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A TEST OF THE INTERNATIONAL CAPM USING BUSINESS CYCLES INDICATORS AS INSTRUMENTAL VARIABLES

Bernard Dumas

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1050 Massachusetts Avenue
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The author is on the faculty of the H.E.C. School of Management (France). He is Research Professor at Duke University (Fuqua School of Business), Research Associate of the NBER and Research Fellow of the CEPR and Delta. Some of the data used in this paper were generously supplied by Lombard Odier, by Jim Stock and by the Center for International Business Cycle Research at Columbia University. Sample GMM programs were provided to me by Wayne Ferson and Campbell Harvey. I acknowledge their help with thanks. Useful comments were received from Bruno Solnik, Michael Rockinger and participants and discussants at the pre-conference and the conference on the "Internationalization of Securities Markets", especially: Jeffrey Frankel, Gikas Hardouvelis, Bruce Lehmann, Richard Lyons, Campbell Harvey, Thierry Wizman, Charles Engel, Wayne Ferson and Vihang Errunza. Here again, I am grateful. This paper is part of NBER's research programs in Asset Pricing and International Finance and Macroeconomics. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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ABSTRACT

Previous work by Dumas and Solnik (1993) has shown that a CAPM which incorporates foreign-exchange risk premia (a so-called "international CAPM") is better capable empirically of explaining the structure of worldwide rates of return than does the classic CAPM. In the specification of that test, moments of rates of return were allowed to vary over time in relation to a number of lagged "instrumental variables". Dumas and Solnik used instrumental variables which were endogenous or "internal" to the financial market (lagged world market portfolio rate of return, dividend yield, bond yield, short-term rate of interest). In the present paper, I use as instruments economic variables which are "external" to the financial market, such as leading indicators of the business cycles. This is an attempt to explain the behavior of the international stock market on the basis of economically meaningful variables which capture "the state of the economy". I find that the leading indicators put together by Stock and Watson (NBER working paper no. 4014, 1992) as predictors of the U.S. business cycle also predict stock returns in the U.S., Germany, Japan and the United Kingdom. These instruments lead again to a rejection of the classic CAPM and no rejection of the international CAPM.

Bernard Dumas
The Fuqua School of Business
Duke University
Durham, NC 27706
and NBER

Introduction

Previous work by Dumas and Solnik (1993) has shown that a CAPM which incorporates foreign-exchange risk premia (a so-called "international CAPM") is better capable empirically of explaining the structure of worldwide rates of return than is the classic CAPM. The test was performed on the conditiona version of the two competing CAPMs. By that is meant that moments of rates o return were allowed to vary over time in relation to a number of lagged "instrumental variables". Dumas and Solnik used instrumental variables which were endogenous or "internal" to the financial market (lagged world market portfolio rate of return, dividend yield, bond yield, short-term rate of interest).

In the present paper, I aim to use as instruments economic variables whic are "external" to the financial market, such as leading indicators of business cycles. This is an attempt to explain the behavior of the international stock market on the basis of economically meaningful variables which capture "the state of the economy".

The stock market is widely regarded as the best predictor of itself. A large body of empirical work shows that asset prices are predictors of the future level of activity or, generally, the future level of economic variables.[1] Several leading indexes of economic activity make use of this property of asset prices.[2]

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[1]Fama and Schwert (1977) show that asset returns predict inflation in the United States. Stambaugh (1988) has extracted the information concerning future economic variables that is contained in bond prices. Several authors have observed that stock prices lead GNP (Fama(1981, 1990), Fama and Gibbons (1982), Geske and Roll (1983) and Barro (1990)).

[2]The list of NBER leading indicators includes, besides exchange rates: (i) the yield on a constant-maturity portfolio of 10-year U.S. Treasury bonds, (ii) the spread between the intrest rate on 6-month corporate paper and the

It may, however, also be true that "external" variables can serve to explain asset returns. Fama and French (1989) show that much of the movement in "internal" variables is related to business conditions; for instance, the term structure spread peaks during recessions. Kandel and Stambaugh (1989) show that expected returns peak at the end of a recession and Harvey (1991b) shows that the ratio of conditional mean return to variance is countercyclical. We show below that a particular set of leading indicators (which does not include asset prices) predicts the stock markets of four economically developed countries with an in-sample R^2 which is comparable (and in some cases superior) to that of "internal" variables.

From a theoretical standpoint, it should be clear that any intertemporal General-equilibrium model, such as the models of domestic or international business cycles that have appeared recently,[3] would generate asset prices that would be functions of the state variables of the economy. In these models, the conditional expected values of rates of return would be functions of state variables as well. Assuming that the mapping from state variables to asset prices is invertible, conditional expected returns must be functions of asset prices. This explains why the stock market predicts itself; a large enough number of asset prices can serve as proxy variables for the state variables.

In the course of this substitution, however, the model has lost some of its

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rate on 6-month U.S. Treasury bills, (iii) the spread between the yield on a constant-maturity portfolio of 10-year U.S. T-bonds and the yield on 1-year U.S. T-bonds. See Stock and Watson (1989). The Department of Commerce list includes, besides money supply, the Standard and Poors 500 Industrials index (See Survey of Current Business, current issues).

[3] On the international side, see, e.g., Backus *et al.* (1993), Baxter and Crucini (1993), Canova (1993) and Dumas (1992).

empirical content since the link to the underlying physical economy has been severed. Even if one found that stock returns are related to stock prices in the theoretical way, that would still leave open the question of the contemporaneous relationship of this perfectly working stock market to the economy. Does the stock market move of its own accord or does it remain in line with the conditions of physical production? More is achieved when underlying state variables are identified and expected returns are related to them, than when expected returns are related to asset prices. This paper is a preliminary investigation into the nature of "the state of the economy", as revealed by the behavior of asset returns.

Capital Asset Pricing models can serve as a tool, or sift, in the identification of state variables. First, one finds variables that can serve to condition returns (i.e., that have some power to predict rates of return). Second, one verifies whether the conditional distribution satisfies some asset pricing restrictions. For instance, can the first moments of returns be made to match time-varying risk premia built on second moments, as the conditional form of the classic CAPM would suggest they should? If not, either the model is incorrect or the variables have been improperly chosen. The search for the relevant state variables, which will account for the time variability of asset returns, is also a search for the relevant model specification.

This paper is organized as follows. Section 1 is a short reminder of the "pricing kernel" or marginal-rate-of-substitution approach to CAPM tests. Section 2 explores the behavior of worldwide asset returns on the basis of U.S. instrumental variables. Section 3 does the same thing on the basis of country-specific instrumental variables. Section 4 concludes.

1. The "pricing kernel" methodology

The "pricing-kernel" method, or marginal-rate-of-substitution method, which was initiated by Gallant and Tauchen (1989) and Hansen and Jagannathan (1991), was used in Bansal, Hsieh and Viswanathan (1992) and generalized by Dumas and Solnik (1993) to test CAPMs.

1.1. The international CAPM

Let there be L + 1 countries, a set of $m = n + L + 1$ assets -- other than the measurement-currency deposit, -- comprised of n equities or portfolios of equities, L non-measurement-currency currency deposits and the world portfolio of equities which is the mth and last asset. The non-measurement-currency deposits are singled out by observing the above order in the list; i.e., they are the (n + 1)st to (n + L)th assets.

