DIVERSIFICATION AND ASSET VALUATION IN AN INTERNATIONAL CAPITAL MARKET*

by

Etienne Losq**

Working Paper No. 18-77

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FOR FINANCIAL RESEARCH

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*Prepared for the Conference on "Multi-Currency Management and International Trade" held at Bergamo (Italy) on October 12-14, 1977.

**The contents of this paper is solely the responsibility of the author.

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A B S T R A C T

This paper analyses the structure of an international capital market characterized by differing consumption patterns across boundaries and by uncertainty on the exchange rates, the national inflation rates and the commodity and security prices. The crucial assumption is that, independently of their nationality, investors share the same beliefs about the stochastic processes that generate the random variables. Thus the paper is compatible with a divergence, across boundaries, of the relative spot commodity prices but not with differing beliefs about how these relative prices will adjust through time.

At the micro-level, the paper indicates the separation properties of portfolio allocation in an international setting. At the macro or valuation level, it expresses the risk-return tradeoff in nominal terms and shows that, in real terms, the standard CAPM still holds. The paper ends up by analysing the factors that affect the discount rate on a forward exchange contract.

INTRODUCTION[1]

Recently, there have been suggested different approaches to give an international flavor to the domestic (i.e. essentially U.S.) models of risky asset valuation. In this paper, it will be recognized that the concept of nation (or country) cannot be ignored in the analysis of the international capital market and, therefore, that the traditional two-fund separation theorem cannot be straightforwardly extended from the domestic to the international scene. In fact there is already considerable doubt that, even in the relatively efficient U.S. stock market, investors do diversify their holdings effectively (see in this respect the recent empirical study by Blume and Friend in [6]); A posteriori then, in the international market investors cannot be expected to acquire a long position in the world market portfolio, some position in the really riskless asset, and nothing else, and this, independently of their nationalities. We suggest therefore that the two fund separation properties (as explored by Cass and Stiglitz in [5] and by Ross in [16]) are too strong to offer a reasonable representation of investing behavior in the international capital market. An obvious route towards a less strained modelization of the international capital market consists in giving some substance to the concept of nationality, which means first that the international market is regarded as something more than a replica of the domestic market and, second, that the separation properties for investment allocation, and therefore the potential profit from diversification, will be considerably weakened.

To the extent that national boundaries do have their importance for the international flow of loanable funds, we may consider giving some substance to the concept of country by endowing an investor with an investment opportunity

set that will depend on his or her nationality. This is the route followed by Adler and Dumas [1] and by Black in [4]. Whereas Adler and Dumas resort to an hypothesis of segmentation to differentiate the investment opportunity sets, Black simply assumes the existence of an ad valorem tax on capital gains realized abroad, which leads him to derive a three fund separation theorem instead of the customary two fund result. Both papers take into account distortions of the capital market that, although apparent, are generally neglected in a domestic setting, but that play a much more considerable role in the international scene. Thus, although discriminatory systems of taxation exist also at the domestic level, they appear more prevalent on transactions from one country to another, which gives the Black model a distinctive international flavor in spite of the absence of exchange rate fluctuations in this model. We can note also, as a side remark to the Black model, that a valid representation of the system of taxes in the international capital markets would ideally account for the non-linearity between the decision variable (i.e. number of shares acquired in some foreign stock) and the after-tax receipts (i.e. the capital losses will not be subsidized correspondingly). Black avoids the issue by assuming a perfectly linear system of taxation, which constitutes of course a sacrifice of realism at the profit of analytical convenience.

As a matter of methodology, we can note also that, even without accounting for the problems posed by the existence of foreign exchange risk, the construction of a workable model of the international capital market would be based on a perfect replica of the domestic model, i.e. devoid of any international specificity, or else, by incorporating features based on the nationality of the investor (such as taxation of foreign capital gains, partial segmentation of the national capital markets or heterogeneous expectations across boundaries -- discriminatory features that would violate the assumptions leading to the

classical results), such an international model of capital asset pricing would have to assume a perfect short-sale mechanism (as Black does) both at the domestic and international level to avoid untractable analytical difficulties. We suggest therefore that the price to be paid to represent in a workable model specific national features consists in assuming that any investor, independently of his nationality, can short-sell any asset that he can buy long, an evidently strong assumption.

