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The Fama-French factors as proxies for Fundamental Economic Risks

Abstract

This paper provides an economic interpretation for the book-to-market (HML) and size (SMB) factors in the Fama-French model using data from ten developed countries. We show that part of the information in these factors that is priced in equity returns, refers to news about future GDP growth. However, a model that includes only the market factor and news about future GDP growth cannot explain asset returns as well as the Fama-French model does. Our tests reveal that HML and SMB also contain important information about the current default premium. A model that includes the information in HML and SMB about the default premium and news about future GDP growth, together with the market factor, can successfully replicate the performance of the Fama-French model in the US. Our results suggest that HML and SMB summarize information about two state variables: the current default premium and news about future GDP growth.

1. Introduction

One of the main research topics in asset pricing in the 1990's has been the work initiated by Fama and French (1992). Fama and French show that the domestic Capital Asset Pricing Model (CAPM) can no longer explain the cross-section of asset returns in the US. They propose an alternative model which includes a factor related to book-to-market information (HML) and a factor related to size (SMB). Fama and French (1992, 1993, 1995, 1996, 1998) document that their model does a good job in explaining equity returns, not only in the US but also internationally. However, there is still little evidence that their proposed factors are related to fundamental risk in the economy.

The question of whether the book-to-market and size factors in the Fama-French model are related to fundamental risk in the economy is crucial. If the HML and SMB factors are anomalies, we can expect them to disappear at some point, rendering the model of little practical relevance. If HML and SMB are indeed risk factors, then it is appropriate to use the Fama-French model, instead of the domestic CAPM, for pricing risky assets.

Recently, Liew and Vassalou (1999) showed that the Fama-French factors can predict future Gross Domestic Product (GDP) growth. This suggests that HML and SMB may be related to fundamental risk factors. However, their work does not explore the asset pricing implications of their finding. In particular, it does not answer the questions of whether GDP growth is a priced risk factor in equity returns and whether it can account for all the asset pricing-related information contained in HML and SMB.

This paper addresses the above questions. We show that news regarding future GDP growth is an important factor in explaining equity returns in ten developed markets. A model that includes a news factor regarding future GDP growth, along with the market factor, can explain more variation in returns than the domestic CAPM.

However, news about future GDP growth is not the only risk related information contained in HML and SMB. Using data for the US, we show that the Fama-French factors also include information about the current default premium. Furthermore, this information is important for pricing equities. A model that includes the information in HML and SMB with respect to the current default premium and news for future GDP growth, in addition to the market factor, constitutes a significant improvement over the domestic CAPM. Furthermore, its ability to explain equity returns is similar to that of the Fama-French model. Our results suggest that HML and SMB summarize information about two risk factors: current default premium and news about future GDP growth.

The remaining of the paper is organized as follows: Section 2 describes the data and the testing approach. Section 3 presents tests of the domestic CAPM and the Fama-French model for ten countries. Using the same data, Section 4 presents tests of a model which includes, apart from the market factor, information on news regarding future GDP growth derived from the HML and SMB factors. Section 5 shows that the Fama-French factors contain also information about the current default premium. It then continues by testing a model that includes, apart from the market factor, the default premium and news on GDP growth conditional on HML and SMB. Due to data unavailability, these tests are confined to the US market. We conclude with a summary of our results in Section 6.

2. Data and empirical approach

2.1 Data

The equity data used in this study are the same as those in Liew and Vassalou (1999). They include end-of-month prices, dividend yields, price-to-book ratios, and market capitalization data both from currently trading and defunct securities. The countries covered are Australia, Canada, France, Germany, Italy, Japan, Netherlands, Switzerland, UK, and USA. The source is Datastream. The time period spanned by the data differs across countries. Appendix 1 reports the number of securities available each year in all ten country samples.

Short-term interest rates are obtained from the database of the International Monetary Fund. We use the three-month Treasury Bill (TB) rate for Australia, Canada, Switzerland, UK, and USA, whereas we use the Call Money Rate for the remaining countries. The GDP data are from OECD's Main Indicators and the National Government Series. They are seasonally adjusted. In the case of Japan, we use GNP data, since a GDP series is not available. Finally, the US default premium is obtained from Ibbotson Associates. It is defined as the return of long-term corporate bonds minus the return on long-term government bonds. All returns in the paper are continuously compounded.

Although part of the tests in this paper use data from many countries, it will be incorrect to characterize it as an international study. This paper does not attempt to address any of the complexities that are in the heart of international finance. Whenever data are available, we repeat purely domestic tests for many countries in order to avoid the possibility that our results are sample specific.

2.2. Portfolio construction and empirical methodology.

The construction of the HML and SMB factors follows that of Liew and Vassalou (1999). Given the small number of securities we have in some countries, the Fama and French (1993) portfolio construction methodology cannot be applied in our case without sacrificing several years of data. The Liew and Vassalou approach involves two sequential sorts. Stocks are first sorted according to book to market (B/M) and three portfolios are formed. Subsequently, each of the three portfolios is split into three new portfolios using market capitalization (MV) information. The result is the creation of nine portfolios in total. HML is then the return on a zero-investment portfolio that is long on high B/M stocks and short on low B/M stocks, while it is neutral in terms of the size characteristics of its constituents. Similarly, SMB is the return on a zero-investment portfolio that is long on small MV stocks and short on big MV stocks, while it remains neutral in terms of its B/M characteristics.

Since the portfolio construction approach uses sequential sorts, it is possible that the HML and SMB factors are specific to the sequence chosen. To check whether our results are influenced by the sorting sequence we use, we do the following. Keeping the time-period the same, we repeat the tests for the US sample using the HML and SMB factors constructed by Fama and French.[1] Our results remain qualitatively the same. To avoid repetition, we do not report them here.

The portfolios are rebalanced every end of June. We use six-month prior B/M information to make sure that it was available to the public at the time the portfolios were formed. The market capitalization information is that of June-end. If a stock ceases to exist during the holding period of the portfolio, we invest that proportion of the portfolio in its country's riskless asset.

Table 1 provides summary statistics on the nine portfolios formed in each country. The

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[1] We are grateful to Kenneth French for providing us with the data.

portfolio formation approach gives rise to a wide range of means for the dependent variables of our asset pricing tests. The difference between the largest and smallest mean across the portfolios of each country is of the order of one percent per month. These relatively large differences in returns provide power for the asset pricing tests.

To test the models, we use the time-series regression approach of Black, Jensen and Scholes (1972). This is also the empirical approach adopted by Fama and French (1993, 1995, 1996, 1998). We purposely adopt the same testing methodology in order to facilitate the interpretation of our results in relation to those of Fama and French. The standard errors of the regressions are corrected for White (1980) heteroskedasticity and serial correlation up to three lags using the Newey-West (1987) estimator. To test whether the intercepts from the time-series regressions are jointly different from zero, we compute the Gibbons, Ross, and Shanken (GRS) (1989) F-test based on Ordinary Least Squares (OLS) regressions.

3. Tests of the domestic CAPM and the Fama-French model.

We start our analysis with a brief discussion of our tests of the domestic CAPM and the Fama-French model. The results of these tests set a benchmark for evaluating the performance of the models proposed later in the paper.

To test the domestic CAPM, we estimate the following regression:

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + e_i^k(t)$$

where:

$R_i^k(t)$ is the return on portfolio i of country k;

$RF^k(t)$ is the risk-free interest rate of country k;

$RM^k(t)$ denotes the return on the stock market portfolio of country k; and

$e_i^k(t)$ denotes the residuals of the regression.

