentage of GDP to total EMU-in GDP), i.e. .03139 is the GDP weighting of Austria, .22064 is the weighting of France, and .31315 is the weighting of Germany. The second factor is the fixed exchange rate to 1 Deutschemark, i.e 7.03552 Austrian schillings and 3.35386 French francs. This formula gives DM to one Euro. It is important to understand how they do this. They take the exchange rates for each of these countries to the ECU for May 4, 1998 (instead of Jan 1, 1999), imagining that the monetary union took place on that day with those rates as the official/announced rates. These fixed cross rates, the second weighting factor above, are computed from the currency to ECU for May 4, for example the DM to EURO is 1.99738 and the AUSTSCH to EURO is 13.9119, so the imagined 'fixed' cross rate is the 7.03552 used above. The idea is that since one ECU will become one EURO on Jan 1, 1999, those rates are the best guess as to what the official conversion rates will be. Finally, the rates such as DM/AUSTSCH are the actual historical exchange rates between these two countries for the time period of interest.

Figure 1

Proportion of Unconditional Variation Explained by Linear Factor Models



R^2 from linear factor model regressions. 1-Factor is the world market return. 2-Factor is the world market plus the world price to book return. 3-Factor is the world market return plus two currency excess returns. 4-Factor is the three factor plus the world price to book return.

