The plausibility of risk estimates and implied costs to international equity investment

Lieven De Moor, Piet Sercu and Rosanne Vanpée
The Plausibility of Risk Estimates
and Implied Costs to International Equity
Investments*

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Abstract

In this paper we reconsider the estimated deadweight costs for the emerging countries implied by the mean-variance portfolio model developed by Cooper and Kaplanis (1994) and generalized by Sercu and Vanpée (2007). We show both theoretically and empirically that estimated implicit investment costs are mostly driven by estimated risk if home bias is strong, which is particularly the case for emerging markets. For OECD countries, risk is stable and relatively easy to estimate, but for emerging markets ex post risk may be very different from ex ante risk and changes substantially over time. The required expected returns that go with the naive risk estimates and are at the basis of the high implied costs of international equity investments defy credibility, whether a priori or empirically. We show that more sophisticated volatility estimates based on a time-varying model a la Bekaert and Harvey (1997) lead to implicit investment costs that are far more credible.
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Introduction

It has been repeatedly shown that investors overinvest in domestic stocks relative to the optimal portfolio allocation implied by international portfolio theory. Seminally, Cooper and Kaplanis (1994) compute what levels of deadweight costs would be needed to reconcile observed home-biased international portfolios with mean-variance portfolio theory, taking into account ex post risks. Recent estimates of these Cooper-Kaplanis costs by Sercu and Vanpée (2007) contain both good and bad news. The good news is that, for mature economies, cost estimates are much lower than earlier studies suggested. The bad news is that, for a few emerging markets, implied deadweight costs are so high that they utterly lack credibility. In this paper, we point out that inadequate risk estimates may provide at least part of the explanation of the latter results.

One possible explanation for the failure of portfolio theory for emerging markets may be that these countries are simply too different. For instance, Bekaert, Erb, Harvey and Viskanta (1998) show empirically that the emerging market returns have a higher volatility than industrialized markets, a lower correlation with other countries, and significant kurtosis and skewness. Therefore, Bekaert et al. conclude, the mean-variance portfolio model cannot be applied to the emerging markets. The explanation for the model failure advanced here is different, although probably also complementary to the Bekaert et al. view. In a nutshell, the argument runs as follows. For emerging markets, risk is harder to estimate, and our estimates may be poor. This is crucial because, for any off-mark risk estimate, portfolio theory implicitly calculates an equally outrageous expected return; and the latter must then be neutralized by outrageous deadweight costs to explain why investors do not all rush into this market. To flesh out the above argument, we proceed in three steps as follows.

We first show theoretically that estimated risk is driving the implicit costs of foreign investments if home bias is strong – which is especially the case for the emerging markets.

Second, we show empirically that Cooper-Kaplanis deadweight costs very much depend

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1 For overviews of the home bias literature, see Lewis (1999) and Karolyi and Stulz (2003).
on risks, far more than they depend on observed home bias: implicit investment costs hardly change when observed portfolios are counterfactually replaced by asset holdings that are far more internationally diversified than actual portfolios, but they depend a lot on the estimation of the covariance matrix of equity returns.

Third, we show that the emerging markets’ risks are much harder to estimate than the risks of industrialized markets. Our ex post risk estimates are much more heterogenous across emerging markets than across (old) OECD countries, and are more variable over time than estimates for OECD countries. In our case, emerging-market risks, estimated in the usual (unweighted) way, defy credibility because the corresponding expected returns turn out to be implausible and empirically unconnected to observed returns, in contrast to the implied expected returns of the industrialized countries, which are fairly close to actual returns. Thus, with a standard covariance matrix, a mean-variance portfolio model with deadweight costs as the explanation for home bias seems to work only for the industrialized countries. For less developed countries ex ante risk is difficult to estimate, making implied expected returns and, hence, implicit investment costs very unreliable.

Since the estimation of the covariance matrix is crucial for the estimated deadweight costs, we finally consider an estimation method for the stock market volatilities that accounts for time-varying, asymmetric volatilities, notably the Bekaert-Harvey (1997) model. We find that time-varying covariance matrices lead to estimated implicit investment costs that are far more realistic: inward investment costs for the emerging countries are up to three times lower than when a constant-volatility model is used.

The paper is organized as follows. Section 1 briefly reviews the international mean-variance framework with foreign investment costs which provides the setting of this paper. In Section 2, we show theoretically that if home bias is strong, the deadweight cost estimates are mostly driven by estimated risk, and notably the host-country variance, without any connection to observed mean returns. Section 3 describes the data. In Section 4, we empirically test whether risk estimates drive the implicit investment costs of Sercu and Vanpée (2007) by running a simulation using counterfactual portfolios. In Section 5, we argue that emerging markets’ risks are probably hard to estimate and we show that the implied expected returns from the mean-variance model substantially overestimate emerging markets returns, while the implied returns for the developed markets are plausible. In Section 6, we present the Bekaert-Harvey time-varying volatility (1997) model as an alternative to estimate the covariance matrix and we show that time-varying covariances lead to better results in the Sercu-Vanpée model. The
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final section concludes.

1 The mean-variance framework with costs for foreign investments

In this section, we briefly discuss the international mean-variance model that is the setting of this paper. We consider a world with $N$ countries and $N$ currencies. There are $N$ risky equity assets, $N - 1$ foreign currency bills or notes and a risk-free asset $2N$. Sercu (1980) and Adler and Dumas (1983) derive the vector of optimal portfolio holdings of risky assets as follows:

$$x^l = \alpha \Omega^{-1} (\mu - r 1) + (1 - \alpha) \Omega^{-1} w^l, \quad (1)$$

where

$x^l$ denotes the $(2N - 1) \times 1$ vector of the proportions of investor $l$'s wealth invested in each risky asset,

$\mu$ denotes the $(2N - 1) \times 1$ vector of p.a. expected returns on the risky assets,

$r$ denotes the p.a. risk-free rate of the reference country,

$\alpha$ is the parameter of relative risk tolerance,

$\Omega$ denotes the $(2N - 1) \times (2N - 1)$ covariance matrix of the p.a. nominal rates of return on the risky securities,

$1$ is a $(2N - 1) \times 1$ vector of elements all equal to unity,

$w^l$ denotes the $(2N - 1) \times 1$ vector of covariances of the risky asset returns with investor $l$'s rate of inflation.

The international mean-variance model implies that all investors hold two portfolios. The first component (with weight $\alpha$) is the portfolio chosen by an investor with a log-utility function and is the same for all investors, irrespective of nationality. The second portfolio component (with weight $1 - \alpha$) is country specific, since it is a portfolio whose nominal rate of return exhibits the highest possible correlation with the investor’s rate of inflation, that is, it is the best possible hedge against the investor’s inflation. This being country specific, it could in
principle be a partial explanation of home bias. However, empirical evidence shows that the inflation hedging potential for stocks and bonds is weak (Adler and Dumas, 1983; Cooper and Kaplanis, 1994; Coen, 2001). The explanation for the fact that investors overinvest in domestic assets compared to the model’s prediction of full international diversification should come from other sources than hedging domestic inflation.

In an attempt to explain the home bias using a mean-variance framework, many authors assume that investors adjust the expected returns of foreign assets before optimizing their utilities. These adjustments can come from the existence of higher transaction costs for foreign assets, or more generally, from a combination of explicit and implicit costs like withholding taxes, informational asymmetries and capital controls (Black, 1974; French and Poterba, 1990; Glassman and Riddick, 1994; Stulz, 1995; Solnik, 1996; Cooper and Kaplanis, 1994, 2000; Sercu and Vanpe, 2007). This means that an investor experiences a proportional deadweight loss for investing in foreign assets. In mean-variance terminology, the vector of optimal risky asset holdings becomes:

\[ x^l = \alpha \Omega^{-1} \left( \mu - r_1 - C^l \right) + (1 - \alpha) \Omega^{-1} w^l, \]

where \( C^l \) is the \((2N-1) \times 1 \) vector of implicit investment costs. In Cooper and Kaplanis (1994) and Sercu and Vanpe (2007), the vector \( C^l \) is structured such that \( C^l_i = 0 \) if \( i = l \) or \( i > N \). This means that domestic equity investments and domestic and foreign lending or borrowing involve no additional costs. Nonzero implicit investment costs for foreign stocks can be the result of a friction in the home country, for example the effects from capital export controls; inefficiencies in the host (foreign) country, like the effects from a poorly developed financial market; or can be the result of a bilateral effect between the home and the host country, such as the physical distance between the two countries.

