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ABSTRACT

Sovereign Risk and Return in Global Equity Markets*

Standard asset pricing models have difficulty explaining cross-sectional differences in observed equity risk premia of developed and emerging markets. We argue that national equity returns are subject to sample selectivity and peso biases. The lack of credible commitment to keep capital markets open (risk of expropriation) leads to these biases. We develop a general equilibrium model for systematic risk (related to market risk and volatility risk) and sample selectivity. We find that after taking account of the sample selectivity bias, our model of systematic risk can account for the differences in risk premia quite well. We estimate the average expropriation risk to be about two-thirds of the ex-post risk premium for emerging economies and close to zero for developed economies. Further, we argue that the measured selectivity bias in equity premia provide valuable economic information regarding the incentives for sovereigns not to expropriate international investors. We find that the measured expropriation risk is related to reputations in capital markets (as argued in Eaton and Gersowitz, 1981) and to the magnitude of trade that an economy conducts (as argued in Bulow and Rogoff, 1989a, 1989b).

JEL Classification: F31, F34, G12 and G15
Keywords: credibility, dynamic general equilibrium model, international CAPM, peso problems and sample selectivity

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1 Introduction

An important message of economic models of asset prices is that expected rates of returns only reflect systematic risk. In the context of developed and emerging equity markets this implies that expected rates of returns reflect aggregate global risks. However, standard economic models have considerable difficulty in capturing the cross-sectional differences in risk premia across these markets. We show that additional risks, unique to sovereign nations, such as the imposition of capital controls (as seen in Malaysia in 1998) and the consequent expropriation of international investors are critical to understanding the risk-return relation in national equity markets. Further, we argue that these unique risks, which are related to sample selectivity biases, provide empirical insights regarding why sovereigns may (or may not) default on their international borrowing (see Eaton and Gersowitz, 1981, and Bulow and Rogoff, 1989a, 1989b).

The possibility that sovereign nations may impose capital controls and hence expropriate international investors, makes the equity issued in sovereigns akin to defaultable debt. Gibson and Sundaresan (2001), and Duffie, Pedersen, and Singleton (2001) present models for capturing the dynamics of sovereign bond spreads, where sovereign default issues are important as well. These papers, however, do not focus on risks in equity markets. Evaluating whether the cross-section of national equity markets (which are open to international investors) solely reflects systematic risks requires that we take account of the fact that currently open markets may in the future, either impose capital controls or completely shut down. Related to this idea, Brown, Goetzmann, and Ross (1995) theoretically show that mean returns may be biased upward due to survival biases. Using a different approach (similar to Heckman, 1976, 1979), we present a selectivity model where the sample selectivity bias is related to attributes of a given market. We also provide a relation between the selectivity bias and the sovereign risk in bond markets. In addition, we show that there is a *peso* bias, in that the econometrician does not observe imposition of capital controls (and market shut-downs) with the requisite probabilities. After accounting for sample selectivity and the peso bias, the measured cross-section of equity premia should solely reflect systematic risks. We find that the selectivity effects are large—after taking account of these, indeed it seems that national equity markets essentially reflect systematic risks. We discuss our model of systematic risks in greater detail below.

In addition to understanding the cross-sectional differences in risk premia across national markets, our approach allows us to address issues regarding the motivations for sovereigns for not expropriating foreign capital (e.g., repaying their debts). In particular, Eaton and Gersovitz (1981) argue that sovereign nations fulfill their international obligations to avoid reputational losses to keep their costs of international borrowing low. This argument suggests that the selectivity bias in the cross-section of risk premia is related to reputational proxies. In contrast, Bulow and Rogoff (1989a, 1989b) argue that foreign lenders must be able to impose direct sanctions (such as trade-sanctions) to induce sovereigns to satisfy their international obligations. In this case, the selectivity bias should be decreasing in trade activity measures like imports and exports. English (1996) and Conklin (1998) focus on specific historical episodes to evaluate which of the two motivations lead sovereigns not to expropriate international investors.

There are two important ingredients in our empirical work—a model for sample selectivity and one for systematic risk. Our analysis captures the idea that the international marginal investor can invest in wide range of developed and currently open emerging economies. Hence, expropriation risk in a given emerging economy will not be part of systematic risk. To model systematic risk, we present a dynamic general equilibrium model that implies that the cross-section of risk premia are determined by world market risk and world market volatility risk. Our model for selectivity relates to the latent variable approach of Heckman (1976, 1979). Measured mean returns are determined by both systematic risks and the selectivity bias. The selectivity bias measures the extra compensation that a given market has to pay to international investors during periods when the market is open (i.e., there is no expropriation).

An important concern for estimation is that the asset pricing conditions from the perspective of an international investor are valid *only* when a given market is open to invest in. Our approach to modeling selectivity takes account of this issue. We use the different stretches of data for 46 developed and emerging markets from 1984 to 2000 and estimate the model via the generalized method of moments (GMM) of Hansen (1982).

We find that standard models, such as the capital asset pricing model (CAPM) or the time-varying beta CAPM, fail to explain the cross-section of risk premia for developed and emerging economies. The cross-sectional R-squares for these models are close to zero. In contrast, our general equilibrium model, in conjunction with the sample selectivity bias, can explain more than 65% of the cross-sectional variation in the risk premia across the 46 developed and emerging markets. Our results imply that once we take account of the sample selectivity, indeed developed and emerging market reflect only systematic risk. This is particularly important for emerging markets for which we find that the magnitude of the compensation for expropriation risk is more than 7% per annum. This is about 2/3 of the average measured *ex-post* risk premium for emerging markets. Hence, it seems that most of the mean returns in these economies is driven by compensation for expropriation risk. Further, we find close to zero compensation for this risk in developed economies. This feature underscores the importance of keeping expropriation risk and hence the cost of equity borrowing low.

We find that the selectivity bias is highly related to measures of economic performance. Further, we find that measures of reputation capture the differences in the this premium fairly well (as argued in Eaton and Gersowitz, 1981); Economies with better financial market reputation have smaller expropriation premia. Differences in trade activity (i.e., imports plus exports over GDP) across economies also capture the cross-sectional differences in the expropriation premia. This is consistent with the arguments presented in Bulow and Rogoff (1989a, 1989b). In all, we see no reason why only reputational or only trade activity should matter—indeed we find that both are important. On the margin though, our evidence suggests that the reputational measure relative to the trade measure, has greater explanatory power. Note that relating the expropriation risk to various economic and reputational measures is akin to Edwards (1984), who explores the issue of across-economies differences in sovereign bond spreads.

Earlier papers on the subject of equity returns document that the static market-based CAPM fails to explain the cross section of risk premia in emerging markets (see, for instance, Harvey, 1995). Brown, Goetzmann, and Ross (1995), and Goetzmann and Jorion (1999) present theoretical and simulation-based evidence to argue that emerging markets risk premia may be biased upward due to selectivity bias. However, they do not directly evaluate the ability of their models to explain the cross-section of risk premia for developed and emerging economies. Further, Bekaert and Harvey (1995) provide an empirical time-series model of returns in emerging markets to measure market integration. Their approach does not imply economic restrictions on the cross-section of measured risk premia.

The remainder of this paper proceeds as follows. Section 2 presents an asset pricing model of sample selectivity. In this framework we discuss the peso problem and sample selectivity. Section 3 presents a dynamic general equilibrium model that determines systematic risk. Section 4 describes data used in the empirical analysis. Section 5 discusses the estimation methodology. Section 6 presents the empirical results. Section 7 summarizes the main results and conclusions.

2 An Asset Pricing Model with Sample Selectivity

This section presents an asset pricing framework that allows for sample selectivity. We first show how risk premia are determined in the world economy when there are two regimes. We then describe the latent process that determines the two regimes and the way sample selectivity arise. We also discuss how sample selectivity affect *ex-post* measured risk premia. Finally, we consider the link between a dollar-denominated bond and the probability of a shut-down.

2.1 The Basic Model

All markets that are accessible to international investors satisfy the following asset pricing condition

$$\mathrm{E}\left(m_{t+1} R_{it+1} | I_t\right) = 1, \tag{1}$$

where m_{t+1} is a stochastic discount factor that describes systematic risk in the world economy, R_{it+1} is the gross dollar return on market i, and I_t is the information set of the investors at time t. The condition follows from the assumption of absence of arbitrage in frictionless asset markets (see, for instance, Hansen and Richard, 1987). Different asset pricing models restrict m_{t+1} in different ways. In Section 3, we present a general equilibrium model in which m_{t+1} is the intertemporal marginal rate of substitution. For now, we let the stochastic discount factor, relevant for all assets in dollars, generally be

$$m_{t+1} = \frac{1}{R_{ft}} \left(1 - \lambda e_{t+1}\right), \tag{2}$$

where λ is the aggregate market price of risk, R_{ft} is the gross riskfree rate, and e_{t+1} is the innovation in the stochastic discount factor. We let σ_{et}^2 denote the conditional variance of the innovation in the stochastic discount factor.

We consider a return process with two regimes. We interpret regime 1 as the regime when the market is open to international investors, and regime 2 as the regime when the market is closed to international investors. Let y_{it+1} represent an indicator for the regime in market i at $t+1$ being 1 or 2. The indicator y_{it+1} is equal to one if the regime at $t+1$ is 1 (open to international investors), and zero otherwise. The return process, expressed in dollars, can then be specified as

$$R_{it+1} = \mathrm{E}\left(R_{it+1}|I_t\right) + y_{it+1}\left(\beta_{i1}e_{t+1} + \eta_{i1t+1}\right) + \left(1 - y_{it+1}\right)\left(\beta_{i2}e_{t+1} + \eta_{i2t+1}\right), \qquad (3)$$

where $\mathrm{E}(R_{it+1}|I_t)$ is the *ex-ante* conditional mean of the gross return, e_{t+1} is the innovation in the systematic risk component, and η_{i1t+1} and η_{i2t+1} are diversifiable risk components specific to market i. The exposure of the return to systematic risk is determined by β_{i1} and β_{i2}.

