Are U.S. Variables Good Predictors of Foreign Equity Risk Premiums?[1]

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We demonstrate that U.S. information variables provide statistically relevant information above and beyond an identical set of local information variables in the formation of international conditional expected returns. Despite this statistical significance, out-of-sample forecasts generated by our model fail to produce superior profitability when used in conjunction with a simple tactical asset allocation strategy.

Introduction

Several authors have demonstrated that U.S. stock market returns possess predictable components, including Keim and Stambaugh (1986), Campbell (1987), Fama and French (1988a, 1989), Fama (1990), Chen (1991), and Ferson, Foerster and Keim (1993). Recently, return predictability of international equity markets has received increasing attention. For instance, Giovannini and Jorion (1989), Cutler, Poterba and Summers (1990), Harvey (1991), Campbell and Hamao (1992), and Ferson and Harvey (1993) show international equity returns are predictable and react similarly to various information variables.

As financial markets around the world become more integrated, it seems logical the world's largest financial market, the U.S., will become a more important factor affecting the performance of other international financial markets. Several authors, including Harvey (1991), and Ferson and Harvey (1993), document the significance of U.S.-based global information variables in their international equity risk premium predictability models. For example, Harvey (1991) finds "common information variables appear to capture the *bulk* of the predictable variation in the country returns", where the common factors to which he refers are mainly U.S. macroeconomic variables. This result may be somewhat surprising given the relatively low correlation among international stock returns. However, the implication for practising fund managers is clear. If U.S. information variables are as significant in determining international equity returns as they appear to be based on Harvey (1991) and Ferson and Harvey (1993), then international portfolio managers using dynamic asset allocation strategies should take them into account in their models of international equity market performance. For example, Arnott and Henriksson (1989), Keppler (1991a, 1991b), Fouse (1992), and Solnik (1993) show international asset allocation can add considerable value to international portfolios using *only local information* variables. Hence, their results may underestimate the true benefits of international asset allocation if the U.S. information set is significant.

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The purpose of this study is twofold. First, we generalize the results of previous U.S. predictability studies which have demonstrated a significant relationship between macroeconomic factors and equity risk premiums, to fourteen other developed economies. Second, we examine the *statistical and economic* significance of U.S. variables in predicting foreign equity risk premiums.

We use the national risk premium, as opposed to the U.S. dollar risk premium used in most previous studies. Use of the national risk premium model is valuable in showing each nation's risk premium is predictable and is influenced similarly by the same macroeconomic variables. The U.S. dollar risk premium model may abstract from this by incorporating the U.S. risk-free interest rate and U.S. foreign exchange rate into foreign equity risk premiums, which may contribute to the significance of the U.S. information set.

Our study provides the first evidence that a U.S. information set, comprised of variables identical to those in the local foreign information set, is statistically significant for predicting foreign equity risk premiums. This represents an important contribution, given the limited attention devoted to this issue in the international predictability literature and its widespread neglect in the international asset allocation literature. However, we find the out-of-sample forecasting power of the information sets are not economically significant, based on a simple tactical asset allocation strategy.

Data and Variables

This study examines the time varying nature of conditional equity market risk premiums of fourteen countries, including the U.S., for the 24 year time period from January 1970 to May 1994. The countries are chosen to represent the world's largest industrial economies and equity markets. Monthly stock market returns and dividend yield data are derived from the Morgan Stanley Capital International Perspectives (MSCI) database. These local currency national stock market returns include dividends. The monthly growth rates in industrial production and monthly interest rate data are obtained from the International Financial Statistics (IFS) database provided by the International Monetary Fund. Unfortunately, the availability, consistency, and precision of short term interest rate data varies from country to country in the IFS database. Consequently, different short term rates, either the T-Bill rate or call money rate, are used for different countries.

The national (local) equity risk premium, defined as the expected equity market return in local currency minus the national risk-free interest rate, is examined in this study. This is the risk premium of primary interest to local national fund managers who invest primarily in local securities using local currency. The U.S. dollar risk premium, which is defined as the expected national market return in U.S. dollars minus the U.S. risk-free rate, is of primary importance to U.S.-based global fund managers. This is important to note because highly cited studies of international risk premium dynamics, including Harvey (1991) and Ferson and Harvey (1993), use the U.S. dollar risk premium. This may have the effect of making U.S. information variables appear more significant than they actually are from the local market point of view due to the fact that U.S. dollar risk premiums are themselves a function of two U.S. variables: the U.S. risk-free rate and the U.S. exchange rate.

