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2 An Exploratory Investigation of the Fundamental Determinants of National Equity Market Returns

Wayne Ferson and Campbell R. Harvey

This paper studies average and conditional expected returns in national equity markets and their relation to a number of fundamental country attributes. The attributes are organized into three groups. The first are relative valuation ratios, such as price-to-book-value, cash-flow, earnings, and dividends. The second group measures relative economic performance, and the third measures industry structure. We find that average returns across countries are related to the volatility of their price-to-book ratios. Predictable variation in returns is also related to relative gross domestic product (GDP), interest rate levels, and dividend-price ratios. We explore the hypothesis that cross-sectional variation in the country attributes proxies for variation in the sensitivity of national markets to global measures of economic risks. We test single-factor and two-factor models in which countries' conditional betas are assumed to be functions of the more important fundamental attributes.

2.1 Introduction

Asset-pricing theories postulate that cross-sectional differences in expected returns are linearly related to the covariances or betas of securities with marginal utility, which is a function of a set of economic risk factors. Firm-specific

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attributes other than betas have traditionally served as alternative hypotheses in tests of these asset-pricing models at the "micro" level. A well-known example is the firm "size-effect," which first drew attention as an alternative to the capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965), and Black (1972). Additional examples include ratios of stock market price to earnings and the book value of equity (e.g., Basu 1977; Fama and French 1992; Chan, Hamao, and Lakonishok 1991). In the early 1990s, a flurry of research is attempting to understand the role of such firm-specific attributes in domestic asset pricing.

In contrast to research on foreign exchange markets, which has long been interested in predictability, research on international equity pricing has traditionally focused on average returns. Recently, however, studies have widened the focus to include the predictability of returns in different countries and the sources of this predictable variation (Harvey 1991b; Dumas and Solnik 1993; Ferson and Harvey 1993). This paper studies the relation between predictable variation and fundamental valuation ratios, measures of economic performance, and industry structure at the country level.

It is interesting that there is a divergence between the cross-sectional fundamental analysis that is important to investment practitioners (e.g., Rosenberg, Reid, and Lanstein 1985, Guerard and Takano 1990; Wadhwani and Shah 1993) and the perspective taken in most of the academic research on asset pricing. The evidence of Fama and French (1992) and others suggests that firm-specific attributes are important for explaining the cross section of domestic equity returns. This, of course, would be no surprise to many practitioners. One of the objectives of this paper is to begin to bridge the gap between the cross-sectional analysis of attributes conducted by practitioners and the beta pricing models for expected returns that are familiar to academics.

We estimate cross-sectional models, using fundamental attributes to predict future equity market returns. For example, the regressions ask whether lagged price-to-book ratios predict the next period's cross section of returns. The simplest international asset-pricing theories, based on perfect and integrated markets, imply that fundamental attributes should be useful in discriminating expected returns across countries only to the extent that they are proxies for the relevant risk exposures. We explore the hypothesis that fundamental ratios serve as proxies for conditional betas in national equity markets. We test single-factor and two-factor models in which countries' conditional betas are assumed to be functions of the fundamental attributes.

The paper is organized as follows. Section 2.2 describes the data. Section 2.3 presents some initial empirical results. Section 2.4 presents our empirical asset-pricing models, and section 2.5 offers concluding remarks.

2.2 The Data

2.2.1 National Equity Market Returns

Total returns for twenty-one countries are based on indexes from Morgan Stanley Capital International (MSCI). The returns are calculated with gross dividend reinvestment. They represent value-weighted portfolios of the larger firms traded on the national equity markets, and are designed to cover a minimum of 60 percent of the market capitalization. Returns are available from January 1970 except for Finland, Ireland, and New Zealand (which begin in February 1988). A value-weighted world market portfolio is constructed as the aggregate of the twenty-one countries.

2.2.2 Country Attributes

We examine three different groups of country attributes. The first are the relative valuation ratios. The second group measures country economic performance, and the third reflects industry structure. The data series are available from different starting dates, the earliest of which is January 1970. We conduct most of our analysis using the January 1976 through May 1993 period, for which all of the series are available. Here we motivate and briefly describe the variables. A data appendix contains more detailed descriptions of the data and sources.

Valuation Ratios

Measures of relative value have long been used by equity analysts in their attempt to discriminate high from low expected return stocks (e.g., Graham 1965). A number of investment services characterize the "styles" of equity managers as "value" or "growth" largely on the basis of similar valuation ratios for the stocks they buy (e.g., Haughton and Christopherson 1989). Quantitative stock selection models place a great deal of weight on valuation ratios for individual stocks in the United States and in other national markets (e.g., Rosenberg, Reid, and Lanstein 1985; Guerard and Takano 1990; Wadhwani and Shah 1993). With the recent work of Fama and French (1992) academics have become increasingly interested in valuation ratios. No previous study, however, has used such ratios at the country level to model the cross section of conditional expected returns as we do in this paper.

The usefulness of valuation ratios to predict stock returns may be related to mean reversion in the stock markets (Poterba and Summers 1988), time-varying risk and expected returns (Fama and French 1989), or investor sentiment (e.g., Shleifer and Summers 1990). At the country level, Stulz and Wasserfallen (1992) suggest that differences in stock market price levels, other things held fixed, may proxy for their relative investability. If expected returns

differ across countries with investability, we might expect differences in valuation ratios to be related to differences in expected returns.[1]

We use four valuation ratios, obtained from MSCI. These are (a) earnings-to-price, (b) price-to-cash-flow, (c) price-to-book-value, and (d) dividend yield. Earnings-to-price was one of the first valuation ratios to attract attention as an alternative to the CAPM for individual stocks (Basu 1977). Our ratio is value-weighted across the firms in the MSCI universe. Chan, Hamao, and Lakonishok (1991) found that a ratio of price to cash flow had a stronger relation to individual stock returns in Japan than a ratio of price to earnings. Our price-to-cash ratio defines cash as accounting earnings plus depreciation. Like the price-to-book-value ratio, this is a value-weighted average across the firms. Finally, we examine dividend yields, which are the twelve-month moving sum of dividends divided by the current MSCI index level for each country.

Economic Performance Measures

We study four measures of country economic performance, designed to capture relative output, inflation, and future expected economic growth. Unlike the relative valuation measures, these variables come from outside the stock markets. The first is the ratio of lagged, quarterly gross domestic product (GDP) per capita to lagged quarterly GDP per capita for the Organization for Economic Cooperation and Development (OECD) countries, both measured in U.S. dollars. GDP per capita is studied by Harris and Opler (1990), who find that stock market returns reflect forecasts of future output. Our second measure is relative inflation, measured monthly as the ratio of country inflation (annual percentage changes in the local consumer price index [CPI]), to OECD annual inflation. Country inflation and inflation volatility, in relation to stock returns, are studied by Mandelker and Tandon (1985). A long-term interest rate and a term spread are the final economic performance measures. Harvey (1988, 1991a) has shown that the slope of the term structure contains forecasts of future economic growth rates in a number of countries. Bond yields and spreads for individual countries are also used in predictive models by Ferson and Harvey (1993), Solnik (1993), and Wadhwani and Shah (1993).[2]

Industry Structure Measures

We measure the industry structure of a country using the coefficients from regressing the country returns on international industry indices. We use the MSCI world industry portfolios to construct the industry indices. MSCI tracks

1. To the extent that such effects are concentrated in smaller shares, we may understate their importance by using the MSCI indexes, which are heavily weighted toward the larger and more liquid issues.

2. We use the long rate and the spread because their correlation is much lower than the correlation of the short rate and the spread, or the short rate and the long rate. While the long rates are highly persistent, appendix table 2A.1 shows that the sample autocorrelations damp out at longer lags.

thirty-eight industry groups. Industry factors are examined for explaining differences in stock return behavior across countries by Roll (1992) and Heston and Rouwenhorst (1993). Investment services, such as BARRA, use related industry structure measures in their models for individual stocks. BARRA uses as many as fifty-five industry groups. However, since our analysis is at the country level instead of the individual firm level, parsimony is important. We therefore aggregate the thirty-eight MSCI industry returns into four groups, as shown in figure 2.1. The industry groups are (*a*) natural resources, (*b*) construction and manufacturing, (*c*) transportation, communication, and energy, and (*d*) services, including financial. Summary statistics of the four industry-grouped portfolio returns are shown in the data appendix.

2.2.3 Global Risk Factors

We consider five global risk factors in our initial exploratory analysis, and focus on the two most important in our empirical asset-pricing models. Our choice of the factors follows previous theoretical and empirical work on international asset pricing. Stulz (1981b, 1984) and Adler and Dumas (1983) provide conditions under which a single-beta capital asset pricing model (CAPM) based on a world market portfolio holds globally, which motivates the use of a world equity market risk factor. A number of empirical studies have used a similar risk factor in a conditional asset-pricing context (e.g., Giovannini and Jorion 1989; Harvey 1991b; Ferson and Harvey 1993). The MSCI world return is the U.S. dollar world market return less the thirty-day Eurodollar rate.

Solnik (1974) showed that exchange risks should be "priced" in a world otherwise similar to that of the static CAPM, when purchasing power parity fails. Adler and Dumas (1983) present a model in which the world market portfolio and exchange risks are the relevant risk factors. The exchange risks can be broken down into a separate factor for each currency, as in Dumas and Solnik (1993), or can be approximated by a single variable, as in Ferson and Harvey (1993, 1994). Our second global risk factor, the G10 FX return, is the return to holding a portfolio of the currencies of the G10 countries (plus Switzerland) in excess of the thirty-day Eurodollar deposit rate. The currency return is the percentage change in the spot exchange rate plus the local currency, thirty-day Eurodeposit rate. The currency returns are trade-weighted to form a portfolio return (see Harvey 1993b for details of the construction). This measure is similar to the one used by Ferson and Harvey (1993, 1994), but it is measured directly as an excess return. This avoids the need to construct a mimicking portfolio for the factor in an asset-pricing model.

International equilibrium and arbitrage pricing (APT) models with several risk factors are described by Stulz (1981a), Hodrick (1981), Ross and Walsh (1983), and Bansal, Hsieh, and Viswanathan (1993) among others. The central intuition of such models is that only the pervasive sources of common variation should be priced. Korajczyk and Viallet (1989) and Heston, Rouwenhorst, and Wessels (1991) find evidence for several common sources of variation in U.S.

Number	Portfolio†	MSCI Composition
1	Natural Resoures	Forest Products & Paper (18) Gold Mines (19) Metals (Non-Ferrous) (26) Metals (Steel) (27) Misc. Materials & Commodities (28) Beverages & Tobacco (5) Food & Household Products (17)
2	Contruction and Manufacturing	Building Materials & Components (7) Construction & Housing (10) Appliances & Household Durables (2) Automobiles (3) Electrical & Electronics (12) Electronic Components & Instruments (13) Industrial Components (21) Machinery & Engineering (24) Aerospace & Military Technology (1) Chemicals (9) Mechandising (25) Textiles & Apparel (33) Wholesale & International Trade (38) Recreation, Other Consumer Goods (31)
3	Transportation/Communication/ Utilities/Energy	Transportation–Airlines (34) Transportation–Road & Rail (35) Transportation–Shipping (36) Broadcasting (6) Telecommunications (32) Utilities–Electrical & Gas (37) Energy Equipment & Services (14) Energy Sources (15)
4	Services and Financial Services	Banking (4) Financial Services (16) Insurance (22) Real Estate (30) Business & Public Services (8) Data Processing & Reproduction (11) Health & Personal Care (20) Leisure & Tourism (23)

Fig. 2.1 International industry portfolios
†An aggregation of thirty-seven Morgan Stanley Capital International industry portfolios. Each of the MSCI portfolios (numbers in parentheses) is valued-weighted. MCSI portfolio Multi-Industries (29) is not included in the aggregation. The aggregated portfolios represent returns to a portfolio that starts with an equally weighted investment in the MSCI categories in December 1969. Data are available through September 1991.

and European stocks, which suggests that a number of worldwide risk factors may be important. Ferson and Harvey (1993, 1994) find evidence that a number of global risk factors are useful in capturing both the cross section of average returns and the predictable variation of returns in national equity markets. Our additional factors are similar to theirs. The OIL return is the percentage change in the dollar price of oil minus the thirty-day Eurodollar deposit rate. The growth in OECD production is the percentage change in the OECD index of industrial production in member countries. OECD inflation is the percentage change in the OECD index of consumer prices in member countries. The data appendix provides more detailed descriptions of these variables.

2.2.4 World Information Variables

We are interested in the relation between predictability in country returns over time and the cross-sectional predictability using the fundamental attributes. We therefore include a number of worldwide information variables, similar to those which previous studies found can predict country returns over time. The variables are lagged values of the MSCI world market return, the G10 FX return, a world dividend yield, a short-term Eurodollar deposit rate, and a short-term structure measure taken from the Eurodollar market. The term spread is the difference between a ninety-day Eurodollar deposit rate and the thirty-day Eurodollar deposit rate. The short-term interest rate is the thirty-day Eurodollar deposit yield which is observed on the last day of the month.

As the predetermined variables follow previous studies using similar variables, there is a natural concern that their predictive ability arises spuriously from data mining. However, Solnik (1993) finds, using step ahead forecasts, that the predictability is economically significant. Ferson and Harvey (1993) find that a large fraction of the predictability is related to premiums for economic factor risks. Even so, the possibility of data mining remains an important caveat. Our methodology addresses this issue to some extent because it is robust to the specification of the expected factor premiums, as is explained below.

2.3 Preliminary Empirical Evidence

The appendix tables present summary statistics for the country returns and the fundamental attributes. We report the sample means, standard deviations, and autocorrelations. The monthly returns are measured in U.S. dollars. The sample period is 1975:01–1993:05, but for some of the countries and series the starting dates are later. Summary statistics are also reported for the MSCI world market index. As time series, the valuation ratios and most of the other fundamental attributes share the high degree of persistence that is familiar from the dividend yield series. However, the autocorrelations of the other series tend to damp out at longer lags more quickly than those of the dividend yields.

The appendix tables report the average correlations across countries of the valuation ratios and economic performance measures. For each country we calculate the time-series correlation matrix of the attributes. We then average these matrices across the countries. The highest absolute correlations are among the valuation ratios, which range from 0.69 to 0.79. The remaining correlations are all smaller than 0.51. The correlations between the valuation ratios and the measures of economic performance are generally much smaller than the correlations among the valuation ratios, which makes sense given the common price level in all of the valuation ratios. This suggests that some of the valuation ratios will be redundant in a time-series model, but there is not

likely to be serious collinearity problems between the group of valuation ratios and the measures of economic performance.

The appendix tables record the measures of industry structure for each of the countries. These are obtained by regressing the country returns, over time, on the industry groups. The coefficients provide a simple measure of the extent to which the returns of a given country move in association with the global industry groups. Some of the industry loadings make intuitive sense. For example, Australia and Canada load heavily on natural resources, Germany on construction and manufacturing, while Hong Kong loads heavily on services, including financial. There are also examples of loadings that do not seem so intuitive. Furthermore, some of the loadings are negative. Negative loadings can be symptomatic of collinearity, or of missing factors. There is high, but not extremely high correlation between the industry groups (see the data appendix). If the four industry groups do not span the relevant factors, then the sum of the loadings should differ from 1.0 (Huberman and Kandel 1987). The coefficients are often less than 1.0, which suggests missing factors. This implies that the industry loadings should be used in conjunction with other attributes in an asset-pricing model.

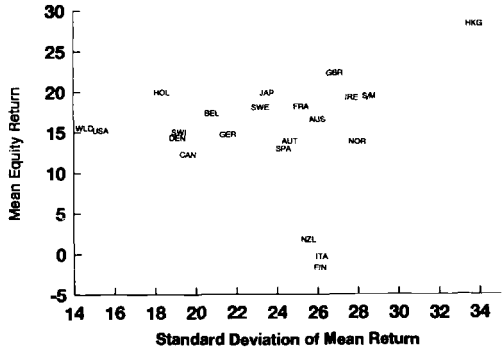
Time-series plots of the valuation ratios for each country are shown in the data appendix figures. Each ratio is plotted on a graph with the corresponding ratio for the MSCI world market index as a reference series. The valuation ratios typically show no strong trends over the sample period. A number of the series show episodes of relatively high and low volatility, suggestive of conditional heteroscedasticity. The price-to-earnings ratios are the most volatile of the valuation ratios and are sometimes negative, due in large part to low and negative earnings during the world recession in 1992 (these graphs are truncated at zero and fifty).

We examine scatter plots of the average returns across countries, against the means and standard deviations of the fundamental attributes. Some of these are displayed in figure 2.2. Most of the plots show little relation among the variables. The plots do suggest a weak positive relation of average returns to the ratio of price to book value. Previous studies (e.g., Jaffe, Keim, and Westerfield 1989; Fama and French 1992) find a U-shaped relation between U.S. stock returns and their earnings-to-price ratios. We find no such pattern at the country level.

The strongest relations revealed by the scatter plots are between average returns and the standard deviation of the price-to-book ratio, and between average returns and the average term spread. The regression equations (standard errors in parentheses) are[3]

3. These are based on the 1976:01–1993:01 period shown in table 2.1. When we begin the samples in 1970:01 when available, the R^2 of the relation between average returns and the standard deviation of the price-to-book ratio increases to 25.7 percent.

(a) Mean equity return vs. standard deviation of equity return



(b) Mean equity return vs. mean earnings to price

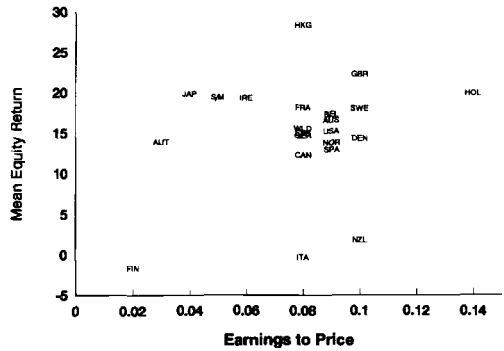
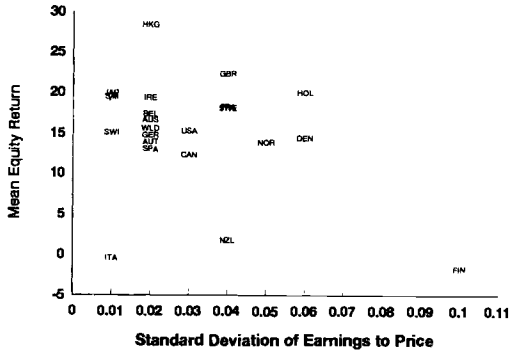


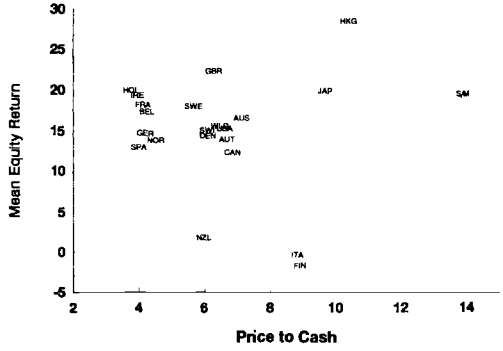
Fig. 2.2 Mean equity returns and the mean and volatility of attributes, January 1975 to May 1993 (221 observations).

Note: The Morgan Stanley Capital International (MSCI) returns are calculated with gross dividend reinvestment. Data exist for twenty-one countries. Value-weighted portfolios designed to cover a minimum of sixty returns are available from January 1970 except for Finland, Ireland, and New Zealand (which begin in February 1988). Earnings to price, price to cash, price to book, dividend to price, are value-weighted. Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for country to per capita annual OECD calculated in U.S. dollars. Inflation to OECD is the annual change in inflation for country i divided by the annual change in inflation for the OECD. The term spread is the long-term rate minus the short-term rate. Detailed descriptions and sources for all the variables are found in the data appendix.

(c) Mean equity return vs. standard deviation of earnings to price



(d) Mean equity return vs. mean price to cash



(e) Mean equity return vs. standard deviation of price to cash

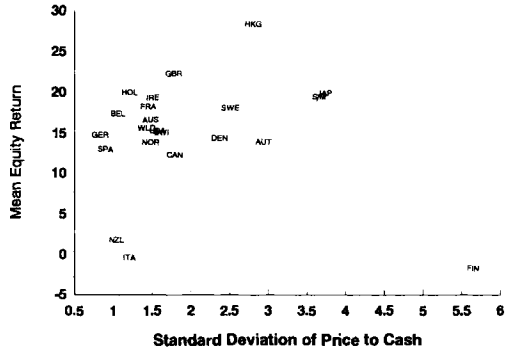
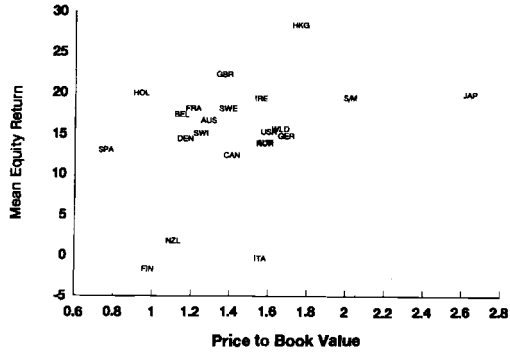
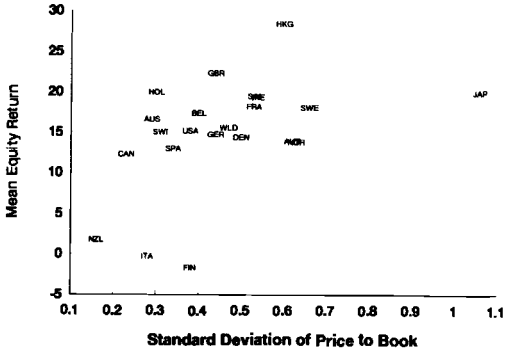


Fig. 2.2 (continued)

(f) Mean equity return vs. mean price to book



(g) Mean equity return vs. standard deviation of price to book



(h) Mean equity return vs. mean dividend yield

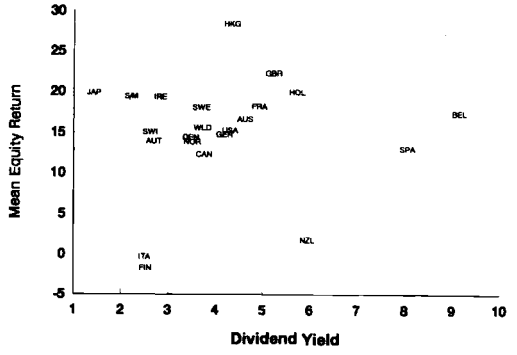
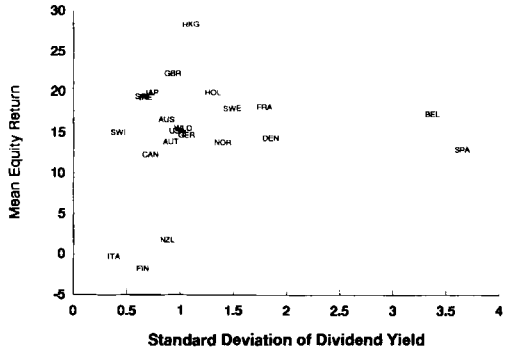
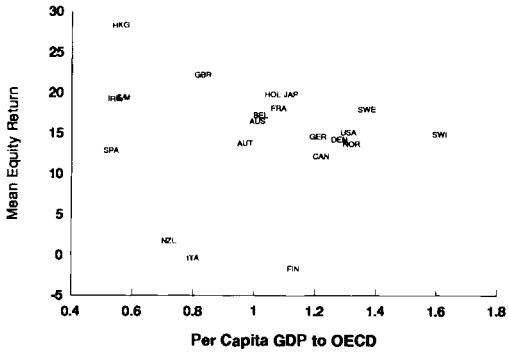


Fig. 2.2 (continued)

(i) Mean equity return vs. standard deviation of dividend yield



(j) Mean equity return vs. mean GDP to OECD GDP



(k) Mean equity return vs. standard deviation of GDP to OECD GDP

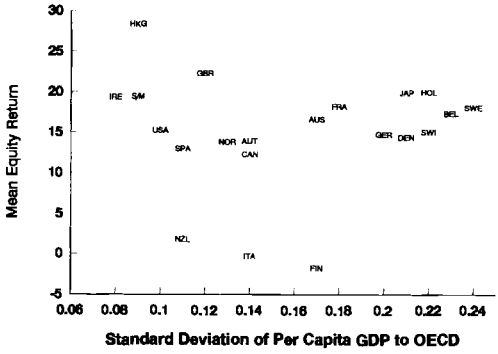
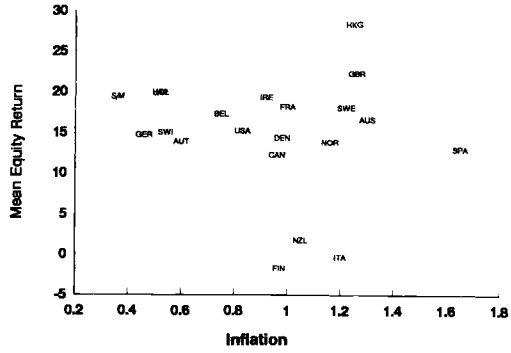
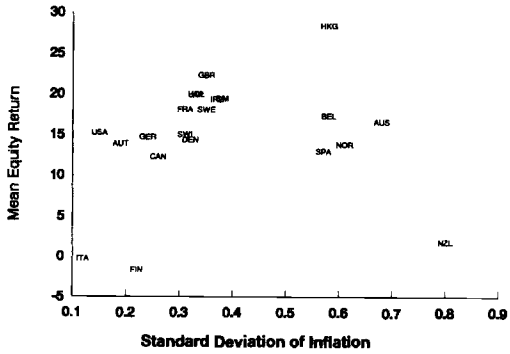


Fig. 2.2 (continued)

(l) Mean equity return vs. mean CPI to OECD CPI



(m) Mean equity return vs. standard deviation of CPI to OECD CPI



(n) Mean equity return vs. mean term spread

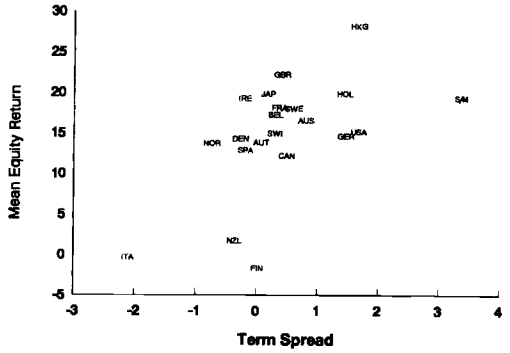
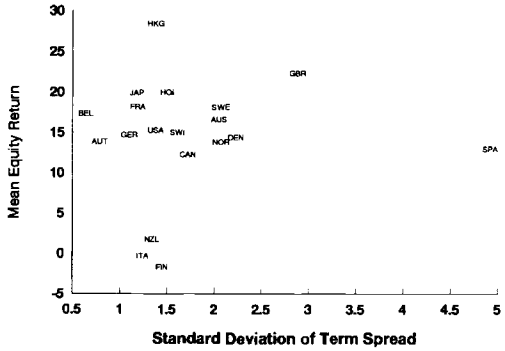
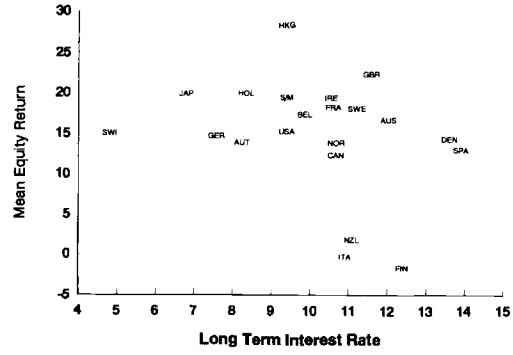


Fig. 2.2 (continued)

(o) Mean equity return vs. standard deviation of term spread



(p) Mean equity return vs. mean long-term rate



(q) Mean equity return vs. standard deviation of long-term rate

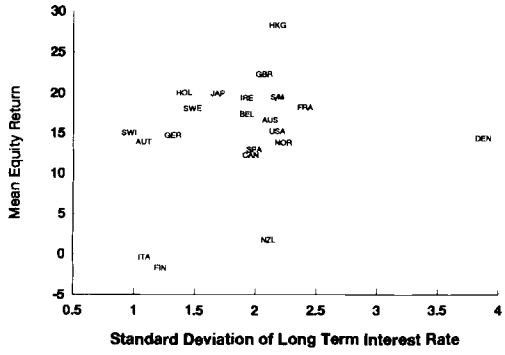


Fig. 2.2 (continued)

$$\text{avg}(R_i) = 6.7 + 17.7\ \text{sd}(P/B)_i + \varepsilon_i,\ R^2 = .23$$
$$(7.4), \text{ and}$$

$$\text{avg}(R_i) = 13.1 + 3.9\ TERM_i + \varepsilon_i,\ R^2 = .34.$$
$$(1.2).$$

These relations are stronger than the relation between the average returns and the standard deviation of the returns. The slope coefficient in that relation is 0.22 (standard error = 0.39) and the R^2 is 1.6 percent.[4] The positive relation of average returns to the term spreads should not be surprising, given previous evidence that both the slope of the term structure (Harvey 1991a) and stock returns (Harris and Opler 1990) forecast future economic growth in many countries.

It is interesting that the volatility of the price-to-book-value ratio is so strongly related to average returns, while stock return volatility shows little relation over this period. If variation over time in price-to-book ratios captures fluctuations of stock prices around "fundamental" values, then countries with higher price-to-book volatility may be countries where the risk of stock price departures from fundamentals is greater. If such deviations from fundamental values represent a risk that is priced in the market (e.g., Shleifer and Summers 1990), we would expect countries with higher volatility of price-to-fundamentals to have higher average returns.

