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## Comment Campbell R. Harvey

### The Contribution

Bernard Dumas's paper is important because it bridges finance and macroeconomics. I am sure that it will cause researchers to reevaluate the way that they specify the representative investor's conditioning information. Indeed, the idea of this paper is to explore the behavior of international stock market returns with "economically meaningful" variables. These variables will be called "external" or "macro" variables. This is in contrast to previous research which focuses on "internal" variables which are usually lagged financial returns. The paper poses and answers two questions: Do the external variables predict returns? and How does the use of external variables change the tests of the international CAPM?

### Why Have Researchers Avoided Using Macro Variables?

Let me begin my discussion with an explanation of why previous research has focused on the use of financial variables as instruments. First, financial variables are available at time  $t - 1$  (last day of month) and can be legitimately used to predict returns over the next month. This is in contrast to the variables used by Dumas. None of the macro variables is available on the last day of the month—not even the number of manufacturers reporting slower deliveries.

In conditional asset-pricing tests, it is crucial to have instruments that are strictly predetermined. None of the variables used in his asset-pricing tests are predetermined. In addition, it is hard to make the argument that all investors know the data before they are released. While they might in some countries, it is not the case in the United States. These macro data are very carefully protected before their release (usually at 8:30 A.M. EST). In addition, the innovations in the announcements affect both returns and volatility (see Harvey and Huang 1993). Hence, the values of the macro variables are not known in advance.

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### The Advantages of Financial Variables as Instruments

Financial variables, on the other hand, are known on the last day of the month. In addition, asset-pricing theory suggests that financial variables should capture expectations of economic growth. A good example is interest rates. The price of the  $j$ -period discount bond,  $Q_j$ , is

$$Q_j^t = E[m_{t+j} | \Omega_{t-1}],$$

where  $m_{t+j}$  is the marginal rate of substitution between  $t$  and  $j$ , and  $\Omega_{t-1}$  is the set of conditioning information that investors use to set prices at time  $t - 1$ . Hence, the term structure of interest rates is an ex ante measure of the marginal rate of substitution, and there has been considerable previous research confirming the relation between the term structure and the business cycle.

Most finance researchers avoid the use of macro variables. Even in consumption-based asset-pricing studies it is not unusual to project personal consumption growth rates (a macro variable) on a set of stock returns and use the resultant portfolio (a maximum correlation portfolio) for asset pricing.

The first reason research has avoided these variables has already been mentioned—the data are generally not available at the end of the month. Aside from violating the econometric assumptions, we lose the important link between asset pricing and real-world asset allocation.

Second, the data are filtered with Census X-11 seasonal adjustment program. This algorithm applies a series of centered moving averages, that is, it uses data in the future to determine the seasonal weights. In addition, the moving average changes in an ad hoc way through time. The use of future data for the seasonal weights makes even a one-year lag of the data technically nonpredetermined in the econometric sense.

Third, the macro data are subject to revisions. These revisions are often very substantial—especially when the data are first differenced. Technically, one should be using the first release of the data (unless one is willing to accept the assumption that economic agents know the data in advance).

Fourth, and most importantly, economic news is filtered by investors in forming expectations. The filter is applied to the innovation in the macro release (i.e., not the first difference as Dumas uses, but the deviation of the actual release from the market consensus expectation). In addition, the filter simultaneously considers many news events. The weights in the filter are potentially time-varying. That is, sometimes a decrease in unemployment is “bad” news if participants believe that there will be an increase in inflationary pressures, and sometimes a decrease in unemployment is good news! The filter is possibly nonlinear and fundamentally unobservable. It is unlikely that it can be proxied by a linear regression of returns on macro variables. The advantage of the financial variables is that this complicated process is collapsed into the predetermined asset price.

### Predictability of Asset Returns

Expected equity returns are influenced by expected real activity. This is the main idea of Fama (1981, 1990) and Schwert (1990). Variables that forecast expected real activity should also forecast equity returns. Well-known examples are term structure variables and default risk measures.

Stock and Watson (1992) swept 280 economic series to isolate 7 which predict real activity. Data snooping is definitely an issue here. Although economic series were not swept for their ability to predict stock returns, there is a correlation between expected stock returns and expected real activity which has been documented in previous research.

Dumas identifies a number of series which "predict" stock returns: housing authorizations, growth in inventories, and the percentage of manufacturers reporting slower deliveries. If the data have been snooped, then we are stacking the deck against the asset-pricing model. Remember, the conditional asset-pricing model generates fitted expected returns. These model-fitted returns should mimic the statistical predictability in unrestricted regressions of asset returns on instruments. If the unrestricted regressions use snooped series, then it is no surprise that the asset-pricing model is rejected—it cannot be expected to explain snooped variation by changes in risk premiums and conditional betas!

### The Econometric Model

The model is identical to Dumas and Solnik 1993. Let

$$E[r_{j,t}|\Omega_{t-1}] = \Lambda'_{t-1} E[r_{j,t}(f_t - E[f_t|\Omega_{t-1}]|\Omega_{t-1}),$$

where  $\Lambda$  = vector of prices of risk and  $f$  = factors (world excess return, FX excess returns).

A general way to test this model is to note

$$E[r_{j,t}|\Omega_{t-1}] = E[r_{j,t}u_t|\Omega_{t-1}],$$

where  $u_t$  is the relative innovation in the marginal rate of substitution (MRS). In terms of the Dumas and Solnik 1993 model,

$$u_t = \lambda_{0,t-1} + \Lambda'_{t-1} f_t,$$

where  $\lambda_{0,t-1}$  is an intercept term.

However, some assumptions are required. Specifically,  $\lambda_{0,t-1}$  is "whatever term is needed to bring about" equality. More precisely,

$$\lambda_{0,t-1} = -\Lambda'_{t-1} E[f_t|\Omega_{t-1}].$$

Some interpretation of this term would add to the paper.

The econometric assumptions include

$$\lambda_{0,t-1} = -Z_{t-1}D$$

and

$$\Lambda_{t-1} = Z_{t-1}\Phi,$$

where  $D$  and  $\Phi$  are coefficient matrices and  $Z$  is the matrix of information variables. This amounts to assuming that the prices of risks are linear in the information set. For the tests, the innovation in the MRS is defined

$$u_t = -Z_{t-1}D + Z_{t-1}\Phi'f_t,$$

where the assumptions on the prices of risk are substituted into the definition of the innovation in the MRS.

However, the economic model imposes restrictions on the meaning of  $\lambda_0$  and  $\Lambda$ . These restrictions are not imposed in the estimation. For example, in the case of the classic CAPM,  $\Lambda = \lambda$ , which is the conditionally expected excess return on the market divided by the conditional variance. That is, the coefficient has an economic definition which is not imposed in the estimation.

Dumas provides a "general test"—but we lose the ability to give intuitive interpretations to results. It is hard to answer questions like What are the model pricing errors? How well does the model do in accounting for the predictability in the asset returns? How well does the model explain the cross-section of expected returns? What do the fitted risk premiums look like? What do the fitted conditional covariances look like? What are the conditional betas? and What is the forecasted premium and covariance for the next period?

The cost of a general test is the inability to answer many of these questions. The approach is limited to verdicts such as "model rejected." In my opinion, the generality is not worth the cost. The model could be rejected but provide a useful approximation to the behavior of returns. It is impossible to measure the quality of the approximation using the approach in this paper. Nevertheless, this is only a comment on the econometric implementation. The main idea of the paper, to explicitly introduce macroeconomic variables into the conditioning information set, is a provocative one and is worthy of future research.

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