To avoid this dilemma it is always possible to define a model as international if it accounts for the exchange risk, and hence for the reality of multiple currencies, even if the investment opportunity sets stay the same across boundaries. A good illustration for this line of work can be found in Heckerman [12] or, more recently, in Grauer et al. [9]. In these models the investors, independently of their nationality, consume the same commodity basket and have the same investment opportunities. Thus, in this framework, no definition of nationality exists and the concept of currency is not vacuous only to the extent that governments issue bonds that are riskless in terms of their national currencies. These models, however, while accounting for the multi-currency feature of the international capital market, can still keep a relatively simple structure because two-fund separation properties still apply, which means that, if a really riskless asset is available, the questionable assumption of perfect short-selling across boundaries is not needed.

There exists finally a last approach to the study of the international capital market that can be viewed as a synthesis of the two alternatives briefly reviewed above. This approach recognizes both the existence of multiple currencies and the dependence of the investment opportunity set on the investor's nationality. The elaboration of these truly international models is still at its infancy. Solnik, in [17], appears as the precursor of such an approach.

Indeed he imagined a scenario where, in each country, consumption would be restricted to the national good, whose price would stay fixed relative to the national currency but would change relative to foreign currencies because of the existence of foreign exchange risk.

In this perspective, therefore, nationality is defined in terms on consumption. It follows that, although all investors have an equal access to the different securities markets, because difference in nationality means difference in consumption goods, the investment opportunity set in real terms -- i.e. how much consumption tomorrow can be gained by a denial of consumption today -- will depend on the nationality of the investor. This assymetry among investors causes, in turn, a considerable weakening of the separation properties that we could expect, as Solnik's article and the present paper clearly illustrate.

The present paper is influenced by Solnik's original work but will underscore the unnecessary limitations that Solnik imposed on his model. The a priori restriction of consumption to the national good constitutes the first limitation of the model. Besides its extreme character, this restriction of the consumption opportunity set to one good does not appear devoid of inconsistencies. Indeed, as Grauer et al. suggest in [10], there are only two possibilities. Either production of foreign goods is allowed and, in this case, the return on the national market portfolio cannot be considered independent of the relative price of the different national goods, i.e. independent of the exchange rates, an assumption explicitly made by Solnik. The second possibility restricts both consumption and production to the national good, a scenario of autarky where the potential for international diversification is not fully apparent.

In contrast with the kind of framework found in Solnik's work, we will present an interpretation of the international capital market where all investors have access to the same consumption opportunity set but where tastes depend

on the investor's nationality so that consumption patterns may change across boundaries.[2] For that reason, the investment opportunity sets in real terms will be specific to each country as in Solnik's model but we will not restrict in any way the form of the investors' utility functions in contrast with the approach adopted by Solnik or by Grauer et al.[3] Futhermore we will exploit the continuous-time technique developed by Merton in [14] and we will thus be in position to incorporate into the analysis the random fluctuations of the exchange rates. This technique appears much more powerful than its discrete-time counterpart to deal with multiple currencies and thus with products of random variables. In this respect a recent paper by Guy in [11] illustrates clearly the awkwardness of a discrete-time framework to deal with multiple currencies.

This paper will incorporate three features into a single model: existence of uncertain inflation in each country, existence of exchange risk, and existence of divergences in consumption tastes across boundaries. The model proposed here will, however, fall short on at least one point: the commodity price index defined below, and used as a building block in the definition of the risk-return tradeoff, will not generally be measurable on the basis of market variables. The special cases where the composition of the index can readily be assessed correspond to scenarios already investigated in the literature, namely the Solnik and the Grauer et al. versions of the international capital market.

The analytical developments to be found here will build on the results of an earlier paper, [13], devoted to the study of the effects of differing consumption patterns in a domestic capital market. The rest of these pages will be organized as follows: we will first investigate the structure of the demand functions for risky assets in an international setting; we will then proceed by expressing the risk-return tradeoff both in nominal and real terms; finally, we will end the paper by determining the equilibrium discount rate on a forward contract and presenting some comments about the notion of exchange risk.

Structure of the Demand for Risky Assets

Let us envision an international exchange economy with an arbitrary number of countries, commodities, securities and investors. We assume that, for each currency, there exists a security that is riskless in terms of this currency. We assume, besides, that some arbitrary currency is chosen as numeraire and that, in terms of this numeraire, the prices of the securities, Ps, s=1, ... ,S, and the prices of the commodities π_g g=1, ... ,G.follow continuous stationary diffusion processes. As is well-known this representation is consistent with the non-negativity constraint on prices.

