



RISK PREMIUMS IN FOREIGN EXCHANGE MARKETS

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Preface

This book contains four papers on international finance and financial economics. The first two papers explore the nature of risk premiums of exchange rates and test the market efficiency hypothesis in foreign exchange markets. The third one is an empirical analysis of firms' financing and investment decisions with imperfect capital markets. The last one examines the relationship between stock returns and the inflation variability.

Empirical studies have found that a forward rate is a biased predictor of the future spot rate. This finding has led some researchers to conclude that the foreign exchange market is inefficient. This conclusion is false because the unbiasedness test is a joint test of efficiency and a constant risk premium. The failure of either hypothesis could lead to the rejection of the unbiasedness. So modeling the risk premium correctly becomes a crucial step to test the market efficiency hypothesis. In the first paper, entitled "Macroeconomic Uncertainty and the Risk Premium in the Foreign Exchange Market", I derive the a tractable time-varying risk premium using Lucas' asset pricing model (1982) under the

assumption that money and production follow a joint stochastic process with time-varying variances and covariance. The model implies that the risk premium in the foreign exchange market is due to time-varying volatilities in macroeconomic variables of both domestic and foreign countries. Compared with previous studies, my model provides potentially clearer insights into the nature of the risk premium in the foreign exchange market. The testing of the model for three currencies relative to the US dollar shows that the time-varying risk premium is significant in explaining the deviation of the forward foreign exchange rate from the future spot rate. The results also partially support the market efficiency hypothesis after accounting for the time-varying risk premium.

Like other researchers, I take an univariate time series approach to model the risk premium in the first paper, implicitly assuming that the risk premium of one currency is determined independently of other currencies. However, the forecast errors of the future spot rate, or the deviations of the forward foreign ex -

change rate from the future spot rate are found to be highly cross-correlated. This suggests that there exists some common factors which influence risk premiums in foreign exchange markets, and that multivariate asset pricing approaches such as the Arbitrage Pricing Theory can provide new insights into the determination of risk premiums in foreign exchange markets. In the second paper, entitled "Common Return and Volatility Movements in Forward Foreign Exchange Markets: A Multivariate Dynamic Factor Pricing Model", I develop a multivariate dynamic factor pricing model to explain returns to a set of forward exchange rate contracts. In the model, the expected components (or the risk premiums) of the returns in the forward exchange market are determined by the volatilities of the common factors, and the unexpected components of the returns are captured by the levels of the factors. Two types of factors are considered in the model: observable factors which represent the shocks of the economic variables to the forward exchange markets, and unobservable factors which represent the fundamental influences on the returns that are not

captured by innovations in the economic variables. The model is examined for a set of forward contracts of six currencies relative to the US dollar. After one observable factor is accounted for, I identify two unobservable factors; the first one is mainly attributed to the Deutschemark which is the most influential currency in the European Monetary System, while the second one is attributed to the Canadian dollar which has a close tie with the US economy.

Theoretical studies on capital structure suggest that when capital markets are imperfect, the capital structure is relevant to a firm's financing decision. More specifically, because of informational asymmetries and agency problems, outside investors demand a premium on a debt or stock issued by a firm which cause external funds to be imperfectly substitutable for internal funds. Since informational asymmetries and agency problems are associated with firms' characteristics, starting from the value of their net worth to their debt obligations, one expects that the sensitivity of investment to the availability of internal funds should vary across firms, and over the time, as general macroeconomic conditions af-

fect the value of firms net worth. In the third paper, entitled "Investment and Financing Constraints: A Switching Regression Approach Using US Firm Panel Data", I test the hypothesis using Tobin's Q model of investment and the switching regression technique. I assume that a firm at each point in time may operate in two investment regimes: a financially constrained regime with higher sensitivity of investment to cash flow, and a financially unconstrained regime with a lower sensitivity of investment to cash flow. The regime under which the firm is operating is determined by a switching function and a threshold. I estimated the model on a panel of 584 US manufacturing firms for the period from 1978 to 1987. The results provide strong evidence that excess sensitivity of investment to cash flow varies with a set of financial factors. In particular, I find that the leverage ratio, interest coverage ratio, cash to capital stock ratio, firm size, investment opportunity, and whether or not the firm has received a bond rating have significant effects on a firm's likelihood of being financially constrained. The variation of this likelihood appears to be consistent

with overall business cycle conditions and the stance of monetary policy.

While a large number of empirical research have documented a negative relationship between inflation and real stock market returns for the United States and a number of other countries, the explanation for this relationship has not been resolved. One possibility, suggested by Fama (1981), is that the relationship is not a true causal one, but only a proxy for the true relationship between expected economic activity and stock returns. Another possibility is that there is a direct, causal relationship based on the well-documented tendency for higher rates of inflation to be more variable and hence promote greater uncertainty. According to this variability hypothesis, a rise in inflation generates greater uncertainty which, in turn, depresses stock returns. Unfortunately, the empirical evidence to date on the proxy hypotheses for the United States has been mixed, and the only major studies of the variability hypothesis of which we are aware found negative results. In the fourth paper I reexamine the variability hypothesis using different

method and sample. I find that the hypothesis is strongly supported for the United States over the period from the mid-1960s through the 1970s when inflation was high and rising but not over the more recent period when inflation was low or falling. I argue that these results highlight the need for refinements in the formulation of the variability hypothesis.