The international Capital Asset Pricing model is Equation (14) in Adler and Dumas (1983):

$$(1) \qquad E[r_{jt}|\Omega_{t-1}] = \sum_{i=1}^{L} \lambda_{i,t-1} Cov[r_{jt}, r_{n+i,t}|\Omega_{t-1}] + \lambda_{m,t-1} Cov[r_{jt}, r_{mt}|\Omega_{t-1}]$$

where r_{jt} is the nominal return on asset or portfolio j, $j = 1 \ldots m$, from time $t - 1$ to t, in excess of the rate of interest of the currency in which returns are measured, r_{mt} is the excess return on the world market portfolio and Ω_{t-1} is the information set which investors use in choosing their portfolios. The time-varying coefficients $\lambda_{i,t-1}$, $i = 1 \ldots L$, are the *world prices of foreign exchange risk*. The time-varying coefficient $\lambda_{m,t-1}$ is the world price of market risk. The model takes into account the fact that investors of different countries view returns differently.

Equation (1.1) is the result of an aggregation over the several categories of investors. Equation (14) in Adler and Dumas (1983) provides an interpretation of the prices of risk. λ_m is a wealth-weighted harmonic mean of the nominal risk aversions of the investors of the various countries -- the world nominal risk aversion, as it were. λ_i is equal to $1 - \lambda_m$ times the weight of country i in the world where a country's weight is determined by its wealth times one minus its nominal risk tolerance.

By contrast, the classic CAPM ignores investor diversity and assumes, in effect, that everyone in the world translates returns into consumption as do the residents of the reference currency country. Hence, no exchange-risk hedging premium appears. In the above notations, the restriction of the international CAPM to the classic CAPM is stated as:

(2) $$\lambda_{i,t-1} = 0 \qquad i = 1...L, \forall t$$

In Dumas and Solnik (1993), a way has been found of writing the international CAPM in a parsimonious way, that minimizes the number of parameters to be estimated. Introduce u_t, the unanticipated component of the market's marginal rate of substitution between nominal returns at date t and at date t-1. u_t has the property that:

(3) $$E[u_t|\Omega_{t-1}] = 0.$$

Define u_t as:

(4) $$u_t = \lambda_{0,t-1} + \sum_{i=1}^{L} \lambda_{i,t-1} r_{n+i,t} + \lambda_{m,t-1} r_{mt}.$$

And define h_{jt} as:

(5) $$h_{jt} = r_{jt} - r_{jt}u_t. \qquad j = 1,\ldots..m.$$

Then, Dumas and Solnik (1993) show that the international CAPm (1) may be rewritten as:

(6) $$E[h_{jt}|\Omega_{t-1}] = 0, \qquad j = 1,\ldots m.$$

Equations (3) and (6) are the moment conditions used in the GMM estimation.

1.2. Auxiliary assumptions of the econometric analysis

In this subsection, we state two auxiliary assumptions that are needed for econometric purposes. They are identical to the auxiliary assumptions used in Dumas and Solnik (1993).

Assumption 1 of the empirical analysis: the information Ω_{t-1} is generated by a vector of instrumental variables Z_{t-1}.

Z_{t-1} is a row vector of ℓ predetermined instrumental variables which reflect everything that is known to the investor. One goal of this paper is to identify the list of Z variables. Assumption 1 is a strong assumption which does not simply limit the information set of the econometrician; it limits the information set of the investors and, therefore, their strategy space.

Next, we specify the way in which the market prices, λ, move over time. We assume that the variables, Z, can serve as proxies for the state variables and that there exists an exact linear relationship between the λs and the Zs:

Assumption 2:

$$
(7) \qquad \begin{aligned} \lambda_{0,t-1} &= -Z_{t-1}\delta, \\ \lambda_{i,t-1} &= Z_{t-1}\,\phi_i\,, \qquad\qquad i = 1,\ldots L \\ \lambda_{m,t-1} &= Z_{t-1}\,\phi_m. \end{aligned}
$$

Here the δs and ϕs are time-invariant vectors of weights which are estimated by GMM, under the moment conditions (3) and (6).

Given Assumption 2 and the definition (1.10) of u_t, we have:

$$
(8) \qquad u_t = - Z_{t-1}\delta + \sum_{i=1}^{L} Z_{t-1}\,\phi_i\, r_{n+i,t} + Z_{t-1}\,\phi_m\, r_{mt}\,,
$$

with u_t satisfying (3). Equation (8) serves to define u_t from now on.

1.3. Data

We consider the monthly excess return on equity and currency holdings measured in a common currency, the U.S. dollar. The excess return on an equity market is the return on that market (cum dividend) translated into dollars, minus the dollar one-month nominally risk-free rate. The return on a currency holding is the one-month interest rate[4] of that currency compounded by the exchange rate variation relative to the U.S. dollar, minus the dollar one-

[4]These are Euro-currency interest rates provided by Lombard Odier.

month risk-free rate.

In this study, we take four countries into account: Germany, the United Kingdom, Japan and the United States. More precisely, we consider eight assets in addition to the U.S. dollar deposit: the equity index of each country,[5] a Deutschemark deposit, a Pound Sterling deposit, a Yen deposit and the world index of equities. In the CAPM, we include only three exchange risk premia -- as many as we have exchange rates in the data set.

Available index level data cover the period January 1970 to December 1991 which is a 264 data point series. However, we work with rates of return and in earlier work we needed to lag the rate of return on the world index by one month in the instrumental-variable set; that left 262 observations spanning March 1970 to December 1991. For the sake of comparability, we use here the same time series of returns.

As we consider below various instrument sets, preliminary statistics will be provided concerning rates of return and their predictability.

2. U.S. instrumental variables

We first investigate a set of instruments common to all securities. We choose United States business cycle variables as a common set. In the next section, we explore country-specific variables. The choice of U.S. variables as a common set is justified by Figure 1 which plots coincident indicators of the

[5] These are Morgan Stanley country indexes and the Morgan Stanley world index. See Harvey (1991a) for an appraisal of these indexes.

business cycle in the four countries of our sample from 1948-01 to 1993-06.[6] It makes it plain that in most upturns and downturns the U.S. economy has lead the two European economies of our sample. Japan has had at the most two downturns since the war; the United States has undergone downturns at about the same time. That the U.S. lead other economies is confirmed by Figure 2 which shows the crosscorrelogram of coincident indicators between the U.S. and other countries.[7] Figure 2 reveals that U.S. lead Japan and Germany by at least twelve months and more strongly lead the U.K. with a lead time of four months approximately. That fact also explains Harvey's (1991a) finding that U.S. stock market "internal" variables are at least as good predictors of worldwide rates of return as are country-specific, "internal" variables.

Below, we consider two sets of U.S. economic indicators: the Main Economic Indicators of the OECD and the component indicators specifically selected by Stock and Watson (1992) to lead the U.S. cycles and predict recessions. Each time we consider a set of instrumental variables, predictability of returns is assessed by OLS and conformity with the international and classic CAPMs is assessed by means of the Generalized Method of Moments (GMM).

2.1. U.S. Main Economic Indicators (OECD)

I extracted from the O.E.C.D. Main Economic Indicators (monthly data) the following variables in their seasonally adjusted version for the twenty years of our rate-of-return sample: (i) the U.S. level of total inventories in

[6]These are the coincident indicators calculated by the Center for International Business Cycle Research (CIBCR), as an overall measure of the overall performance of a country's economy.