The average relations shown in the scatter plots can be misleading if expected returns vary over time, as recent evidence suggests. The slopes in the cross-sectional relations represent a return premium associated with the attribute. Ferson and Harvey (1991) note that if the expected risk premium is time-varying, it is possible to find an average slope close to zero even though the conditional expected premium is important at some times. Table 2.1 summarizes cross-sectional predictive regressions of the country returns each month on the predetermined, fundamental attributes. The regression equation for month t is

$$(1) \qquad R_{it+1} = \gamma_{o,t+1} + + \sum_{j=1}^{K} \gamma_{j,t+1} A_{ij,t} + \varepsilon_{it+1}\ ;\ i = 1, \ldots, N,$$

where $\gamma_{o,t+1}$ is the intercept, the $\gamma_{j,t+1}$ are the slope coefficients, and $A_{ij,t}$ is the fundamental ratio j, $j = 1, \ldots, K$, for the country i in month t. The dating convention indicates that the fundamental attribute is public information at time t.[5] The slope coefficient $\gamma_{j,t+1}$, $j = 1, \ldots, K$ is the return on a maximum

4. Starting the sample in 1970:01 when available, the slope is 0.35 (standard error = 0.23) and the R^2 is .107.

5. The GDP and inflation variables are lagged fifteen months in these regressions to account for publication lag, and the interest rates are lagged one month. The industry structure variables are not predetermined, since they are estimated using regressions over the full sample period. However, they are constrained to be constant over time, which limits their predictive ability. We should not expect significant bias from including these measures, but we believe that future research should use alternative measures of industry structure which are predetermined.

Table 2.1 **Cross-Sectional Regression Coefficients of Country Returns on Attributes: 1976:01–1993:01 (205 regressions)**

Fundamental	Mean	Standard Deviation	t-ratio	Minimum	Maximum	1st-order Autocorrelation	Average Cross-Sectional R^2
Univariate models[a]							
Earnings to price	0.0360	0.4616	1.15	−1.578	1.723	0.105	0.078
Price to cash	0.0002	0.0058	0.55	−0.014	0.020	0.062	0.099
Price to book	−0.0010	0.0320	−0.47	−0.194	0.103	−0.111	0.083
Dividend to price	0.0009	0.0074	1.78	−0.021	0.032	0.148	0.066
Per capita GDP to OECD	−0.0084	0.0525	−2.29	−0.179	0.154	0.051	0.089
Inflation to OECD	0.0046	0.0391	1.73	−0.102	0.144	0.096	0.088
Term spread	0.0005	0.0081	1.45	−0.023	0.030	0.097	0.064
Long-term interest rate	−0.0002	0.0061	−0.48	−0.017	0.018	0.107	0.077
Industry 1 loading	−0.0072	0.0900	−1.18	−0.247	0.260	−0.006	0.087
Industry 2 loading	0.0006	0.0624	0.14	−0.147	0.211	0.003	0.088
Industry 3 loading	−0.0053	0.0495	−1.58	−0.164	0.117	0.043	0.079
Industry 4 loading	0.0089	0.0527	2.49	−0.141	0.256	0.088	0.092
Multivariate models[b]							
Earnings to price	−0.0111	0.7040	−0.23	−3.49	2.03	0.102	0.294
Price to cash	0.0012	0.0109	2.83	−0.029	0.079	0.114	0.294
Price to book	−0.0017	0.0440	−0.57	−0.111	0.154	0.062	0.294
Dividend to price	0.0010	0.0094	1.57	−0.028	0.034	0.083	0.294
Per capita GDP to OECD	−0.0064	0.0582	−1.57	−0.203	0.186	0.029	0.303
Inflation to OECD	0.0044	0.0555	1.14	−0.175	0.182	0.154	0.303
Term spread	−0.00002	0.0100	−0.03	−0.050	0.025	0.088	0.303
Long-term interest rate	−0.0010	0.0084	−1.75	−0.025	0.033	0.058	0.303

Industry 1 loading	0.0010	0.1307	0.11	−0.405	0.572	0.077	0.317
Industry 2 loading	0.0074	0.1260	0.87	−0.446	0.474	0.102	0.317
Industry 3 loading	0.0063	0.1259	0.74	−0.346	0.461	0.101	0.317
Industry 4 loading	0.0125	0.1111	1.66	−0.301	0.634	0.174	0.317
Price to cash	−0.0003	0.0080	−0.45	−0.026	0.024	0.049	0.305
Dividend to price	0.0005	0.0107	0.67	−0.044	0.028	0.213	0.305
Per capita GDP to OECD	−0.0063	0.0679	−1.36	−0.247	0.239	0.168	0.305
Long-term interest rate	−0.0007	0.0062	−1.67	−0.018	0.018	0.135	0.305
Price to cash	−0.0004	0.0066	−0.79	−0.032	0.017	0.067	0.241
Per capita GDP to OECD	−0.0079	0.0568	−1.99	−0.218	0.154	0.184	0.241
Long-term interest rate	−0.0008	0.0062	−1.73	−0.019	0.017	0.110	0.241
Dividend to price	0.0007	0.0080	1.25	−0.033	0.021	0.065	0.221
Per capita GDP to OECD	−0.0063	0.0560	−1.61	−0.211	0.165	−0.002	0.221
Long-term interest rate	−0.0008	0.0057	−1.88	−0.017	0.014	0.181	0.221
Dividend to price	0.0007	0.0081	1.18	−0.033	0.026	0.067	0.286
Per capita GDP to OECD	−0.0040	0.0627	−0.92	−0.207	0.178	−0.004	0.286
Long-term interest rate	−0.0007	0.0059	−1.77	−0.017	0.017	0.176	0.286
Industry 4 loading	0.0034	0.0535	0.91	−0.180	0.140	−0.056	0.286

Note: In the regressions from January 1975 to January 1977, there are fourteen countries (Austria, Finland, Italy, Ireland, New Zealand, Spain, and Switzerland are excluded). From February 1977 to February 1978, there are sixteen countries in the regressions (Finland, Italy, Ireland, New Zealand, and Spain are excluded). From March 1978 to April 1984, there are seventeen countries in the regressions (Finland, Italy, Ireland, and New Zealand are excluded). From May 1984 to January 1988, there are eighteen countries (Finland, Ireland, and New Zealand are exluded). From February 1988 to May 1990, there are twenty countries (Ireland is excluded). All twenty-one countries are used from June 1990. Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for the country to per capita annual OECD calculated in U.S. dollars. Inflation to OECD is the annual change in inflation for country i divided by the annual change in inflation for the OECD. The term spread is the long-term rate minus the short-term rate. The industry loadings are slope coefficients in the regressions of country returns on four industry returns: natural resources (loading 1), construction and manufacturing (loading 2), transportation/communication/energy and utilities (loading 3), and services and financial services (loading 4). Detailed descriptions and sources for all the variables are found in the data appendix.

[a]The univariate model is the cross-sectional regression of the returns in month t on the lagged attribute. Earnings to price, price to cash, price to book, dividend to price, term spread, long-term interest rate, and the industry loadings are lagged by one month. The per capita GDP to OECD GDP and the inflation to OECD inflation are lagged by fifteen months to allow for publication delays. Mean represents the average time-series cross-sectional coefficient on the attribute.

[b]The multivariate model is the cross-sectional regression of returns in month t on a group of lagged attributes.

correlation, zero net investment portfolio for the jth attribute, subject to zero cross-sectional correlation with the other attributes.[6] The portfolio weights depend only on the cross section of the attributes observed at time t. The expected values of the coefficients therefore represent expected return premia associated with the attributes.

Table 2.1 reports the mean, standard deviation, and other summary statistics for time series of the cross-sectional regression slopes and for the coefficients of determination of the regressions. There are 205 regressions, one for each month over the 1976:01–1993:01 sample period. To avoid the extreme outliers caused by near zero earnings, we use the ratio of earnings to price, rather than the inverse, in these regressions. Panel A of Table 2.1 reports univariate regressions. In panel B, multivariate regressions are shown, with each regression reported in a subpanel. The first three subpanels show regressions using the three main groups of fundamental attributes. The remaining subpanels show regressions which combine attributes across the three main groups. For the univariate regressions, the average of the cross-sectional R-squares varies from 6.4 to 9.9 percent. For the multivariate regressions, the average R-squares vary from 22.1 to 31.7 percent. While the average R-squares suggest that the cross-sectional predictive regressions have explanatory power, they should be interpreted with caution because they do not control for cross-sectional dependence of the error terms.

Table 2.1 reports t-ratios for the time-series average of each slope coefficient. The time-series average of the slopes is the same as the slope in the average relation, similar to those shown in figure 2.2. (However, the numbers in table 2.1 and figure 2.2 are multiplied by 1200, while those in the regressions are not, and the samples of firms differ between table 2.1 and figure 2.2.) The t-ratios are calculated as in Fama and MacBeth (1973), an approach which controls for cross-sectional dependence of the error terms. The t-ratios should be a better guide as to the significance of the average premia than the scatter plots of figure 2.2 (see Shanken 1992). For example, based on the scatter plots, the term spread showed a strong relation to average returns. However, term structure slopes are strongly positively dependent across countries, so the Fama-MacBeth t-ratios are reduced.[7] Table 2.1 also reports the standard deviations and the minimum and maximum values of the coefficients. The return premiums for the fundamental ratios vary substantially over the sample. This is not surprising, since the premiums are the realized excess returns of portfolios. Some of the premiums show significant autocorrelation, which implies time-variation in the conditional expected premiums. Recall that if the ex-

6. The maximum correlation and zero correlation condition with the other attributes is imposed only in a cross-sectional sense, and need not hold over time (see Shanken and Weinstein 1990 or Ferson and Harvey 1991).

7. The slope of the average relation, equal to 3.9, is not identical to .005*1200 = 6.0 in table 2.1 because the cross-sectional regressions for different months use different numbers of countries in table 2.1.

pected risk premium is time-varying, it is possible to find a small Fama-MacBeth t-ratio, even though the conditional expected premium is important.

Overall, a few of the fundamental attributes emerge as the more important cross-sectional predictors. We retain three of them for our subsequent investigations, based on the overall evidence. These are the ratio of per capita GDP to OECD per capita GDP, the dividend-to-price ratio, and the long-term interest rate. The price-to-cash-flow variable performs similarly to the dividend-to-price ratio, so we check the sensitivity of our main results to this substitution.

In table 2.2 we examine sample correlations between the slope coefficients from cross-sectional regressions on the three surviving attributes, and the contemporaneous values of the five global risk factors. If the levels of the fundamental ratios are proxies for the risk sensitivity of a national market to underlying risk factors, the cross-sectional regression slopes should jointly be proxies for the risk factors. Most of the correlations in table 2.2 are low, although some are statistically significant. Using the approximate standard error equal to $T^{-1/2} = 0.067$, two of the fifteen simple correlations exceed three standard errors and four more exceed two standard errors. The multiple correlations, reported in the right-hand column and the bottom two rows of the table, are all less than 0.35, which corresponds to regression R-squares of about 10 percent or less.

Table 2.2 **Correlations of Mimicking Portfolios Returns and Prespecified Factors: 1976:01–1993:01 (205 observations)**

Factor	γ YD	γ RGDP	γ LONG	Multiple
MSCI world excess return	−0.14	−0.07	−0.01	0.14
G10 excess FX return	0.07	−0.02	−0.32	0.32
Oil excess return	0.15	0.20	0.02	0.21
Growth OECD production	0.02	0.00	0.03	0.04
OECD inflation	−0.10	−0.03	0.09	0.13
2 factors	0.18	0.07	0.34	
5 factors	0.26	0.21	0.35	

Note: The mimicking portfolio returns, γ, are based on cross-sectional regressions of country returns on three lagged attributes: dividend yield, country per capita GDP to OECD GDP, and the long-term interest rate. GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for the country to per capita annual OECD calculated in U.S. dollars. In the cross-sectional regressions from January 1975 to January 1977, there are fourteen countries (Austria, Finland, Italy, Ireland, New Zealand, Spain, and Switzerland are excluded). From February 1977 to February 1978, there are sixteen countries in the regressions (Finland, Italy, Ireland, New Zealand, and Spain are excluded). From March 1978 to April 1984, there are seventeen countries in the regressions (Finland, Italy, Ireland, and New Zealand are excluded). From May 1984 to January 1988, there are eighteen countries (Finland, Ireland, and New Zealand are excluded). From February 1988 to May 1990, there are twenty countries (Ireland is excluded). All twenty-one countries are used from June 1990. The cross-setional slope coefficients are the mimicking portfolio returns. Time-series correlations are reported with five world risk factors: the excess return on the MSCI world market return, the excess return on a portfolio of currency investments in ten countries (see Harvey 1993b for details of the construction of this variable), the excess return to holding crude oil, growth in OECD industrial production, and the rate of change in OECD inflation.

(The two-factor case refers to the MSCI world excess return as the first factor and the G10 FX excess return is a second factor.)

There are a number of possible interpretations for the low correlations in table 2.2. One possibility is that the factors exclude some important priced risks. Another possibility is that the cross-sectional predictability using the attributes is not explained by a rational pricing model using the global risk factors in an integrated capital market. Yet a third possibility is that there is so much noise in the cross-sectional regression estimates of the return premiums that the true relation is obscured. It is likely that the cross-sectional regression slopes are noisy estimates, given the range of the values recorded in table 2.1. (See also Shanken and Weinstein 1990 in a domestic asset-pricing context.)

Our hypothesis is that expected returns, which are modeled in the cross-sectional regressions as a combination of the attributes multiplied by the conditional expected values of the γs, are equal to a combination of betas multiplied by conditional expected risk premia for the global risk factors. If this view is correct, there are a number of things that can cloud the relation between the cross-sectional slopes and the risk factors. Both time-series and cross-sectional variation in the ratios of betas to attributes can reduce the time-series correlation between the regression slopes and the risk factors. In order to obtain a clearer picture of the relation between the fundamental attributes and betas, we need to model the relation of the attributes to the betas explicitly.

Table 2.3 explores the time-series predictability of the national market returns in relation to the predetermined attributes. We report the results of time-series regressions for each country, on a constant, the vector of predetermined, world information variables (denoted by Z), and on the three own-country fundamental attributes (denoted by A). F-statistics examine the hypotheses that Z may be excluded or that the fundamental attributes may be excluded. The results are interesting and differ from previous studies. Harvey (1991b) found that world information variables were more important than country-specific variables for predicting the MSCI index returns over the 1970–89 period, while Ferson and Harvey (1993) found that both global and local information variables had marginal explanatory power. Solnik (1993) chose to use only local information variables. In table 2.3 we reject the hypothesis that the country attributes can be excluded when the world information variables are in the regressions, for eleven of the twenty-one countries at the 5 percent level, and five more at the 10 percent level. In contrast, we reject the hypothesis that the world information variables can be excluded, for one country only (Australia), at the 5 percent level. When we replace the dividend-to-price ratio with the ratio of price-to-cash-flow, the results are similar.[8]

There are several differences between the regressions in table 2.3 and previ-

8. Joint tests across the countries are complicated by the fact that the regressions for different countries use different sample periods. This also reduces the dependence across the separate regressions.

Table 2.3 **World Information and Country Attributes for Predicting National Excess Equity Returns: 1976:01–1993:01 (205 observations)**

Country i	Intercept	wr_{t-1}	$rg10fx_{t-1}$	$wdiv_{t-1}$	$e\$90\text{-}30_{t-1}$	$e\$30_t$	$div_{i,t-1}$	$rgdp_{i,t-1}$	$long_{i,t-1}$	$\bar{R}^2$	F-test Exclude World Z	F-test Exclude Local A
Australia	0.033	0.463	−0.072	0.013	0.030	−2.018	0.017	−0.144	−0.000	0.066	3.230	2.565
	(0.064)	(0.144)	(0.180)	(0.009)	(0.015)	(2.601)	(0.009)	(0.052)	(0.003)		[0.008]	[0.056]
Austria	0.150	0.245	−0.139	−0.004	0.033	1.327	−0.009	−0.076	−0.007	0.054	1.079	2.157
	(0.046)	(0.156)	(0.221)	(0.009)	(0.015)	(1.910)	(0.012)	(0.037)	(0.006)		[0.374]	[0.095]
Belgium	0.152	−0.107	−0.034	0.005	0.006	−2.277	0.005	−0.100	−0.009	0.095	0.670	6.230
	(0.038)	(0.110)	(0.167)	(0.012)	(0.013)	(2.610)	(0.004)	(0.028)	(0.004)		[0.647]	[0.000]
Canada	0.185	0.201	−0.072	0.003	0.026	2.224	0.028	−0.177	−0.010	0.058	1.592	3.988
	(0.058)	(0.070)	(0.106)	(0.007)	(0.014)	(2.619)	(0.015)	(0.055)	(0.004)		[0.164]	[0.009]
Denmark	0.072	−0.216	−0.064	−0.025	0.014	−2.036	0.006	−0.037	0.005	0.014	2.052	1.562
	(0.045)	(0.107)	(0.141)	(0.010)	(0.014)	(1.940)	(0.005)	(0.033)	(0.003)		[0.073]	[0.200]
Finland	0.526	0.393	−0.551	−0.069	0.017	−5.380	0.079	−0.308	−0.010	0.137	1.630	2.880
	(0.174)	(0.194)	(0.241)	(0.049)	(0.049)	(6.704)	(0.023)	(0.111)	(0.008)		[0.167]	[0.044]
France	0.205	−0.030	−0.149	−0.000	−0.005	2.678	0.014	−0.161	−0.010	0.057	0.437	5.051
	(0.051)	(0.119)	(0.183)	(0.013)	(0.019)	(3.133)	(0.008)	(0.039)	(0.004)		[0.822]	[0.002]
Germany	0.098	0.006	−0.269	0.000	0.011	−3.266	0.008	−0.078	−0.002	0.032	0.999	2.730
	(0.036)	(0.147)	(0.181)	(0.006)	(0.015)	(2.445)	(0.010)	(0.028)	(0.004)		[0.419]	[0.045]
Hong Kong	0.052	0.226	0.034	0.001	−0.009	2.992	0.016	−0.078	−0.009	0.015	0.554	2.055
	(0.073)	(0.154)	(0.268)	(0.009)	(0.028)	(5.028)	(0.008)	(0.081)	(0.007)		[0.735]	[0.107]
Ireland	0.611	−0.174	−0.024	−0.033	−0.033	−3.066	0.052	−0.902	−0.013	0.104	0.449	4.560
	(0.220)	(0.150)	(0.254)	(0.032)	(0.026)	(5.063)	(0.027)	(0.272)	(0.007)		[0.813]	[0.005]
Italy	−0.360	−0.454	0.308	−0.119	0.014	36.013	0.184	0.308	−0.022	0.068	1.240	2.070
	(0.671)	(0.271)	(0.326)	(0.099)	(0.057)	(14.506)	(0.069)	(0.430)	(0.016)		[0.317]	[0.129]
Japan	0.172	−0.043	0.112	−0.004	−0.001	0.225	0.004	−0.095	−0.007	0.033	0.127	3.746
	(0.053)	(0.154)	(0.180)	(0.012)	(0.014)	(2.906)	(0.017)	(0.029)	(0.006)		[0.986]	[0.012]

(*continued*)

Table 2.3 (continued)

Country i	Intercept	wr_{t-1}	$rg10fx_{t-1}$	$wdiv_{t-1}$	$e\$90\text{-}30_{t-1}$	$e\$30_t$	$div_{i,t-1}$	$rgdp_{i,t-1}$	$long_{i,t-1}$	$\bar{R}^2$	F-test Exclude World $\boldsymbol{Z}$	F-test Exclude Local $\boldsymbol{A}$
Netherlands	0.058	−0.043	−0.095	−0.003	0.010	−3.290	0.020	−0.078	−0.006	0.082	1.178	5.495
	(0.024)	(0.103)	(0.127)	(0.008)	(0.013)	(1.648)	(0.007)	(0.024)	(0.003)		[0.321]	[0.001]
New Zealand	0.406	0.227	−0.192	−0.131	−0.100	3.874	0.031	−0.251	−0.008	0.072	1.743	1.291
	(0.499)	(0.280)	(0.314)	(0.085)	(0.051)	(22.803)	(0.018)	(0.753)	(0.018)		[0.140]	[0.287]
Norway	0.141	0.108	−0.073	−0.011	0.012	2.713	0.007	−0.089	−0.002	−0.022	0.257	0.908
	(0.091)	(0.176)	(0.201)	(0.013)	(0.020)	(3.722)	(0.007)	(0.060)	(0.004)		[0.936]	[0.438]
Singapore/Malaysia	0.031	0.112	−0.002	0.002	−0.004	4.722	0.013	0.015	−0.011	0.012	0.506	2.186
	(0.088)	(0.132)	(0.192)	(0.010)	(0.026)	(4.661)	(0.019)	(0.115)	(0.006)		[0.771]	[0.091]
Spain	0.177	0.059	−0.089	−0.020	−0.013	0.313	0.007	−0.115	−0.007	0.039	0.743	3.289
	(0.065)	(0.148)	(0.171)	(0.014)	(0.015)	(2.553)	(0.004)	(0.050)	(0.004)		[0.592]	[0.022]
Sweden	−0.024	0.250	−0.223	−0.011	0.002	−1.436	0.015	−0.052	0.009	0.027	1.400	2.396
	(0.073)	(0.140)	(0.176)	(0.009)	(0.020)	(2.890)	(0.007)	(0.032)	(0.005)		[0.226]	[0.069]
Switzerland	0.070	−0.005	−0.097	−0.001	0.030	−3.682	0.009	−0.047	0.003	0.055	1.944	2.180
	(0.041)	(0.115)	(0.154)	(0.006)	(0.016)	(1.936)	(0.019)	(0.018)	(0.004)		[0.089]	[0.092]
United Kingdom	0.036	0.144	−0.121	−0.021	0.017	1.443	0.043	−0.202	−0.002	0.059	1.240	4.923
	(0.043)	(0.113)	(0.149)	(0.010)	(0.014)	(2.267)	(0.015)	(0.064)	(0.005)		[0.292]	[0.003]
United States	0.044	−0.008	−0.017	−0.016	−0.003	−5.090	0.033	−0.060	−0.001	0.018	1.331	2.682
	(0.056)	(0.091)	(0.106)	(0.008)	(0.012)	(2.219)	(0.011)	(0.053)	(0.003)		[0.252]	[0.048]

Note: Time-series regressions begin in January 1976 or later depending on data availability. Returns are available from January 1970 except for Finland, Ireland, and New Zealand (which begin in February 1988). The instruments consist of two sets: the world $\boldsymbol{Z}$ and the attributes $\boldsymbol{A}$. The world instruments are the lagged MSCI world return, the lagged change in a portfolio of ten currency returns, the lagged MSCI world dividend yield, the lagged spread between the ninety-day and thirty-day Eurodollar rates (based on average daily rates), and the thirty-day Eurodollar rate (quote last day of previous month). The attributes are the first lag of the local dividend yield, the fifteenth lag of the ratio of per capita GDP to OECD GDP, and the first lag of the long-term interest rate. Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for country to per capita annual OECD calculated in U.S. dollars. The long-term interest rate in Spain is only available from March 1978.

ous studies. The sample period is different, as table 2.3 refers to the 1976:01–1993:01 period (205 observations or fewer, depending on the country). The importance of the world information variables as predictors seems to diminish in such regressions when the 1970–75 period is excluded (see Ferson and Harvey 1993). Our fundamental attributes differ from the local information variables used in previous studies. In particular, the measure of relative GDP is a strong predictor of future stock returns in our regressions. The coefficient on this variable has a t-statistic larger than two for fourteen of the twenty-one countries.

We conclude from table 2.3 that the fundamental attributes are important in time-series as well as in cross-sectional predictive models. In time-series, they largely subsume the global information variables over this sample period. Ferson and Harvey (1993) found that beta variation contributed less to the time-series predictability of returns than risk premium variation for most countries, but they modeled the effect of local information variables through betas, and the effect of world information variables through the expected risk premia.[9] The results of table 2.2 and 2.3 lead us to an asset-pricing model in which global expected risk premiums are not restricted to depend only on our world information variables.

2.4 Conditional Asset Pricing

2.4.1 The Models

While international beta pricing models make strong assumptions about market integration, lack of frictions, and information efficiency, it is interesting to see how far one can go in modeling the relation of conditional returns to fundamental attributes and world information variables by using this standard framework. We hypothesize that conditional expected returns can be written as

$$E(R_{it+1}|\Omega_t) = \lambda_o(\Omega_t) + \sum_{j=1}^{K} b_{ij}(\Omega_t)\lambda_j(\Omega_t), \tag{2}$$

where the $b_{ij}(\Omega_t)$ are the conditional regression betas of the country returns, R_{it+1}, measured in a common currency, on K global risk factors, $j = 1, \ldots, K$. The expected risk premia, $\lambda_j(\Omega_t)$, $j = 1, \ldots, K$, are the expected excess returns on *mimicking portfolios* for the risk factors.[10] The expectations are conditioned on a public information set, denoted by Ω_t. The intercept, $\lambda_o(\Omega_t)$, is

9. Ferson and Harvey motivated their assumption that the global risk premia depend only on world information variables by appealing to market integration. But they pointed out that their distinction between world and local market information variables was somewhat arbitrary. Expected risk premia may depend on the collection of the country attributes, as well as other public information variables, even in integrated equity markets.

10. Mimicking portfolios are defined as portfolios that may be substituted for the factors in a factor model regression, to measure the betas, and whose expected excess returns are the risk premiums. See Huberman, Kandel, and Stambaugh (1987), or Lehmann and Modest (1988).

the expected return of portfolios with all of their betas equal to zero. Equation (2) implies an expression for the expected *excess* returns:

$$E(r_{it+1}|\Omega_t) = \sum_{j=1}^{K} \beta_{ij}(\Omega_t)\lambda_j(\Omega_t), \tag{3}$$

where the $\beta_{ij}(\Omega_t) = b_{ij}(\Omega_t) - b_{fj}(\Omega_t)$ are the conditional betas of the excess returns and the $b_{fj}(\Omega_t)$, $j = 1, \ldots, K$, are the conditional betas of a thirty-day Eurodollar deposit. Note that, according to equations (2) and (3), the only variables which differ across countries in the expressions for expected returns are the conditional betas of the country on the underlying risk factors. If rational expectations are assumed, then the difference between the actual returns at time $t + 1$ and the conditional expected returns, using information at time t, should not be predictable using information at time t. Therefore, if a cross-sectional regression of time $t + 1$ returns on variables known at time t, such as the fundamental attributes, has explanatory power, the model implies that the attributes measure the underlying betas.

In addition to evidence that expected country returns vary over time, there is evidence that the conditional covariances move over time in association with lagged variables (e.g., King, Sentana, and Wadhwani 1990; Harvey 1991b), and evidence of time-varying betas for international asset returns (e.g., Giovannini and Jorion 1987, 1989; Mark 1985; Ferson and Harvey 1993). Given the evidence in these studies and our tables, we allow for time-variation in both the expected risk premia and the conditional betas. Let $\Omega_t = \{Z_t, A_t^i, i = 1, \ldots, n, \phi_t\}$, where Z_t represents our global information variables, A_t^i the fundamental attributes of country i at time t, and ϕ_t any remaining public information that is relevant for conditional expected returns. We isolate the fundamental attributes from the other information to incorporate the idea that the variables with cross-sectional explanatory power for future returns are the variables which drive the conditional betas, $\beta_{ij}(\Omega_t)$. A parsimonious model, similar to one suggested by Ferson and Harvey (1993), assumes that the betas are functions only of the fundamental attributes. That is, we assume $\beta_{ij}(\Omega_t) = \beta_{ij}(A_t^i)$.[11] Taking the first term of a Taylor series, we use a linear function and model the conditional betas as

11. Some informal intuition for the impact of this restriction is suggested by Ferson and Harvey (1993). Assume that $E(r_{it+1}|\Omega_t)$ is a function $f(A_t^i, Y_t)$, where Y_t is the remaining public information, given A_t. Dropping the subscripts, consider an example where there is a single factor ($K = 1$), where β, λ, A^i, and Y are scalars, and where A^i is uncorrelated with Y. Writing $f(A^i, Y) = \beta(A^i, Y)\lambda(A^i, Y)$ and taking a first order Taylor series about the means, we have

$$\mathrm{Var}(f) \approx [\lambda(\cdot)\partial\beta/\partial A^i + \beta(\cdot)\partial\lambda/\partial A^i]^2 \mathrm{Var}(A^i) + [\lambda(\cdot)\partial\beta/\partial Y + \beta(\cdot)\partial\lambda/\partial Y]^2 \mathrm{Var}(Y),$$

where $\lambda(\cdot)$ and $\beta(\cdot)$ are evaluated at the means. The first term captures the contribution of the fundamental attributes to the variance of country i's expected return, and the second term captures the contribution of the remaining public information. The assumption that the betas depend only on the local market information implies that $\partial\beta/\partial Y = 0$ in the second term. By setting $\partial\beta/\partial Y = 0$, we are ignoring what should be the smaller of the coefficients on the variance in the second term. This is because the square of an average risk premium is a small number, compared with the square of an average beta.

$$\beta_{ij}(A_t^i) = b_{0ij} + B_{ij}' A_t^i. \tag{4}$$

The elements of the vector B_{ij} describe the response of the conditional beta of country i on factor j to the attributes which are the components of A_t^i.

Equation (4) allows the functional relation between the fundamental attributes and the betas to differ across countries, as was suggested by the evidence of table 2.2 and 2.3. The relation between attributes and betas for a given country is assumed to be stable over time, however, as B_{ij} is a vector of fixed coefficients. The relation may differ across countries because of differences in the accounting conventions used to compute earnings, depreciation, and book values, as well as other factors. For example, Kester and Luehrman (1989) and Ando and Auerbach (1990) argue that high cross-holdings of corporate shares in Japan inflate measured price-to-earnings ratios in that country.

