Does the Fed Model Travel Well?

For short-run tactical allocation, yes, but not for the long haul.

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One of the most popular valuation methods for assessing stock markets involves comparing stock and bond yields. The so-called Fed model, available in several flavors, generally compares the earnings yield on the market (EY) to a nominal (government) long bond yield (LB), often the ten-year Treasury (see *Lex* column [2005]). Stocks are considered cheap when the EY exceeds the LB, and expensive when the EY is lower than the LB.

Asness [2003] offers an in-depth investigation of the issues and the U.S. evidence as to the Fed model. He concludes that there is serious confusion between monetary and real variables in discussions of the model, and that the model has no power to forecast long-term real stock returns.

We extend this empirical analysis to include a variety of alternative yield models for predicting stock returns and to look at five additional countries. We consider seven models overall, including three based on single yields and four based on combinations of these yields to describe relative value. Simple single-yield models are supported by persuasive evidence in a wide range of studies that these absolute valuation levels have long-run predictive power (see Campbell and Shiller [1988], Asness [2003], and Stein and DeMuth [2003]).

Asness [2003] suggests a range of explanations as to why the Fed model may or may not work. First, since stocks and bonds are competing assets in an investor's portfolio, we should compare their yields; yet EY is not the expected return on equities, so we are really comparing chalk and cheese. Second, the present value (PV) argument says that when inflation and interest rates drop, the PV of stocks should rise, without acknowledging that lower inflation implies not only lower discount rates but also lower future nominal cash flows.

Finally, while the historical correlation between low EY and low inflation and low LB suggests EY is set as a function of LB, this implies neither causality nor an empirically successful investment strategy in the future. A key common ingredient in this confusion is clearly the role of inflation and money illusion, although these may have a very real role via distorted corporate earnings and capital gains taxes, interest cost calculations, and possible increases in uncertainty in times of high inflation.

As Modigliani and Cohn [1979] and Ritter and Warr [2002] show, the net impact of these factors on EY is unknown, but Asness [2003] favors the assumption that expected real stock returns move with inflation and nominal interest rates, because investors suffer from money illusion. This cannot be distinguished empirically from the assertion that the equity risk premium varies with inflation.

Analysts have recently noted that the S&P 500 earnings yield remained above the ten-year Treasury yield for a sustained period for the first time since the early 1980s, which some believe may have been the trigger for the great equity bull market of the 1980s and 1990s. Certainly, some periods during those decades when the earnings yield came close to the ten-year bond also preceded significant rises in the equity market.

For those who subscribe to the Fed model, the current scenario is indeed bullish for stocks, although doubters note bonds have been in a bull market of their own. Thus, while stocks may outperform bonds in the future, the gap between the earnings yield and Treasury yields may close because bond yields are rising rather than because stock prices are appreciating.

Asness [2003] reports that for 1926-1965 there was only a weak correlation between earnings yields and bond yields. The former were substantially higher than the latter for much of the period. On this basis, one could argue there is no reason for these variables to converge in the near term. Asness finds that earnings yield and the long bond yield individually dominate the Fed model over a long period (see also Campbell and Shiller [1988]), while Fama and French [1988] and Campbell and Hamao [1989] have found that high dividend yield is consistent with subsequent high returns.

An alternative and more general rationale for testing relative-value models lies in the arbitrage approach of Clare, Thomas, and Wickens [1994], who effectively consider a generalized version of the Fed model including equities, bonds, and Treasury bills that produces a tactical forecasting model for stocks driven by past information including the ratio of the yields of stocks and bonds.

We find that both absolute and relative valuation metrics have something to offer in terms of asset allocation, and that the anticipated holding period is the determining factor in choosing a valuation approach. We conclude that:

1. While absolute-value metrics certainly explain a great amount of the variation in five-year returns, they are less successful when used as a trading rule.
2. From a tactical asset allocation standpoint, relative-value models are clearly better than absolute models for one-year horizons, and the Fed model is the best.

DATA AND METHODOLOGY

This study is based on a sample of six countries: the U.S., the U.K., France (FR), Germany (GY), Switzerland (SW), and Japan (JP). For the U.S., we use the S&P 500 index as an aggregate equity market index. A total market index is chosen as an aggregate equity market measure for the other countries except for Germany. For Germany, we use the DAX 30 index because the total market index has missing values.