[7]These represent the correlation between the U.S. and other countries at various leads and lags, calculated after linear time detrending.

manufacturing industries (noted INV), (ii) U.S. residential construction put in place (RES), (iii) U.S. total value of retail sales (RSAL), (iv) U.S. percentage unemployment out of the civilian labor force (UNMP),[8] (v) U.S. commercial bank loans (LOAN), (vi) the U.S. money supply M3 (noted M3). All of these were selected as being presumably "forward looking variables". Series (iv) is stationary naturally. Other series were included in their first difference form. Even though it is properly classified as an "internal" variable, the lagged rate of return on the world market portfolio was added as an instrument in an attempt to capture potential lagged impacts of instruments on returns.[9]

Table 1 contains some descriptive statistics on rates of return, instrumental variables and their ability to predict rates of return. I summarize in Table 2 the R^2s that have been achieved by Main Economic Indicators (column 2) and, for purposes of comparison the R^2s that had been achieved by Dumas and Solnik (1993) by means of "internal" variables (column 1). It is observed that the predictive power of the Main Economic Indicators is generally lower than was that of the "internal" financial variables. One variable has a consistent ability in predicting rates of return worldwide: the increase in U.S. inventories in manufacturing industries, with a positive increase of that variable being followed by lower returns.

[8] Business cycle experts know that unemployment lags the cycle. The use of this variable was not a good idea but I refrained from making any changes to my original list for fear of accusations of data mining.

[9] The coefficient of this predictor will be found to be insignificant.

Using these variables as instruments, I proceed to estimate the international and the classic CAPMs. The results appear in Tables 3 and 4 respectively. The international CAPM yields a p-value of 0.0144 and is rejected. The classic CAPM produces a p-value of 0.0064 and is also rejected. It is not clear whether it is legitimate to test a hypothesis when the unrestricted model (in this case the international CAPM) is itself rejected. A Newey-West test does not reject the hypothesis that exchange rate risk receives a zero price ($\phi_i = 0$, $i = 1...L$) (see Table 5, pvalue = 0.088).

2.2. U.S. Leading Economic Indicators (NBER)

In a recent article, Stock and Watson (1992) have proposed a leading index (called XLI2) which does not refer to financial variables and is instead constructed from the following leading indicators of the U.S. business cycle:[10] (i) Housing authorizations (new private housing) in levels (HSBP),[11] (ii) Average weekly hours of production workers in manufacturing, in level form (LPHRM), (iii) Vendor performance: percent of companies reporting slower deliveries, in levels (IVPAC), (iv) Manufacturers' unfilled orders in the

[10] All variables are seasonally adjusted. In addition, Stock and Watson (1992) include the Trade Weighted Nominal Exchange Rate between the U.S. and other countries as a leading indicator. We do not use it because it is a financial variable (although it obviously has real effects).

[11] Observe that we use some of Stock and Watson's variables in level form, others in first-difference form. The issue of stationarity arises. There is no evidence that the level variables are non stationary. However, there is a question of consistency in the comparisons; here we have Housing authorizations in levels, whereas Construction put in place -- an MEI variable -- was used in first-difference form in Section 2. Further investigation is needed.

durable goods industries, 1982 dollars, smoothed[12] in growth rate form (MDU82), (v) the capacity utilization rate in manufacturing (Federal Reserve Board), in first difference form (IPXMCA), (vi) an index of help-wanted advertising in newspapers (The Conference Board), in growth rates (LHELL).

Table 6 reports the results of multiple OLS (and heteroskedasticity corrected) regressions of rates of return on these variables.[13] For purposes of comparison, the overall performance (R^2s) is transcribed in Table 2. This set of instruments predicts stock returns worldwide about as well as do the financial or internal variables used by Dumas and Solnik. They predict currencies less well. The outstanding contribution to predictability is that of the indicator IVPAC (Vendor Performance) whose t-statistics in regressions of the various securities rates of return are respectively: -2.72, -4.23, -2.96, -4.05, -0.138, -1.42, -1.62, -4.30. The signs are as expected: an increase in the number of firms reporting slower deliveries is followed by lower returns on securities. The larger values of t occur for stock returns. The forecasting of currencies presumably requires bilateral instrumental variables; U.S. business cycle variables by themselves are insufficient. Another valuable contribution is that of HSBP (Housing authorizations), also

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[12] The series described as "smoothed" were passed through the filter $(1 + 2L + 2L^2 + L^3)$.

[13] The indicated variables were used in a VAR form by Stock and Watson to predict increments in their index of coincident indicators (XCI). I use here the raw variables, in the form described, without the VAR form and without lags. I did reconstruct the implied VAR coefficients that Stock and Watson used but found that the VAR form predicts securities returns with approximately the same degree of success as do the raw variables.

with the anticipated sign.

Many time series (280 series precisely) were mined by Stock and Watson to select variables, and their lags in order to make up an index that predicts the three-month increments in their U.S. Index of coincident indicators (XCI, defined in Stock and Watson (1989)). It turns out, however, that these variables (without lags) also predict U.S. and other stock returns about as well as do internal variables. That is not the result of data mining.[14]

There is, of course, an issue concerning the precise timing of releases of economic data. Internal variables are observed in real time in the financial markets whereas some economic variables are released several weeks after the end of the month. In the statistical analysis we have simply used the data pertaining to month t-1 to predict rates of return over the month (t-1, t). That procedure is not congruent with actual release dates. However, the variable that is most effective in bringing about predictive performance is vendor performance IVPAC. IVPAC is released by the National Association of Purchasing Managers a mere two days after the end of the month.

Even if economic data are released with some delay by statistical agencies and would, therefore, be available to external observers at that time only, it is also true that the investors, whose information set we are trying to

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[14]The correlations between monthly securities returns and one-month increments in XCI are as follows:

German stock market	-0.074
British stock market	-0.073
Japanese stock market	0.046
U.S. stock market	-0.027
Deutschemark	-0.075
British Pound	-0.073
Japanese Yen	0.026
World stock market	-0.032.

represent, are not external observers and do not await actual releases. They enjoy the benefits of early estimates.

Furthermore, financial market prices and flows of goods and services act as aggregators of information faster than do statistical agencies. My goal in this article is not to show that external, economic variables are superior in their predictive ability to internal, financial variables. I use them because I believe that their message is more meaningful. I am comfortable with the idea that news about economic variables may be "released" through the channel, *inter alia*, of financial market prices. Even then, I am interested in identifying the relevant economic variables.

The reader may nonetheless wish to know how the results would have been affected by a different assumption on the timing of releases. In order to provide that information to him, I have shown in Table 2 the levels of R^2s attained when the Stock and Watson variables are delayed further by one and also two months. Not surprisingly, the predictive performance for stock returns deteriorates gradually.[15] The predictive performance for currencies, which was poor in the first place, is not markedly affected.

Tables 7 and 8 report on the tests of the two CAPMs based on the Stock and Watson leading variables. The overidentifying restrictions of the international CAPM are marginally accepted with a p-value of 0.067 and the

[15] In my opinion, the gradual deterioration in predictive power that occurs confirms that earlier results were not pure chance and that there was some *bona fide* predictive power in the first place.

classic CAPM is rejected with a p-value of 0.03.[16] A Newey-West test of the hypothesis of zero price on foreign exchange risk is reported in Table 5 and shows rejection (p-value = 0.0005). Foreign exchange risk premia are significant.

3. Worldwide instrumental variables

In tests of conditional CAPMs, it is crucial to predict well the market rate of return and, in tests of the international, conditional CAPM, it is important to predict well the rates of return on currencies. Exchange rates are bilateral variables. Their prediction should not logically be based on unilateral instrumental variables, such as U.S. leading indicators. In this section, I consider instrumental variables reflecting the business cycles of the four countries of our sample. I use leading indexes of the four countries' cycles simultaneously.