The global beta pricing model (3), our model of the conditional betas (4), and rational expectations imply the following econometric model:

$$r_{it+1} = \alpha_i + \sum_j \{b_{0ij} F_{jt+1} + B_{ij}' [A_t^i F_{jt+1}]\} + u_{i,t+1}, \tag{5}$$

where F_{jt+1} is the excess return on the jth risk-factor–mimicking portfolio. The intercept, α_i, is an average pricing error similar to a Jensen's (1968) alpha, and should be zero if the model is well specified.

Using an ordinary least squares (OLS) regression to estimate (5) imposes moment conditions that identify $b_{0ij} + B_{ij}'A_t^i$ as a conditional beta. Indeed, these are the same conditions that would be imposed if the generalized method of moments (GMM) is used. To see this informally, consider the normal equations for a conditional regression coefficient given A, with the time and other subscripts suppressed:

$$(F^* F^{*\prime})\beta^*(A) - F^* r' = w \tag{6}$$

$$E(w|A) = 0,$$

where $F^* = (1, F)'$ is a $(1 + K) \times T$ data matrix and $\beta^*(A) = (\alpha', \beta(A)')'$ is a $(1 + K)$ column vector of conditional regression coefficients. Using the GMM, the standard approach is to work with the weaker condition $E(w'A) = 0$, finding parameters which make the corresponding sample means close to zero. If the model is exactly identified, the sample means can be set equal to zero. Using the regression (5) to substitute for the term r in (6), it follows that $E(w'A) = 0$ if and only if $E(uF'A) = 0$. Since the OLS regression imposes the conditions that $E(u'F) = E(u) = E(uF'A) = 0$, it implies that $E(w'A) = 0$. Hence, $b_{0ij} + B_{ij}'A_t^i$, as estimated by regression (5), is a conditional beta.

To improve the power of tests using regression (5), we generalize the regression to provide specific alternative hypotheses. One interesting alternative hypothesis is that the fundamental attributes can predict returns, over and above their role as instruments for the betas. This alternative may provide powerful tests, in view of the traditional role of the attributes as alternatives to beta. In other words, we can address the question of whether the attributes represent

country-specific determinants of expected returns, as in segmented capital markets, or proxies for country exposures to the global risk factors. For this alternative we replace the intercept in (5) with $\alpha_{it} = \alpha_{i0} + D_i' A_t^i$, and test the hypothesis that $D_i = 0$. A second alternative posits that the deviations between the "true" expected country returns and the model are linear functions of the world information variables. That is, we consider an alternative hypothesis with a time-varying conditional alpha: $\alpha_{it} = \alpha_{i0} + C_i' Z_t$.[12]

Under the null hypothesis, the regression model (5) should be robust to the form of the expected risk premiums, $E(F_{jt+1}|\Omega_t)$. To see this, write $F_{jt+1} = E(F_{jt+1}|\Omega_t) + \varepsilon_{jt+1}$ and note that the error term in (5) may be written, under the null hypothesis, as

$$u_{it+1} = \{r_{it+1} - E(r_{it+1}|\Omega_t)\} - \beta(A_t^i)'\varepsilon_{t+1}, \tag{7}$$

where $\beta(A_t^i)$ is the vector of conditional betas for country i and ε_{t+1} is the vector of unexpected factor excess returns. Since the $\beta(A_t^i)$ are, under the null hypothesis, the conditional betas given Ω_t, equation (7) implies that u_{it+1} is the error from projecting the unanticipated country return $\{r_{it+1} - E(r_{it+1}|\Omega_t)\}$ on the unanticipated factor excess returns, where $\beta(A_t^i)'\varepsilon_{t+1}$ is the projection. The error term u_{it+1} in (7) should be orthogonal to both the public information set Ω_t and the ex post factors, F_{jt+1}, and therefore to the right-hand-side variables in the regression (5). The expected risk premiums, $E(F_{jt+1}|\Omega_t)$, may depend on the world information variables, as in Ferson and Harvey (1993), or they may depend on the world variables and the country attributes, or possibly on all of Ω_t. The risk conditional premia could even be constant over time, and the regression (5) should still be well specified.

The robustness of the regression (5) is attractive, since the evidence suggests that it is restrictive to model the risk premia as functions only of our world information variables. Robustness to the functional form of the expected risk premia is also attractive given that linearity may be restrictive, and in view of the possibility that the relation between the expected factor risk premia and the predetermined variables could be subject to a data mining bias.

2.4.2 Asset-Pricing Results

Table 2.4 records the results of estimating the conditional asset-pricing models. The first panel shows results for a one-factor model, in which the MSCI world excess return is the factor. The second panel presents a two-factor model, using the world market portfolio and the G10 FX excess return as the second factor. F-statistics test for the significance of the products of the factors with the lagged fundamental attributes.

The results for the one-factor model confirm that the fundamental attributes

12. We also combined the alternative hypotheses, modeling $\alpha_{it} = \alpha_{i0} + C_i' Z_t + D_i' A_t^i$. The impressions from these tests are similar to the results reported below.

Table 2.4 **National Attributes and Asset Pricing Using Dividend Yields, Economic Performance, and Long-Term Interest Rates, 1976:01–1993:01 (205 observations)**

Country i	wr_t	$wr_t \times div_{i,t-1}$	$wr_t \times rgdp_{i,t-1}$	$wr_t \times long_{i,t-1}$	$\bar{R}^2$	F-test Exclude $wr_t \otimes \boldsymbol{A}_{t-1}$
Australia	1.068	−0.434	1.670	0.012	0.282	4.568
	(1.452)	(0.182)	(0.818)	(0.052)		[0.004]
Austria	0.129	−0.142	−0.001	0.089	0.077	0.407
	(1.101)	(0.185)	(0.947)	(0.110)		[0.748]
Belgium	1.991	0.041	−0.604	−0.084	0.374	0.947
	(0.876)	(0.046)	(0.651)	(0.073)		[0.419]
Canada	−2.531	−0.116	2.045	0.127	0.499	5.717
	(1.326)	(0.253)	(1.468)	(0.044)		[0.001]
Denmark	0.850	−0.001	0.031	−0.015	0.251	0.163
	(0.931)	(0.089)	(0.685)	(0.034)		[0.921]
Finland	−5.180	−0.434	6.381	−0.138	0.126	1.405
	(3.749)	(0.353)	(3.526)	(0.262)		[0.250]
France	2.652	0.176	−0.626	−0.154	0.400	1.919
	(0.919)	(0.110)	(0.675)	(0.079)		[0.128]
Germany	0.984	0.035	−0.232	−0.003	0.289	0.058
	(0.822)	(0.123)	(0.582)	(0.095)		[0.981]
Hong Kong	1.027	−0.296	−0.145	0.135	0.196	3.791
	(1.413)	(0.187)	(1.795)	(0.068)		[0.011]
Ireland	9.731	0.449	−11.697	−0.332	0.367	4.165
	(2.832)	(0.214)	(3.589)	(0.113)		[0.008]
Italy	−2.569	0.208	1.322	0.192	0.619	0.413
	(9.243)	(0.892)	(6.376)	(0.415)		[0.745]
Japan	2.066	−0.376	−0.402	0.003	0.529	2.202
	(0.798)	(0.242)	(0.535)	(0.084)		[0.089]

(*continued*)

Table 2.4 (continued)

Country i	wr_t	$wr_t \times div_{i,t-1}$	$wr_t \times rgdp_{i,t-1}$	$wr_t \times long_{i,t-1}$	$\bar{R}^2$	F-test Exclude $wr_t \otimes \mathbf{A}_{t-1}$
Netherlands	0.365	0.080	0.166	−0.009	0.524	1.461
	(0.346)	(0.088)	(0.420)	(0.061)		[0.226]
New Zealand	2.082	0.033	−1.450	−0.061	0.029	0.186
	(4.591)	(0.218)	(0.796)	(0.352)		[0.905]
Norway	−2.185	−0.062	2.072	0.061	0.282	1.483
	(1.662)	(0.090)	(1.094)	(0.072)		[0.220]
Singapore/Malaysia	4.909	−0.631	−5.458	0.043	0.320	5.721
	(1.403)	(0.299)	(1.720)	(0.059)		[0.001]
Spain	2.913	−0.056	−0.641	−0.092	0.337	4.161
	(1.140)	(0.027)	(1.056)	(0.064)		[0.007]
Sweden	−1.383	−0.066	0.302	0.178	0.299	2.106
	(1.178)	(0.072)	(0.594)	(0.072)		[0.101]
Switzerland	0.492	0.043	0.038	0.047	0.442	0.222
	(0.746)	(0.154)	(0.351)	(0.076)		[0.881]
United Kingdom	0.285	−0.039	0.346	0.065	0.490	0.958
	(0.634)	(0.129)	(0.982)	(0.059)		[0.413]
United States	−2.511	−0.104	2.693	0.026	0.642	3.767
	(1.370)	(0.122)	(1.202)	(0.036)		[0.012]

Country i	wr_t	$wr_t \times div_{i,t-1}$	$wr_t \times rgdp_{i,t-1}$	$wr_t \times long_{i,t-1}$	$rg10_t$	$rg10_t \times div_{i,t-1}$	$rg10_t \times rgdp_{i,t-1}$	$rg10_t \times long_{i,t-1}$	$\bar{R}^2$	F-test Exclude $\boldsymbol{F}_t \otimes \boldsymbol{A}_{t-1}$
Australia	1.910	−0.414	1.044	−0.014	−4.666	0.378	2.274	0.053	0.306	3.894
	(1.111)	(0.143)	(0.809)	(0.051)	(1.662)	(0.227)	(1.373)	(0.070)		[0.001]
Austria	−0.095	−0.252	0.562	0.053	1.252	0.314	−1.745	0.070	0.213	1.112
	(0.987)	(0.203)	(0.824)	(0.125)	(1.367)	(0.226)	(1.234)	(0.161)		[0.357]
Belgium	2.251	0.012	−0.803	−0.083	−0.258	0.085	0.239	−0.007	0.470	1.971
	(0.858)	(0.047)	(0.559)	(0.081)	(0.881)	(0.044)	(0.574)	(0.079)		[0.071]
Canada	−1.971	−0.065	1.650	0.109	−1.340	−0.001	0.519	0.042	0.509	3.044
	(1.379)	(0.264)	(1.586)	(0.042)	(1.576)	(0.391)	(2.157)	(0.062)		[0.007]
Denmark	−0.161	−0.122	0.735	0.012	2.457	0.208	−1.367	−0.062	0.329	0.867
	(0.800)	(0.091)	(0.612)	(0.032)	(0.984)	(0.148)	(0.731)	(0.057)		[0.520]
Finland	−5.212	−0.404	3.859	0.140	6.897	−0.579	1.319	−0.617	0.329	2.699
	(3.560)	(0.255)	(2.866)	(0.172)	(7.008)	(0.719)	(4.568)	(0.246)		[0.022]
France	2.915	0.140	−0.868	−0.156	−0.396	0.104	0.330	0.025	0.466	1.467
	(0.731)	(0.115)	(0.560)	(0.072)	(1.136)	(0.136)	(0.868)	(0.076)		[0.191]
Germany	0.768	−0.136	0.062	0.039	1.069	0.321	−0.723	−0.095	0.414	0.807
	(0.841)	(0.131)	(0.578)	(0.100)	(0.902)	(0.170)	(0.737)	(0.096)		[0.566]
Hong Kong	0.542	−0.356	0.605	0.167	1.289	0.394	−3.629	−0.096	0.199	2.569
	(1.521)	(0.169)	(1.852)	(0.078)	(2.971)	(0.307)	(2.954)	(0.124)		[0.020]
Ireland	8.494	0.465	−9.921	−0.316	2.012	−0.202	−2.676	0.017	0.364	2.362
	(2.546)	(0.229)	(3.333)	(0.112)	(4.183)	(0.619)	(5.726)	(0.205)		[0.035]
Italy	−2.814	0.057	1.600	0.219	4.152	0.726	−3.668	−0.195	0.566	0.292
	(8.375)	(0.854)	(5.887)	(0.367)	(8.552)	(0.712)	(7.088)	(0.292)		[0.936]
Japan	1.934	−0.541	−0.569	0.063	0.940	0.472	0.229	−0.200	0.571	2.321
	(1.138)	(0.247)	(0.739)	(0.081)	(1.272)	(0.243)	(0.772)	(0.094)		[0.034]
Netherlands	0.517	0.028	0.214	−0.010	−0.257	0.127	−0.485	0.049	0.553	1.196
	(0.422)	(0.091)	(0.442)	(0.066)	(0.486)	(0.110)	(0.620)	(0.070)		[0.310]

(*continued*)

Table 2.4 (continued)

New	−2.355	−0.081	12.347	−0.460	8.117	0.553	−36.321	1.265	0.138	1.596
Zealand	(5.068)	(0.245)	(10.864)	(0.367)	(6.480)	(0.308)	(19.142)	(0.665)		[0.165]
Norway	−2.118	−0.087	2.096	0.057	−0.272	0.079	−0.037	0.015	0.271	0.824
	(1.718)	(0.099)	(1.206)	(0.075)	(2.361)	(0.124)	(1.457)	(0.102)		[0.552]
Malaysia	4.999	−0.675	−5.053	0.023	−3.190	0.827	1.116	0.057	0.346	4.021
	(1.070)	(0.259)	(1.480)	(0.065)	(2.187)	(0.311)	(2.652)	(0.094)		[0.001]
Spain	2.261	−0.084	−0.035	−0.061	1.546	0.078	−2.380	−0.037	0.374	3.421
	(1.272)	(0.028)	(1.179)	(0.066)	(1.421)	(0.040)	(1.232)	(0.097)		[0.003]
Sweden	−1.817	−0.150	0.944	0.162	1.427	0.259	−2.038	0.042	0.308	2.137
	(1.218)	(0.088)	(0.673)	(0.071)	(1.654)	(0.127)	(0.711)	(0.110)		[0.051]
Switzerland	0.571	−0.177	0.088	0.093	−0.435	0.801	−0.561	−0.017	0.571	2.429
	(0.673)	(0.137)	(0.321)	(0.080)	(0.804)	(0.220)	(0.419)	(0.099)		[0.028]
United	−0.232	−0.108	1.088	0.080	1.623	0.342	−2.613	−0.083	0.506	1.249
Kingdom	(0.652)	(0.120)	(1.012)	(0.062)	(0.922)	(0.239)	(1.156)	(0.095)		[0.283]
United	−2.630	−0.009	2.886	−0.017	2.613	0.072	−3.150	0.075	0.742	4.333
States	(1.219)	(0.079)	(1.041)	(0.028)	(1.366)	(0.097)	(1.261)	(0.029)		[0.000]

Note: Time-series regressions begin in January 1976 or later depending on data availability. Returns are available from January 1976 except for Finland, Ireland, and New Zealand (which begin in February 1988). The returns are regressed on one factor (first panel) or two factors (second panel). The first factor is the excess MSCI world return. The second factor is the excess return on a portfolio of ten currency investments. The models regress the country return on the factor and the factor times each attribute. The three attributes are the first lag of the local dividend yield, the fifteenth lag of the ratio of per capita GDP to OECD GDP, and the first lag of the long-term interest rate. Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for country to per capita annual OECD calculated in U.S. dollars. The long-term interest rate in Spain is only available from March 1978. No intercept is included in the regression. Tests are presented that exclude the factor times each attribute.

are important when they enter the regression through the conditional betas. The tests reject the hypothesis of constant conditional betas, for seven countries at the 5 percent level and one more at the 10 percent level. In the two-factor model, the F-tests reject the exclusion of the product terms for ten of the countries, using a 5 percent level, and two more using a 10 percent level. The tests therefore show that using the attributes to model conditional betas improves the explanatory power of the regressions.[13]

Table 2.5 reports tests of the asset-pricing models against three alternative hypotheses. Testing for exclusion of the intercept α_i in equation (5), the tests produce only weak evidence against the models. In the one-factor model, the average pricing errors are significant at the 5 percent level for two countries, and at the 10 percent level for two more. These results are similar to those of Harvey (1991b) in testing a conditional version of a world CAPM.[14] In the two-factor model, none of the intercepts are significant at the 5 percent level, while three are significant at the 10 percent level.

Table 2.5 also reports the results of the tests against the alternative of a time-varying conditional alpha, using the fundamental attributes to model the time variation. These tests ask if the attributes represent country-specific determinants of expected returns, as in segmented capital markets, or proxies for country exposures to global risk factors. If the model captures the role of the fundamental attributes adequately through the conditional betas, we should find that the attribute variables do not provide additional explanatory power when added to the regression in an unrestricted way. In the one-factor model, the hypothesis that the model captures the information in the attributes through the betas is rejected at the 5 percent level for five countries, and at the 10 percent level for three more. In the two-factor model, the hypothesis can be rejected at the 5 percent level for only two countries, although it can be rejected at the 10 percent level for seven more. Thus, it appears that the conditional beta pricing model is only partially successful at capturing the explanatory power of the fundamental attributes.

The final tests in table 2.5 consider the alternative in which the model pricing errors are assumed to be a function of the world information variables. In the one-factor model, the exclusion hypothesis for these variables is rejected at the 5 percent level for five countries, and in the two-factor model the hypothesis is rejected for four countries.

2.5 Concluding Remarks

This paper analyses both the cross section of average returns and the time series of expected returns in twenty-one national equity markets, focusing on

13. We repeated the tests in table 2.4, where the dividend-to-price ratio is replaced by the price-to-cash-flow ratio. The results are generally similar, which shows some robustness of the results to the precise specification of the fundamental attributes.

14. Harvey (1991b) also conducted joint tests across the countries and did not reject that the average pricing errors are zero. Such joint tests would be complicated here because the sample periods for the countries are different.

Table 2.5 **Tests of Asset Pricing Models Using National Attributes: 1976:01–1993:01 (205 observations)**

Country	*F*-test Exclude Intercept	*F*-test Exclude *Z*	*F*-test Exclude *A*
One-factor model			
Australia	0.294	2.569	0.895
	[0.588]	[0.028]	[0.445]
Austria	0.228	2.273	3.171
	[0.633]	[0.049]	[0.026]
Belgium	0.363	1.311	4.066
	[0.548]	[0.261]	[0.008]
Canada	0.005	1.126	1.185
	[0.941]	[0.348]	[0.316]
Denmark	0.116	1.965	1.123
	[0.734]	[0.085]	[0.341]
Finland	2.880	2.410	1.917
	[0.095]	[0.048]	[0.138]
France	0.000	0.427	3.220
	[0.985]	[0.829]	[0.024]
Germany	0.005	1.131	1.496
	[0.945]	[0.345]	[0.217]
Hong Kong	4.067	0.629	0.698
	[0.045]	[0.678]	[0.555]
Ireland	0.089	0.238	2.218
	(0.766]	[0.945]	[0.091]
Italy	1.261	0.904	0.822
	[0.271]	[0.493]	[0.493]
Japan	0.563	0.096	2.176
	[0.454]	[0.993]	[0.092]
Netherlands	2.758	0.582	2.048
	[0.098]	[0.714]	[0.108]
New Zealand	0.621	2.459	0.760
	[0.434]	[0.044]	[0.521]
Norway	0.221	0.581	0.080
	[0.639]	[0.715]	[0.971]
Singapore/Malaysia	1.539	0.400	1.164
	[0.216]	[0.849]	[0.325]
Spain	0.008	0.836	1.222
	[0.929]	[0.526]	[0.303]
Sweden	0.820	2.703	2.039
	[0.366]	[0.022]	[0.110]
Switzerland	0.081	1.873	2.678
	[0.777]	[0.101]	[0.048]
United Kingdom	1.269	0.089	2.140
	[0.261]	[0.994]	[0.096]
United States	0.202	0.384	2.819
	[0.653]	[0.859]	[0.040]
Two-factor model			
Australia	0.670	2.952	0.707
	[0.414]	[0.014]	[0.549]

Table 2.5 (continued)

Country	*F*-test Exclude Intercept	*F*-test Exclude Z	*F*-test Exclude A
Austria	0.558	2.683	2.165
	[0.456]	[0.023]	[0.094]
Belgium	0.945	0.292	2.834
	[0.332]	[0.917]	[0.039]
Canada	0.037	0.714	1.413
	[0.847]	[0.613]	[0.240]
Denmark	0.030	1.443	2.706
	[0.862]	[0.210]	[0.047]
Finland	3.045	1.643	2.616
	[0.087]	[0.166]	[0.061]
France	0.053	0.625	2.046
	[0.818]	[0.681]	[0.109]
Germany	0.296	1.104	1.413
	[0.587]	[0.359]	[0.240]
Hong Kong	3.580	0.545	0.949
	[0.060]	[0.742]	[0.418]
Ireland	0.285	0.369	2.320
	[0.595]	[0.868]	[0.080]
Italy	1.266	0.902	0.856
	[0.272]	[0.496]	[0.478]
Japan	0.636	0.361	1.877
	[0.426]	[0.875]	[0.135]
Netherlands	3.835	0.183	2.429
	[0.052]	[0.969]	[0.067]
New Zealand	0.001	3.786	1.183
	[0.970]	[0.005]	[0.325]
Norway	0.314	0.685	0.028
	[0.576]	[0.636]	[0.994]
Singapore/Malaysia	1.248	0.376	1.522
	[0.265]	[0.865]	[0.210]
Spain	0.189	0.671	1.224
	[0.664]	[0.646]	[0.303]
Sweden	1.168	2.802	2.308
	[0.281]	[0.018]	[0.078]
Switzerland	0.998	1.062	2.486
	[0.319]	[0.383]	[0.062]
United Kingdom	0.726	0.191	1.800
	[0.395]	[0.966]	[0.148]
United States	1.025	1.879	2.188
	[0.313]	[0.100]	[0.091]

Note: A model is estimated with the world risk factor(s) and the product of the world risk factor(s) and the lagged country attributes. The first risk factor is the excess return on the MSCI world market portfolio. The second risk factor is the excess return on holding a trade-weighted portfolio of ten countries' currencies invested in local Eurodeposits. Three exclusion tests are presented: (*a*) exclude an intercept; (*b*) exclude the lagged world information (the lagged MSCI world return, the lagged change in a portfolio of ten currency returns, the lagged MSCI world dividend yield, the lagged spread between the ninety-day and thirty-day Eurodollar rates [based on average daily rates], and the thirty-day Eurodollar rate [quote last day of previous month]); (*c*) exclude the lagged country attributes (dividend yield, ratio of GDP to OECD GDP, and long-term interest rates).

the fundamental attributes of these economies. Our paper is the first to examine the relation of these attributes to asset pricing on a world economywide basis. We provide a framework that links the attribute analysis of investment practitioners to asset pricing theory.

We study three types of attributes. The first group includes traditional valuation ratios such as price-to-book-value, cash-flow, earnings, and dividends. The second group quantifies relative economic performance with measures such as relative GDP per capita, relative inflation, the term structure of interest rates, and long-term interest rates. Finally, we examine the industrial composition of each of the countries.

Our cross-sectional analysis suggests that the average country returns are related to the term structure of interest rates, which is a measure of expected economic performance. We also find a significant relation between the average returns and the volatility of the price-to-book-value ratios. If the variation in the price-to-book value represents movements of the stock price around fundamental values, then the countries with higher price-to-book-value volatility are the countries with the greatest departures from fundamental values. If this type of risk is priced, then this could account for our discovery of a positive relation between average country returns and the price-to-book-value volatility.

Our paper also provides evidence that the time series of expected returns is related to some of the fundamental attributes. We find that measures such as relative gross domestic product, interest-rate levels, and dividend-price ratios have the ability to predict returns in a number of countries.

The most important contribution of our work is to link the cross-sectional analysis of fundamental attributes and the time-series predictability in the framework of asset pricing theory. Asset managers often employ fundamental ratios to predict the cross section of expected returns. That is, the returns in one quarter for a large number of firms are regressed on attributes which are measured in the previous quarter. However, according to asset pricing theory, the only way to predict the cross section of expected returns is with the risk exposures. Therefore, the cross-sectional prediction based on attributes is linked to the cross-sectional prediction based on risk measures, from asset pricing theory. We explore the hypothesis that cross-sectional variation in the country attributes proxies for variation in the sensitivity of national markets to global measures of economic risk. We test single-factor and two-factor models in which countries' conditional betas are modeled as country-specific functions of the fundamental attributes.

When the betas are allowed to be functions of the attributes, the models are reasonably successful in capturing time-varying expected returns in the national equity markets. The average pricing errors for a single-factor specification are significant at the 5 percent level in only two of twenty-one countries. When a second factor is added, none of the twenty-one specifications is rejected using this test. However, there is some evidence that our model could be improved. In five of the twenty-one countries, the pricing errors from the

one-factor model are partially predictable. Even when a second factor is added, there is some residual predictability in four of the twenty-one countries.

There are three natural directions for future research. First, while our model allows for changing betas and for the attributes to influence the changing betas, the structural relation between the attributes and the betas is fixed through time. A natural extension is to generalize this structural relation. Second, while we relate the betas to the level of the attributes, there is motivation for examining the volatility of the attributes. Our cross-sectional analysis indicated that the volatility of the price-to-book ratio is an important measure. A logical next step is to link the second moments of the attributes to the conditional betas. Finally, in our cross-sectional analysis we are limited by a relatively small sample of twenty-one countries. The framework that we have proposed can be immediately applied to individual firms. In addition to increased sample size, using individual firms will allow us to more precisely analyze the role of industrial composition as an economic attribute.

Data Appendix

Appendix tables 2A.1–2A.3 and appendix figures 2A.1–2A.4 describe our data and sources in more detail. IFS refers to International Financial Statistics. DataSt refers to Datastream, Ltd. OECD refers to the Organization for Economic Cooperation and Development.

Valuation Ratios

Value-weighted price-to-earnings ratios are available from MSCI starting in January 1970 except for Austria (January 1977), Finland (January 1988), Italy (April 1984), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), and Spain (January 1977). These are value-weighted averages of the ratios for the firms in the MSCI universe, based on the most recently available accounting data each month. Value-weighted price-to-cash earnings are defined as accounting earnings plus depreciation. These ratios are available beginning in January of 1970 except for Canada (December 1974), Finland (January 1988), France (September 1971), Hong Kong (December 1972), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), Spain (September 1971), and Switzerland (January 1977).

Value-weighted price-to-book-value ratios are available from January 1974 for all countries except Finland and New Zealand (both begin January 1988) and Ireland, which begins in May 1990. Dividend yields are the twelve-month moving sum of dividends divided by the current index level. The lagged value of the dividend yields are used. Dividend yields are available from January

1970 except for Finland and New Zealand (both begin January 1988), Hong Kong (January 1973), Ireland (May 1990), and Singapore/Malaysia (December 1972).

Economic Performance Measures

The ratio of lagged gross domestic product (GDP) per capita to lagged GDP per capita for the OECD countries is provided by the OECD, which provides quarterly OECD GDP figures for most of the countries. For some countries, the GDP data are only available on an annual basis. The ratio is lagged five quarters to account for publication lag. Since the data are observed quarterly (or annually), the monthly observations for each month in a quarter (or year) are the same. The population data are observed annually. The data sources and retrieval codes for the GDP data are listed below.

Country	Period	Frequency	Source	Code
AUS	1960Q1–1992Q4	Quarter	IFS	19399B.CZF...
AUT	1960Q1–1963Q4	Annual	IFS	12299B..ZF...
	1964Q1–1992Q4	Quarter	OECD	OE020000A
BEL	1960Q1–1969Q4	Annual	IFS	12499B..ZF...
	1970Q1–1992Q4	Annual	OECD	BGGDPCR.
CAN	1960Q1–1992Q4	Quarter	IFS	15699B.CZF...
DEN	1960Q1–1986Q4	Annual	IFS	12899B..ZF...
	1987Q1–1992Q4	Quarter	IFS	12899B..ZF...
FIN	1960Q1–1964Q4	Annual	IFS	17299B..ZF...
	1965Q1–1969Q4	Quarter	IMF	FNI99B..A
	1970Q1–1992Q4	Quarter	IFS	17299B..ZF...
FRA	1960Q1–1964Q4	Annual	IFS	13299B.CZF...
	1965Q1–1969Q4	Quarter	IFS	13299B.CZF...
	1970Q1–1992Q4	Quarter	OECD	FR104000B
GER	1960Q1–1992Q4	Quarter	IFS	13499A.CZF...
HKG	1960Q1–1992Q5	Annual	DataSt	HKEXTOTL
IRE	1960Q1–1969Q4	Annual	IFS	17899B..ZF...
	1970Q1–1970Q4	Annual	OECD	IRGDPCR.
ITA	1960Q1–1987Q4	Quarter	IFS	13699B.CZF...
	1988Q1–1992Q4	Quarter	OECD	IT301000B
JAP	1960Q1–1992Q4	Quarter	IFS	15899B.CZF...
HOL	1960Q1–1976Q4	Annual	IFS	13899B.CZF...
	1977Q1–1992Q4	Quarter	OECD	NL201000B
NZL	1960Q1–1969Q4	Annual	IFS	19699B..ZF...
	1970Q1–1992Q4	Annual	OECD	NZGDPCR.
NOR	1960Q1–1960Q4	Annual	IFS	14299B..ZF...
	1961Q1–1970Q4	Quarter	IFS	14299B..ZF...
	1971Q1–1977Q4	Annual	IFS	14299B..ZF...
	1978Q1–1986Q3	Quarter	IFS	14299B..ZF...
	1986Q4	Annual	IFS	14299B..ZF...
	1987Q1–1993Q1	Quarter	IFS	14299B..ZF...
SNG	1960Q1–1992Q4	Annual	IFS	57699B..ZF...
SPA	1960Q1–1969Q4	Annual	IFS	18499B..ZF...