Summary statistics for the equity risk premiums (not reported here) indicate monthly local risk premiums range from a low of 0.163% for Denmark to a high of 0.915% for Sweden, with an average across all countries of 0.522%. The monthly standard deviations range from a low of 4.31% for the U.S., to 7.74% for Norway, and average 5.71% across all 15 countries.

National equity market risk premium cross correlations (also not reported here) indicate that none of the correlations between national risk premiums are negative, and thus, all national risk premiums tend to move together. Correlations range from 0.086 between Japan and Austria, to 0.710 between Canada and the U.S. The correlations between the U.S. risk premium and the other national risk premiums are of particular interest for this study, and they range from 0.156 between the U.S. and Austria, to 0.710 between the U.S. and Canada. The average correlation between the U.S. and the other 14 markets is 0.443, with 7 of the 14 correlations greater than 0.44.

We choose six information variables to predict local equity risk premiums based on their relationship with economic growth and their success in previous U.S. predictability studies. The first variable is a January dummy variable, $JAN_{t-1,}$ which is included to account for the "January effect" in stock returns. The five other variables are related to expected future macroeconomic conditions. They are: lagged equity risk premiums, RP_{t-1}; lagged dividend yield, DIV_{t-1}; lagged 12 month growth in real industrial production, IP_{t-1}, which measures recent macroeconomic output; the lagged domestic short term interest rate, SHT_{t-1}, which serves as a proxy for expected future inflation; and, a term structure variable, $TERM_{t-1}$, defined as the lagged long term domestic government bond yield minus the lagged government short term interest rate.

The Conditional Equity Risk Premium Model

We have chosen information variables that are related to local economic activity and have proven successful in U.S. predictability studies. However, their success in U.S. predictability studies does not guarantee success in predicting international returns. In fact, other variables may be better predictors of international returns, although no such variables were tested to limit the data-snooping bias. If these variables are found to be successful internationally, this study offers out-of-sample support for their use in the U.S.

We assume the instrument variables are used as a linear combination in the formation of the local risk premium expectation, which implies we will observe the following relationship:

$$(1) \qquad E(R_t^k | \Omega_{t-1}^k) = \alpha^k + \sum_{i=1}^{j} \beta_i^k Z_{i,t-1}^k$$

where R_t^k is nation k's risk premium for time period t, Ω_{t-1}^k is the observable local information set comprising of j local information variables $Z_{i,t-1}^k$, α^k is a constant, and β_i^k represents the national sensitivities to the information variables. Although it is assumed each country's expected risk premium is a function of the same set of information variables, each country possesses a unique time series history of its own local information variables and thus their sensitivities to these variables will also be unique.

Table 1 reports regression results for the local information set, based on monthly observations. F-test statistics confirm the significance of the variables as a group at the 5% level, for 12 of the 15 countries examined. The local information set explains between 1.1% (Germany) and 8.9% (U.S.) of the variance of expected local quarterly risk premiums, based on the adjusted R-squared values, which is consistent with the results of previous predictability studies. The average explained variance is 4.4% for all 15 countries, and is 3.8% for the non-U.S. risk premiums. In all, 29 of 75 (39%) coefficients are statistically significant at the 5% level, 20 out of 60 (33%) if we exclude the January dummy variables. These results are also consistent with previous studies. For example Solnik (1993) finds 10 out of 32 (or 31%) variables are significant in his international predictability study, 8 of 24 (or 33%) excluding January dummies. Thus, we confirm the usefulness of these local variables in predicting market risk premiums.

The Statistical Significance of U.S. Macroeconomic Variables

The U.S. conditioning information set includes the five variables (excluding the January dummies) used in the local information set and are denoted as $USRP_{t-1}$,$USDIV_{t-1}$, $USIP_{t-1}$, $USSHT_{t-1}$, and $USTERM_{t-1}$. These instruments represent measures of the past and present state of the U.S. economy and allow us to examine the impact of U.S. macroeconomic conditions on global financial markets. It is important to include the same U.S.-

based variables as local variables in the expected risk premium regressions to reduce the possibility that U.S. variables are proxying for equivalent local variables.