The Center for International Business Cycles Research (CIBCR) publishes every month a leading index of the business cycle for eleven countries. The growth rate of the index provides advance warning of a growth cycle uptrun or downturn.[17] I used the leading indicators of Japan (JALDT), the United Kingdom (UKLDT), former West Germany (WGLDT) and the United States (USLDT), in

[16] When the Stock-Watson instruments are lagged one month further, the international CAPM is marginally rejected (p-val = 3.9%) and the domestic CAPm is marginally accepted (p-val = 9.17%).

[17] Descriptions of various leading indicators are available in Lahiri and Moore (1991) and Moore (1992).

their growth rate form, as instrumental variables. The forecasting performance of the five variables (including a constant) is reported in Table 9. R^2s are very low, of the order of 1% or 2%. It did not seem worthwhile to pursue a test of any CAPM.

The fact that a leading index shows poor forecasting performance for stock returns does not preclude the component series of the index from faring many times better. For instance, the Stock and Watson XLI2 index predicts returns very poorly but we reported in Subsection 2.2 that its components provide the best forecasting basis that we have found so far. This remark applies even more in the case of the CIBCR indexes since they are meant to be qualitative predictors of upturns and downturns, not quantitative predictors of the subsequent movement in the business cycle.

Accordingly, I have also investigated the predictive ability of the series which compose the country leading indexes of the CIBCR. For each country, I used as instruments every component series that was available on a monthly basis. Then, e.g., German stock returns were predicted on the basis of German instruments alone but the Deutschemark/dollar return was predicted on the basis of German and US. instruments; the worldwide stock returns were predicted on the basis of all country instruments put together. In Table 2 a column, marked "LDT components", contains the R^2s obtained by this method. The number of instruments is large; yet, the forecasting performance reached for stocks is no better than that of the NBER component series. For currencies, the performance is better (R^2s of the order of 10%). However, due to their large number, these instruments cannot be used to test CAPMs by GMM.

Instruments ought to be selected in each country for the purpose of predicting increments in business cycle coincident indicators. This would be a replication of the Stock and Watson procedure with worldwide data. Then, the selected instruments could be investigated for the ability to forecast securities returns. This will be left for future research.

4. Conclusion

This preliminary investigation was meant to highlight the links that exist between predicted activity levels and conditionally expected stock returns. The following conclusions emerge from it:

i. The nonfinancial leading indicators selected by Stock and Watson (1992) for the purpose of predicting United States business cycles seem to offer also some potential for the prediction of worldwide stock returns. Outstanding contributions to predictive power were made by the variables IVPAC (Vendor Performance) and HSBP (Housing authorizations). Furthermore, the signs of these variables' coefficients made intuitive sense. IVPAC is an especially valuable predictor since its value is released a mere 48 hours after the end of the month.

ii. Using the Stock and Watson instrument set, the international, conditional CAPM was marginally not rejected while the classic, conditional CAPM was rejected.

iii. Other sets of instrumental variables that I have tried so far (U.S. Main Economic Indicators, CIBCR country leading indexes) have not proven as successful both in regard to their power of prediction and in regard to their ability to discriminate between asset pricing models.

Other, more subtle clues could be gathered from the data and could point the way toward future research. The first issue that I would like to raise concerns the link between predictability of returns and the power of asset pricing tests. The OECD Main Economic Indicators (MEIs), as used here, have lower predictive power than did the Stock Watson leading series, while these series in turn had a lower predictive ability than did the "internal" variables used by Dumas and Solnik and others (see Table 2). In tests of asset prices, the MEIs rejected both the classic and the international models, while the Stock-Watson variables rejected one model and marginally did not reject the other. In Dumas and Solnik (1993), the discrimination between the two asset pricing models was much sharper (the classic CAPM was rejected while the international one had a p-value of 22%). As we improve the degree of predictability, should we expect better discrimination between models? Since our goal is not to predict but to identify state variables of the economy and to determine which asset pricing model is correct, how much importance should we give to the predictive power (the R^2) of the instruments?

The second issue concerns the choice of instrumental variables. In this respect, it is important to avoid the pitfalls of data mining. That is the reason why I never modified my list of MEI indicators and why I chose to work with the Stock and Watson variables which have been preselected to predict activity and not to predict stock returns. This defense against accusations of data mining is all the stronger as the correlations between stock returns and activities levels are small (see footnote 14). As we attempt to predict worldwide stock returns, should we be content to use U.S. variables, such as those of Stock and Watson, on the grounds that the U.S. business cycle seems to lead other cycles? Or can we hope to attain greater predictibility by using country-specific indicator variables? If so, should these variables be selected on the basis of their ability to predict local levels of activity?

A third issue that will deserve more scrutiny is the influence of time lags. Time lags are both of economic and statistical significance. Economically speaking, only innovation in a data series is capable of constituting news. News are the primary moving force behind realized returns. It is not clear, however, to what extent the past information and the lag structure that were identified as giving the best prediction of activity levels should also be relevant as determinants of conditionally expected returns. We did observe here (footnote 13) that the use of the Stock and Watson lags did not improve the predictability of returns.

Finally, from the point of view of the statistical specification, Thierry Wizman will point out in his discussion that the levels, the first differences of indicator variables and their first differences at different lags do not convey the same information concerning the stage of the business cycle the economy is in and do not have the same power to predict returns. How does one determine which specification is preferable for our purposes?

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Table 1
Summary statistics using U.S. MEI as instrumental variables

number of obs= 262.00000

SECURITIES:

	MEAN OF EXCESS RETURN	STANDARD DEVIATION OF EXCESS RETURN
German stock market	0.0050726679	0.062362157
British stock market	0.0065975649	0.077541166
Japanese stock marke	0.0090457824	0.065944529
U.S. stock market	0.0024764962	0.046825699
Deutschemark	0.0017136374	0.034912228
British Pound	0.0017428969	0.031856602
Japanese Yen	0.0027198626	0.033234643
World stock market	0.0031789237	0.043619171

INSTRUMENTS:

	MEAN	STDEV	CORRELATIONS						
Cst	1.00000	0.00000							
r_m-1	0.0361454	0.521389	1.0	-0.15	0.11	0.026	0.13	-0.054	0.054
inv	0.00521380	0.0105418	-0.15	1.0	-0.21	-0.086	-0.18	0.14	0.11
res	0.00644040	0.0253341	0.11	-0.21	1.0	0.20	0.25	0.14	0.27
rsal	0.00633719	0.0132688	0.026	-0.086	0.20	1.0	0.038	0.097	0.15
unmp	6.69847	1.38235	0.13	-0.18	0.25	0.038	1.0	-0.25	0.14
loan	0.00774770	.00643937	-0.054	0.14	0.14	0.097	-0.25	1.0	0.41
M3	0.00733305	.00353889	0.054	0.11	0.27	0.15	0.14	0.41	1.0

OLS WITH HETEROSKEDASTICITY CONSISTENT STANDARD ERRORS
(Securities returns regressed on instruments)
(Consistency is achieved by the Newey-West (NW) procedure)

German stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.00569285	0.0216447	0.263013	0.0222965
r_m-1	0.00669026	0.00859968	0.777966	0.00746890
inv	-0.368126	0.243561	-1.51143	0.384939
res	0.0937675	0.152453	0.615060	0.167409
rsal	-0.326319	0.289070	-1.12886	0.295759
unmp	0.00189927	0.00285244	0.665842	0.00308242
loan	-0.0120132	0.618495	-0.0194233	0.698068
M3	-1.37839	1.10329	-1.24934	1.26840