Country	Period	Frequency	Source	Code
	1970Q1–1992Q4	Annual	OECD	ESGDPCR.
SWE	1960Q1–1979Q4	Annual	IFS	14499B..ZF...
	1980Q1–1992Q4	Quarter	IFS	14499B.ZF...
SWI	1960Q1–1966Q4	Annual	IFS	14699B.CZF...
	1967Q1–1969Q4	Quarter	IMF	SWI99B..A
	1970Q1–1993Q1	Quarter	IFS	14699B.CZF...
GBR	1960Q1–1992Q4	Quarter	IFS	11299B.CZF...
USA	1960Q1–1993Q1	Quarter	IFS	11199B.CZF...
WRD	1960Q1–1992Q4	Quarter	OECD	OC001000B

To obtain the measures of GDP per capita, the country GDP measures are divided by the following population series:

Country	Period	Frequency	Source	Code
AUS	1960Q1–1992Q4	Annual	IFS	19399Z..ZF...
AUT	1960Q1–1992Q4	Annual	IFS	12299Z..ZF...
BEL	1960Q1–1992Q4	Annual	IFS	12499Z..ZF...
CAN	1960Q1–1992Q4	Annual	IFS	15699Z..ZF...
DEN	1960Q1–1992Q4	Annual	IFS	12899Z..ZF...
FIN	1960Q1–1992Q4	Annual	IFS	17299Z..ZF...
FRA	1960Q1–1992Q4	Annual	IFS	13299Z..ZF...
GER	1960Q1–1992Q4	Annual	IFS	13499Z..ZF...
HKG	1973Q4–1992Q4	Annual	DataSt	HKTOTPOP
IRE	1960Q1–1992Q4	Annual	IFS	17899Z..ZF...
ITA	1960Q1–1992Q4	Annual	IFS	13699Z..ZF...
JAP	1960Q1–1992Q4	Annual	IFS	15899Z..ZF...
HOL	1960Q1–1992Q4	Annual	IFS	13899Z..ZF...
NZL	1960Q1–1992Q4	Annual	IFS	19699Z..ZF...
NOR	1960Q1–1992Q4	Annual	IFS	14299Z..ZF...
SNG	1960Q1–1992Q4	Annual	IFS	57699Z..ZF...
SPA	1960Q1–1992Q4	Annual	IFS	18499Z..ZF...
SWE	1960Q1–1992Q4	Annual	IFS	14499Z..ZF...
SWI	1960Q1–1992Q4	Annual	IFS	14699Z..ZF...
GBR	1960Q1–1992Q4	Annual	IFS	11299Z..ZF...
USA	1960Q1–1992Q4	Annual	IFS	11199Z..ZF...
WRD	1969Q4–1992Q4	Annual	OECD	OCDTOTPP
	1973Q4–1992Q4	Annual	DataSt	WDTOTPOP

The following currency exchange rate data are used to convert GDP in local currency to U.S. dollar terms. These series are national currency units per U.S. dollar, quarterly and annual averages, depending on the frequency of the GDP data. Period averages are used to better match the fact that GDP figures also represent an average over the period as opposed to a spot figure.

Country	Rate	Code	Country	Rate	Code
AUS	Market	193..RF.ZF...	ITA	Market	136..RF.ZF...
AUT	Official	122..RF.ZF...	JAP	Market	158..RF.ZF...
BEL	Market	124..RF.ZF...	HOL	Market	138..RF.ZF...
CAN	Market	156..RF.ZF...	NZL	Market	196..RF.ZF...
DEN	Market	128..RF.ZF...	NOR	Official	142..RF.ZF...
FIN	Official	172..RF.ZF...	SNG	Market	576..RF.ZF...
FRA	Official	132..RF.ZF...	SPA	Market	184..RF.ZF...
GER	Market	134..RF.ZF...	SWE	Official	144..RF.ZF...
HKG	Market	532..RF.ZF...	SWI	Official	146..RF.ZF...
IRE	Market	178..RF.ZF...	GBR	Market	112..RF.ZF...

The relative inflation measure is the ratio of annual percentage changes in the local consumer price index to annual percentage changes in the OECD CPI inflation series, available monthly for most of the countries. In predictive regressions, the variable is lagged five quarters to account for publication lag. The inflation series and their access codes are as follows:

Country	Period	Frequency	Source	Code
AUS	1957Q1–1993Q1	Quarter	IFS	19364...ZF...
AUT	1957Jan–1993Apr	Month	IFS	12264...ZF...
BEL	1957Jan–1993May	Month	IFS	12464...ZF...
CAN	1957Jan–1993Apr	Month	IFS	15664...ZF...
DEN	1957Q1–1966Q4	Quarter	IFS	12864...ZF...
	1967Jan–1993Mar	Month	IFS	12864...ZF...
FIN	1957Jan–1993Apr	Month	IFS	17264...ZF...
FRA	1957Jan–1993May	Month	IFS	13264...ZF...
GER	1957Jan–1993Apr	Month	IFS	13464...ZF...
HKG	1969Mar–1993Feb	Month	IFS	53264...ZF...
IRE	1957Q1–1993Q1	Quarter	IFS	17864...ZF...
	1969Q4–1993Q2	Quarter	OECD	IROCPCONF
ITA	1957Jan–1992Oct	Month	IFS	13664...ZF...
JAP	1957Jan–1993Apr	Month	IFS	15864...ZF...
HOL	1957Jan–1993Mar	Month	IFS	13864...ZF...
NZL	1957Q1–1993Q1	Quarter	IFS	19664...ZF...
NOR	1957Jan–1993Apr	Month	IFS	14264...ZF...
SNG	1968Jan–1993Apr	Month	IFS	57664...ZF...
SPA	1957Jan–1993Apr	Month	IFS	18464...ZF...
SWE	1957Jan–1993Mar	Month	IFS	14464...ZF...
SWI	1957Jan–1993May	Month	IFS	14664...ZF...
GBR	1957Jan–1993Feb	Month	IFS	11264...ZF...
USA	1957Jan–1993May	Month	IFS	11164...ZF...
WRD	1957Jan–1992Dec	Month	IFS	00164...ZF...

A long-term interest rate is measured for each country as an annualized percentage rate. In the predictive regressions, the long-term rate is lagged one month. For Hong Kong and Singapore, data are not available, so a U.S. rate was used. The sources and series codes are as follows:

Country	Period	Frequency	Source	Code	Description
AUS	1960Jan–1993May	Month	IFS	19361...ZF..	Treasury Bonds: 15 years
AUT	1971Jan–1993Apr	Month	IFS	12261...ZF..	Government bond yield
BEL	1960Jan–1993May	Month	IFS	12461...ZF..	Government bond yield
CAN	1960Jan–1993May	Month	IFS	15661...ZF..	Government bond yield > 10 yrs.
DEN	1960Jan–1993Apr	Month	IFS	12861...ZF..	Government bond yield
FIN	1972Jan–1993Apr	Month	OECD	FNOCLNG%	FN long-term rate-yield on taxable public bonds (3–6 YEARS) M. AVG. (P)
FRA	1960Jan–1993May	Month	IFS	13261...ZF..	Government bond yield (Moymens)
GER	1960Jan–1993Feb	Month	IFS	13461...ZF..	Public authorities bond yield
HKG	1960Jan–1993May	Month	IFS	11161...ZF..	Government bond yield: 10 yr.
IRE	1964Jan–1993May	Month	IFS	17861...ZF..	Government bond yield
ITA	1960Jan–1992Jun	Month	IFS	13661...ZF..	Government bond yield
JAP	1966Oct–1993Apr	Month	IFS	15861...ZF..	Government bond yield
HOL	1964Nov–1993May	Month	IFS	13861...ZF..	Government bond yield
NZL	1964Jan–1993May	Month	IFS	19661...ZF..	Government bond yield
NOR	1961Sep–1993May	Month	IFS	14261...ZF..	Government bond yield
SNG	1960Jan–1993May	Month	IFS	11161...ZF..	Government bond yield: 10 yr.
SPA	1978Mar–1993May	Month	IFS	18461...ZF..	Government bond yield
SWE	1960Jan–1993Apr	Month	IFS	14461...ZF..	Secondary Market: CENT. Government bonds: 5 yr.
SWI	1964Jan–1993May	Month	IFS	14661...ZF..	Government bond yield
GBR	1960Jan–1993Apr	Month	IFS	11261...ZF..	Government bond yield: long-term
USA	1960Jan–1993May	Month	IFS	11161...ZF..	Government bond yield: 10 yr.

Short-term interest rates for the various countries are used to construct a measure of the slope of the term structure. The term spread is the difference between the long-term interest rate and a short-term interest rate in each country. The term spread is lagged one month in the predictive regressions. The short-term interest rates are listed here together with their series codes:

Country	Period	Frequency	Source	Code	Description
AUS	1969Jul–1993May	Month	IFS	19360C..ZF..	13-weeks treasury bills
AUT	1960Jan–1993May	Month	OECD	OEOCSTIR	OE short-term interest rate—3-month vibor (monthly average) (P)
BEL	1960Jan–1993Jun	Month	IFS	12460C..ZF..	Treasury paper

CAN	1960Jan–1993Jun	Month	IFS	15660C..ZF...	Treasury bill rate
DEN	1960Jan–1993May	Month	OECD	DKOCSTIR	DK short-term interest rate—3-month interbank rate (P)
FIN	1977Dec–1993May	Month	IFS	17260B..ZF...	Average cost of CB debt
FRA	1970Jan–1986Jun	Month	IFS	13260BS.ZF...	Interbank money rate
	1986Jul–1993May	Month	IFS	13260C..ZF...	13-week Treasury bills
GER	1975Jul–1993Mar	Month	IFS	13460C..ZF...	Treasury bill rate
HKG	1974Sep–1993May	Month	IFS	11160CS.ZF...	Treasury bill rate (bond equivalent basis)
IRE	1972Mar–1993Apr	Month	IFS	17860C..ZF...	Exchequer bills
ITA	1977Mar–1993Mar	Month	IFS	13660C..ZF...	Treasury bills (weighted average before tax)
JAP	1960Jan–1977Jan	Month	IFS	15860B..ZF...	Call money rate
	1977Feb–1993May	Month	OECD	JPOCGEN%	JP short-term interest rate—3-month Gensaki rate—monthly average (P)
HOL	1968Dec–1990Aug	Month	IFS	13860C..ZF...	Treasury bill rate
NZL	1978Feb–1993May	Month	IFS	19660C..ZF...	New issue rate: 3-month Treasury bills
NOR	1971Aug–1993May	Month	IFS	14260B..ZF...	Call money rate
SNG	1972Apr–1993Apr	Month	IFS	57660B..ZF...	3-month interbank rate
SPA	1974Jan–1978Dec	Month	IFS	18460B..ZF...	Call money rate
	1979Jan–1993May	Month	IFS	18460C..ZF...	Treasury bill rate
SWE	1960Mar–1993Apr	Month	IFS	14460C..ZF...	3-month Treasury disc. notes
SWI	1975Sep–1979Dec	Month	IFS	14660B..ZF...	Call money rate
	1980Jan–1993May	Month	IFS	14660C..ZF...	Treasury bill rate
GBR	1974Jun–1993May	Month	IFS	11260CS.ZF...	Treasury bill rate bond equivalent
USA	1974Sep–1993May	Month	IFS	11160CS.ZF...	Treasury bill rate (bond equivalent basis)

Industry Structure Measures

These are the regression coefficients from regressing the country returns on the four groupings of the MSCI industry indexes, presented in figure 2.1. We use the MSCI world industry portfolios to construct the industry indexes. Each aggregate index is an equally weighted average of the returns of the MSCI industries in the group. MSCI tracks thirty-eight industry groups. These are: aerospace and military technology, appliances and household durables, automobiles, banking, beverages and tobacco, broadcasting and publishing, building materials and components, business and public services, chemicals, construction and housing, data processing and reproduction, electrical and electronics, electronic components and instruments, energy equipment and services, energy sources, financial services, food and household products, forest products and paper, gold mines, health and personal care, industrial components, insurance, leisure and tourism, machinery and engineering, merchandising, metals (nonferrous), metals (steel), miscellaneous materials and

commodities, multi-industry, recreation, other consumer goods, real estate, telecommunication, textiles and apparel, transportation–airlines, transportation–road and rail, transportation–shipping, utilities–electrical and gas, and wholesale and international trade. All of the world industry indexes have a base value of 100 in December 1969. The indexes are calculated in U.S. dollars but do not include dividends. We group thirty-seven of the industry returns into the four groups shown in figure 2.1. The correlations of the four industry grouped portfolio returns are:

	IND1	IND2	IND3	IND4
IND1	1	0.69	0.71	0.64
IND2		1	0.81	0.90
IND3			1	0.78

World Information Variables

A short-term slope of the term structure is the difference between the ninety-day Eurodollar rate (Citibase FYUR3M) and the thirty-day Eurodollar deposit rate. The short-term interest rate is the thirty-day Eurodollar deposit yield. Both are monthly averages of daily quotes. The lagged values of the MSCI world stock market return, the dividend yield of the world stock market index, and the G10 FX return are also used.

Global Risk Factors

Data are available as early as January 1970 for some of the series; all are available by February 1971. The MSCI world return is the U.S. dollar world market return less the thirty-day Eurodollar rate. This series is from Datastream. The oil return is the percentage change in the U.S. dollar price of Saudi light crude, less the thirty-day Eurodollar deposit rate, which is available from the OECD from 1973. Prior to that date, the OECD series is constant, so we use the same oil price series as in Ferson and Harvey (1993, 1994) prior to 1973. This is the posted West Texas intermediate price from 1969 to 1973. Since the West Texas price reflects a different grade of oil than the Saudi light crude, the 1969–73 data is grossed down by a scale factor, based on the average price levels over the 1974–76 period. The G10 FX return is the return on holding a portfolio of currencies of the G10 countries (plus Switzerland) in excess of the thirty-day Eurodollar rate. The currency return is the percentage change in the spot exchange rate plus the local currency, thirty-day Eurodeposit rate. The portfolio weights are based on a one-year lag of a five-year moving average of trade sector weights. The numerator of the weight is the sum of the imports plus exports, and the denominator is the sum, over the countries, of the imports plus exports of each country, measured in a common currency (U.S. dollars). We use a five-year moving average of these weights, lagged by one year to insure that they are predetermined, public information. Further details of the index construction are presented by Harvey (1993b), who compares this measure with the Federal Reserve series of G10 exchange-rate changes that was

used by Ferson and Harvey (1993, 1994). He finds that the correlation of the two series is in excess of 0.9.

The sample correlations of the global risk factors are:

	EXG10FX	EXOIL	dOECDIP	dOECDCPI
EXWRD	.36	−.09	−.14	−.11
EXG10FX		.03	.01	−.13
EXOIL			−.04	.09
dOECDIP				−.02

Table 2A.1 **Means, Standard Deviations, and Autocorrelations of International Equity Returns and Attributes: January 1975 to May 1993 (221 observations)**

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
			Australia					
Equity return	16.60	26.02	0.03	−0.12	−0.04	0.04	−0.11	0.03
Earnings to price	0.09	0.02	0.93	0.85	0.79	0.74	0.22	0.13
Price to cash earnings	7.14	1.48	0.92	0.84	0.78	0.72	0.39	0.26
Price to book value	1.29	0.29	0.93	0.86	0.80	0.76	0.46	0.15
Dividend yield	4.63	0.87	0.93	0.86	0.81	0.76	0.20	−0.09
Per capita GDP to OECD	1.01	0.17	0.71	0.44	0.29	0.21	—	—
Inflation to OECD	1.30	0.68	0.98	0.95	0.91	0.87	0.41	−0.09
Term spread	0.81	2.05	0.93	0.85	0.78	0.74	0.32	−0.27
Long-term interest rate	12.03	2.12	0.98	0.96	0.94	0.91	0.75	0.39
			Austria					
Equity return	13.90	24.63	0.14	0.01	0.05	0.11	0.02	0.03
Earnings to price	0.03	0.02	0.95	0.90	0.87	0.85	0.64	0.38
Price to cash earnings	6.70	2.94	0.96	0.91	0.87	0.83	0.49	0.14
Price to book value	1.58	0.62	0.97	0.92	0.88	0.86	0.58	0.23
Dividend yield	2.70	0.91	0.98	0.97	0.95	0.94	0.80	0.61
Per capita GDP to OECD	0.97	0.14	0.67	0.22	−0.12	−0.34	—	—
Inflation to OECD	0.60	0.19	0.93	0.86	0.79	0.71	0.27	0.00
Term spread	0.08	0.79	0.96	0.91	0.86	0.82	0.45	0.05
Long-term interest rate	8.24	1.08	0.99	0.96	0.93	0.90	0.61	0.14
			Belgium					
Equity return	17.35	20.83	0.07	0.07	−0.02	0.02	0.00	0.02
Earnings to price	0.09	0.02	0.91	0.84	0.80	0.76	0.28	0.15
Price to cash earnings	4.25	1.06	0.97	0.93	0.90	0.88	0.67	0.48
Price to book value	1.15	0.40	0.98	0.96	0.95	0.93	0.85	0.69
Dividend yield	9.15	3.37	0.99	0.98	0.96	0.95	0.87	0.72
Per capita GDP to OECD	1.02	0.23	0.81	0.53	0.23	−0.06	—	—
Inflation to OECD	0.75	0.58	0.28	0.27	0.27	0.27	−0.18	0.03
Term spread	0.31	0.64	0.85	0.73	0.62	0.52	0.20	0.16
Long-term interest rate	9.86	1.93	0.99	0.98	0.96	0.95	0.76	0.37

Table 2A.1 (continued)

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
				Canada				
Equity return	12.29	19.61	−0.02	−0.06	0.06	−0.03	−0.09	0.09
Earnings to price	0.08	0.03	0.98	0.96	0.94	0.92	0.66	0.42
Price to cash earnings	6.86	1.80	0.97	0.93	0.89	0.84	0.45	0.28
Price to book value	1.41	0.23	0.94	0.88	0.84	0.79	0.37	0.02
Dividend yield	3.76	0.72	0.96	0.92	0.88	0.84	0.49	0.43
Per capita GDP to OECD	1.22	0.14	0.64	0.28	0.11	0.12	—	—
Inflation to OECD	0.96	0.26	0.95	0.90	0.84	0.76	−0.03	−0.30
Term spread	0.50	1.72	0.93	0.84	0.75	0.67	0.27	−0.21
Long-term interest rate	10.67	1.96	0.97	0.94	0.91	0.88	0.65	0.31
				Denmark				
Equity return	14.35	19.09	−0.06	0.07	0.05	0.05	−0.16	0.07
Earnings to price	0.10	0.06	0.97	0.93	0.90	0.86	0.55	0.55
Price to cash earnings	6.12	2.37	0.98	0.96	0.94	0.91	0.69	0.50
Price to book value	1.17	0.50	0.99	0.97	0.96	0.94	0.78	0.60
Dividend yield	3.48	1.85	0.99	0.99	0.98	0.97	0.88	0.71
Per capita GDP to OECD	1.28	0.21	0.74	0.36	0.08	−0.18	—	—
Inflation to OECD	0.98	0.32	0.92	0.84	0.75	0.67	0.23	0.11
Term spread	−0.26	2.23	0.91	0.86	0.80	0.74	0.22	−0.14
Long-term interest rate	13.60	3.88	0.98	0.97	0.96	0.94	0.82	0.69
				Finland				
Equity return	−1.68	26.10	0.22	−0.27	−0.14	−0.01	−0.00	0.35
Earnings to price	0.02	0.10	0.98	0.94	0.92	0.88	0.77	−0.44
Price to cash earnings	8.92	5.65	0.95	0.89	0.83	0.80	−0.05	−0.72
Price to book value	0.98	0.38	0.99	0.96	0.95	0.93	0.80	0.55
Dividend yield	2.53	0.65	0.90	0.75	0.62	0.50	0.26	−0.54
Per capita GDP to OECD	1.13	0.17	0.67	0.21	−0.11	−0.38	—	—
Inflation to OECD	0.97	0.22	0.95	0.92	0.90	0.86	0.45	−0.49
Term spread	0.02	1.45	0.80	0.51	0.28	0.18	0.11	−0.28
Long-term interest rate	12.39	1.22	0.94	0.84	0.72	0.59	0.21	0.07
				France				
Equity return	18.19	25.23	0.03	−0.02	0.12	0.05	−0.09	−0.02
Earnings to price	0.08	0.04	0.96	0.91	0.86	0.81	0.28	−0.24
Price to cash earnings	4.13	1.45	0.98	0.95	0.92	0.89	0.71	0.67
Price to book value	1.21	0.53	0.99	0.97	0.95	0.94	0.80	0.66
Dividend yield	4.93	1.79	0.98	0.96	0.94	0.92	0.79	0.58
Per capita GDP to OECD	1.08	0.18	0.72	0.35	0.5	−0.17	—	—
Inflation to OECD	1.00	0.31	0.99	0.96	0.94	0.91	0.75	0.57
Term spread	0.37	1.19	0.92	0.83	0.74	0.64	0.20	0.31
Long-term interest rate	10.60	2.41	0.99	0.98	0.96	0.94	0.76	0.41

(*continued*)

Table 2A.1 (continued)

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
			Germany					
Equity return	14.71	21.59	−0.02	−0.01	0.11	0.08	−0.09	−0.00
Earnings to price	0.08	0.02	0.97	0.93	0.90	0.86	0.67	0.44
Price to cash earnings	4.20	0.83	0.95	0.90	0.84	0.78	0.51	0.35
Price to book value	1.69	0.44	0.97	0.94	0.91	0.88	0.63	0.32
Dividend yield	4.19	1.06	0.98	0.95	0.93	0.90	0.73	0.44
Per capita GDP to OECD	1.21	0.20	0.74	0.34	0.03	−0.21	—	—
Inflation to OECD	0.46	0.24	0.98	0.95	0.92	0.88	0.47	0.10
Term spread	1.47	1.10	0.95	0.90	0.87	0.83	0.55	0.14
Long-term interest rate	7.57	1.32	0.98	0.95	0.91	0.88	0.57	0.01
			Hong Kong					
Equity return	28.43	33.74	0.05	−0.04	−0.04	−0.12	−0.01	0.00
Earnings to price	0.08	0.02	0.93	0.84	0.75	0.67	0.27	−0.23
Price to cash earnings	10.42	2.81	0.91	0.80	0.72	0.65	0.18	−0.32
Price to book value	1.76	0.60	0.94	0.88	0.81	0.76	0.36	−0.20
Dividend yield	4.35	1.10	0.91	0.80	0.69	0.61	0.24	−0.31
Per capita GDP to OECD	0.56	0.09	0.71	0.42	0.15	−0.09	—	—
Inflation to OECD	1.25	0.58	0.96	0.93	0.92	0.90	0.70	0.52
Term spread	1.68	1.38	0.93	0.82	0.73	0.65	0.37	0.08
Long-term interest rate	9.39	2.18	0.98	0.96	0.93	0.91	0.69	0.38
			Ireland					
Equity return	19.36	27.73	0.09	0.09	0.16	0.11	−0.04	0.09
Earnings to price	0.06	0.02	0.93	0.87	0.80	0.73	0.44	−0.03
Price to cash earnings	3.96	1.51	0.96	0.92	0.87	0.83	0.41	−0.05
Price to book value	1.56	0.54	0.97	0.93	0.89	0.84	0.31	−0.31
Dividend yield	2.84	0.68	0.95	0.90	0.84	0.78	0.31	−0.28
Per capita GDP to OECD	0.54	0.08	0.66	0.22	−0.21	−0.39	—	—
Inflation to OECD	0.92	0.37	0.97	0.92	0.88	0.83	0.47	0.52
Term spread	−0.19	1.60	0.87	0.69	0.55	0.42	0.39	0.07
Long-term interest rate	10.55	1.93	0.97	0.91	0.85	0.79	0.57	0.49
			Italy					
Equity return	−0.32	26.18	−0.16	−0.09	−0.05	0.18	−0.15	−0.37
Earnings to price	0.08	0.01	0.78	0.48	0.33	0.10	−0.36	0.08
Price to cash earnings	8.84	1.21	0.85	0.57	0.26	0.04	−0.31	0.64
Price to book value	1.56	0.28	0.85	0.56	0.22	0.01	0.11	0.44
Dividend yield	2.51	0.38	0.88	0.75	0.60	0.49	0.26	0.74
Per capita GDP to OECD	0.80	0.14	0.73	0.34	0.04	−0.12	—	—
Inflation to OECD	1.20	0.12	0.87	0.74	0.65	0.58	−0.34	0.68
Term spread	−2.10	1.24	0.67	0.62	0.51	0.36	−0.12	−0.74
Long-term interest rate	10.91	1.09	0.80	0.72	0.53	0.34	−0.70	0.04

Table 2A.1 (continued)

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
				Japan				
Equity return	19.89	23.54	0.04	−0.05	0.05	0.05	0.05	0.03
Earnings to price	0.04	0.01	0.99	0.98	0.97	0.96	0.86	0.74
Price to cash earnings	9.70	3.73	0.99	0.98	0.96	0.95	0.83	0.59
Price to book value	2.64	1.06	0.99	0.97	0.96	0.95	0.81	0.54
Dividend yield	1.43	0.73	0.99	0.99	0.99	0.98	0.97	0.93
Per capita GDP to OECD	1.12	0.21	0.76	0.42	0.15	−0.01	—	—
Inflation to OECD	0.52	0.33	0.96	0.94	0.91	0.89	0.66	0.50
Term spread	0.19	1.18	0.92	0.84	0.75	0.64	−0.13	−0.02
Long-term interest rate	6.79	1.69	0.98	0.96	0.94	0.91	0.71	0.30
				Netherlands				
Equity return	19.95	18.35	−0.02	−0.06	0.03	−0.07	0.04	−0.04
Earnings to price	0.14	0.06	0.97	0.95	0.92	0.89	0.59	0.48
Price to cash earnings	3.77	1.21	0.98	0.96	0.93	0.91	0.80	0.78
Price to book value	0.94	0.30	0.99	0.97	0.95	0.93	0.89	0.82
Dividend yield	5.73	1.31	0.97	0.94	0.92	0.89	0.74	0.58
Per capita GDP to OECD	1.06	0.22	0.81	0.53	0.27	0.01	—	—
Inflation to OECD	0.52	0.33	0.98	0.95	0.93	0.91	0.63	0.24
Term spread	1.45	1.51	0.85	0.75	0.65	0.56	0.36	0.05
Long-term interest rate	8.34	1.41	0.98	0.95	0.92	0.89	0.69	0.28
				New Zealand				
Equity return	1.80	25.56	−0.05	−0.06	−0.06	−0.13	−0.08	0.11
Earnings to price	0.10	0.04	0.85	0.70	0.61	0. 54	−0.37	−0.31
Price to cash earnings	5.99	1.04	0.64	0.33	0.26	0.20	0.02	−0.12
Price to book value	1.11	0.16	0.85	0.70	0.57	0.46	−0.22	−0.32
Dividend yield	5.95	0.88	0.87	0.78	0.69	0.59	−0.25	−0.53
Per capita GDP to OECD	0.72	0.11	0.62	0.22	−0.07	−0.25	—	—
Inflation to OECD	1.05	0.80	0.95	0.90	0.89	0.87	0.41	0.63
Term spread	−0.36	1.34	0.95	0.91	0.86	0.81	0.26	0.10
Long-term interest rate	11.09	2.11	0.99	0.97	0.96	0.95	0.83	0.66
				Norway				
Equity return	13.81	27.96	0.12	−0.01	0.10	−0.06	−0.01	−0.02
Earnings to price	0.09	0.05	0.96	0.91	0.85	0.79	0.45	−0.07
Price to cash earnings	4.52	1.48	0.93	0.87	0.80	0.73	0.48	0.27
Price to book value	1.58	0.63	0.98	0.94	0.91	0.88	0.72	0.42
Dividend yield	3.51	1.40	0.98	0.95	0.92	0.89	0.61	0.29
Per capita GDP to OECD	1.32	0.13	0.64	0.23	−0.06	−0.32	—	—
Inflation to OECD	1.16	0.61	0.98	0.96	0.92	0.87	0.43	0.04
Term spread	−0.73	2.07	0.55	0.41	0.32	0.22	−0.11	−0.03
Long-term interest rate	10.68	2.23	0.99	0.98	0.97	0.96	0.88	0.67

(*continued*)

Table 2A.1 (continued)