Figure 2

Australia

January 1975 to June 1998

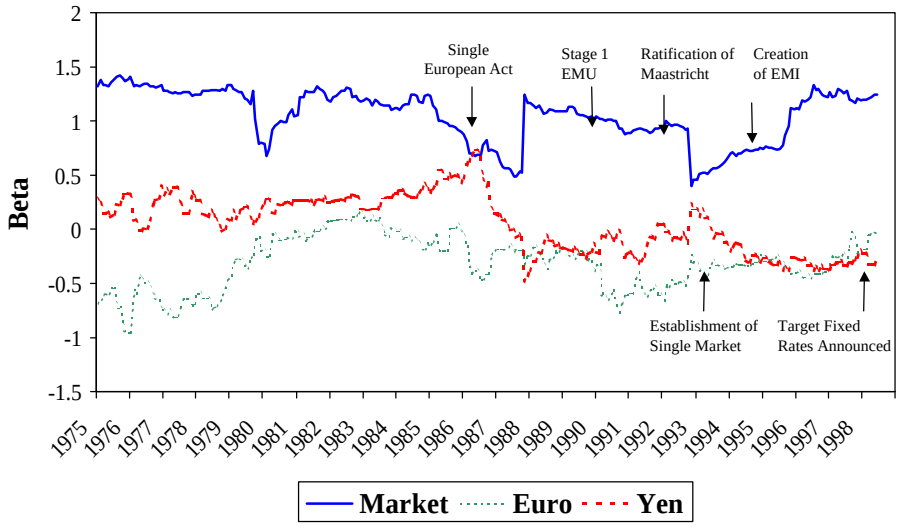


Figure 2

Austria

January 1975 to June 1998

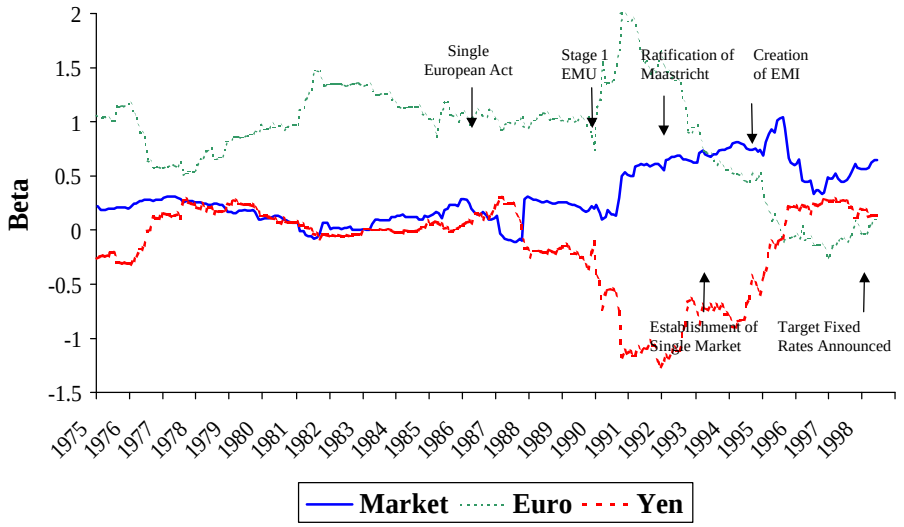


Figure 2

Belgium

January 1975 to June 1998

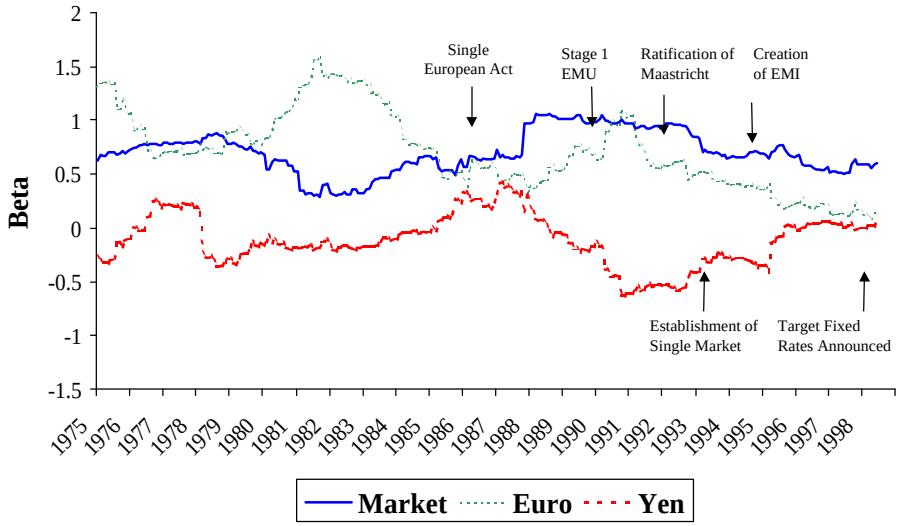


Figure 2

Canada

January 1975 to June 1998

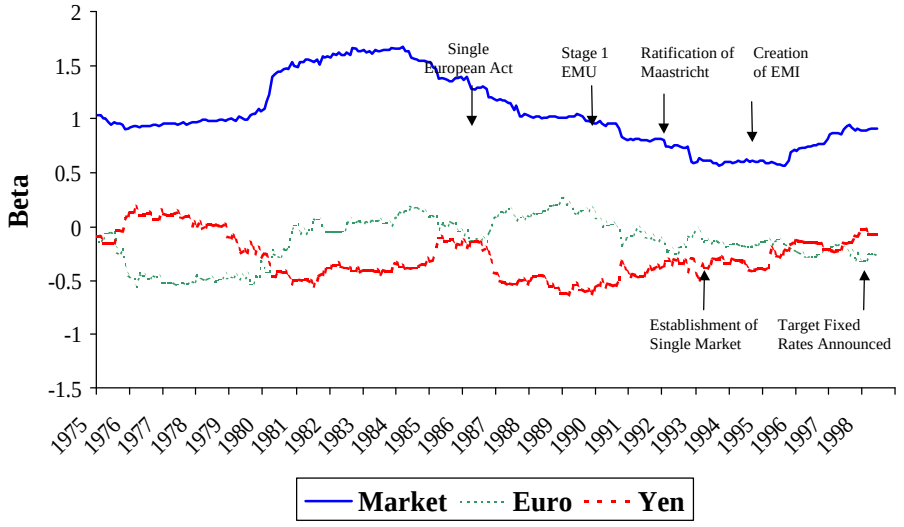


Figure 2

Denmark

January 1975 to June 1998

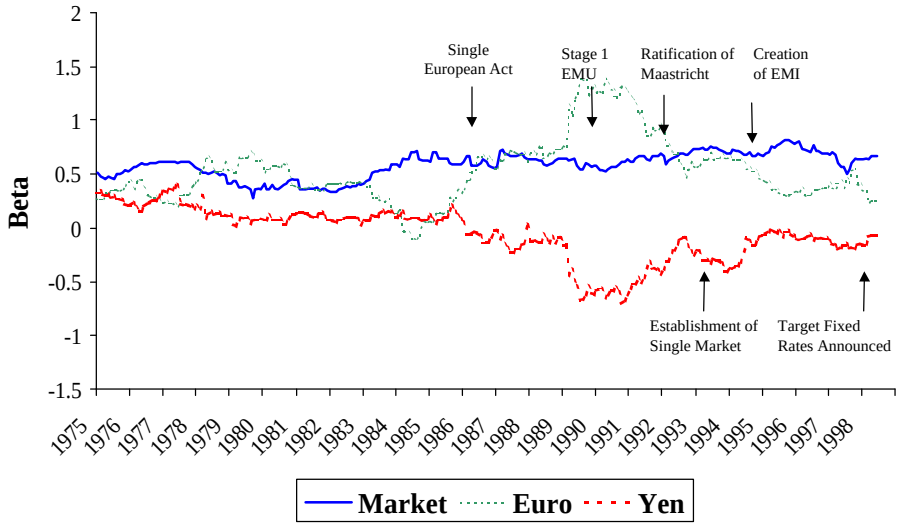


Figure 2

France

January 1975 to June 1998

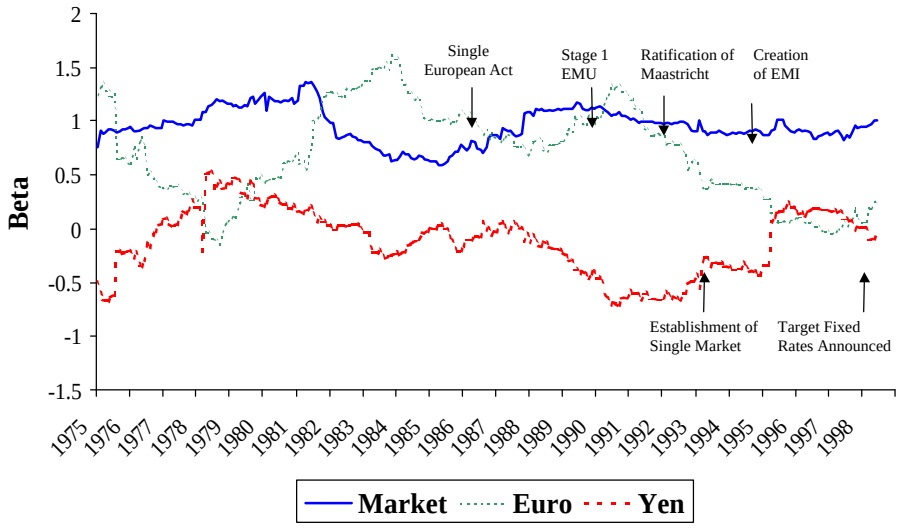


Figure 2

Germany

January 1975 to June 1998

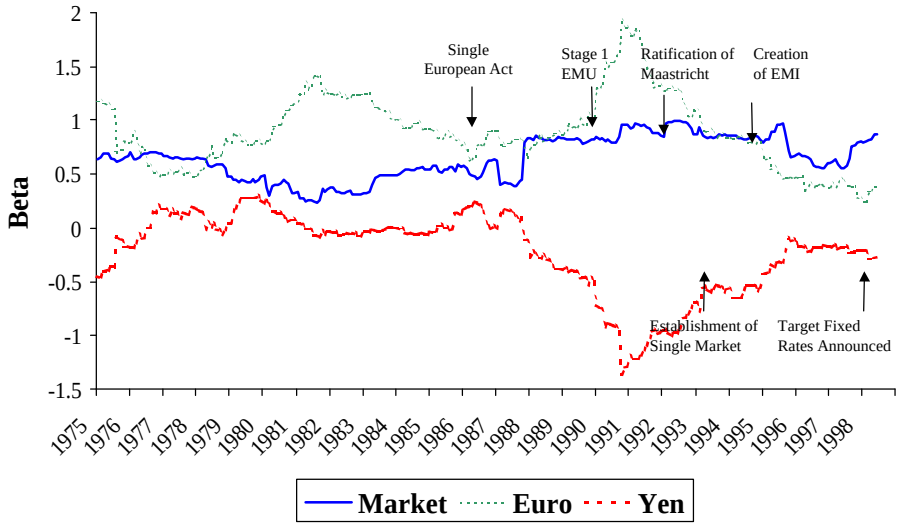


Figure 2

Hong Kong

January 1975 to June 1998

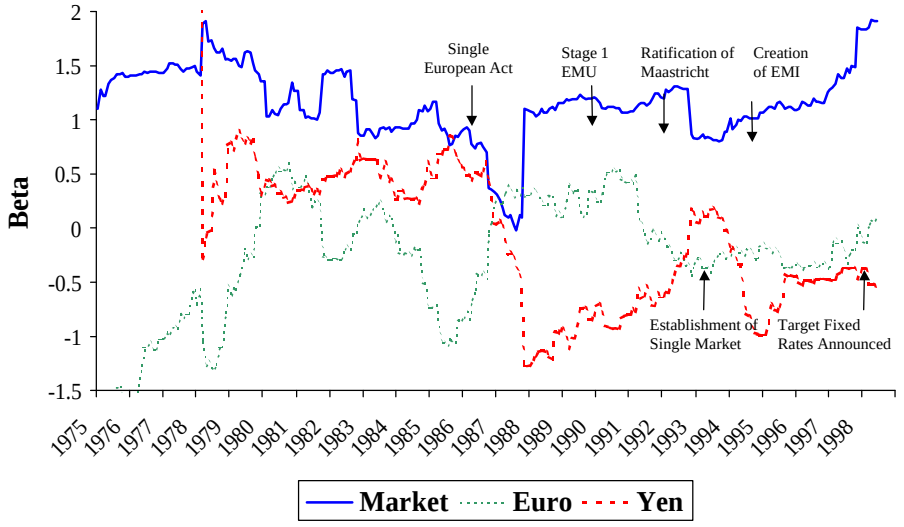


Figure 2

Italy

January 1975 to June 1998

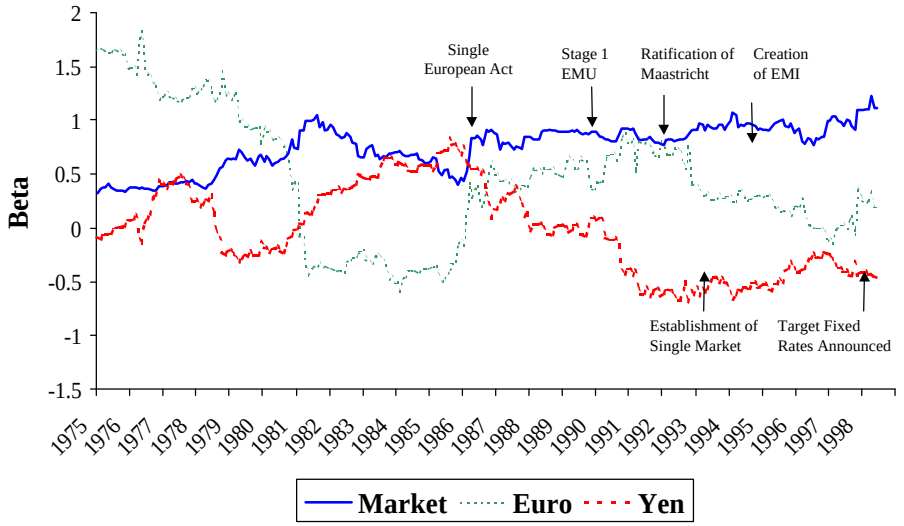


Figure 2

Japan

January 1975 to June 1998

