Measuring Company Exposure to Country Risk: Theory and Practice

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The growth of financial markets in Asia and Latin America and the allure of globalization has made the analysis and assessment of country risk a critical component of valuation in recent years. In this paper, we consider two issues. The first is the whether country risk should be considered explicitly in valuation, and if the answer is yes, how to do it. Generically, there are two ways of incorporating country risk; we can either adjust the cash flows or change the discount rate and we will consider both approaches. The second and equally important issue is how to assess a company's exposure to country risk and we will emphasize two points. The first is that not all companies in an emerging market are equally exposed to country risk and that we need to differentiate between firms. The second is that a company's exposure to country risk comes not from where it incorporates and trades but from where it does its business. In other words, assessing and dealing with country risk can be important even for companies that trade in developed markets, if they get a significant portion of their revenues in emerging markets.

As companies and investors globalize and financial markets expand around the world, we are increasingly faced with estimation questions about the risk associated with this globalization. When investors invest in Petrobras, Gazprom and China Power, they may be rewarded with higher returns but they are also exposed to additional risk. When Coca Cola and Nestle push for growth in Asia and Latin America, they clearly are exposed to the political and economic turmoil that often characterize these markets.

In practical terms, how, if at all, should we adjust for this additional risk? In the first part of the paper, we will review the discussion on country risk premiums and how to estimate them. In the latter part of the paper, we will focus on a related question: Once we have estimated a country risk premium, how do we evaluate a company's exposure to country risk? In the process, we will argue that a company's exposure to country risk should not be determined by where it is incorporated and traded. By that measure, neither Coca Cola nor Nestle are exposed to country risk. Exposure to country risk should come from a company's operations, making country risk a critical component of the valuation of almost every large multinational corporation.

Country Risk

There are two key questions that we face when we are asked to evaluate emerging markets in Asia, Latin America and Eastern Europe. The first relates to whether there should be an additional risk premium when valuing equities in these markets, because of the country risk. As we will see, the answer will depend upon whether we view markets to be open or segmented and whether we believe in a one-factor or a multi-factor model. The second question relates to estimating an equity risk premium for emerging markets. Depending upon our answer to the first question, we will consider several solutions.

Should there be a country risk premium?

Is there more risk in investing in Malaysian or Brazilian equities than there is in investing in equities in the United States? The answer, to most, seems to be obviously affirmative. That, however, does not answer the question of whether there should be an additional risk premium charged when investing in those markets.

Note that the only risk that is relevant for purposes of estimating a cost of equity is market risk or risk that cannot be diversified away. The key question then becomes

whether the risk in an emerging market is diversifiable or non-diversifiable risk. If, in fact, the additional risk of investing in Malaysia or Brazil can be diversified away, then there should be no additional risk premium charged. If it cannot, then it makes sense to think about estimating a country risk premium.

But diversified away by whom? Equity in a Brazilian or Malaysian firm can be held by hundreds or thousands of investors, some of whom may hold only domestic stocks in their portfolio, whereas others may have more global exposure. For purposes of analyzing country risk, we look at the marginal investor – the investor most likely to be trading on the equity. If that marginal investor is globally diversified, there is at least the potential for global diversification. If the marginal investor does not have a global portfolio, the likelihood of diversifying away country risk declines substantially. Stulz (1999) made a similar point using different terminology. He differentiated between segmented markets, where risk premiums can be different in each market, because investors cannot or will not invest outside their domestic markets, and open markets, where investors can invest across markets. In a segmented market, the marginal investor will be diversified only across investments in that market, whereas in an open market, the marginal investor has the opportunity (even if he or she does not take it) to invest across markets.

Even if the marginal investor is globally diversified, there is a second test that has to be met for country risk to not matter. All or much of country risk should be country specific. In other words, there should be low correlation across markets. Only then will the risk be diversifiable in a globally diversified portfolio. If, on the other hand, the returns across countries have significant positive correlation, country risk has a market risk component, is not diversifiable and can command a premium. Whether returns across countries are positively correlated is an empirical question. Studies from the 1970s and 1980s suggested that the correlation was low, and this was an impetus for global diversification. Partly because of the success of that sales pitch and partly because economies around the world have become increasingly intertwined over the last decade, more recent studies indicate that the correlation across markets has risen. This is borne out by the speed with which troubles in one market, say Russia, can spread to a market with which it has little or no obvious relationship, say Brazil.

So where do we stand? We believe that while the barriers to trading across markets have dropped, investors still have a home bias in their portfolios and that markets remain partially segmented. While globally diversified investors are playing an increasing role in the pricing of equities around the world, the resulting increase in correlation across markets has resulted in a portion of country risk being non-diversifiable or market risk. In the next section, we will consider how best to measure this country risk and build it into expected returns.

Estimating a Country Risk Premium

If country risk is not diversifiable, either because the marginal investor is not globally diversified or because the risk is correlated across markets, we are left with the task of measuring country risk and estimating country risk premiums. In this section, we will consider two approaches that can be used to estimate country risk premiums. One approach builds on historical risk premiums and can be viewed as the *historical risk premium plus* approach. In the other approach, we estimate the equity risk premium by looking at how the market prices stocks and expected cash flows – this is the *implied premium approach.*

1. Historical Premium

Most practitioners, when estimating risk premiums in the United States. look at the past. In this approach, we look at what we would have earned as investors by investing in equities as opposed to investing in riskless investments. We will consider why this approach cannot be used in emerging market and possible modifications.

Historical Premiums in Emerging Markets

The argument for using historical risk premiums is a simple one. If investors have, on average, earned 5% more by investing in stocks than government bonds in the past, this is a reasonable estimate of what they will continue to make in the future. Notwithstanding the logic in this statement, the problem with historical risk premiums remains their imprecision. After all, the historical premiums are extracted from returns on stocks and bonds, which are volatile over time. As a consequence, the historical premium of 5% may come with a standard error that is so large as to make it useless. How can we estimate the standard error? Roughly speaking, the standard error in the risk premium is a

function of the annual standard deviation in stock returns and the number of years of data that we have:

$$\text{Standard Error in the Risk Premium} = \frac{\text{Annualized Standard deviation in Stock Returns}}{\sqrt{\text{Number of years of data in sample}}}$$

To illustrate, the standard error in the historical risk premium for the United States, computed using 75 years of data is calculated below:

$$\text{Standard Error in US Risk Premium} = \frac{20\%}{\sqrt{75}} = 2.31\%$$

With an annualized standard deviation in stock returns of 20%, the standard error, even with 75 years of data, is roughly 2.31%.