Rsquared is 0.0236371

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36)::

-0.018	-0.0031	0.067	0.059	0.0027	-0.041	0.066	0.030

Table 1 continued

U.K. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.00456223	0.0230321	0.198082	0.0275204
r_m-1	0.00693558	0.00955990	0.725486	0.00921879
inv	-0.553277	0.451608	-1.22513	0.475126
res	0.126568	0.242514	0.521900	0.206631
rsal	-0.553975	0.360443	-1.53693	0.365052
unmp	0.00330507	0.00330871	0.998899	0.00380460
loan	-0.684188	0.682991	-1.00175	0.861619
M3	-1.29185	1.27644	-1.01207	1.56557

Rsquared is 0.0378930

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36)::

0.065	-0.11	0.043	0.0099	-0.041	-0.017	0.085	-0.067

Japanese stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	-0.00782489	0.0253743	-0.308378	0.0233101
r_m-1	0.0136144	0.00992300	1.37201	0.00780844
inv	-0.862245	0.230546	-3.74001	0.402438
res	0.0640068	0.174230	0.367371	0.175019
rsal	-0.268500	0.357431	-0.751195	0.309204
unmp	0.00178737	0.00316203	0.565262	0.00322255
loan	0.352924	0.598969	0.589220	0.729803
M3	1.01683	1.20467	0.844073	1.32606

Rsquared is 0.0456416

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.057	-0.019	0.036	0.030	0.062	0.075	-0.015	0.051

U.S. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	-0.00669039	0.0168837	-0.396264	0.0165100
r_m-1	0.00231443	0.00607610	0.380906	0.00553053
inv	-0.579509	0.195591	-2.96286	0.285037
res	0.00226372	0.119716	0.0189091	0.123962
rsal	-0.112179	0.234005	-0.479386	0.219002
unmp	0.00337828	0.00223428	1.51203	0.00228245
loan	-0.383116	0.444596	-0.861718	0.516902
M3	-0.935501	0.823839	-1.13554	0.939217

Rsquared is 0.0504767

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.024	-0.064	-0.026	-0.049	-0.016	0.054	-0.020	-0.11

Table 1 continued

Deutschemark

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.0258594	0.0111676	2.31557	0.0123199
r_m-1	-0.00801109	0.00404676	-1.97963	0.00412691
inv	-0.385613	0.148917	-2.58945	0.212696
res	0.0204019	0.0911840	0.223744	0.0925011
rsal	-0.201447	0.159687	-1.26152	0.163420
unmp	-0.00275891	0.00157580	-1.75080	0.00170318
loan	0.268681	0.402691	0.667214	0.385715
M3	-0.586607	0.605239	-0.969215	0.700848

Rsquared is 0.0488795

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.028	0.10	-0.0038	0.021	-0.0049	0.034	0.049	0.056

British Pound

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.0338504	0.0104436	3.24125	0.0111803
r_m-1	-0.00303430	0.00378204	-0.802292	0.00374519
inv	-0.233203	0.109419	-2.13128	0.193023
res	0.0888226	0.0846396	1.04942	0.0839452
rsal	-0.220981	0.136461	-1.61937	0.148305
unmp	-0.00339392	0.00139092	-2.44005	0.00154564
loan	0.222244	0.318936	0.696829	0.350038
M3	-1.21933	0.543510	-2.24344	0.636023

Rsquared is 0.0592174

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.066	0.067	-0.017	0.028	-0.084	-0.047	0.037	0.00080

Japanese Yen

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.0110907	0.0120695	0.918900	0.0118473
r_m-1	-0.000429227	0.00397897	-0.107874	0.00396862
inv	-0.365841	0.111626	-3.27740	0.204538
res	0.113531	0.0832779	1.36328	0.0889533
rsal	-0.213294	0.169312	-1.25977	0.157152
unmp	-0.000364428	0.00168879	-0.215793	0.00163785
loan	0.00795930	0.290915	0.0273595	0.370921
M3	-0.470191	0.575398	-0.817156	0.673967

Rsquared is 0.0294043

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.048	0.041	0.080	0.068	-0.0037	0.096	-0.051	-0.052

Table 1 continued

World stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	-0.00802493	0.0160887	-0.498793	0.0153149
r_m-1	0.00598386	0.00545754	1.09644	0.00513018
inv	-0.622000	0.183153	-3.39607	0.264404
res	0.0297202	0.117849	0.252190	0.114989
rsal	-0.293711	0.211799	-1.38674	0.203149
unmp	0.00311797	0.00202408	1.54044	0.00211723
loan	-0.00729195	0.440082	-0.0165695	0.479484
M3	-0.672124	0.776432	-0.865657	0.871228

Rsquared is 0.0584330

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.011	-0.049	0.021	-0.041	-0.013	0.067	0.0098	-0.095

Table 2
Summary of predictive ability of instruments

$R^2\%$

	Dumas -Solnik	OECD MEI (Table 1)	NBER XLI2 components (Table 6)	NBER XLI2 delayed 1 month	NBER XLI2 delayed 2 months
Number of instruments (including constant)	6	8	7	7	7
German stock market	5.97	2.36	4.28	3.69	2.65
British stock market	10.28	3.79	12.18	10.20	5.03
Japanese stock market	7.93	4.56	9.27	7.86	7.40
U.S. stock market	9.60	5.05	7.96	4.55	4.42
Deutschemark	10.63	4.89	4.07	4.52	3.12
British Pound	11.24	5.92	3.14	3.62	2.61
Japanese Yen	7.74	2.94	3.63	3.29	2.68
World stock market	11.33	5.84	10.17	5.86	4.99

Table 2 continued

	CIBCR country LDTs (Table 9)	CIBCR LDT components	
Number of instruments (including constant)	5	(Number of instruments varies)	
German stock market	2.76	2.19	(7)
British stock market	0.50	2.84	(9)
Japanese stock market	0.82	6.43	(7)
U.S. stock market	0.93	8.93	(10)
Deutschemark	2.23	6.75	(16)
British Pound	0.72	9.56	(18)
Japanese Yen	0.06	10.39	(16)
World stock market	0.90	18.26	(30)

Table 3

Estimation of the international CAPM with U.S. MEI as instrumental variables

number of observation= 262.00000
number of factors= 4.0000000
degrees of freedom= 32.000000

****
** GMM Results, Stage 20 **
****

Coeff	Value	Std Err	T-stat
Linear form for $\lambda_{0,t-1}$ (see Equation (7))			
Cst	-0.7624	0.3710	-2.0553
r_m-1	0.0567	1.3231	0.0428
inv	27.9459	15.0797	1.8532
res	2.1540	2.1545	0.9998
rsal	-6.2960	4.9054	-1.2835
unmp	0.0185	0.0055	3.3873
loan	-2.7934	9.7046	-0.2878
M3	-34.0587	14.2208	-2.3950
Linear forms for market prices of risk, $\lambda_{m,t-1}$ and $\lambda_{i,t-1}$			
Cst			
λm,t-1	53.8784	24.1627	2.2298
λ1,t-1	45.0855	20.5153	2.1977
λ2,t-1	-30.7942	20.7468	-1.4843
λ3,t-1	-23.0563	9.9523	-2.3167
rm(-1)			
λm,t-1	-160.2995	86.3428	-1.8565
λ1,t-1	87.9048	83.4154	1.0538
λ2,t-1	39.4347	75.9711	0.5191
λ3,t-1	17.2105	34.7671	0.4950
inv			
λm,t-1	-1390.1074	733.0540	-1.8963
λ1,t-1	718.7262	727.4729	0.9880
λ2,t-1	-229.0456	561.8708	-0.4076
λ3,t-1	-148.8943	256.9847	-0.5794
res			
λm,t-1	-206.5363	138.6434	-1.4897
λ1,t-1	78.9526	159.1203	0.4962
λ2,t-1	140.8913	169.2117	0.8326
λ3,t-1	7.2748	82.5645	0.0881