Let r_{it+1} denote the excess return on market i, that is, $r_{it+1} = R_{it+1} - R_{ft}$. The valuation condition (1) then implies that

$$\mathrm{E}\left(r_{it+1}|I_t\right) = \lambda\sigma_{et}^2\left[p_{it}\beta_{i1} + \left(1 - p_{it}\right)\beta_{i2}\right], \qquad (4)$$

where p_{it} is the probability of the regime where market i is accessible to international investors at time t. In other words, p_{it} is the conditional probability that $y_{it+1} = 1$. The risk premium is determined by the aggregate market price of risk, the volatility in the innovation of the stochastic discount factor, and an overall beta that is a probability-weighted average of the betas in the two regimes. Next, we describe the determination of regimes 1 and 2.

2.2 The Sample Selectivity Process

Let y_{it}^* be a latent process that determines the opening and closing for market i. That is, it determines if the regime is 1 or 2. In particular, if $y_{it}^* > 0$ then the regime is 1 and if $y_{it}^* \leq 0$, then the regime is classified as 2. Given this classification, it follows that

$$y_{it} = \begin{cases} 1 \text{ if } y_{it}^* > 0, \\ 0 \text{ otherwise.} \end{cases} \qquad (5)$$

Following Heckman (1976, 1979), we assume that the conditional mean of the latent process is determined by a vector of pre-determined variables x_{it}. Hence, we assume that

$$y^*_{it+1} = \delta_i' x_{it} + \varepsilon_{it+1}, \qquad \varepsilon_{it+1}|x_{it} \sim \mathrm{N}\left(0,1\right), \tag{6}$$

where ε_{it+1}, by assumption, is a standard normal error. Brown, Goetzmann, and Ross (1995) argue that the opening and closing of markets is determined solely by the price process itself. However, this seems restrictive, as many emerging markets, such as Thailand, Indonesia, and Malaysia, have had comparable drops in the market capitalization, but only Malaysia, has effectively closed its market. This suggests that other economic considerations may be important in the decision to leave a market closed or open. These other influences are captured by x_{it} and ε_{it+1}. Further, the latent variable model of selectivity provides connections between default risk in sovereign dollar-denominated bonds and the likelihood of capital controls. This allows us to provide a link between the cross-section of equity risk premia and country risk ratings.

Let $\phi(.)$ denote the standard normal probability density function, and let $\Phi\left(.\right)$ denote the standard normal cumulative distribution function. It is straightforward to show that the conditional probability that $y_{it+1} = 1$ is characterized by

$$p_{it} = \mathrm{E}\left(y_{it+1}|y_{it+1} = 1, x_{it}\right) = \int_{-\delta_i' x_{it}}^{\infty} \phi(\varepsilon_{it+1}) d\varepsilon_{it+1} = \int_{-\infty}^{\delta_i' x_{it}} \phi(\varepsilon_{it+1}) d\varepsilon_{it+1} = \Phi\left(\delta_i' x_{it}\right), \tag{7}$$

where the third equality follows from the symmetry of the normal distribution. As ε_{it+1} and the innovation in the return of asset i may be correlated, consider the following conditional projections for the different regimes

$$\beta_{i1} e_{t+1} + \eta_{i1t+1} = \gamma_{i1}\varepsilon_{it+1} + v_{i1t+1}, \tag{8}$$

$$\beta_{i2} e_{t+1} + \eta_{i2t+1} = \gamma_{i2}\varepsilon_{it+1} + v_{i2t+1}, \tag{9}$$

where γ_{i1} and γ_{i1} are the projection coefficients between $\beta_{ij} e_{t+1} + \eta_{it+1}$ and ε_{it+1} and $\beta_{ij} e_{t+1} + \eta_{it+1}$ and ε_{it+1}, respectively, and v_{i1t+1} and v_{i2t+1} are projection errors. The above equations then imply that the excess return process can be written as

$$r_{it+1} = \mathrm{E}\left(r_{it+1}|I_t\right) + y_{it+1}(\gamma_{i1}\varepsilon_{it+1} + v_{i1t+1}) + (1 - y_{it+1})(\gamma_{i2}\varepsilon_{it+1} + v_{i2t+1}). \tag{10}$$

2.3 The Sample Selectivity Criteria

We consider the case where data are missing as an outcome of an attrition process. That is, we consider the sample selectivity effects of only observing the regime where the markets are accessible to international investors. In fact, there are no dollar returns in the regime when the market is closed. In this case, the restriction on the empirical conditional mean of the returns is

$$\mathrm{E}\left(r_{it+1}|I_t, y_{it}=1, y_{it+1}=1\right) = \mathrm{E}\left(r_{it+1}|I_t\right) + \gamma_{i1}\mathrm{E}\left(\varepsilon_{it+1}|\varepsilon_{it+1} > -\delta_i' x_{it}\right). \tag{11}$$

Note that $\mathrm{E}(\varepsilon_{it+1}|\varepsilon_{it+1} > -\delta_i' x_{it})$ is the same as $\mathrm{E}(\varepsilon_{it+1}|y_{it+1}=1)$. Moreover, this quantity satisfies the relation

$$\mathrm{E}\left(\varepsilon_{it+1}|y_{it+1}=1\right) = \frac{1}{p_{it}}\int_{-\delta_i' x_{it}}^{\infty} \varepsilon_{it+1}\phi(\varepsilon_{it+1})d\varepsilon_{it+1}, \tag{12}$$

which can be further simplified as follows

$$\frac{1}{p_{it}}\int_{-\delta_i' x_{it}}^{\infty} \varepsilon_{it+1}\phi(\varepsilon_{it+1})d\varepsilon_{it+1} = \frac{\phi(\delta_i' x_{it})}{p_{it}} = \frac{\phi(\delta_i' x_{it})}{\Phi(\delta_i' x_{it})}. \tag{13}$$

This is typically referred to as a hazard rate, or the inverse Mill's ratio. We denote this by h_{it}, that is $h_{it} = \phi(\delta_i' x_{it})/\Phi(\delta_i' x_{it})$. Based on the above results, it follows that the conditional mean of the excess return is given by

$$\mathrm{E}\left(r_{it+1}|I_t, y_{it}=1, y_{it+1}=1\right) = \lambda\sigma_{et}^2\left[p_{it}\beta_{i1} + (1-p_{it})\,\beta_{i2}\right] + \gamma_{i1}h_{it}. \tag{14}$$

This restriction shows that there are two biases in measuring the *ex-ante* risk-premium. The first bias stems from the fact that the econometrician does not observe regime 2 (the regime when the market is closed to international investors). This is reflected in the first term of (14). β_{i1} can obviously be identified in the time series from observations when the market is open. However, β_{i2} cannot be estimated without additional restrictions. Furthermore, the probability of a shut-down can not be measured without additional restrictions. Note that the resulting bias is on the *ex-ante* mean of the return and we refer to it as a *peso problem.*

The second bias is due to *sample selectivity*, the effects of this can be seen in the second term of (14). This is an adjustment to the *ex-post* mean to correctly estimate the *ex-ante* risk premium. Conditional on the market being open today and tomorrow, the risk premium is biased upwards. Put differently, investors require, on average, a higher return when the market is open, much like a defaultable bond.

Brown, Goetzmann, and Ross (1995) focus on the second effect. It seems that the measured risk premium will also be affected by the beta associated with the market shut-down regime. If this beta is higher that in the regime for which data is available, then the *ex-ante* mean asset will be higher, and in standard time-series regression this will show up as an abnormal return, or an alpha. However, purging the empirical means of these two effects implies that the *ex-ante* means lie on the security market line.

In the special case of the world CAPM, Equation (14) can be stated as

$$\mathrm{E}\left(r_{it+1}|I_t, y_{it}=1, y_{it+1}=1\right) = \mathrm{E}\left(r_{Wt+1}|I_t\right)\left[p_{it}\beta_{i1} + \left(1-p_{it}\right)\beta_{i2}\right] + \gamma_{i1}h_{it}, \tag{15}$$

where $\mathrm{E}\left(r_{Wt+1}|I_t\right)$ is the conditional risk premium on the world market portfolio, and the betas are the world CAPM betas for the two regimes. The equation allows us to also determine today's dollar value (price) of the equity market for country i. In particular, the price is determined by the expectations of all future cash flows discounted at the expected return in that market. It is important to note that this present value computation is conditional on the current information (i.e., I_t) and that the market continues to be open (i.e., $y_{it+j}=1$ for all $j=0,\ldots,\infty$). This implication, of course, holds for any model of systematic risk.

Finally, note that for high survival probabilities, the hazard rate is almost linear in the probabilities. Further, there are alternative ways of measuring the probability p_{it}. Under the assumption that the expectations about expropriation in equity markets and sovereign debt markets are highly related, it is straightforward to show that p_{it} can essentially be backed out from observed sovereign bond spreads (see Appendix A). That is, for high survival probabilities, the hazard rate is almost linear in sovereign bond spreads. As discussed and documented later, at least for the few sovereign spreads that we observe, the spreads are highly correlated with observed measures of country ratings. Hence, it follows that we can use the more extensively available data on country ratings to measure the hazard rates themselves.