With emerging markets, we will almost never have access to as much historical data as we do in the United States. In markets like Brazil, Russia and Indonesia, we can consider ourselves lucky if we can find 10 to 20 years of reliable historical data. If we combine this with the high volatility in stock returns in these markets, the conclusion we have to draw is that historical risk premiums can be computed for these markets but they will be useless because of the large standard errors in the estimates.[1]

Modified Historical Risk Premiums

While historical risk premiums for markets outside the United States cannot be estimated with much precision, we still need to estimate a risk premium for use in these markets. To approach this estimation question, let us start with the basic proposition that the risk premium in any equity market can be written as:

Equity Risk Premium = Base Premium for Mature Equity Market + Country Equity Risk Premium

The country premium could reflect the extra risk in a specific market, reflecting the fact that it is not a mature equity market. To estimate the base premium for a mature equity market, we can look at the US market. Between 1928 and 2002, stocks in the United States delivered a premium of 4.53% over government bonds. A more expansive

[1] Consider the Brazilian market, where we have about 10 years of reliable historical data on stock returns since the Real Plan in 1994. With an annualized standard deviation of about 30% in returns, the standard error in the risk premium, using 10 years of data, is about 10%.

look at all equity markets in the 20th century suggests an equity risk premium of about 4%.[2] To estimate the country equity risk premium, however, we need to measure country risk and convert the country risk measure into a country risk premium.

Measuring Country Risk

While there are several measures of country risk, one of the simplest and most easily accessible is the rating assigned to a country's debt by a ratings agency (S&P, Moody's, Fitch and IBCA all rate countries). These ratings measure default risk (rather than equity risk) but they are affected by many of the factors that drive equity risk – the stability of a country's currency, its budget and trade balances and its political stability, for instance[3]. Consider Brazil, as an example. In September 2003, the Brazilian government has dollar denominated C-Bonds outstanding, with ten years to maturity. S&P rated the Brazilian government C-bond at B+ whereas Moody's assigned a B2 rating to the same bond.

While ratings provide a convenient measure of country risk, there are costs associated with using them as the only measure. First, ratings agencies often lag markets when it comes to responding to changes in the underlying default risk. Second, the ratings agency focus on default risk may obscure other risks that could still affect equity markets. What are the alternatives? There are numerical country risk scores that have been developed by some services as much more comprehensive measures of risk. The Eurasia Group, for instance, has a score that runs from 0 to 100, where 0 is no risk, and 100 is most risky, that it uses to rank emerging markets. In September 2003, the country risk score for Brazil, based upon this measure, was 61. Alternatively, country risk can be estimated from the bottom-up by looking at economic fundamentals in each country. This, of course, requires significantly more information than the other approaches.

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[2] See "Triumph of the Optimistis" by Dimson, Marxh and Staunton.

[3]The process by which country ratings are obtained in explained on the S&P web site at http://www.ratings.standardpoor.com/criteria/index.htm.

Measuring Country Risk Premiums

If country risk matters and leads to higher premiums for riskier countries, the obvious follow-up question becomes how we measure this additional premium. In this section, we will look at three approaches. The first builds on default spreads on country bonds issued by each country whereas the latter two use equity market volatility as their basis.

1. Country Bond Default Spreads

The simplest and most widely used measure of country risk comes from looking at the yields on bonds issued by the country in a currency (such as the dollar or the euro) where there is a default free bond yield to which it can be compared.[4] Consider the dollar denominated Brazilian C-Bond that we highlighted earlier in this section. The C-Bond is widely traded and both the price and yield of the bond reflect market views of Brazil. In September 2003, the 10-year C-bond was priced to yield 10.12%. Comparing this yield to the 10-year U.S. treasury bond rate of 4.11% generates a default spread of 6.01% for the Brazilian bond.

While we can make the argument that the default spread in the C-Bond is a reasonable measure of the default risk in Brazil, it is also a volatile measure. In figure 1, we have graphed the yields on the C-Bond and the U.S. treasury bond and highlighted the default spread.

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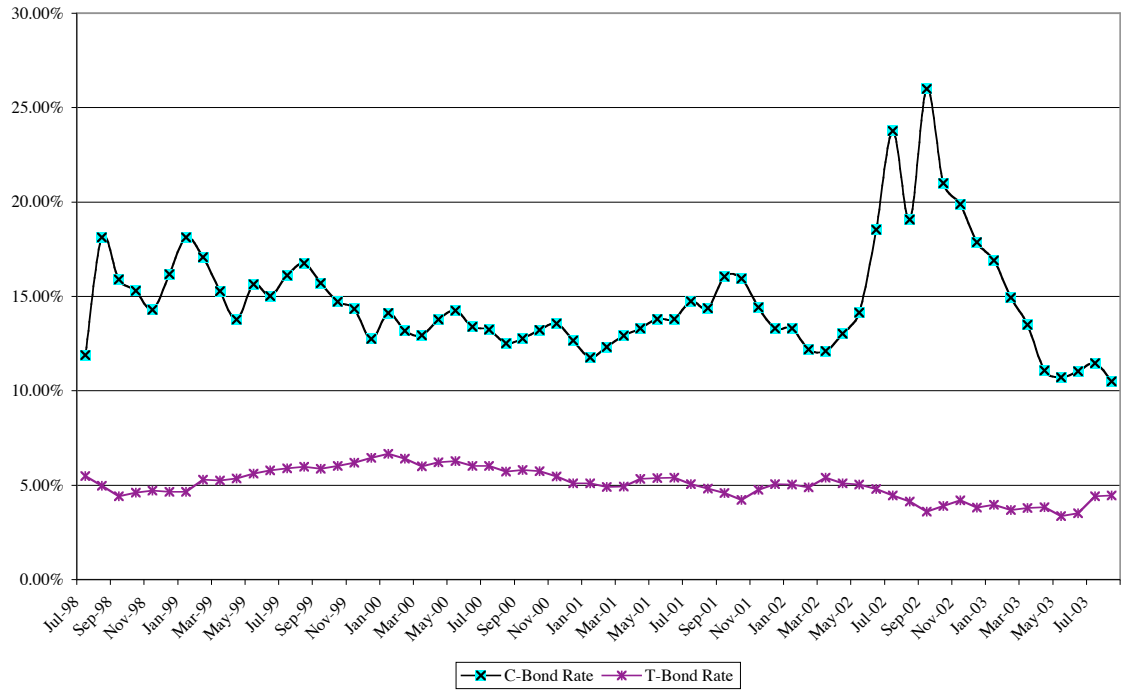
[4] You cannot compare interest rates across bonds in different currencies. The interest rate on a peso bond cannot be compared to the interest rate on a dollar denominated bond.