The data series run from January 1965 through December 2004 for the U.S. and the U.K. and from July 1973 through December 2004 for the other markets. To provide a comparison across all countries, we focus largely on the period of data that is common for all markets.

The dataset consists of monthly values of dividend yield, earnings yield, the Retail Price Index (RPI) or Consumer Price Index (CPI) as appropriate, and the monthly stock index level. The source is DataStream, an on-line database covering all listed companies on the world's major stock exchanges. All data, including returns, are for local markets, calculated using local currency.

The nominal bond yield is taken as a long-term government bond yield. As per the definition of International Financial Statistics (IFS), the long-term government bond yield refers to one or more series representing yields to maturity of government bonds or other bonds with longer-term rates than other available interest rates (unlike Asness [2003], who uses the ten-year Treasury rate). Unless explicitly stated, all earnings yields used in this study are based on five-year trailing earnings. The earnings yield values are calculated following Shiller [2000] and Asness [2003] to create a smoothed series.

THE FED MODEL

To assess the ability of the Fed model to explain real returns, we follow Asness [2003]. For each country we run three different regressions, each with real returns as the dependent variable. These are a univariate regression with earnings yield (EY) as the independent variable; a univariate regression with EY minus the long bond (LB) rate, i.e. the Fed model; and a bivariate regression including both EY and LB.

Asness [2003] reports a correlation between EY and LB in the U.S. over 1965-2001. It seems likely that this may be true of EY and LB in other markets. Thus we advise caution in examining the results of these regressions. While Asness [2003] reports results based on 10- and 20-year real returns, we opt for 5-year real returns, given the shorter data period for countries outside the U.S.

One caveat to this approach is that Asness [2003] finds ten-year return predictability results support the use of raw valuation, but in 2000 he reported that a variant of the Fed model has predictive power at one-year horizons. There is a risk that our five-year results will show the average characteristics of these results.

Exhibit 1 presents the results of the 18 regressions with *t*-statistics shown in parentheses (adjusted for overlapping observations). For each country we see a positive relationship between returns and earnings yield. This variable alone is enough to explain about half of the variation in returns for the U.K., France, Germany, and Japan. The Fed model (EY − LB) has the expected positive relationship with returns for only four of the countries; coefficients are negative for Switzerland and Japan. Three of the four positive coefficients are significant (at the 5% level) for the U.K., France, and Germany. The Fed model regressions have almost universally poor explanatory power, always considerably lower power than for EY alone.

In the bivariate regressions, there are positive coefficients for LB in five of the six countries; France is the lone exception. Although results for LB are statistically significant (at the 5% level) for only two countries, there is evidence that the inclusion of LB reduces the significance of EY somewhat.

Our international findings are consistent with Asness [2003] to the extent that EY has considerable ability to explain real returns while the Fed model fails in each market examined. The introduction of LB in the bivariate equation adds little to the explanatory power of the regressions in any of the markets except Switzerland. Its positive coefficient in five of the six markets, moreover, is inconsistent with the Fed model, which would predict it should take the opposite sign to EY.

EXHIBIT 1

Five-Year Real Returns Described by Earnings Yield, Bond Yields, and the Fed Model During 1978-2004

Country	Intercept	EY	LB	EY − LB	Adj. R^2
United States	0.07	0.59	-	-	7.4%
	(2.24)	(1.85)			
	0.12	-	-	0.41	0.6%
	(10.22)			(0.75)	
	0.04	0.17	0.65	-	8.4%
	(1.03)	(0.38)	(1.23)		
United Kingdom	−0.03	2.30	-	-	66.9%
	(−1.09)	(8.68)			
	0.19	-	-	1.60	5.5%
	(8.38)			(2.04)	
	−0.08	1.06	1.60	-	71.2%
	(−2.49)	(2.24)	(2.70)		
France	−0.03	1.86	-	-	42.6%
	(−1.48)	(9.40)			
	0.15	-	-	2.08	15.4%
	(9.68)			(4.16)	
	−0.00	2.59	−0.92	-	45.0%
	(−0.12)	(4.93)	(−1.59)		
Germany	−0.11	3.04	-	-	44.1%
	(−3.94)	(8.59)			
	0.10	-	-	3.10	17.9%
	(7.23)			(3.98)	
	−0.13	2.74	0.55	-	44.2%
	(−3.01)	(4.09)	(0.54)		
Switzerland	0.06	0.61	-	-	3.3%
	(1.48)	(1.21)			
	0.11	-	-	−0.15	−0.2%
	(4.86)			(−0.29)	
	−0.13	−0.01	5.34	-	38.8%
	(−3.10)	(−0.03)	(6.18)		
Japan	−0.17	7.88	-	-	58.6%
	(−6.28)	(6.61)			
	0.00	-	-	−2.06	9.0%
	(0.16)			(−2.32)	
	−0.19	6.42	1.13	-	61.2%
	(−8.07)	(4.08)	(1.89)		