Table 2 reports the results. It shows that the market portfolio can explain part of the variation in returns in all countries. However, for several portfolios, more than 50% of the variation in returns remains unexplained. The smallest R-squares are typically those referring to high B/M and small MV portfolios. In addition, the values of the intercepts are economically large. For instance, the mean absolute intercept (MAI) across US portfolios is forty five basis points (bps) per month. In the remaining countries, MAI varies between nineteen bps for Germany, and eighty five bps for Australia. These findings are in line with those reported in Fama and French (1993) for the US market.

The results from the GRS F-test are reported in Table 3. In five out of the ten countries, we reject at the 5% level the hypothesis that the intercepts of the high B/M portfolios are jointly zero. The hypothesis that the intercepts of the small MV portfolios are jointly zero is rejected in six countries at the 5% level. There results suggest that there are more factors affecting equity returns than simply the market factor.

Next, we test the Fama-French model using the following regression model:

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + cSMB^k(t) + dHML^k(t) + e_i^k(t)$$

where:

$SMB^k(t)$ is the return on a zero-investment portfolio in country k that is long on small MV stocks and long on big MV stocks; and

$HML^k(t)$ is the return on a zero-investment portfolio in country k that is long on high B/M stocks and short on low B/M stocks.

The results from the tests of the Fama-French model are presented in Table 6. The slope coefficients of HML and SMB are statistically significant for the majority of the portfolios. In addition, the betas of the market factor in each country are larger and closer to one than those in the case of the domestic CAPM. As expected, the R-squares are now higher than those of the domestic CAPM. The increase is more notable in the cases of small MV and high B/M portfolios. In general, at least 70% of the variation in returns is explained by the model. The GRS F-tests in Table 5 still suggest that the hypothesis of zero intercepts is rejected in some countries. However, the economic significance of these intercepts is much smaller. For instance, the MAI across the US portfolios is now only thirteen bps. In the remaining countries, it varies between seven bps for Japan and eighty bps for Australia. Our results for the US are again consistent with those reported in Fama and French (1993).

4. News on GDP growth conditional on HML and SMB

In this section, we test whether the asset pricing-related information in HML and SMB refers solely to information regarding GDP growth. Liew and Vassalou (1999) show that the current year's returns on HML and SMB can predict next year's GDP growth. The model tested in this section builds on this finding. Our aim is to see whether we can replicate the performance of the Fama-French model discussed above by simply using the GDP related information in HML and SMB.

For each country, we regress next year's GDP growth on the current year's returns on HML and SMB:

$$GDPGR^k(t,t+4) = m_0 + m_1 HML^k(t-4,t) + m_2 SMB^k(t-4,t) + e^k(t,t+4)$$

where:

$GDPGR^k(t,t+4)$ denotes the GDP growth in country k over the next year (i.e., four quarters ahead).

The regressions in (3) are performed using quarterly data, since GDP is only observed on a quarterly basis. The results are reported in Table 6. We can see that in all cases apart from that of HML in Canada, the coefficients on HML and SMB are positive. This implies that an increase in HML and/or SMB is associated with an increase in future GDP growth. Furthermore this positive relation is statistically significant in seven of the ten countries. These results are consistent with those reported in Liew and Vassalou (1999).[2]

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[2] Note that the regressions performed here are not identical to those reported in Liew and Vassalou (1999). Our aim in this section is to extract only information contained in HML and SMB about future GDP growth. Therefore, the market factor, as well as other business cycle variables considered in Liew and Vassalou, are omitted.

We isolate the information about future GDP growth contained in HML and SMB by calculating the forecast values of GDP growth from the regressions in Table 6. These forecasts represent expectations about future GDP growth included in the returns of HML and SMB. In the remainder of the paper we assume that expectations about future GDP growth are well approximated by expectations about next year's GDP growth.[3] We then create a variable which proxies for "news" on expectations of future GDP growth by calculating the first difference of the forecast values. This variable is our candidate risk factor in the asset pricing model presented here. It is necessary to calculate the change in forecasts since only "news" about future values of economic variables may be priced in asset returns. We will call this variable NGDPGR.

The asset pricing model we test in Table 7 is based on the following regression model:

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + f\ NGDPGR^k(t) + e_i^k(t)$$

This is a conditional model in the sense that NGDPGR is conditional on the information This contained in HML and SMB about future GDP growth. Again, these tests are performed using quarterly observations. Furthermore, we express NGDPGR on an annual basis. The interpretation of the slope coefficients is therefore as follows. For instance, in the case of the US portfolios, news about a one percent increase in next year's expected GDP growth leads to a 5.11 percent increase in the returns of the low B/M and small MV portfolio over the current quarter.

The results of Table 7 suggest that NGDPGR is important for explaining asset returns in all

[3] We concentrate on next year's expectations about GDP growth, because this is the horizon for which HML and SMB have the most predictive power. This is also the horizon studied in Liew and Vassalou (1999).

countries and for most of the portfolios examined. The slope coefficients of NGDPGR are generally positive and economically significant. This means that good news about future GDP growth will lead to increases in equity returns. These increases tend to be larger, in most countries, for small MV and, to some extent, for high B/M portfolios. In other words, all stocks stand to benefit from positive news about future GDP growth, but small MV and high B/M stocks may benefit more.

The slope coefficients of NGDPGR are also, in general, statistically significant. The average adjusted R-squares are significantly higher than those for the domestic CAPM. An average increase in the adjusted R-squares of at least eight percentage points is observed for France, Germany, Japan, Netherlands, Switzerland, and UK and USA. The increases are generally larger for the small MV and high B/M portfolios.

Given that most slope coefficients of NGDPGR are economically and statistically significant, and given that the adjusted R-squares are substantially larger than those of the domestic CAPM, one would expect to find an equally important decrease in the average alphas (intercepts). That is not, however, the case. The MAI is lower, compared to that of the domestic CAPM, in the US, Australia, Netherlands and the UK, but remains largely the same or increases slightly in the remaining countries.[4] In addition, the GRS F-tests, reported in Table 8, often reject the hypothesis that the intercepts are statistically indistinguishable from zero. Note also that the intercepts are generally positive. This means that although NGDPGR can explain part of the variation in equity returns, the mean of the series is too low to explain the mean of the portfolio returns.

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[4] Recall that the tests of this model are performed using quarterly observations, since GDP is only observed quarterly. Therefore, to compare the intercepts of this model with those of the domestic CAPM and the Fama-French model, we need to divide them by three.

A comparison of the results of this model with those of the Fama-French model, show that the Fama-French model remains superior in its ability to explain equity returns. Therefore, although HML and SMB contain information about future GDP growth and NGDPGR is priced, there is still important asset pricing-related information in HML and SMB which is still unknown. In the following section, we explore further the information content of the Fama-French factors.

5. The Fama-French factors and the default premium.

Fama and French (1993) test whether bond factors such as a term premium (the difference between long-term bond returns and the one-month T-Bill rate) and default premium (the difference between the return on long-term corporate and government bonds) are priced in equity returns. They find that both the term premium (TERM) and default premium (DEF) can explain part of the variation in the returns of equities. However, in the presence of HML and SMB, TERM and DEF lose their ability to explain equity returns. They interpret this finding by showing that the common variation in stock returns related to term-structure factors is contained in the excess market return. In this section, we provide an alternative interpretation of their result. We show that a reason why DEF loses its explanatory power in the presence of HML and SMB is that HML and SMB contain significant information about the current default premium. Due to data limitations, our analysis in this section is limited to the US market.