3 A General Equilibrium Model Under Credibility

In this section we present a dynamic general equilibrium model that determines the cross-section of risk premia for markets that are credible open. We consider the portfolio problem of an international representative investor's with non-expected utility preferences, and derive analytical expressions for risk premia in equilibrium. This is similar to the set-up in Bansal and Yaron (2000), who consider the implications in terms of consumption growth and consumption volatility to explain the equity premium puzzle. Our object is to derive implications for the risk premium, as in Campbell (1993, 1996), in an environment where consumption data may not be available. Consequently, as shown below, our risk premium implications will be driven by market beta and the exposure to market volatility. Further, we consider the cross-sectional implications for risk premia across assets.

3.1 The Model

Consider an international representative investor with recursive preferences as in Epstein and Zin (1989) and Weil (1989). An attractive feature of this preference structure is that it disentangles the coefficient of relative risk aversion, $\gamma \geq 0$, and the elasticity of intertemporal substitution, $\psi \geq 0$. More specifically, the objective function of the investor is

$$U_t = \left\{ (1-\delta) C_t^{\frac{1-\gamma}{\theta}} + \delta \left[\mathrm{E}\left(U_{t+1}^{1-\gamma} | I_t \right) \right]^{\frac{1}{\theta}} \right\}^{\frac{\theta}{1-\gamma}}, \tag{16}$$

where $\theta \equiv (1-\gamma) / (1 - 1/\psi)$, and $0 < \delta < 1$ is a time discount factor. The sign of θ is determined by the magnitudes of the risk aversion and the elasticity of substitution. In particular, when $\psi > 1$ and $\gamma > 1$, θ is negative. Note that when $\gamma = 1/\psi$, $\theta = 1$ and the above recursive preferences objective collapses to the standard time-separable power utility case. Further, when $\gamma = \psi = 1$, we get the log utility case.

Let W_t and C_t denote the wealth and consumption of the investor at time t. The investor's dynamic budget constraint can be written as

$$(W_t - C_t) R_{Mt+1} = W_{t+1}, \tag{17}$$

where $W_t - C_t$ is the invested wealth after consumption, and R_{Mt+1} is the gross return on the invested wealth. Following Lucas (1978), we normalize the supply of all equity claims to be one and the riskfree asset to be in zero net supply. In equilibrium, aggregate dividends in the economy D_t equals aggregate consumption of the representative investor, that is, $D_t = C_t$. As consumption equals dividends, the return on the aggregate consumption process also coincides with the return on aggregate dividends, that is, the market portfolio. We hence refer to R_{Mt+1} as the world market return.

Epstein and Zin (1989) solve for the Euler equation corresponding to the recursive preferences in (16) and the dynamic budget constraint in (17). The asset pricing restrictions for asset return i satisfy the valuation condition (1) with

$$m_{t+1} = \left[\delta\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{1}{\psi}}\right]^{\theta}\left[\frac{1}{R_{Mt+1}}\right]^{(1-\theta)} \tag{18}$$

being the intertemporal marginal rate of substitution, or the stochastic discount factor. Let r_{Mt+1} denote the log of the gross market return, that is, $\ln R_{Mt+1} = r_{Mt+1}$. Note that the one step ahead innovation of the log of the stochastic discount factor is

$$\eta_{t+1} = -\frac{\theta}{\psi}\eta_{gt+1} - (1-\theta)\eta_{Mt+1}, \tag{19}$$

where η_{gt+1} is the innovation in the log growth of consumption and η_{Mt+1} is the innovation in the log market return. The covariance with the innovation in (19) determines the risk premium on an asset

$$\mathrm{E}\left(r_{it+1}|I_t\right) = -\mathrm{Cov}\left(-\frac{\theta}{\psi}\eta_{t+1} - (1-\theta)\eta_{Mt+1}, \eta_{it+1}|I_t\right), \tag{20}$$

where η_{it+1} is the return innovation for asset i.

To solve the model we further need to characterize the log growth rate process g_t. We follow Bansal and Yaron (2000) and assume an ARMA(1,1) for the growth rate

$$g_{t+1} = \mu + \rho g_t + \eta_{gt+1} - \omega\eta_{gt}. \tag{21}$$

To allow for time variation in risk premia, we further assume that there is stochastic volatility in the growth rate dynamics. We model the conditional volatility of consumption growth, that is, $\mathrm{Var}_t\left(\eta_{gt+1}\right) \equiv \sigma^2_{gt}$ as follows

$$\sigma^2_{gt+1} = \nu_0 + \nu_1\sigma^2_{gt} + w_{t+1}. \tag{22}$$

Further, we assume that w_{t+1} is normally distributed and is independent of the innovation in consumption growth rate η_{gt+1}.

Bansal and Yaron (2000) derive the equilibrium solution to the consumption-wealth ratio, and derive an analytical expression for the return on the market portfolio. From this derivation, it follows that

$$\eta_{Mt+1} \equiv r_{Mt+1} - \mathrm{E}\left(r_{Mt+1}|I_t\right) = B_1\eta_{gt+1} + B_2 w_{t+1}, \tag{23}$$

where

$$\begin{aligned} B_0 &= \frac{1-\frac{1}{\psi}}{1-\kappa_1\rho}, &(24)\\ B_1 &= 1 + B_0\kappa_1\left(\rho-\omega\right), &(25)\\ B_2 &= \frac{0.5\kappa_1[\theta - \frac{\theta}{\psi} + \theta B_0\kappa_1(\rho-\omega)]^2}{\theta(1-\kappa_1\nu_1)}. &(26)\end{aligned}$$

Note that B_0, B_1 and B_2 are functions of preferences, growth rate and volatility parameters, and κ_1 which is an approximating constant which only depends on the average log price-dividend ratio as in Campbell and Shiller (1988). Further note that equation (23) also implies that $\mathrm{Var}_t\left(\eta_{Mt+1}\right) = B_1^2\sigma_{gt}^2 + B_2^2\sigma_w^2$. The conditional volatility of the market return is proportional to the conditional volatility of consumption. Consequently, the volatility shock can be obtained from the market volatility process itself.

3.2 Implications for Risk Premia

We consider the case where aggregate consumption is not observable but the aggregate market portfolio is observable. In this case, equation (23) can be used to replace the unobserved innovation in consumption growth, η_{gt+1}, by the innovation in the market return and the innovation in the volatility. The risk premium, as in equation (20), can equivalently be stated as follows

$$\mathrm{E}\left(r_{it+1}|I_t\right) = -\mathrm{Cov}\left(-\frac{\theta}{\psi}\frac{1}{B_1}\left(\eta_{Mt+1} - \kappa_1 A_2 w_{t+1}\right) - (1-\theta)\eta_{Mt+1}, \eta_{it+1}|I_t\right). \tag{27}$$

The asset pricing condition implies that the premium for asset i is

$$\mathrm{E}\left(r_{it+1}|I_t\right) = \lambda_{Mt}\beta_{iM} + \lambda_V\beta_{iV} \tag{28}$$

where

$$\lambda_{Mt} = \left[\frac{\theta}{B_1\psi} + (1-\theta)\right]\sigma_{Mt}^2, \tag{29}$$

$$\lambda_V = -\frac{\theta}{B_1\psi}B_2^2\sigma_w^2. \tag{30}$$

The β_{iM} refers to the usual market beta of the asset, and β_{iV} is the exposure of the asset return to innovations in the market volatility. There are hence two sources of risks that determine the risk premium in the cross-section of assets. When λ_V is zero, that is market volatility is not stochastic, then the cross-sectional risk premia implications coincide with the standard static CAPM. Note that the betas need not be constant. In fact, in our empirical work we will allow for time-varying market betas.

4 Data

We collect monthly return data on 46 developed and emerging markets from Datastream. According to International Finance Corporation (IFC) of the World Bank, 21 of these markets are classified as developed and 25 as emerging markets. The underlying sources of the data are Morgan Stanley Capital International (MSCI) for developed markets and IFC for emerging markets. The returns from IFC are the *investable* returns that incorporate foreign investment restrictions (including special classes of shares, sector restrictions, single foreign shareholder limits, restrictions allowing only authorized investors, company statues, and national limits). We also consider the return on the MSCI world market portfolio. All returns are in U.S. dollars, and excess returns are calculated by subtracting the one-month Eurodollar rate for each month.

The sample period is January 1984 to November 2000. It is, however, well known that many emerging markets only were accessible for international investors beginning in the late 1980s and the early 1990s. This is reflected in our data base. Data for emerging markets are included as and when they open up. We let the opening date of an emerging market be the date when IFC begins to record *investable* returns. The inclusion date for each market is shown in Table 1. The inclusion dates are similar to what other studies have considered to be the financial market liberalization dates (see, for instance, Kim and Singal, 2000, Bekaert and Harvey, 2000, and Henry, 2000). Our empirical results are not sensitive to using alternative choices of liberalization dates.

This means that the total number of observations for developed markets is 203 and for emerging markets the number of observations varies between 90 and 144.

In Table 1 we report summary statistics of the monthly dollar returns. The average returns across developed and emerging markets are about the same, 1.32% and 1.34% per month, respectively. However, the average standard deviation of emerging markets is about twice as high as for developed markets. It also seems to be greater dispersion in returns and return volatilities of emerging economies. The correlation with the world market return is much higher for developed markets than for emerging markets.