Cooper and Kaplanis (1994) compute point estimates of the implicit costs of foreign investments for a sample of eight developed countries, for selected levels of relative risk aversion. Assuming a risk aversion parameter of 2.5, for instance, they estimate that in 1987 the costs of inward investments were 2.85 percent p.a. for the U.S., 4.28 percent p.a. for France, and 12.65 percent p.a. for Spain. Assuming a level of relative risk aversion of 3, Glassman and Riddick (2001) estimate that over the period 1985 to 1990, implicit investment costs for France, Germany, Japan and the U.K. should have been in excess of 14 to 19 percent p.a. to explain the observed home bias in equity portfolios. These cost estimates are far larger than any reasonable measure of explicit or implicit costs because they are about as large as the actual returns themselves.
Sercu and Vanpée (2007, henceforth SV) generalize the Cooper and Kaplanis (1994) model and find estimates of implicit investment costs that are in a more realistic range for the developed countries. To obtain these estimates, they start by invoking Sercu’s (1980) results for the demand for a subset of assets, which turns out to be a mean-variance demand for assets whose returns have been “hedged” against risks correlated with the other assets’ returns. These hedged stock returns are the residuals of a regression of a stocks’ return on the $N-1$ exchange rate changes and the equity returns of the stock markets not included in the sample (see Appendix). Accordingly, SV use hedged stock returns, so as to properly account for both exchange rate risk and omitted economies. SV premultiply equation (2) by (minus) the covariance matrix of hedged returns, $\Omega_{S|X}$, and denote the resulting vector of conditional covariance risks by $y_i = -\Omega_{S|X}x^l$. They then show that expected returns can be eliminated and shadow costs can be extracted from the international portfolio holdings model by subtracting the domestic portfolio covariance risk from the covariance of the foreign asset with the return on the portfolio of the domestic investor.

$$y_i^l = \alpha(-Re_{S_i} + C(h_l, f_i, a_{t,i}) + \Gamma_l^i Re_{e,X}) - (1-\alpha)w_{S_i|X}^l,$$

$$y_i^i = \alpha(-Re_{S_i} + \Gamma_l^i Re_{e,X}) - (1-\alpha)w_{S_i|X}^i,$$

$$\Rightarrow (y_i^l - y_i^i) = \alpha [C(h_l, f_i, a_{t,i})] - (1-\alpha) \left(w_{S_i|X}^l - w_{S_i|X}^i\right),$$

where

$-y_i^l := \text{cov}(R_{h_i}^l, R_{p(i)})$ is the conditional covariance of hedged stock $i$’s return with the return on the portfolio held by investor $l$,

$C$ denotes the vector of shadow costs, consisting of home country-related (h) costs, foreign-country related (f) costs and interaction variables between the home and host country (a),

$w_{S_i|X}^l := \text{cov}(R_{h_i}^l, \Pi^l)$, the conditional covariance between the hedged return of stock $i$ with investor’s $l$’s inflation rate,

$Re_{S_i}$ and $Re_{e,X}$ denote the expected excess returns on stocks and bonds respectively,

$\Gamma$ is the matrix of hedge ratios (the coefficient in the regression of the $N$ countries’ stock returns on the other assets’ returns).

There are as many elements in $C$ as there are country pairs (and observed $x^l_{i}$’s per cross-section) and also $\alpha$ is unknown. Thus, point estimates of the deadweight costs can only be backed out
if $\alpha$ is known. This is essentially what Cooper and Kaplanis (1994) do: they postulate various values for $\alpha$ and compute the corresponding implied costs. SV, in contrast, estimate $\alpha$ and replace $C^t$ by a projection on a much smaller number of instruments that have been proven to be correlated with home bias. SV assume an exponential cost structure such that all fitted values for the cost functions are strictly positive and the effect of alpha on the coefficient estimates is minimal. Thus, the regression for the SV-model is:

$$
\left( y^*_t - y^i_t \right) = \alpha \times \exp \left( c + \sum \beta_j X_j \right)_t + (1 - \alpha) \left( w^i_{S_t|X} - w^j_{S_t|X} \right)_t,
$$

where $\bar{c} = c + \log(\alpha)$ and $X$ is the vector of instruments.

The calculations of SV lead to implicit investment cost estimates for the developed countries that are much lower than the estimates of Cooper and Kaplanis (1994) or Glassman and Riddick (2001). For the period 2001 to 2004, implicit inward investment costs are estimated to be 0.01 percent p.a. for the U.S., to 0.24 percent p.a. for Japan, with relative risk aversion estimated at 2.4. SV include also emerging markets into their sample, but for those countries estimated implicit investment costs are much higher and more difficult to accept. Average p.a. inward investment costs in Argentina are estimated at 21.5 percent, while for Indonesia the cost estimate is even 37.1 percent. SV already suggest that these high costs estimates for the emerging markets are very unlikely to reflect actual costs. They conjecture that the home bias in these countries may also be caused by an inflated perception of risk in addition to deadweight costs. In the next section, we come up with another explanation: outrageous costs stem from flawed estimates of risk.

2 Estimated risk and home bias

In this section we reconsider the Cooper-Kaplanis model expressed by equation (2) by focusing on the role played by the risk of foreign assets. To keep the equations simple we initially make two assumptions: (i) we disregard inflation since the inflation hedging potential for stocks has been shown to be minimal (Adler and Dumas, 1983; Cooper and Kaplanis, 1994; Coëns, 2001; Sercu and Vanpeé, 2007), and (ii) we assume that all stocks are uncorrelated, i.e. $\Omega = \text{diag}\{\sigma^2_1, \ldots, \sigma^2_{N-1}\}$. The special case we look at here is good enough to explain the case of emerging markets, whose returns are relatively weakly correlated with other markets. Under
these assumptions, the first component in expression (2) can be written as:

\[
\alpha \Omega^{-1} (\mu - r_1 - C^l) = \alpha \begin{pmatrix}
1/\sigma^2_1 & 0 & \ldots & 0 \\
0 & 1/\sigma^2_2 & \ldots & 0 \\
\vdots & \vdots & \ddots & \vdots \\
0 & 0 & \ldots & 1/\sigma^2_{2N-1}
\end{pmatrix}
\begin{pmatrix}
(\mu_1 - r - C^l_1) \\
(\mu_2 - r - C^l_2) \\
\vdots \\
(\mu_{2N-1} - r - C^l_{2N-1})
\end{pmatrix},
\]

(5)

Let us now consider the case where all investors from emerging country \( l \) hold mostly domestic stocks, or \( x^l_l \approx 1 \). This implies that the expected return for the equity index of country \( l \) is:

\[
x^l_l \approx 1 \Rightarrow (\mu_l - r_l) \approx \frac{1}{\alpha} \sigma^2_l.
\]

(6)

The investors from another country \( i \), in contrast, hold almost no assets from emerging country \( l \), or \( x^l_i \approx 0 \). Thus the deadweight cost for investors of country \( i \) to invest in equity index \( l \) is equal to the entire excess return:

\[
x^l_i \approx 0 \Rightarrow C^i_l = (\mu_l - r_l) \approx \frac{1}{\alpha} \sigma^2_l.
\]

(7)

indicating that the estimate of the implicit investment costs is driven by the risk estimate of the host country returns. This highlights the crucial role of risk estimates in the entire CK-SV procedure. If the model is told that, say, the Argentina market has a variance that is nine times that of the U.S., the model figures that the expected excess return must have been nine times higher than the U.S. too, otherwise Argentinians would not hold the portfolio they appear to have chosen. But since non-Argentinian investors do not seem to buy Argentina’s stock in vast amounts, the model then figures that virtually all of that ninefold expected return must be creamed off as investment costs born by non-Argentinians. Thus, given strong home bias, cost estimates are directly driven by risk estimates, via expected returns that are implied by the model and are not at all confronted with reality.