Fama and French (1995) show that HML and SMB are related to profitability. High B/M stocks tend to be persistently distressed, whereas small MV stocks are less profitable than big MV stocks. The hypothesis we test in this section is related to that of Fama and French (1995). We test whether HML and SMB contain information about the current default premium. If high B/M stocks are relatively distressed, then HML may contain information about the default premium. For the same reason, small MV stocks may earn a default premium which is captured by the SMB factor.

The default premium may be another state variable in Merton's (1973) Intertemporal Capital Asset Pricing Model (ICAPM). The existence of a default premium affects the cost of borrowing of firms, and therefore, their ability to take advantage of their investment opportunities.

6.1 Current default premium and news on future GDP growth conditional on HML and SMB.

We project the variable DEF on SMB and HML in order to extract any information contained in the Fama-French factors about the current default premium. The regression produces the following results (t-values, corrected for heteroskedasticity and serial correlation up to three lags, appear in parentheses):

$$DEF(t) = -0.002 + 0.076\ SMB(t) + 0.058\ HML(t) + e(t) \qquad \textbf{(5)}$$

$$(-1.20) \quad (2.28) \qquad\qquad (2.06) \qquad\qquad \text{adj. } R^2\text{: } 0.06$$

In other words, both SMB and HML contain information about the current level of default premium. The slope coefficients are positive, which means that an increase in the returns of SMB and/or HML is associated with an increase in the default premium.

We construct a variable, FDEF, that captures *only* the information contained in the Fama-French factors about default premium. This is done by summing the products of the slope coefficients with SMB and HML.

FDEF is used as explanatory variable in the asset pricing tests of Table 9. The regression model employed is as follows:

$$R_i^{US}(t) - RF^{US}(t) = a + b[\,RM^{US}(t) - RF^{US}(t)] + f\ NGDPGR^{US}(t) + g\ FDEF^{US}(t) + e_i^{US}(t)$$

Six out of the nine slope coefficients of FDEF are statistically significant at the 5% level. It appears that FDEF is particularly able to explain the returns of high B/M and small MV portfolios. Similarly to the case of NGDPGR, we express FDEF in annual terms.

The slope coefficients of FDEF are always positive except in the case of the low B/M - big MV portfolio. Positive coefficients imply that an increase in the default premium triggers an increase in the returns of the portfolios. Recall that an increase in the default premium implies a decrease in the cost of borrowing. Since high B/M and small MV firms have typically high debt ratios, they are able to benefit the most from an increase in the default premium. As a result, their returns go up.

Table 9 also shows that the slope coefficients of NGDPGR are also statistically significant, at the 10% level or less, for five portfolios. Their values, however, are somewhat smaller than those reported in Table 7. NGDPGR and FDEF have a correlation of 0.32. This explains the observed reduction in the values and statistical significance of the NGDPGR slope coefficients when FDEF is included in the regression model.

Note that the intercepts of the model in Table 9 are smaller in magnitude than those reported in Table 7. The GRS F-tests suggest that the intercepts are not statistically different from zero in two cases: the high B/M and big-MV portfolios. The intercept of the low B/M-small MV portfolio is , however, economically significant. It has a value of -168 bps and a t-value of -1.61. The values of this coefficient lead to the rejection of the hypotheses of jointly zero intercepts in the cases of low

B/M and small-MV portfolios. Despite this fact, the MAI of the model is only 12 bps per month. This has to be compared with a MAI of 13 bps for the Fama-French model, 45 bps for the domestic CAPM, and 40 for the GDP news model.[5]

A comparison of the adjusted R-squares of Tables 7 and 9 shows significant increases in the R-squares of the high B/M and small MV portfolios. Furthermore, the R-squares for the proposed model are comparable to those of the Fama-French model in Table 4. Overall, the proposed model appears to have similar ability to explain returns in the US as the Fama-French model does. In addition, it seems to be able to explain the returns of high B/M portfolios reasonably well.

The above results suggest that a significant part of the information contained in SMB and HML refers to the current default premium and news about future GDP growth. Furthermore, using only the information in SMB and HML that refers to the default premium and news about future GDP growth, we are able to closely replicate the performance of the Fama-French model in the US. This implies that the Fama-French factors are, at least to a large extent, risk-based. Our results support the wide use of the Fama-French model in capital budgeting and portfolio management.

7. Conclusions

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[5] Note that when we estimate the domestic CAPM and the Fama-French models using quarterly observations instead of monthly, their intercepts are slightly smaller. However, a comparison of model (6) with the CAPM and the Fama-French model still leads to the same conclusion: model (6) performs significantly better than the CAPM and similarly to the Fama-French model.

This paper shows that the information contained in the Fama-French factors about equity returns is, to a large extent, risk-based. In particular, HML and SMB proxy for risk related to the current default premium and news about future GDP growth.

We show that the information contained in HML and SMB about news on future GDP growth is important for pricing equities in the ten developed markets examined. However, a model that contains only the market factor and information about news on future GDP growth cannot successfully replicate the performance of the Fama-French model. This means that the HML and SMB factors contain additional information which helps explain further the variation in equity returns.

Using data from the US market, we show that HML and SMB include also important information about the current default premium. We propose a model which incorporates the information in HML and SMB about the current default premium and news about future GDP growth, in addition to the market factor. This model can successfully replicate the performance of the Fama-French model in the US. Therefore, our results suggest that the asset-pricing related information in HML and SMB can be summarized as information regarding the current default premium and news about future GDP growth.

The results of this study show that the Fama-French factors proxy for two fundamental sources of risk in the economy, and pinpoint to two likely state variables in the context of Merton's (1973) ICAPM: the current default premium and news about future GDP growth. These findings provide an economic interpretation for the ability of the Fama-French model to explain asset returns.

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Table 1: Summary Statistics for Dependent Variables

	Means			Standard Deviations			t-statistics for means		
	Low	M	High	Low	M	High	Low	M	High
				Australia					
Small	1.36	1.87	1.50	8.49	12.28	6.43	1.92	1.83	2.80
M	0.30	0.95	0.91	6.50	6.99	5.27	0.55	1.63	2.07
Big	0.43	1.70	1.15	6.61	12.02	6.17	0.78	1.70	2.23
				Canada					
Small	0.72	0.93	1.71	6.50	4.83	5.64	1.66	2.90	4.57
M	0.29	0.71	1.26	5.64	4.89	4.61	0.79	2.19	4.12
Big	0.68	0.61	0.77	5.24	5.49	5.18	1.97	1.68	2.25
				France					
Small	0.69	1.22	2.32	6.60	6.57	7.59	1.36	2.41	3.96
M	0.52	1.07	1.37	5.96	6.15	7.14	1.12	2.25	2.48
Big	0.88	1.02	0.98	5.74	6.52	6.20	1.99	2.03	2.05
				Germany					
Small	0.07	0.31	0.66	3.82	4.11	4.00	0.20	0.83	1.80
M	0.05	0.29	0.33	4.12	4.48	4.15	0.14	0.71	0.87
Big	0.17	0.31	0.44	5.18	5.25	4.38	0.36	0.65	1.10
				Italy					
Small	-0.65	-0.06	0.28	7.57	7.54	8.51	-0.94	-0.08	0.37
M	-0.67	-0.35	-0.03	6.55	7.66	7.57	-0.94	-0.50	-0.03
Big	-0.39	-0.15	-0.03	7.03	7.41	7.67	-0.61	-0.21	-0.04
				Japan					
Small	0.49	0.82	1.04	7.70	7.28	6.83	0.89	1.56	2.11
M	-0.01	0.48	0.65	7.01	6.47	6.34	-0.02	1.03	1.42
Big	-0.14	0.29	0.57	6.08	6.02	5.94	-0.31	0.66	1.32
				Netherlands					
Small	1.00	1.47	1.21	6.63	5.99	7.35	2.28	3.71	2.48
M	0.96	0.96	0.95	6.16	6.14	5.76	2.34	2.36	2.49
Big	1.00	1.11	0.97	5.52	5.94	6.04	2.73	2.83	2.42
				Switzerland					
Small	0.01	0.38	0.95	5.23	5.03	5.80	0.02	0.86	1.89
M	0.07	-0.03	0.49	4.09	4.47	6.33	0.19	-0.08	0.89
Big	0.16	0.59	0.90	4.69	4.80	5.70	0.38	1.41	1.81
				United Kingdom					
Small	0.59	1.06	1.46	4.96	4.90	4.58	1.81	3.27	4.83
M	0.59	0.76	0.99	4.91	4.81	4.66	1.82	2.37	3.22
Big	0.54	0.81	0.99	5.10	5.10	5.10	1.60	2.39	2.92
				United States					
Small	1.00	1.23	1.76	7.08	5.66	5.44	2.14	3.29	4.87
M	0.72	0.92	1.27	5.99	4.87	4.89	1.82	2.84	3.92
Big	0.58	0.84	0.96	5.21	4.88	4.68	1.68	2.60	3.10