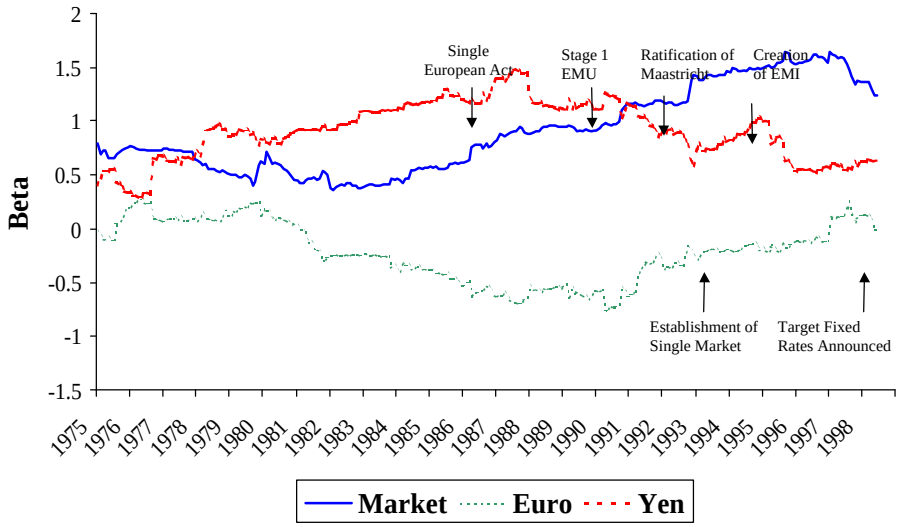


Figure 2

The Netherlands

January 1975 to June 1998

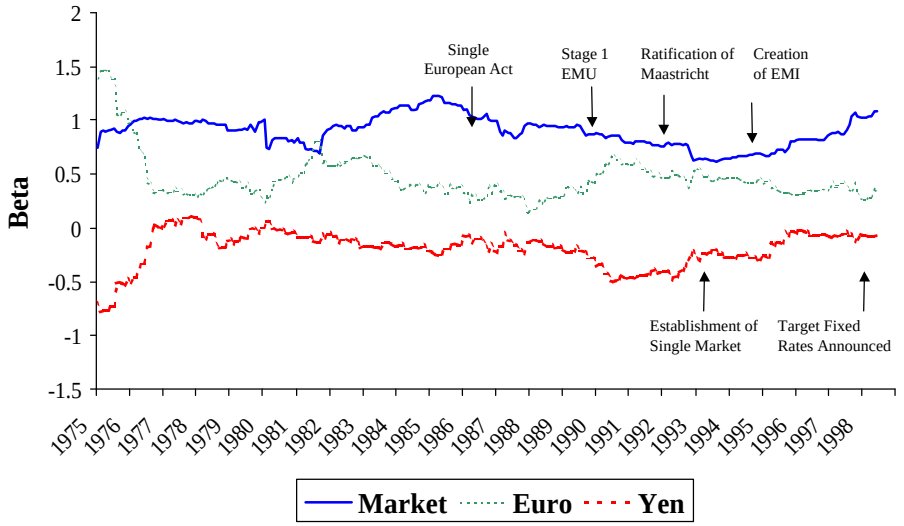


Figure 2

Norway

January 1975 to June 1998

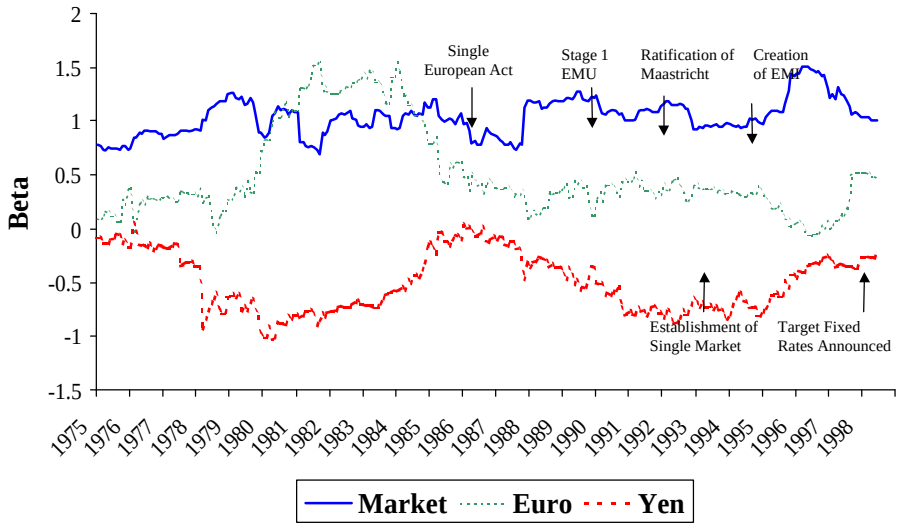


Figure 2

Singapore

January 1975 to June 1998

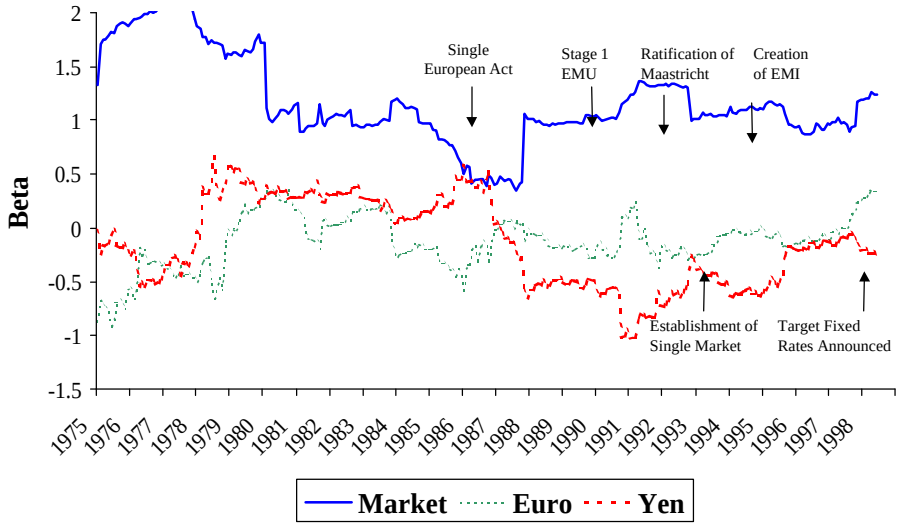


Figure 2

Spain

January 1975 to June 1998

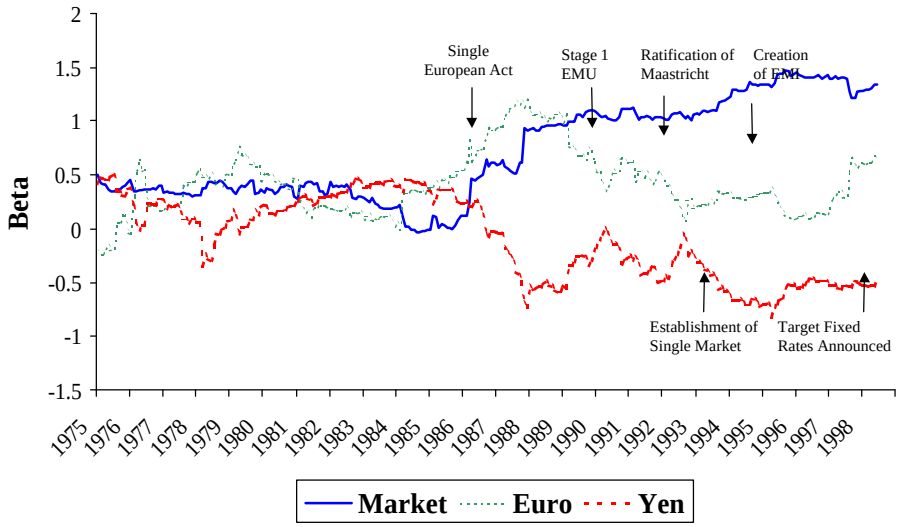


Figure 2

Sweden

January 1975 to June 1998

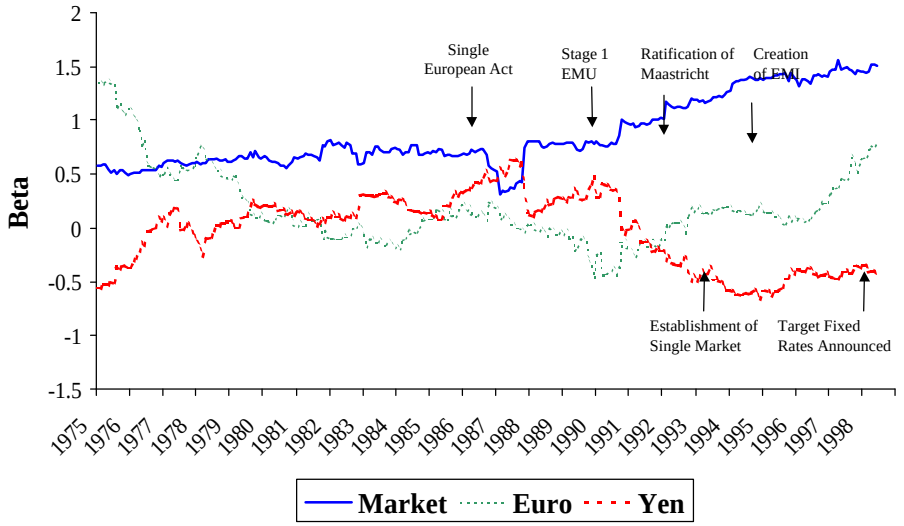


Figure 2

Switzerland

January 1975 to June 1998

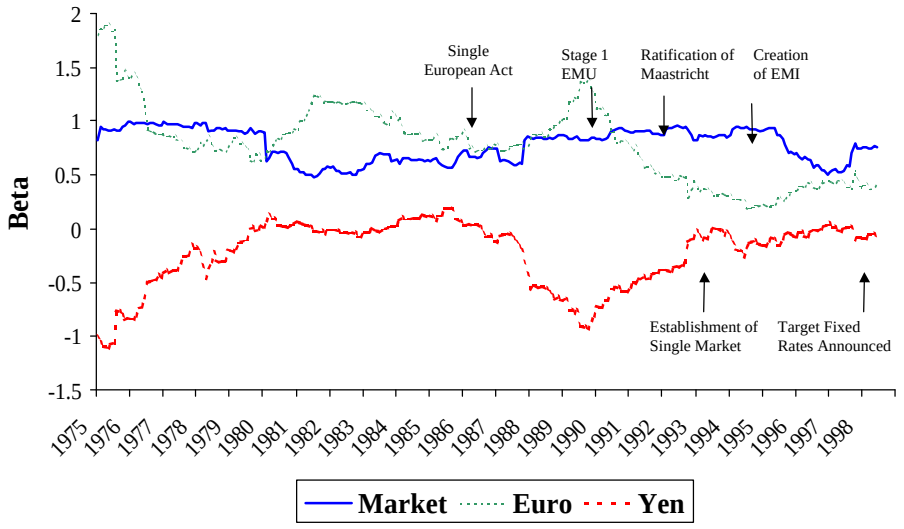


Figure 2

United Kingdom

January 1975 to June 1998

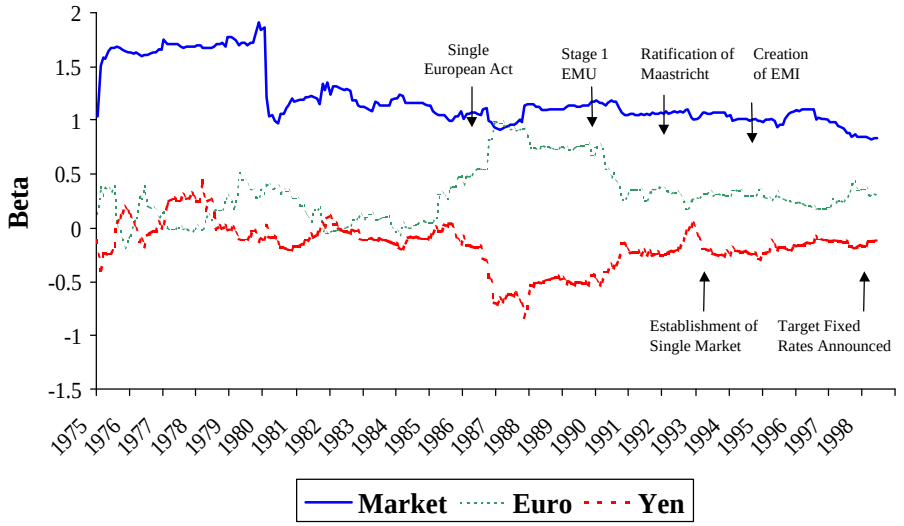


Figure 2

United States

January 1975 to June 1998

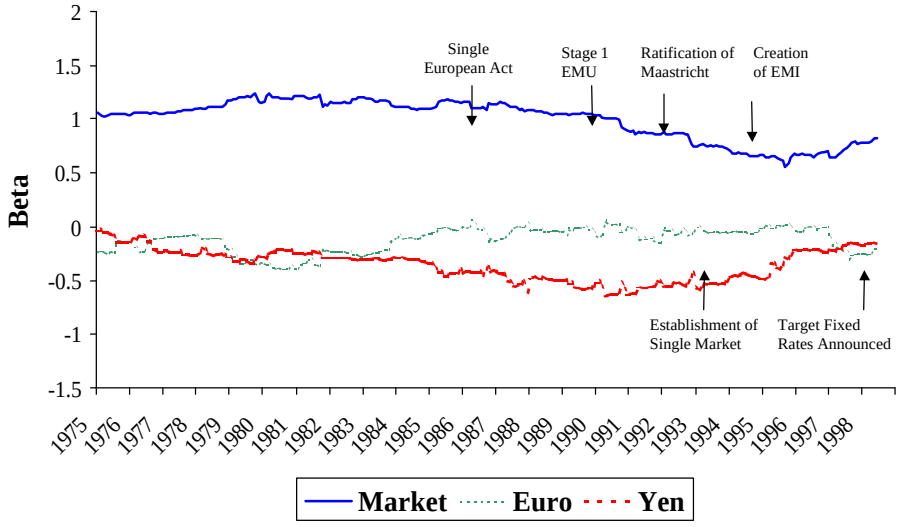
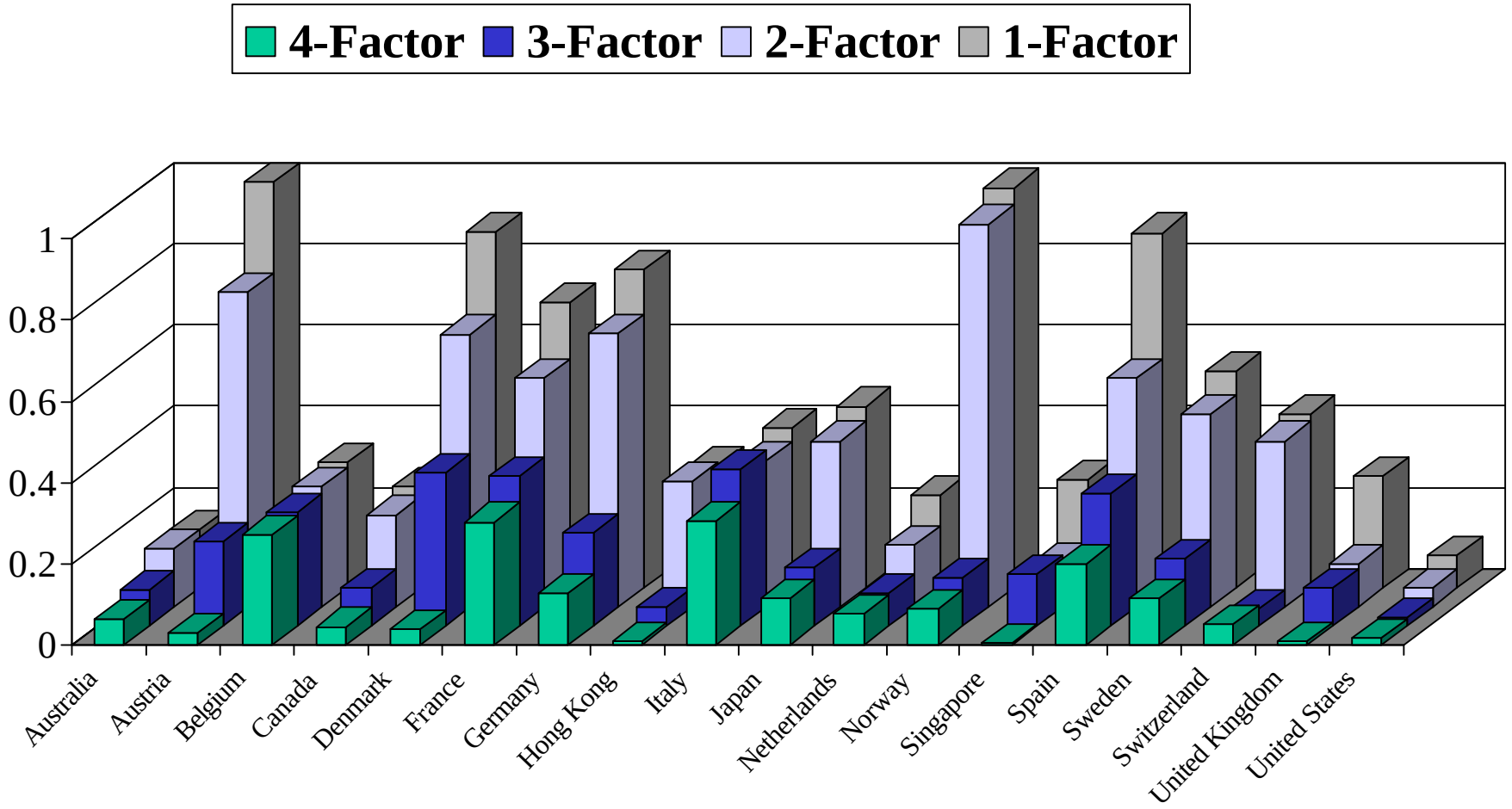