In this framework, each investor attempts to maximize the expected utility of his lifetime stream of consumption by choosing the optimal values for his investment portfolio and for his flow of consumption of commodity g, g=1 ... ,G. The application of stochastic calculus to the above optimization problem yields the following results:

Theorem 1: any investor will be indifferent to the reduction of his investment opportunity set from the original set to a reduced set consisting of the world market portfolio and G hedging portfolios whose composition depends on aggregated characteristics of the international market.

Proof: Appendix A in Losq [13]

Thus, in the general case where tastes differ across countries and where uncertainty is prevalent on at least G commodity prices, any investor is going to allocate his wealth between G+1 funds, the composition of which is determined by the aggregation of national variables. We can note also that the asset that is riskless in terms of the investor's currency does not play any pivotal role in the analysis. Also Theorem 1 implies that we can obtain the classical results of two fund separation if we are willing to assume that every investor, regardless of his nationality, consumes the same commodity basket. In that case only

the price of this universal commodity basket matters so that G=1 and that the unique hedging portfolio becomes a zero-beta portfolio. Thus, in that case, in the absence of a really riskless asset, we find ourselves into an international version of the no-borrowing, no-lending world investigated by Fisher Black.

In the general case the composition of the G hedging portfolios will depend on the variance-covariance matrix of the relative changes in prices. There exists an important special case, though, where we can identify the G hedging portfolios; this happens when the market can be considered complete, i.e. when the price of any commodity can be represented by a linear combination of the securities prices. Thus, we will assume, for convenience, that for every commodity there exists a specific security, called a commodity forward contract, whose price will be proportional to the commodity price. In this framework, as a corollary to theorem 1 we can state:

Corollary 1: when the international capital market is complete any investor, independently of his nationality, will be indifferent between his original investment opportunity set and a reduced set consisting of the world market portfolio and the G forward contracts associated with the G commodities whose future price is uncertain.[4]

Proof: Appendix A in Losq [13]

This corollary indicates therefore that, if the nominally riskless bond of some country does not play the role of a forward contract (i.e. if, in terms of the currency of this country, the price of any commodity basket stays random) then this bond will be held by resident investors and foreign investors alike at the pro rata share of its market value. Therefore, to the extent that the supply of such a bond would be zero, nobody will hold this nominally riskless

bond. We can note that the same remark could be made also in the context of the international model developed by Grauer et al. in [9].

Now we are going to be still more specific. Like Solnik we are going to consider that, for every country, there exists a commodity called the national commodity, so that the price of this commodity in terms of the country's currency stays constant. Thus, in corollary 2, we place ourselves in a world where the nominally riskless bonds of the different countries play the role of forward contracts:

Corollary 2: if, for every commodity, there exists a currency in terms of which the commodity price is not random, any investor will form his portfolio as a linear combination of the world market portfolio and the G national (nominally riskless) bonds.

Proof: direct application of corollary 1

We note that, in this specific framework where the national bonds play the role of commodity forward contracts, even if the net supply of this bond is zero, some investors will hold a long position and some a short position in this bond, depending on their consumption and risk-aversion patterns.

We can still go a step further towards Solnik's framework and assume that an investor is limited to the consumption of his national good. With this questionable assumption at hand, we obtain a stronger separation result:

Corollary 3: if the own currency denominated price of any national good is non-random and if investors have to consume the national good exclusively, then any investor will choose a portfolio consisting of the world market portfolio, a portfolio of the national bonds and his country's nominally riskless bond, where the composition of the first two portfolios depend only on market characteristics.

Proof: from Appendix A in Losq [13], the demand vector D for the securities can be written:

$$J_D^h = V^{-1} a_o A^{-1^h} + {}^{0}B_g^h \pi_g \qquad (1)$$

where: V is the variance-covariance matrix for the securities returns; h denotes an arbitrary investor of the specific country c; a_o is the column vector of the securities risk premia; A^h the coefficient of absolute risk-aversion for investor h; π_g the current price of commodity g;

$B_g^h = J_{Wg}^h / J_{WW}^h$ where $J(W^h, \pi_o)$ is the indirect utility function for investor h with current wealth W^h and a vector of current commodity prices equal to π_o.

Since an investor h of country c restricts his consumption to his national commodity, i.e. the commodity c, then the marginal increase in utility caused by a decrease in any commodity price except π_c is zero, which means that:

$$g \neq c \quad B_g^h = 0$$

This implies that equation (1) can be rewritten as:

$$D^h = (A^{-1})^h \; V^{-1} a_o + 0_c \qquad (2)$$

where 0_c is a vector consisting uniquely of zeros except for the element corresponding for the bond of country c since B_c^h is different from zero. Corollary 3 is a verbal transcription of equation (2).