Note: In each country, stocks are classified into nine portfolios according to their book-to-market (B/M) and market value (MV) characteristics. The labels in the first column refer to MV characteristics, whereas the labels in the second row to B/M characteristics. Portfolios are rebalanced every end of June. We use the most recent available market value information at the time of the portfolio formation. However, we use six month prior book-to-market ratios. Stocks are first allocated into three portfolios according to their book-to-market values. Each portfolio is subsequently divided into three portfolios according to the market values of its stocks. All data are from Datastream. Returns are monthly and continuously compounded.

Table 2: Tests of the Domestic Capital Asset Pricing Model

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + e_i^k(t)$$

	Low	M	High	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			t-statistic for a			t-statistic for b			adjusted R^2	
							Australia								
Small	1.11	1.58	1.35	0.65	0.76	0.41	1.54	1.36	2.50	10.76	7.41	8.54	0.23	0.15	0.16
M	-0.00	0.65	0.72	0.79	0.78	0.51	-0.00	1.59	1.69	17.64	24.90	8.68	0.59	0.49	0.36
Big	0.09	1.34	0.83	0.90	0.96	0.83	0.27	1.64	3.09	21.02	14.49	18.15	0.75	0.25	0.72
							Canada								
Small	0.45	0.71	1.50	0.84	0.69	0.66	1.21	2.80	3.73	13.05	13.78	10.52	0.41	0.50	0.33
M	-0.00	0.45	1.05	0.92	0.81	0.64	-0.00	2.10	4.30	16.76	19.65	10.94	0.65	0.67	0.47
Big	0.40	0.30	0.49	0.88	0.97	0.90	2.00	1.68	2.43	24.94	23.07	20.00	0.69	0.76	0.73
							France								
Small	0.10	0.67	1.71	0.91	0.85	0.93	0.35	2.05	3.97	9.10	9.88	8.90	0.65	0.57	0.51
M	-0.05	0.49	0.73	0.88	0.89	0.98	-0.25	2.07	2.30	18.14	14.52	12.26	0.74	0.71	0.63
Big	0.29	0.37	0.39	0.91	1.00	0.91	1.76	1.96	1.69	25.20	17.70	17.84	0.86	0.80	0.73
							Germany								
Small	-0.01	0.22	0.58	0.40	0.45	0.39	-0.03	0.61	1.54	4.85	6.76	5.56	0.38	0.41	0.33
M	-0.05	0.16	0.22	0.53	0.61	0.54	-0.20	0.60	0.72	13.23	17.75	16.16	0.57	0.63	0.58
Big	0.02	0.15	0.30	0.74	0.78	0.70	0.10	0.64	2.01	11.20	28.51	25.22	0.71	0.75	0.87
							Italy								
Small	-0.25	0.31	0.69	0.98	0.93	1.01	-0.71	0.76	1.33	17.78	12.62	1.99	0.74	0.67	0.63
M	-0.22	0.05	0.37	0.85	1.00	0.98	-0.79	0.16	1.07	15.32	17.98	13.86	0.76	0.76	0.75
Big	-0.00	0.26	0.39	0.97	1.02	1.04	-0.02	0.96	1.52	22.01	22.65	16.41	0.85	0.85	0.82
							Japan								
Small	0.29	0.62	0.87	0.88	0.81	0.72	0.72	1.60	2.10	8.45	8.91	7.54	0.45	0.43	0.38
M	-0.21	0.28	0.47	0.87	0.85	0.78	-0.72	1.06	1.42	9.28	10.40	9.39	0.54	0.59	0.52
Big	-0.34	0.08	0.36	0.88	0.90	0.87	-1.81	0.44	1.59	13.95	15.93	17.07	0.73	0.77	0.73
							Netherlands								
Small	0.32	0.70	0.52	0.73	0.82	0.73	0.78	2.11	1.20	7.44	9.71	9.20	0.28	0.43	0.22
M	0.10	0.26	0.30	0.91	0.75	0.69	0.32	0.71	0.88	10.00	9.41	11.38	0.50	0.34	0.33
Big	0.18	0.29	0.14	0.88	0.88	0.89	0.68	0.95	0.49	11.04	10.12	14.36	0.58	0.50	0.50
							Switzerland								
Small	-0.42	-0.05	0.46	0.57	0.56	0.64	-1.01	-0.12	0.94	4.38	4.75	5.29	0.33	0.35	0.34

	Low	M	High	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			t-statistic for a			t-statistic for b			adjusted R^2	
M	-0.34	-0.49	-0.17	0.54	0.61	0.87	-1.24	-1.70	-0.41	9.80	9.48	10.75	0.49	0.52	0.53
Big	-0.41	0.00	0.18	0.74	0.77	0.95	-1.89	0.01	0.61	10.30	22.28	19.58	0.71	0.72	0.78
							United Kingdom								
Small	0.23	0.72	1.15	0.67	0.62	0.58	0.70	2.17	3.55	12.78	10.24	16.32	0.46	0.40	0.40
M	0.17	0.34	0.60	0.78	0.75	0.72	0.76	1.51	2.43	21.27	17.59	17.81	0.64	0.62	0.60
Big	0.04	0.31	0.49	0.93	0.91	0.92	0.27	2.11	3.06	38.77	32.86	35.13	0.84	0.81	0.82
							United States								
Small	0.22	0.60	1.24	1.26	1.02	0.83	0.68	2.41	3.92	13.50	11.94	8.13	0.56	0.58	0.41
M	-0.03	0.31	0.69	1.21	0.98	0.93	-0.14	1.88	3.30	21.48	18.88	13.06	0.73	0.73	0.65
Big	-0.01	0.20	0.36	1.13	1.03	0.96	-0.96	1.60	2.11	29.92	29.56	16.84	0.84	0.79	0.76

Note: Returns are monthly and expressed in the local currency of each country. R^k_i refers to the return of portfolio i in country k. RM^k is the return on the market portfolio of country k which is proxied by its MSCI index. RF^k is the one-month risk-free rate of country k. Stocks are classified first into three portfolios according to their book-to-market values. Subsequently, each portfolio is divided into three portfolios according to the market values of its stocks. Nine portfolios are formed in total for each country. The t-values reported are corrected for White(1980) heteroskedasticity and serial correlation up to three lags, using the Newey-West (1987) estimator.

Table 3: Gibbons, Ross, and Shanken (1989) F-tests on the estimated intercepts of the Capital Asset Pricing Model.