Figure 3a

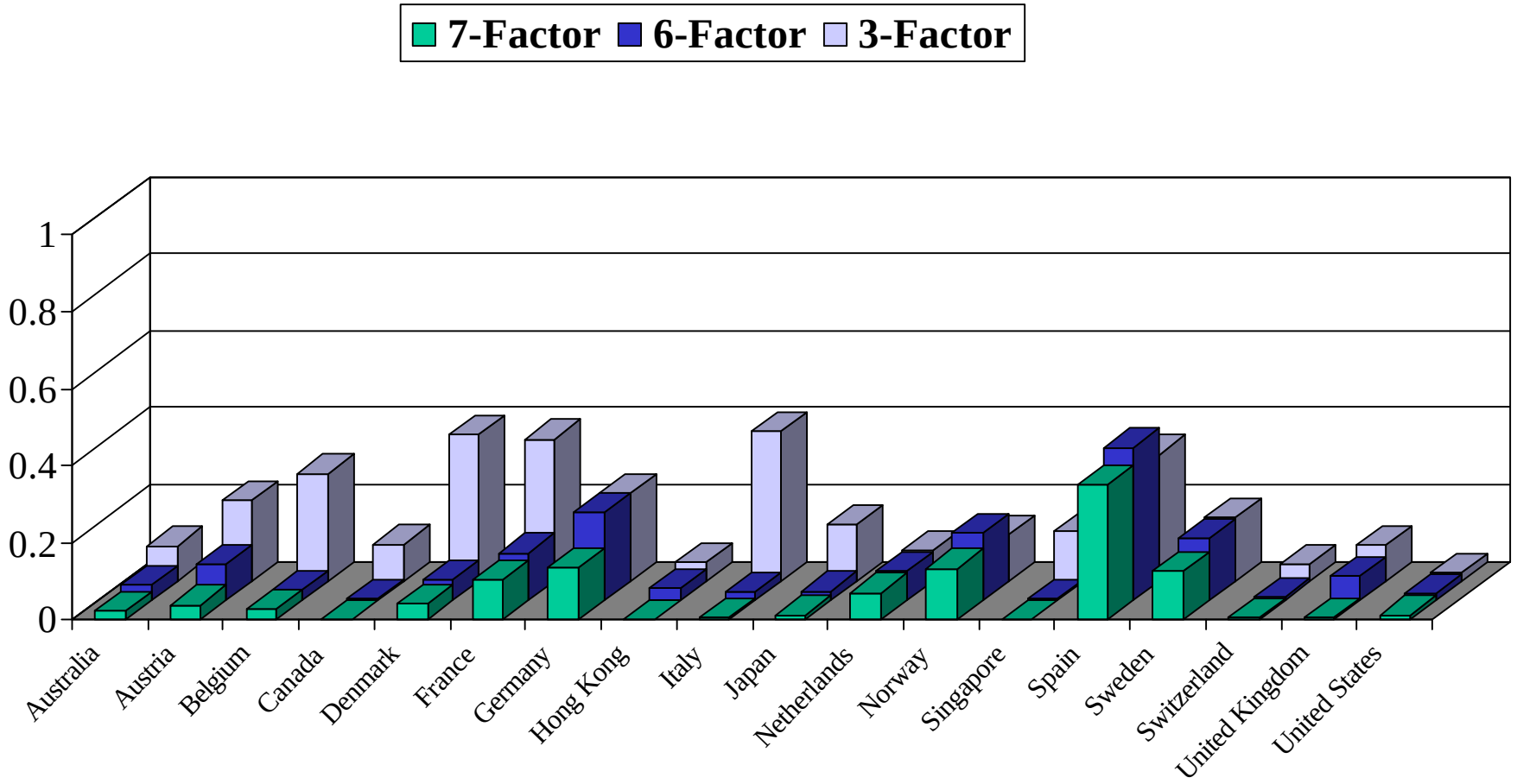
Proportion of Predictable Variation Unexplained by Models



Bars represent one minus the variance ratios reported in Table 8. 1-Factor is the world market return. 2-Factor is the world market plus the world price to book return. 3-Factor is the world market return plus two currency excess returns. 4-Factor is the three factor plus the world price to book return.

Figure 3b

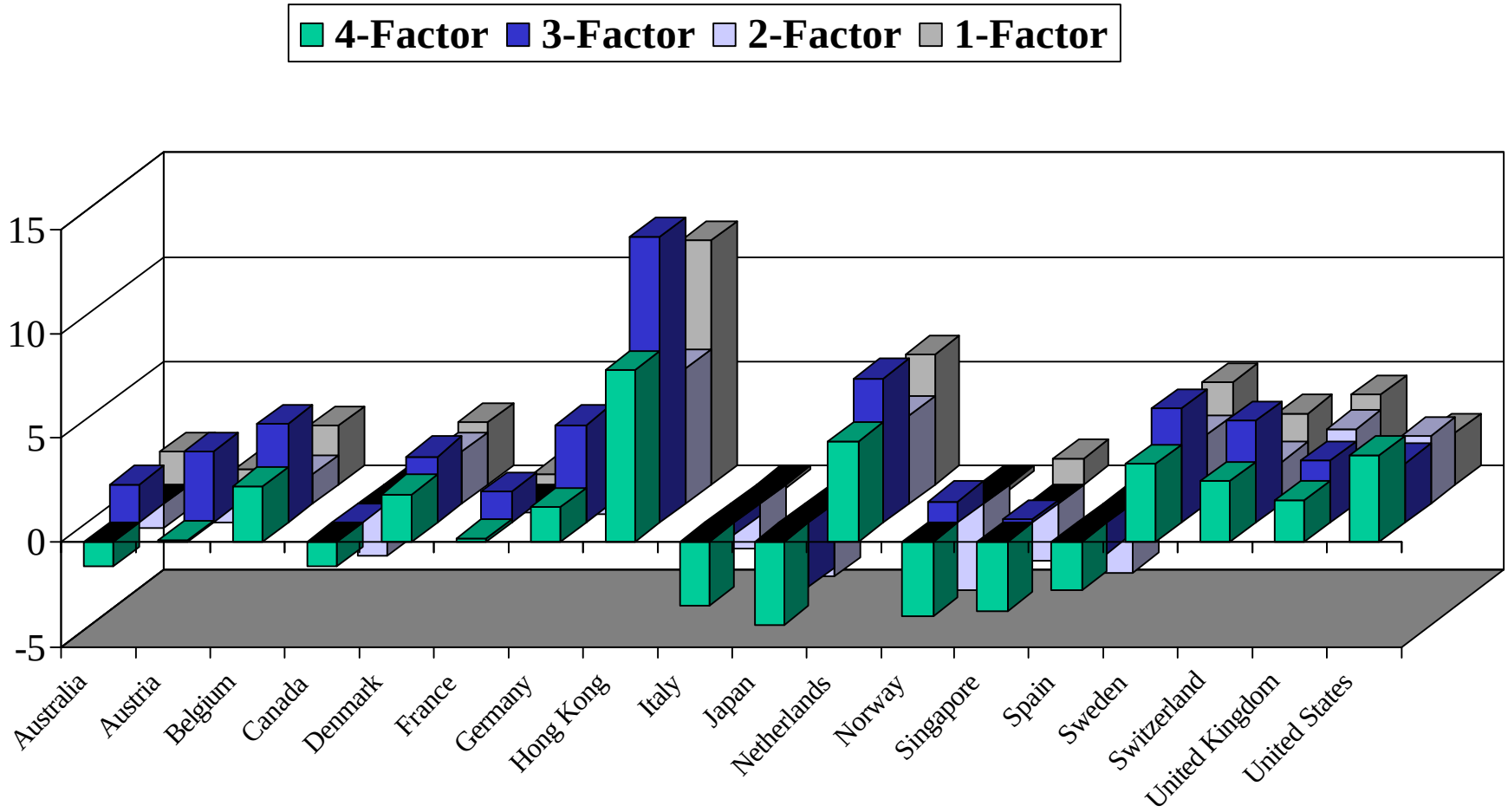
Proportion of Predictable Variation Unexplained by Models



Bars represent one minus the variance ratios reported in Table 8. 3-Factor is the world market return plus two currency excess returns. 6-Factor is the 3-Factor plus three economic factors. 7-Factor is the 6-Factor model plus world price to book return.

Figure 4a

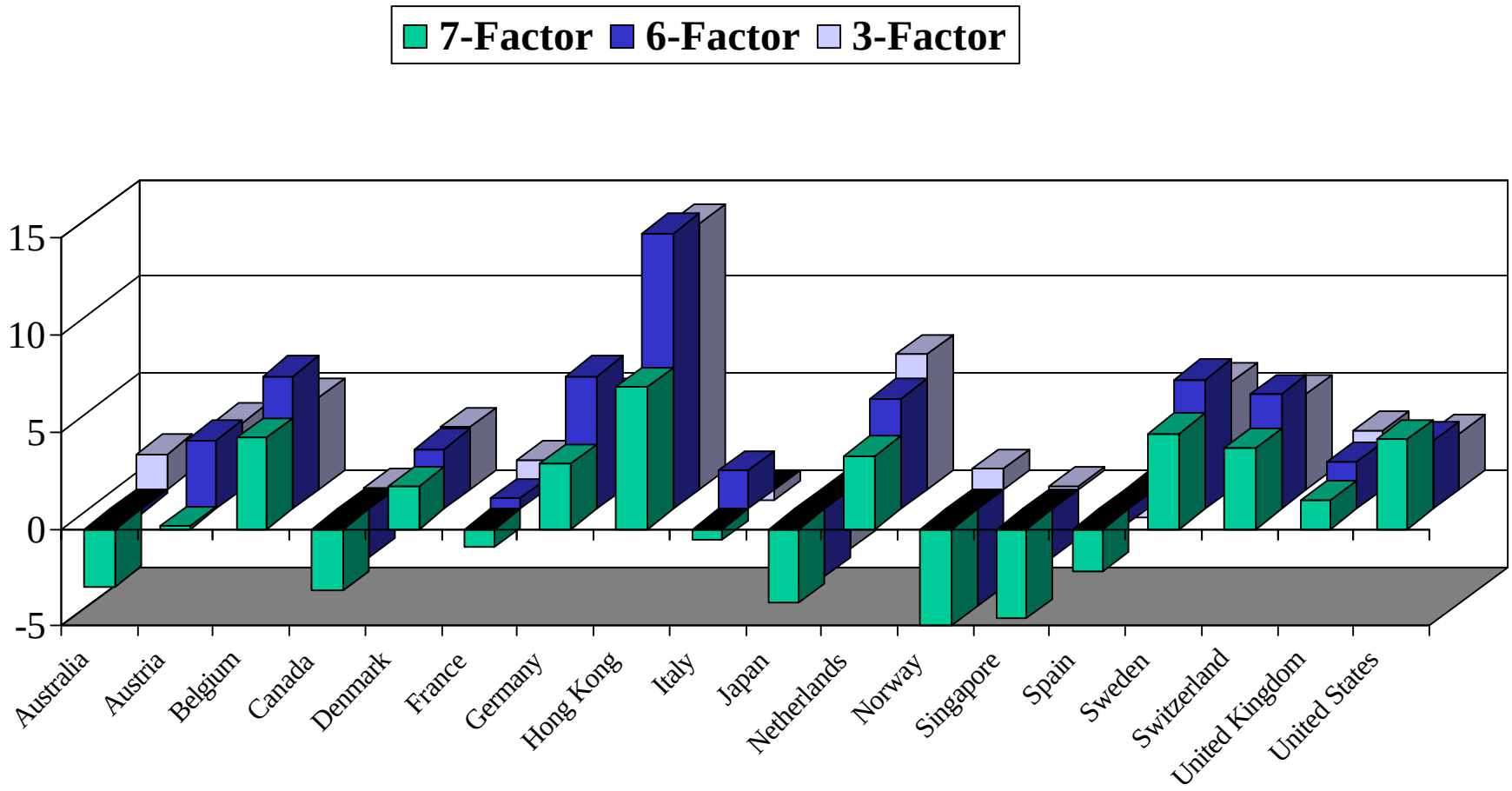
Average Pricing Errors of Conditional Asset Pricing Models



Bars represent annualized percentage average pricing errors reported in Table 8. 3-Factor is the world market return plus two currency excess returns. 6-Factor is the 3-Factor plus three economic factors. 7-Factor is the 6-Factor model plus world price to book return.