Table 2 presents information regarding various attributes of the countries. These attributes are used in our cross-sectional analysis of risk premia. The Real GDP per Capita attribute is the real GDP per capita in constant dollars in 1990 (expressed in international prices, base 1985). The Trading Activity attribute is the sum of exports and imports divided by GDP in 1990. The real GDP per capita and trading activity attributes are collected from the World Penn Tables. The Economic Rating and the Financial Rating attributes refer to the average country ratings from inclusion date to November 2000, and is provided by the International Country Risk Guide (ICRG). The economic risk rating is meant to measure an economy's current strengths and weaknesses, whereas the financial risk rating is meant to measure an economy's ability to finance its official, commercial, and trade obligations (see Erb, Harvey, and Viskanta, 1996). More specifically, the variables determining the economic rating include a weighted average of inflation, debt service as a percent of exports, international liquidity ratios, foreign trade collection experience, current account balance, and foreign exchange market indicators. In the empirical work our measure of reputation is the financial rating, which is a weighted average of loan default, delayed payment of suppliers' credit, repudiation of contracts by government, losses from exchange controls, and expropriation of private investment. The country ratings are published on a scale from 0 to 50 where a higher number indicates lower risks. We have re-scaled the ratings to be between 0 (low) and 100 (high). A rating of 0 to 49 then indicates a very high risk; 50 to 59 high risk; 60 to 69 moderate risk; 70 to 79 low risk; and 80 or more very low risk. Finally, we report betas versus the MSCI world market portfolio. The betas are, on average, about the same for developed and emerging markets. However, the dispersion in betas is much larger across emerging markets ranging from 0.07 to 1.80, whereas they are all about one in the developed markets.

It is evident from Table 2 that the emerging economies are economies with relatively low GDP per capita. Further, emerging economies have a much lower country ratings than developed economies. In fact, the correlation between the real GDP per capita and the ratings are 70% (economic rating) and 80% (financial rating). The trading activity attribute has a lower correlation with the real GDP per capita (about 20%). The correlations between trading activity and the ratings are about 20% and 40%. There are a few outliers (notably Hong Kong and Singapore), but excluding them does not affect the correlation between trading activity and credit rating significantly.

We also collect sovereign spreads for nine emerging economies from J.P. Morgan. These are economies with Brady bonds (restructured dollar-denominated debt). We argue that the country ratings contain much of the cross-sectional information in the spreads. For each month, we computed the correlation between the sovereign spreads and the country ratings. The correlations varied from -95% to -43% with an average of -72%. That is, sovereign nations with a high spread on their dollar-denominated debt tend to have a low country rating. This is also highlighted in Figure 1, which shows the spreads versus country ratings after the averages of the variables for each month have been subtracted. That is, the variables are measured as deviation from month averages to sweep out time effects. The correlation is about -58% and is highly significant (a p-value close to zero).

Our sample begins in 1984 for developed markets, and in the late 1980s and early 1990s for emerging markets. Consequently, only brief data histories are available, particularly for emerging economies. This makes it difficulty to solely rely on time-series methods for measurement and statistical inference. For this reason, we extensively use pooled cross-sectional methods in the estimation. Importantly, the relative rankings of the attributes do not vary a lot over time, indicating that most of the information is in the cross-section. We typically rely on the time series to estimate exposures to risk sources, but evaluates the asset pricing implications in the cross-section. Increasing the sample for developed markets (going back to 1976) does not change our results qualitatively and are therefore not reported.

In some specifications we allow the beta of a market versus the world market portfolio to vary according a conditional information variable, namely the world excess dividend yield (i.e., the dividend yield on the world market portfolio in excess of the one-month Eurodollar deposit rate). These series are collected from Datastream.

5 Estimation and Methodology

In this section we present the estimation approach and discuss testable implications in the time series as well as in the cross-section. We employ the generalized method of moments (GMM) of Hansen (1982) to estimate all parameters simultaneously as in Cochrane (2000), and similar to Bansal and Dahlquist (2000) and Jagannathan and Wang (2001). In this framework, specific distributional assumptions of the asset returns are not required, and we do not need to work in a normally independently and identically distributed setting. We can handle both conditional heteroskedasticity and serial correlation in pricing errors. The approach is different from traditional approaches as we avoid the problem of generated regressors, and it is not necessary to develop further methods and corrections as in two-step procedures.

We have to deal with missing data as the dollar return series for emerging markets have different lengths of histories. That is, we have an unbalanced panel. We handle the missing data as in Bansal and Dahlquist (2000). The idea is to balance the data set, and then apply the asymptotic results in the standard GMM framework. This is further discussed below.

We are interested in estimating the risk exposures and risk premia simultaneously. Consider N markets ($i = 1, 2, \ldots, N$), each with T observations ($t = 1, 2, \ldots, T$). Recall that the emerging markets have different lengths of histories. We describe the estimation approach for the dynamic general equilibrium model with time-varying betas. However, it applies straightforwardly to other cases. To simplify the analysis and document the estimation strategy we will make the assumption that the betas for market i are the same in the two regimes. We consider, however, alternative specifications below.

As in Jagannathan and Wang (1996), Cochrane (1996), amongst others, we evaluate the implications of our general equilibrium model in the cross-section as their is considerable cross-sectional variation in the mean returns. Consider the cross-sectional risk premium implications in (28), augmented to include sample selectivity. In addition, allow for the market beta of an asset to be time-varying according to $\beta_{iM} + \beta_{iMz} z_t$, where z_t is a variable known at time t capturing time variation in the market beta. The cross-sectional implications can then be written as

$$\mathrm{E}\left(r_{i,t+1}\right) = \lambda_M \beta_{iM} + \lambda_{Mz} \beta_{iMz} + \lambda_V \beta_{iV} + \gamma_i h_i, \tag{31}$$

where $\lambda_M = \mathrm{E}(\lambda_{Mt})$ and $\lambda_{Mz} = \mathrm{E}(\lambda_{Mt} z_t)$. All the considered models are nested in Equation (31).

The β_{iM}s and β_{iMz}s are the standard time series projection coefficients. Hence, our first sets of moment conditions, for each market i, are

$$\mathrm{E}\left[\left(r_{it+1} - \alpha_{iM} - \beta_{iM} r_{Mt+1} - \beta_{iMz} r_{Mt+1} z_t\right) y_{it} y_{it+1}\right] = 0, \tag{32}$$

$$\mathrm{E}\left[\left(r_{it+1} - \alpha_{iM} - \beta_{iM} r_{Mt+1} - \beta_{iMz} r_{Mt+1} z_t\right) r_{Mt+1} y_{it} y_{it+1}\right] = 0, \tag{33}$$

$$\mathrm{E}\left[\left(r_{it+1} - \alpha_{iM} - \beta_{iM} r_{Mt+1} - \beta_{iMz} r_{Mt+1} z_t\right) r_{Mt+1} z_t y_{it} y_{it+1}\right] = 0. \tag{34}$$

These moment conditions are exactly identified. We have $3N$ moment conditions and the same number of parameters. The point estimates from these moment conditions correspond to the usual least squares estimates. We follow the literature and add constants, or alphas. In CAPM, the α_{iM}s should be equal to zero. Indeed, we will evaluate the CAPM by checking whether the alphas are all equal to zero in the time series. Our focus, however, is on the ability of the various models (with and without sample selectivity) to explain the cross-section of risk premia.

Note that we use the regime indicator variable to make our unbalanced panel a balanced panel as in Bansal and Dahlquist (2000). That is, the moment conditions are multiplied with the product of the regime indicators at time t and $t+1$, $y_{it} y_{it+1}$. The product $y_{it} y_{it+1}$ selects returns when markets are open both at time t and $t+1$. In essence, this procedure treats missing observations as zeros. This has a practical advantage since the usual moment conditions which contain missing data can be filled with zeros, and then standard GMM routines can be utilized. Hayashi (2000) considers, also in an analysis of panel data, a similar approach.

The second set of moment conditions, for each market i, relate to the estimation of the volatility exposures β_{iV}s

$$\mathrm{E}\left[\left(r_{it+1} - \alpha_{iV} - \beta_{iV} R_{ft+1}\right) y_{it} y_{it+1}\right] = 0, \tag{35}$$

$$\mathrm{E}\left[\left(r_{it+1} - \alpha_{iV} - \beta_{iV} R_{ft+1}\right) R_{ft+1} y_{it} y_{it+1}\right] = 0, \tag{36}$$

where the market volatility is assumed to be proportional to the level of the nominal interest rate, R_{ft+1}. There is evidence in Glosten, Jagannathan, and Runkle (1993) that supports this specification. Further, we have also considered exposures to squared market returns with similar results. These moment conditions are also exactly identified as we have $2N$ moment conditions and the same number of parameters.

The sample selectivity part in Equation (31) is $\gamma_i h_i$. As noted in the discussion of Equation (14), under simplifying assumptions, the probability of default can be recovered from the sovereign bond spread. Further, this spread can be used to completely characterize the hazard rate at time t. However, the data on sovereign interest rate spreads are not available for many economies in our sample period. As shown earlier, there is a high negative correlation between the country ratings and the spreads in the cross-section (for economies where sovereign spread data are available). That is, a country with a low rating tends to have a high spread (a high probability of default). Consequently, to characterize the cross-section of hazard rates, we model the hazard rate for market i as follows

$$\gamma_i h_i = (\gamma_0 + \gamma_1 C_i) A_i, \tag{37}$$

where A_i proxies for h_i in the cross-section. For example, we let A_i equal the country is economic rating which then captures the cross-sectional variation in the hazard rate. Further, to allow for controlled cross-sectional heterogeneity in γ_i, we model it as $\gamma_i = \gamma_0 + \gamma_1 C_i$, where C_i denotes a country-specific attribute such as its return volatility, financial rating, or its trading activity.