We now generalize this special case to study the demand for the equity of country \( l \). We consider the regression of country \( l \)’s excess stock return onto all other countries’ excess stock
returns and currency returns:

\[
\mu_l - r = a_l + \sum_{i=1, i \neq l}^{2N-1} \gamma_{li} (\mu_i - r) + \epsilon_l.
\]  

(9)

Thus, regression (9) tries to find the portfolio of assets that best resembles asset \( l \), in the sense that the portfolio has the highest possible correlation with asset \( l \). The variable denoted by \( a_l \) is like Jensen’s alpha except that the regression includes each and every other asset’s return as a separate regressor, instead of just the market return. Sercu (1980) shows that the \( i \)th element of \( \alpha \Omega^{-1}(\mu - r_1 - C^l) \) equals

\[
x_l^i = \alpha \frac{(\mu_i - r - C^l_i) - \sum_{j=1,j \neq i}^{2N-1} \gamma_{lj} (\mu_j - r)}{\text{var}(\epsilon_l)} = \frac{a_l}{\text{var}(\epsilon_l)}.
\]  

(10)

In sum, equation (10) implies that the demand for a country’s equities depends on the conditional risk of its equities, \( \text{var}(\epsilon_l) \). The rest of the analysis of the special case then still holds. By looking at differential weights, \( x_l^i - x_i^i \), the hedges in the numerator disappear. Since \( x_l^i - x_i^i \approx -1 \), calculated costs are essentially proportional to the conditional variance of the country’s return. Thus the quality of the risk inputs is crucial.

3 Data

To check the empirical validity of the theoretical reasoning in the previous section, we use data that are similar to SV. We use ten years of monthly data to estimate the covariance matrix of hedged stock returns. Stock prices from 1992 to 2000 are from the research list of De Moor (2005), based on Datastream. From January 2001 to December 2004 we use the Morgan Stanley International Country indices. Exchange rates and CPI are from Datastream. The currency of denomination is USD.

Data on international portfolio holdings in equities and bonds are from the Coordinated Portfolio Investment Survey (CPIS), conducted by the IMF. We use portfolio holdings data for 37 countries for each of the years 2001 to 2004. To obtain an estimate for the total wealth portfolio, we combine the aggregate equity holdings with the aggregate bond holdings for each country. Domestic stock market capitalizations for each year end are from the World Federation of Exchanges (http://www.world-exchanges.org) and bond market capitalizations are from the Bank of International Settlements Security Statistics (http://www.bis.org/statistics/secstats.htm). Domestic equity holdings are calculated as the difference between a country’s equity market
capitalization and its foreign holdings of these equities. The country’s total equity holdings are equal to the sum of its domestic equity holdings and the total amount invested in foreign equities reported in the CPIS. Domestic and total bond holdings are calculated in a similar way. Total invested wealth is the sum of the total equity and bond portfolio of each country. Following SV, investments in off-shore financial centers are reallocated over the sample countries in proportion to the foreign investments of these centers.

Table 5 in the Appendix offers a brief description of the instruments that SV use for the projection of the shadow costs of international investments. SV distinguish six categories of instruments: information asymmetries, explicit frictions, the level of financial development, economic health and stability measures, political risk and corporate governance and return skewness of stocks. Following SV, we estimate the model for the pooled sample 2001-2004 using GMM with a Newey-West weighted covariance matrix to account for heteroskedasticity and autocorrelation. Note that most cross-country commonalities are already picked up by variables indicating e.g. common language, common region, English-speaking countries and Euroland countries.

In section 6, we use the Bekaert-Harvey model to estimate time-varying covariance matrices. This model requires a set of domestic and world information variables. For the world market dividend yield and the country dividend yields, we use the dividend yields of the Datastream Global Indices. Eurodollar rates are retrieved from the IFS. Moody’s bond yield are from the Federal Reserve Data Release, and US bond and T-bill yields are from Datastream. Data on exports, imports and GDP are also retrieved from Datastream.

In the next section, we test empirically to what extent the high implicit investment cost estimates in SV are a reflection of estimated (co)variances in stead of observed portfolio choices.

4 Implicit investment costs are insensitive to home bias

In the above, the assumption of strong home bias \(x_i l \approx 0, \text{ if } i \neq l\) is important. We now show that, in practice, major variations in the degree of home bias have but a small effect on the

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\(^{2}\)These off-shore financial centers are Luxembourg, Ireland, Bermuda, Cayman Islands, Panama, the Netherlands Antilles and Guernsey. SV show that alternative allocation methods for the investments from and into financial off-shores do not meaningfully affect the estimation results.
cost functions. Specifically, if half of the observed home bias had disappeared, the CK-SV cost calculations would not have registered much lower costs.

We replace the actual international portfolio holdings by artificial ones that are internationally well-diversified and check to what extent the results change. Perfectly diversified portfolios can be obtained by setting the vector of optimal portfolio weights for each country equal to the vector of proportional market capitalizations, \( e_i \). However in the SV-framework, this leads to a left-hand side variable in equation (3) equal to zero, since all the vectors of conditional covariances \( y_l \) are equal for each country. Therefore, instead, we calculate international diversified portfolios as the halfway situation:

\[
x_{l,new}^i = 0.5 \times x_l^i + 0.5 \times e_i
\]

Thus, the new vector of portfolio weights is an average of actual portfolio weights \( x_l^i \) and the proportional market capitalizations of the countries \( e_i \), meaning that half of the real-world home bias is assumed to have disappeared.

Table 1 shows the estimation results of the SV-model assuming that all countries hold the semi-diversified portfolios. The results of the model with the actual portfolio holdings from the CPIS (IMF) are also reported for comparison. The results from Table 1 show that only a very tiny part of the implicit cost estimates is explained by the cross-country differences in actual portfolio holdings. If the representative investor of each country holds a far more diversified portfolio, the same instruments come up as explanations for the implicit investment costs and

Figure 1: **Average implicit investment costs under alternative portfolio allocations**

This figure shows the estimated deadweight costs from the SV model using actual international portfolio holdings versus internationally diversified portfolios.
Table 1: Estimation results for internationally diversified portfolios

The estimated model is that of equation (4). The second column contains the GMM estimation results for the model with the actual international portfolio holdings from the CPIS (IMF). Column three contains the results for the SV-model assuming internationally diversified portfolios. Significance at the 99%, 95%, and 90% level is denoted by three, two and one * respectively.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Exp.</th>
<th>Actual portfolios</th>
<th>Diversified portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sign</td>
<td>Coefficient</td>
<td>t-stat</td>
</tr>
<tr>
<td>Inflation hedging ($\alpha$)</td>
<td>+</td>
<td>0.42 ***</td>
<td>4.06</td>
</tr>
<tr>
<td>Constant ($\log(\alpha) + c$)</td>
<td>?</td>
<td>-1.88 ***</td>
<td>-6.91</td>
</tr>
</tbody>
</table>

**Int. investment costs $C(H_t, F_t, A_{t,i})$**

1. Information-related

- $F_t$ English-speaking host
  - $A_{t,i}$ Common region
  - $A_{t,i}$ Common language
  - Log(distance)
  - Bilateral imports

2. Explicit frictions

- $F_t$ Transaction costs, host
  - Dest. capital-import ctrls
  - $H_t$ Transaction costs, home
  - Home capital-export ctrls

3. Fin. development

- $F_t$ (Bank+Cap)/GDP, abroad
  - Liquidity abroad

4. Economic health and stability

- $F_t$ GDP, host
  - GDP–growth host
  - Misery index, host
  - Current acc deficit, host
  - Crisis, host
  - $H_t$ Home GDP
  - $A_{t,i}$ Euroland

5. Political risk and corporate governance

- $F_t$ ENF, host
  - ACC, host
  - ENFACC, host
  - Government effect., host
  - Insider trading, host
  - TI CPI, host

6. Skewness

- $F_t$ Skewness, host

| Adjusted $R^2$ | 0.82 | 0.76 |

even the coefficient estimates and t-statistics are similar. The model that uses actual portfolio holdings has an adjusted $R^2$ of 82 percent, which is only marginally higher than the adjusted $R^2$ 76 percent from the model with diversified portfolios.