WITHIN-SAMPLE ESTIMATION

The most important factor for any absolute- or relative-value model is the ability to explain returns. Exhibit 2 displays the results of univariate regressions using three absolute valuation metrics (EY, the dividend yield (DY), and LB) and four relative valuation metrics (the Fed model (EY – LB); the bond-equity ratio (LB/DY), which Clare, Thomas, and Wickens [1994] call the gilt-equity yield ratio; and two "opposite" models of LB/EY and DY – LB) as independent variables. The dependent variable is one-year returns; results based on both real and nominal returns are reported.

We evaluate model performance using the methodology of Harris and Sanchez-Valle [2000], reporting the average adjusted R^2 value across a number of recursive regressions, when all the data available at the time are used, and rolling regressions, when only the most recent 60 observations are used. Each type of regression is estimated only once 60 complete observations are available.

For example, beginning in July 1973, the first 60 months of data are used to calculate the initial earnings yield, while the next 60 months form the basis of the data for the first regressions, along with the subsequent return over the next year. Thus observations are collected from June 1978 through December 2003, allowing for one-year returns to run until the end of December 2004. For each month between July 1978 and December 2003, a univariate regression is run for each of the seven metrics, and the adjusted R^2 value is recorded. The average adjusted R^2 value for each metric is then calculated as the mean of the monthly values.

One advantage of using the average explanatory power approach is that it replicates the past performance a practitioner would see using the variables to forecast returns on a continuing basis.

Exhibit 2 reports means by recursive or rolling regression and for nominal or real returns. Panel A reveals that for the recursive regressions it is generally easier to explain nominal returns than real returns. Both DY – LB and LB are very poor metrics, whatever the type of return. There is little to choose between EY – LB, EY, and LB/EY (i.e., those models dominated by earnings) for real returns except for France, where EY – LB and LB/EY are clearly superior, and this is also true for nominal returns. Of the remaining models including dividend yield, LB/DY is slightly better than DY for real and nominal returns, and the explanatory power is particularly high for the U.K. In general, there is not much difference in the performance of the relative-value models of EY – LB, LB/DY, and LB/EY.

Panel B demonstrates that there is little difference between the general explanatory power for real and nominal returns when we use rolling regressions. As would be expected, the rolling regressions explain much more of the variation in returns than the recursive regressions. DY – LB and LB remain the poorest metrics. DY is the best for three of the six markets in both real and nominal terms, but it is relatively poor for France. LB/EY is nearly always better than EY – LB, although the difference is often only minor. There is no metric that clearly dominates all others across every market.

EXHIBIT 2

Estimation of Within-Sample Performance for One-Year International Equity Returns 1978-2004 Using Average Adjusted R^2 Values

Panel A: Recursive Regressions

Country	Real Returns							Nominal Returns						
	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB
United States	0.063	0.069	0.001	0.023	0.043	0.026	–0.004	0.089	0.128	0.004	0.085	0.114	0.076	0.008
United Kingdom	0.027	0.087	0.018	0.056	0.226	0.080	0.047	0.101	0.181	0.047	0.121	0.187	0.162	0.034
France	0.037	0.002	0.018	0.260	0.073	0.223	0.055	0.069	0.024	0.017	0.282	0.113	0.260	0.052
Germany	0.020	0.009	0.005	0.047	0.028	0.052	0.014	0.033	0.012	0.003	0.064	0.036	0.073	0.012
Switzerland	0.024	0.027	0.000	0.022	0.017	0.015	0.008	0.026	0.033	–0.002	0.023	0.018	0.015	0.007
Japan	0.071	0.080	0.026	0.031	0.124	0.093	0.022	0.079	0.087	0.025	0.029	0.125	0.094	0.020
Average	**0.040**	**0.046**	**0.011**	**0.073**	**0.085**	**0.082**	**0.024**	**0.066**	**0.078**	**0.016**	**0.101**	**0.099**	**0.113**	**0.022**