It can be readily seen that corollary 3 corresponds to the second separation theorem proposed by Solnik. However we have proven corollary 3 without any assumption on the returns other than technical requirements of continuity and stationarity. In particular, the doubtful assumption made by Solnik denying any correlation between exchange risk and market returns appears quite superfluous.

We have seen also (Theorem 1 and Corollaries 1 and 2) that weaker separation theorems can be attained if less structure is imposed on the economy.[5]

Risk Return Tradeoff

We now look at the tradeoff between risk and return in the international capital market where both consumption tastes and risk-aversion differ across boundaries. Here, we are coming back to the minimal set of assumptions that was used for theorem 1: securities and commodities prices follow stationary continuous diffusion processes and, for each country, there exists a riskless bond in nominal terms. Under those conditions we can state:

Theorem 2: there exists a commodity price index π, i.e. a linear combination of the commodity prices, such that, in terms of an arbitrary currency, the expected return on a security s is the sum of three components:

1) the risk-free rate for that currency: R
2) one minus the world market price of risk times the covariance between the security's returns and the relative change in the commodity price index: $(1-C)\ \sigma_{s\pi}$
3) the world market price of risk times the covariance between the security's returns and the world market returns: $C\ \sigma_{sM}$

Proof: see proof of Theorem 3 in Losq [13]

We emphasize that the form of the risk return tradeoff is independent of the particular currency that is chosen as a numeraire[6] but that, as we shall see, the particular values taken by the risk-free rate or the covariance terms would differ with the choice of another currency as numeraire.

Whenever there exists only one commodity that is characterized by price uncertainty, or if all investors throughout the world consume the same commodity basket, then the commodity price index will simply be the price of this basket denominated in the particular currency considered. Theorem 2 appears therefore as a generalization to multi-commodity price uncertainty of the framework developed to analyse uncertain domestic inflation by Friend et al. in [7].

Theorem 2 indicates also that a necessary and sufficient condition for commodity price uncertainty to play a role in the international risk-return tradeoff is that the world market price of risk, C, be different from unity. This international market price of risk is simply the wealth-weighted harmonic mean of the different countries' aggregate risk-aversion coefficients. We can see that the variable C really measures the market price of risk by referring to theorem 3:

Theorem 3: the traditional form of the capital asset pricing model is preserved in real terms, in spite of the presence of uncertain inflation, exchange risk and differing consumption terms, under one condition: there exists an asset whose price stays proportional to the international commodity price index.

Proof: if we denote the real price of a security by $p_s = P_s/\pi$, i.e. the nominal price deflated by the commodity price index, and by r the real rate of return, i.e. the relative increase in purchasing power yielded by an indexed or really riskless bond (the purchasing power being defined in terms of the commodity price index), we will have, from theorem 2:

$$E(dp_s\pi/p_s\pi) = R + (1-C)\ COV(dp_s\pi/p_s\pi,\ d\pi/\pi) + C\ COV(dp_s\pi/p_s\pi,\ dm/m)$$

Where: m is the real or deflated value of the world market portfolio; $m = M/\pi = \sum_s P_s/\pi$. Now we can apply the previous equation to an arbitrary security s and to the indexed bond. By using Ito's lemma (see, for instance [14]) and by replacing the nominal interest rate by its expression as a function of the real rate we obtain:

$$E(dp_s/p_s) = r + C\ COV(dp_s/p_s,\ dm/m)$$

Theorem 3 is a verbalization of the previous equation.

Thus, in spite of the presence of exchange risk and commodity price uncertainty, if we deflate all securities prices by the commodity price index, we are still in a position to state that two components only enter the determination of the expected real return on a security: the real interest rate (common to all countries) and the systematic risk, valued at the international market price of risk; we have defined here the systematic risk as the covariance between the security's real returns and the world market portfolio's real returns.

Theorem 3 appears also as the continuous-time version of the results obtained by Grauer et al. in [9]. These authors, however, could not incorporate into their model the risk-return tradeoff when consumption patterns are different across boundaries. Although in a domestic setting we can presumably ignore divergent patterns of consumption inside the investing population, such a procedure appears questionable in an international context where empirical studies have consistently shown that the composition of the national commodity basket would differ significantly from one country to another, hence the potential interest of the analysis pursued here.