The cross-sectional parameters (i.e., the risk premium parameters and the γ_0 and γ_1) are then identified in the last set of moment conditions for each asset i

$$\mathrm{E}\left[\left(r_{it+1} - \lambda_0 - \lambda_M \beta_{iM} - \lambda_{Mz}\beta_{iMz} - \lambda_V \beta_{iV} - \gamma_0 A_i - \gamma_1 A_i C_i\right) y_{it} y_{it+1}\right] = 0. \tag{38}$$

The constant term λ_0 should be zero according to theory, and a non-zero constant indicates that a model cannot price the assets on average. Alternatively, a non-zero constant can be interpreted as a zero-beta rate different from the riskfree rate that is imposed. Note that all parameters including the betas and the cross-sectional parameters λ_0, λ_M, λ_{Mz}, λ_V, γ_0, and γ_1 are jointly estimated using GMM. Details of the estimation are given in Appendix B.

6 Results

This section presents the empirical results. Recall, that we earlier reported that the cross-sectional dispersion in the average returns is fairly large for emerging markets and small for developed markets. This cross-sectional dispersion poses a serious challenge to the various asset pricing models under consideration. Variables that characterize the selectivity bias, such as country ratings, have very little time-series variation, but considerable cross-sectional variation. Hence, the effects of selectivity are primarily identifiable in the cross-section. Given the large cross-sectional dispersion in the data along with the short data histories for many emerging markets, we, as in Black, Jensen, and Scholes (1972), Fama and MacBeth (1973), and Jagannathan and Wang (1996), focus primarily on the explaining the cross-sectional differences in risk-premia.[1]

We first discuss the ability of the various models to capture the cross-section of average returns through only systematic risk. We then include sample selectivity in the cross-section. Finally, we discuss the results and provide further interpretations of the results.

6.1 Evidence in the Absence of Selectivity

In Table 3, we provide evidence from the cross-section of asset returns. The estimated risk premium for the market portfolio is negative, as can be seen in line (*i*) in Panel A. The ability of the CAPM with constant betas to explain the cross-section of average returns is basically zero as indicated by the adjusted R-square. In Panel B, line (*iii*), we consider the CAPM where the market betas are allowed to be time-varying. The model fails to capture the cross-sectional dispersion in average returns in this specification as well. The adjusted R-square is only about 8%.

The failure of the CAPM can also be seen in Figure 2 where we plot the average returns against the predicted expected returns from the model. A true model would, ignoring estimation errors, produce observations along the 45-degree line. The figure reveals that there is almost no dispersion in predicted expected returns. Hence, the

[1]For completeness, we have conducted the time-series tests for both the constant beta and time-varying beta versions of the CAPM (not reported in a table). We find that the joint test of zero alphas is rejected in both cases. The rejections seem to be primarily due to abnormal returns in emerging markets—this is consistent with Harvey (1995) who also shows that CAPM implications are rejected in emerging markets data.

model does not capture the large cross-sectional variation in average returns.

Finally, in Panel C, line (v), we consider the dynamic general equilibrium model where we incorporate volatility risk. This specification does better than the previous specifications and the model is able to capture about 18% of the cross-sectional variation in average returns. The average pricing error is measured by the constant term λ_0. The average pricing error is not statistically different from zero at the 5% significance level in the case of the dynamic general equilibrium model. The average pricing error for the time-varying beta version of the CAPM is significant on the margin.

6.2 Evidence with Selectivity Included

The model specifications with sample selectivity are reported in lines (ii), (iv), and (vi) in Table 3. In these specifications the selectivity is modelled as $(\gamma_0 + \gamma_1\sigma_i)A_i$, where σ_i is the annual return volatility for market i, and A_i is defined as the economic rating for country i less the economic rating for the U.S. The expression $(\gamma_0 + \gamma_1\sigma_i)$ is the γ_i for country i. The proxy for the hazard rate for country i is A_i, based on the reasoning provided earlier. Note that A_i is negative for emerging economies and close to zero for developed economies. This specification captures the intuition that as economies improve their economic rating they become akin to developed markets and the sample selectivity term would fall.

When sample selectivity is incorporated in the standard CAPM (line (ii) in Panel A), the cross-sectional R-square rises to 41% and the parameters associated with the selectivity term are significant (a p-value of 3%). Economies with poor economic rating have a larger and positive selectivity bias. For developed economies the variable A_i is essentially zero and hence the effect of selectivity on their mean returns is absent. Table 4 provides the magnitudes of the overall risk premia explained by systematic risk and by sample selectivity. For the constant beta CAPM, the systematic risk contribution is about 0.45% per month for both emerging and developed economies. However, the selectivity premium is 0.50% per month for emerging markets and close to zero for developed markets.

The time-varying beta based CAPM with sample selectivity is included is reported in line (iv) in Panel B. This specification does quite well in capturing the cross-sectional variation in risk premia, and has an adjusted R-square of 61%. The magnitudes of the parameters that govern the selectivity bias are not that different from the constant beta case and are still jointly significant at usual significance levels. The fraction of the emerging market return attributed to the selectivity bias is somewhat higher, and now stands at 0.58% per month.

The dynamic general equilibrium model is reported in line (*vi*) in Panel C. It captures about 67% of the cross-sectional variation in the risk premia. This rise in the adjusted R-square relative to the time-varying beta CAPM highlights the importance of the volatility risk. Table 4 shows that systematic risk explains almost all of the risk premia across developed markets, and the effect of selectivity is zero. For emerging markets about 2/3 of the *ex-post* risk premium can be attributed to selectivity. That is, sample selectivity seems to be the dominant influence on the measured risk premiums in emerging economies.

The high explanatory ability of the dynamic general equilibrium model with sample selectivity can be seen in Figure 3 which displays the average returns against predicted expected returns. The improvement in fit is visible and the model is able to produce the high dispersion in average returns.

In the context of the dynamic general equilibrium model we also considered alternative specifications for the parameter γ_i. In particular, we replaced σ_i with a reputational variable—the financial rating of an economy i less the comparable rating for the U.S. The ability of this specification in terms of capturing the cross-sectional variation in risk premia (i.e., adjusted R-square) is about 50%. This is quite high relative the cases without the selectivity effects. As shown in Table 4 the average emerging markets risk premium is still predominantly due to selectivity bias. Yet another choice for the specification of γ_i, the trading activity variable, produces again similar results.

We have also considered specifications to accommodate the peso problem. More specifically, we have estimated models where the betas have been varying with country ratings. However, the increases in adjusted R-squares have, at best, been marginal. Given observed sovereign bond spreads and moderate recovery rates, it is difficult to empirically distinguish betas in the two regimes. That is, it is hard to detect and measure the contribution to measured returns of the peso problem.

6.3 What Drives the Selectivity Bias?

In Panel B of Table 5 we inquire what economic variables can explain the cross-sectional dispersion in the selectivity bias for emerging markets. In particular, we are interested in whether the measured selectivity premium is related to trading activity and/or measures of reputation. To do so, we consider the measures of the selectivity premium based on the specification where $\gamma_i = (\gamma_0 + \gamma_1 \sigma_i)$, and the relative economic rating is the proxy for the hazard rate. This specification was reported in line (vi) in Table 3. The reputational variable (country i's financial rating less the comparable rating for the U.S.) is able to explain about 46% of the dispersion in the selectivity premium. This regression also shows that the selectivity premium rises as the country's financial rating falls. Similarly, when we use the trading activity variable, this explains about 26% of the dispersion in the selectivity premium. Economies with larger trading activity have a smaller selectivity premium. In essence our evidence suggests that both trading activity and reputational considerations are important for explaining the selectivity premium.

Allowing the selectivity premium to depend on the volatility in the cross-section is motivated by arguments presented in Brown, Goetzmann, and Ross (1995). Our evidence indicates that this attribute is not uniquely important to capture the cross-sectional differences in risk premia. Indeed, the trade activity and financial reputation variables do, at least in economic terms, a comparable job of explaining the cross-sectional differences in the risk premia. Thus, it seems to us that this is due to the fact that the volatility of returns are related to these variables. This is shown in Panel B of Table 5: return volatility is decreasing in both trading activity and financial reputation. These variables, based on the work of Eaton and Gersovitz (1981), and Bulow and Rogoff (1989a, 1989b) should matter to the compensation that emerging markets have to additionally pay, due to risks of a market shut-down. We find that this indeed is the case.

7 Conclusion

In this paper we show that the cross-sectional differences in the equity returns across sovereign economies is determined by two features—systematic risk and a selectivity premium. We show that the selectivity premium captures about 2/3 of the average risk premium in emerging markets. The equity risk premia in developed markets seems to be driven solely by systematic risk. The main economic implication of this result is that after taking account of selectivity premium all international equity returns reflect systematic risk, as predicted by theory.

Our empirical work also shows that sovereigns that have better financial market reputations and trade more actively have to pay a smaller selectivity premium. This empirical evidence lends support to the view that both reputations and fear of trade sanctions are important in determining the cost of equity borrowing for a sovereign nation.