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
			Singapore/Malaysia					
Equity return	19.48	28.58	0.13	0.04	−0.10	−0.01	0.04	0.02
Earnings to price	0.05	0.01	0.91	0.81	0.75	0.70	0.45	0.36
Price to cash earnings	13.90	3.66	0.93	0.87	0.81	0.72	0.19	0.14
Price to book value	2.02	0.53	0.95	0.88	0.80	0.74	0.45	0.16
Dividend yield	2.22	0.64	0.94	0.88	0.84	0.80	0.58	0.42
Per capita GDP to OECD	0.57	0.09	0.74	0.38	0.11	−0.12	—	—
Inflation to OECD	0.36	0.38	0.96	0.91	0.85	0.79	0.19	−0.07
Term spread	3.37	1.62	0.82	0.69	0.64	0.60	0.26	0.09
Long-term interest rate	9.39	2.18	0.98	0.96	0.93	0.91	0.69	0.38
			Spain					
Equity return	12.97	24.31	0.11	0.01	−0.06	0.07	−0.06	0.12
Earnings to price	0.09	0.02	0.94	0.87	0.80	0.74	0.45	0.03
Price to cash earnings	4.00	0.90	0.94	0.87	0.80	0.74	0.48	0.20
Price to book value	0.76	0.34	0.99	0.97	0.95	0.94	0.86	0.71
Dividend yield	8.06	3.65	0.99	0.97	0.96	0.95	0.85	0.69
Per capita GDP to OECD	0.53	0.11	0.77	0.39	0.00	−0.27	—	—
Inflation to OECD	1.65	0.57	0.97	0.93	0.88	0.82	0.22	−0.03
Term spread	−0.18	4.92	0.76	0.54	0.38	0.17	0.01	−0.04
Long-term interest rate	13.90	1.99	0.97	0.93	0.89	0.84	0.52	0.13
			Sweden					
Equity return	18.08	23.22	0.09	−0.00	0.05	−0.01	0.02	0.01
Earnings to price	0.10	0.04	0.97	0.94	0.91	0.87	0.50	0.12
Price to cash earnings	5.68	2.51	0.98	0.95	0.93	0.90	0.75	0.62
Price to book value	1.39	0.66	0.99	0.97	0.95	0.93	0.79	0.65
Dividend yield	3.70	1.49	0.98	0.96	0.94	0.92	0.79	0.62
Per capita GDP to OECD	1.37	0.24	0.78	0.46	0.18	−0.04	—	—
Inflation to OECD	1.22	0.35	0.93	0.87	0.78	0.70	0.07	−0.03
Term spread	0.61	2.07	0.87	0.75	0.65	0.57	0.16	0.07
Long-term interest rate	11.21	1.48	0.97	0.94	0.90	0.86	0.52	0.29
			Switzerland					
Equity return	15.03	19.18	0.04	−0.00	−0.00	0.01	−0.02	0.02
Earnings to price	0.08	0.01	0.95	0.89	0.84	0.79	0.49	0.38
Price to cash earnings	6.09	1.62	0.97	0.94	0.91	0.89	0.75	0.75
Price to book value	1.25	0.31	0.98	0.95	0.92	0.90	0.72	0.59
Dividend yield	2.62	0.42	0.95	0.90	0.84	0.80	0.55	0.37
Per capita GDP to OECD	1.61	0.22	0.57	0.08	−0.17	−0.30	—	—
Inflation to OECD	0.54	0.31	0.98	0.95	0.92	0.90	0.62	0.41
Term spread	0.30	1.61	0.93	0.89	0.84	0.79	0.45	−0.02
Long-term interest rate	4.81	0.96	0.98	0.96	0.93	0.90	0.66	0.23

Table 2A.1 (continued)

Variable	Mean	Standard Deviation	Autocorrelation ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
			United Kingdom					
Equity return	22.31	26.88	0.09	−0.12	0.03	−0.01	−0.07	0.08
Earnings to price	0.10	0.04	0.95	0.90	0.88	0.83	0.55	0.41
Price to cash earnings	6.29	1.78	0.97	0.94	0.91	0.88	0.73	0.61
Price to book value	1.37	0.44	0.98	0.96	0.94	0.92	0.85	0.77
Dividend yield	5.23	0.93	0.88	0.78	0.76	0.69	0.47	0.44
Per capita GDP to OECD	0.83	0.12	0.66	0.09	−0.44	−0.71	—	—
Inflation to OECD	1.26	0.35	0.97	0.91	0.84	0.77	0.27	0.11
Term spread	0.42	2.88	0.79	0.75	0.71	0.69	0.41	0.20
Long-term interest rate	11.58	2.07	0.98	0.94	0.91	0.88	0.73	0.59
			United States					
Equity return	15.23	15.32	0.00	−0.05	−0.07	−0.05	0.00	0.05
Earnings to price	0.09	0.03	0.98	0.97	0.95	0.93	0.73	0.60
Price to cash earnings	6.63	1.57	0.98	0.96	0.94	0.92	0.73	0.55
Price to book value	1.60	0.38	0.98	0.96	0.95	0.93	0.84	0.78
Dividend yield	4.31	0.97	0.98	0.96	0.94	0.92	0.77	0.62
Per capita GDP to OECD	1.31	0.10	0.70	0.49	0.35	0.22	—	—
Inflation to OECD	0.83	0.15	0.97	0.91	0.85	0.80	0.31	−0.06
Term spread	1.68	1.38	0.93	0.82	0.73	0.65	0.37	0.08
Long-term interest rate	9.39	2.18	0.98	0.96	0.93	0.91	0.69	0.38
			World					
Equity return	15.55	14.54	0.06	−0.06	−0.02	−0.04	0.02	0.07
Earnings to price	0.08	0.02	0.99	0.98	0.96	0.95	0.81	0.72
Price to cash earnings	6.48	1.43	0.98	0.96	0.93	0.91	0.76	0.71
Price to book value	1.66	0.47	0.99	0.97	0.96	0.95	0.85	0.74
Dividend yield	3.73	1.03	0.99	0.98	0.97	0.96	0.87	0.78

Note: Summary statistics use data that begin in January 1975 or later depending on data availability. Returns are available from January 1970 except for Finland, Ireland, and New Zealand (which begin in February 1988). Price to earnings ratios start in January 1970 except for Austria (January 1977), Finland (January 1988), Italy (April 1984), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), and Spain (January 1977). The price to book ratios are available from January 1974 for all countries except Finland and New Zealand (both begin January 1988) and Ireland (May 1990). The price to cash ratios are available over the entire sample except for Canada (December 1974), Finland (January 1988), France (September 1971), Hong Kong (December 1972), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), Spain (September 1971), and Switzerland (January 1977). Dividend yields are available from January 1970 except for Finland and New Zealand (both begin January 1988), Hong Kong (January 1973), Ireland (May 1990), and Singapore/Malaysia (December 1972). Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for country to per capita annual OECD calculated in U.S. dollars. The annual observations are observed quarterly except for Belgium, Denmark (annual through 1987Q4), Hong Kong, Netherlands and Norway (annual through 1976Q4), Singapore, and Spain. The population data are annual. The summary statistics for this variable are based on annual observations. Inflation to OECD is the annual change in inflation for country i divided by the annual change in inflation for the OECD. These monthly data are available from December 1969 for all countries. Monthly long-term interest rates begin in December 1969 except for Austria (January 1971), Finland (January 1972), and Spain (March 1978). Data were not avail-

(*continued*)

Table 2A.1 (continued)

able for Hong Kong and Singapore so the U.S. rate was used. The term spread is the long-term rate minus the short-term rate. Short-term interest rates begin in December 1969 except for Denmark (December 1974), Finland (December 1977), France (January 1970), Germany (December 1974), Hong Kong (September 1974 U.S. used), Ireland (November 1972), Italy (November 1977), Netherlands (December 1974), New Zealand (February 1978), Norway (August 1971), Singapore (August 1973), Spain (January 1974), Switzerland (December 1974), United Kingdom (January 1974), and United States (October 1974).

Table 2A.2 **Average Cross-Country Time-Series Correlations of Attributes 1975:01–1993:05 (221 observations)**

Attributes	EP	PC	PB	YD	RGDP	RCPI	TERM	LONG
Earnings to price	1.00							
Price to cash earnings	−0.79	1.00						
Price to book value	−0.51	0.69	1.00					
Dividend yield	0.69	−0.76	−0.79	1.00				
Per capita GDP to OECD	0.29	−0.27	−0.17	0.27	1.00			
Inflation to OECD	0.07	−0.11	−0.05	0.09	−0.14	1.00		
Term spread	−0.01	−0.04	−0.16	0.03	−0.03	−0.09	1.00	
Long-term interest rate	0.29	−0.28	−0.29	0.36	−0.07	0.4	0.00	1.00

Note: Time-series correlations of the attributes were calculated for each country. The statistics reported are the averages of these correlations across all the countries. The sample size is not the same for each country. Correlations use data that begin in January 1975 or later depending on data availability. Returns are available from January 1970 except for Finland, Ireland, and New Zealand (which begin in February 1988). Price to earnings ratios start in January 1970 except for Austria (January 1977), Finland (January 1988), Italy (April 1984), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), and Spain (January 1977). The price to book ratios are available from January 1974 for all countries except Finland and New Zealand (both begin January 1988) and Ireland (May 1990). The price to cash ratios are available over the entire sample except for Canada (December 1974), Finland (January 1988), France (September 1971), Hong Kong (December 1972), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), Spain (September 1971), and Switzerland (January 1977). Dividend yields are available from January 1970 except for Finland and New Zealand (both begin January 1988), Hong Kong (January 1973), Ireland (May 1990), Sinapore/Malaysia (December 1972). Per capita GDP to OECD is the ratio of per capita annual GDP calculated in U.S. dollars for country to per capita annual OECD calculated in U.S. dollars. The annual observations are observed quarterly except for Belgium, Denmark (annual through 1987Z4), Hong Kong, Netherlands and Norway (annual through 1976Q4), Singapore, and Spain. The population data are annual. The summary statistics for this variable are based on annual observations. Inflation to OECD is the annual change in inflation for country *i* divided by the annual change in inflation for the OECD. These monthly data are available from December 1969 for all countries. Monthly long-term interest rates begin in December 1969 except for Austria (January 1971), Finland (January 1972), and Spain (March 1978). Data were not available for Hong Kong and Singapore so the U.S. rate was used. The term spread is the long-term rate minus the short-term rate. Short-term interest rates begin in December 1969 except for Denmark (December 1974), Finland (December 1977), France (January 1970), Germany (December 1974), Hong Kong (September 1974 U.S. used), Ireland (November 1972), Italy (November 1977), Netherlands (December 1974), New Zealand (February 1978), Norway (August 1971), Singapore (August 1973), Spain (January 1974), Switzerland (December 1974), United Kingdom (January 1974), and United States (October 1974).

Table 2A.3 **International Industry Loadings for Twenty-One Equity Markets: 1975:01–1991:09 (202 observations)**

Country	Natural Resources	Construction and Manufacturing	Transportation, Communication, Energy	Services and Financial Services
Australia	0.52	0.13	0.05	0.10
Austria	0.19	0.42	0.04	−0.20
Belgium	0.22	0.35	−0.19	0.39
Canada	0.40	−0.18	0.50	0.16
Denmark	−0.05	0.24	0.18	0.21
Finland	1.01	−0.36	−0.02	0.20
France	0.27	0.47	0.01	0.23
Germany	0.04	0.68	−0.07	0.06
Hong Kong	0.01	−0.10	0.05	1.04
Ireland	0.32	−0.09	−0.39	0.93
Italy	−0.29	0.93	0.65	−0.42
Japan	0.03	0.59	−0.40	0.76
Netherlands	0.10	0.17	0.39	0.20
New Zealand	0.50	−0.71	1.38	−0.43
Norway	0.35	0.03	0.70	−0.11
Singapore/Mal	0.07	0.49	−0.08	0.51
Spain	0.03	0.30	−0.13	0.48
Sweden	0.04	0.50	0.10	0.13
Switzerland	0.15	0.42	−0.01	0.25
United Kingdom	0.23	0.14	−0.16	0.85
United States	−0.03	0.07	0.69	0.08

Note: The loadings are slope coefficients in the regressions of country returns on four industry returns: natural resources, construction and manufacturing, transportation/communication/energy and utilities, and services and financial services. The details of the industry portfolio construction are provided in figure 2.5. The regressions are run (when possible) from January 1975 through September 1991 (the last date of the industry returns). The returns for Finland, Ireland, and New Zealand begin in February 1988.

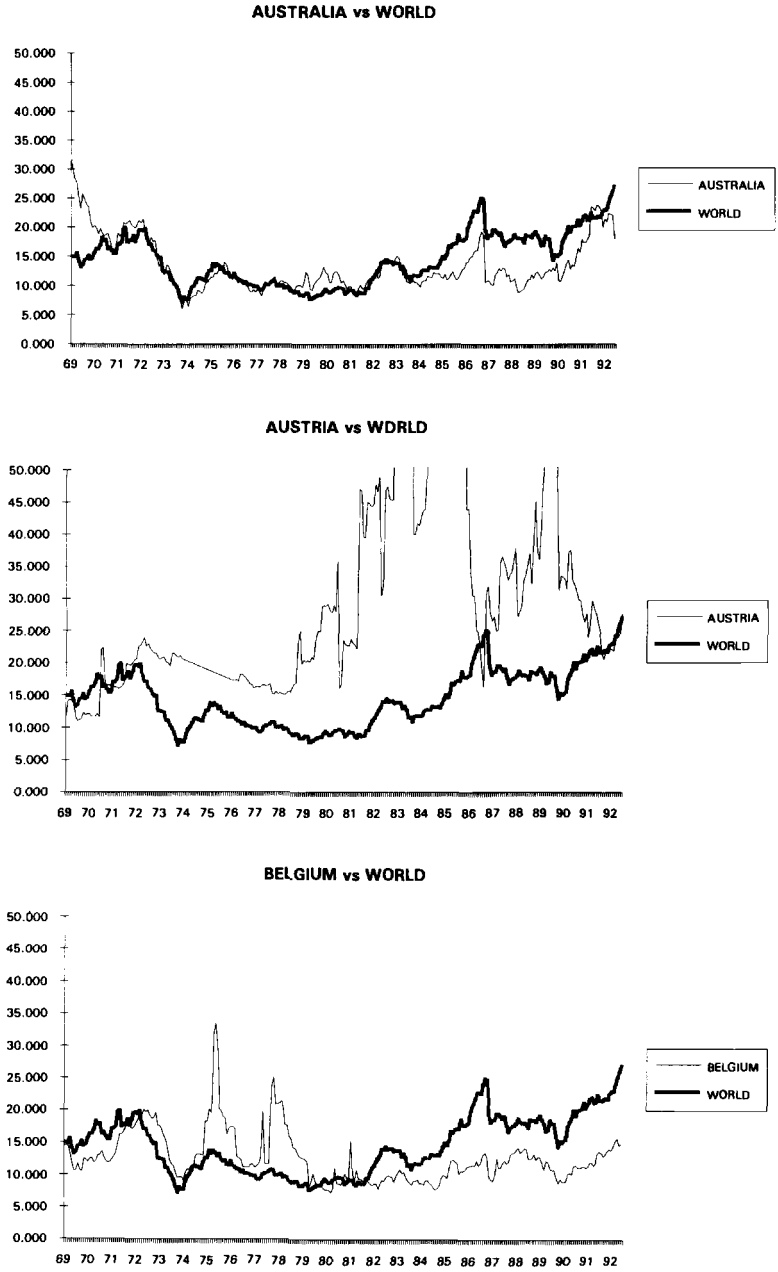


Fig. 2A.1 Price to earnings ratios, country versus world
Note: Value-weighted price to earnings ratios start in January 1970 except for Austria (January 1977), Finland (January 1988), Italy (April 1984), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), and Spain (January 1977).

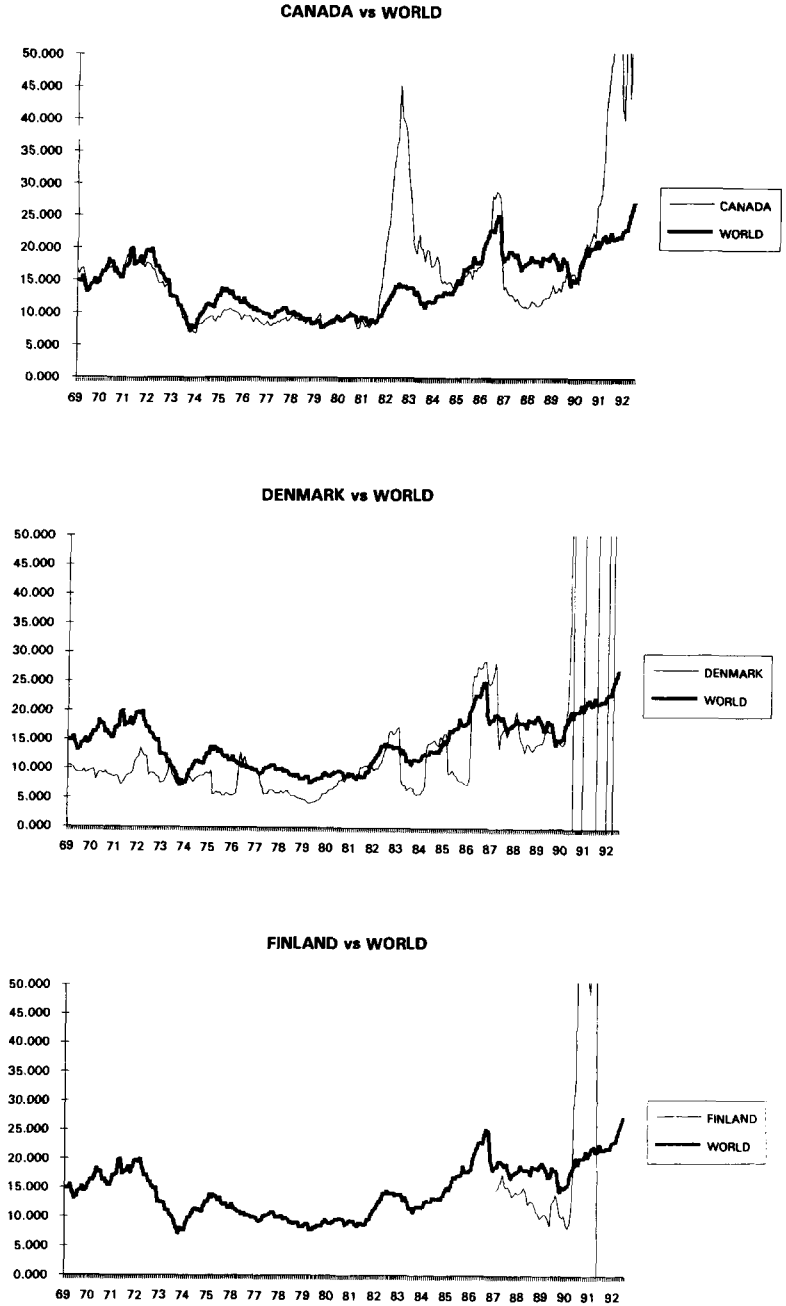


Fig. 2A.1 (continued)

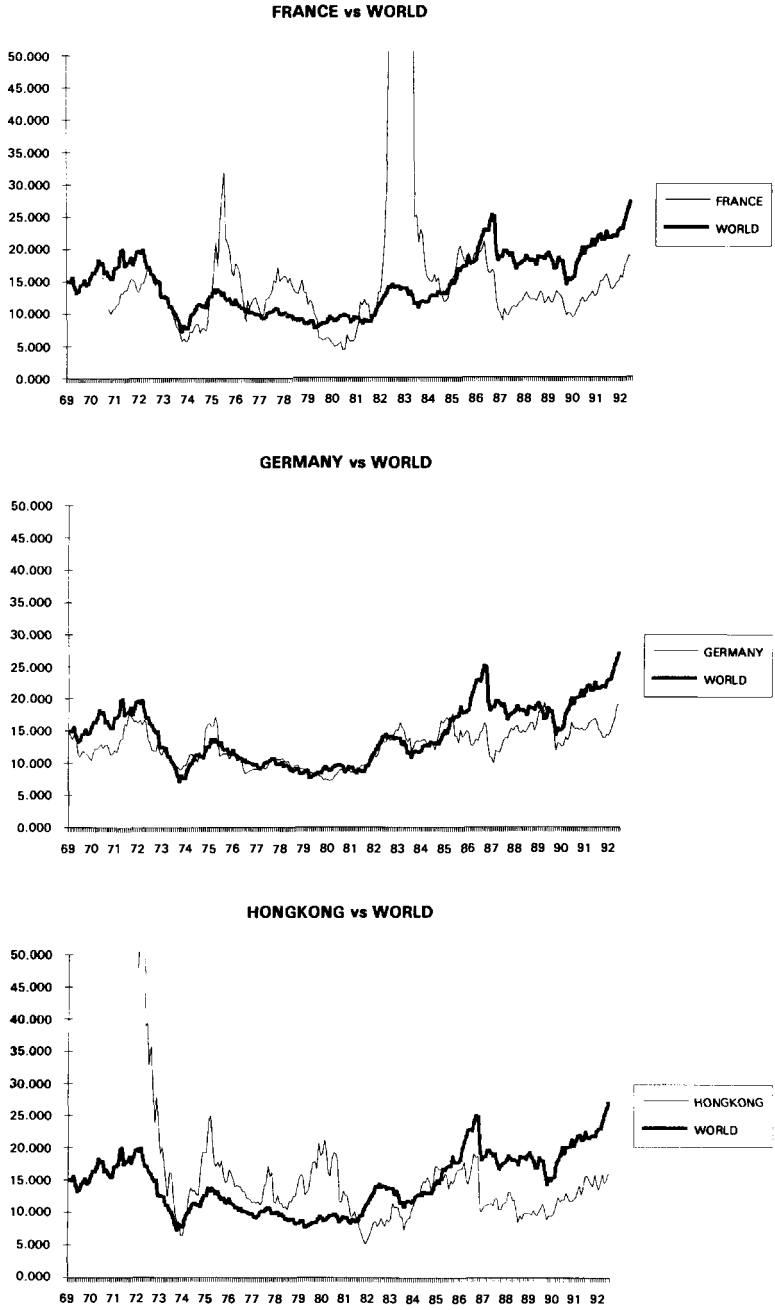
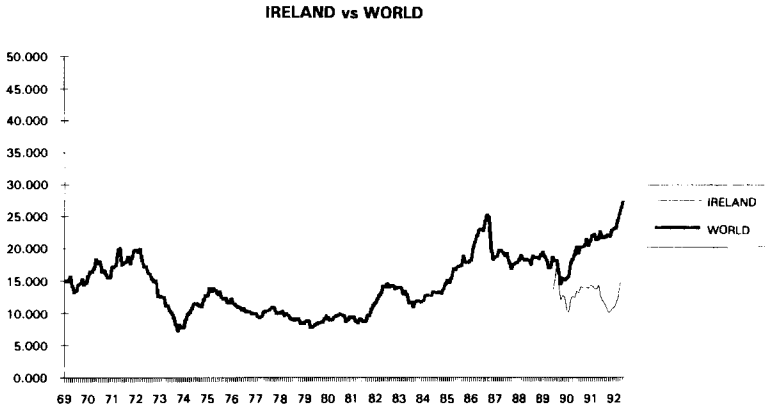
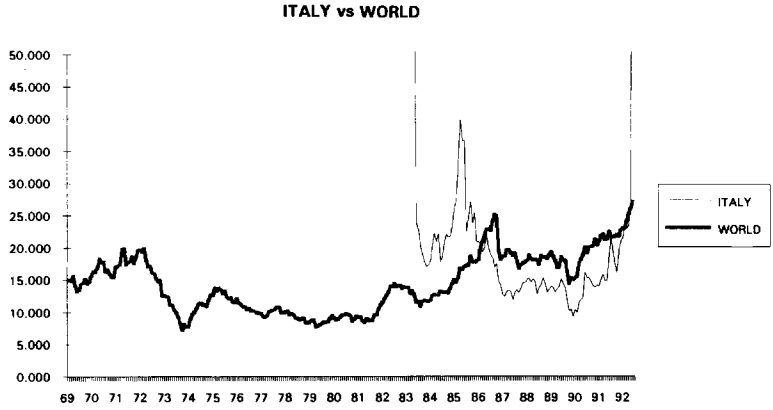
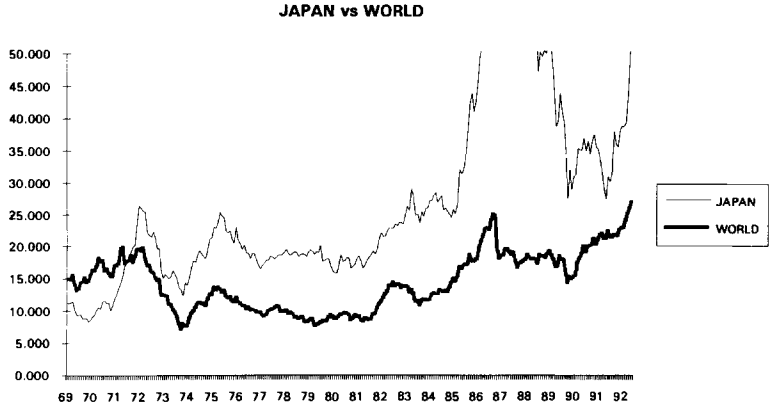


Fig. 2A.1 Price to earnings ratio (continued)







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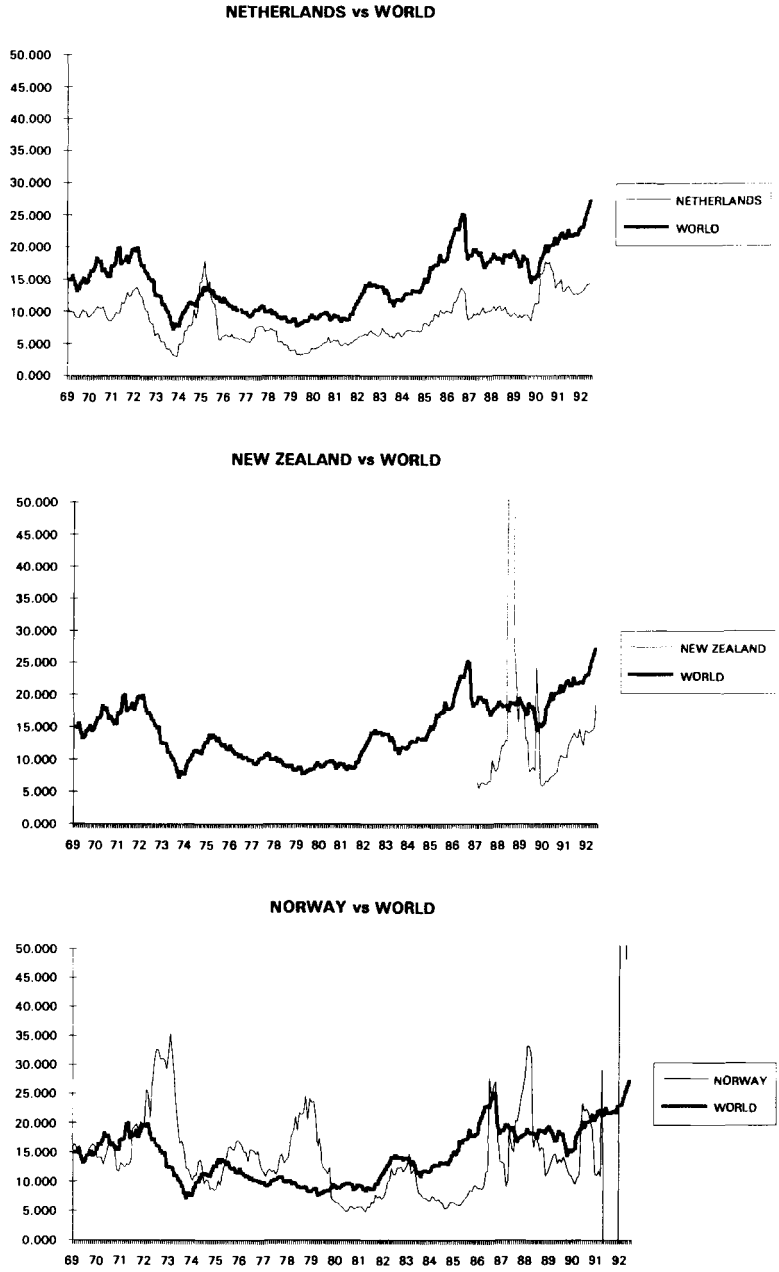


Fig. 2A.1 Price to earnings ratio (continued)

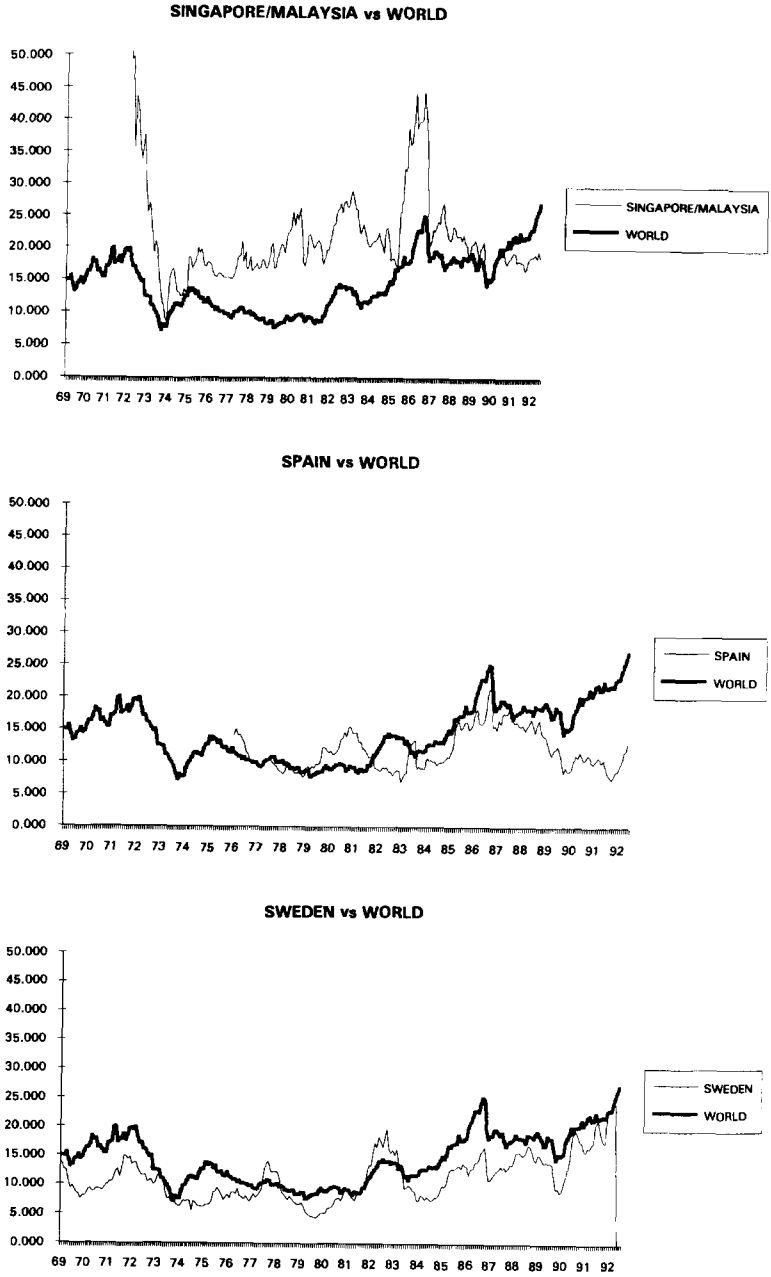


Fig. 2A.1 (continued)