Figure 1 shows the estimated implicit investment costs, averaged over the sample period 2001-2004 for the 37 countries under the two different portfolio allocations: the actual international portfolio holdings reported to the CPIS and the semi-diversified portfolios. Following the SV-model, well diversified portfolios would be expected to induce lower implicit investment cost estimates compared to the actual international portfolio allocation. Figure 1 shows that this does not hold in practice: overall, the actual implicit costs are very similar to the computed costs if the home bias is halved. For some countries, the estimated investment costs are
even higher if home bias is reduced. Also, the ranking of the countries remains very similar, regardless of the portfolio composition.

The results from Table 1 and Figure 1 indicate that the implicit cost estimates of SV are highly insensitive to the degree of home bias in the investors’ portfolios. Therefore, the CK-SV deadweight costs should be determined by the estimated (co)variances, as has been laid out theoretically in the previous section. In Section 6, we show formally that the estimated deadweight costs are heavily dependent on the estimation of the covariance matrix.

5 Gauging the quality of risk estimates for emerging markets

In this section, we describe the difficulties of correctly estimating the risk of the emerging countries’ stock markets. We consider two possible explanations for the extreme values of the deadweight cost estimates for the developing countries: their risk is mis-estimated or the mean-variance model is simply inappropriate to capture the characteristics of emerging stock markets.

5.1 Risk estimates for the emerging markets

Table 2 and Figure 2 show the estimated variances for each country based on annualized monthly returns. We split the sample in two subperiods of five years, 1995-1999 and 2000-2004, and compare the subsample variances. A first observation is that the estimated variances for the emerging countries are several times higher than those for the industrialized countries. For instance, the estimated risk of Indonesia over the period 1995-2004 is equal to 0.16, which is more than five times the estimated risk for the U.S. (0.03). A second observation from Table 2 and Figure 2 is that the estimated risk for the emerging countries is lower in 2000-2004 than in the earlier subperiod. The estimated risk for Malaysian equities is 0.23 in the period 1995-1999, compared to 0.04 in the 2000-2004 period. The higher estimated variances in the earlier subperiods reflect financial crises that hit the emerging markets, like the Asian crisis in 1997 and the Russian crisis in 1998. For the industrialized countries, the estimated risk is higher in the more recent subperiod, although differences never become as large as what we saw for emerging markets. The estimated risk for Germany, for example, rises from 0.03 in 1995-1999 to 0.07 in 2000-2004. A third observation from Table 2 is that the largest returns for the emerging countries are more extreme than those for the developed countries. For example,
the largest monthly return for Brazil is equal to 39.3 percent, which is nearly four times the largest return for the U.K. Our results are consistent with Kohers et al. (2006), who find that the risk associated with emerging markets is higher than the risk in developed markets, but at the same time, the returns in emerging markets are higher on average than those in developed markets.

We conclude from Table 2 and Figure 2 that the variances of the emerging countries are much more time-varying and contain more extreme values than those of the developed countries. Thus, the risk of the emerging markets is harder to estimate precisely but simultaneously, it strongly affects the estimated investment costs for these countries. This indicates that we should interpret the estimated deadweight costs of SV for the emerging countries with some caution. In the next subsection we determine to what extent the estimated risk affects expected returns in the CK-SV model.

5.2 Implied expected returns versus actual realized returns

To check the influence of the estimated risk on implied expected returns, we compare the expected returns implied by the SV-model with actual realized returns. The implied expected return for each country can be derived by using the expression for $y^i$ in equation (3); the
Table 2: Estimated risk

This table contains the estimated p.a. variance of each country’s monthly equity returns over the full sample 1995-2004 (\(\text{Var}_{\text{total}}\)), the subsamples 1995-1999 (\(\text{Var}_1\)) and 2000-2004 (\(\text{Var}_2\)) and the absolute value of the variance differential between the two subsamples (|\(\text{Var}_1 - \text{Var}_2\)|). The last column (\(R_{\text{high}}\)) shows the highest monthly return estimated over the full sample period. The last two rows show the mean values for the old OECD countries (excluding Turkey) and the emerging markets respectively.

<table>
<thead>
<tr>
<th>Country</th>
<th>(\text{Var}_{\text{total}})</th>
<th>(\text{Var}_1)</th>
<th>(\text{Var}_2)</th>
<th></th>
<th></th>
<th>(R_{\text{high}})</th>
</tr>
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</table>

The expected excess return for the hedged stocks of country \(i\) as perceived by its domestic investors is:

\[
R_{i,i}^{\text{h}} = \frac{1}{\alpha} [y_i^d + (1 - \alpha)w_i^d|X].
\] (12)

To calculate the implied expected returns, we use the estimated risk tolerance parameter from the model with constant variances (\(\alpha = 0.42\)).

Figure 3 shows the plot of the implied expected return for domestic investors against the actual realized return. Figures for 2001, 2002 and 2003 are similar and can be obtained from the corresponding author. First note the levels of the expected return: there are a few outliers...
The Plausibility of Risk Estimates and Implied Costs to International Equity Investments

Figure 3: Implied vs actual returns, 2004
This figure plots the implied p.a. expected returns $R_{i,i}^h = \frac{1}{\alpha} [y_i + (1 - \alpha)w_{S_i|X}]$ from the SV-model with 2004 inputs and the average realized returns for the period 1995-2004 (actual $r_{2004}$).

for the emerging markets, for instance Turkey has an expected return of 49 percent, and the expected return for Russian shares is even 67.5 percent per annum. Second, the figure shows that there is an important discrepancy between expected returns implied by the SV-model and actual realized returns, especially for the emerging markets like Turkey, Russia and Venezuela. The CK-SV methodology systematically overestimates expected returns for the emerging markets. This means that the estimated risks for the emerging countries are so large, that they almost surely differ from the actual risks that investors have in mind. For most of the industrialized countries, by contrast, expected returns are generally underestimated.

We now turn to two more formal tests to compare the actual returns with the implied expected returns.

5.2.1 Actual returns: regression

We first verify whether there is any trace of the estimated costs in the realized returns, as the Cooper-Kaplanis model predicts.

Cooper and Kaplanis (1994, 2000) derive the expression for the vector of expected returns from the mean-variance model with deadweight costs for foreign investments. For simplicity and based on the empirical findings that inflation hedging is irrelevant for international portfolio allocation, we disregard inflation. Thus, the vector of optimal proportions of wealth
invested in risky assets is:

\[ x^l = \alpha \Omega^{-1} (\mu - r_1 - C^l), \tag{13} \]

Let \( v_l \) denote country \( l \)'s wealth as a proportion of the world wealth, and \( e_l \) country \( l \)'s market capitalization as a proportion of the world market; thus the market aggregation condition is \( \sum x_l v_l = e \). We substitute expression (13) in the aggregation condition and use the property \( \sum v_l = 1 \):

\[ \sum \Omega^{-1} [\alpha(\mu - r_1 - C^l)] v^l = e, \]

\[ \Rightarrow \mu - r_1 = \sum C^l v^l + \frac{1}{\alpha} \Omega e, \tag{14} \]

which predicts the following mean returns:

\[ \tau - r_1 = \sum C^l v^l + \gamma \Omega e + \tilde{e}, \tag{15} \]

with \( \gamma = 1/\alpha \), the level of relative risk aversion. Expression (14) states that the expected excess return consists of a wealth-weighted average deadweight cost of holding the asset, \( \sum C^l v^l \), plus a market risk premium, \( \Omega e \).\(^3\) Equation (14) implies that the instruments of SV that have been shown to correlate with the implicit costs of foreign investments should come up as explanatory variables in a regression where the excess returns are explained by the implicit investment cost-related instruments.