A Measuring Hazard Rates From Sovereign Spreads

This Appendix shows how the hazard rate can be measured from sovereign bond spreads. Consider a dollar denominated pure discount bond issued by a country. The payoff is equal to one if there is no default, and $\mu_b + \beta_b e_{t+1} + \eta_{bt+1}$ if the country defaults. The payoff process can thus be written as

$$q_{bt+1} = y_{bt+1} + (1 - y_{bt+1}) (\mu_b + \beta_b e_{t+1} + \eta_{bt+1}) . \tag{39}$$

For simplicity, we assume that $\beta_b = 0$. That is, we assume that the recovery value of the bond is not related to the systematic risk in the world economy. Further, the expected payoff on this bond in default is less than one (i.e., $\mu_b < 1$). Valuing this payoff using the stochastic discount factor implies that

$$1/R_{bt} = [p_{bt} + (1 - p_{bt}) \mu_b] / R_{ft}. \tag{40}$$

Solving for the probability of no default, we obtain

$$p_{bt} = \frac{R_{ft} - \mu_b R_{bt}}{R_{bt} (1 - \mu_b)}. \tag{41}$$

Assume that the probabilities of default for the bond correspond to the probability of a market shut-down, that is, $p_{bt} = p_{it}$. Under the further assumption that the recovery rate is zero, we can directly recover the probability of default. Further, given the normal cumulative distribution function we can completely characterize the hazard rate.

The above expression can also be used to compute the *ex-ante* beta on market i. We denote this with $\beta_{it} = p_{it}\beta_{i1} + (1 - p_{it}) \beta_{i2}$. If we assume that the ratio of the betas across the two regimes is equal to a constant c and $\mu_b = 0$, it follows that

$$\beta_{it} = \beta_{i1} \left[\frac{R_{ft}}{R_{bt}} + c \left(\frac{R_{bt} - R_{ft}}{R_{bt}} \right) \right] . \tag{42}$$

Note that R_{ft} and R_{bt} can be observed directly from U.S. Treasuries and Sovereign bonds, or as we demonstrate, approximated with a country's relative country rating. Hence, conditional on c, one can estimate the model with both a peso problem and sample selectivity. In the special case with $c = 1$, there is no peso problem and we have that $\beta_{it} = \beta_{i1} = \beta_{i2}$.

B Estimation Details

This Appendix shows the estimation in more detail. Let θ_0 denote the true parameter vector that we want to estimate. The typical elements in θ_0 are α_{iM}, β_{iM}, β_{iMz}, α_{iV} and β_{iV} that are specific to each market, and the common parameters λ_0, λ_M, λ_{Mz}, λ_V, γ_1 and γ_2. By stacking the sample counterparts of the moment conditions in (32) to (36), and (38), we have a vector of moment conditions

$$g_T(\theta) = \frac{1}{T}\sum_{t=1}^{T} f(X_t, \theta), \tag{43}$$

where X_t summarizes the data used to form the moments conditions. The vector $g_T(\theta)$ has the dimension $6N$. The five first sets of moment conditions, given by (32) to (36), exactly identify the α_{iM}, β_{iM}, β_{iMz}, α_{iV}, and β_{iV} parameters. However, the sixth set of moment conditions, given by (38), is overidentified. We have N moment conditions, but only 6 parameters (λ_0, λ_M, λ_{Mz}, λ_V, γ_1 and γ_2).

We estimate the parameters by setting linear combinations of g_T equal to zero. That is, the moment conditions can be written as

$$A_T g_T = 0, \tag{44}$$

where A_T is a $(5N+6) \times 6N$ matrix. In particular, our choice of A_T is designed to ensure that the point estimates are the ones given by ordinary least squares. Let A_T be the product of two matrices denoted by A_{1T} and A_{2T} (that is, $A_T = A_{1T}A_{2T}$). The following matrices result in least square point estimates

$$A_{1T} = \begin{bmatrix} I_{5N} & 0_{5N} & \cdots & 0_{5N} \\ 0'_{5N} & 1 & \cdots & 1 \\ 0'_{5N} & \hat{\beta}_{1M} & \cdots & \hat{\beta}_{NM} \\ 0'_{5N} & \hat{\beta}_{1Mz} & \cdots & \hat{\beta}_{NMz} \\ 0'_{5N} & \hat{\beta}_{1V} & \cdots & \hat{\beta}_{NV} \\ 0'_{5N} & A_1 & \cdots & A_N \\ 0'_{5N} & C_1 A_1 & \cdots & C_N A_N \end{bmatrix}, \tag{45}$$

where I_{5N} is the identity matrix with dimension $5N$, 0_{5N} is a $5N$ vector of zeros, 0_N is an N vector of zeros, and A_{2T} is a diagonal matrix with typical element equal to $1/\sum_{t=1}^{T} y_{it+1}$. The $\hat{\beta}_{iM}$s, $\hat{\beta}_{iMz}$s and $\hat{\beta}_{iV}$ are estimates of β_{iM}s, β_{iMz}s and β_{iV}, and they are given in the estimation. The $\hat{\beta}_{iM}$s and $\hat{\beta}_{iMz}$s are exactly the least square estimates obtained in a regression of the assets' excess returns on the market excess return and scaled market excess returns as in (32) to (34). The $\hat{\beta}_{iV}$ is the least square estimate obtained in a regression of the assets' excess returns on the riskfree rate as in (35) to (36). Further, the estimates of λ_0, λ_M, λ_{Mz}, λ_V, γ_1, and γ_2 coincide with the least square estimates obtained in a regression of average returns on the betas and the proxies for sample selectivity. Our choice of A_T ensures that $A_T g_T(\theta_T) = 0$.

Based on Hansen (1982) we know that when linear combinations of g_T are set equal to zero as in (44), the asymptotic distribution of the point estimator θ_T is given by

$$\sqrt{T}\left(\theta_T - \theta_0\right) \xrightarrow{d} N\left(0, \left(A_0 D_0\right)^{-1}\left(A_0 S_0 A_0'\right)\left(A_0 D_0\right)^{-1\prime}\right), \tag{46}$$

where D_0 is the gradient of the moment conditions in (43), and where S_0 is the variance-covariance matrix of the moment conditions and given by

$$S_0 = \sum_{j=-\infty}^{\infty} \mathrm{E}\left[f\left(X_t, \theta_0\right) f\left(X_{t-j}, \theta_0\right)'\right]. \tag{47}$$

The sample counterpart S_T is estimated using the procedure in Newey and West (1987) with four lags. D_0 and A_0 can be estimated by their sample counterparts D_T and A_T. Note that the standard errors based on (46) are robust to heteroskedasticity and serial correlation in the moment conditions.

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Figure 1: Sovereign Bond Spreads and Country Ratings

Figure 1 shows sovereign spreads versus country ratings for nine emerging markets with Brady bonds on a monthly basis. The cross-sectional averages of the variables for each month have been subtracted.

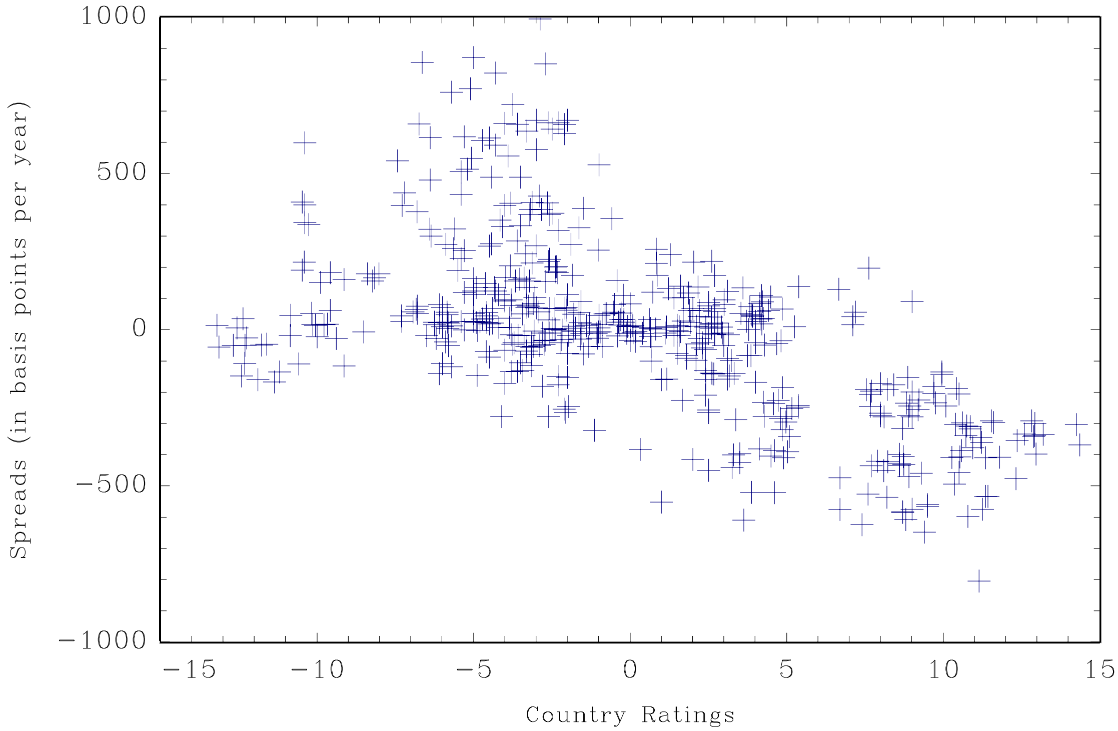

Figure 2: World CAPM with Constant Betas

Figure 2 shows average realized excess returns versus predicted excess returns (in % per month) on 46 national market portfolios. The predicted returns represented by crosses (developed markets) and circles (emerging markets) are the fitted values from the estimation of a world CAPM with constant betas and no sample selectivity in Panel A, Table 3. The straight line is a 45-degree line through the origin. The sample period is January 1984 (or inclusion date) to November 2000.