Figure 4b

Average Pricing Errors of Conditional Asset Pricing Models



Bars represent annualized percentage average pricing errors reported in Table 8. 1-Factor is the world market return. 2-Factor is the world market plus the world price to book return. 3-Factor is the world market return plus two currency excess returns. 4-Factor is the three factor plus the world price to book return.

Table 1

Summary statistics for the world risk factors and instrumental variables

January 1975 to December 1997

Variable	Symbol	Mean x 100	Std. Dev. x 100	ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
World risk factors									
World excess return	wdret	0.692	4.027	0.029	-0.032	-0.029	-0.039	0.011	0.082
Euro currency excess return	euroret	0.067	3.035	0.031	0.118	0.039	0.014	0.000	0.016
Yen currency excess return	yenret	0.243	3.494	0.096	0.061	0.105	0.054	0.089	-0.057
World Price-book high-low return	wrpbret	0.527	2.132	0.137	0.063	0.044	-0.115	0.153	0.066
Change in Eurodollar-Treasury yield	dted	-0.001	0.034	-0.080	-0.092	-0.061	-0.126	0.042	-0.085
Unexpected G7 inflation	dg7ui	-0.007	0.170	0.108	-0.028	0.002	-0.045	0.046	0.104
Change in long-term G7 expected inflation	dg7elt	0.484	0.199	0.978	0.962	0.951	0.937	0.846	0.746
Change in price of oil	doil	0.345	7.035	0.368	0.021	-0.021	-0.050	-0.069	-0.051
Change in G7 industrial prod.	dg7ip	0.207	0.677	-0.063	0.154	0.231	0.078	-0.053	-0.128
G7 real interest rate	g7rtb	0.206	0.264	0.576	0.389	0.393	0.442	0.618	0.445
Instrumental variables									
Lagged world dividend yield	lwrdivy	0.285	0.093	0.982	0.967	0.955	0.942	0.844	0.749
Lagged Euro-dollar Treasury spread	lted	0.049	0.047	0.839	0.683	0.554	0.496	0.372	0.282
Lagged slope of US term structure	lterm	0.131	0.123	0.942	0.854	0.784	0.722	0.487	0.200
30-day US Treasury bill rate	tb1	0.568	0.233	0.939	0.889	0.854	0.819	0.672	0.399
Lagged world price-book ratio*	lwrpb*	1.819	0.540	0.976	0.956	0.933	0.913	0.762	0.617

Correlations among world risk factors

	wdret	euroret	yenret	wrpbret	dted	dg7ui	dg7elt	doil	dg7ip	g7rtb
wdret	1.000									
euroret	0.258	1.000								
yenret	0.327	0.593	1.000							
wrpbret	-0.190	-0.136	-0.127	1.000						
dted	-0.045	-0.021	-0.074	-0.011	1.000					
dg7ui	-0.041	-0.014	-0.013	0.023	-0.064	1.000				
dg7elt	0.036	-0.080	-0.115	0.038	-0.024	-0.024	1.000			
doil	-0.179	-0.015	-0.045	0.059	0.015	0.268	0.078	1.000		
dg7ip	-0.140	-0.070	-0.053	0.037	-0.033	0.029	-0.092	-0.012	1.000	
g7rtb	0.052	0.057	0.001	-0.103	-0.001	-0.605	-0.305	-0.272	-0.086	1.000

Correlations among world instruments

	lwrdivy	lted	lterm	tb1	lwrpb
lwrdivy	1.000				
lted	0.623	1.000			
lterm	-0.440	-0.402	1.000		
tb1	0.612	0.470	-0.692	1.000	
lwrpb	-0.953	-0.490	0.275	-0.481	1.000

Table 2

Regressions of the asset returns on the world risk factors

January 1975 to December 1997

Country	intercept	wdret	euroret	yenret	wrpbret	dg7ui	dg7elt	dted	g7rtb	doil	dg7ip	Adj. R^2 1factor	Adj. R^2 3factor	Adj. R^2 2factor	Adj. R^2 9factor	Adj. R^2 10factor	Adj. R^2 6factor	Adj. R^2 7factor
Australia	0.002	1.041	-0.238	0.056	0.446	4.020	-0.698	5.486	-0.320	0.096	-0.056	0.273	0.277	0.291	0.292	0.302	0.291	0.305
	0.012	0.166	0.143	0.133	0.184	3.046	1.944	16.464	1.976	0.055	0.544							
Austria	-0.003	0.388	0.758	-0.049	0.456	2.835	-1.123	-27.854	2.445	-0.099	0.969	0.096	0.195	0.105	0.235	0.242	0.205	0.223
	0.011	0.393	0.136	0.111	0.148	2.776	1.545	9.730	1.455	0.081	0.536							
Belgium	-0.001	0.794	0.601	-0.099	0.306	1.300	-0.497	-0.987	1.905	-0.060	0.406	0.391	0.467	0.397	0.479	0.482	0.473	0.485
	0.008	0.082	0.097	0.078	0.100	1.665	1.330	11.946	1.283	0.037	0.368							
Canada	-0.005	1.050	-0.108	-0.260	0.143	-0.655	0.417	-1.969	-0.382	0.079	0.272	0.460	0.497	0.464	0.500	0.501	0.503	0.505
	0.008	0.073	0.106	0.098	0.105	2.030	1.411	10.200	1.379	0.034	0.353							
Denmark	0.014	0.624	0.456	-0.043	0.084	-2.589	-2.343	0.835	-0.170	0.059	-0.006	0.265	0.322	0.262	0.321	0.320	0.325	0.324
	0.009	0.066	0.113	0.086	0.143	2.003	1.396	9.651	1.413	0.041	0.411							
France	-0.008	0.992	0.632	-0.077	0.258	1.958	1.375	-10.197	0.549	-0.060	0.341	0.406	0.459	0.406	0.458	0.459	0.457	0.461
	0.010	0.086	0.128	0.125	0.162	2.237	1.783	13.412	1.569	0.034	0.440							
Germany	-0.003	0.743	0.783	-0.196	0.484	-0.809	0.055	-30.403	1.097	-0.084	0.122	0.315	0.415	0.331	0.430	0.462	0.424	0.452
	0.009	0.089	0.115	0.097	0.145	1.997	1.388	11.343	1.402	0.045	0.435							
Hong Kong	0.013	1.244	-0.197	-0.028	0.731	-2.251	-0.622	-28.917	-2.825	0.031	-0.995	0.234	0.235	0.262	0.235	0.258	0.231	0.256
	0.018	0.172	0.207	0.198	0.229	4.375	3.088	25.302	2.702	0.065	0.751							
Italy	-0.002	0.813	0.259	-0.043	0.205	-4.744	-0.078	-13.281	0.851	-0.090	-0.121	0.205	0.206	0.204	0.217	0.218	0.218	0.219
	0.014	0.094	0.195	0.142	0.225	3.348	2.230	14.720	1.988	0.065	0.565							
Japan	-0.006	0.949	-0.247	0.911	-0.002	1.236	1.010	-5.707	0.311	-0.046	-0.411	0.507	0.667	0.506	0.663	0.663	0.665	0.664
	0.007	0.083	0.096	0.091	0.139	1.817	1.156	8.836	1.093	0.046	0.385							
Netherlands	0.000	0.968	0.360	-0.132	0.345	-0.589	0.139	1.463	0.854	0.050	0.147	0.566	0.591	0.581	0.595	0.608	0.591	0.612
	0.007	0.061	0.084	0.069	0.118	1.673	1.156	8.662	1.186	0.028	0.314							
Norway	0.001	1.199	0.530	-0.484	0.560	2.207	-1.606	3.228	0.278	0.232	0.977	0.284	0.319	0.303	0.368	0.385	0.365	0.383
	0.011	0.107	0.143	0.141	0.171	2.978	2.038	19.755	2.013	0.044	0.556							
Singapore	0.001	1.255	-0.085	-0.116	0.765	-3.222	0.671	-7.611	-3.686	0.135	-0.957	0.313	0.315	0.360	0.350	0.383	0.340	0.381
	0.012	0.166	0.159	0.149	0.241	3.073	1.995	17.048	2.135	0.059	0.616							
Spain	0.023	0.772	0.365	-0.068	0.083	0.743	-4.909	-4.389	0.027	-0.125	-0.102	0.251	0.268	0.248	0.291	0.289	0.299	0.297
	0.011	0.113	0.154	0.121	0.188	2.882	1.767	13.258	1.901	0.055	0.533							
Sweden	0.004	0.919	0.094	-0.034	0.171	1.198	-0.914	-24.623	1.554	-0.057	0.254	0.321	0.317	0.320	0.319	0.320	0.317	0.317
	0.012	0.090	0.122	0.108	0.191	2.572	1.872	14.225	1.833	0.059	0.490							
Switzerland	0.007	0.844	0.601	-0.116	0.293	-2.724	-1.122	-15.022	0.170	0.002	-0.290	0.456	0.536	0.463	0.540	0.552	0.535	0.549
	0.008	0.072	0.095	0.079	0.128	1.756	1.196	8.493	1.144	0.032	0.409							
United Kingdc	-0.002	1.244	0.409	-0.179	0.604	-3.348	1.485	2.838	-1.796	0.056	-0.517	0.464	0.476	0.492	0.482	0.511	0.480	0.511
	0.008	0.139	0.113	0.103	0.256	3.157	1.505	16.843	1.847	0.042	0.632							
United States	0.006	0.960	-0.149	-0.349	-0.167	-0.939	-0.676	3.402	0.028	0.026	0.128	0.636	0.746	0.637	0.747	0.750	0.746	0.751
	0.004	0.041	0.054	0.052	0.071	0.961	0.669	5.080	0.588	0.029	0.212							
χ^2		82.562	160.441	184.304	94.230	15.793	18.186	19.873	66.944	5.658	15.601							
$\beta_i = 0$, all I		0.000	0.000	0.000	0.000	0.607	0.443	0.340	0.000	0.997	0.620							