Once we include the U.S. information set, our conditional expected risk premium model will be estimated using:

$$E(R_t^k | \Omega_{t-1}^k, \Omega_{t-1}^{US}) = \alpha^k + \sum_{i=1}^{j} \beta_i^k Z_{i,t-1}^k + \sum_{i=j+1}^{n} \beta_i^k Z_{i,t-1}^k \quad (2)$$

This is identical to equation (1), except for the last term which estimates the sensitivity of national market risk premiums to the five U.S. information variables, which are included in $Z_{i,t-1}^{US}$.

Table 2 reports the regression results which demonstrate that the U.S. information set is indeed important in the determination of expected local risk premiums. F-tests confirm the U.S. information variables as a group are significant at the 10% levels for 11 of the 14 non-U.S. countries, and 9 of the 14 countries possesses at least one significant U.S. variable at the 5% significance level. The adjusted-R^2 of every country except Italy and Norway increases with the addition of the U.S. information to the local information set. In fact, the average adjusted-R^2 across the non-U.S. countries increases from 3.8% to 6.5%, an increase in explained variance of 71%.

Ex-Ante Predictive Ability of Information Sets

This section deals with the more interesting question of whether we can profit from the statistical significance of our predictive variables. We examine this issue by using a relatively straightforward tactical asset allocation strategy that makes use of the predictive power of our information variables. The performance of this strategy is then compared on a risk-adjusted basis, to a simple buy-and-hold strategy on the local market index. Our strategy involves obtaining market risk premium forecasts, by performing the regressions outlined above, for each country for the upcoming month. If the predicted risk premium is positive, then we buy and hold the local stock market index for the following month, otherwise we buy and hold the local short term rate.

Out-of-sample forecasts for each month are obtained by estimating two moving-window regression equations, one for the local information set and one for the local plus U.S. information set, using the previous six years of data for each country. The regression equations are again of the form in equation (2). Month t risk premium forecasts are generated by substituting the month t-1 information variable values into the estimated regression equation. In this manner, the forecasts are generated without using any information past the end of month t-1.

The Sharpe ratios produced using the investment rule described above, along with those produced by a simple buy-and-hold strategy on the local stock market index, are reported in the final three columns of Table 3. We begin by noting there is on average, no significant increase in the Sharpe ratios that occur using our strategy with local information only, versus the index buy-and-hold strategy. The average Sharpe ratio for the national stock indices is 0.090 across all 15 countries and is 0.089 for the non-U.S. countries, which are the exact same averages that resulted from the use of our tactical asset allocation rule, using only domestic information variables. These results are not very glamorous unlike those offered by Solnik (1993) in his study of 8 national stock market indices over the 1971-90 period, using a similar investment rule.

However, the non-U.S. average Sharpe ratios increases from 0.089 to 0.107, although the Sharpe ratios increase in magnitude for only 6 of the 14 countries. These results are also not very impressive, suggesting that it is not easy to profit from the statistical predictive power documented in the previous section. This result is inconsistent with the results of Solnik (1993), however, it is consistent with the notion of market efficiency, since it implies that investors would not be able to profit from the historical statistical relationship between publicly available information variables and market risk premiums.

Conclusion

We demonstrate that U.S. information variables provide statistically relevant information above and beyond an identical set of local information variables in the formation of international conditional expected returns. However, despite this statistical significance, out-of-sample forecasts generated by our model fail to produce superior profitability when used in conjunction with a simple tactical asset allocation strategy.