US Treasury Bond and Brazil C Bond Rates: 1998- 2003



Note that the spread widened dramatically during 2002, mostly as a result of uncertainty in neighboring Argentina and concerns about the Brazilian presidential elections.[5] After the elections, the spreads decreased just as quickly. Given this volatility, a reasonable argument can be made that we should consider the average spread over a period of time such as two years rather than the default spread at the moment.

Analysts who use default spreads as measures of country risk typically add them on to both the cost of equity and debt of every company traded in that country. For instance, the cost of equity for a Brazilian company, estimated in U.S. dollars, will be 6.01% higher than the cost of equity of an otherwise similar U.S. company, using the September 2003 measure of the default spread. In some cases, analysts add the default spread to the U.S. risk premium and multiply it by the beta. This increases the cost of

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[5] The polls throughout 2002 suggested that Lula who was perceived by the market to be a leftist would beat the establishment candidate. Concerns about how he would govern roiled markets and any poll that showed him gaining would be followed

equity for high beta companies and lowers them for low beta firms. We will consider the relative strengths of both approaches in the next section.

2. Relative Equity Market Standard Deviations

There are some analysts who believe that the equity risk premiums of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. A conventional measure of equity risk is the standard deviation in stock prices; higher standard deviations are generally associated with more risk. If you scale the standard deviation of one market against another, you obtain a measure of relative risk.

$$\text{Relative Standard Deviation}_{\text{Country X}} = \frac{\text{Standard Deviation}_{\text{Country X}}}{\text{Standard Deviation}_{\text{US}}}$$

This relative standard deviation when multiplied by the premium used for U.S. stocks should yield a measure of the total risk premium for any market.

$$\text{Equity risk premium}_{\text{Country X}} = \text{Risk Premum}_{\text{US}} * \text{Relative Standard Deviation}_{\text{Country X}}$$

Assume, for the moment, that you are using a equity risk premium for the United States of 4.53%. The annualized standard deviation in the S&P 500 between 2001 and 2003, using weekly returns, was 18.59%, whereas the standard deviation in the Bovespa (the Brazilian equity index) over the same period was 33.37%.[6] Using these values, the estimate of a total risk premium for Brazil would be as follows.

$$\text{Equity Risk Premium}_{\text{Brazil}} = 4.53\% * \frac{33.37\%}{18.59\%} = 8.13\%$$

The country risk premium can be isolated as follows:

$$\text{Country Risk Premium}_{\text{Brazil}} = 8.13\% - 4.53\% = 3.60\%$$

While this approach has intuitive appeal, there are problems with using standard deviations computed in markets with widely different market structures and liquidity. There are very risky emerging markets that have low standard deviations for their equity markets because the markets are illiquid. This approach will understate the equity risk premiums in those markets. The second problem is related to currencies since the

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[6] If the dependence on historical volatility is troubling, the options market can be used to get implied volatilities for both the US market (about 20%) and for the Bovespa (about 38%).

standard deviations are usually measured in local currency terms; the standard deviation in the U.S. market is a dollar standard deviation, whereas the standard deviation in the Brazilian market is a nominal Brazilian Real standard deviation. This is a relatively simple problem to fix, though, since the standard deviations can be measured in the same currency – you could estimate the standard deviation in dollar returns for the Brazilian market.

3. Default Spreads + Relative Standard Deviations

The country default spreads that come with country ratings provide an important first step, but still only measure the premium for default risk. Intuitively, we would expect the country equity risk premium to be larger than the country default risk spread. To address the issue of how much higher, we look at the volatility of the equity market in a country relative to the volatility of the bond market used to estimate the spread. This yields the following estimate for the country equity risk premium.

$$\text{Country Risk Premium} = \text{Country Default Spread} * \left(\frac{\sigma_{\text{Equity}}}{\sigma_{\text{Country Bond}}} \right)$$

To illustrate, consider again the case of Brazil. As noted earlier, the default spread on the Brazilian C-Bond in September 2003 was 6.01% and the annualized standard deviation in the Brazilian equity index over the previous year was 33.37%. Using two years of weekly returns, the annualized standard deviation in the Brazilian dollar denominated C-bond was 26.15%. The resulting country equity risk premium for Brazil is as follows:

$$\text{Brazil's Additional Equity Risk Premium} = 6.01\% \left(\frac{33.37\%}{26.15\%} \right) = 7.67\%$$

Unlike the equity standard deviation approach, this premium is in addition to a mature market equity risk premium. Note that this country risk premium will increase if the country rating drops or if the relative volatility of the equity market increases.

Why should equity risk premiums have any relationship to country bond spreads? A simple explanation is that an investor who can make 11% on a dollar-denominated Brazilian government bond would not settle for an expected return of 10.5% (in dollar terms) on Brazilian equity. Playing devil's advocate, however, a critic could argue that the interest rate on a country bond, from which default spreads are extracted, is not really

an expected return since it is based upon the promised cash flows (coupon and principal) on the bond rather than the expected cash flows. In fact, if we wanted to estimate a risk premium for bonds, we would need to estimate the expected return based upon expected cash flows, allowing for the default risk. This would result in a much lower default spread and equity risk premium.

Both this approach and the previous one use the standard deviation in equity of a market to make a judgment about country risk premium, but they measure it relative to different bases. This approach uses the country bond as a base, whereas the previous one uses the standard deviation in the U.S. market. This approach assumes that investors are more likely to choose between Brazilian bonds and Brazilian equity, whereas the previous one approach assumes that the choice is across equity markets.

Choosing between the approaches

The three approaches to estimating country risk premiums will generally give you different estimates, with the bond default spread and relative equity standard deviation approaches yielding lower country risk premiums than the melded approach that uses both the country bond default spread and the equity and bond standard deviations. Table 1 summarizes the estimates of country equity and total risk premium using the three approaches for Brazil in September 2003:

Table 1: Country and Total Equity Risk Premium: Brazil in September 2003

Approach	*Mature Market Equity Premium*	*Brazil Country Risk Premium*	*Total Equity Risk Premium*
Country Bond Default Spread	4.53%	6.01%	10.54%
Relative Equity Market Standard Deviations	4.53%	3.60%	8.13%
Melded Approach (Bond default spread + Relative Standard Deviation)	4.53%	7.67%	12.20%

We believe that the larger country risk premiums that emerge from the last approach are the most realistic for the immediate future, but that country risk premiums will decline

over time. Just as companies mature and become less risky over time, countries can mature and become less risky as well.

One way to adjust country risk premiums over time is to begin with the premium that emerges from the melded approach and to adjust this premium down towards either the country bond default spread or the country premium estimated from equity standard deviations. Another way of presenting this argument is to note that the differences between standard deviations in equity and bond prices narrow over longer periods and the resulting relative volatility will generally be smaller[7]. Thus, the equity risk premium will converge to the country bond default spread as we look at longer term expected returns. As an illustration, the country risk premium for Brazil would be 7.67%% for the next year but decline over time to either the 6.01% (country default spread) or 3.60% (relative standard deviation).