Panel B: Rolling Regressions

Country	Real Returns							Nominal Returns						
	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB
United States	0.298	0.331	0.086	0.212	0.291	0.251	0.125	0.299	0.344	0.093	0.223	0.301	0.258	0.132
United Kingdom	0.217	0.263	0.106	0.215	0.206	0.249	0.115	0.224	0.274	0.105	0.220	0.202	0.252	0.229
France	0.235	0.192	0.098	0.257	0.257	0.282	0.142	0.231	0.194	0.095	0.260	0.258	0.284	0.137
Germany	0.190	0.202	0.184	0.252	0.228	0.257	0.179	0.207	0.216	0.173	0.259	0.237	0.267	0.168
Switzerland	0.216	0.186	0.089	0.231	0.186	0.195	0.100	0.194	0.084	0.084	0.232	0.175	0.190	0.091
Japan	0.271	0.348	0.115	0.244	0.259	0.266	0.159	0.267	0.345	0.105	0.233	0.252	0.259	0.148
Average	**0.238**	**0.254**	**0.113**	**0.235**	**0.238**	**0.250**	**0.137**	**0.237**	**0.243**	**0.109**	**0.238**	**0.238**	**0.252**	**0.151**

EXHIBIT 3

Estimation of Within-Sample Performance for Five-Year International Equity Returns 1978-2004 Using Average Adjusted R^2 Values

Panel A: Recursive Regressions

Country	Real Returns							Nominal Returns						
	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB
United States	0.207	0.126	0.268	0.008	0.054	0.034	0.193	0.346	0.291	0.223	0.058	0.049	0.115	0.091
United Kingdom	0.407	0.538	0.280	0.230	0.089	0.348	0.116	0.686	0.660	0.478	0.339	0.028	0.483	0.274
France	0.585	0.401	0.430	0.225	0.109	0.282	0.257	0.739	0.648	0.565	0.243	0.242	0.359	0.248
Germany	0.548	0.324	0.457	0.219	0.054	0.241	0.230	0.635	0.433	0.481	0.283	0.081	0.312	0.192
Switzerland	0.063	0.122	0.345	0.038	0.093	0.171	0.088	0.077	0.135	0.348	0.028	0.080	0.073	0.159
Japan	0.481	0.484	0.332	0.058	0.307	0.259	0.236	0.510	0.517	0.356	0.057	0.315	0.265	0.247
Average	**0.382**	**0.333**	**0.352**	**0.130**	**0.118**	**0.223**	**0.187**	**0.499**	**0.447**	**0.409**	**0.168**	**0.133**	**0.268**	**0.202**

Panel B: Rolling Regressions

Country	Real Returns							Nominal Returns						
	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB	EY	DY	LB	EY–LB	LB/DY	LB/EY	DY–LB
United States	0.536	0.550	0.311	0.150	0.215	0.252	0.182	0.547	0.556	0.279	0.150	0.212	0.256	0.152
United Kingdom	0.544	0.518	0.235	0.358	0.341	0.411	0.228	0.551	0.496	0.252	0.380	0.320	0.422	0.252
France	0.514	0.417	0.441	0.395	0.261	0.460	0.308	0.508	0.440	0.470	0.367	0.267	0.428	0.308
Germany	0.537	0.474	0.424	0.322	0.189	0.398	0.253	0.575	0.514	0.420	0.341	0.202	0.426	0.236
Switzerland	0.474	0.379	0.257	0.248	0.148	0.209	0.171	0.482	0.372	0.236	0.262	0.137	0.217	0.157
Japan	0.542	0.546	0.238	0.162	0.332	0.352	0.220	0.533	0.535	0.236	0.162	0.346	0.362	0.220
Average	**0.525**	**0.481**	**0.318**	**0.273**	**0.248**	**0.347**	**0.227**	**0.533**	**0.486**	**0.316**	**0.277**	**0.247**	**0.352**	**0.221**

One note of caution with regard to the rolling regressions is that, on occasion, it was possible to obtain a relatively high adjusted R^2 value, but the coefficient on the valuation metric was not of the expected sign. In these instances it is likely an investor would not be predisposed to accept the forecast. There was no such problem with the recursive regressions.