Table 3

Unconditional asset pricing tests

January 1975 to December 1997

		One Factor Model		Three Factor Model				Seven Factor Model							
			Average				Average								Average
	Average	β	pricing	β	β	β	pricing	β	β	β	β	β	β	β	pricing
Country	return	wdret	error	wdret	euroret	yenret	error	wdret	euroret	yenret	wrpbret	dg7elt	g7rtb	doil	error
Australia	0.013	1.098	-0.0002	1.036	-0.266	0.024	-0.0006	1.111	-0.267	0.064	0.452	-0.749	-2.016	0.113	-0.0003
		0.117	0.0610	0.136	0.122	0.115	0.0600	0.145	0.128	0.123	0.149	1.502	0.970	0.045	0.0586
Austria	0.009	0.447	0.0007	0.316	0.781	-0.016	0.0003	0.355	0.702	-0.001	0.404	-2.019	0.486	-0.094	0.0002
		0.104	0.0610	0.118	0.134	0.111	0.0570	0.105	0.149	0.110	0.143	1.420	0.767	0.082	0.0554
Belgium	0.014	0.942	0.0021	0.814	0.599	-0.068	0.0015	0.803	0.578	-0.100	0.309	-0.688	1.165	-0.067	-0.0003
		0.065	0.0430	0.073	0.099	0.072	0.0400	0.074	0.103	0.077	0.088	1.241	0.762	0.028	0.0394
Canada	0.011	0.994	-0.0021	1.047	-0.097	-0.363	-0.0023	1.050	-0.118	-0.259	0.117	0.100	-1.050	0.062	0.0005
		0.073	0.0400	0.077	0.095	0.092	0.0380	0.072	0.096	0.097	0.087	1.139	0.669	0.036	0.0376
Denmark	0.013	0.661	0.0026	0.556	0.512	-0.075	0.0023	0.615	0.445	-0.041	0.075	-1.971	0.725	0.055	0.0004
		0.057	0.0450	0.056	0.107	0.074	0.0430	0.058	0.111	0.074	0.119	1.160	0.801	0.033	0.0425
France	0.014	1.183	0.0004	1.029	0.626	-0.042	-0.0003	1.006	0.584	-0.083	0.242	0.928	0.799	-0.043	0.0010
		0.078	0.0530	0.071	0.131	0.115	0.0500	0.072	0.135	0.118	0.147	1.610	0.720	0.034	0.0496
Germany	0.013	0.867	0.0012	0.719	0.731	-0.121	0.0009	0.762	0.749	-0.196	0.424	0.306	0.945	-0.083	0.0003
		0.090	0.0490	0.103	0.107	0.090	0.0450	0.090	0.116	0.092	0.138	1.191	0.716	0.047	0.0433
Hong Kong	0.021	1.208	0.0068	1.164	-0.243	0.051	0.0061	1.367	-0.227	-0.057	0.725	1.294	-1.104	0.052	0.0009
		0.145	0.0830	0.173	0.175	0.178	0.0820	0.166	0.184	0.178	0.199	2.791	1.410	0.059	0.0805
Italy	0.012	0.870	-0.0001	0.802	0.306	-0.042	-0.0008	0.809	0.282	-0.056	0.123	0.800	1.372	-0.142	-0.0020
		0.096	0.0690	0.093	0.159	0.131	0.0690	0.080	0.171	0.132	0.183	1.926	1.002	0.071	0.0677
Japan	0.012	1.039	-0.0006	0.921	-0.245	0.927	-0.0032	0.949	-0.204	0.864	-0.020	0.860	-0.434	-0.041	-0.0006
		0.082	0.0470	0.085	0.085	0.079	0.0390	0.084	0.090	0.076	0.145	1.136	0.736	0.042	0.0384
Netherlands	0.017	1.040	0.0043	0.935	0.361	-0.116	0.0040	0.993	0.328	-0.115	0.314	0.364	0.755	0.043	-0.0001
		0.060	0.0340	0.067	0.073	0.053	0.0320	0.055	0.072	0.054	0.109	0.968	0.633	0.026	0.0314
Norway	0.012	1.114	-0.0011	1.045	0.612	-0.594	-0.0007	1.196	0.472	-0.453	0.504	-2.622	-1.654	0.226	0.0001
		0.105	0.0640	0.117	0.130	0.106	0.0620	0.105	0.135	0.128	0.146	1.961	1.219	0.040	0.0587
Singapore	0.014	1.143	0.0001	1.099	-0.119	-0.062	-0.0004	1.315	-0.065	-0.143	0.780	2.246	-2.469	0.138	-0.0003
		0.150	0.0660	0.173	0.146	0.128	0.0650	0.148	0.141	0.125	0.203	1.889	1.182	0.057	0.0617
Spain	0.010	0.818	-0.0016	0.763	0.362	-0.064	-0.0023	0.783	0.361	-0.084	0.109	-4.251	0.288	-0.123	0.0000
		0.102	0.0590	0.112	0.136	0.116	0.0580	0.110	0.139	0.110	0.205	1.607	1.026	0.065	0.0562
Sweden	0.016	0.886	0.0044	0.894	0.034	0.052	0.0032	0.957	0.089	-0.067	0.185	-2.026	0.375	-0.040	0.0014
		0.085	0.0540	0.094	0.093	0.100	0.0540	0.095	0.102	0.096	0.155	1.441	0.816	0.045	0.0539
Switzerland	0.015	0.923	0.0026	0.817	0.605	-0.092	0.0020	0.868	0.579	-0.120	0.291	-0.008	1.014	-0.003	-0.0003
		0.065	0.0400	0.075	0.086	0.071	0.0370	0.068	0.085	0.070	0.116	1.185	0.610	0.033	0.0361
United Kingdom	0.018	1.236	0.0036	1.209	0.378	-0.221	0.0027	1.308	0.385	-0.167	0.667	3.373	0.015	0.052	-0.0009
		0.142	0.0520	0.151	0.101	0.098	0.0510	0.143	0.105	0.087	0.212	1.438	0.930	0.037	0.0494
United States	0.014	0.914	0.0015	0.986	-0.168	-0.339	0.0013	0.956	-0.159	-0.338	-0.161	-0.711	0.545	0.024	0.0006
		0.044	0.0260	0.047	0.053	0.046	0.0210	0.044	0.053	0.043	0.070	0.545	0.470	0.025	0.0208
		λ	χ^2	λ	λ	λ	χ^2	λ	λ	λ	λ	λ	λ	λ	χ^2
		wdret	p-value/df	wdret	euroret	yenret	p-value/df	wdret	euroret	yenret	wrpbret	dg7elt	g7rtb	doil	p-value/df
		0.0069	18.795	0.0080	0.0013	0.0030	13.401	0.0064	-0.0068	0.0035	0.0120	-0.0003	0.0046	0.0186	5.165
		0.0004	0.405	0.0004	0.0021	0.0024	0.571	0.0012	0.0070	0.0055	0.0102	0.0010	0.0027	0.0245	0.923
			18.000				15.000								11.000

Table 4

Proportion of times that the right-tail probability value is less than 10% for the statistic testing whether the beta coefficients are equal to zero or equal across all countries

January 1975 to December 1997

Country	wdret	euroret	yenret	wrpbret	dted	dg7ui	dg7elt	doil	dg7ip	g7rtb	Adj. R^2
Australia	1.000	0.245	0.255	0.454	0.000	0.222	0.120	0.116	0.000	0.222	0.334
Austria	0.389	0.713	0.097	0.412	0.389	0.319	0.426	0.204	0.009	0.329	0.384
Belgium	1.000	0.782	0.241	0.130	0.120	0.046	0.019	0.037	0.417	0.106	0.484
Canada	1.000	0.093	0.519	0.185	0.106	0.065	0.125	0.130	0.097	0.111	0.529
Denmark	1.000	0.639	0.065	0.065	0.065	0.236	0.380	0.120	0.176	0.157	0.344
France	1.000	0.764	0.222	0.065	0.310	0.093	0.134	0.167	0.046	0.097	0.502
Germany	1.000	0.991	0.171	0.523	0.389	0.157	0.171	0.204	0.079	0.019	0.511
Hong Kong	0.935	0.037	0.333	0.292	0.074	0.102	0.255	0.093	0.069	0.139	0.234
Italy	0.977	0.255	0.111	0.185	0.046	0.259	0.194	0.375	0.009	0.218	0.303
Japan	1.000	0.486	1.000	0.370	0.042	0.088	0.282	0.028	0.134	0.171	0.716
Netherlands	1.000	0.731	0.264	0.407	0.213	0.250	0.079	0.102	0.343	0.259	0.626
Norway	1.000	0.444	0.491	0.625	0.361	0.111	0.074	0.477	0.204	0.088	0.451
Singapore	0.968	0.000	0.264	0.269	0.079	0.102	0.065	0.130	0.023	0.153	0.348
Spain	0.704	0.259	0.417	0.199	0.014	0.083	0.176	0.287	0.037	0.264	0.371
Sweden	0.940	0.014	0.157	0.009	0.222	0.148	0.106	0.218	0.171	0.060	0.330
Switzerland	1.000	0.815	0.167	0.356	0.324	0.060	0.134	0.051	0.236	0.088	0.574
United Kingdom	1.000	0.523	0.097	0.634	0.250	0.037	0.241	0.241	0.250	0.319	0.560
United States	1.000	0.222	0.995	0.449	0.000	0.093	0.222	0.125	0.222	0.130	0.745
$\beta_i = 0$, all i	1.000	1.000	0.991	0.769	0.231	0.185	0.315	0.509	0.134	0.296	
$\beta_i = \beta$, all i	0.912	0.940	0.824	0.639	0.264	0.190	0.273	0.509	0.134	0.255	

Table 5

Price to book value and time-varying risk

January 1975 to December 1997

A. Using high-low world price to book return

	intercept	$wdret_t$	$wdret_t$ * $wrpbret_{t-1}$	$euroret_t$	$euroret_t$ * $wrpbret_{t-1}$	$yenret_t$	$yenret_t$ * $wrpbret_{t-1}$	Conditional beta Adj. R^2	Constant beta Adj. R^2
Australia	0.001	0.809	11.928	-0.176	-6.403	0.096	-6.611	0.276	0.277
	0.004	0.104	7.604	0.143	5.799	0.122	6.591		
Austria	0.001	0.344	4.786	0.739	3.293	-0.051	-2.428	0.192	0.195
	0.004	0.144	3.797	0.159	6.658	0.128	5.413		
Belgium	0.003	0.710	6.575	0.611	2.185	-0.090	-5.107	0.459	0.467
	0.002	0.075	2.510	0.098	3.899	0.079	3.437		
Canada	-0.002	0.994	0.099	-0.099	-4.463	-0.247	-0.311	0.481	0.497
	0.002	0.086	2.244	0.106	3.928	0.101	3.853		
Denmark	0.003	0.590	2.130	0.490	1.518	-0.064	0.046	0.315	0.322
	0.003	0.077	2.547	0.115	6.384	0.088	4.135		
France	0.001	0.938	0.901	0.598	0.313	-0.046	-2.224	0.435	0.459
	0.003	0.074	3.264	0.129	6.176	0.126	5.673		
Germany	0.002	0.702	2.980	0.766	-3.100	-0.185	0.792	0.403	0.415
	0.003	0.114	4.073	0.124	5.029	0.102	4.164		
Hong Kong	0.008	0.941	19.005	-0.132	-9.417	0.075	-11.820	0.244	0.235
	0.005	0.164	5.354	0.210	8.295	0.195	7.767		
Italy	0.000	0.855	0.612	0.222	8.999	-0.037	-6.454	0.198	0.206
	0.004	0.118	3.442	0.202	9.017	0.146	6.602		
Japan	-0.002	1.044	-3.356	-0.280	1.958	0.886	4.200	0.675	0.667
	0.002	0.082	2.504	0.101	3.667	0.091	3.556		
Netherlands	0.005	0.875	1.063	0.354	-0.115	-0.121	-2.081	0.572	0.591
	0.002	0.062	2.109	0.086	3.280	0.070	3.248		
Norway	0.001	0.999	6.549	0.555	-1.250	-0.500	-1.127	0.313	0.319
	0.004	0.118	4.051	0.163	5.230	0.136	4.947		
Singapore	0.000	0.908	13.036	-0.077	-4.187	-0.014	-9.618	0.307	0.315
	0.004	0.133	6.045	0.165	6.652	0.149	7.001		
Spain	-0.001	0.783	7.015	0.393	12.140	-0.080	-11.265	0.289	0.268
	0.003	0.115	3.958	0.149	7.627	0.117	5.350		
Sweden	0.004	0.908	2.462	0.111	-0.606	-0.013	-5.357	0.309	0.317
	0.003	0.118	3.329	0.128	4.809	0.116	4.337		
Switzerland	0.003	0.762	3.790	0.600	5.925	-0.076	-10.337	0.531	0.536
	0.002	0.073	2.501	0.090	4.021	0.076	3.259		
United Kingdom	0.004	0.978	9.025	0.370	3.366	-0.114	-4.843	0.484	0.476
	0.003	0.074	3.887	0.109	4.351	0.099	4.532		
United States	0.002	0.946	1.606	-0.112	-2.160	-0.341	-2.077	0.740	0.746
	0.001	0.050	1.325	0.056	1.998	0.051	1.704		