II. An Alternative Approach: Implied Equity Premiums

There is an alternative to estimating risk premiums that does not require historical data or corrections for country risk, but does assume that the market, overall, is correctly priced. Consider, for instance, a very simple valuation model for stocks:

$$\text{Value} = \frac{\text{Expected Dividends Next Period}}{(\text{Required Return on Equity} - \text{Expected Growth Rate})}$$

This is essentially the present value of dividends growing at a constant rate. Three of the four inputs in this model can be obtained externally - the current level of the market (value), the expected dividends next period and the expected growth rate in earnings and dividends in the long term. The only "unknown" is then the required return on equity; when we solve for it, we get an implied expected return on stocks. Subtracting out the riskfree rate will yield an implied equity risk premium.

To illustrate, assume that the current level of the S&P 500 Index is 900, the expected dividend yield on the index is 2% and the expected growth rate in earnings and dividends in the long term is 7%. Solving for the required return on equity yields the following:

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[7] Jeremy Siegel reports on the standard deviation in equity markets in his book "Stocks for the very long run" and notes that they tend to decrease with time horizon.

$$900 = (.02*900) /(r - .07)$$

Solving for r,

$$r = (18+63)/900 = 9\%$$

If the current riskfree rate is 6%, this will yield a premium of 3%.

This approach can be generalized to allow for high growth for a period, and extended to cover cash flow based, rather than dividend, models. To illustrate this, consider the S&P 500 Index, as of September 23, 2003. The index was at 1018, and the cash yield (dividends + stock buybacks) on the index over the previous 12 months was roughly 2.93%; the treasury bond rate on that date was 4.05%. In addition, the consensus estimate[8] of growth in earnings for companies in the index was approximately 9% for the next 5 years. Since this is not a growth rate that can be sustained forever, we employ a two-stage valuation model, where we allow growth to continue at 9% for 5 years, and then lower the growth rate to the treasury bond rate of 4.05% after that.[9] The following table summarizes the expected cash flows for the next 5 years of high growth, and the first year of stable growth thereafter:

Year	Cash Flow on Index
1	32.49
2	35.41
3	38.60
4	42.07
5	45.86
6	48.84

[a]Cash flow in the first year = 2.93% of 1018 (1.09)

If we assume that these are reasonable estimates of the cash flows and that the index is correctly priced, then

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[8] We used the average of the analyst estimates for individual firms (bottom-up). Alternatively, we could have used the top-down estimate for the S&P 500 earnings.

[9] The treasury bond rate is the sum of expected inflation and the expected real rate. If we assume that real growth is equal to the real interest rate, the long term stable growth rate should be equal to the treasury bond rate.

Level of the index = 1018 = $32.49/(1+r) + 35.41/(1+r)^2 + + 38.60/(1+r)^3 + 42.07/(1+r)^4 + (45.86+(48.84/(r-.0405))/(1+r)^5$

Note that the last term in the equation is the terminal value of the index, based upon the stable growth rate of 4.05%, discounted back to the present. Solving for r in this equation yields us the required return on equity of 7.84%. Subtracting the treasury bond rate of 4.05% from this return yields an implied equity premium of 3.79% for the United States in September 2003.

Implied Premiums in Emerging Markets

The advantage of the implied premium approach is that it is market-driven and current, and does not require any historical data. Thus, it can be used to estimate implied equity premiums in any market. It is, however, bounded by whether the model used for the valuation is the right one and the availability and reliability of the inputs to that model. For instance, the equity risk premium for the Brazilian equity market on September 23, 2003, was estimated from the following inputs. The index (Bovespa) was at 16889 and the current dividend yield on the index was 4.55%. Earnings in companies in the index are expected to grow 15% (in US dollar terms) over the next 5 years, and 5% thereafter.[10] These inputs yield a required return on equity of 12.17%, which when compared to the treasury bond rate of 4.05% on that day results in an implied equity premium of 8.12%. For simplicity, we have used nominal dollar expected growth rates[11] and treasury bond rates, but this analysis could have been done entirely in the local currency.

While the level of the index and the dividend yield are widely available, earnings growth estimates are more difficult to come by in many markets. To the extent that firms do not pay out what they can afford to in dividends and expected growth rates cannot be

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[10] We have deviated from our rule of setting the stable growth rate equal to the riskfree rate, because real growth in Brazil is likely to be slightly higher than real growth in mature economy like the United States.

[11] The input that is most difficult to estimate for emerging markets is a long term expected growth rate. For Brazilian stocks, I used the average consensus estimate of growth in earnings for the largest Brazilian companies which have ADRs listed on them. This estimate may be biased, as a consequence.

easily estimated, implied risk premiums may be understated. Nevertheless, they offer promise because they offer forward-looking estimates.

Decomposing Implied Equity Risk Premiums

The implied equity risk premium for a market can be very different from the premiums estimated from the three approaches used in the last section. Part of the reason for that is that the implied equity risk premium is an estimate in perpetuity whereas the estimates from the last section are estimated for the immediate future. The other reason for the difference lies in the assumption that we make when estimating implied equity risk premiums that the market is correctly priced at the time of the estimation. In essence, we are being market neutral, i.e., not taking a view on markets, when we use an implied equity premium.

Once we have an estimate of the implied equity risk premium for an emerging market, we can decompose it into a mature market equity risk premium and a country-specific equity risk premium by comparing it to the implied equity risk premium for a mature equity market (the US, for instance). Applying this approach to Brazil in September 2003, we get the following:

Implied Equity premium for Brazil (see above) = 8.12%

Implied Equity premium for US (see above) = 3.79%

Country Specific Equity Risk Premium for Brazil = 4.33%

Estimating Asset Exposure to Country Risk Premiums

Once country risk premiums have been estimated, the final question that we have to address relates to the exposure of individual companies to country risk. Should all companies in a country with substantial country risk be equally exposed to country risk? While intuition suggests that they should not, we will begin by looking at standard approaches that assume that they are. We will follow up by scaling country risk exposure to established risk parameters such as betas and complete the discussion with an argument that individual companies should be evaluated for exposure to country risk.