Exhibit 3 presents the results of a process similar to that in Exhibit 2, but taking five-year returns now as the independent variable. The observations used are from June 1978 through December 1999 to allow for five-year returns to run until the end of December 2004. As before, 60 complete observations are recorded before the analysis began.

Examine first the recursive regressions in Panel A. Note that the relative-value metrics are generally poorer at explaining real returns than the absolute-valuation metrics of EY and DY. EY – LB is very poor for U.S. returns, consistent with the findings of Asness [2003]. This is also true for nominal returns.

LB has considerably more explanatory power for five-year real and nominal returns than for one-year returns. Of the relative-value models, LB/EY is better than EY – LB, and DY – LB is better than LB/DY. Overall, LB/EY is probably the best relative metric for five-year returns.

Panel B reports the results of the rolling regressions. The first point to note regarding these regressions is that 60 observations are equivalent to just one independent time period, compared to the one-year returns in Exhibit 2, where the same 60 observations produce five independent periods. Therefore, one might reasonably expect the five-year regressions to be less useful at predicting returns.

With this caveat in mind, EY is the best metric except for the U.S. and Japan, where DY is comparable. As in the case of the recursive regressions, absolute valuation is better than relative valuation in explaining five-year returns. Of the relative-value models, LB/EY is again the best performer.

We should repeat our note of caution as in the rolling regressions in Exhibit 2, with some instances of high adjusted R^2 values but unexpected coefficient signs.

Overall the results in Exhibits 2 and 3 indicate relative-value models are far more competitive for explaining one-year returns, particularly nominal returns, than five-year returns. Absolute valuation metrics are clearly the best at explaining five-year returns, while there is little to choose between these and relative valuation metrics for one-year returns, The different metrics for five-year returns almost universally explain more than the metrics for one-year returns. This confirms the apparently counterintuitive findings by Fama and French [1988] and Asness [2003] that it is far harder to predict short-term movements of equity markets than long-term movements.

TRADING RULE

A practitioner seeking to use some of the metrics we describe would want to see how they perform in an investment strategy. As an example, raw valuation does not have to be able to deliver short-term trading success but must work for long-term horizons as prices return to fair value. An illusory metric such as the Fed model that has been shown to fail at explaining long-term returns may be useful as a tactical asset allocation tool as long as investors continue in their historical pattern of error.

The strategy we test involves a monthly comparison of the nominal forecasted returns over the one-year and five-year horizons with the nominal risk-free rate (assumed to be the annual interest rate on three-month Treasury bills). If the forecasted equity return is higher, a 100% long position is taken in equities; otherwise 100% of the investment is placed in the short-term bills. To add realism to the exercise, a transaction cost of 0.5% is levied each time the switch is made from equities to bills or vice versa. This is accounted for in making the asset allocation decision each month.

That is, if the one-year holding-period return is estimated at 10.0% from equities and 9.6% from bills, and the money is already in the latter, it is assumed no change in investment policy is made. In the case of these same annual returns, but with a five-year equity return, the shift would be made because compounding of the additional 0.4% difference in annual returns would more than compensate for the 0.5% one-off trading cost.

Exhibit 4 presents the results of implementing the trading strategy between May 1988 and December 2004. Results are reported as annually compounded returns relative to the buy-and-hold return of the specific country. Results based on nominal returns are reported, because these appear to be the best for tactical asset allocation purposes, given the results in Exhibits 2 and 3.

The results of trading based on forecasts from the recursive regressions are shown in Panel A. Note that a number of the strategies show exactly the same performance as the buy-and-hold return. This is almost universally because the strategies always favor equities over T-bills in every period.

Japan is the market where the most value could be added through one-year forecast trading strategies. Germany and Switzerland demonstrate the most variation across the different metrics. No value is added in the U.S. or France. The relative-value models are clearly better than the absolute-value models for one-year forecasts, and EY − LB appears to be the best. This is the only metric that did not create a loss in any country relative to the buy-and-hold position.