	Portfolios			
	H-B/M	L-B/M	S-MV	B-MV
	Australia			
F(a)	4.83	1.45	2.85	3.48
p(F)	0.003	0.231	0.039	0.018
	Canada			
F(a)	9.75	2.42	9.01	3.67
p(F)	0.000	0.067	0.000	0.013
	France			
F(a)	5.94	1.60	8.73	1.92
p(F)	0.001	0.191	0.000	0.128
	Germany			
F(a)	2.11	0.04	2.24	1.50
p(F)	0.102	0.988	0.087	0.219
	Italy			
F(a)	0.88	0.32	2.59	0.87
p(F)	0.452	0.813	0.056	0.461
	Japan			
F(a)	2.29	2.71	3.91	3.00
p(F)	0.079	0.047	0.010	0.032
	Netherlands			
F(a)	0.61	0.36	1.98	0.40
p(F)	0.610	0.783	0.117	0.754
	Switzerland			
F(a)	1.79	1.21	1.87	1.77
p(F)	0.152	0.307	0.137	0.155
	United Kingdom			
F(a)	9.56	0.34	14.88	4.83
p(F)	0.000	0.795	0.000	0.002
	United States			
F(a)	6.85	0.98	13.21	3.64
p(F)	0.000	0.405	0.000	0.014

Note: The Gibbons, Ross and Shanken (1989) F-statistic tests whether the intercepts from the regressions of the domestic CAPM (Table 2) are jointly zero for portfolios of the same country. Four groups of portfolios are studied: high book-to-market (B/M), low B/M, small market value (MV), and big MV.

Table 4: Tests of the Fama-French Model

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + cSMB^k(t) + dHML^k(t) + e_i^k(t)$$

	Low	M	High	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			c			d				
Australia															
Small	1.29	0.87	0.74	0.64	1.11	0.68	0.71	1.22	0.67	-1.05	-0.02	0.37			
M	0.23	0.77	0.38	0.72	0.73	0.64	0.19	-0.07	0.30	-0.60	-0.14	0.28			
Big	0.38	1.73	0.78	0.80	0.79	0.84	0.01	-0.35	-0.07	-0.53	-0.34	0.17			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	2.45	1.19	1.85	4.68	5.31	6.33	2.38	2.68	2.89	-5.67	-0.09	2.63	0.63	0.41	0.49
M	0.70	1.51	0.98	17.41	16.80	8.66	3.49	-0.70	2.86	-5.51	-1.19	2.32	0.73	0.49	0.48
Big	1.55	1.60	2.88	19.70	9.98	17.85	0.19	-1.76	-1.43	-8.09	-1.53	2.25	0.84	0.27	0.73
Canada															
Small	0.33	0.36	0.54	0.98	0.83	0.94	1.30	0.79	1.05	-0.70	-0.05	0.60			
M	0.16	0.24	0.53	0.92	0.89	0.79	0.33	0.34	0.47	-0.44	0.06	0.39			
Big	0.78	0.26	0.19	0.80	0.98	0.97	0.03	-0.02	0.13	-0.54	0.08	0.32			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	1.62	1.96	2.96	18.65	24.02	17.15	13.47	9.51	8.13	-9.81	-0.85	5.60	0.80	0.70	0.71
M	0.90	1.34	3.15	17.02	22.33	15.77	3.42	3.38	5.97	-5.60	1.10	5.69	0.72	0.71	0.62
Big	4.61	1.47	1.26	20.33	21.59	20.15	0.33	-0.22	2.07	-8.16	1.06	5.64	0.77	0.76	0.76
France															
Small	-0.16	0.07	0.50	0.97	0.89	0.95	1.02	1.09	1.17	-0.28	0.09	0.80			
M	-0.08	0.15	-0.18	0.91	0.91	0.97	0.51	0.56	0.60	-0.26	0.09	0.75			
Big	0.40	0.16	-0.15	0.93	1.00	0.88	0.18	0.15	-0.05	-0.24	0.17	0.67			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	-0.85	0.35	2.33	23.53	25.35	27.47	12.20	17.27	16.31	-3.43	0.88	9.77	0.85	0.83	0.87
M	-0.46	0.74	-0.87	20.78	21.23	21.25	4.85	7.88	7.97	-4.08	0.75	6.66	0.80	0.79	0.82
Big	2.39	0.83	-0.75	31.50	20.02	21.58	3.44	1.41	-0.69	-3.46	1.54	7.32	0.87	0.81	0.82
Germany															
Small	0.18	0.19	0.40	0.71	0.77	0.75	0.99	1.00	1.09	-0.78	-0.18	0.17			
M	0.11	0.19	0.10	0.71	0.76	0.67	0.57	0.47	0.41	-0.57	-0.19	0.22			
Big	0.40	0.17	0.19	0.71	0.82	0.70	-0.06	0.14	-0.00	-0.98	-0.08	0.28			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	1.01	0.87	2.18	16.03	15.44	12.99	8.65	7.76	8.90	-9.27	-1.39	1.48	0.75	0.67	0.68
M	0.51	0.81	0.39	11.33	13.04	10.58	4.15	3.54	2.36	-5.10	-1.46	1.77	0.69	0.68	0.63

	Low	M	High	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			c			d				
Big	2.12	0.69	1.39	13.84	13.97	21.11	-0.46	0.91	-0.05	-7.73	-0.50	3.97	0.82	0.75	0.88
								Italy							
Small	-0.05	040	0.24	1.04	0.98	1.01	0.97	1.11	1.18	-0.37	-0.19	0.64			
M	0.06	-0.10	0.04	0.91	1.01	0.96	0.49	0.52	0.46	-0.46	0.21	0.47			
Big	0.30	0.26	0.02	1.01	1.03	0.99	0.10	0.24	-0.08	-0.48	-0.01	0.58			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	-0.21	1.26	0.91	26.04	18.39	23.67	10.26	11.97	17.74	-3.54	-1.71	6.09	0.87	0.84	0.89
M	0.21	-0.36	0.18	18.38	21.07	18.61	7.58	5.88	5.14	-3.97	1.79	4.00	0.81	0.82	0.83
Big	1.28	0.99	0.08	23.46	22.66	19.48	1.55	3.07	-0.69	-5.86	-0.11	4.35	0.87	0.85	0.85
								Japan							
Small	-0.02	0.13	-0.00	0.92	0.88	0.84	1.20	1.16	1.15	-0.57	-0.24	0.33			
M	-0.12	0.01	-0.19	0.86	0.89	0.87	0.71	0.70	0.81	-0.76	-0.18	0.31			
Big	-0.04	0.13	0.02	0.84	0.89	0.91	0.21	0.13	0.17	-0.65	-0.20	0.38			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	-0.09	0.79	-0.00	21.46	18.24	16.35	18.07	17.55	17.55	-7.52	-2.92	4.73	0.89	0.85	0.85
M	-0.64	0.04	-1.12	14.97	15.72	15.80	9.34	10.29	13.37	-8.30	-2.10	4.40	0.79	0.79	0.79
Big	-0.25	0.77	0.12	17.80	17.22	19.76	3.74	2.05	2.17	-10.37	-2.35	4.45	0.83	0.79	0.77
								Netherlands							
Small	0.10	0.51	0.07	0.80	0.89	0.92	0.96	0.64	1.21	-0.70	-0.06	0.61			
M	0.07	0.20	0.16	0.91	0.77	0.76	0.33	0.27	0.30	-0.52	-0.17	0.39			
Big	0.22	0.31	0.16	0.85	0.87	0.89	0.02	-0.00	-0.20	-0.40	-0.12	0.37			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	0.32	1.86	0.23	10.87	12.11	10.68	12.42	6.49	7.37	-8.17	-0.55	6.40	0.58	0.56	0.64
M	0.25	0.56	0.53	13.68	10.53	11.89	3.52	2.72	3.95	-5.44	-1.47	3.09	0.59	0.36	0.42
Big	0.93	1.01	0.57	13.44	10.46	13.14	0.25	-0.03	-2.68	-5.90	-1.30	4.75	0.63	0.50	0.54
								Switzerland							
Small	-0.21	-0.16	-0.04	0.96	0.76	0.72	1.23	0.95	1.03	-0.56	0.07	0.78			
M	-0.26	-0.64	-0.56	0.67	0.65	0.92	0.40	0.37	0.73	-0.20	0.21	0.61			
Big	-0.24	-0.06	-0.11	0.86	0.72	0.87	0.22	-0.10	0.09	-0.34	0.13	0.50			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	-0.91	-0.72	-0.19	15.07	10.74	10.57	15.75	11.35	13.01	-4.66	0.58	7.33	0.78	0.65	0.83
M	-1.03	-2.58	-2.11	10.06	11.85	15.28	4.19	3.19	6.61	-1.66	1.68	4.54	0.56	0.60	0.75
Big	-1.15	-0.31	-0.47	10.86	13.15	14.93	2.29	-1.36	1.43	-2.83	1.42	4.53	0.75	0.73	0.84
								United Kingdom							
Small	0.09	0.20	0.41	0.96	0.95	0.91	1.07	1.10	0.99	-0.52	0.10	0.53			
M	0.18	0.09	0.04	0.93	0.93	0.92	0.58	0.60	0.58	-0.43	0.01	0.53			
Big	0.30	0.28	0.12	0.91	0.93	0.98	0.02	0.04	0.09	-0.45	0.03	0.54			