The Bludgeon Approach

The simplest assumption to make when dealing with country risk, and the one that is most often made, is that all companies in a market are equally exposed to country risk. The cost of equity for a firm in a market with country risk can then be written as:

Cost of equity = Riskfree Rate + Beta (Mature Market Premium) + Country Risk Premium

Thus, for Brazil, where we have estimated a country risk premium of 7.67% from the melded approach, each company in the market will have an additional country risk premium of 7.67% added to its expected returns. For instance, the costs of equity for Embraer, an aerospace company listed in Brazil, with a beta[12] of 1.07 and Embratel, a Brazilian telecommunications company, with a beta of 0.80, in US dollar terms would be:

Cost of Equity for Embraer = 4.05% + 1.07 (4.53%) + 7.67% = 16.57%

Cost of Equity for Embratel = 4.05% + 0.80 (4.53%) + 7.67% = 15.34%

Note that the riskfree rate that we use is the US treasury bond rate (4.05%), and that the 4.53% is the equity risk premium for a mature equity market (estimated from historical data in the US market). It is also worth noting that analysts estimating cost of equity for Brazilian companies, in US dollar terms, often use the Brazilian C-Bond rate, a dollar denominated Brazilian bond, as the riskfree rate. This is dangerous, since it is often also accompanied with a higher risk premium, and ends up double counting risk. It also seems inconsistent to use a rate that clearly incorporates default risk as a riskfree rate. To convert this dollar cost of equity into a cost of equity in the local currency, all that we need to do is to scale the estimate by relative inflation. To illustrate, if the BR inflation rate is 7%[13] and the U.S. inflation rate is 2%, the cost of equity for Embraer in BR terms can be written as:

Expected Cost of Equity$_{BR}$ = 1.1657 (1.07/1.02) – 1 = .2228 or 22.28%

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[12] We used a bottom-up beta for Embraer, based upon an unleverd beta of 0.95 (estimated using aerospace companies listed globally) and Embraer's debt to equity ratio of 19.01%. For more on the rationale for bottom-up betas read the companion paper on estimating risk parameters.

[13] The average inflation rate in Brazil between 1998 and 2003 was 7.13%.

This will ensure consistency across estimates and valuations in different currencies.

The Beta Approach

For those investors who are uncomfortable with the notion that all companies in a market are equally exposed to country risk, a fairly simple alternative is to assume that a company's exposure to country risk is proportional to its exposure to all other market risk, which is measured by the beta. Thus, the cost of equity for a firm in an emerging market can be written as follows:

Cost of equity= Riskfree Rate+ Beta (Mature Market Premium + Country Risk Premium)

In practical terms, scaling the country risk premium to the beta of a stock implies that stocks with betas above one will be more exposed to country risk than stocks with a beta below one. For Embraer, with a beta of 1.07, this would lead to a dollar cost of equity estimate of:

Cost of Equity for Embraer = 4.05% + 1.07 (4.53% + 7.67%) = 17.10%

For Embratel, with its lower beta of 0.80, the cost of equity is:

Cost of Equity for Embraer = 4.05% + 0.80 (4.53% + 7.67%) = 13.81%

The advantage of using betas is that they are freely available for most firms. The disadvantage is that while betas measure overall exposure to macro economic risk, they may not be good measures of country risk.

The Lambda Approach

The most general, and our preferred approach, is to allow for each company to have an exposure to country risk that is different from its exposure to all other market risk. For lack of a better term, let us term the measure of a company's exposure to country risk to be lambda (λ). Like a beta, a lambda will be scaled around one, with a lambda of one indicating a company with average exposure to country risk and a lambda above or below one indicating above or below average exposure to country risk. The cost of equity for a firm in an emerging market can then be written as:

$$\text{Expected Return} = R_f + \text{Beta (Mature Market Equity Risk Premium)} + \lambda \text{ (County Risk Premium)}$$

Note that this approach essentially converts our expected return model to a two-factor model, with the second factor being country risk, with λ measuring exposure to country risk.

Determinants of a company's exposure to country risk

Most investors would accept the general proposition that different companies in a market should have different exposures to country risk. But what are the determinants of this exposure? In this section, we will consider the factors that determine lambdas.

Revenue Sources

The most obvious determinant of a company's risk exposure to country risk is how much of the revenues it derives from the country. A company that derives 30% of its revenues from Brazil should be less exposed to Brazilian country risk than a company that derives 70% of its revenues from Brazil. Note, though, that this then opens up the possibility that a company can be exposed to the risk in many countries. Thus, the company that derives only 30% of its revenues from Brazil may derive its remaining revenues from Argentina and Venezuela, exposing it to country risk in those countries. Extending this argument to multinationals, we would argue that companies like Coca Cola and Nestle can have substantial exposure to country risk because so much of their revenues come from emerging markets.

Production Facilities

A company can be exposed to country risk, even if it derives no revenues from that country, if its production facilities are in that country. After all, political and economic turmoil in the country can throw off production schedules and affect the company's profits. Companies that can move their production facilities elsewhere can spread their risk across several countries, but the problem is exaggerated for those companies that cannot move their production facilities. Consider the case of mining companies. An African gold mining company may export all of its production but it will face substantial country risk exposure because its mines are not moveable.

Risk Management

Companies that would otherwise be exposed to substantial country risk may be able to reduce this exposure by buying insurance against specific (unpleasant)

contingencies and by using derivatives. A company that uses risk management products should have a lower exposure to country risk – a lower lambda – than an otherwise similar company that does not use these products. Since a lower lambda will reduce the cost of equity and capital, why would a company choose not to manage risk? The answer lies in the fact that risk management is not costless. Insurance costs money and will reduce the margins and profits of any company that uses it. Futures contracts may be less expensive but companies that use them lose upside potential while protecting against downside risk. A gold mining company that uses futures contracts to hedge against gold pricing risk will be protected from an earnings decline if gold prices go down but will have to give up higher earnings if gold prices go up.

Data Constraints

In practical terms, few would argue with the notion that a company's exposure to country risk should be a function of a number of variables including the three listed above – where revenues originate, where production facilities are located and the use of risk management products. Before we start listing off more variables, we should be careful to note that much of this information is not publicly available. Even with the three variables listed above, only one – revenue origins – is accessible for most companies in emerging markets. A few firms do provide information about their production facilities and very few provide details of the extent of risk management.

It is possible that managers within a firm and consultants who are allowed access to internal records can come up with sophisticated measures of lambda for firms that incorporate more information about the firm. Investors have access to far less information and therefore have to settle for less ambitious measure of lambda.

Measuring Lambda

The lambda of a company can be estimated using one of three variables. The first and simplest measure is based entirely on where a company generates its revenues. The second measure is based upon accounting earnings in the most recent period and the variation in these earnings over time. The third measure uses stock prices, akin to conventional beta estimates, to estimate company risk exposure.