Exchange Risk and Forward Discount

Finally, we can exploit the results obtained above to determine the factors that affect the discount rate on a forward contract and, thus to propose a characterization of the exchange risk. As is well-known by now, the discount rate on a foreign exchange forward contract would be expected to coincide with the differential between the nominally risk-free interest rates in the two countries, domestic and foreign. It is therefore only a matter of algebra to derive the discount rate from the risk-return tradeoff of Theorem 2:

Corollary 4: the discount rate on a forward contract (or, alternatively, the differential in interest rates) is the sum of two components:

1) the differential in the expected relative increase in purchasing power of the two currencies
2) the world market of risk times the exchange risk.

Proof: let us take as numeraire the domestic currency; the price P_f of a foreign nominally riskless bond characterized by the nominal interest rate R_f (f for foreign) will be such that:

$$dP_f/P_f = R_f\, dt + dS/S$$

Where: S is the value of the foreign currency in terms of the domestic currency. Applying Theorem 2 to this foreign bond we obtain:

$$R_f - R = \text{discount rate} = -E[\frac{dS}{S}] + (1-C)\ COV(dS/S,\ d\pi/\pi) + C\ COV(dS/S,\ dm/m)$$

an equation for which an alternative presentation is:

$$R_f - R = \text{discount rate} = E[d(S/\pi)/(S/\pi) - d(1/\pi)/(1/\pi)] + C\ COV[dS/S,\ dm/m]$$

Where: S/π represents the purchasing power of one unit of foreign currency ($1/\pi$ one unit of domestic currency) and where COV[dS/S, dm/m] stands for exchange risk; hence, corollary 4.

Corollary 4 suggests a rather obvious remark. Indeed it indicates that, even if we abstract from the exchange risk, a discrepancy will still remain between the forward discount and the expected relative appreciation of the currency, E(dS/S). This discrepancy would result from commodity price uncertainty, the presence of which makes it mandatory not to consider the nominal value (the relative increase in the exchange rate) but the real or purchasing power of the currency, $d(S/\pi)/(S/\pi)$. Thus the forward discount would depend crucially on how much the holding of one unit of foreign currency would be expected to yield in increased purchasing power, as contrasted with the holding of domestic currency. As a first approximation, this term could be estimated by the expected difference between the domestic and foreign rate of inflation, although, because of divergent consumption patterns across boundaries, the inflation rate (the relative increase in the cost of the national consumption basket) would not measure appropriately the decrease in the purchasing power of the currency since the purchasing power is defined in terms of an international commodity price index, π, whose composition stays invariant across boundaries.

Also, along with Corollary 4, we have proposed to define as exchange risk that part of exchange rate variability that the market values, namely the covariance

between relative changes in the exchange rate and the real return on the world market portfolio. Since this world market return measures the relative increase in purchasing power generated by holding the world's securities, and therefore reflects changes in the world's real wealth, then the exchange risk measures to what extent an increase in the general level of prosperity is followed by an appreciation of the currency. Thus, Corollary 4 would indicate that, if the value of a currency exhibits a cyclical (counter-cyclical) pattern, then the exchange risk is positive (negative) and the foreign currency would tend to command a discount (premium) on the forward market.

As far as the determination of the interest rate is concerned, the implications for monetary stabilization then are clear, to the extent that the value of a currency is inversely correlated with the money supply. Indeed, with a cyclical monetary policy (expansion of money supply in times of prosperity and contraction in times of recession), the exchange risk would be negative so that, in this framework, a high level of uncertainty in the monetary policy followed by a country would have the paradoxical effect of decreasing the interest rate required by the world-wide investing population to hold the risk-free bonds offered by that country. In contrast, with a counter-cyclical monetary policy (i.e. a tendency towards monetary expansion as a response to unemployment and depressed economic activity), then the exchange risk, COV[dS/S, dm/m], would be positive which, according to Corollary 4, would mean that, the lower the uncertainty about future monetary conditions, the lower the nominal rate of interest demanded by investors to hold the currency-denominated nominally risk-free securities. Such a scenario of counter-cyclical monetary policy appears reasonable and would offer a rationale for the monetary authority to adopt a stable and smooth course of action, so as to limit the fluctuations of the exchange rate, which, by limiting the exchange risk, would tend to reduce the cost of financing through sources outside the national capital market.[7]

FOOTNOTES

1. As a preliminary point, it should be mentioned that this paper would not have gone past the embryonic stage without the support and expertise I was fortunate enough to receive from the Rodney L. White Center for Financial Research and, more especially, its director, Irwin Friend.