Table 5 (continued)

January 1975 to December 1997

B. Using world price to book ratio

	$wdret_t$	$_{t-1}$	$wrpb_t$	$euroret_t$ *		$wrpb_t$	beta	Constant beta
							Adj. R	Adj. R
Australia	0.001		0.167	0.385		0.932	-0.488		0.277
	0.004		0.289	0.529		0.459	0.262		
	0.001	-0.141		1.233	-0.244		-0.328	0.208	
	0.004	0.203		0.548	0.337		0.225		
Belgium		0.491	0.133		-0.422	0.086		0.480	0.467
		0.221	0.114		0.175	0.258			
Canada	-0.001		-0.322	0.331		-0.387	0.078		0.497
	0.002		0.130	0.409		0.347	0.183		
	0.002	0.296		0.025	0.269		-0.284	0.324	
	0.003	0.190		0.418	0.218		0.155		
France		0.897	0.026		-0.334	0.477		0.472	0.459
		0.303	0.139		0.256	0.450			
Germany	0.002		0.316	0.991		0.789	-0.542		0.415
	0.003		0.119	0.437		0.278	0.172		
	0.007	0.708		0.205	-0.206		-0.700	0.251	
	0.005	0.689		0.915	0.453		0.397		
Italy		0.457	0.203		0.273	1.056		0.213	0.206
		0.292	0.144		0.349	0.414			
Japan	-0.002		0.285	-0.611		1.030	-0.066		0.667
	0.002		0.141	0.344		0.264	0.160		
	0.005	1.082		0.648	-0.167		-0.077	0.594	
	0.002	0.259		0.339	0.178		0.141		
Norway		0.905	0.059		-0.351	-0.470		0.316	0.319
		0.375	0.184		0.312	0.517			
Singapore	0.000		-0.058	0.107		0.873	-0.545		0.315
	0.004		0.389	0.722		0.571	0.298		
	-0.002	-0.523		-0.155	0.376		-0.697	0.322	
	0.003	0.280		0.538	0.276		0.187		
Sweden		0.291	0.338		0.271	0.707		0.326	0.317
		0.252	0.133		0.253	0.344			
Switzerland	0.004		0.068	1.422		0.254	-0.198		0.536
	0.002		0.133	0.316		0.261	0.147		
	0.004	1.900		0.342	-0.015		-0.079	0.487	
	0.003	0.703		0.442	0.219		0.216		
United States		1.188	-0.125		-0.111	-0.265		0.752	0.746
		0.121	0.064		0.103	0.146			

Table 5 (continued)

Price to book value and time-varying risk

January 1975 to December 1997

C. Using local price to book ratio

	intercept	$wdret_t$	$wdret_t$ * $locpb_{t-1}$	$euroret_t$	$euroret_t$ * $locpb_{t-1}$	yenret_t	yenret * $locpb_{t-1}$	Conditional beta Adj. R^2	Constant beta Adj. R^2
Australia	0.002	-0.087	0.675	0.202	-0.282	1.467	-0.986	0.328	0.277
	0.004	0.466	0.304	0.768	0.576	0.530	0.356		
Austria	0.002	-0.386	0.421	0.057	0.452	1.177	-0.776	0.231	0.195
	0.003	0.251	0.163	0.492	0.325	0.379	0.269		
Belgium	0.004	0.543	0.160	1.197	-0.463	0.041	-0.113	0.477	0.467
	0.002	0.208	0.150	0.290	0.207	0.222	0.164		
Canada	-0.002	1.048	-0.026	-0.944	0.542	0.418	-0.449	0.498	0.497
	0.002	0.414	0.265	0.877	0.580	0.531	0.358		
Denmark	0.003	0.312	0.196	0.569	-0.035	0.119	-0.138	0.327	0.322
	0.003	0.122	0.067	0.224	0.144	0.157	0.110		
France	0.002	0.959	0.014	0.685	-0.038	0.359	-0.338	0.462	0.459
	0.003	0.261	0.149	0.480	0.322	0.391	0.262		
Germany	0.002	0.272	0.240	0.693	0.064	0.544	-0.411	0.424	0.415
	0.003	0.323	0.190	0.571	0.339	0.332	0.211		
Hong Kong	0.008	0.654	0.264	0.293	-0.286	0.652	-0.343	0.244	0.235
	0.005	0.459	0.216	0.698	0.369	0.815	0.411		
Italy	0.000	0.791	0.036	0.154	0.068	-0.095	0.034	0.198	0.206
	0.004	0.296	0.203	0.603	0.427	0.405	0.321		
Japan	-0.002	0.815	0.053	0.099	-0.146	0.695	0.099	0.666	0.667
	0.002	0.229	0.078	0.318	0.123	0.287	0.126		
Netherlands	0.005	0.972	-0.054	0.551	-0.175	-0.190	0.041	0.589	0.591
	0.002	0.163	0.111	0.214	0.153	0.155	0.108		
Norway	0.000	1.298	-0.140	0.855	-0.199	-0.569	0.034	0.316	0.319
	0.004	0.318	0.152	0.519	0.276	0.365	0.203		
Singapore	0.001	0.844	0.164	0.453	-0.295	-0.530	0.206	0.311	0.315
	0.004	1.291	0.616	0.915	0.469	0.845	0.423		
Spain	-0.002	0.587	0.188	0.387	0.034	0.350	-0.471	0.274	0.268
	0.004	0.262	0.229	0.372	0.335	0.249	0.244		
Sweden	0.004	0.563	0.219	-0.171	0.206	0.337	-0.250	0.324	0.317
	0.003	0.163	0.092	0.277	0.158	0.200	0.110		
Switzerland	0.003	0.800	-0.002	1.029	-0.295	0.025	-0.091	0.544	0.536
	0.002	0.214	0.134	0.263	0.180	0.205	0.136		
United Kingdom	0.004	1.929	-0.467	0.408	-0.075	-0.024	-0.091	0.505	0.476
	0.003	0.582	0.298	0.362	0.199	0.351	0.179		
United States	0.002	1.194	-0.128	0.052	-0.106	-0.463	0.059	0.750	0.746
	0.001	0.094	0.046	0.152	0.075	0.118	0.060		

Table 6

Regression of asset returns on world instrumental variables

January 1975 to December 1997

	intercept	lwrdivy	lted	lterm	tb1	lwrpb	Adj. R^2
Australia	0.206	-0.284	27.072	-6.919	-6.383	-0.047	0.020
	0.144	23.493	13.671	7.034	3.380	0.038	
Austria	-0.045	4.123	-3.719	3.575	0.816	0.016	0.006
	0.103	18.442	11.497	4.843	2.392	0.029	
Belgium	0.135	-25.327	26.960	5.372	-1.711	-0.035	0.040
	0.090	15.820	10.789	4.679	2.398	0.025	
Canada	0.065	-3.469	26.855	-6.147	-7.119	-0.008	0.050
	0.099	17.406	9.253	4.707	2.551	0.027	
Denmark	0.009	-5.142	13.869	1.616	-0.298	0.003	0.003
	0.088	15.773	7.375	3.594	2.173	0.024	
France	-0.034	14.055	0.630	0.814	-3.794	0.012	0.008
	0.139	27.083	16.502	5.317	3.303	0.037	
Germany	0.044	-4.301	-0.809	1.213	-1.570	-0.010	0.010
	0.113	20.051	12.588	4.657	2.461	0.031	
Hong Kong	0.202	-17.500	7.131	-9.022	-8.056	-0.046	0.005
	0.195	33.459	21.655	8.341	4.680	0.054	
Italy	-0.052	11.693	7.493	2.163	-2.330	0.017	0.013
	0.146	26.595	12.441	5.700	3.192	0.039	
Japan	0.254	-39.834	18.823	1.746	-1.387	-0.075	0.027
	0.117	21.552	11.080	4.276	2.495	0.032	
Netherlands	0.022	3.381	12.737	0.825	-4.756	0.000	0.019
	0.100	17.627	11.642	4.323	2.608	0.027	
Norway	0.037	-5.485	5.814	-5.395	-1.765	0.000	0.012
	0.125	22.292	14.742	6.374	3.453	0.033	
Singapore	0.263	-29.782	49.826	-16.789	-12.711	-0.055	0.094
	0.153	25.749	18.068	6.431	4.044	0.042	
Spain	0.171	-41.721	17.102	-0.027	2.822	-0.040	0.012
	0.118	21.251	9.848	4.688	2.808	0.033	
Sweden	0.170	-33.078	26.096	-2.720	-0.372	-0.040	0.001
	0.119	21.868	13.303	5.173	2.796	0.033	
Switzerland	0.105	-14.012	13.781	0.087	-3.813	-0.023	0.014
	0.100	17.620	12.265	4.614	2.520	0.027	
United Kingdom	-0.050	22.395	22.780	-2.869	-8.722	0.022	0.037
	0.106	18.347	20.584	5.697	4.106	0.028	
United States	0.062	-8.239	23.429	-0.328	-3.739	-0.011	0.040
	0.085	14.976	8.764	3.608	1.809	0.024	

Table 7
Incremental Explanatory Power of local information variables in predicting 18 countries' excess returns
January 1975 to December 1997

	Adj. R^2 world excluding lwrpb	Adj. R^2 world including lwrpb	Adj. R^2 local excluding llocpb	Adj. R^2 local including llocpb	F-test world excluding lwrpb	F-test world + local (no pbs) exclude local	F-test local exclude llocpb
Australia	0.031	0.038	0.018	0.026	1.879	5.100	2.449
					0.172	0.025	0.119
Austria	0.011	0.012	0.011	0.011	0.273	0.652	0.027
					0.602	0.420	0.869
Belgium	0.052	0.058	0.014	0.016	1.777	3.928	0.523
					0.184	0.049	0.470
Canada	0.067	0.068	0.024	0.035	0.116	0.259	3.202
					0.734	0.611	0.075
Denmark	0.015	0.015	0.003	0.005	0.027	0.272	0.545
					0.869	0.602	0.461
France	0.010	0.010	0.014	0.014	0.136	4.234	0.027
					0.712	0.041	0.868
Germany	0.008	0.008	0.008	0.012	0.109	1.685	1.290
					0.742	0.195	0.257
Hong Kong	0.020	0.024	0.071	0.083	0.995	17.043	3.755
					0.319	0.000	0.054
Italy	0.005	0.006	0.017	0.030	0.190	5.583	3.603
					0.663	0.019	0.059
Japan	0.026	0.045	0.023	0.023	5.456	3.850	0.000
					0.020	0.051	1.000
Netherlands	0.037	0.037	0.042	0.044	0.000	4.961	0.397
					1.000	0.027	0.529
Norway	0.007	0.007	0.001	0.009	0.000	2.011	2.435
					1.000	0.157	0.120
Singapore	0.103	0.110	0.070	0.081	2.245	9.462	3.184
					0.135	0.002	0.075
Spain	0.025	0.030	0.022	0.053	1.448	10.455	8.697
					0.230	0.001	0.003
Sweden	0.013	0.019	0.004	0.008	1.513	3.299	1.011
					0.220	0.070	0.316
Switzerland	0.029	0.031	0.003	0.009	0.753	0.747	1.640
					0.386	0.388	0.201
United Kingdom	0.053	0.055	0.111	0.142	0.429	35.819	9.566
					0.513	0.000	0.002
United States	0.057	0.058	0.016	0.023	0.315	0.284	1.998
					0.575	0.594	0.159

Table 8
A Decomposition of the Predictable Variation in International Equity Returns
January 1975 to December 1997