Table 3 continued

rsal			
$\lambda m,t-1$	-157.2546	223.5246	-0.7035
$\lambda 1,t-1$	-99.0278	253.8506	-0.3901
$\lambda 2,t-1$	-59.7750	222.6823	-0.2684
$\lambda 3,t-1$	-206.2905	140.8505	-1.4646
unmp			
$\lambda m,t-1$	-0.8447	0.3391	-2.4906
$\lambda 1,t-1$	-0.4295	0.2883	-1.4897
$\lambda 2,t-1$	0.5240	0.2841	1.8446
$\lambda 3,t-1$	0.4676	0.1505	3.1062
loan			
$\lambda m,t-1$	705.1855	645.9489	1.0917
$\lambda 1,t-1$	117.8120	796.5030	0.1479
$\lambda 2,t-1$	-311.7085	734.6841	-0.4243
$\lambda 3,t-1$	-594.0021	371.0511	-1.6009
M3			
$\lambda m,t-1$	283.5984	1168.9769	0.2426
$\lambda 1,t-1$	-2710.4280	1559.4271	-1.7381
$\lambda 2,t-1$	350.1110	1346.4438	0.2600
$\lambda 3,t-1$	99.3373	664.8671	0.1494

no. of iterations: 2.000000
weighing matrix updated 20.000000 times
Chi-square : 51.923974
RIGHT TAIL P-value : 0.014421
Degrees of freedom : 32.000000

Table 4

Estimation of the classic CAPM with U.S. MEI as instrumental variables

nbre observation= 262.00000000
nbre facteurs= 1.00000000
degrees of freedom= 56.00000000

```
**********************************
**    GMM Results, Stage    31 **
**********************************
```

Coeff	Value	Std Err	T-stat
Linear form for $\lambda_{0,t-1}$ (see Equation (7))			
Cst	-0.0590	0.1727	-0.3416
r_m-1	-0.2638	0.5272	-0.5003
inv	8.0625	11.0876	0.7272
res	1.4246	1.2198	1.1679
rsal	-6.7746	3.1070	-2.1804
unmp	0.0023	0.0026	0.8853
loan	-0.3844	3.0409	-0.1264
M3	-2.0035	7.9628	-0.2516
Linear form of market price of covariance risk, $\lambda_{m,t-1}$			
Cst	-2.0280	7.9695	-0.2545
r_m-1	14.2907	30.0824	0.4751
inv	-344.1557	126.6979	-2.7163
res	113.9686	72.0067	1.5828
rsal	-343.5483	121.5828	-2.8256
unmp	0.1899	0.1152	1.6485
loan	-81.3205	306.1997	-0.2656
M3	-379.7604	541.0834	-0.7019

no. of iterations: 4.000000
weighing matrix updated 31.000000 times
Chi-square : 85.755252
RIGHT TAIL P-value : 0.006427
Degrees of freedom : 56.000000

Table 5
Tests of hypotheses

Statistics in this table test the hypothesis: $\phi_i = 0$, $i = 1, 2, 3$ against the alternative that the international CAPM holds. The various tests differ only in the set of the instrumental variables used.

Instruments	Specification	χ^2 difference	degrees of freedom	p-value
U.S. MEI 8 instr.	Linear	85.750564 -51.923974 33.826590	24	0.088
U.S. NBER 7 instr.	Linear	86.702953 -39.961045 46.741908	21	0.001

Table 6
Summary statistics with U.S. NBER variables as instruments

INSTRUMENTS

	MEAN	STDEV	CORRELATIONS					
cst	1.00000	0.00000						
hsbp	121.004	32.6542	1.0	0.34	0.49	0.44	0.41	0.48
lphrm	40.2859	0.607544	0.34	1.0	0.45	0.38	0.30	0.23
ivpac	53.3844	13.0493	0.49	0.45	1.0	0.58	0.23	0.29
mdu82	0.00139399	0.0102974	0.44	0.38	0.58	1.0	0.27	0.31
ipxmca	-0.0164122	0.772366	0.41	0.30	0.23	0.27	1.0	0.49
lhell	-0.000517679	0.0316811	0.48	0.23	0.29	0.31	0.49	1.0

OLS WITH HETEROSKEDASTICITY CONSISTENT STANDARD ERRORS
(Securities returns regressed on instruments)
(Consistency is achieved by the Newey-West (NW) procedure)

German stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.390731	0.276101	-1.41518	0.285232
hsbp	0.000343379	0.000136858	2.50901	0.000149806
lphrm	0.0102116	0.00712679	1.43284	0.00722220
ivpac	-0.00107297	0.000393827	-2.72446	0.000389195
mdu82	0.0304419	0.444454	0.0684928	0.469395
ipxmca	-0.00305786	0.00572859	-0.533789	0.00584667
lhell	-0.113002	0.159433	-0.708775	0.146780

Rsquared is 0.0428200

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.031	-0.039	0.049	0.053	-0.0062	-0.036	0.056	0.036

U.K. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.534844	0.308444	-1.73401	0.339701
hsbp	0.000559973	0.000184360	3.03739	0.000178414
lphrm	0.0147479	0.00770939	1.91298	0.00860139
ivpac	-0.00227316	0.000537946	-4.22562	0.000463518
mdu82	0.379958	0.548411	0.692834	0.559033
ipxmca	-0.0170324	0.0136970	-1.24351	0.00696319
lhell	-0.181394	0.159830	-1.13492	0.174810

Rsquared is 0.121848

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.016	-0.15	0.038	-0.027	-0.050	-0.013	0.043	-0.0079

Table 6 continued

Japanese stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.253508	0.320174	-0.791781	0.293657
hsbp	0.000750459	0.000148571	5.05119	0.000154231
lphrm	0.00563301	0.00822220	0.685097	0.00743553
ivpac	-0.00102859	0.000346998	-2.96424	0.000400692
mdu82	-0.288754	0.449197	-0.642822	0.483261
ipxmca	-0.00251334	0.00529847	-0.474353	0.00601938
lhell	-0.166150	0.141414	-1.17492	0.151116

Rsquared is 0.0926722

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.020	-0.071	-0.0020	-0.011	0.043	0.073	0.0095	0.077

U.S. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.235663	0.215653	-1.09279	0.210016
hsbp	0.000251501	0.000108271	2.32289	0.000110302
lphrm	0.00660721	0.00542312	1.21834	0.00531770
ivpac	-0.00109923	0.000271581	-4.04752	0.000286564
mdu82	0.0564726	0.361858	0.156063	0.345615
ipxmca	-0.00219562	0.00430679	-0.509805	0.00430490
lhell	-0.187171	0.117017	-1.59952	0.108074

Rsquared is 0.0795992

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.034	-0.090	-0.028	-0.052	-0.022	0.032	-0.0042	-0.088