Using the five-year forecasts, it is very hard to add value. The absolute-value metrics, which looked very good from the within-sample tests in Exhibit 3, are poor on a trading basis. Japan is the only market where these models added meaningful value.

Panel B presents the trading performance for one- and five-year forecasts based on rolling regressions. For one-year forecasts, the absolute-value metrics are not very successful (as in Panel A). *EY − LB adds value in five of the six markets,* however, with negative relative returns only in the U.S. LB/EY adds value in two countries, but again fails to generate any excess returns in the U.S.

The five-year forecasts offer few examples of excess returns, especially for the absolute-value models. There

EXHIBIT 4

Compound Returns Relative to a Buy-and-Hold Strategy for Seven Tactical Equity Strategies in Six International Markets for 1988-2004

Panel A: Recursive Regressions

Country	Buy & Hold	1-Year Nominal Forecasts							5-Year Nominal Forecasts						
		EY	DY	LB	EY−LB	LB/DY	LB/EY	DY−LB	EY	DY	LB	EY−LB	LB/DY	LB/EY	DY−LB
United States	+12.11	+0.00	−1.75	+0.00	+0.00	−0.43	−1.23	+0.00	−1.10	+0.00	+0.00	+0.00	+0.00	+0.00	+0.00
United Kingdom	+10.80	−0.50	+0.54	−1.34	+1.57	+0.00	+2.24	−0.95	+0.00	+0.57	−0.63	+0.00	+0.00	+0.00	−2.16
France	+12.35	+0.00	+0.00	−4.89	+0.00	−0.38	−0.41	−1.84	+0.00	−2.93	−6.53	+0.00	+0.00	+0.00	−4.89
Germany	+8.63	−2.68	−4.47	−0.40	+2.53	+3.11	+2.27	+0.00	−5.46	−1.83	−4.85	+0.00	+0.00	+0.37	+0.00
Switzerland	+12.40	−1.60	−2.96	−1.32	+1.18	−1.54	+0.63	−0.79	−2.76	−0.85	+0.00	+0.00	+0.00	+0.00	+0.00
Japan	−2.55	−0.31	+0.21	−1.92	+2.03	+2.77	+4.38	−1.67	+3.47	+0.94	+1.18	−1.33	+0.00	+0.00	+1.03

Panel B: Rolling Regressions

Country	Buy & Hold	1-Year Nominal Forecasts							5-Year Nominal Forecasts						
		EY	DY	LB	EY−LB	LB/DY	LB/EY	DY−LB	EY	DY	LB	EY−LB	LB/DY	LB/EY	DY−LB
United States	+12.11	−4.48	−1.71	−3.07	−1.60	+0.00	−1.87	+0.00	−2.33	+0.00	−2.33	+0.00	−0.88	+0.06	+0.00
United Kingdom	+10.80	−2.40	+0.77	−2.67	+2.39	−1.90	+2.92	−2.13	−0.44	−0.47	−1.26	−2.02	−1.57	−0.92	−1.34
France	+12.35	−2.23	−4.43	−2.50	+0.75	−1.49	−0.23	+0.00	−2.56	−2.72	−4.05	+0.00	−0.51	+0.75	−3.55
Germany	+8.63	−2.80	−1.68	+0.69	+1.03	+1.56	−0.03	+0.76	−5.89	−5.12	−1.65	+0.83	+4.35	+1.29	−2.45
Switzerland	+12.40	−3.97	−3.81	−2.67	+0.02	−3.35	−1.23	−2.38	−3.41	−1.77	−1.24	+0.43	−1.93	−0.28	−2.91
Japan	−2.55	+1.19	+1.18	−0.85	+0.42	+0.55	+2.84	−0.86	+2.11	+1.56	−2.75	−1.75	+3.51	+2.68	−0.10

EXHIBIT 5

Earnings Yield as a Function of Bond Yield and the Volatility of Stocks and Bonds