A. One factor: wdret

		Beta is function of local information			Beta is function of wrpbret and local information			Beta is function of locpb and local information		
	Average return	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (lagged lwrpbret)	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (lagged local pb)
Australia	0.0130	0.0013	0.855	8.766	0.0021	0.836	2.031	0.0022	0.935	4.230
		0.0033	0.176	0.033	0.0034	0.172	0.154	0.0035	0.120	0.040
Austria	0.0094	0.0007	0.000	1.126	0.0005	0.006	0.365	0.0008	0.020	0.398
		0.0041	0.011	0.771	0.0043	0.070	0.546	0.0041	0.145	0.528
Belgium	0.0140	0.0024	0.689	0.474	0.0029	0.698	2.842	0.0025	0.699	0.002
		0.0029	0.215	0.925	0.0029	0.205	0.092	0.0029	0.216	0.966
Canada	0.0110	-0.0007	0.749	12.661	-0.0013	0.744	0.125	-0.0014	0.751	0.015
		0.0021	0.168	0.005	0.0021	0.173	0.724	0.0022	0.175	0.903
Denmark	0.0130	0.0025	0.124	0.322	0.0027	0.068	0.220	0.0026	0.084	0.811
		0.0028	0.294	0.956	0.0027	0.242	0.639	0.0028	0.263	0.368
France	0.0140	0.0004	0.297	1.500	0.0011	0.290	0.020	0.0011	0.282	0.460
		0.0032	0.526	0.682	0.0033	0.543	0.889	0.0034	0.535	0.498
Germany	0.0130	0.0016	0.216	0.850	0.0011	0.082	0.130	0.0013	0.098	0.026
		0.0029	0.372	0.837	0.0030	0.257	0.718	0.0030	0.273	0.873
Hong Kong	0.0210	0.0098	0.700	5.357	0.0083	0.579	4.081	0.0077	0.586	2.804
		0.0048	0.425	0.147	0.0051	0.637	0.043	0.0049	0.623	0.094
Italy	0.0120	-0.0001	0.605	1.159	-0.0003	0.488	0.218	-0.0002	0.491	0.011
		0.0041	0.631	0.763	0.0041	0.752	0.640	0.0041	0.760	0.916
Japan	0.0120	-0.0020	0.554	5.268	-0.0019	0.450	0.779	-0.0015	0.476	0.006
		0.0029	0.245	0.153	0.0029	0.258	0.377	0.0029	0.255	0.939
Netherlands	0.0170	0.0052	0.772	4.444	0.0046	0.713	0.296	0.0047	0.722	0.029
		0.0019	0.175	0.217	0.0019	0.210	0.586	0.0019	0.206	0.864
Norway	0.0120	-0.0002	0.016	0.356	0.0006	0.009	4.346	-0.0009	0.004	1.507
		0.0048	0.173	0.949	0.0047	0.128	0.037	0.0048	0.090	0.220
Singapore	0.0140	0.0010	0.732	2.354	0.0001	0.611	0.782	0.0028	0.566	5.032
		0.0036	0.230	0.502	0.0038	0.271	0.377	0.0035	0.278	0.025
Spain	0.0098	-0.0020	0.126	15.089	-0.0009	0.022	4.304	-0.0015	0.037	0.845
		0.0035	0.216	0.002	0.0036	0.108	0.038	0.0035	0.136	0.358
Sweden	0.0160	0.0041	0.465	6.186	0.0042	0.305	0.055	0.0043	0.377	2.940
		0.0030	0.367	0.103	0.0032	0.372	0.814	0.0031	0.387	0.086
Switzerland	0.0150	0.0029	0.572	1.376	0.0026	0.555	0.004	0.0026	0.541	0.140
		0.0026	0.220	0.711	0.0026	0.237	0.947	0.0026	0.234	0.708
United Kingdom	0.0180	0.0036	0.725	7.117	0.0030	0.509	0.817	0.0028	0.520	2.078
		0.0028	0.239	0.068	0.0027	0.299	0.366	0.0028	0.301	0.149
United States	0.0140	0.0021	0.919	2.656	0.0023	0.882	1.075	0.0021	0.910	0.458
		0.0015	0.086	0.448	0.0014	0.101	0.300	0.0015	0.098	0.499

Table 8 (continued)

A Decomposition of the Predictable Variation in International Equity Returns

January 1975 to December 1997

	B. Three factor: wdret, euroret, yenret				*C. Two factor: wdret, wrpbret*			*D. Four factor: wdret, euroret, yenret, wrpbret*		
	Average return	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)
Australia	0.0130	0.0015	0.910	24.862	-0.0009	0.856	12.593	-0.0010	0.937	34.778
		0.0033	0.214	0.003	0.0034	0.171	0.050	0.0034	0.148	0.001
Austria	0.0094	0.0029	0.791	19.202	-0.0008	0.225	14.100	0.0001	0.970	36.800
		0.0038	0.951	0.024	0.0041	0.516	0.029	0.0038	0.267	0.000
Belgium	0.0140	0.0040	0.720	26.562	0.0012	0.704	4.105	0.0022	0.727	33.999
		0.0023	0.201	0.002	0.0029	0.254	0.662	0.0022	0.247	0.001
Canada	0.0110	0.0000	0.904	28.889	-0.0021	0.773	17.672	-0.0009	0.954	35.719
		0.0021	0.117	0.001	0.0022	0.158	0.007	0.0022	0.108	0.000
Denmark	0.0130	0.0027	0.622	12.977	0.0021	0.329	1.785	0.0019	0.961	17.713
		0.0027	0.549	0.164	0.0030	0.522	0.938	0.0028	0.238	0.125
France	0.0140	0.0013	0.631	19.400	-0.0003	0.435	8.897	0.0001	0.696	29.769
		0.0028	0.558	0.022	0.0031	0.589	0.179	0.0027	0.497	0.003
Germany	0.0130	0.0039	0.772	23.429	-0.0004	0.326	3.667	0.0014	0.871	22.402
		0.0028	0.575	0.005	0.0030	0.502	0.722	0.0027	0.701	0.033
Hong Kong	0.0210	0.0114	0.952	26.448	0.0054	0.689	7.486	0.0068	0.991	37.687
		0.0048	0.155	0.002	0.0049	0.470	0.278	0.0047	0.086	0.000
Italy	0.0120	-0.0005	0.613	32.591	-0.0018	0.641	4.484	-0.0025	0.693	52.243
		0.0038	0.704	0.000	0.0044	0.752	0.611	0.0041	0.633	0.000
Japan	0.0120	-0.0026	0.854	20.724	-0.0029	0.591	15.884	-0.0033	0.883	31.379
		0.0023	0.149	0.014	0.0032	0.216	0.014	0.0024	0.121	0.002
Netherlands	0.0170	0.0058	0.921	23.779	0.0035	0.849	13.931	0.0040	0.924	49.326
		0.0018	0.142	0.005	0.0019	0.196	0.030	0.0018	0.149	0.000
Norway	0.0120	0.0009	0.880	4.000	-0.0034	0.058	8.309	-0.0029	0.910	10.965
		0.0044	0.361	0.911	0.0049	0.336	0.216	0.0046	0.345	0.532
Singapore	0.0140	0.0001	0.871	17.784	-0.0023	0.891	7.332	-0.0027	0.995	22.731
		0.0037	0.197	0.038	0.0039	0.137	0.291	0.0040	0.034	0.030
Spain	0.0098	-0.0012	0.672	39.723	-0.0027	0.438	23.093	-0.0019	0.800	57.628
		0.0035	0.516	0.000	0.0033	0.329	0.001	0.0034	0.300	0.000
Sweden	0.0160	0.0046	0.835	15.188	0.0028	0.524	12.719	0.0032	0.886	20.361
		0.0030	0.284	0.086	0.0034	0.376	0.048	0.0033	0.300	0.061
Switzerland	0.0150	0.0041	0.956	26.600	0.0017	0.591	4.729	0.0024	0.948	33.138
		0.0023	0.139	0.002	0.0028	0.262	0.579	0.0025	0.146	0.001
United Kingdom	0.0180	0.0025	0.906	14.322	0.0030	0.894	12.165	0.0017	0.992	19.253
		0.0028	0.150	0.111	0.0031	0.214	0.058	0.0030	0.074	0.083
United States	0.0140	0.0024	0.979	24.180	0.0027	0.953	2.955	0.0035	0.980	34.640
		0.0013	0.038	0.004	0.0016	0.089	0.814	0.0012	0.043	0.001

Table 8 (continued)

A Decomposition of the Predictable Variation in International Equity Returns

January 1975 to December 1997

		E. Six factor: wdret, euroret, yenret, economic mimicking			*F. Seven factor: wdret, euroret, yenret, economic mimicking, wrpbret*		
	Average return	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)	Average pricing error (alpha)	Variance ratio (VR1)	χ^2 constant beta (local info.)
Australia	0.0130	-0.0002	0.959	15.865	-0.0024	0.975	32.001
		0.0037	0.149	0.198	0.0036	0.131	0.006
Austria	0.0094	0.0030	0.907	18.093	0.0001	0.960	54.452
		0.0037	0.623	0.113	0.0041	0.245	0.000
Belgium	0.0140	0.0057	0.973	24.798	0.0039	0.971	32.462
		0.0027	0.075	0.016	0.0025	0.076	0.006
Canada	0.0110	-0.0021	0.995	28.506	-0.0026	0.999	42.649
		0.0023	0.029	0.005	0.0021	0.010	0.000
Denmark	0.0130	0.0026	0.946	31.505	0.0018	0.958	34.716
		0.0027	0.365	0.002	0.0027	0.225	0.003
France	0.0140	0.0005	0.877	39.388	-0.0008	0.894	53.254
		0.0028	0.492	0.000	0.0027	0.395	0.000
Germany	0.0130	0.0057	0.771	22.648	0.0028	0.864	27.781
		0.0027	0.711	0.031	0.0028	0.679	0.023
Hong Kong	0.0210	0.0119	0.968	25.139	0.0061	0.999	39.523
		0.0051	0.153	0.014	0.0052	0.030	0.001
Italy	0.0120	0.0017	0.976	39.637	-0.0005	0.994	87.213
		0.0041	0.245	0.000	0.0043	0.124	0.000
Japan	0.0120	-0.0029	0.975	28.066	-0.0032	0.987	40.739
		0.0025	0.118	0.005	0.0025	0.046	0.000
Netherlands	0.0170	0.0048	0.923	25.217	0.0031	0.929	61.984
		0.0020	0.175	0.014	0.0017	0.135	0.000
Norway	0.0120	-0.0068	0.824	25.383	-0.0097	0.866	52.947
		0.0033	0.441	0.013	0.0035	0.275	0.000
Singapore	0.0140	-0.0021	0.995	37.473	-0.0038	0.999	49.000
		0.0040	0.054	0.000	0.0039	0.001	0.000
Spain	0.0098	-0.0006	0.604	47.526	-0.0018	0.648	76.230
		0.0033	0.779	0.000	0.0033	0.419	0.000
Sweden	0.0160	0.0056	0.837	14.030	0.0041	0.874	19.625
		0.0034	0.384	0.299	0.0034	0.350	0.187
Switzerland	0.0150	0.0050	0.990	19.980	0.0035	0.995	34.511
		0.0023	0.075	0.067	0.0026	0.069	0.003
United Kingdom	0.0180	0.0020	0.936	17.099	0.0012	0.994	25.007
		0.0029	0.314	0.146	0.0029	0.066	0.050
United States	0.0140	0.0029	0.981	30.858	0.0038	0.988	42.935
		0.0014	0.061	0.002	0.0014	0.290	0.000