Revenue

In the last section, we argued that a company that derives a smaller proportion of its revenues from a market should be less exposed to country risk. But how do we go from this statement to an actual measure of lambda? Given the constraint that the average lambda across all stocks has to be one (some one has to bear the country risk), we cannot use the percentage of revenues that a company gets from a market as lambda. We can, however, scale this measure by dividing it by the percent of revenues that the average company in the market gets from the country to derive a lambda.

$Lambda_j$ = % of Revenues in country for company j/ % of revenues for average company

Consider the two large and widely followed Brazilian companies – Embraer, an aerospace company that manufactures and sells aircraft to many of the world's leading airlines and Embratel, the Brazilian telecommunications giant. In 2002, Embraer generated only 3% of its revenues in Brazil, whereas the average company in the market obtained 85% of its revenues in Brazil. Using the measure suggested above, the lambda for Embraer would be:

$Lambda_{Embraer}$ = 3%/ 85% = 0.04

In contrast, Embratel generated 95% of its revenues from Brazil, giving it a lambda of

$Lambda_{Embraer}$ = 95%/ 85% = 1.12

Following up, Embratel is far more exposed to country risk than Embraer and will have a much higher cost of equity.

To use this approach, we need to estimate both the percent of revenues for the firm in question and for the average firm in the market. While the former may be simple to obtain, estimating the latter can be a time consuming exercise. One simple solution is to use data that is publicly available on how much of a country's gross domestic product comes from exports. In table 2, we list the percentage of the GDP that comes from exports by region of the world and use it to compute the percent of GDP that is domestically directed.

Table 2: GDP from Exports by Region of the World in 2001

Region	Percent of GDP from Exports	Percent of GDP from domestic economy
East Asia & Pacific	61%	39%

Central Asia	66%	34%
Latin America & Caribbean	38%	62%
Middle East and N. Africa	45%	55%
South Asia	23%	77%
Sub-Saharan Africa	56%	44%

Source: World Bank

The breakdown for individual countries is provided in appendix 1. According to the World Bank data in this table, Brazil got 23.2% of its GDP from exports in 2001. If we assume that this is an approximation of export revenues for the average firm, the average firm can be assumed to generate 76.8% of its revenues domestically. Using this value would yield slightly higher betas for both Embraer and Embratel.

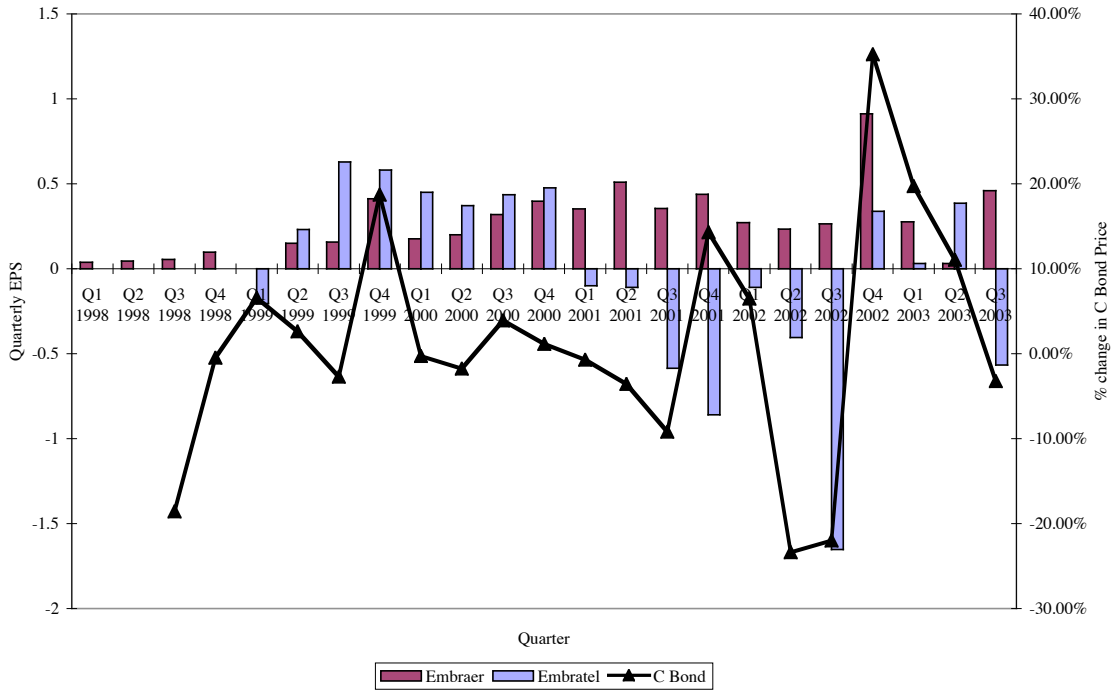
Accounting Earnings

As investors, we are more interested in a company's earnings than its revenues. Consequently, an argument can be made that we should be looking at how exposed a company's earnings are to country risk. In theory, at least, the earnings of a company that is more exposed to country risk should increase as country risk decreases and decrease as country risk exposes. There are three practical problems, though, with using accounting earnings in measuring country risk:

1. Earnings often lag changes in the underlying fundamentals at a company. In other words, the earnings changes are likely to occur well after the change in country risk occurs.
2. Earnings can be smoothed out even for companies that are exposed to country risk. On the surface, these companies look far safer and less exposed to country risk than they truly are.
3. Accounting earnings are measured four times a year, at the most, and less often in some emerging markets. With the resulting small sample, it may be difficult to draw any conclusions.

Consider again Embraer and Embratel. In figure 2, we graph the percentage changes in quarterly earnings per share for each firm in Brazilian Real from 1999 to 2002 and compare them to percentage changes in the C-Bond price each quarter:

Figure 2: EPS changes versus Country Risk: Embraer and Embratel



Note that Embratel earnings are much more sensitive to country risk than Embraer earnings. In 2002, in particular, Embratel earnings declined as country risk increased bu Embraer earnings were unaffected.