Table 2
In-Sample Regression of international equity market risk premiums on local and US information variables
January 1975 to March 1994[1]

Country	Local + US Information Regression Coefficients												Adjusted R^2	US Info. F-Test
	Constant	JAN_{t-1}	RP_{t-1}	DIV_{t-1}	IP_{t-1}	SHT_{t-1}	$TERM_{t-1}$	$USRP_{t-1}$	$USDIV_{t-1}$	$USIP_{t-1}$	$USSHT_{t-1}$	$USTERM_{t-1}$		
AUS	-3.57	2.01	0.01	1.13	-0.06	-0.12	0.09	0.23	1.76	0.06	-0.87	-0.30	0.059	3.12**
	(-1.47)	(1.25)	(0.11)	(1.75)*	(-0.69)	(-0.49)	(0.21)	(2.05)**	(2.57)**	(0.86)	(-2.07)**	(-0.48)	(2.66)**	
AIA	6.19	-0.86	0.17	0.44	0.07	-0.84	-1.08	0.18	-0.30	-0.08	0.23	0.29	0.055	1.76
	(2.07)**	(-0.70)	(1.69)	(0.71)	(0.95)	(-2.10)**	(-2.37)**	(2.29)**	(-0.73)	(-1.70)*	(1.20)	(0.93)	(2.48)**	
BEL	-0.02	2.93	0.15	0.75	0.10	-0.48	-1.14	0.06	-0.66	-0.07	0.48	1.04	0.080	2.54**
	(-0.02)	(3.07)**	(2.21)**	(2.45)**	(1.62)	(-1.79)*	(-1.62)	(0.91)	(-0.96)	(-1.19)	(1.08)	(1.91)*	(3.31)**	
CAN	6.40	1.61	-0.08	1.46	-0.07	-1.18	-0.97	0.29	3.30	0.01	-0.12	0.46	0.085	5.51**
	(1.50)	(1.18)	(-1.19)	(2.42)**	(-0.99)	(-3.47)**	(-1.90)*	(2.35)**	(4.62)**	(0.15)	(-0.20)	(0.64)	(3.45)**	
DEN	1.57	4.42	0.10	0.16	-0.08	-0.21	-0.12	-0.12	-0.84	0.02	0.45	0.95	0.091	2.07*
	(0.94)	(3.98)**	(1.58)	(1.03)	(-1.64)	(-1.42)	(-1.87)*	(-1.99)**	(-1.30)	(0.28)	(2.01)**	(2.90)**	(3.63)**	
FRA	2.18	2.27	0.06	0.42	-0.06	-0.39	0.08	0.13	2.11	0.10	-0.57	-0.22	0.028	2.19*
	(1.14)	(1.56)	(0.86)	(1.55)	(-0.64)	(-1.64)	(0.18)	(1.48)	(2.43)**	(1.26)	(-1.11)	(-0.36)	(1.75)*	
GER	0.30	1.09	0.07	0.37	-0.07	-0.19	0.06	0.22	0.30	-0.04	0.06	0.32	0.036	2.44**
	(0.13)	(0.98)	(0.78)	(0.72)	(-0.95)	(-0.63)	(0.14)	(2.57)**	(0.44)	(-0.52)	(0.21)	(0.89)	(1.98)**	
ITA	-0.49	4.94	0.13	0.35	-0.01	-0.07	-0.24	0.15	0.71	0.05	0.10	0.39	0.034	0.67
	(-0.12)	(2.99)**	(1.94)*	(0.47)	(-0.10)	(-0.33)	(-0.81)	(1.79)*	(0.90)	(0.59)	(0.27)	(0.79)	(1.93)**	
JAP	2.29	1.92	0.02	1.09	-0.05	-0.54	-0.38	0.26	0.18	0.16	0.18	0.18	0.060	2.85**
	(1.31)	(1.81)*	(0.23)	(2.26)**	(-0.94)	(-1.77)*	(-0.74)	(3.47)**	(0.41)	(1.81)*	(0.80)	(0.66)	(2.68)**	
NET	1.64	3.27	0.07	1.14	0.02	-0.95	-0.96	0.10	-0.37	-0.04	0.36	0.93	0.100	2.62**
	(0.68)	(2.78)**	(0.90)	(3.19)**	(0.31)	(-3.02)**	(-2.43)**	(1.12)	(-0.46)	(-0.64)	(1.31)	(2.40)**	(3.94)**	
NOR	-1.71	5.07	0.16	0.68	-0.01	-0.04	0.08	-0.07	0.20	0.11	-0.40	-0.57	0.041	0.76
	(-0.81)	(3.17)**	(2.44)**	(1.47)	(-0.21)	(-0.21)	(0.25)	(-0.56)	(0.15)	(1.43)	(-0.90)	(-0.99)	(2.14)**	
SWE	-7.29	3.62	0.12	0.31	0.09	0.59	0.98	0.13	0.27	-0.17	-0.47	-0.37	0.058	1.97*