We tested this model in three versions – one containing the world-market risk \( \Omega e \) on the right as in equation (15), one containing also covariances with other priced factors (SMB, HML, MOM), and one omitting all covariances on the right-hand side. The expanded CAPM is meant to test whether any prima facie CK-costs effects may be proying for, or be proxied for by, priced factors. The reduced version is of the return tests is less restrictive and is meant to test whether the cost effects come up in raw returns.

We first estimate alpha’s for each country for five different five-year samples using a simple market model:

\[ r_{i,t} - r_{f,t} = \alpha_i + \beta_i (r_{m,t} - r_{f,t}), \tag{16} \]

where \( r_i \) denotes equity index return of country \( i \), \( r_f \) is return of risk-free asset, and \( r_m \) denotes world index return.

---

\(^3\)Expression (14) is similar to the expression for expected returns derived in Cooper and Kaplanis (2000), except that we do not distinguish between short and long positions.
The Plausibility of Risk Estimates and Implied Costs to International Equity Investments

Table 3: Panel estimation results realized returns and alpha tests

The third and fourth column contain coefficient estimates and t-statistics for the model \((r_i - r_f) = \alpha + \exp(\sum \beta_i X_{i,t}) + \xi_{i,t}\). The last four columns contain the estimation results from the alpha-tests, \(\hat{\alpha}_{i,t} = c + \exp(\sum \beta_i X_{i,t}) + \xi_{i,t}\). The CAPM-test shows the results for alpha’s estimated from a simple international CAPM, while the 4-factor model shows the results for alpha’s estimated using a four-factor model. Significance at the 99%, 95%, and 90% level is denoted by three, two and one * respectively.

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\[
 r_{i,t} - r_{f,t} = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \delta_i SMB_t + \varphi_i HML_t + \kappa_i MOM_t + \varepsilon_{i,t} \tag{17}
\]

where

\(SMB = \) return differential of small portfolio (50% smallest stocks) and large portfolio (50% largest stocks),

\(HML = \) return differential of high portfolio (30% highest book-to-market stocks) and low portfolio (30% lowest book-to-market stocks),

\(MOM = \) return differential of winner portfolio (30% short-term winning stocks) and loser portfolio (30% short-term losing stocks),
Following Fama and French (1993) the small, large, high and low portfolios are updated yearly at the end of June based on the stock’s end of June dollar market value (for SMB) and book-to-market ratio (for HML). The portfolios are equally weighted across stocks. Following Jegadeesh and Titman (1993), Carhart (1997) and Rouwenhorst (1999) the winner and loser portfolios (or momentum portfolios) are based on the stock’s 6-month past returns. The momentum portfolios are updated monthly and have a 6-month holding period. To avoid the bid-ask bounce (see Rouwenhorst, 1999) we leave a 1-month gap between the 6-month past return and the 6-month holding period. The momentum portfolios are updated monthly. As the updating period is smaller than the holding period, momentum portfolios (of the same kind) are time-overlapping. The resulting winner and loser portfolio is calculated as the equally weighted average of the ongoing, time-overlapping winner and loser portfolios.

To calculate the risk factors, we use Datastream’s country indices and individual stock data collected from Datastream’s world market list. We use Datastream’s world market index and the 3-month US T-bill from Financial Times. The alpha’s are estimated using Seemingly Unrelated Regression (SUR) for the 5-year periods in the range from January 1981 to December 2005. To obtain a larger sample and thus more reliable estimates, we add six countries to the SV sample: Australia, China, India, Ireland, Luxembourg and New Zealand. For some countries, there is no data available in the early eighties, thus we end up with an unbalanced panel of alpha’s (44 cross-sectional and 5 longitudinal observations).

To check whether the SV instruments come up in the estimated alpha’s, we estimate following (unbalanced) panel:

$$\hat{\alpha}_{i,t} = c + \exp(\sum \beta_i \times X_{i,t}) + \xi_{i,t}$$

where $X = [H, F]$, the set of home country related instruments $H$ and foreign (host) country related instruments $F$ of SV. The estimation looks similar to the test on gross realized returns in equation (19). However, we consider different time periods. Here, the alpha’s are estimated over the period 1981 to 2005 (one alpha for each five-year period), so that we can test whether the instruments come up as explanatory variables if we use a longer time period and more risk-return controls.

As a third test, we calculate average realized excess returns for each of our four sample years using a moving window of ten years of monthly data. Thus, we obtain a panel over 4 time periods, each covering 37 countries, that we estimate imposing country fixed effects. Similar to SV, we impose again an exponential structure to the cost function. That is, we estimate
The following panel model:

\[(\bar{r}_i - r_f)_t = \alpha + \exp(\sum \beta_i * X_{i,t}) + \xi_{i,t}\]  \hspace{1cm} (19)

where \(X = [H, F]\), the set of home country related instruments \(H\) and foreign (host) country related instruments \(F\) of SV. We cannot include the interaction variables between the host and the home country, since we do not consider return differences.

The estimation results of equation (18) for the CAPM-alpha’s and the four-factor alpha’s and the results of equation (19) are reported in Table 3. For the ENF Index, the ACC Index and the Insider Trading Index, there is no data available for the full time period 1981-2005. We use another transparency variable instead, notably a component from the Economic Freedom Index, that captures the effect of transparent and efficient regulation in the credit market, the labor market and business in general. We also omit the financial-development variable that measures the amount of credit provided by the banking sector plus stock market capitalization relative to GDP, since there is insufficient data available for the earlier periods.

The results from Table 3 show that only one of the deadweight-cost-related instruments comes up with a significant coefficient: for the CAPM-alpha’s is the coefficient for the Misery Index significantly positive and for the four-factor alpha’s is the coefficient for the current account balance significantly positive. None of the other variables appear to have any explanatory power for the cross-country difference in Jensen’s alpha. The overall fit of the model is only 2 to 4 percent.

For the test on the raw returns, a first observation is that only half of the instruments come up with coefficients that are significantly different from zero, and often this significance is only weak. A second observation from Table 3 is that more than half – five out of nine – of the significant coefficient estimates come up with a wrong sign. The only three variables that seem to have some meaningful explanatory power for the excess realized returns are the financial crisis dummy, the GDP-growth variable and the measure for financial development. Overall, Table 3 shows that the instruments that correlate with the implicit investment costs in SV do not consistently come up as explanatory variables for actual realized returns.

We conclude from this section that the model’s implications for returns do not match reality: (i) the \textit{ex post} risks of the emerging markets are substantially overestimated in the sense that they would imply unrealistic required expected returns and (ii) the instruments that are used in SV to explain the return-reducing investment costs do not come up as explanatory variables for actual realized (abnormal) returns. Therefore, the instruments of SV are probably explanations for the estimated risk differentials between emerging and developed countries,
rather than explanations for differences in their returns.

6 Implicit investment costs under time-varying volatilities

An implicit assumption in the SV-model is that equity return correlations are constant over time: the covariance matrix is estimated using equally weighted return observations over a ten-year horizon. As a robustness check, SV calculate alternative covariance matrices using exponentially weighted return observations, thus emphasizing more recent returns. If recent returns are strongly emphasized, SV find that the implicit cost structure becomes more flat: estimated investment costs are higher for the developed countries and lower for the emerging markets. This is already a first indication that the estimation of the covariance matrix influences implicit cost estimates.