	Low	M	High	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			c			d				
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	0.59	1.27	2.72	31.75	24.17	26.35	20.33	15.17	17.95	-5.80	1.13	6.12	0.84	0.80	0.81
M	1.05	0.52	0.23	26.01	25.45	24.07	9.72	8.57	9.89	-4.17	0.06	5.96	0.77	0.74	0.76
Big	2.04	1.64	0.87	33.60	26.15	36.10	0.36	0.57	1.95	-6.05	0.25	6.76	0.86	0.81	0.85
							United States								
Small	-0.02	0.13	0.26	1.09	1.01	0.97	1.29	0.97	1.18	-0.61	-0.07	0.47			
M	0.15	0.13	0.07	1.04	0.97	1.06	0.51	0.44	0.57	-0.61	-0.07	0.43			
Big	0.18	0.21	-0.02	0.99	1.00	1.08	0.14	0.11	0.20	-0.50	-0.09	0.38			
		t-statistic for a			t-statistic for b			t-statistic for c			t-statistic for d			adj. R^2	
Small	-0.14	0.83	1.87	16.51	22.31	19.51	23.93	15.87	22.89	-8.51	-0.99	6.67	0.91	0.86	0.87
M	0.80	0.85	0.46	18.51	18.88	19.70	7.38	8.89	9.78	-8.31	-0.88	6.07	0.85	0.80	0.80
Big	1.40	1.36	-0.14	22.94	21.55	16.41	3.01	2.07	3.34	-8.27	-0.99	5.42	0.89	0.80	0.80

Note: Returns are monthly and expressed in the local currency of each country. R_i^k stands for the return of portfolio i in country k. RM^k is the return on the stock market portfolio of country k which is proxied by the MSCI index. RF^k is the one-month risk-free rate of country k. SMB^k is the return on a portfolio in country k that is long on small market value stocks and short on big market value stocks, keeping the book-to-market characteristics of the portfolio constant. Likewise, HML^k is the return on a portfolio in country k that is long on high book-to-market stocks and short on low book-to-market stocks, keeping the size characteristics of the portfolio constant. Stocks are classified first into three portfolios according to their book-to-market values. Subsequently, each portfolio is divided into three portfolios according to the market values of its stocks. Nine portfolios are formed in total for each country. T-values are corrected for White(1980) heteroskedasticity and serial correlation up to three lags, using the Newey-West (1987) estimator. The R-squares are adjusted for degrees of freedom.

Table 5: Gibbons, Ross, and Shanken (1989) F-tests on the estimated intercepts of the Fama-French Model.

	Portfolios			
	H-B/M	L-B/M	S-MV	B-MV
		Australia		
F(a)	3.50	3.59	3.77	3.97
p(F)	0.017	0.015	0.012	0.009
		Canada		
F(a)	4.33	8.88	4.18	8.31
p(F)	0.005	0.000	0.007	0.000
		France		
F(a)	3.43	4.48	4.06	3.65
p(F)	0.018	0.005	0.008	0.014
		Germany		
F(a)	1.61	1.69	1.27	1.42
p(F)	0.191	0.173	0.289	0.240
		Italy		
F(a)	0.34	1.12	1.43	0.86
p(F)	0.796	0.340	0.239	0.465
		Japan		
F(a)	0.75	0.175	0.36	0.47
p(F)	0.522	0.913	0.783	0.704
		Netherlands		
F(a)	0.17	0.417	1.33	0.52
p(F)	0.919	0.740	0.264	0.666
		Switzerland		
F(a)	1.65	0.63	0.39	0.48
p(F)	0.182	0.597	0.763	0.694
		United Kingdom		
F(a)	5.79	2.91	4.97	3.05
p(F)	0.001	0.035	0.002	0.029
		United States		
F(a)	2.97	1.82	2.70	3.21
p(F)	0.033	0.144	0.047	0.024

Note: The Gibbons, Ross and Shanken (1989) F-statistic tests whether the intercepts from the regressions of the Fama-French model (Table 4) are jointly zero for portfolios of the same country. Four groups of portfolios are studied: high book-to-market (B/M), low B/M, small market value (MV), and big MV.

Table 6: Predicting future GDP growth using the HML and SMB factors

$$GDPGR^k(t,t+4) = m_0 + m_1 HML^k(t-4,t) + m_2 SMB^k(t-4,t) + e(t,t+4)$$

Country	Intercept	HML	SMB	adj. R^2
Australia	0.666	0.012	0.052	0.37
	(9.39)	(1.03)	(4.03)	
Canada	0.534	-0.048	0.088	0.13
	(4.33)	(-1.23)	(3.40)	
France	0.289	0.043	0.073	0.39
	(2.69)	(2.03)	(3.46)	
Germany	0.559	0.180	0.12	0.22
	(2.87)	(1.61)	(2.80)	
Italy	0.220	0.054	0.019	0.29
	(2.19)	(1.51)	(0.60)	
Japan	0.667	0.025	0.031	0.03
	(4.82)	(0.75)	(1.14)	
Netherlands	0.483	0.024	0.022	0.03
	(8.27)	(1.24)	(0.92)	
Switzerland	0.056	0.098	0.043	0.60
	(0.63)	(4.04)	(2.48)	
UK	0.354	0.045	0.079	0.28
	(2.85)	(1.26)	(3.61)	
USA	0.422	0.057	0.057	0.15
	(3.69)	(2.13)	(1.68)	

Note: Returns are quarterly and in the local currency of each country. $GDPGR^k$ stands for the growth in the Gross Domestic Product of country k. HML^k is the return on a portfolio in country k that is long on high book-to-market stocks and short on low book-to-market stocks, while it is neutral in terms of the size characteristics of its constituents. Similarly, SMB^k is the return on a portfolio in country k that is long on small market value stocks and short on big market value stocks, keeping the book-to-market characteristics of its stocks constant. T-values are reported in parentheses below the coefficient estimates. They are corrected for White(1980) heteroskedasticity and serial correlation up to three lags using the Newey-West (1987) estimator. The R-squares are adjusted for degrees of freedom.