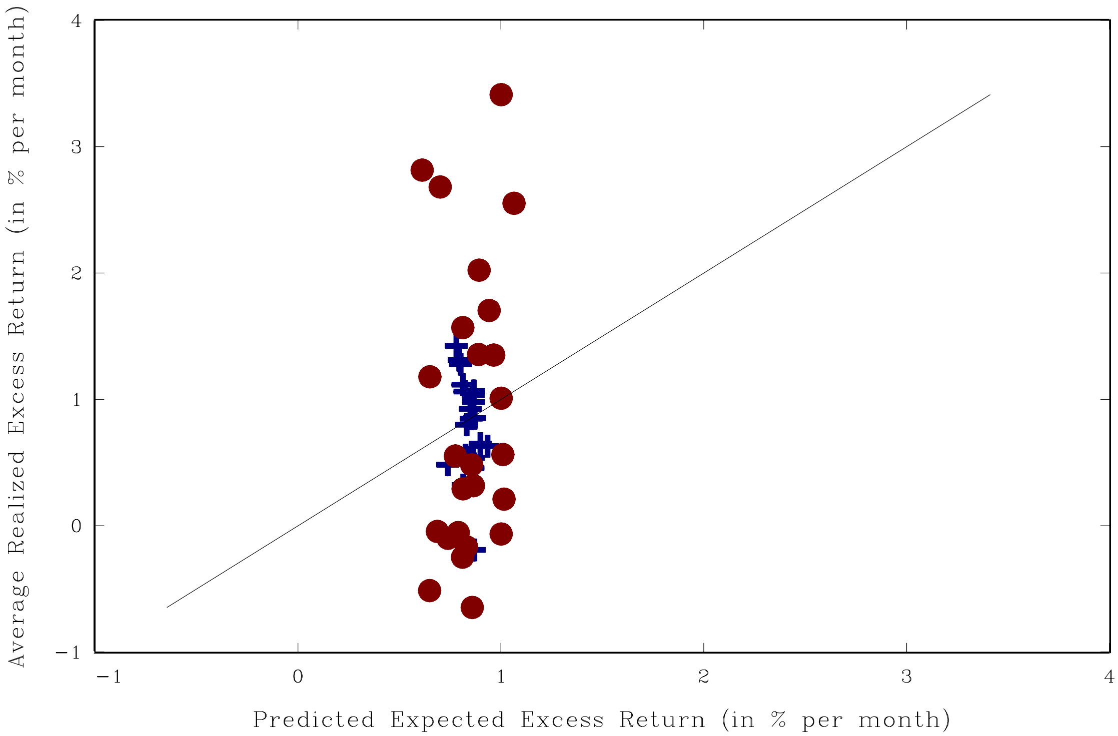

Figure 3: Dynamic General Equilibrium Model with Sample Selectivity

Figure 3 shows average realized excess returns versus predicted excess returns (in % per month) on 46 national market portfolios. The predicted returns represented by crosses (developed markets) and circles (emerging markets) are the fitted values from the estimation of the dynamic general equilibrium model with sample selectivity in Panel C, Table 3. The straight line is a 45-degree line through the origin. The sample period is January 1984 (or inclusion date) to November 2000.

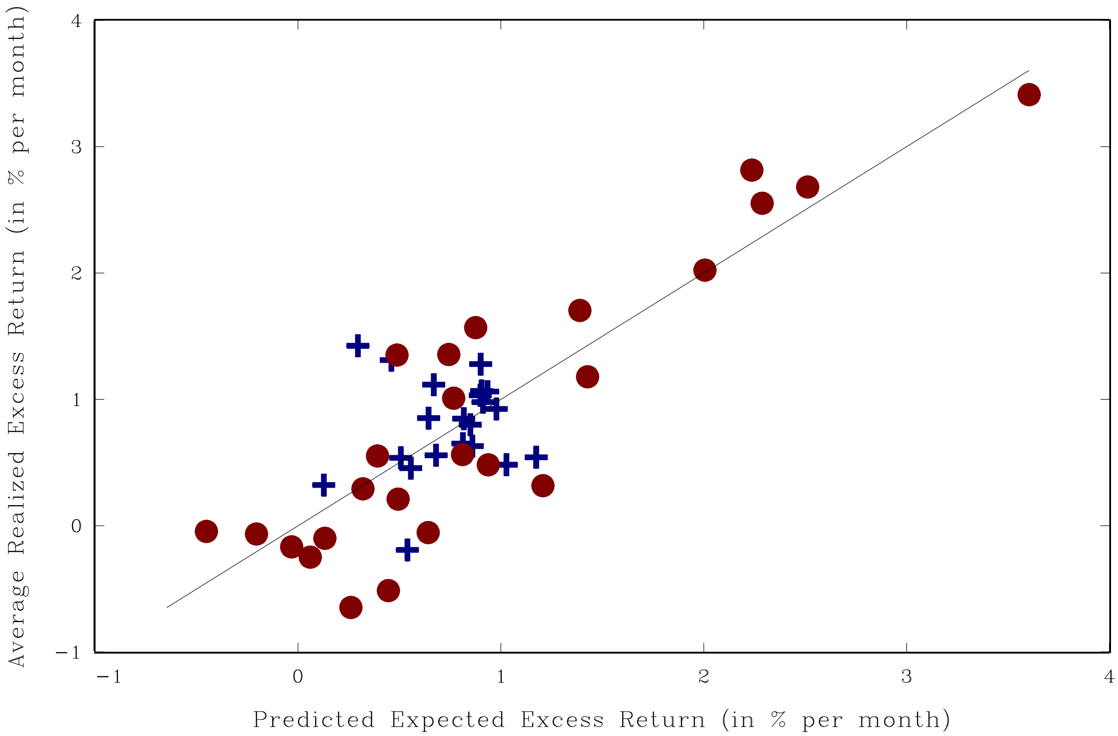

Table 1: Summary Statistics of Global Equity Returns

	Mean	Standard Deviation	Correlation with World	Inclusion Date	T
Panel A. Developed Markets					
Australia	1.07	6.84	0.52	84-01	203
Austria	1.16	7.33	0.34	84-01	203
Belgium	1.60	5.55	0.64	84-01	203
Canada	0.99	5.13	0.70	84-01	203
Denmark	1.18	5.66	0.53	84-01	203
Finland	1.91	8.62	0.54	88-01	156
France	1.59	6.07	0.70	84-01	203
Germany	1.38	6.27	0.60	84-01	203
Hong Kong	1.84	8.76	0.53	84-01	203
Ireland	1.03	5.73	0.65	88-01	156
Italy	1.46	7.51	0.51	84-01	203
Japan	1.02	7.36	0.76	84-01	203
Netherlands	1.56	4.73	0.75	84-01	203
New Zealand	0.30	7.02	0.47	88-01	156
Norway	1.09	7.26	0.58	84-01	203
Singapore	0.85	8.05	0.54	84-01	203
Spain	1.81	7.03	0.66	84-01	203
Sweden	1.65	6.92	0.63	84-01	203
Switzerland	1.51	5.38	0.66	84-01	203
U.K.	1.33	5.41	0.76	84-01	203
U.S.	1.38	4.37	0.79	84-01	203
Average	1.32	6.52	0.61		
Panel B. Emerging Markets					
Argentina	3.89	23.46	0.06	89-01	144
Brazil	3.16	19.61	0.31	89-01	144
Chile	1.83	7.73	0.24	89-01	144
China	0.26	13.41	0.27	93-01	96
Colombia	1.43	10.91	0.10	91-03	118
Greece	2.18	12.22	0.19	89-01	144
Hungary	1.61	13.15	0.47	93-01	96
India	0.36	8.68	0.13	92-12	97
Indonesia	-0.08	15.13	0.41	90-10	123
Jordan	0.69	4.85	0.22	89-01	144
Korea	0.37	14.15	0.39	92-02	107
Malaysia	0.23	10.12	0.39	89-01	116
Mexico	2.04	10.18	0.42	89-01	144
Pakistan	0.99	12.56	0.08	91-04	117
Peru	0.75	9.14	0.34	93-01	96
Philippines	0.42	11.42	0.40	89-01	144
Poland	3.24	17.91	0.37	93-01	96
Portugal	0.96	6.91	0.51	89-01	144
South Africa	0.98	8.34	0.53	93-01	96
Sri Lanka	-0.22	10.07	0.31	93-01	96
Taiwan	0.72	10.50	0.37	91-02	119
Thailand	0.38	12.55	0.43	89-01	144
Turkey	2.48	19.39	0.16	89-09	136
Venezuela	3.00	17.43	0.02	90-02	131
Zimbabwe	1.80	12.81	0.21	93-07	90
Average	1.34	12.50	0.29		
Panel C. World					
World	1.21	4.24	1.00	84-01	203

This table presents summary statistics of monthly dollar returns in global equity markets from inclusion date to November 2000. Panels A, B and C show statistics for developed markets, emerging markets and the World, respectively. The labels Average in Panels A and B refer to the average (equally-weighted) across developed and emerging markets, respectively. The means and standard deviations are expressed in % per month. Correlation with World refers to the correlation coefficient with the world market portfolio. The inclusion date (year-month) is the first month with observations of investable returns. The last observation of Malaysia is August 1998. T refers to the number of observations for each market.