The exponentially weighted covariance matrix à la RiskMetrics cannot fully capture the characteristics of the volatilities, especially for emerging markets. The financial literature provides plenty of evidence suggesting the existence of higher volatility and price changes in emerging stock markets (Bekaert and Harvey, 1997; Bekaert et al., 1997; Bekaert et al., 1998; Kohers et al., 2006). In this section, we use the Bekaert-Harvey (1997) TGARCH model to estimate the covariance matrix of equity returns and apply this matrix to the SV-model. The Bekaert-Harvey model allows for nonnormalities in the market returns and time-varying conditional mean returns. Interestingly, in the Bekaert-Harvey methodology, the means and volatilities are designed to let the relative importance of local and world information shift through time as emerging equity markets become more or less influenced by world capital markets.

6.1 The Bekaert-Harvey model

The general form of the Bekaert-Harvey (1997) model is expressed by the following set of equations:

\[ r_{l,t} = \mu_{l,t-1} + \varepsilon_{l,t}, \quad (20) \]

\[ \varepsilon_{l,t} = \nu_{l,t-1}\varepsilon_{w,t} + \varepsilon_{l,t}, \quad (21) \]

\[ (\sigma_{l,t}')^2 = E[\varepsilon_{l,t}^2 | I_{t-1}] = c_l + \alpha_l(\sigma_{l,t-1}')^2 + \beta_l\varepsilon_{l,t-1}^2 + \gamma_l\varepsilon_{w,t}^2 \quad (22) \]

\[ \varepsilon_{t,l} = \sigma_{l,t}'z_{l,t}, \quad (23) \]
where \( r_l \) represents the excess equity return of country \( l \), \( \mu_{l,t-1} \) is the information available at time \( t-1 \) and \( \mu_{l,t-1} \) denotes conditional mean return for country \( l \). The unexpected portion of country’s \( l \)’s return, \( \epsilon_{l,t} \), is driven by world shocks, \( \varepsilon_{w,t} \) and a purely idiosyncratic shock, \( \epsilon_{l,t} \).

The dependence of local shocks on world shocks is determined by \( \nu_{l,t-1} \). The local idiosyncratic standard deviation is \( \sigma_{l,t} \) and \( z_{l,t} \) is a standardized residual with zero mean and unit variance. \( S_{l,t} \) is an indicator variable that is equal to unity when the idiosyncratic shock is negative and zero otherwise. Equations (20) to (23) are the expression of a TGARCH (1,1) model which accounts for asymmetries in the volatility of equity returns.

Bekaert and Harvey (1997) develop both a linear and a non-linear model to describe the influence of local and world information on the countries’ expected returns. In the linear model the influence of world and local shocks is kept constant over time, while in the nonlinear model the influence of local and world information on stock market returns changes over time. For simplicity, we only consider the linear model here. The model assumes that, as a market becomes more integrated, both the conditional mean and the variance should be more influenced by world factors.

\[
\begin{align*}
\mu_{l,t-1} &= \delta'_{l,1} X_{l,t-1} + \delta'_{l,2} X_{t-1}, \\
\nu_{l,t-1} &= q_{l,0} + q'_{l,1} X_{l,t-1}^*,
\end{align*}
\] (24) (25)

where \( X_{l,t-1} \) represents a set of world information variables including a constant, the world market dividend yield in excess of the 30-day Eurodollar rate, the default spread (Moody’s Baa minus Aaa bond yields), the change in the term structure spread (US ten-year bond yield minus three-month T-bill yield), and the change in the 30-day Eurodollar rate. \( X_{l,t-1} \) is a set of local information variables: a constant, the equity return, the exchange rate, the dividend yield, the ratio of equity market capitalization to GDP, and the ratio of trade (exports plus imports) to GDP. \( X_{l,t-1}^* \) is a subset of \( X_{l,t-1} \) that contains market cap to GDP and trade to GDP, which should capture the degree of integration of a country in the world market. Thus, the dependence of the conditional variance on world factors is allowed to change with the degree of integration. All information variables are lagged.

### 6.2 Estimation of the Bekaert-Harvey model

The Bekaert-Harvey model is estimated in two steps. In the first step, we estimate the model for the world market return. If we apply the model in equations (20)-(23) to the world market return, we obtain a special case where \( l = w \), \( \sigma_{l,t} = \sigma_{w,t} \), \( \nu_{w,t-1} = 0 \) and \( \mu_{w,t-1} = \delta_{w} X_{t-1} \).
In the second step, we estimate the model country by country, conditioning on the world market estimates. We consider two different distributional assumptions for the standardized residuals, the standard normal and the t-distribution (to accommodate fat tails). We report only the results of the model that scores best on the Pagan-Schwert (1990) test.\footnote{Following Pagan and Schwert (1990), we regress the squared residuals onto the estimated variances and select the model with the highest $R^2$.}

The estimation results of equations (20)-(23) are interesting in se, but not particularly relevant for this paper. Therefore, we report and discuss the estimation results for the Bekaert-Harvey model in the Appendix.

### 6.3 Computation of the covariance matrix

Figure 4 shows the fitted conditional variances for two emerging countries, Malaysia and Russia. For Malaysia, volatility is substantially higher during the Asian crisis, while for Russia, the volatility of equity returns declines sharply at the end of the nineties. If the covariance matrix is estimated using equally weighting of historical returns, the variances will be overestimated considerably. Therefore, we estimate the covariance of the equity return from country $l$ with the return of country $i$ as $\sigma_{l,i,t} = \rho_{l,i} \sigma_{l,t} \sigma_{i,t}$, where $\rho_{l,i}$ is the correlation between the standardized unexpected equity returns of country $l$ and country $i$. This procedure to estimate the covariance matrix assuming a constant conditional correlation matrix has been used in Bollerslev (1990)
Table 4: Estimation results for the Bekaert-Harvey time varying volatility model

The estimated model is that of equation (4). The second column contains the GMM estimation results for the model with the historical, equally weighted covariance matrix (the standard setting in SV). Column three contains the results for the SV-model with the covariance matrix implied the Bekaert-Harvey volatility model. Significance at the 99%, 95%, and 90% level is denoted by three, two and one * respectively.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Exp.</th>
<th>Constant volatility</th>
<th>Time varying volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sign</td>
<td>Coefficient</td>
<td>t-stat</td>
</tr>
<tr>
<td>Inflation hedging (α)</td>
<td>+</td>
<td>0.42 ***</td>
<td>4.06</td>
</tr>
<tr>
<td>Constant (log(α) + c)</td>
<td>?</td>
<td>-1.88 ***</td>
<td>-6.91</td>
</tr>
</tbody>
</table>

Int. investment costs C(H_i, F_i, A_{i,t})

1. Information-related
   - F_i English-speaking host
     - -0.32 *** -5.45 0.19 0.68
   - A_{i,t} Common region
     - -0.40 *** -5.81 -0.17 *** -4.77
   - Common language
     - -0.17 *** -3.06 -0.24 *** -2.83
   - Log(distance)
     + 0.35 *** 8.74 0.16 *** 6.56
   - Bilateral imports
     - -0.05 *** -2.73 -0.07 *** -2.93

2. Explicit frictions
   - F_i Transaction costs, host
     + 0.31 *** 8.10 0.09 1.28
   - Dest. capital-import ctrls
     + 0.29 *** 5.98 0.06 0.73
   - H_i Transaction costs, home
     - -0.21 *** -5.29 0.10 ** 2.21
   - Home capital-export ctrls
     + -0.02 -0.82 0.02 ** 0.77

3. Financial development
   - F_i (Bank+Cap)/GDP, abroad
     - -0.01 -0.33 0.15 ** 2.39
   - Liquidity abroad
     - -0.14 *** -3.88 -0.78 *** -11.03

4. Economic health and stability
   - F_i GDP, host
     - -6.09 *** -9.06 -18.25 *** -6.95
   - GDP-growth host
     - 1.42 *** 13.57 0.61 *** 6.66
   - Misery index, host
     + 0.01 1.92 0.01 *** 3.47
   - Current acc deficit, host
     + 0.05 *** 33.30 0.05 *** 15.02
   - Crisis, host
     + 0.25 *** 10.79 0.04 1.13
   - H_i Home GDP
     - 0.50 *** 2.90 0.50 ** 2.33
   - A_{i,t} Euroland
     - -0.13 -1.51 -0.31 *** -4.53