2. In this paper we have focused on consumption tastes and their heterogeneity from one country to another in order to make the investment opportunity set dependent, in real terms, on the investor's nationality. This same purpose could have been reached, also, by considering that commodity prices, even if measured in a common numeraire, do differ from country to country, at least as far as services and non-tradeable goods are concerned. Surprisingly enough, the analysis of such a scenario, based on the violation of the law of one price, would require only national changes to be encompassed by the framework developed in this paper. To be precise, even if relative prices of goods differ from country to country, to the extent that all investors share the same expectations as to the rate of increase or decrease of the commodity prices, then Theorems 1, 2 and 3, as well as Corollaries 1 to 4 of this paper would still hold. The justification for the above statement lies in the fact that indexing the current commodity prices by the nationality of the consumer-investor considered would neither affect the composition of the separation portfolios nor the value of the commodity price index which depends only on the relative changes in the commodity prices, not on their current levels. Thus we venture that the crucial limitation of this paper lies in the assumed homogeneity, even across boundaries, of expectations about the future rates of change of both security and commodity prices.

3. The utility function has only one argument in Solnik's model whereas Grauer et al. chose homothetic functions.

4. Corollary 1 indicates therefore that, if for each commodity whose price is uncertain, there exists the equivalent of a commodity forward contract on which short or long positions can be taken, then investors would not be expected to short-sell any security that forms the world market portfolio. In contrast the validity of Theorem 1 for incomplete markets would require a perfect short-selling mechanism for every security and not only for a subset of these.

5. In particular, the model sketched in these pages can account for uncertain inflation in any country. In that case, Corollary 1 yields the strongest separation result that can be involved in this framework, namely that the commodity forward contracts, and not the nominally riskless bonds of the different countries, will be used as separation portfolios. This would tend to suggest that Solnik's contention in the ninth footnote of his paper is invalid.

6. The market price of risk, C, as the wealth-weighted harmonic mean of the individual coefficients of absolute risk-aversion, is invariant to changes in scale (i.e. to changes in numeraire) since the utility function is homogeneous of degree zero in wealth and commodity prices.

7. The last paragraph of this paper assumes implicitly that the monetary policy followed by the domestic country does not affect the interest rate in the foreign country. Such an assumption would definitely be invalid where the domestic country is the United States.

REFERENCES

1. Adler, Michael and Dumas, Bernard, "Optimal International Acquisitions," The Journal of Finance, March 1975.

2. ----------, "The Microeconomics of the Firm in an Open Economy," The American Economic Review, Vol. 67, No. 1.

3. Anderson, James and Riley, John, "International Trade with Fluctuating Prices," International Economic Review, February 1976.

4. Black, Fisher, "International Capital Market Equilibrium with Capital Barriers," Journal of Financial Economics, 1, 1974.

5. Cass, David and Stiglitz, Robert, "Some Results in the Pure Theory of Mutual Funds," Journal of Economic Theory, 1973.

6. Friend, Irwin and Blume, Marshall, The Individual Investor and the Stock Market, 20th Century Fund. Forthcoming.

7. Friend, Irwin, Landskroner, Yoram and Losq, Etienne, "The Demand for Risky Assets Under Uncertain Inflation," Journal of Finance, December 1976.

8. Genberg, Hans, "The Concept and Measurement of the World Price Level and Rate of Inflation," Journal of Monetary Economics, 3, 1977.

9. Grauer, Frederic, Litzemberger, Robert and Stehle, Richard, "Sharing Rules and Equilibrium in an International Capital Market under Uncertainty," Journal of Financial Economics, 3, 1976.

10. ----------, "Reply to Bruno Solnik" mimeograph, undated.

11. Guy, James, "The International Capital Asset Pricing Model in Discrete Time," Berkeley Working Papers, undated.

12. Heckerman, Donald, "On the Effects of Exchange Risk," Journal of International Economics, 3, 1972.

13. Losq, Etienne, "Commodity Price Uncertainty and Capital Market Equilibrium," mimeograph, July 1977.

14. Merton, Robert, "An Intertemporal Capital Asset Pricing Model," Econometrica, September 1973.

15. Roll, Richard and Solnik, Bruno, "A Pure Foreign Exchange Asset Pricing Model," mimeograph, August 1975.

16. Ross, Steve, "Mutual Fund Separation," Rodney L. White Center for Financial Research Working Paper, 1976.

17. Solnik, Bruno, "An Equilibrium Model of the International Capital Market," Journal of Economic Theory, 8, 1974.

18. ----------, "Sharing Rules and Equilibrium in an International Capital Market: a Comment," mimeograph, undated.