Table 7: Conditional news on future GDP growth as a risk factor in equity returns.

$$R_i^k(t) - RF^k(t) = a + b[RM^k(t) - RF^k(t)] + f\ NGDPGR^k(t) + e_i^k(t)$$

	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			f				
						Australia						
Small	2.82	5.55	2.91	1.41	1.57	0.82	13.42	19.92	8.15			
M	0.67	2.00	0.87	1.13	1.22	0.95	4.45	5.40	6.27			
Big	0.89	4.54	1.97	1.11	1.46	0.95	1.40	9.61	0.08			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	1.41	1.62	1.60	8.11	3.74	6.82	4.12	1.84	2.65	0.55	0.27	0.32
M	0.53	1.72	0.83	14.42	10.50	9.32	2.46	1.55	3.69	0.64	0.64	0.68
Big	1.06	1.92	2.40	22.61	4.75	15.93	1.48	1.29	0.07	0.78	0.35	0.74
						Canada						
Small	1.34	2.15	4.29	1.15	0.86	0.86	8.49	3.68	3.38			
M	0.16	1.33	3.11	1.05	0.95	0.80	2.50	1.84	1.26			
Big	1.14	0.81	1.40	0.93	1.06	0.97	2.36	1.15	-0.57			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	1.32	3.21	2.89	14.27	10.47	7.11	6.55	4.30	2.44	0.64	0.61	0.28
M	0.28	1.93	4.03	12.13	15.11	9.12	2.50	2.27	1.09	0.72	0.68	0.46
Big	1.76	1.58	2.14	15.68	24.27	18.56	2.59	1.18	-0.74	0.67	0.77	0.68
						France						
Small	0.52	2.70	5.94	1.02	0.88	1.09	3.89	3.94	8.77			
M	0.20	1.58	2.83	0.96	1.03	1.08	1.68	3.11	3.85			
Big	1.33	1.23	1.43	0.90	1.07	1.04	-0.77	-0.24	2.29			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	0.66	2.81	4.61	10.75	16.91	9.53	2.16	1.97	3.77	0.77	0.68	0.72
M	0.34	2.43	2.64	14.00	16.65	8.77	1.44	2.38	2.44	0.82	0.84	0.76
Big	2.88	2.21	2.48	19.48	12.90	13.49	-1.80	-0.23	1.48	0.86	0.88	0.83
						Germany						
Small	0.38	1.19	2.13	0.43	0.50	0.45	2.03	2.32	2.47			
M	-0.04	0.95	0.87	0.47	0.64	0.61	0.91	1.21	1.45			
Big	0.43	0.88	1.09	0.72	0.81	0.65	-0.50	0.08	0.58			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	0.34	0.89	1.38	5.39	10.88	7.56	3.05	3.03	4.51	0.49	0.52	0.47
M	-0.04	0.88	0.74	12.63	14.65	8.01	1.83	2.52	2.10	0.59	0.74	0.66

	Low	M	High	Low	M	High	Low	M	High	Low	M	High
		a			b			f				
Big	0.65	0.90	1.90	22.57	21.09	12.88	-0.81	0.19	1.89	0.80	0.83	0.90
						Italy						
Small	-1.22	0.76	2.02	0.90	0.96	0.96	0.60	2.72	4.05			
M	-0.48	0.16	1.41	0.76	0.87	0.92	2.13	4.07	3.95			
Big	-0.03	0.38	1.21	0.87	0.93	0.96	0.22	-1.44	-0.28			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	-0.93	0.78	1.09	14.07	11.26	9.28	0.30	1.32	0.98	0.75	0.77	0.65
M	-0.49	0.15	1.28	7.99	10.27	9.27	1.84	3.18	2.43	0.75	0.82	0.79
Big	-0.03	0.50	1.35	13.05	15.39	10.47	0.11	-1.29	-0.16	0.80	0.87	0.80
						Japan						
Small	1.61	2.64	3.37	0.91	0.81	0.76	7.93	7.89	8.95			
M	-0.11	1.36	2.02	0.84	0.84	0.77	3.88	4.92	6.22			
Big	-0.81	0.46	1.51	0.85	0.87	0.80	0.65	0.82	3.06			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	1.52	2.78	2.96	9.60	8.69	9.07	2.40	2.79	2.67	0.60	0.59	0.56
M	-0.13	1.76	2.22	9.30	12.97	12.08	1.59	2.13	2.42	0.62	0.71	0.63
Big	-1.73	0.90	2.15	19.37	22.03	11.32	0.42	0.65	2.00	0.80	0.83	0.74
						Netherlands						
Small	0.41	2.04	1.40	1.11	1.15	1.21	4.32	8.10	17.94			
M	0.12	0.67	1.06	1.10	0.83	0.87	-2.27	0.10	10.72			
Big	0.31	0.75	0.59	1.09	1.10	1.06	-2.69	3.38	5.62			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	0.35	2.09	1.07	7.02	11.91	5.86	0.96	3.10	2.93	0.44	0.56	0.42
M	0.13	0.56	0.95	9.27	7.09	8.02	-0.78	0.04	2.50	0.56	0.34	0.38
Big	0.46	0.93	0.67	10.52	11.13	8.22	-0.91	1.91	2.33	0.71	0.58	0.59
						Switzerland						
Small	-1.31	0.10	1.78	0.56	0.53	0.64	2.70	3.31	5.98			
M	-1.27	-1.24	-0.15	0.59	0.62	0.90	0.90	2.25	5.40			
Big	-1.04	0.28	1.38	0.69	0.75	0.91	-0.05	0.62	2.68			
		t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2	
Small	-0.92	0.07	1.15	8.19	3.74	5.28	1.27	1.74	2.50	0.44	0.46	0.55
M	-1.34	-1.20	-0.10	7.85	11.86	16.53	0.68	1.62	3.22	0.61	0.63	0.70
Big	-1.36	0.43	1.47	18.03	21.68	16.55	-0.06	0.51	1.79	0.79	0.80	0.82
						United Kingdom						
Small	0.20	1.80	2.93	1.04	1.00	0.97	5.19	5.98	6.13			
M	0.11	0.79	1.49	0.99	0.97	1.01	2.27	3.56	4.29			
Big	0.04	1.00	1.32	0.99	0.97	1.04	-0.06	0.79	1.65			

	Low	M	High	Low	M	High	Low	M	High	Low	M	High
	a			b			f					
	t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2		
Small	0.20	2.14	3.05	9.21	9.96	11.03	4.55	4.56	5.27	0.64	0.64	0.66
M	0.21	1.50	2.12	11.35	12.65	11.99	2.78	3.95	4.86	0.71	0.71	0.74
Big	0.11	2.15	2.62	16.76	11.54	12.98	-0.11	1.08	2.34	0.85	0.78	0.83
					United States							
Small	0.33	1.68	3.54	1.64	1.24	1.15	5.11	4.21	5.36			
M	0.08	0.96	2.14	1.33	1.12	1.08	2.40	3.72	4.40			
Big	-0.25	0.61	1.09	1.19	1.07	1.01	0.71	0.94	2.16			
	t-statistic for a			t-statistic for b			t-statistic for f			adj. R^2		
Small	0.35	2.65	4.07	15.43	19.16	10.38	2.19	1.92	1.49	0.69	0.70	0.53
M	0.16	2.27	3.57	11.53	13.38	10.09	2.21	3.35	3.07	0.81	0.83	0.73
Big	-0.61	1.60	2.03	12.53	17.92	9.53	0.96	1.39	2.25	0.87	0.88	0.78

Note: Returns are quarterly and expressed in the local currency of each country. R_i^k denotes the return of portfolio i in country k. RM^k is the return on the stock market portfolio of country k which is proxied by its MSCI index. RF^k is the one-month risk-free interest rate in country k. $NGDPGR^k$ stands for news on GDP growth in country k. To calculate this variable, we use the forecast values of $GDPGR^k$ obtained from the regressions of Table 6. We then calculate the one month change in the forecast which is given by $NGDPGR^k$. Stocks are classified first into three portfolios according to their book-to-market values. Subsequently, each portfolio is divided into three portfolios according to the market values of its stocks. Nine portfolios are formed in total for each country. T-values are corrected for White(1980) heteroskedasticity and serial correlation up to three lags using the Newey-West (1987) estimator. The R-squares are adjusted for degrees of freedom.