Country	Intercept	LB	σ_{stocks}	σ_{bonds}	$\sigma_{stocks}/\sigma_{bonds}$	Adj. R^2
Panel A: 1970-2004						
United States	0.0038	1.0081	0.0425	−0.0715	-	79.7%
	(0.32)	(13.82)	(4.04)	(−5.68)		
	−0.0333	1.0168	-	-	0.0198	78.6%
	(−5.75)	(14.36)			(7.74)	
United Kingdom	−0.0216	0.8013	0.0148	0.0393	-	76.2%
	(−2.07)	(10.05)	(2.01)	(2.12)		
	−0.0101	0.9638	-	-	−0.0004	72.7%
	(−1.24)	(10.81)			(−0.15)	
Panel B: 1978-2004						
United States	−0.0008	1.0326	0.0421	−0.0681	-	80.8%
	(−0.06)	(14.56)	(3.60)	(−3.92)		
	−0.0422	1.0462	-	-	0.0251	81.1%
	(−7.13)	(15.13)			(6.38)	
United Kingdom	−0.0178	0.7155	0.0343	0.0308	-	79.9%
	(−2.01)	(10.88)	(5.97)	(1.65)		
	−0.0005	0.8278	-	-	0.0022	73.8%
	(−0.08)	(12.58)			(0.72)	
France	−0.0122	0.8077	−0.0027	0.0439	-	67.5%
	(−0.61)	(8.44)	(−0.18)	(1.70)		
	0.0170	0.8308	-	-	−0.0060	67.1%
	(2.37)	(8.94)			(−1.64)	
Germany	−0.0496	0.8410	0.0155	0.0891	-	51.3%
	(−2.37)	(6.45)	(1.16)	(3.91)		
	0.0335	0.6828	-	-	−0.0080	40.1%
	(2.25)	(3.73)			(−3.56)	
Switzerland	0.1120	0.8325	−0.1088	−0.0171	-	42.0%
	(5.19)	(3.68)	(−7.56)	(−1.12)		
	0.0420	0.9023	-	-	−0.0088	15.0%
	(2.96)	(3.23)			(−1.69)	
Japan	0.0283	0.2294	−0.0318	0.0113	-	64.2%
	(7.83)	(7.23)	(−8.64)	(4.97)		
	0.0209	0.3020	-	-	−0.0078	52.4%
	(11.26)	(9.90)			(−5.43)	

is modest support for LB/EY, in that it delivers positive excess returns in four of the six markets. Japan again appears to be the country where there is most opportunity for adding value using a trading strategy.

Overall, trading based solely on valuation models generates varying results. Despite the theoretical inconsistencies highlighted by Ritter and Warr [2002] and Asness [2003], investors would clearly have benefited from focusing on the relative-valuation metric of EY − LB when using one-year forecasts for tactical asset allocation. Absolute-valuation models are poor whether short- or long-term forecasts are used. This is very much contrary to the good performance observed in the earlier retrospective estimations.

RELATIONSHIP BETWEEN P/E RATIOS AND NOMINAL INTEREST RATES

Asness [2000, 2003] argues that the Fed model has more than theoretical shortcomings. It fails to consider a further important factor: investors' perceptions of the risks of stocks relative to bonds and vice versa. Asness [2003] suggests that it is arbitrary for the Fed model to assume that EY and LB should be equal; instead EY could be any linear function of LB.

Taking this one step farther, Asness [2003] suggests an equation to explain how investors set EY:

$$EY = a + bLB + c\sigma_{stocks} + d\sigma_{bonds}$$

where σ_{stocks} and σ_{bonds} are the prior 20-year volatilities of stocks and bonds.

Asness [2003] hypothesizes that the coefficients b and c should be positive and that d should be negative. Thus the weighted difference of stock and bond volatility affects EY; relatively higher stock volatility means investors demand a higher EY. When Asness tests the model in the U.S. for 1926-2001, the coefficients of the variables have the anticipated signs and the model can explain EY quite well, despite some econometric difficulties associated with the equation. An alternative interpretation of the equation according to Clare, Thomas, and Wickens [1994] is that the investor perception variable proxies for a risk premium.

To investigate whether price-earnings ratios are set internationally in the way that Asness [2003] describes, we again modify the variables by using five-year volatilities for both stocks and bonds. Stock volatility is calculated as the annualized monthly return volatility, and bond volatility is estimated using the annualized monthly change in yield volatility (bond returns were not available for all our series). We also examine a more parsimonious version of the model that includes simply LB and the ratio of stock volatility to bond volatility. For these tests we use the extended data available for the U.S. and the U.K.