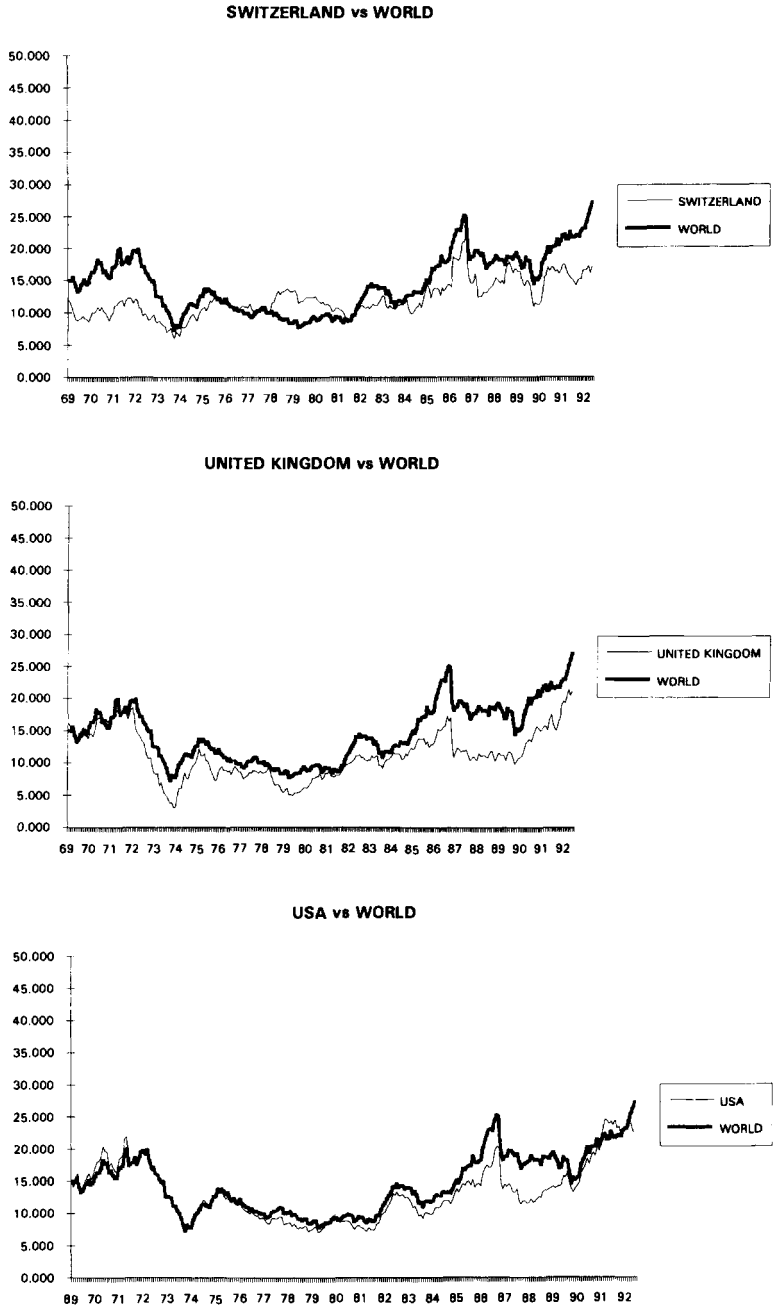


Fig. 2A.1 Price to earnings ratio (continued)

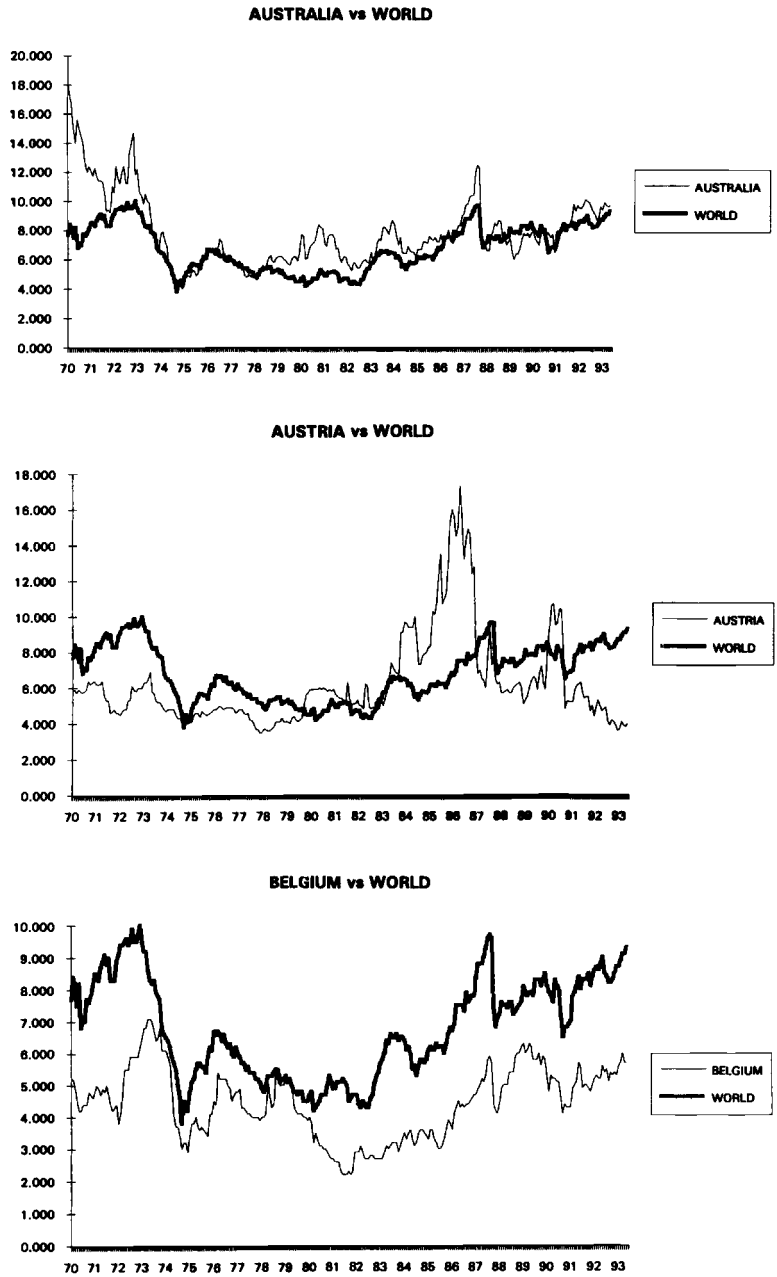


Fig. 2A.2 Price to cash earnings ratios, country versus world
Note: The value-weighted price to cash earnings (earnings plus depreciation) ratios are available over the entire sample except for Canada (December 1974), Finland (January 1988), France (September 1971), Hong Kong (December 1972), Ireland (May 1990), New Zealand (January 1988), Singapore/Malaysia (December 1972), Spain (September 1971), and Switzerland (January 1977).

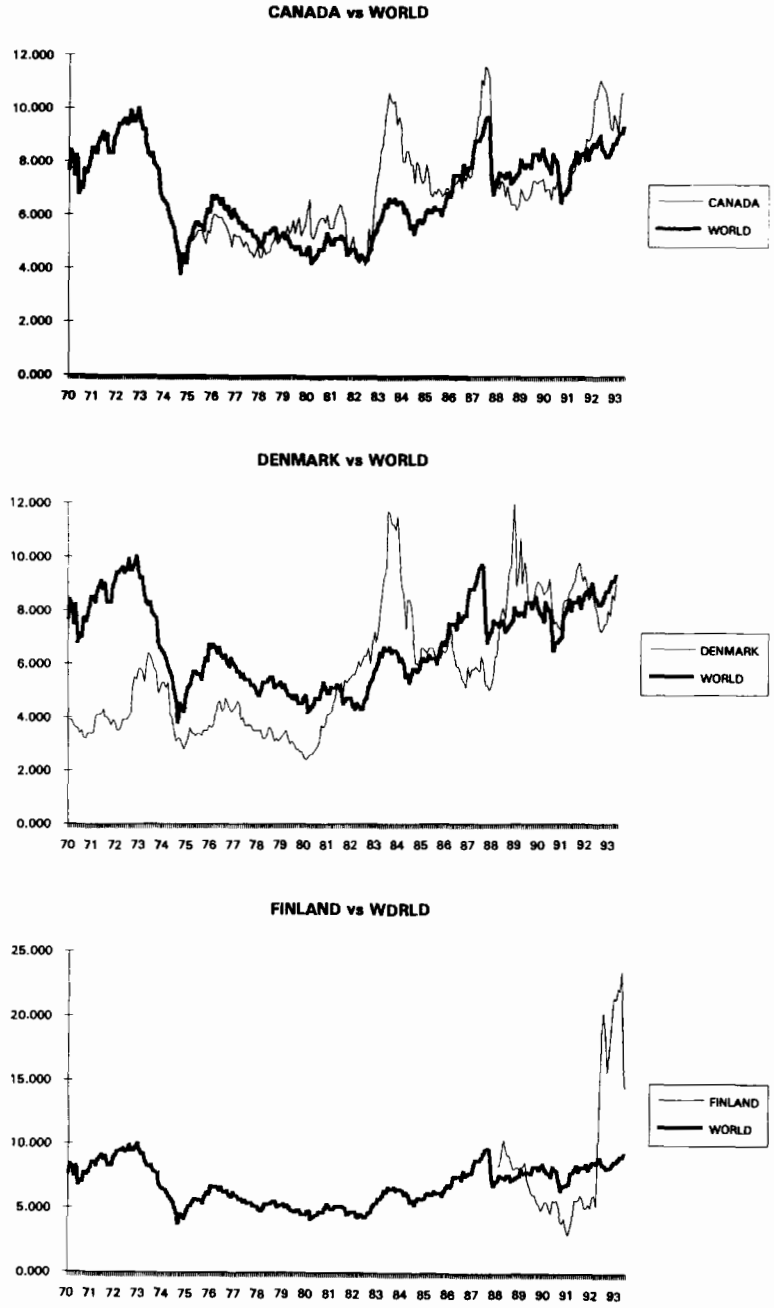


Fig. 2A.2 Price to cash earnings ratios (continued)

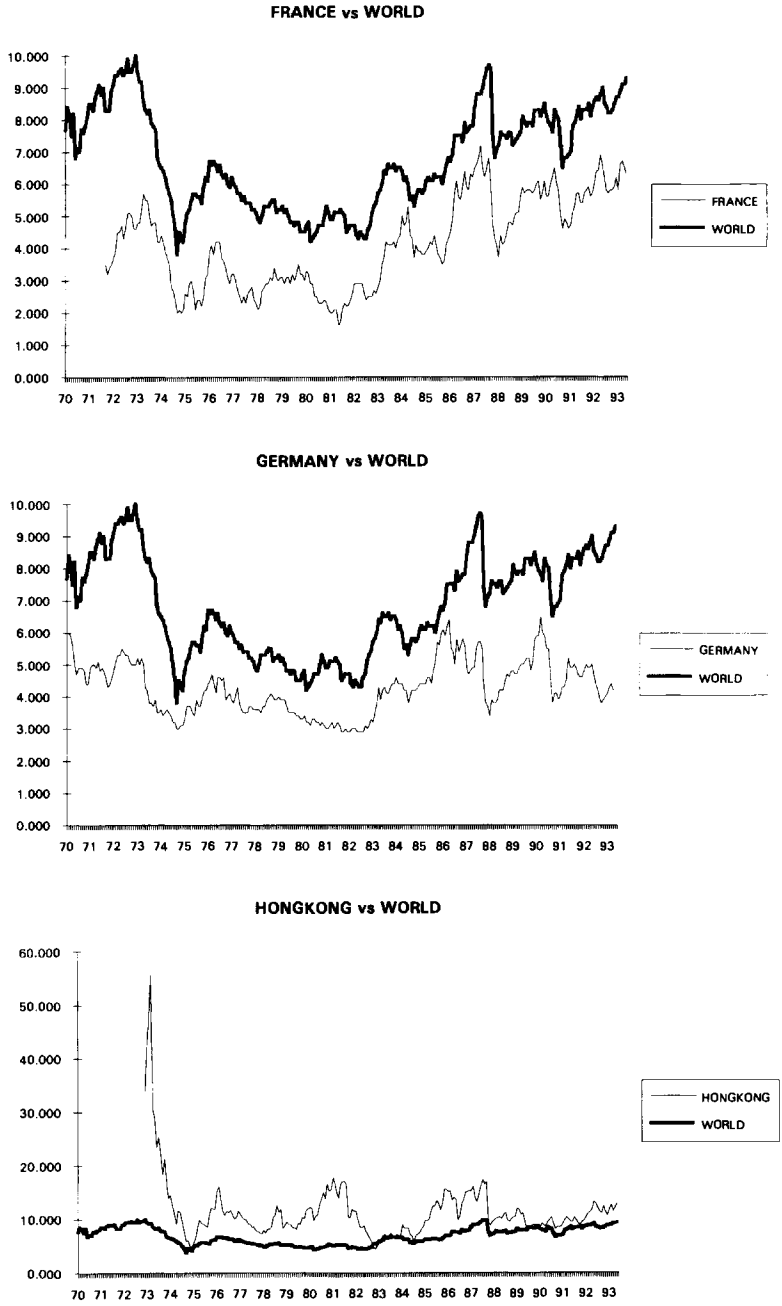


Fig. 2A.2 (continued)

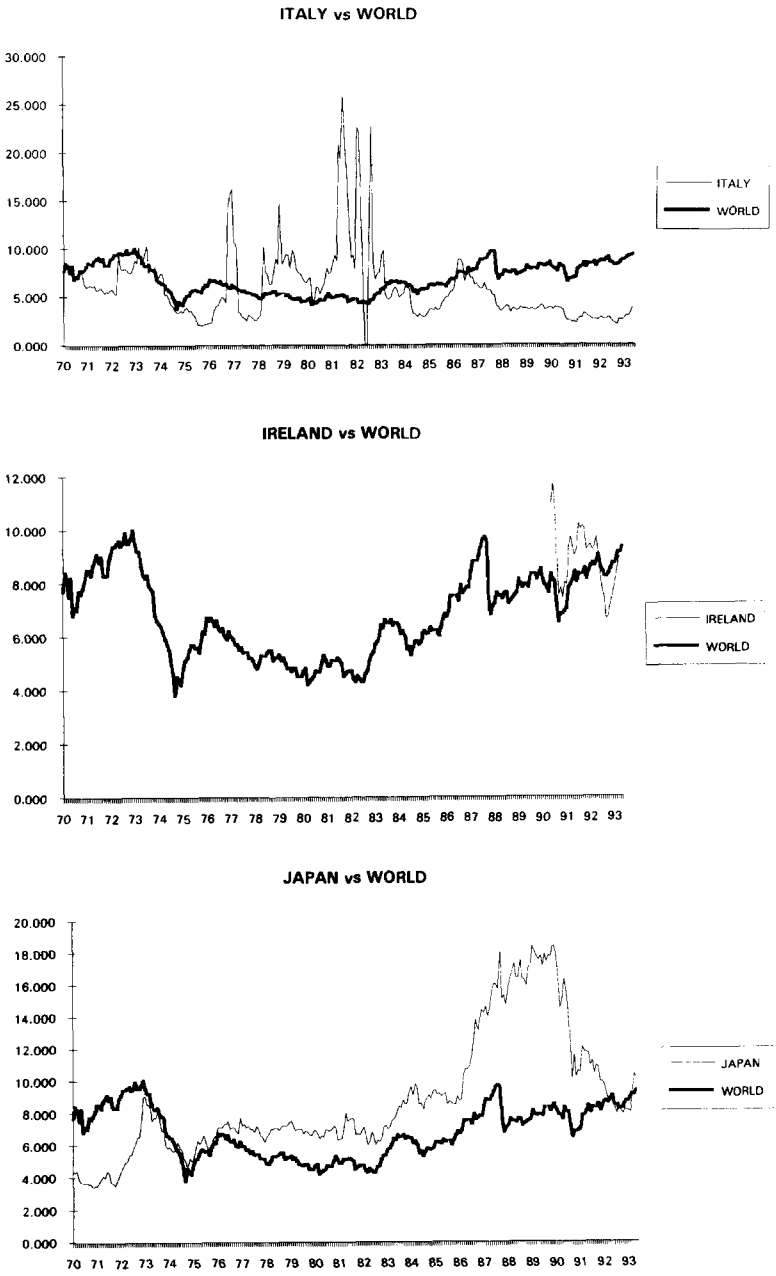
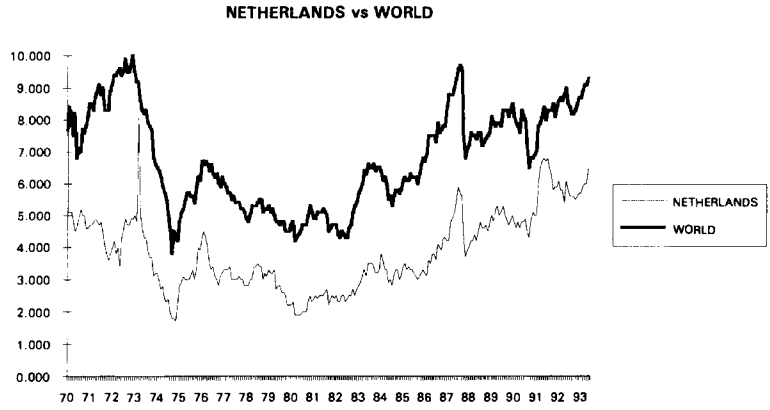
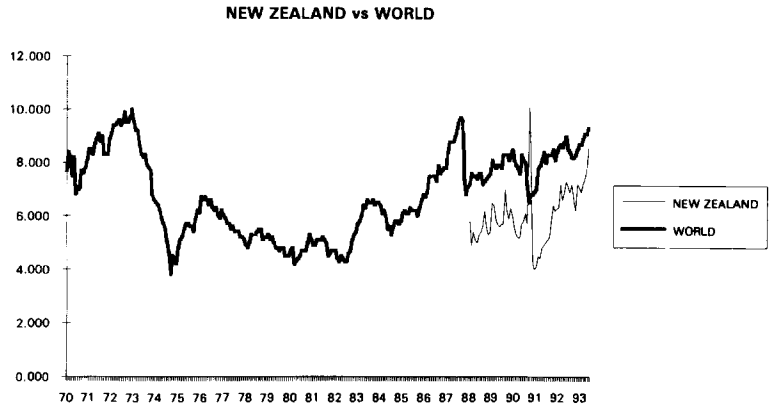


Fig. 2A.2 Price to cash earnings ratios (continued)





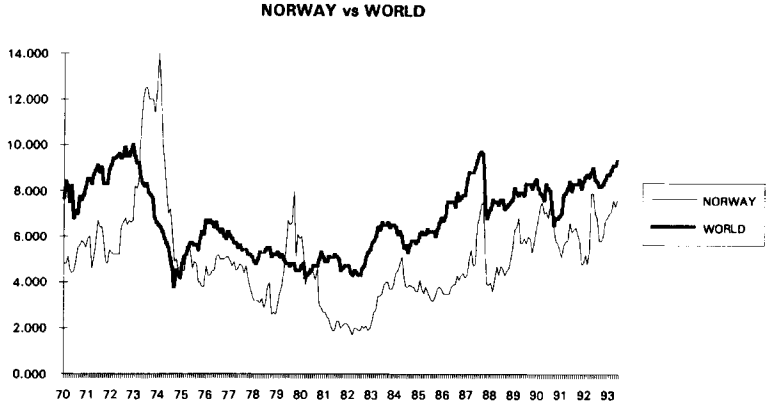


Fig. 2A.2 (continued)

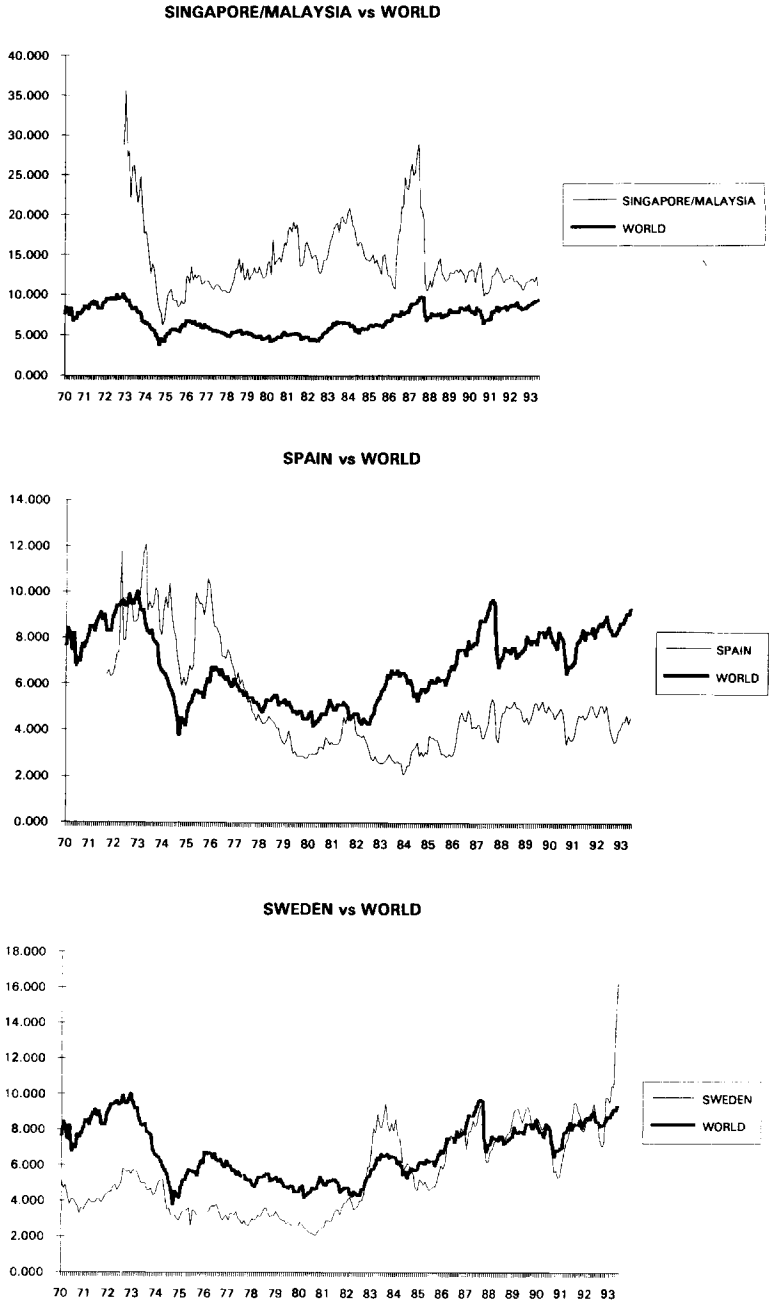


Fig. 2A.2 Price to cash earnings ratios (continued)

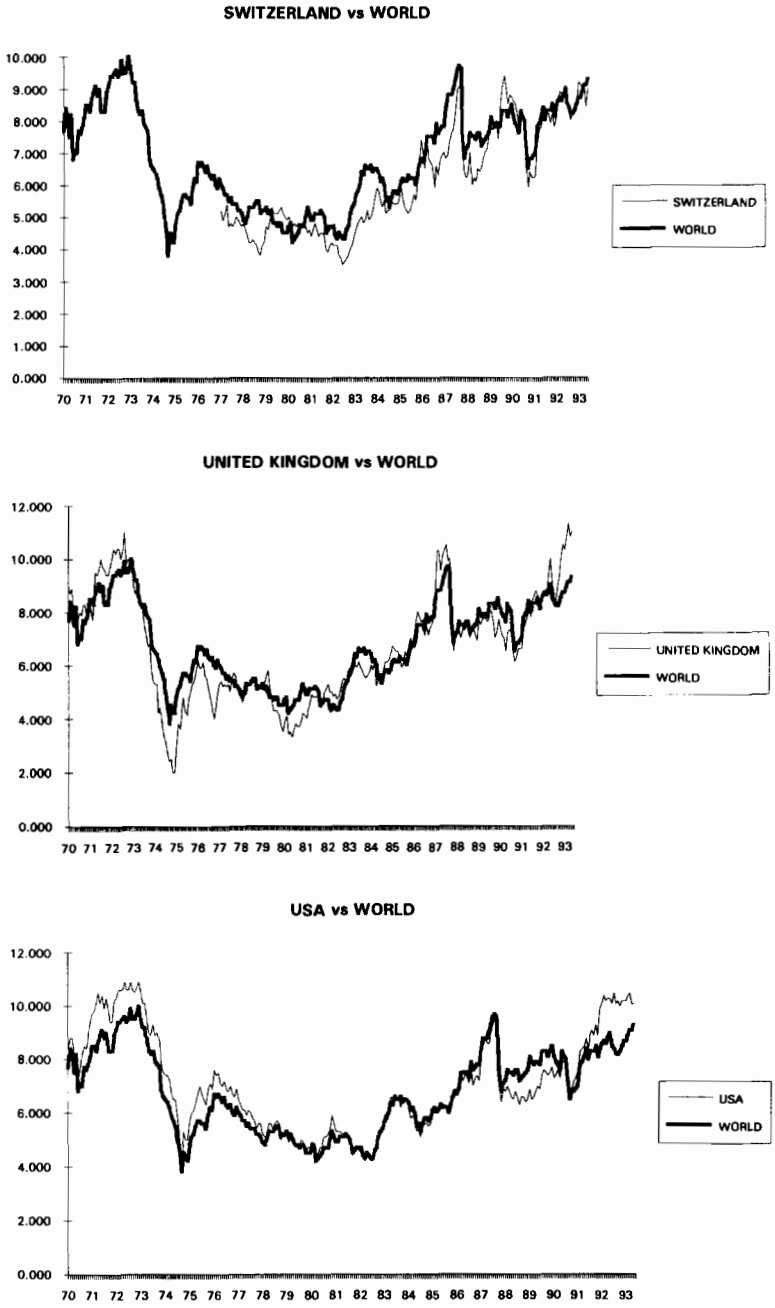


Fig. 2A.2 (continued)

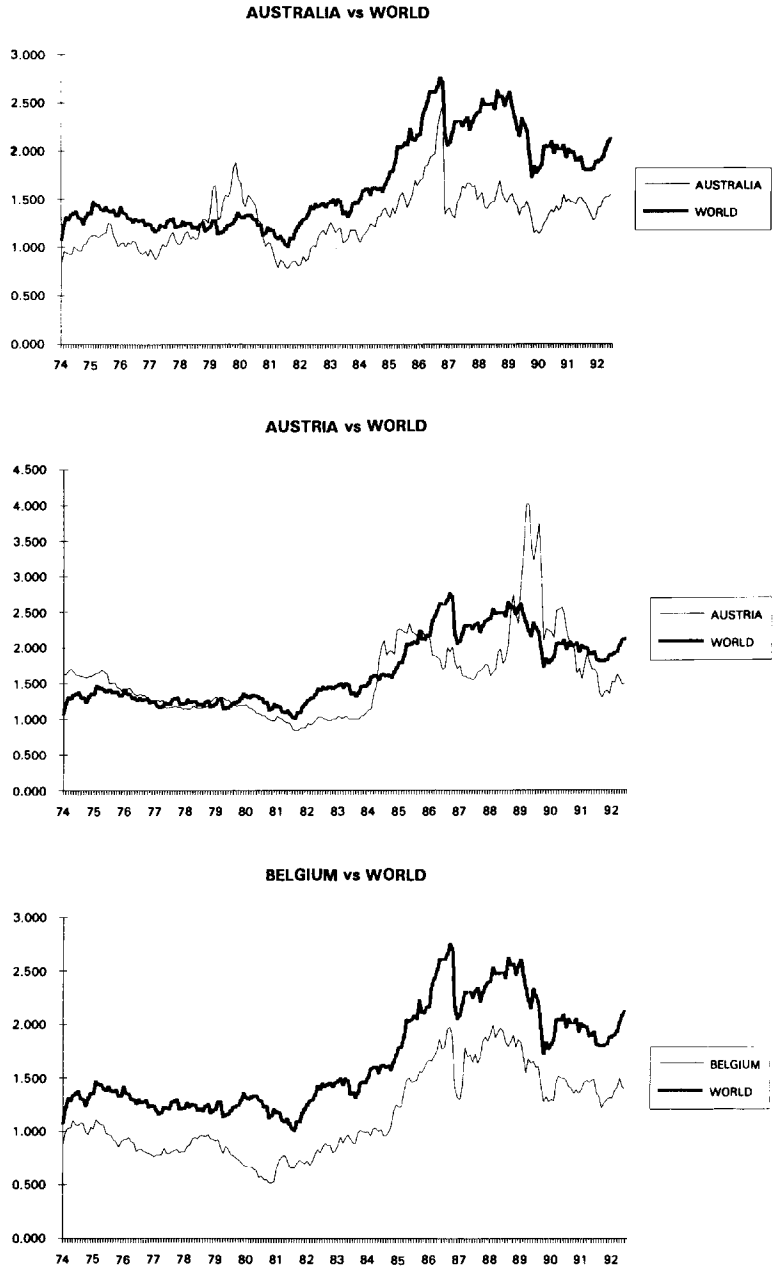


Fig. 2A.3 Price to book value ratios, country versus world
Note: The value-weighted price to book value ratios are available from January 1974 for all countries except Finland and New Zealand (both begin January 1988) and Ireland (May 1990).