These four papers have been presented at several academic meetings. The first and the third papers have been published by *Journal of International Money and Finance* and *Review of Economics and Statistics* respectively. The second paper has received the award of outstanding doctoral student paper at the 1994 Eastern Finance Association Meetings in the United State.

Xiaoqiang Hu

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Chapter 1

Macroeconomic Uncertainty and the Risk Premium in the Foreign Exchange Market

Abstract

In modeling the risk premium in the foreign exchange market, we assume that money and production follow a joint stochastic process with bivariate GARCH innovations. Our formulation is based on Lucas' asset pricing model and implies that the risk premium in the foreign exchange market is due to time-varying volatilities in macroeconomic variables. Testing the model for three currencies shows the time-varying risk premium to be significant in explaining the deviation of the forward foreign exchange rate from the future spot rate. Diagnostic testing of the model partially supports the market efficiency hypothesis after accounting for the time-varying risk premium.

I. Introduction

An exchange rate is the price of one currency in terms of another, and a forward rate is the contractual exchange rate established at date t for a transaction that will occur at date $t + k$ in the future (the maturity date). Risk premium is an expected return in excess of that on risk-free securities, the premium provides a compensation for the risk of an investment. Assuming that the forward exchange market is efficient and that speculators are rational, the forward rate must be an unbiased predictor of the expected future spot rate, and no profit can be made by speculating in the forward market. However, this hypothesis has been overwhelmingly rejected by empirical research based on various techniques and data sets.^① Before concluding that the foreign exchange market is inefficient, an alternative hypothesis draws economist's attention; namely, a risk premium may exist in the forward exchange market. Because the unbiasedness test is a joint test of efficiency and a zero risk premium, the failure of either the efficiency or the zero risk premium assumptions could

① See Geweke and Feige (1979), Frankel (1980), Hansen and Hodrick (1980), and Hakkio (1981).

lead to the rejection of unbiasedness. Empirically, the findings by Cumby and Obstfeld (1982) and Hansen and Hodrick (1983) of serially correlated forecast errors suggest the possibility of time-varying risk premiums in the forward exchange markets. Therefore, modeling risk premiums becomes a crucial step in testing market efficiency.⁽¹⁾

Extensive studies have attempted to explain and test risk premia in foreign exchange markets. Frankel (1982) proposes a portfolio balance model in which investors optimize over the mean and variance of expected returns. The model implies that the risk premium in the foreign exchange markets depends on the supplies of nominal government bonds and investors' risk aversion. However, Frankel fails to find such a risk premium which explains the deviation of the forward rate

(1) The existence of a time-varying risk premium is also an important issue in the international finance literature. Several monetary models of foreign exchange rates built on the joint assumptions of market efficiency and no risk premium do not perform well (see Meese and Rogoff, 1983). We should check whether the existence of a time-varying risk premium is responsible for the poor empirical performance of these relationships, and if necessary, adjust for time-varying risk premia when we apply the models.

from the expected future spot rate. Hansen and Hodrick (1983) apply the Intertemporal Asset Pricing Model to the context of the risk premium in the forward foreign exchange market. They find that the conditional first cross-moment between the intertemporal marginal rate of substitution of domestic money and the normalized profits from foreign exchange speculation equals zero. Because of the highly stylized nature of the model, Hansen and Hodrick are unable to test the model; they introduce instrumental variables as proxies for the risk premium. Their work has been followed by Hodrick and Srivastava (1984) and Mark (1985), who find only weak support for a time-varying risk premium. Without relying on any theoretical model, a few researchers have attempted to model a risk premium using a time series approach. Domowitz and Hakkio (1986) test whether the risk premium can be explained by the ARCH-in-mean model, where the risk premium is a function of the conditional variance of the errors in forecasting the spot rate using the forward rate. Baillie and Bollerslev (1990) use a multivariate generalized ARCH approach where the forward rate forecast error is modeled by a MA (4) process. Again little support is found for a time-varying risk premium.

A possible reason that previous empirical studies have not uncovered a time-varying risk premium is that these studies fail to directly test theoretical models because they are, in general, highly stylized. Accordingly, they cannot focus on the nature of the time-varying risk premium; in particular, the relationship between macroeconomic uncertainty and the time-varying risk premium in the foreign exchange market. It is known that a risk averse investor demands a premium to compensate for the risk of holding a currency. As macroeconomic uncertainty is the main source of such risk, its importance should be emphasized. Using a cash-in-advance model with a log normal process of the exogenous variables, Hodrick (1989) is able to highlight such a relationship from a theoretical perspective and provides a new direction for empirical work in this area. In his model, Hodrick shows that the exchange rate is affected by changes in the variances of the exogenous macroeconomic variables. Hodrick also derives the risk premium function for the forward foreign exchange rate, but he does not perform an empirical test.

Following Hodrick's approach, in this paper we derive the time-varying risk premium with a more general specification of the exogenous variables process,