Market Prices

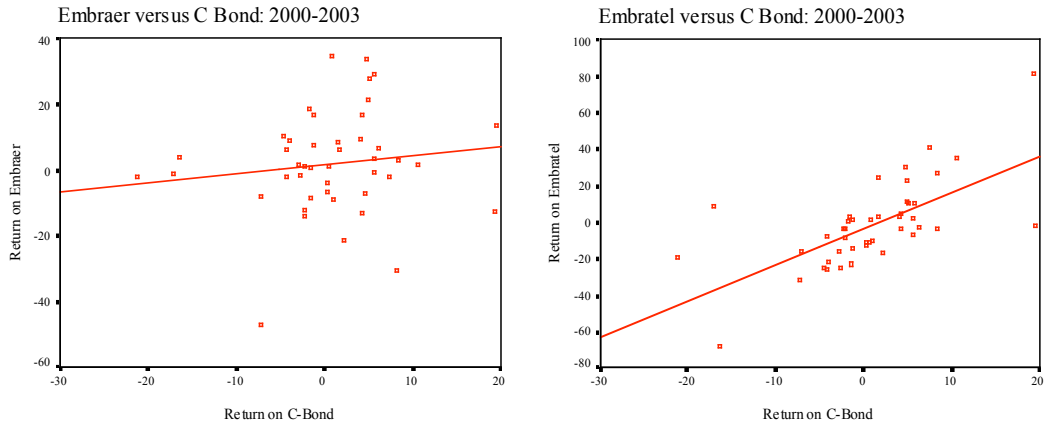
Unlike accounting earnings and revenues, which are measured only a few times each year and lag changes in the firm, stock prices are updated through every trading day and reflect investor assessments, faulty though they may be sometimes, of the effects of new information (including changes in country risk). If we can come up with market measures of country risk, we can measure the sensitivity of a company's stock price to country risk to estimate its lambda.

Bonds issued by countries offer a simple and updated measure of country risk. As investor assessments of country risk become more optimistic, bonds issued by that country go up in price, just as they go down when investors become more pessimistic. A regression of the returns on a stock against the returns on a country bond should therefore yield a measure of lambda in the slope coefficient. Note that this parallels the approach

that we often use to get a company's beta. The difference lies in the independent variable used, since the returns on an equity index are used to estimate betas.

Applying this approach to Brazil is relatively straightforward. The Brazilian C-Bond, which we used earlier to get the default spread, is widely traded and returns on the bond are available going back to 1998. We regressed monthly stock returns on Embraer and Embratel against monthly returns on the C-Bond and the resulting graphs are shown in figure 3:

Figure 3: Sensitivity to Country Risk: Embraer versus Embratel



The regression results are summarized below for the two companies:

$\text{Return}_{\text{Embraer}} = 0.0195 + 0.2681\ \text{Return}_{\text{C Bond}}$

$\text{Return}_{\text{Embratel}} = -0.0308 + 2.0030\ \text{Return}_{\text{C Bond}}$

Based upon these regressions, Embraer has a lambda of 0.27 and Embratel has a lambda of 2.00. The resulting dollar costs of equity for the two firms, using a mature market equity risk premium of 4.53% and a country equity risk premium of 7.67% for Brazil are:

Cost of Equity for Embraer = 4.05% + 1.07 (4.53%) + 0.27 (7.67%) = 10.97%

Cost of Equity for Embratel = 4.05% + 0.80 (4.53%) + 2.00 (7.67%) = 23.01%

What are the limitations of this approach? The lambdas estimated from these regressions are likely to have large standard errors; the standard error in the lambda estimate of Embratel is 0.35. It also requires that the country have bonds that are liquid and widely traded, preferably in a more stable currency (dollar or euro). While there are more country bonds in circulation now, there are dozens of countries where the data is not available.

Risk Exposure in Many Countries

The discussion of lambdas in the last section should highlight a fact that is often lost in valuation. The exposure to country risk, whether it is measured in revenues, earnings or stock prices, does not come from where a company is incorporated but from its operations. There are U.S. companies that are more exposed to Brazilian country risk than is Embraer. In fact, companies like Nestle, Coca Cola and Gillette have built much of their success on expansion into emerging markets. While this expansion has provided them with growth opportunities, it has also left them exposed to country risk in multiple countries.

In practical terms, what does this imply? When estimating the costs of equity and capital for these companies and others like them, we will need to incorporate an extra premium for country risk. Thus, the net effect on value from their growth strategies will depend upon whether the growth effect (from expanding into emerging markets) exceeds the risk effect.

We can adapt the measures suggested above to estimate the risk exposure to different countries for an individual company.

- We can break down a company's revenue by country and use the percent of revenues that the company gets from each emerging market as a basis for estimating lambda in that market. While the percent of revenues itself can be used as a lambda, a more precise estimate would scale this to the percent of revenues that the average company in that market gets in the country.
- If companies break earnings down by country, these numbers can be used to estimate lambdas. The peril with this approach is that the reported earnings often reflect accounting allocation decisions and differences in tax rates across counties.
- If a company is exposed to only a few emerging markets on a large scale, we can regress the company's stock price against the country bond returns from those markets to get country specific lambdas.

Adjusting Cashflows versus Discount Rates

The adjustments that we have suggested for country risk so far in this paper have all been directed at the discount rates – costs of equity and capital. Can we adjust

cashflows for risk? Absolutely, but before we look at how, we should dispense with some widely held misconceptions about cashflow adjustment:

- Adjusting the cashflows to reflect expectations about dire scenarios arising from political or economic turmoil is not risk adjustment. For instance, assume that you are a company investing in a large telecommunications project in China and that you expect to generate $ 1 billion in cashflows each year if the economy remains vibrant. However, your risk assessment experts tell you that there is a 10% chance of political and economic turmoil, in which case you expect to lose $ 500 million a year. You could compute an expected cashflow from these inputs:

  Expected Cashflow = 1000 (.90) – 500 (.10) = $ 850 million

  If you use this expected cashflow in your analysis, you have not adjusted for risk yet. All you have done is compute expected cashflows correctly.
- Doing Monte Carlo simulations on the cashflows or returns on an investment may give you a better sense of the risk in an investment, but they do not represent risk adjustments. The expected value across your simulations should converge on the expected value that you would have obtained with a single, base case analysis, assuming your estimates in the analysis are done correctly.
- Arbitrary reductions in the cashflows – hair cuts of 10% or 20% to the expected cashflows to reflect the fact that they are risky – may yield conservative estimates of value but do not represent real risk adjustment.

So, how can we adjust cashflows for risk? Instead of adding the risk premium to the riskfree rate, as we did in the earlier sections, we could adjust the expected cashflows for the risk. As an example, consider the cost of equity that we estimated for Embraer of 10.67% in the last section, which represents a risk premium of 6.62% over the riskfree rate. Assume that you have projected expected cashflows of $ 200 million for next year and $ 250 million for the year after for Embraer. The risk adjusted cashflows for these two years would be:

Risk adjusted cashflow for year 1 = $ 200/ 1.0662 = $187.58 million

Risk adjusted cashflow for year 2 = $ 250/1.0662^2 = $219.92 million

These cashflows would then be discounted at the riskless rate to yield almost the same value as you would have obtained with the risk adjusted discount rate approach.[14]

Conclusion

As companies expand operations into emerging markets and investors search for investment opportunities in Asia and Latin America, the assessment of country risk has become a central component of valuation. In this paper, we considered two key questions.