Table 8: Gibbons, Ross, and Shanken (1989) F-tests on the estimated intercepts of the Conditional news on GDP growth Model.

	Portfolios			
	H-B/M	L-B/M	S-MV	B-MV
		Australia		
F(a)	2.66	1.06	1.44	2.33
p(F)	0.059	0.376	0.243	0.087
		Canada		
F(a)	5.56	1.93	5.24	2.51
p(F)	0.002	0.133	0.003	0.066
		France		
F(a)	9.22	2.92	11.91	4.08
p(F)	0.000	0.043	0.000	0.011
		Germany		
F(a)	3.28	0.37	2.27	1.81
p(F)	0.032	0.775	0.098	0.163
		Italy		
F(a)	0.87	0.51	4.46	0.61
p(F)	0.463	0.679	0.009	0.614
		Japan		
F(a)	3.13	4.34	5.70	3.10
p(F)	0.032	0.008	0.002	0.033
		Netherlands		
F(a)	0.61	0.116	2.51	0.33
p(F)	0.609	0.950	0.065	0.801
		Switzerland		
F(a)	3.71	1.09	3.05	3.29
p(F)	0.019	0.366	0.040	0.030
		United Kingdom		
F(a)	6.82	0.15	11.12	3.91
p(F)	0.000	0.928	0.000	0.012
		United States		
F(a)	5.90	0.71	10.07	2.95
p(F)	0.001	0.547	0.000	0.038

Note: The Gibbons, Ross and Shanken (1989) F-statistic tests whether the intercepts from the regressions of the GDP news model (Table 7) are jointly zero for portfolios of the same country. Four groups of portfolios are studied: high book-to-market (B/M), low B/M, small market value (MV), and big MV.

Table 9: Conditional current default premium and news about future GDP growth as Risk Factors in US Equities

$$R_i^{US}(t) - RF^{US}(t) = a + b[RM^{US}(t) - RF^{US}(t)] + f\ NGDPGR^{US}(t) + g\ FDEF^{US}(t) + e_i^{US}(t)$$

Portfolios	a (t-value)	b (t-value)	f (t-value)	g (t-value)	adj. R^2
H-B/M, S-MV	0.05 (0.09)	1.20 (11.67)	0.60 (0.49)	4.22 (15.22)	0.90
H-B/M, M-MV	0.41 (0.74)	1.11 (9.02)	2.03 (4.45)	2.10 (9.32)	0.87
H-B/M, B-MV	0.21 (0.35)	1.03 (8.50)	0.97 (1.68)	1.06 (4.01)	0.82
M-B/M, S-MV	-0.26 (-0.42)	1.27 (16.91)	1.57 (1.62)	2.34 (9.03)	0.84
M-B/M, M-MV	0.03 (0.05)	1.14 (10.85)	2.44 (4.63)	1.13 (5.33)	0.88
M-B/M, B-MV	0.31 (0.69)	1.07 (15.70)	0.53 (0.86)	0.36 (1.74)	0.89
L-B/M, S-MV	-1.68 (-1.61)	1.67 (14.70)	2.36 (1.69)	2.44 (5.17)	0.77
L-B/M, M-MV	-0.14 (0.21)	1.33 (10.93)	2.10 (1.84)	0.27 (0.88)	0.81
L-B/M, B-MV	0.03 (0.07)	1.19 (13.49)	1.10 (1.16)	-0.34 (-1.60)	0.88

Gibbons, Ross, and Shanken (1989) F-Tests

	H-B/M	L-B/M	S-MV	B-MV
F(a)	0.51	4.07	4.81	0.47
p(F)	0.67	0.010	0.004	0.706

Note: Returns are quarterly. R_i^{US} denotes the return on the ith US portfolio. RM^{US} is the return on the US stock market portfolio which is proxied by the US MSCI index. RF^{us} is the one-month US risk-free interest rate. $NGDPGR^{us}$ stands for news on US GDP growth. To calculate this variable, we use the forecast values of $GDPGR^{us}$ obtained from the regressions of Table 6. We then calculate the one month change in the forecast which is given by $NGDPGR^{us}$. $FDEF^{us}$ summarizes the information about the current US default premium contained in the US HML and SMB factors. To construct this variable, we first regress the current default premium on HML^{US} and SMB^{US}. We then calculate $FDEF^{US}$ as the sum of the products of HML^{US} and SMB^{US} with their slope coefficients. HML^{US} is the return on a US portfolio which is long on high book-to-market stocks and low on low book-to-market stocks, keeping the size characteristics of the portfolio constant. Similarly, SMB^{US} is the return on a US portfolio that is long on small market value stocks and short on big market value stocks, keeping the book-to-market characteristics of the portfolio constant. Stocks are classified first into three portfolios according to their book-to-market values. Subsequently, each portfolio is divided into three portfolios according to the market values of its stocks. Nine portfolios are formed in total for each country. T-values appear in parentheses below the coefficient estimates. They are corrected for White(1980) heteroskedasticity and serial correlation up to three lags using the Newey-West (1987) estimator. The R-squares are adjusted for degrees of freedom. The Gibbons, Ross and Shanken (1989) F-statistic tests whether the intercepts of the model are jointly zero for groups of portfolios. Four groups of portfolios are studied: high book-to-market (B/M), low B/M, small market value (MV), and big MV.

Appendix 1: Number of Securities Included in the HML and SMB portfolios Each Year

Year	Australia	Canada	France	Germany	Italy	Japan	Netherlands	Switzerland	UK	USA
1978		143					27		1,145	1,565
1979		145					35		1,160	1,615
1980		150					39		1,160	1,657
1981		157				71	41		1,198	1,676
1982		198				85	44		1,193	1,743
1983		213	95			85	44		1,182	1,809
1984		225	104			714	43		1,194	1,837
1985	78	242	106			761	42		1,165	1,884
1986	91	248	120			806	49	48	1,116	1,884
1987	101	271	126	131	38	817	50	62	1,061	1,938
1988	100	296	133	137	79	824	49	102	1,051	2,014
1989	159	294	158	150	85	997	52	119	1,001	1,955
1990	161	316	284	310	97	1,047	53	132	942	1,840
1991	171	329	293	376	104	1,064	48	136	904	1,772
1992	175	254	299	402	111	1,071	55	135	861	1,710
1993	168	399	297	399	109	1,068	90	136	828	1,792
1994	182	434	293	411	117	1,076	94	140	813	1,957
1995	175	414	285	415	125	1,076	100	137	854	1,947
1996	175	384	280	441	121	1,087	100	131	834	1,770
average	145	274	205	317	99	791	56	116	1,035	1,808

Note: We report the number of securities used to form portfolios each year and in each country. These numbers are the sum of currently traded and defunct securities available each year. The data are monthly. The source is Datastream.