	(-1.78)*	(2.49)**	(1.81)*	(0.96)	(1.34)	(1.68)*	(1.80)*	(1.17)	(0.38)	(-2.36)**	(-1.19)	(-0.76)	(2.62)**	
SWI	0.95	2.58	0.02	2.23	-0.04	-1.14	-1.63	0.10	-0.60	-0.06	-0.06	0.42	0.071	2.67**
	(0.21)	(2.30)**	(0.30)	(1.78)*	(-0.71)	(-2.15)**	(-2.67)**	(1.12)	(-0.73)	(-1.04)	(-0.27)	(1.50)	(3.03)**	
UK	-1.62	4.24	0.13	2.53	0.02	-0.90	-0.96	-0.09	0.31	-0.02	-0.31	0.55	0.107	2.14*
	(-0.68)	(1.98)**	(1.36)	(2.03)**	(0.29)	(-1.70)*	(-1.71)*	(-0.61)	(0.25)	(-0.23)	(-1.02)	(1.55)	(4.18)**	
US	-2.38	1.71	-0.03	1.16	-0.11	-0.32	0.37						0.072	
	(-1.85)*	(1.52)	(-0.35)	(2.30)**	(-2.33)**	(-1.58)	(1.32)						(4.75)**	

[1] Countries are denoted as follows: AIA=Austria, AUS=Australia, BEL=Belgium, CAN=Canada, DEN=Denmark, FRA=France, GER=Germany, ITA=Italy, JAP=Japan, NET=Netherlands, NOR=Norway, SWE=Sweden, SWI=Switzerland, UK=United Kingdom, and US=United States. T-statistics are in parentheses below the coefficients, except for the last column where the F-statistic testing the significance of the entire group of variables is in parentheses. * denotes significance at the 10% level, while ** denotes significance at the 5% level.

Table 3

Out-of-Sample Risk Premium Sign Forecasting Ability of Local Only Information and Local Plus U.S. Information Sets
January 1975 to March 1994

Country	Returns				Standard Deviations			Sharpe Ratios		
	Risk-Free Rate	Equity Market	TAA Local Info.	TAA Local + US Info.	Equity Market	TAA Local Info.	TAA Local + US Info.	Equity Market	TAA Local Info.	TAA Local + US Info.
AUS	0.923	1.478	0.708	1.928	6.168	4.323	4.236	0.090	-0.050	0.041
AIA	0.588	0.934	1.060	1.407	6.159	5.390	5.226	0.056	0.088	0.158
BEL	0.792	1.309	1.474	1.548	5.083	3.465	4.022	0.102	0.197	0.187
CAN	0.834	1.040	0.935	1.557	4.933	3.845	3.356	0.042	0.026	0.074
DEN	1.004	1.204	1.275	1.717	5.005	3.298	3.770	0.040	0.082	0.093
FRA	0.826	1.423	1.284	1.808	6.212	5.223	4.858	0.096	0.088	0.029
GER	0.532	0.910	0.879	1.096	5.217	4.531	3.577	0.072	0.076	0.074
ITA	1.197	1.598	1.897	2.057	7.598	5.488	5.100	0.053	0.127	0.050
JAP	0.484	1.020	1.011	1.323	5.377	3.791	4.030	0.100	0.139	0.130
NET	0.595	1.342	1.405	1.432	4.747	3.678	4.009	0.157	0.220	0.164
NOR	0.947	1.354	0.879	2.011	7.633	4.961	5.226	0.053	-0.014	0.094
SWE	0.886	1.787	1.444	2.211	6.900	5.373	5.650	0.131	0.104	0.187

SWI	0.298	0.934	0.575	1.160	4.476	3.800	3.161	0.142	0.073	0.148
UK	0.875	1.500	1.267	1.803	5.401	4.083	3.902	0.116	0.096	0.075
US	0.642	1.096	0.977		4.223	3.443		0.107	0.097	