The first is whether there should be an extra premium assessed for country risk, and if yes how to estimate it. While it is true that globally diversified investors can eliminate some country risk by diversifying across equities in many countries, the increasing correlation across markets suggests that country risk cannot be entirely diversified away. To estimate the country risk premium, we consider three measures: the default spread on a government bond issued by that country, a premium obtained by scaling up the equity risk premium in the United States by the volatility of the country equity market relative to the US equity market and a melded premium where the default spread on the country bond is adjusted for the higher volatility of the equity market. We also estimated an implied equity premium from stock prices and expected cashflows.

The second question relates to how this country risk premium should be reflected in the costs of equities of individual companies in that country. While the standard approaches add the country risk premium as a constant to the cost of equity of every company in that market, we argue for a more nuanced approach where a company's exposure to country risk is measured with a lambda. This lambda can be estimated either by looking at how much of a company's revenues or earnings come from the country – the greater the percentage, the greater the lambda – or by regressing a company's stock returns against country bond returns – the greater the sensitivity the higher the lambda. If we accept this view of the world, the costs of equity for multinationals that have

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[14] If you want the same value, the risk premium you use will be slightly different and computed thus:

Risk premium to adjust cash flows = $\frac{(1+\text{Risk Adjusted Discount Rate})}{(1\ +\ \text{Riskfree Rate})} - 1 = \frac{1.1067}{1.0405} - 1 = 6.37\%$

significant operations in emerging markets will have to be adjusted to reflect their exposure to risk in these markets.

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Appendix 1: Exports as % of GDP in 2001

	Exports as % of GDP			*Exports as % of GDP*			*Exports as % of GDP*	
Country	*2000*	*2001*	*Country*	*2000*	*2001*	*Country*	*2000*	*2001*
Afghanistan	..	..	Greece	33.2	29.1	Norway	53.1	54.3
Albania	29	39.4	Guatemala	36.8	39.4	Oman	77.7	80.2
Algeria	36.6	54.4	Guinea	49.5	47.7	Pakistan	32.6	33.8
Angola	53.5	106.1	Guinea-Bissau	43	60.3	Panama	35.4	38.1
Argentina	11.6	17.5	Haiti	17.2	34.5	Papua New Guinea	73.6	97.3
Armenia	..	57.1	Honduras	57.9	66.3	Paraguay	43.9	43.5
Australia	26.3	34.5	Hungary	61.5	123.6	Peru	25.5	29.1
Austria	55.9	76.8	India	13.1	19.5	Philippines	47.7	88.9
Azerbaijan	..	71.4	Indonesia	41.5	60.1	Poland	43.9	49
Bangladesh	17.6	32	Iran	32.9	37.5	Portugal	58.3	56.4
Belarus	..	127.4	Iraq	41.2	..	Puerto Rico	..	..
Belgium	120.4	161.3	Ireland	93.9	129.3	Romania	32.8	69.6
Benin	30	43.5	Israel	55	59.2	Russian Federation	..	50.6
Bolivia	33.1	37.8	Italy	32	43.5	Rwanda	15.4	19.7
Bosnia Herzogovina	..	81.6	Jamaica	67.2	58.5	Saudi Arabia	65.4	53.3
Botswana	98.4	91.6	Japan	17.1	18.2	Senegal	34.7	55.8
Brazil	11.6	23.2	Jordan	91.1	80.8	Sierra Leone	44.2	25.9
Bulgaria	48.9	91.1	Kazakhstan	..	67	Singapore	309.5	277.6
Burkina Faso	24.9	33.4	Kenya	38.1	42.4	Slovak Republic	110.8	133.9
Burundi	27	26	Korea, North	..	..	Slovenia	102.4	103.1
Cambodia	22.4	91.7	Korea, South	53.4	69.1	Somalia	26.7	..
Cameroon	30.5	42.4	Kuwait	59.8	72.8	South Africa	37.5	50.9
Canada	43.7	70.1	Kyrgyz Republic	..	61.6	Spain	28.1	43.4
Central African Republic	18.4	27	Lao PDR	30.5	50.4	Sri Lanka	57.3	67.5
Chad	27.2	49.8	Latvia	..	72.9	Sudan	7.5	25.6
Chile	53.1	52.2	Lebanon	106.5	48.8	Swaziland	138.2	130.9
China	32.5	44	Lesotho	118	120.9	Sweden	46.9	65.7
Hong Kong	223.5	242.8	Liberia	143.1	173.1	Switzerland	58.4	67.2
Colombia	30.7	30.4	Libya	64.2	62	Syria	53.7	45.1
Congo, Dem Rep.	43.5	34.2	Lithuania	..	90.6	Tajikistan	..	127
Congo, Rep.	57.2	109.8	Macedonia	103.8	81.7	Tanzania	31.9	26.1
Costa Rica	60.2	71.9	Madagascar	31.5	45.7	Thailand	65.7	110.9
Côte d"Ivoire	47.9	60.3	Malawi	52.7	49.2	Togo	52.1	83.6
Croatia	89.3	62.7	Malaysia	133.4	184	Trinidad & Tobago	65.9	93.3
Cuba	..	..	Mali	39.7	52.8	Tunisia	73.5	80.8
Czech Republic	83.6	123.1	Mauritania	84.1	61.1	Turkey	23.4	48.6
Denmark	52.6	60.2	Mauritius	118	78.1	Turkmenistan	..	79.3
Dominican Republic	73.2	66.6	Mexico	32.1	54.2	Uganda	10.2	36.1
Ecuador	42.8	54.5	Moldova	..	99	Ukraine	..	85.2
Egypt	36.8	17.1	Mongolia	..	67.8	United Arab Emirates	101.8	..
El Salvador	38.4	57.4	Morocco	43.3	52.8	United Kingdom	41.2	42.5
Eritrea	65	72.6	Mozambique	40.8	49	United States	15.8	19
Estonia	..	137.7	Myanmar	..	..	Uruguay	32.7	27.4
Ethiopia	20.2	23.4	Namibia	80.7	94.8	Uzbekistan	..	53.9
Finland	39.2	62	Nepal	24.1	39.7	Venezuela	51.1	36.4
France	37.1	49.4	Netherlands	87.6	114.9	Vietnam	79.7	93.6
Gabon	52.5	82.3	New Zealand	43.3	53.7	West Bank and Gazo	..	..
Gambia	69.1	53.5	Nicaragua	95.9	..	Yemen	46.9	58.9
Georgia	..	32.8	Niger	27	35.3	Yugoslavia	..	62.1
Germany	46	57.6	Nigeria	67.5	73.2	Zambia	76.9	50.3
Ghana	35.7	89.2				Zimbabwe	40.7	36.5