5. Political risk and corporate governance
   - F_i ENF, host
     + 0.01 *** 7.53 0.02 *** 3.10
   - ACC, host
     + -0.04 *** -11.91 0.02 ** 2.25
   - ENFACC, host
     - 0.00 0.54 -0.00 -0.94
   - Government effect., host
     - -1.10 *** -17.68 -0.10 -0.93
   - Insider trading, host
     - -0.57 -1.37 0.42 1.44
   - TI CPI, host
     - -0.05 *** -2.31 -0.81 *** -9.13

6. Skewness
   - F_i Skewness, host
     - 0.27 *** 17.11 -0.32 *** -4.85

Adjusted $R^2$

| - 0.82 | 0.69 |


We insert the estimated covariance matrix in the SV-model to verify whether (and to what extent) the covariance matrix estimation influences the estimated implicit costs of international equity investments. Table 4 shows the regression results and Figure 6 shows the corresponding implicit costs estimates.

A first observation from Table 4 is that the risk tolerance parameter, $\alpha$, and the constant are considerably lower for the time-varying volatilities than for the constant volatility model. This is a first indication that the estimated implicit costs are lower when we use the Bekaert-Harvey model to estimate volatilities. A second observation is that only three coefficient estimates are substantially affected by the covariance matrix estimation: the corporate governance vari-
while ACC, the interaction term between corporate governance and country-level governance (ENF*ACC), and the measure for return skewness. The positive coefficient for the ACC Index and the negative coefficient for return skewness make more sense, since one would expect implicit inward investment costs to be positively correlated with corporate opacity and negatively correlated with host-country return skewness.

While the impact of the Bekaert-Harvey estimates on the regression is not overwhelming, the estimated implicit investment costs do change substantially. For the developed countries, the Bekaert-Harvey volatilities induce higher estimated inward investment costs. For instance, implicit investment costs rise from 0.03 percent p.a. to 0.49 percent p.a. for the Netherlands, and from 0.10 to 0.49 percent for Switzerland. For the emerging markets, we observe exactly the opposite: estimated inward investment costs are lower for the time-varying volatilities than for the constant volatilities. For Indonesia, for example, estimated inward investment costs drop from 37 percent p.a. to 10.5 percent p.a., while for Thailand the estimated investment
Figure 6: **Average implicit investment costs using time-varying volatilities**

This figure shows the average annual inward investment costs for each sample year, estimated from the SV-model, assuming time varying volatilities *a la* Bekaert and Harvey (1997). The figure also shows confidence intervals (+/− 2 standard deviations) for each cost estimate.

Costs change from 13.7 percent *p.a.* to 4.9 percent *p.a.*. Thus, we conclude from Table 4 and Figure 6 that a different covariance-estimation method has an important influence on
estimated deadweight costs. This can be explained by the fact that the high-volatility period came earlier for the emerging markets than for the developed countries. Several emerging markets suffered from a financial crisis in 1997-1999, while for the developed countries the volatilities were higher during the burst of the tech bubble and the war in Iraq (2000-2003). Allowing for time-varying and asymmetric volatilities leads to smaller implicit investment costs estimates for the emerging markets, which are far more realistic.

7 Conclusion

Relative to the deadweight-cost approach (Cooper and Kaplanis, 1994; Sercu and Vanpée, 2007), we propose an alternative or complementary explanation for the home bias by showing both theoretically and empirically that most of the deadweight costs of foreign investments are actually driven by estimated risk (variances), not by observed differences in international portfolio holdings. We show that emerging markets’ risks are hard to estimate precisely and are more time-varying than the risks of industrialized countries. We compare the implied expected returns from the Sercu-Vanpée model with actual realized returns and show that especially for emerging markets, the Sercu-Vanpée model substantially overestimates expected returns. For the industrialized countries, expected returns are generally underestimated. We show that using time-varying covariance matrices in the SV-methodology leads to much better results: estimated inward investment costs for the emerging markets are much lower and far more realistic.

References


Appendix

A.1 The inverse covariance matrix: hedging interpretation, Sercu (1980)

We partition the covariance matrix in two subsets, where group d contains all domestic stocks and group f contains all foreign assets and currency bills:

\[
\Omega = \begin{pmatrix}
\Omega_{d,d} & \Omega_{d,f} \\
\Omega_{d,f} & \Omega_{f,f}
\end{pmatrix}
\]

and think of the portfolio of domestic stocks hedged against foreign stocks and exchange risk. The hedging works as follows: regress the excess return of the domestic stock \(d\) onto all excess returns of the foreign assets of group f, indicated as \(k_f = 1_f, 2_f, \ldots, N_f\):

\[
\mu_d - r = a_d + \gamma_{d,1_f}(\mu_{1_f} - r) + \gamma_{d,2_f}(\mu_{2_f} - r) + \ldots + \gamma_{d,N_f}(\mu_{N_f} - r) + \epsilon_d.
\]

If you now take stock \(d\) and add to it a short position of size \(\gamma_{d,k_f}\) for each of the foreign stocks and currency bills \(k_f\), the only risky item left is the noise term, \(\epsilon\):

\[
\mu_d - r - \sum_{k_f=1}^{N_f} \gamma_{d,k_f}(\mu_{k_f} - r) = a_d + \epsilon_d.
\]

The gammas, in a regression, are chosen such that the variance of the residual is as small as possible. In this sense the regression hedge is the best possible hedge. The remaining risk \(\epsilon\) is also uncorrelated with all the foreign equity and currency bill returns.

Let us denote the matrix of \(\gamma\)'s by \(\Gamma\) (where \(\Gamma = \Omega_{f,f}\Omega_{d,f}^\prime\)), and the variance-covariance matrix of the hedged returns \(\epsilon_d\) by \(\Omega_{\epsilon,\epsilon}\). Then

\[
\Rightarrow \Omega^{-1}E = \begin{pmatrix}
\Omega_{\epsilon,\epsilon}^{-1} & -\Omega_{\epsilon,\epsilon}^{-1}\Gamma' \\
-\Gamma\Omega_{\epsilon,\epsilon}^{-1} & \Omega_{f,f}^{-1} + \Gamma\Omega_{\epsilon,\epsilon}^{-1}\Gamma'
\end{pmatrix}
\begin{pmatrix}
E_d \\
E_f
\end{pmatrix},
\]

\[
= \begin{pmatrix}
\Omega_{\epsilon,\epsilon}^{-1}(E_d - \Gamma'E_f) \\
-\Gamma\Omega_{\epsilon,\epsilon}^{-1}E_d + [\Omega_{f,f}^{-1} + \Gamma\Omega_{\epsilon,\epsilon}^{-1}\Gamma']E_f
\end{pmatrix},
\]

\[
= \begin{pmatrix}
\Omega_{\epsilon,\epsilon}^{-1}(E_d - \Gamma'E_f) \\
-\Gamma\Omega_{\epsilon,\epsilon}^{-1}(E_d - \Gamma'E_f)
\end{pmatrix}.
\]

In the top part of \(\Omega^{-1}E\), we see the expected returns from the hedged domestic assets, \((E_d - \Gamma'E_f)\), premultiplied by the covariance matrix of these hedged returns. So the first part of \(\Omega^{-1}E\) is the demand for hedged stocks. The second part has two components. First, \(\Omega_{f,f}^{-1}E_f\) is the demand for foreign assets as if there had been no correlations between groups d and f; the second term then is \(-\Gamma[\Omega_{\epsilon,\epsilon}^{-1}(E_d - \Gamma'E_f)]\), which corresponds to the positions needed to hedge the investments in domestic stocks.
Table 5: Definition of the deadweight cost related instruments of SV