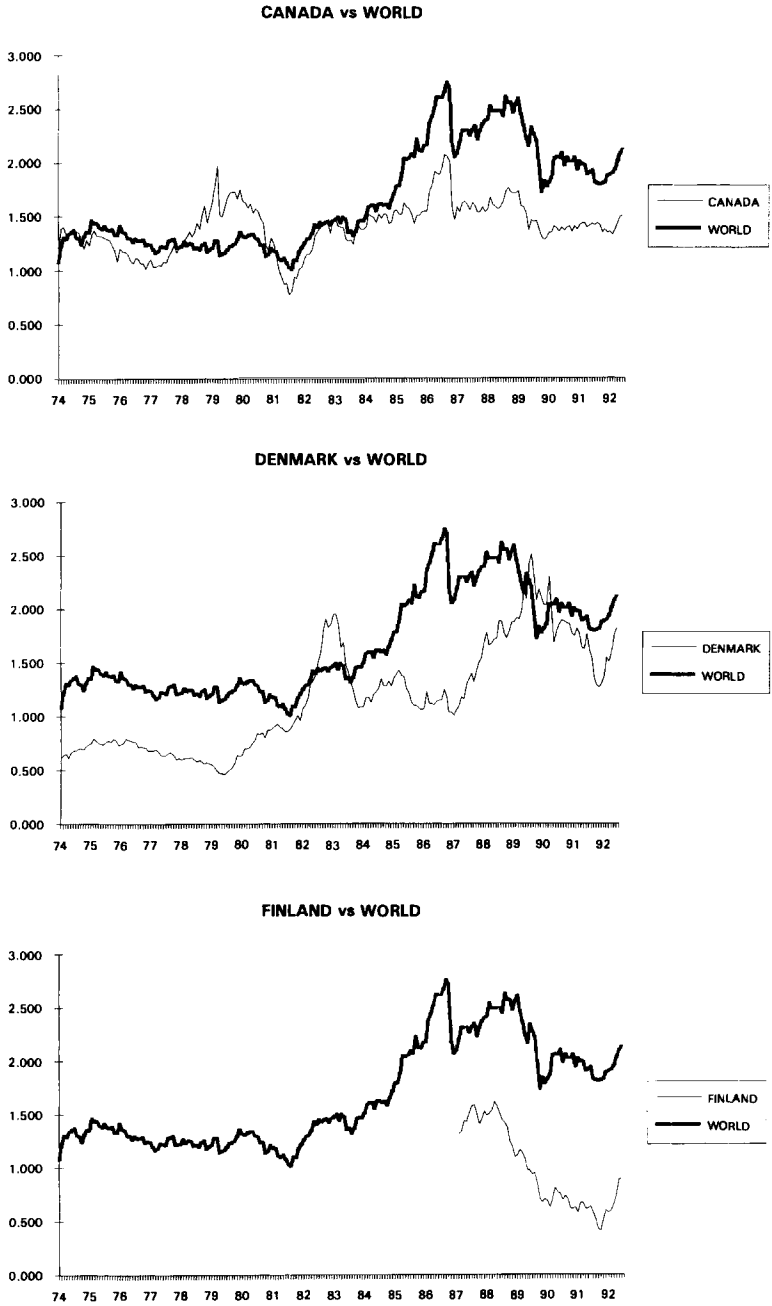


Fig. 2A.3 (continued)

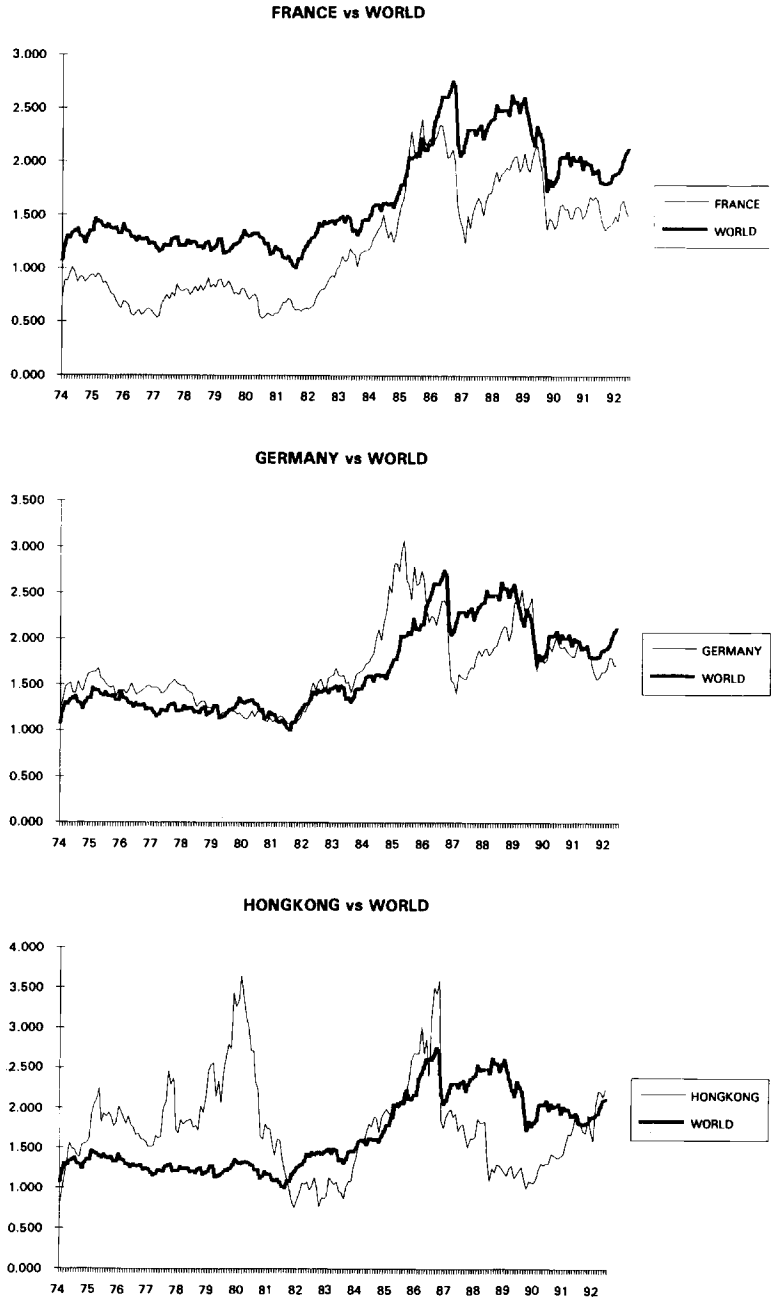


Fig. 2A.3 Price to book value ratios (continued)

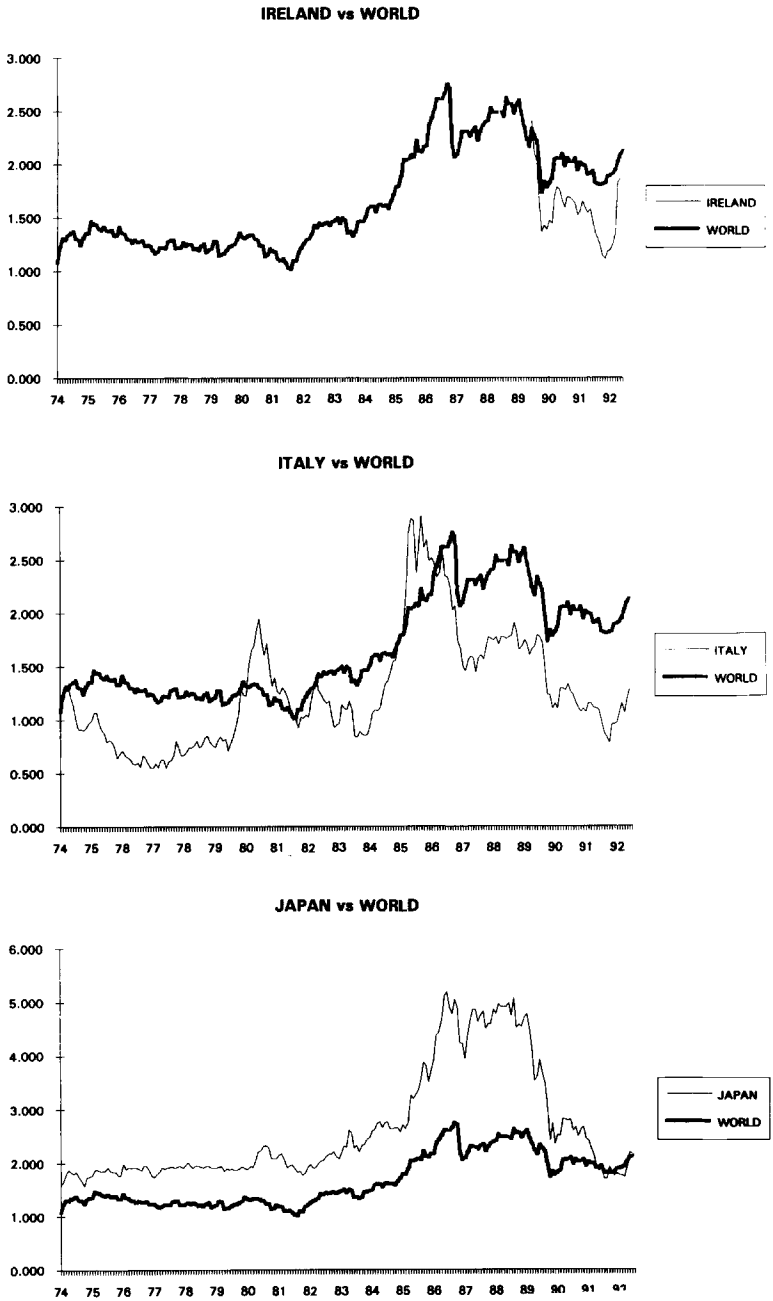


Fig. 2A.3 (continued)

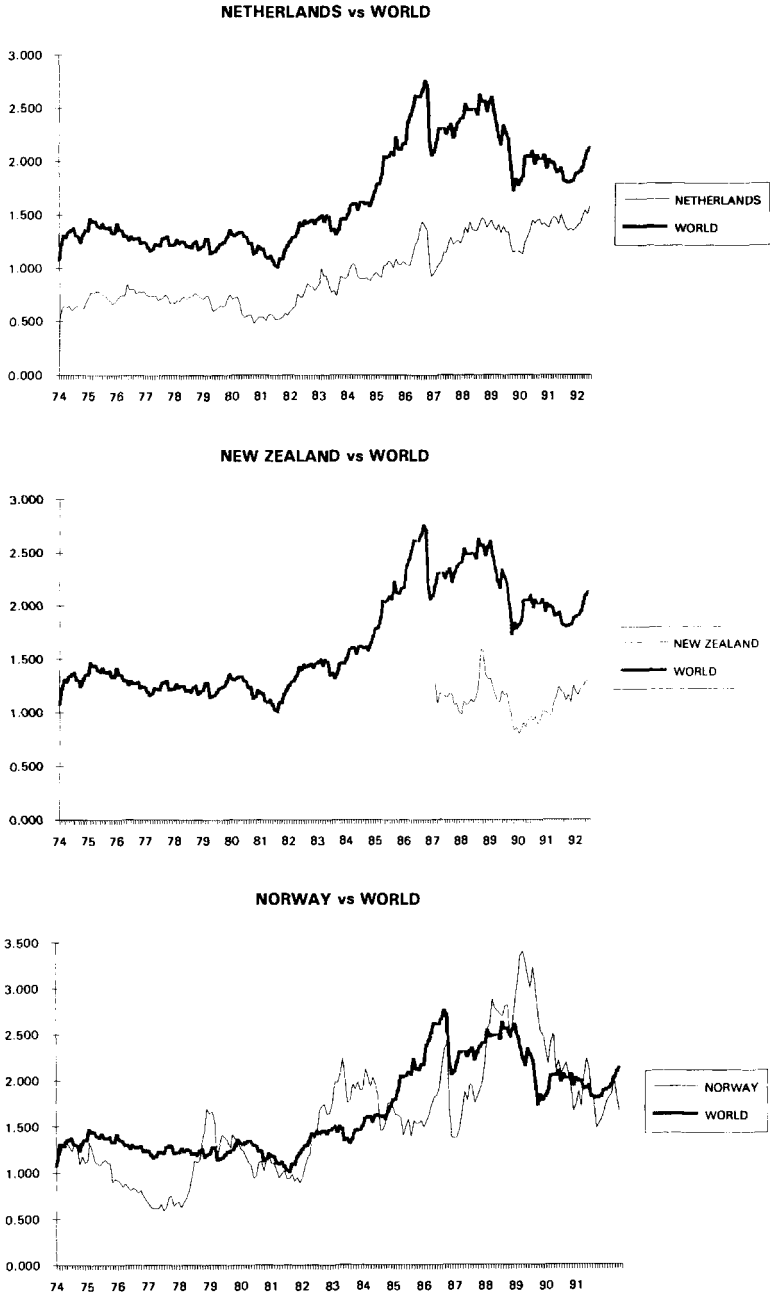
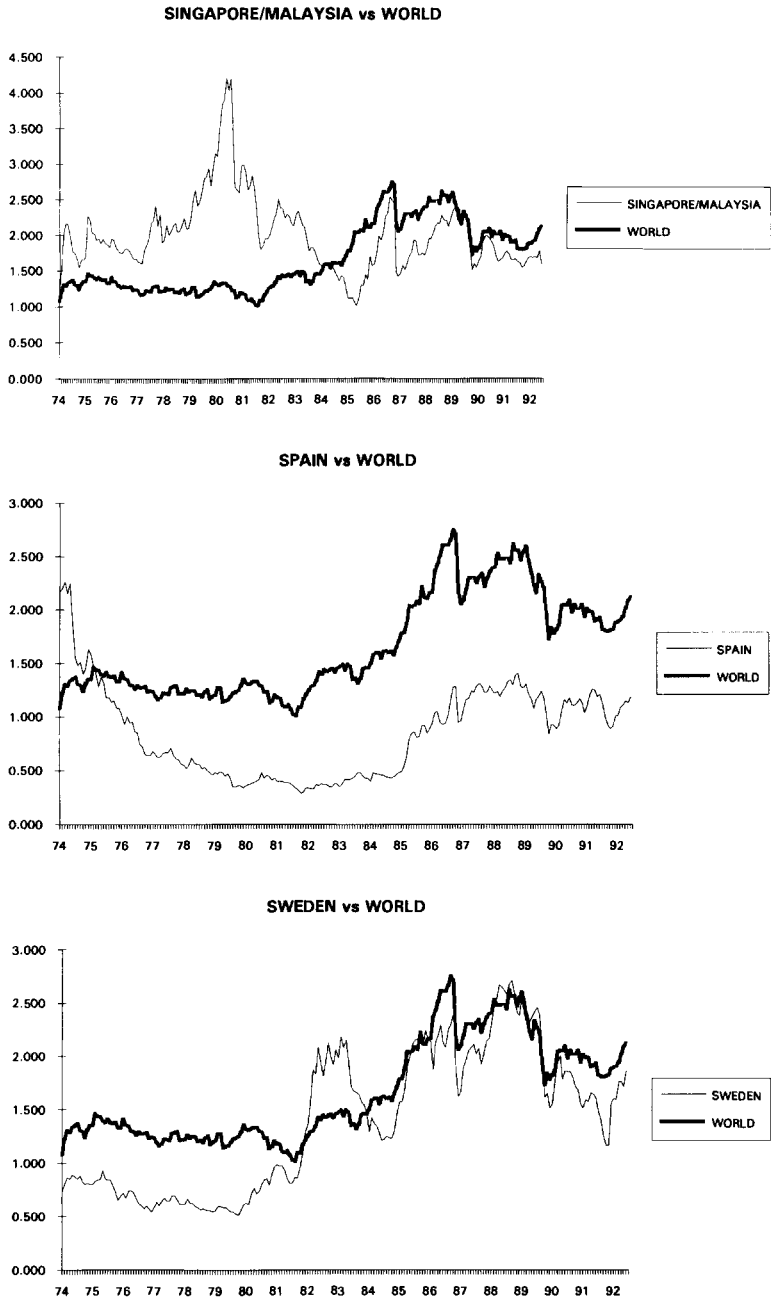


Fig. 2A.3 Price to book value ratios (continued)



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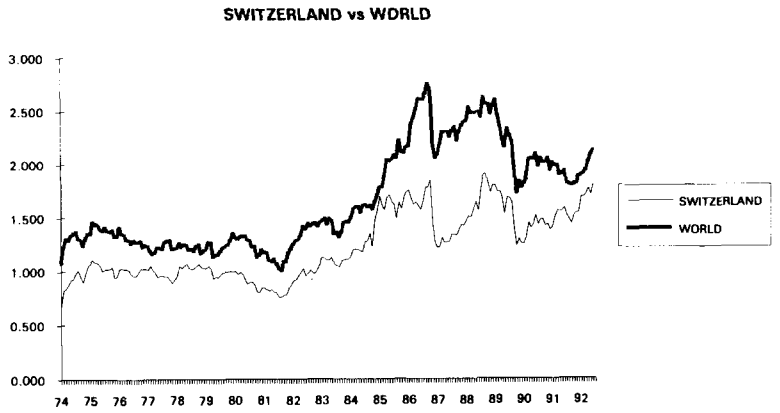
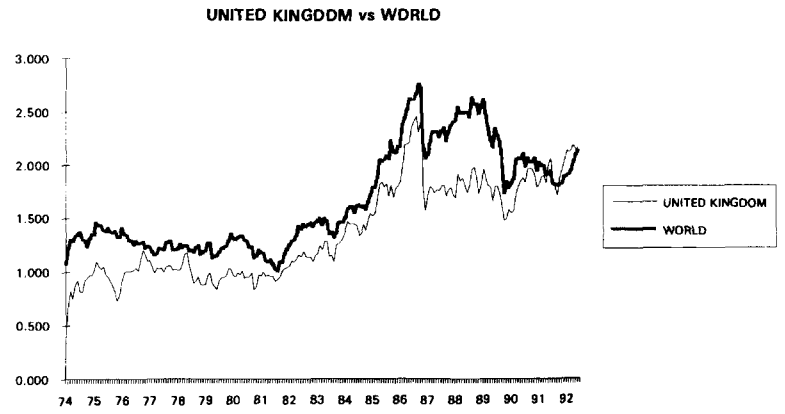




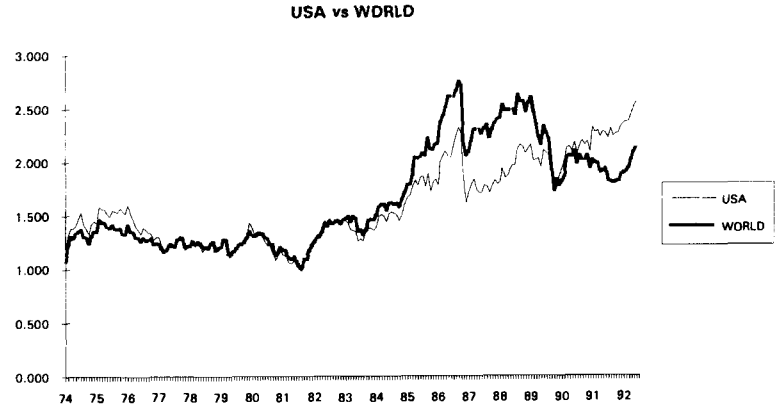


Fig. 2A.3 Price to book value ratios (continued)

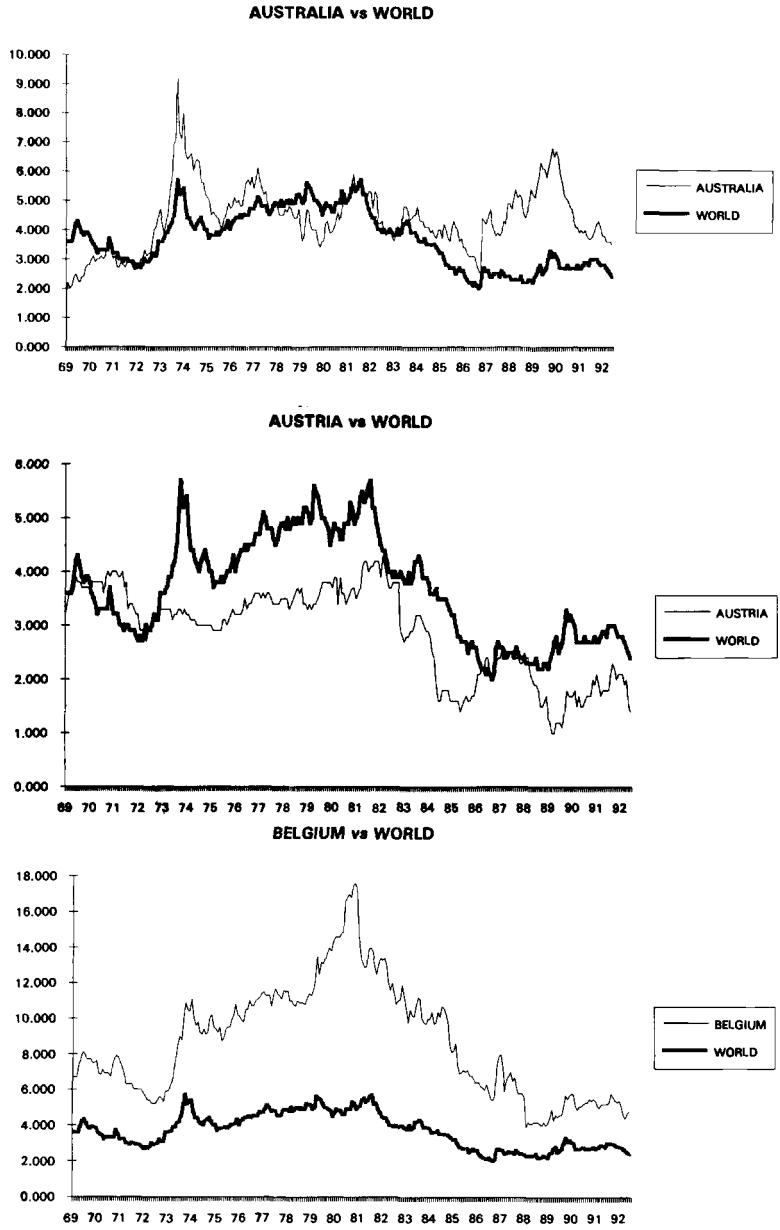


Fig. 2A.4 Dividend to price ratios, country versus world

Note: Dividend yields twelve-month moving sum of dividends divided by the current index level. They are available from January 1970 except for Finland and New Zealand (which both begin January 1988), Hong Kong (January 1973), Ireland (May 1990), and Singapore/ Malaysia (December 1972).

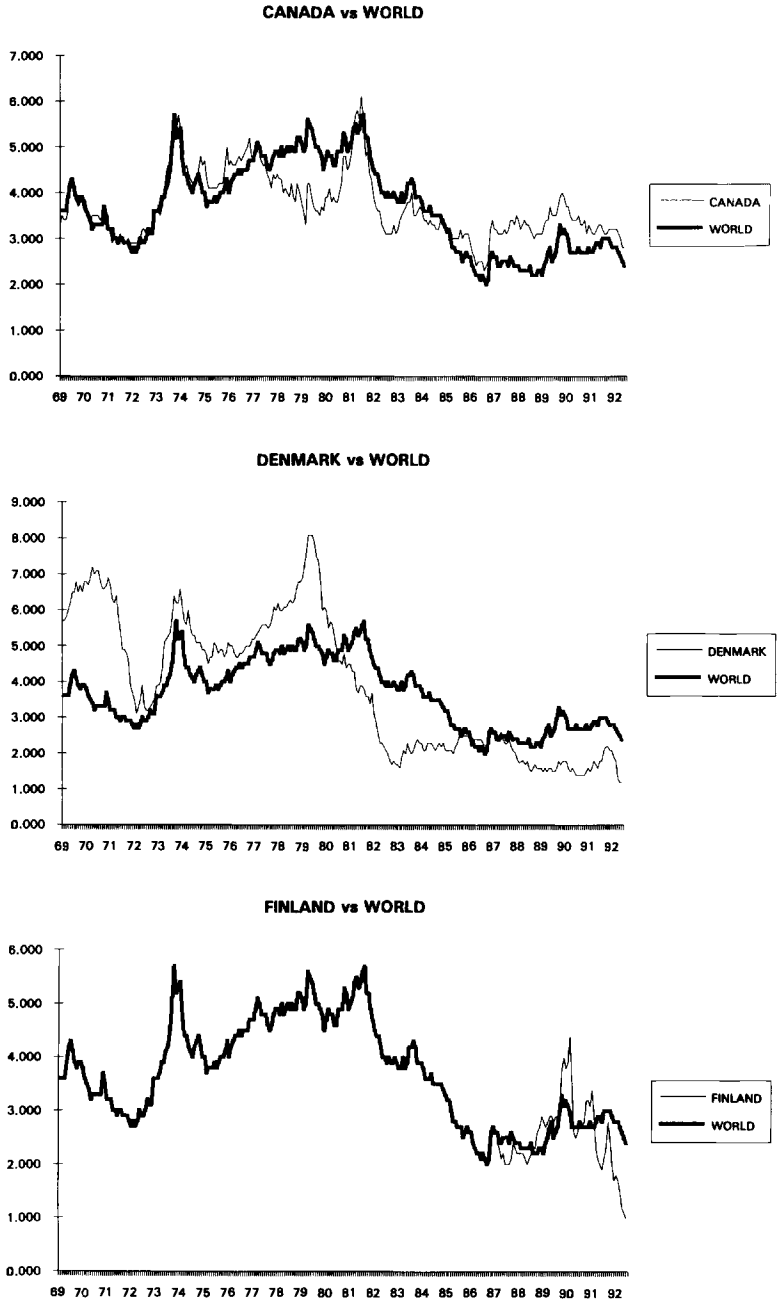


Fig. 2A.4 Dividend to price ratios (continued)

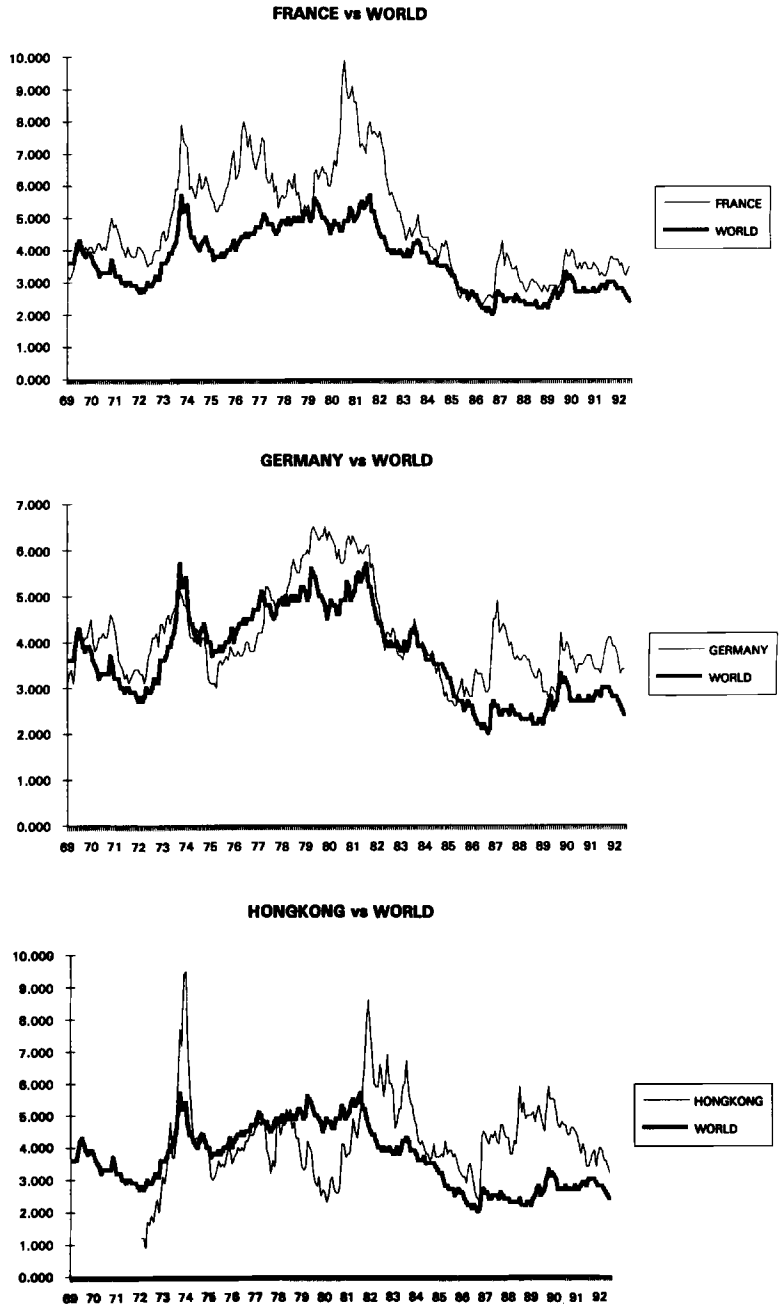


Fig. 2A.4 (continued)