Deutschemark

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.328134	0.137363	-2.38880	0.159854
hsbp	0.000193983	6.49824e-05	2.98516	8.39562e-05
lphrm	0.00766495	0.00353697	2.16710	0.00404757
ivpac	-3.82105e-05	0.000276595	-0.138146	0.000218118
mdu82	-0.328321	0.241348	-1.36036	0.263065
ipxmca	-0.00438420	0.00321052	-1.36557	0.00327667
lhell	-0.0215355	0.0852959	-0.252481	0.0822604

Rsquared is 0.0407542

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

-0.022	0.071	-0.010	0.018	-0.039	-0.00073	0.028	0.096

Table 6 continued

British Pound

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.332575	0.133099	-2.49870	0.146574
hsbp	0.000103983	5.95071e-05	1.74741	7.69820e-05
lphrm	0.00828977	0.00341368	2.42840	0.00371133
ivpac	-0.000231653	0.000163528	-1.41660	0.000199999
mdu82	0.0712808	0.212960	0.334714	0.241212
ipxmca	-0.000255775	0.00267844	-0.0954940	0.00300448
lhell	-0.0733277	0.0714012	-1.02698	0.0754270

Rsquared is 0.0313697

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.056	0.073	-0.016	0.036	-0.093	-0.046	-0.011	0.038

Japanese Yen

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.159703	0.166350	-0.960047	0.152527
hsbp	0.000187078	6.24738e-05	2.99450	8.01082e-05
lphrm	0.00389288	0.00423289	0.919674	0.00386205
ivpac	-0.000316085	0.000194594	-1.62433	0.000208121
mdu82	-0.134085	0.244464	-0.548487	0.251008
ipxmca	-0.00347325	0.00299366	-1.16020	0.00312649
lhell	0.0734632	0.0826545	0.888798	0.0784901

Rsquared is 0.0362787

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.039	0.018	0.065	0.067	-0.015	0.094	-0.061	-0.030

World stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
cst	-0.304620	0.201082	-1.51490	0.193269
hsbp	0.000392649	9.90945e-05	3.96237	0.000101506
lphrm	0.00789062	0.00511004	1.54414	0.00489366
ivpac	-0.00108092	0.000251444	-4.29886	0.000263713
mdu82	-0.0322675	0.322532	-0.100044	0.318056
ipxmca	-0.00401874	0.00432539	-0.929105	0.00396162
lhell	-0.172625	0.102169	-1.68960	0.0994560

Rsquared is 0.101723

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.0092	-0.096	0.0014	-0.048	-0.031	0.051	0.015	-0.036

Table 7

Estimation of the international CAPM with U.S. NBER instrumental variables

nbre observation= 262.00000
nbre facteurs= 4.0000000
degrees of freedom= 28.000000

```
*********************************
**    GMM Results, Stage   19  **
*********************************
```

Coeff	Value	Std Err	T-stat
Linear form for $\lambda_{0,t-1}$ (see Equation (7))			
cst	7.2346	3.9152	1.8478
hsbp	0.0176	0.0234	0.7530
lphrm	-0.1811	0.0957	-1.8915
ivpac	0.0030	0.0053	0.5681
mdu82	11.3602	5.6840	1.9986
ipxmca	-0.0063	0.0077	-0.8162
lhell	-1.5675	1.8945	-0.8274
Linear forms for market prices of risk, $\lambda_{m,t-1}$ and $\lambda_{i,t-1}$			
cst			
$\lambda m,t-1$	-244.6722	300.3837	-0.8145
$\lambda 1,t-1$	-421.7032	230.8744	-1.8265
$\lambda 2,t-1$	361.2365	233.2194	1.5489
$\lambda 3,t-1$	-32.8439	151.6363	-0.2166
hsbp			
$\lambda m,t-1$	6.3348	2.0582	3.0779
$\lambda 1,t-1$	-1.7197	1.8737	-0.9178
$\lambda 2,t-1$	-1.0261	1.6096	-0.6374
$\lambda 3,t-1$	2.2875	0.9770	2.3414
lphrm			
$\lambda m,t-1$	4.0333	7.6146	0.5297
$\lambda 1,t-1$	11.0753	5.9827	1.8512
$\lambda 2,t-1$	-7.8050	5.9297	-1.3162
$\lambda 3,t-1$	0.9961	3.8104	0.2614
ivpac			
$\lambda m,t-1$	0.4265	0.3275	1.3021
$\lambda 1,t-1$	-0.1739	0.4019	-0.4327
$\lambda 2,t-1$	-0.7289	0.3564	-2.0453
$\lambda 3,t-1$	-0.4764	0.1738	-2.7418

Table 7 continued

mdu82			
$\lambda m,t-1$	-1518.8104	512.2532	-2.9650
$\lambda 1,t-1$	762.5102	432.8288	1.7617
$\lambda 2,t-1$	583.1863	426.5617	1.3672
$\lambda 3,t-1$	-105.5570	259.2887	-0.4071
ipxmca			
$\lambda m,t-1$	-0.6235	0.4303	-1.4488
$\lambda 1,t-1$	1.1746	0.5937	1.9785
$\lambda 2,t-1$	-0.2372	0.4885	-0.4856
$\lambda 3,t-1$	0.3153	0.1770	1.7812
lhell			
$\lambda m,t-1$	-200.9777	114.8282	-1.7502
$\lambda 1,t-1$	-227.7343	111.1008	-2.0498
$\lambda 2,t-1$	354.0376	126.1874	2.8056
$\lambda 3,t-1$	-171.5884	56.9768	-3.0116

no. of iterations: 2.000000
weighing matrix updated 19.000000 times
Chi-square : 39.961045
RIGHT TAIL P-value : 0.066658
Degrees of freedom : 28.000000

Table 8

Estimation of the classic CAPM with U.S. NBER instrumental variables

nbre observation= 262.00000000
nbre facteurs= 1.00000000
degrees of freedom= 49.00000000

```
**********************************
**    GMM Results, Stage    8   **
**********************************
```

Coeff	Value	Std Err	T-stat
Linear form for $\lambda_{0,t-1}$ (see Equation (7))			
cst	2.5886	1.8490	1.4000
hsbp	0.0087	0.0162	0.5388
lphrm	-0.0709	0.0469	-1.5126
ivpac	0.0056	0.0037	1.5079
mdu82	1.5476	3.2085	0.4823
ipxmca	-0.0082	0.0051	-1.6022
lhell	-1.4689	1.0460	-1.4044
Linear form of market price of covariance risk, $\lambda_{m,t-1}$			
cst	-124.5130	117.8852	-1.0562
hsbp	2.4277	0.7155	3.3930
lphrm	3.3990	2.9848	1.1388
ivpac	-0.6296	0.1319	-4.7728
mdu82	61.8821	202.6053	0.3054
ipxmca	0.1011	0.1378	0.7339
lhell	-99.3850	44.9423	-2.2114

no. of iterations: 4.000000
weighing matrix updated 8.000000 times
Chi-square : 69.235898
RIGHT TAIL P-value : 0.029985
Degrees of freedom : 49.000000

Table 9
Summary statistics with CIBCR's country leading indexes as instruments

INSTRUMENTS:

	MEAN	STDEV	CORRELATIONS			
Cst	1.000000	0.000000				
JALDT	0.003146	0.013503	1.00	0.29	0.37	0.25
UKLDT	0.001078	0.006056	0.29	1.00	0.23	0.22
WGLDT	0.001533	0.005653	0.37	0.23	1.00	0.28
USLDT	0.002531	0.009265	0.25	0.22	0.28	1.00

OLS WITH HETEROSKEDASTICITY CONSISTENT STANDARD ERRORS
(Securities returns regressed on instruments)
(Consistency is achieved by the Newey-West (NW) procedure)

German stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.006115	0.004093	1.493955	0.004043
JALDT	-0.528313	0.307287	-1.719281	0.313727
UKLDT	0.856442	0.673679	1.271291	0.669450
WGLDT	1.028668	0.699139	1.471335	0.745461
USLDT	-0.742447	0.391963	-1.894175	0.438001
Rsquared is	0.027619			

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36)::

0.01	-0.02	0.08	0.08	-0.04	-0.03	0.05	0.05

U.K. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.007672	0.006315	1.214889	0.005085
JALDT	-0.045286	0.480511	-0.094246	0.394588
UKLDT	-0.828986	1.006346	-0.823758	0.841997
WGLDT	-0.234803	0.911190	-0.257689	0.937598
USLDT	0.127008	0.705268	0.180084	0.550892
Rsquared is	0.005056			

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.10	-0.08	0.06	0.00	-0.05	-0.00	0.07	-0.03

Table 9 continued

Japanese stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.007704	0.004565	1.687841	0.004318
JALDT	0.128434	0.308548	0.416253	0.335046
UKLDT	0.502277	0.691403	0.726461	0.714943
WGLDT	-0.487162	0.745188	-0.653744	0.796118
USLDT	0.451507	0.458765	0.984179	0.467765

Rsquared is 0.008194

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.05	0.00	0.06	0.05	0.08	0.08	-0.02	0.07

U.S. stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.002766	0.003427	0.807155	0.003064
JALDT	0.094160	0.240852	0.390946	0.237778
UKLDT	0.072221	0.450946	0.160154	0.507384
WGLDT	-0.842245	0.582581	-1.445712	0.564994
USLDT	0.247814	0.331390	0.747801	0.331966

Rsquared is 0.009287

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.05	-0.03	0.01	0.00	-0.00	0.03	-0.03	-0.05

Deutschemark

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.002498	0.002209	1.130873	0.002270
JALDT	-0.093262	0.180581	-0.516453	0.176112
UKLDT	0.345475	0.321228	1.075484	0.375799
WGLDT	0.344474	0.477226	0.721825	0.418468
USLDT	-0.549694	0.232381	-2.365488	0.245874

Rsquared is 0.022317

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.04	0.09	0.02	0.05	-0.00	0.03	0.03	0.08

Table 9 continued

British Pound

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.002029	0.001968	1.030766	0.002087
JALDT	0.057912	0.152396	0.380009	0.161934
UKLDT	-0.191978	0.292474	-0.656395	0.345546
WGLDT	0.246833	0.383650	0.643380	0.384779
USLDT	-0.252616	0.219688	-1.149884	0.226080

Rsquared is 0.007217

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.10	0.08	0.02	0.06	-0.05	-0.00	0.02	0.02

Japanese Yen

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.002853	0.002193	1.300887	0.002184
JALDT	-0.036799	0.171975	-0.213981	0.169500
UKLDT	-0.013601	0.340779	-0.039911	0.361690
WGLDT	-0.087413	0.378062	-0.231214	0.402756
USLDT	0.051806	0.231718	0.223571	0.236642

Rsquared is 0.000616

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.07	0.05	0.08	0.10	0.02	0.10	-0.06	-0.04

World stock market

Coeff	Value	NW Std Err	T-stat	OLS Std Err
Cst	0.003171	0.003181	0.996848	0.002855
JALDT	0.109950	0.219190	0.501620	0.221523
UKLDT	0.113356	0.435592	0.260235	0.472700
WGLDT	-0.730282	0.514128	-1.420427	0.526371
USLDT	0.260565	0.325975	0.799338	0.309273

Rsquared is 0.009033

residual auto correlations (rho1~rho2~rho3~rho4~rho8~rho12~rho24~rho36):

0.10	-0.03	0.04	-0.00	-0.01	0.05	-0.01	-0.03

Figure 1: Worldwide business cycles

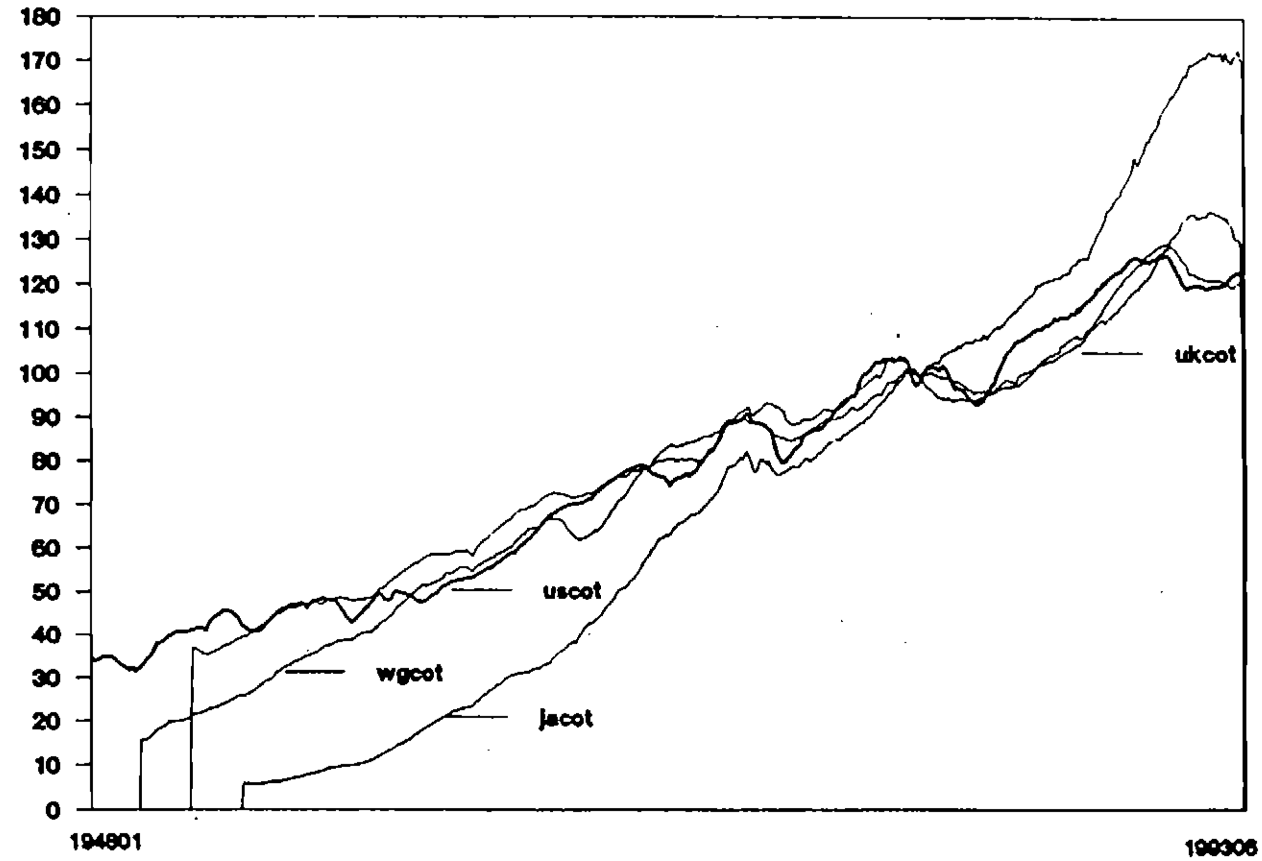

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Figure 2: Crosscorrelogram of business cycles (1954–1993)