<table>
<thead>
<tr>
<th>Variable</th>
<th>Exp.</th>
<th>Sign</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Int. investment costs</strong> $C(H_l,F_i,A_{l,i})$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. Information-related</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>$\text{Int. investment costs}$</td>
<td>+</td>
<td>Dummy if the host country has English as official language</td>
</tr>
<tr>
<td>Interaction</td>
<td>English-speaking</td>
<td>+</td>
<td>Dummy if home and host country are situated in the same region</td>
</tr>
<tr>
<td>Common region</td>
<td>Common language</td>
<td>+</td>
<td>Dummy if home and host country share the same official language</td>
</tr>
<tr>
<td>Log(distance)</td>
<td>Bilateral imports</td>
<td>+</td>
<td>Logarithm of the physical distance between the home and the host country</td>
</tr>
<tr>
<td></td>
<td>&lt; country i from country l's GDP</td>
<td>&lt;</td>
<td>Imports of country i from country l's GDP</td>
</tr>
<tr>
<td><strong>2. Explicit frictions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>Transaction costs</td>
<td>+</td>
<td>Elkins/McSherry Co., Inc. transaction costs of the host country</td>
</tr>
<tr>
<td>Capital-import ctrl</td>
<td>+</td>
<td>Elkins/McSherry Co., Inc. transaction costs of the host country</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>Transaction costs</td>
<td>+</td>
<td>Elkins/McSherry Co., Inc. transaction costs of the home country</td>
</tr>
<tr>
<td>Capital-export ctrl</td>
<td>+</td>
<td>Index of controls on capital outflows</td>
<td></td>
</tr>
<tr>
<td><strong>3. Fin. development</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>(Bank+Cap)/GDP</td>
<td>+</td>
<td>Dom. credit provided by banks plus stock market cap relative to GDP</td>
</tr>
<tr>
<td>Liquidity</td>
<td>+</td>
<td>Stock market turnover relative to stock market capitalization of the host country</td>
<td></td>
</tr>
<tr>
<td><strong>4. Economic health and stability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>GDP</td>
<td>+</td>
<td>GDP of the host country relative to world GDP</td>
</tr>
<tr>
<td>Misery index</td>
<td>+</td>
<td>Annual inflation rate + unemployment rate of the host country</td>
<td></td>
</tr>
<tr>
<td>Current account balance to GDP</td>
<td>+</td>
<td>Host country's current account balance as a percentage of its GDP</td>
<td></td>
</tr>
<tr>
<td>Crisis</td>
<td>+</td>
<td>Dummy if the host country suffered from a financial crisis recently</td>
<td></td>
</tr>
<tr>
<td>GDP-growth</td>
<td>?</td>
<td>3-year annual average GDP-growth of the host country</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>GDP</td>
<td>?</td>
<td>GDP of the home country relative to world GDP</td>
</tr>
<tr>
<td>Interaction</td>
<td>Euroland</td>
<td>+</td>
<td>Dummy if home and host country are Euroland members</td>
</tr>
<tr>
<td><strong>5. Political risk and corporate governance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>ENF index</td>
<td>+</td>
<td>Measure for economic policy opacity (PwC and the Kurtzman Group)</td>
</tr>
<tr>
<td>ACC index</td>
<td>+</td>
<td>Measure for accounting practices and corporate governance (PwC and the Kurtzman Group)</td>
<td></td>
</tr>
<tr>
<td>ENF*ACC index</td>
<td>+</td>
<td>Interaction term country-level and corporate-level opacity (PwC and the Kurtzman Group)</td>
<td></td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>+</td>
<td>Indicator of government effectiveness (Kaufmann, Kraay and Mastruzzi, 2006)</td>
<td></td>
</tr>
<tr>
<td>Insider trading index</td>
<td>+</td>
<td>Index for insider trading in the host country (Global Competitiveness Report)</td>
<td></td>
</tr>
<tr>
<td>TI CPI index</td>
<td>+</td>
<td>Transparency International Corruption Perception Index</td>
<td></td>
</tr>
<tr>
<td><strong>6. Skewness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Host</td>
<td>Skewness-indicator</td>
<td>+</td>
<td>Skewness of the return of the host country</td>
</tr>
</tbody>
</table>
A.3 Estimation results for the Bekaert-Harvey time-varying volatility model

We estimate the following Bekaert-Harvey model:

\[ r_{l,t} = \mu_{l,t} - 1 + \epsilon_{l,t}, \]  

\[ \epsilon_{l,t} = \nu_{l,t-1} \epsilon_{w,t} + \epsilon_{l,t}, \]  

\[ (\sigma'_{l,t})^2 = E[\epsilon^2_{l,t}|I_{t-1}] = c_l + \alpha_l (\sigma'_{l,t-1})^2 + \beta_l \epsilon^2_{l,t-1} + \gamma_l S_{l,t} \epsilon^2_{l,t-1}, \]  

\[ e_{t,l} = \sigma'_l z_{l,t}, \]  

where \( \mu_{l,t-1} \) is the conditional mean return. The unexpected portion of country \( l \)'s returns, \( \nu_{l,t-1} \), is driven by world shocks, \( \epsilon_{w,t} \) and an idiosyncratic shock, \( \epsilon_{l,t} \). The dependence of local shocks on world shocks is determined by the parameter \( \nu_{l,t-1} \). The domestic idiosyncratic standard deviation is \( \sigma'_{l,t} \), \( z_{l,t} \) is a standardized residual with zero mean and unit variance, and \( S_{l,t} \) is an indicator that is equal to unity when the idiosyncratic shock is negative en zero otherwise. The distributional assumptions for the residuals are the normal (N) or the t-distribution (t). The conditional mean and variance are determined by (lagged) information variables in a linear way:

\[ \mu_{l,t-1} = \delta'_{l,1} X_{l,t-1} + \delta'_{l,2} X_t, \]  

\[ \nu_{l,t-1} = q_{l,0} + q'_{l,1} X^*_{l,t-1}, \]  

where \( X_{t-1} \) represents a set of world information variables, \( X_{l,t-1} \) is a set of local information variables and \( X^*_{l,t-1} \) is a subset of \( X_{l,t-1} \) that contains market cap to GDP and trade to GDP, to should capture the degree of integration of a country in the world market.

Table 6 reports three Wald tests. The first Wald test is a test of the significance of the global information variables in the mean return, or \( H_0 : \delta_l = 0 \). The second Wald test is a test of the significance of the variance parameters in \( \nu_{l,t-1} \), or \( H_0 : q_l = 0 \). The third Wald test is a test for the significance of the trade and size variables in \( X^* \) in \( \nu_{l,t-1} \). The last columns show the coefficient estimates for \( q_{l,0} \), the first element in \( \nu_{l,t-1} \); and \( \gamma_l \), the asymmetry parameter. Each Wald test-statistic and parameter estimate is followed by its p-value in the next column.

The hypothesis that the global factor do not influence the mean (\( \delta_l = 0 \)) is rejected in 30 out of 37 cases at the 5 % level of significance. The hypothesis that the world factor does not influence the variance (\( q_l = 0 \)) is rejected in 36 out of 37 cases. Thus we can conclude that world and domestic information variables have a significant effect on mean returns and there is a significant world factor in the conditional variance. We find that only for ten countries, there is significant time variation in the world factor dependence (\( q_{l,1} = 0 \)).

The asymmetry parameter, \( \gamma_l \) is positive for 26 countries, and for 12 out of these 26 countries the asymmetry parameter is significantly different from zero. This indicates that for these countries, negative shocks increase the volatility by more than positive shocks. The Philippines are the only
exception: $\gamma$ is significantly negative, indicating that positive shocks increase the volatility by more than negative shocks.
Table 6: Estimation results for the Bekaert-Harvey volatility model

<table>
<thead>
<tr>
<th>Country</th>
<th>Distribution</th>
<th>$\delta = 0$</th>
<th>Wald tests</th>
<th>Parameters</th>
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