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Table 1
In-Sample Regression of international equity market risk premiums on local information variables
January 1975 to March 1994[1]

Country	Local Information Regression Coefficients							Adjusted R^2 (F-Test Stat.)
	Constant	JAN_{t-1}	RP_{t-1}	DIV_{t-1}	IP_{t-1}	SHT_{t-1}	$TERM_{t-1}$	
AUS	-2.27	2.12	0.03	0.75	-0.14	-0.05	-0.01	0.024
	(-1.06)	(1.34)	(0.48)	(1.19)	(-1.66)*	(-0.26)	(-0.02)	(2.19)**
AIA	5.85	-0.77	0.18	0.53	0.05	-0.84	-1.00	0.042
	(2.25)**	(-0.62)	(1.78)	(0.87)	(0.60)	(-2.18)**	(-2.22)**	(3.03)**
BEL	0.52	2.92	0.18	0.63	0.06	-0.48	-0.38	0.055
	(0.36)	(3.07)	(2.63)	(2.12)	(1.06)	(-1.81)*	(-0.74)	(3.84)**
CAN	0.07	1.59	0.01	0.74	-0.03	-0.28	-0.15	0.012
	(0.03)	(1.20)	(0.21)	(1.36)	(-0.56)	(-1.40)	(-0.44)	(1.61)
DEN	3.54	4.06	0.12	0.02	-0.07	-0.34	-0.14	0.074

	(2.79)	(3.56)**	(1.93)*	(0.17)	(-1.35)	(-3.23)**	(-2.44)**	(4.83)**
FRA	0.64	2.49	0.08	0.12	-0.10	-0.09	0.08	0.007
	(0.44)	(1.77)*	(1.15)	(0.49)	(-1.14)	(-0.54)	(0.26)	(1.35)
GER	1.47	1.28	0.07	0.19	-0.10	-0.27	-0.02	0.011
	(0.76)	(1.11)	(0.76)	(0.41)	(-1.45)	(-1.02)	(-0.07)	(1.55)
ITA	-3.64	5.07	0.14	0.76	-0.01	0.09	-0.08	0.040
	(-1.33)	(3.23)**	(2.00)**	(1.07)	(-0.12)	(0.70)	(-0.33)	(2.99)**
JAP	2.22	2.19	0.02	0.72	-0.07	-0.45	0.03	0.029
	(1.46)	(2.14)**	(0.28)	(2.04)**	(-1.34)	(-1.85)*	(0.09)	(2.46)**
NET	2.23	3.35	0.07	0.89	-0.06	-0.84	-0.75	0.074
	(1.11)	(2.90)**	(1.02)	(2.54)**	(-0.81)	(-2.74)**	(-2.12)**	(4.90)**
NOR	-0.15	5.12	0.17	0.44	-0.01	-0.13	-0.11	0.045
	(-0.08)	(3.27)**	(2.54)**	(1.25)	(-0.15)	(-0.80)	(-0.47)	(3.30)**
SWE	-3.84	3.88	0.14	0.22	0.06	0.32	0.28	0.042
	(-1.83)*	(2.69)**	(2.02)**	(0.89)	(0.96)	(1.70)*	(0.85)	(3.11)**
SWI	0.88	2.65	0.04	1.70	-0.08	-0.85	-1.31	0.044
	(0.30)	(2.18)**	(0.46)	(1.79)*	(-1.39)	(-2.63)**	(-2.82)**	(3.23)**
UK	0.35	4.29	0.15	2.40	0.05	-1.02	-1.11	0.089
	(0.17)	(1.99)**	(1.73)*	(1.82)*	(0.63)	(-1.83)*	(-1.98)**	(5.77)**
US	-2.38	1.71	-0.03	1.16	-0.11	-0.32	0.37	0.072
	(-1.85)*	(1.52)	(-0.35)	(2.30)**	(-2.33)**	(-1.58)	(1.32)	(4.75)**

1 T-statistics are in parentheses below the coefficients, except for the last column where the F-statistic testing the significance of the entire group of variables is in parentheses. * denotes significance at the 10% level, while ** denotes significance at the 5% level.