Table 2: Country Attributes

	Real GDP per Capita	Trading Activity	Economic Rating	Financial Rating	Beta
Panel A. Developed Markets					
Australia	14,445	34.43	82.3	75.8	0.84
Austria	12,695	79.18	91.1	80.3	0.57
Belgium	13,232	144.96	87.6	78.6	0.83
Canada	17,173	51.24	89.2	78.5	0.85
Denmark	13,909	65.26	86.4	79.2	0.71
Finland	14,059	47.67	84.5	76.3	1.16
France	13,904	45.16	86.3	77.4	1.00
Germany	14,628	58.03	93.0	81.9	0.88
Hong Kong	14,849	262.96	83.7	78.4	1.11
Ireland	9,274	114.60	85.3	80.5	0.93
Italy	12,488	41.46	84.9	76.0	0.90
Japan	14,331	20.92	96.1	84.4	1.32
Netherlands	13,029	103.72	90.2	83.8	0.84
New Zealand	11,513	55.34	84.3	75.4	0.82
Norway	14,902	81.11	92.6	86.5	0.99
Singapore	11,710	373.26	89.2	83.9	1.03
Spain	9,583	37.52	81.2	75.1	1.08
Sweden	14,762	59.46	85.8	78.1	1.04
Switzerland	16,505	72.73	98.0	85.5	0.84
U.K.	13,217	51.48	90.7	73.2	0.97
U.S.	18,054	21.50	92.3	76.7	0.82
Average	13,727	86.76	88.3	79.3	0.93
Panel B. Emerging Markets					
Argentina	4,706	15.18	63.4	60.6	0.31
Brazil	4,042	12.66	65.7	57.0	1.46
Chile	4,338	65.46	81.0	73.7	0.46
China	1,324	25.42	82.1	74.7	0.97
Colombia	3,300	35.38	75.0	67.4	0.31
Greece	6,768	54.16	68.9	68.5	0.54
Hungary	5,357	60.67	76.4	66.0	1.66
India	1,264	18.76	73.8	67.4	0.31
Indonesia	1,974	52.61	75.2	66.7	1.67
Jordan	2,919	144.21	64.0	71.4	0.26
Korea	6,673	62.48	85.9	78.8	1.52
Malaysia	5,124	154.20	83.5	81.1	1.04
Mexico	5,827	32.72	74.4	63.1	1.04
Pakistan	1,394	35.01	60.6	62.0	0.28
Peru	2,188	26.80	68.5	65.4	0.84
Philippines	1,763	61.48	64.0	66.7	1.12
Poland	3,820	45.84	77.8	72.1	1.80
Portugal	7,478	75.20	82.2	79.2	0.87
South Africa	3,248	47.22	75.3	71.2	1.18
Sri Lanka	2,096	67.37	69.2	68.1	0.86
Taiwan	8,063	89.88	92.6	86.5	1.03
Thailand	3,580	75.83	81.1	75.3	1.32
Turkey	3,741	41.99	60.3	55.4	0.73
Venezuela	6,055	59.64	72.6	64.5	0.07
Zimbabwe	1,182	59.00	55.7	56.0	0.74
Average	3,929	56.77	73.2	68.8	0.90

This table lists country attributes. Panels A and B show the attributes for developed markets and emerging markets, respectively. The labels Average in Panels A and B refer to the average (equally-weighted) across developed and emerging markets, respectively. Real GDP per capita refers to Real GDP per capita in constant dollars (expressed in international prices, base 1985). Trading Activity refers to exports plus imports over nominal GDP. Real GDP per capita and trading activity are taken from the Penn World Table for the year of 1990. The Economic and Financial Ratings refer to the average financial and economic country rating provided by International Country Risk Guide from inclusion date to November 2000. The Beta refers to the slope-coefficient in a regression on a market's excess return versus the excess return on the MSCI world market portfolio.

Table 3: Cross-Sectional Estimates of Risk and Sample Selectivity Premia

		World Market			Sample Selectivity		Adjusted R-square	Tests of Joint Significance		
	Constant λ_0	Market λ_M	Conditional λ_{Mz}	Volatility λ_V	Relative Economic Rating γ_0	Volatility × Relative Economic Rating γ_1		World Market	Sample Selectivity	All
Panel A: World CAPM with Constant Betas										
(*i*)	1.08	-0.26					0.01	[0.69]		[0.69]
	(0.61)	(0.65)								
(*ii*)	0.74	-0.18			7.90	-0.80	0.41	[0.79]	[0.03]	[0.07]
	(0.51)	(0.67)			(4.69)	(0.32)				
Panel B: World CAPM with Time-Varying Betas										
(*iii*)	1.09	-0.18	0.13				0.08	[0.48]		[0.48]
	(0.55)	(0.59)	(0.82)							
(*iv*)	0.82	-0.18	0.26		7.92	-0.85	0.61	[0.27]	[0.02]	[0.06]
	(0.47)	(0.62)	(0.85)		(4.86)	(0.33)				
Panel C: Dynamic General Equilibrium Model										
(*v*)	0.94	0.16	0.73	0.24			0.18	[0.54]		[0.54]
	(0.58)	(0.52)	(0.79)	(0.25)						
(*vi*)	0.63	0.18	0.88	0.22	4.33	-0.64	0.67	[0.20]	[0.07]	[0.11]
	(0.48)	(0.53)	(0.79)	(0.24)	(3.50)	(0.30)				

This table presents results from estimations of the asset pricing models. All markets are estimated in one common system which includes both a time-series estimation of betas as well as a cross-sectional estimation of risk premia and sample selectivity premia. Panel A and B show the results for the world CAPM with constant and time-varying betas, respectively. Panel C shows the results for the dynamic general equilibrium model model with time-varying betas. Autocorrelation and heteroscedasticity consistent standard errors for the estimated coefficients are reported in parentheses. The Adjusted R-square reports the adjusted coefficient of determination between fitted returns generated by the model and actual realized returns on the assets. Average pricing error refers to the cross-sectional average (equally-weighted) of the pricing errors, and is reported for Developed and Emerging markets. Tests of joint significance report p-values from tests of jointly significant risk premia associated with the market, sample selectivity, and all premia.

Table 4: Decomposition of Average Excess Returns

	Average	Systematic Risk	Sample Selectivity	Pricing Error
Panel A: World CAPM with Constant Betas				
Developed Markets	0.79	0.45	0.07	0.27
Emerging Markets	0.89	0.44	0.50	-0.05
Panel B: World CAPM with Time-Varying Betas				
Developed Markets	0.79	0.46	0.06	0.28
Emerging Markets	0.89	0.33	0.58	-0.01
Panel C: Dynamic General Equilibrium Model				
Volatility Attribute				
Developed Markets	0.79	0.66	-0.03	0.17
Emerging Markets	0.89	0.24	0.64	0.01
Financial Rating Attribute				
Developed Markets	0.79	0.73	-0.05	0.10
Emerging Markets	0.89	0.18	0.71	0.01
Trading Activity Attribute				
Developed Markets	0.79	0.75	-0.10	0.15
Emerging Markets	0.89	0.20	0.70	0.00

This table presents the decomposition of the measured excess returns for developed and emerging markets (equally-weighted averages) generated by models with sample selectivity. Panel A and B show the decomposition for the world CAPM with constant and time-varying betas, respectively, as in Table 3 but without a constant. Panel C shows the decomposition for the dynamic general equilibrium model model with time-varying betas. The specification with the volatility attribute is as reported in Table 3 but without a constant. The specifications with financial rating and trading activity use these attributes instead of the volatility attribute. The decompositions are expressed in % per month. Average refers to the the average excess return from inclusion date. Systematic risk refers to the contribution of market components. Sample selectivity refers to contribution due to sample selectivity. Pricing error refers to the average pricing error.

Table 5: Sample Selectivity and Volatility Projections

Constant	Economic Rating	Financial Rating	Trading Activity	Volatility	Adjusted R-square	Test of Joint Significance
Panel A: Sample Selectivity Projections						
-0.10	-6.34				0.70	
(0.09)	(0.96)					
-0.19		-5.19			0.46	
(0.13)		(1.18)				
1.07			-0.26		0.26	
(0.22)			(0.08)			
-1.13				0.14	0.64	
(0.24)				(0.02)		
-1.19	-3.17	-1.45	0.01	0.10	0.92	[0.00]
(0.17)	(1.16)	(0.89)	(0.04)	(0.01)		
Panel B: Volatility Projections						
(0.17)	(1.16)	(0.89)	(0.04)	(0.01)		
10.08	-20.76				0.20	
(0.98)	(6.99)					
10.59		-11.92			0.04	
(1.23)		(8.30)				
14.65			-1.30		0.19	
(1.33)			(0.50)			
12.10	-20.35	6.20	-0.59		0.19	[0.01]
(1.90)	(18.65)	(16.24)	(0.87)			

This table presents the results of cross-sectional regressions for 25 emerging markets. Heteroscedasticity consistent standard errors for the estimated coefficients are reported in parentheses. Panel A and B show the results for sample selectivity and volatility, respectively, on various country attributes. Sample selectivity is measured as the part of the measured equity premium due to sample selectivity as obtained in the dynamic general equilibrium model using relative economic rating, and volatility × relative economic rating as in Table 3 but without a constant. The attributes are the economic rating, the financial rating, and the relative trading activity. All attributes are relative the U.S. The Adjusted R-square reports the adjusted coefficient of determination. Test of joint significance reports p-values (within square brackets) from a test of jointly significant coefficients.