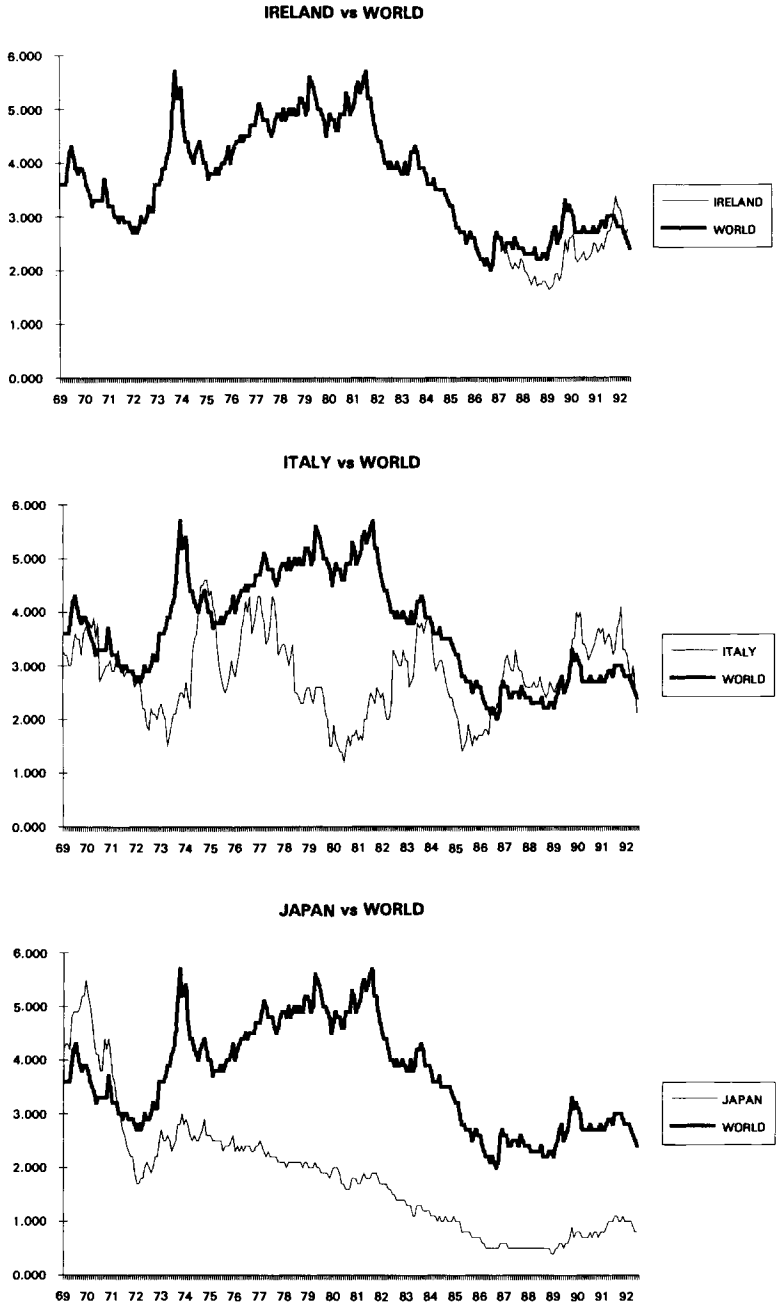
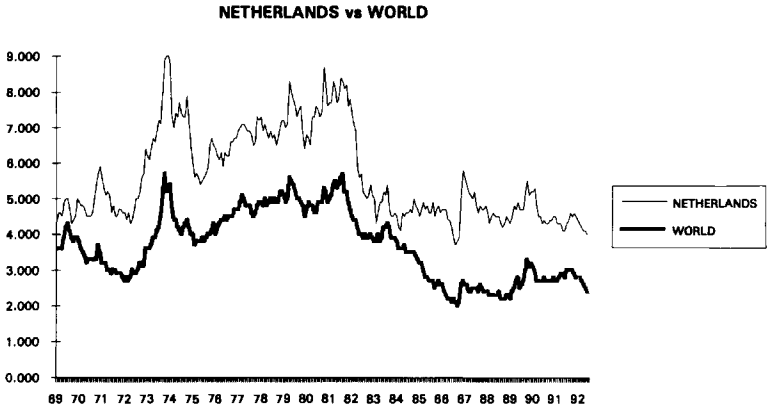
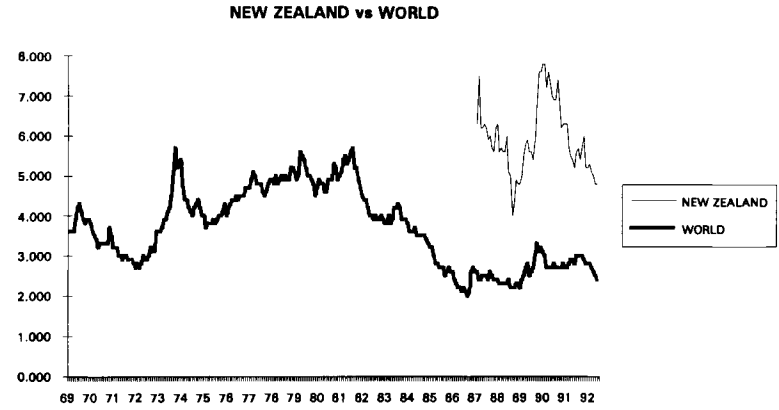


Fig. 2A.4 Dividend to price ratios (continued)





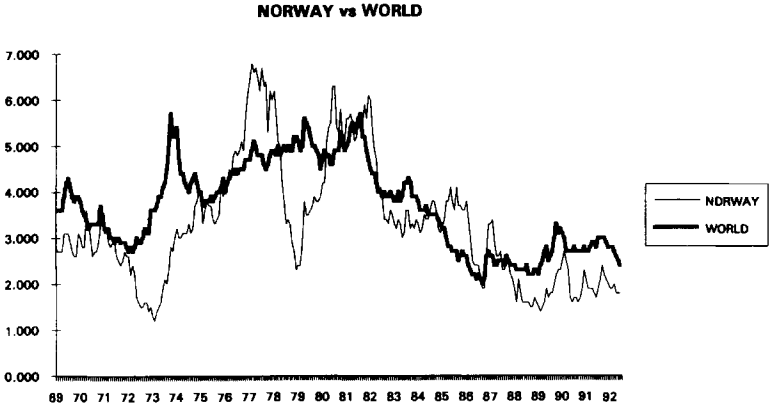


Fig. 2A.4 (continued)

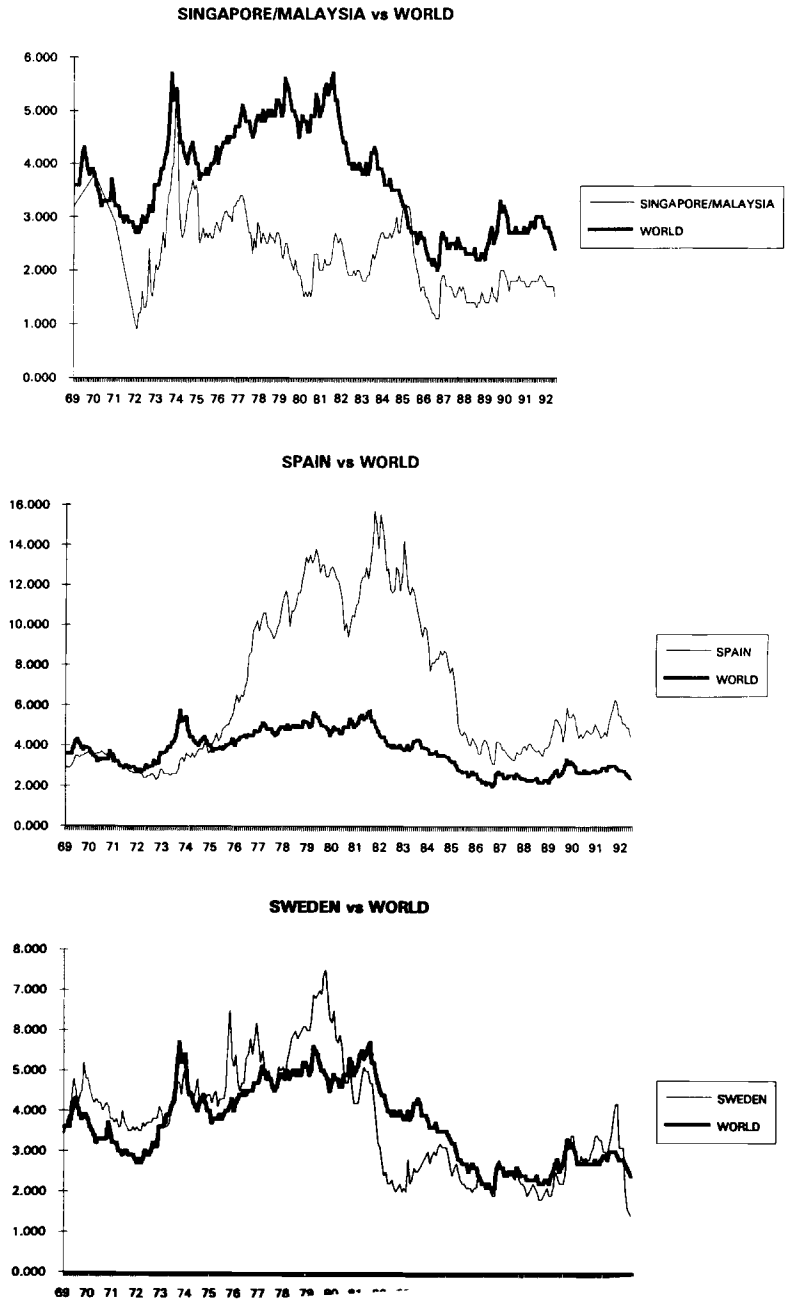


Fig. 2A.4 Dividend to price ratios (continued)

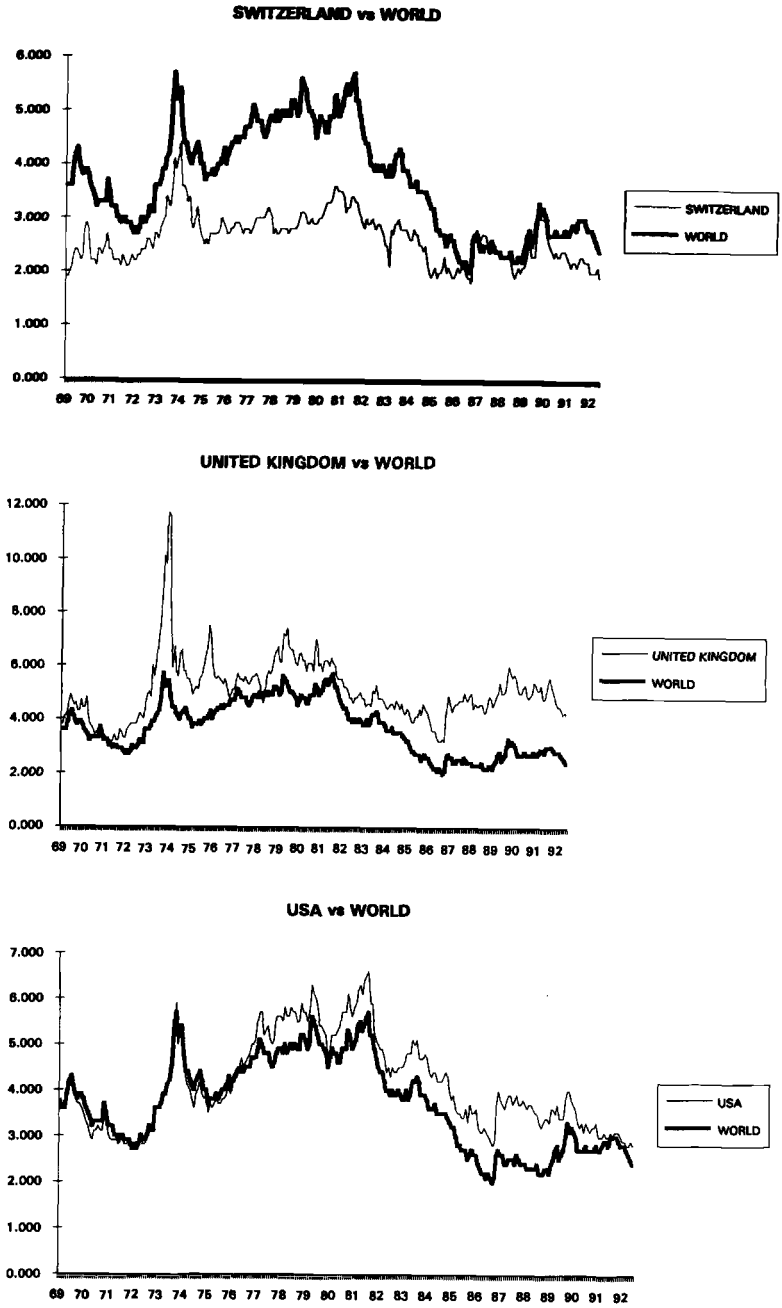


Fig. 2A.4 (continued)

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Comment

Bruce N. Lehmann

To many mainstream financial economists, it is natural to view international finance as providing a different asset menu for an otherwise conventional asset allocation analysis. The Ferson and Harvey paper has this flavor, seeking to interpret comovements in equity returns across countries in terms of the kinds of risk/return models that have proved useful in domestic U.S. equity market studies. This approach is congenial for one (such as I) schooled in conventional asset allocation analysis.

The principal tool used in this paper is the ubiquitous factor model for asset returns. Factor models for any asset menu have three components: sources of risk that impinge on most of the asset menu, variables that reflect the asset risk exposures to these common sources of risk, and return components that are largely specific to a small subset of the asset menu. This decomposition has provided a useful framework for organizing facts about asset return comovements and the structure of expected returns.

Factor model builders follow one of three strategies to get at the heart of these models—the sources of risk and risk exposures. One strategy is to postulate asset attributes that measure risk exposures and implicitly measure the common risk factors. Another approach is to postulate common risk factors and implicitly measure the corresponding asset risk exposures. The third procedure is to implicitly measure both risk factors and asset risk exposures from the covariance structure of asset returns.

The main contributions of this paper are factor models of the first two kinds for national equity index returns. The principal focus is on several country attributes as candidate measures of country risk exposures to global risk factors. Ferson and Harvey also postulate two kinds of global risk factors: a pair of proxies for the variables in the international CAPM and a set of international industry index returns. No new methods are required for this investigation—the principal decisions made by the authors involve the choices of these sets of variables.

There is no natural measure of success in an exploratory model-fitting exercise of this sort. I find it useful to think in terms of two criteria: how well the model fits international equity returns and how much insight the model provides about them. Model fit is determined by the choices of the variables included in the analysis. Accordingly, my main questions involve these choices, particularly with regard to their suitability in an international application. My discussion consists of a brief description of these choices followed by a discussion of their consequences.

Probably the main challenge confronting any risk-based international asset-pricing model is the possibility that actual markets are partially or totally seg-

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mented. This prospect is very real in light of the apparent benefits of global diversification and investors' apparent abstention from exploiting them, the so-called home-country bias problem. Hence, the other focus of my comment is how well the Ferson and Harvey analysis informs us about this question. One might hope for insight into this issue from this exploration.

The Selection of Country Attributes

The principal contribution of this paper is the investigation of several heretofore unused country attributes in international applications. These attributes fall into three categories: valuation ratios, economic performance indicators, and industry exposure measures, all at the country level. I will discuss each of these choices in turn.

Valuation Ratios

As is now commonplace in asset-pricing applications, Ferson and Harvey use financial ratios that have proved useful in studies of cross-sectional variation in expected U.S. equity returns. They use ratios like earnings and dividend yields, the ratio of the market value to the book value of equity, and the ratio of price to cash flow (in place of earnings). The novelty in the present application is that these variables are not *firm* attributes as in most research but rather represent *country* attributes in this application.

Ferson and Harvey use these attributes because they are plausible risk exposure indicators.[1] For example, dividend and earnings yields are plausible indicators of expected returns, particularly for the cash cows (i.e., mature firms with no uncertain growth opportunities) that populate corporate finance textbooks. Replacing earnings with cash flow is reasonable given cross-country differences in the treatment of depreciation.[2] Similarly, the ratio of equity market values to their book values is also a plausible value indicator—if book value equals the market value of firm capital (i.e., historical cost of capital investment equals the market value of capital), this ratio is the expected present value of growth opportunities, another textbook valuation measure. After preliminary data analysis, they settle on dividend yield as the representative of this group.[3]

1. Of course, these variables were "asset pricing anomalies" before they were transformed into "valuation ratios." These security characteristics helped explain expected returns after risk adjustments using the capital asset pricing model (CAPM) or the arbitrage pricing theory (APT) in violation of these theories. The major missing anomaly from the Ferson and Harvey list is size or market capitalization, which appears in the numerator or denominator of each of the valuation ratios.

2. It might be better to use cash-flow yield instead of price/cash flow. It also would be better to measure cash flow (i.e., net income calculated on a realized basis) rather than earnings plus depreciation, since the latter takes no account of cross-country differences in accruals and other accounting practices. Unfortunately, cross-country data on realized net income are hard to come by, although such data are available from several commercial vendors.

3. Ferson and Harvey also informally study the role of the volatility of attributes such as market to book. While they highlight some suggestive regressions, these results are not subjected to the kind of scrutiny afforded those obtained from the other attributes.

It might be useful at this point to reflect on what these variables measure in an international setting. I neither question the risk exposure interpretation of these valuation ratios nor do I dwell on potentially important international differences in accounting measurement. Rather, I wonder about cross-country differences in dividend setting and earnings retention practices.

For example, consider the role of dividend policy in the agency cost models of Rozeff (1982) and Easterbrook (1984). In these models, dividend payments are a device forcing the production of information about the firm. The basic idea is that the payment of regular cash dividends requires firms to obtain more frequent debt and equity funding in the capital markets. The concomitant scrutiny by lending institutions, investment banks, and potential outside investors constitutes information production that might help reduce agency costs.

There are substantial cross-country differences in the capital market mechanisms designed to cope with these agency problems. For example, dividend payouts in Japan are quite low by world standards. Japanese institutional arrangements provide for other means of reducing agency costs within corporate cross-ownership structures like *keiretsu,* particularly in the form of monitoring by trust and long-term banks. By contrast, agency problems in Spain may be more severe than in Japan because of the absence of such institutional arrangements, perhaps accounting for Spain's relatively high dividend yield.

Problems of this sort potentially infect all of these valuation ratios. In the absence of new equity issues or asset write-downs, dividends, earnings, and book values are all related by the arithmetic accounting relation:

$$\text{Change in Book Value} = \text{Earnings} - \text{Dividend Payments}$$

Similarly, there are international differences in the time scale of these numbers—countries may have quarterly, semiannual, or annual payment and information release patterns. There might be some payoff to thinking about minutiae of this sort in order to more precisely measure putative country risk exposures.

It might also be advisable to distinguish the international and domestic components of earnings and cash flows to shed more light on the segmentation/integration question. While it might be hard to differentiate the domestic content of revenues and costs (i.e., the sale of traded and nontraded goods produced with traded and nontraded factors of production), it would certainly be desirable to move as far in this direction as possible. Dividing expected returns indicators like earnings yield into traded and nontraded components would certainly facilitate more powerful and economically interesting tests of the extent to which country cash flows are priced internationally or in segmented domestic markets.

National Economic Performance Measures

It is also now commonplace to use both macroeconomic variables and asset prices from other markets like bond and foreign exchange markets as risk factors in domestic asset pricing applications. Ferson and Harvey use a conven-

tional variable set: the GDP growth rates, inflation rates, and long-term bond yields and yield spreads.[4]

However, Ferson and Harvey use these variables in an unusual and novel way. In most asset-pricing applications, such variables measure time-series risk factors. In contrast, Ferson and Harvey assume that the magnitudes of the macroeconomic variables relative to world values measure country risk exposures to world macroeconomic risk factors. Similarly, they take domestic bond yields and yield spreads to measure country exposure to long-run world growth risks. After preliminary data analysis, they settle on relative GDP growth and the long-term bond yield as representatives of this group.

It is hard to think about these economic performance indicators as measures of country risk exposure. There is a natural analogy between the relative GDP measure and the kind of industry analysis found, for example, in the commercial BARRA multifactor model (see Rosenberg 1974 and Rosenberg and Marathe 1979) and in unpublished work by Kale, Hakansson, and Platt (1991). Industry models of this sort measure the exposure to industry risk by the fraction of firm revenues from a given industry segment and implicitly measure industry risk factors from cross-sectional return regressions. This useful analogy suggests that we might think of relative GDP as measuring the fraction of world income from a given country "segment," measuring exposure to world income risk.[5]

The question of whether these variables measure risk factors or exposure to risk factors is really a restatement of the segmentation/integration question. Perhaps relative GDP and domestic bond yields do measure country risk exposure to global risk factors but surely a reasonable alternative hypothesis is that these variables measure domestic risk factors that are "priced" in (perhaps segmented) domestic equity markets. One might hope for sharper insights into this question from this investigation.[6]

Country Industry Exposure Measures

The final country attributes considered by Ferson and Harvey are country industry exposures. They measure these attributes by linear regression using data on the thirty-eight Morgan Stanley Capital International (MSCI) world industry portfolios as risk factors. For reasons of parsimony, they aggregate these portfolios into four groups: natural resources; construction and manufacturing; transportation, communication, utilities, and energy; and services in-

4. One can imagine other choices, such as relative real or nominal exchange rates or real wage differentials.

5. The interpretation of the long-term bond yield in this fashion is a bit more strained. Ferson and Harvey think of long-term yields as capturing real return differentials arising from different growth risks. However, a reasonable implication of the notion is that bond yield differentials should satisfy some asset-pricing model if capital markets are integrated. It would then be natural to ask whether yields would be plausible national equity risk exposures in such a model.

6. For example, Ferson and Harvey could apply the formal tests of integration and segmentation discussed in Jorion and Schwartz (1986) and Wheatley (1988).

cluding financial services. They then regress the national equity index returns on these four aggregated world industry portfolio returns, and the estimated time-series regression coefficients constitute the country industry exposures.

It has certainly become interesting to examine industry returns in an international setting in light of the results of Roll (1992) and Heston and Rouwenhorst (1993). Accordingly, it is not surprising that Ferson and Harvey sought to examine industry components in this paper. Nevertheless, their industry analysis is really out of character with the remainder of the paper. The other country attributes vary over time and, in some specifications, risk factor exposures are modeled as varying over time with these attributes. Country industry exposures that are time invariant regression coefficients are just in a different league from the other dynamic characteristics and it is probably better to wait for better and more appropriate data in order to investigate these issues.[7]

The Global Risk Factors

Ferson and Harvey make conventional choices in this domain. The two main global risk factors are commonly used in empirical work: the MSCI world index and the trade-weighted G10 currency return. These factors naturally arise from a loose reading of the international CAPM literature, particularly the well-known equation (14) of Adler and Dumas (1983).[8] There is a secondary set of world factors employed in some of the specifications: the world oil return along with OECD inflation and production growth.

There is little to note about these choices save for the recapitulation of the puzzles that arise when one thinks about an international CAPM along these lines. There are easy and hard empirical challenges confronting such a model. The easy ones involve cross-country variation in mean returns—sample mean country index returns are imprecisely measured and generally cluster around four values (0, 12, 16, and 20 percent). Accordingly, it is typically not hard for a one- or two-dimensional model to fit these features of the data.

By contrast, the other challenge is the poor fit of the one-, two-, and five-factor models. The time-series R^2s are small and the incremental time-series R^2 after the MSCI index is negligible for most countries. These numbers are much smaller than those for U.S. sector portfolios and on the order of the time-series R^2s for individual securities in U.S. asset-pricing applications. This is just another way of stating the "home-country bias" question: why don't investors systematically eliminate this measured residual country risk through diversification? It remains difficult to imagine how rational world risk premiums can account for this puzzle in the context of the international CAPM.

7. Once again, see Rosenberg (1974), Rosenberg and Marathe (1979), and Kale, Hakansson, and Platt (1991) for a possible formulation.

8. The phrase "loose reading" merely constitutes an application of the well-known Roll (1977) critique to the MSCI index and the observation that the international CAPM requires a separate exchange rate hedging term for each country of origin. Ferson and Harvey note both points.

Dynamic Asset Allocation Implications of the Factor Models

Ferson and Harvey presume that country index returns follow a factor model. Standard factor models for security returns take the form

$$R_{it+1} = a_{it+1} + \sum_{k=1}^{K} b_{ikt+1} R_{kt+1} + \varepsilon_{it+1}; \; E\{\varepsilon_{it+1}|R_{kt+1}\} = 0,$$

where R_{it+1} is the percentage return of security i in period $t + 1$, a_{it+1} is the unsystematic portion of the expected return of security i as of time t, b_{ikt+1} security i's exposure to the k^{th} common factor as of time t, R_{kt+1} is the percentage return of the mimicking portfolio for the k^{th} common factor (i.e., the portfolio that perfectly tracks the k^{th} common factor during time period $t + 1$), and ε_{it+1} is security i's residual return. In international CAPM applications where i represents country indices, these residuals are only weakly correlated, yet another restatement of the home-country-bias puzzle.

If one thinks of these models as tools for international asset allocation, it is worth discussing how one would produce portfolios based on the country attributes in actual practice. These portfolios have returns that implicitly measure the common risk factors associated with the country attributes. The weights of these mimicking portfolios are chosen to give the portfolios unit exposure to the factor being tracked, to give zero exposure to the others, and to satisfy some (usually minimum variance) optimality criterion. In principle, portfolios with these qualities track the appropriate risk factors with negligible error.

Several of the factor loadings exhibit substantial short-run volatility due to their dependence on national equity values and bond yields. Accordingly, mimicking portfolios for these risk exposure measures have weights that vary substantially over time, requiring frequent rebalancing. Asset allocation models with these kinds of factor loading dynamics implicitly require very active portfolio strategies. That is, these factor models are, in part, "tactical" models for country timing.[9]

Some Concluding Observations

This paper answers some questions and suggests others. On the positive side, Ferson and Harvey document several potential uses of different country attributes in global asset allocation models. Two kinds of country attributes—national valuation ratios and economic performance measures—yield some marginally significant risk premiums when treated as factor loadings and are sometimes significant at conventional levels when used as explanatory variables for conditional betas on the MSCI world index and the trade-weighted G10 currency return. On the negative side, the measured correlations and risk premiums are often small, suggesting that even "statistically significant" results may not represent economically important ones.

9. This issue is also discussed in Hardy (1990).

This international evidence stands in sharp contrast to the domestic U.S. asset-pricing evidence that motivated the selection of variables to a considerable extent. Cross-firm differences in earnings and dividend yield, market capitalization, and market/book ratios play both economically and statistically important roles in accounting for both unconditional expected returns and return predictability in U.S. data. Similarly, time-series variation in long-term yields, yield spreads, and industrial production growth play an important part in domestic macrofactor models. Just as international asset-pricing models fit poorly compared with their domestic counterparts, so these models based on country attributes fare worse than the domestic models on which they were based.

How should one measure success in this kind of exercise, particularly since the observations made above seem somewhat subjective? One way is to nest this integrated international asset-pricing model into one with segmented domestic components. Appropriate tests can be based on the hypothesized homogeneity of risk premiums across countries. Such tests seem to be a sensible way to organize international equity return data to provide insight into some of the key questions in international asset pricing.[10] I venture to guess that the home-country-bias problem will deepen as a result of such an effort.

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10. More powerful and more ambitious tests can be constructed by collecting more data. In particular, data on individual securities or sector portfolios within asset markets could be used in more powerful tests for segmentation and integration within and across asset markets. Models in which factors are based on market prices such as yields and yield spreads are particularly easy to implement. Such factors require neither mimicking portfolio construction (because their returns are already perfectly correlated with particular asset returns, themselves) nor risk premium estimation since they are already priced in the market.

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Comment

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My intent with these comments is to complement those of the other discussant, Bruce Lehmann. His are directed at what I would refer to as the production side of the paper, issues such as pushing the research further and polishing what is already there. I will address the perspective of a consumer of this area of research: What does the measured predictability tell us? And how does this study relate to the research on exchange rates mentioned in the authors' introduction?

The paper's evidence of predictable excess returns in international equities—an important contribution—leads naturally to the question: Is it risk? The paper goes on to present evidence consistent with a factor-model representation of risk premia. One is left, however, with the usual concern about whether the seeming black box of the factor model is in fact capturing risk.

Three Asset Classes

Here, in my view, the black box is a little larger than usual. This view is tied largely to the fact that the paper measures returns in dollars. Digressing slightly, most of the literature on global asset allocation makes the point that there are (at least) three distinct asset classes to choose from: currency-hedged equities, currency-hedged bonds, and currencies. That is, nonzero currency positions are viewed as an active management decision, rather than viewing the unhedged position as a benchmark. Accordingly, the inputs to models such as the Black-Litterman global asset allocation model (Goldman-Sachs) are beliefs regarding each of these classes—separately. The paper as currently written confounds the first class with the third class by including the currency component in realized returns.

A Two-by-Two View

What is needed is a clearer decomposition, not just for the practitioner, but also to help researchers determine whether predictability is coming from risk premia. Consider figure 2C.1, a two-by-two diagram. In my judgment, there is

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	Structural Models –Risk	Statistical Models –Inefficiency?
Equities – Curr. Hedged		
Currencies		

Fig. 2C.1 Two-by-two diagram

insufficient evidence in the paper to place the results in the upper-left-hand cell of figure 2C.1, which is the natural tendency. We know from statistical models of foreign exchange that predictable excess returns exist in that asset class; and researchers have been struggling for years to find models of a risk premium that can account for the predictability, with little success. It is possible that the predictability the authors find comes from the currency component of dollar equity returns.

Final Thoughts

Even if the authors were to effect a decomposition, one might still debate whether to place the equity evidence in the left-hand versus the right-hand cell of row 1 of figure 2C.1. As the authors point out, international factor models make strong assumptions about integration, information, and lack of frictions that are even more strained here than in the context of a domestic pricing model and U.S. data.

In the end, there is no doubt that the authors advance the literature. They extend past work on predictable variation, and demonstrate a clear link between country attributes and beta pricing models. My comments are not intended to detract from their results, but rather to provide a perspective for consumers of their work.