Panel A of Exhibit 5 reports the results of the regressions for 1970-2004. The evidence for the U.S. is indeed consistent with Asness [2003]; the coefficients on both LB and σ_{stocks} are positive, while the coefficient on σ_{bonds} is negative. These results are supported by the positive coefficient on the volatility ratio in the bivariate equation. For the U.K., both LB and σ_{stocks} have positive coefficients, but so does σ_{bonds}. In addition the coefficient on the volatility ratio is negative.

Panel B displays the results for the 1978-2004 period. The U.K. and U.S. results remain largely consistent with the results in Panel A although the ratio of volatility coefficient in the U.K. has become slightly positive. In the remaining markets we observe negative coefficients on three of the four σ_{stocks} variables (and strongly negative for Switzerland and Japan). Only Switzerland has the expected negative σ_{bonds} coefficient, while all four markets have a negative volatility ratio coefficient. The adjusted R^2 values of each regression are typically fairly high, suggesting that the volatilities of the asset classes are important factors but in a different way from that observed for the U.S. by Asness [2003].

It would clearly be interesting if it were possible to use 20-year volatilities as a more direct robustness check on these international results, but for now the consistency between the 20-year findings of Asness [2003] and our own 5-year findings in Exhibit 5 for the U.S. is reassuring.

CONCLUSION

The Fed model has been widely used in the U.S. as a way to describe whether stocks are cheap or expensive. We have extended previous U.S.-based work by considering this model from an international perspective against other absolute- and relative-valuation models. We find absolute-valuation metrics such as earnings yield and dividend yield can explain a considerable amount of the variation in five-year returns, but the Fed model fails in each country within-sample.

Our international evidence provides valuable support for conclusions by Ritter and Warr [2002] and Asness [2003] that the Fed model is not appropriate for explaining longer-term returns. This is the expected result for a metric subject to the money illusion problem by incorrectly comparing real yields with nominal yields.

Relative-valuation models are considerably better at explaining one-year returns and perform at least as well as absolute metrics, and in some cases better. A trading rule finds the Fed model to be the best-performing metric using one-year forecasts measured against a buy-and-hold strategy. The model outperforms in the United Kingdom, Germany, Switzerland, and Japan when recursive forecasts are used, and also in France when rolling forecasts are used. The United States proves to be the lone exception.

This provides international confirmation of the notion proposed by Asness [2000, 2003] that the Fed model may have some effectiveness as a tactical asset allocation tool, assuming investors continue to repeat their past behavior, making mistakes and following the wrong model but in a consistent fashion.

ENDNOTE

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REFERENCES

Asness, C. "Fight the Fed Model." *The Journal of Portfolio Management*, Fall 2003.

——."Stocks vs. Bonds: Explaining the Equity Risk Premium." *Financial Analysts Journal*, March/April 2000.

Campbell, J., and Y. Hamao. "Predictable Stock Returns in the United States and Japan: A Study of Long Term Capital Market Integration." LSE Financial Markets Group Discussion Paper 69, 1989.

Campbell, J., and R. Shiller. "Stock Prices, Earnings and Expected Dividends." *Journal of Finance*, 43, No. 3 (July 1988), pp. 661-676.

Clare, A., S. Thomas, and M. Wickens, "Is the Gilt-Equity Yield Ratio Useful for Predicting UK Stock Returns?" *Economic Journal*, 104, No. 423 (March 1994), pp. 303-315.

Fama, E., and K. French, "Permanent and Temporary Components of Stock Prices." *Journal of Political Economy*, 96, No. 2 (April 1988), pp. 246-273.

Harris, R., and R. Sanchez-Valle. "The Gilt-Equity Yield Ratio and the Predictability of UK and US Equity Returns." *Journal of Business, Finance and Accounting*, 27, No. 3/4 (April/May 2000), pp. 333-357.

Lex column. *The Financial Times*, July 4, 2005.

Modigliani, F., and R. Cohn. "Inflation, Rational Valuation, and the Market." *Financial Analysts Journal*, March/April 1979.

Ritter, J., and R. Warr. "The Decline of Inflation and the Bull Market of 1982-1999." *Journal of Financial and Quantitative Analysis*, 37, No. 1 (March 2002), pp. 29-61.

Shiller, R. *Irrational Exuberance.* Princeton: Princeton University Press, 2000.

Stein, B., and P. DeMuth. *Yes, You Can Time the Market.* New York: John Wiley & Sons, 2003.