Introduction

Despite the inherent risks of investing in international emerging markets, American foreign direct investment in Latin America soared during the 1990's.

International emerging markets attract foreign capital because overseas investments usually have high expected returns and provide diversification opportunities. Traditionally, emerging markets have provided higher returns by offering lower taxes, lower wages, and less competition, particularly if their economies are growing rapidly and their political climates are relatively stable. Research conducted during the 1980's and early 1990's showed that there was a low correlation between the emerging and developed economies (Errunza, 1994). For example, if developed markets experience slow growth, developing economies could have rapid growth. By investing in both markets, one can reduce the overall risk of a portfolio. As a general rule, investment strategists recommend that long-term investors obtain international exposure--between 10 percent and 20 percent of their holdings (Wilcox, 1992).

Another major factor that affects the inflow of foreign capital into emerging markets is their political climate. Countries with unstable governments disrupt economic activity and may be unable to protect the assets themselves. During the past decade, several economies in Latin America experienced rapid economic growth and relative political stability. Thus, the inflow of American foreign direct investment (FDI) soared during the 1990's.

International investing has reached the mainstream in the United States, particularly during the past 10 years. Given that there is a positive correlation between risk and return, as overseas investments' expected returns increase their associated risks also increase. Because wages are depressed, taxes are low, and the political climate is stable, it does not mean that this trend will continue. In fact, last year's economic crisis in Asia

and this year's currency crisis in Brazil have been a rude awakening to investors who failed to take a more dynamic view of the economic conditions in developing markets. In fact, recent economic crises in Asia and Latin America indicate that overseas emerging economies are fragile and more integrated--among themselves and with developed markets--than in prior years. Recent free trade agreements among developing markets plus the additional inflow of capital from developed markets into developing markets have increased the degree of integration among these economies. This added correlation eliminates hedging opportunities. Nonetheless, because expected returns from overseas investments are usually high, there is great interest in them. But how risky are they? The focus of this paper is to answer the following question: Can investors reasonably measure the risks associated with their foreign investments?

To answer this question, expected returns and risk must be defined, the sources of risk must be identified, and finally the type of risk being measured should be described. In short, expected returns of any asset or an investment can be defined as the sum of its discounted expected cash flows. Expected risk can be broadly define as the probability that those discounted cash flows will be less than expected. In this context, there are two sources of risk: political and economic. Political risk includes the risk of expropriation, currency incovertibility, and political violence. This paper does not attempt to measure political risk. In practice, investors who are concerned with the political risk in a particular country or region can reduce the political risk by obtaining insurance. The Overseas Private Investment Corporation (OPIC), a U. S. government agency, provides insurance for investments in countries where the political risk is high. As the threat of communism is practically eliminated and dictators are removed from power, the political risk in emerging markets is being reduced substantially.

This paper focuses on the economic risk connected with U. S. Foreign Direct Investing (FDI) in Latin America's emerging markets: Argentina, Brazil, Chile, and Mexico. (Appendix A contains an explanation as to why these four economies were selected.) In

short, economic risk comes from various factors. These risk factors can be divided into two groups: unsystematic and systematic. An unsystematic risk factor affects a single asset or a small group of assets. Hiring a new CEO is an example of an unsystematic risk, affecting stock return for that firm alone. Unsystematic risk can be eliminated through diversification. In this paper, the data represent a well diversified portfolio so that there is no attempt to measure unsystematic risk. In contrast, systematic risk factors affect a large number of assets each to a greater or lesser degree. Uncertainty about general economic conditions, such as economic growth, interest rates, and inflation are examples of systematic risk factors. Systematic risk, unlike unsystematic, cannot be eliminated by diversification. Thus, economic systematic risk is defined as the potential loss in revenue due to unexpected changes in the market-wide risk factors. More specifically, the focus of this paper is to determine if investors can measure the systematic risk of investing in Latin America's emerging markets.

The remainder of this paper is organized into six sections. Section 2 describes Risk and Return Theory. Section 3 provides a literature review. Section 4 presents the empirical model. Section 5 describes the data and sources. Section 6 summarizes the empirical result. Finally, Section 7 contains the conclusions. Appendix A contains background information on U.S. foreign direct investment in Latin America's emerging markets. Appendix B contains the tables not presented in the main body of the paper.

Risk and Return Theory

According to financial theory, there is a positive relationship between risk and expected returns. Higher returns are expected when the perceived risk is higher. Consequently, individuals or corporations unwilling to take on risk will purchase risk free assets such as Treasury Bills. On the other hand, individuals or corporations able to invest in a risky asset or project will do so only if the expected returns contain a risk premium high enough to properly compensate the exposure to risk. In equation form this can be expressed as follows:

$$E(R) = \text{Risk free } (rf) + \text{Risk premium}$$

Where *E(R)* is the expected return. For a risky asset, the expected return will be greater than the risk free rate of return. Because of its risk, the actual return in a particular year can be below the risk free rate or even negative. Briefly, expected returns of any asset or investment can be defined as the sum of its discounted expected cash flows. Expected risk can be broadly define as the probability that those discounted cash flows will be less than expected. But how do investors measure expected returns and expected risks? Expected returns and risks can be estimated by using past, current, and forecast information on all the factors that affect the asset or investment.

The goal in this section is to explain how expected returns and risk can be measured according to the Arbitrage Pricing Theory (APT), formalized in 1976 by Stephen Ross. To this end, the sources of risk are identified and actual returns are divided into two parts. Lastly, two alternatives methods for measuring risk are provided.

According to APT, an investment is exposed to two types of risk factors. First, investments are exposed to events that affect the individual corporation or firm or a small group of firms. This firm specific risk is called unsystematic. For example, hiring a new

president for a firm will affect its management practices. This unsystematic risk can be eliminated by diversification. Second, investments are exposed to events that affect, in a different degree, all investments. For instance, all investments are systematically affected--positively or negatively--by the market-wide factors, such as, inflation, interest rates, and economic growth. Systematic risk is market risk that cannot be eliminated through diversification. APT assumes that the factors determining the asset prices and hence returns might be identified as macroeconomic factors.

According to APT, actual return on any asset can be divided into two parts. First, the normal or expected return is the return predicted. Predictions on returns for risky assets are made based on information available at that time including past trends and forecasts. For instance, specific information on the corporation and information on all other factors that affect the asset, such as economic performance, inflation, labor cost, and interest rates are used to derive expected returns. Because predictions are not always equal to the actual, the second part of the return is the uncertain or risky portion. This is the portion unanticipated by either the lack of information at the time of deriving expected returns or the inaccuracy of the information used at the time of forecasting expected returns. In other words, risk premium comes from the fact that the information available may not be accurate, especially forecasts of the economic factors that affect returns. In equation form, actual return can be expressed as follows:

(1) $$R_i = E(R_i) + U(R_i)$$

Where R_i is the actual return of asset i, $E(R_i)$ is the expected part of the return on the asset i, and $U(R_i)$ is the unanticipated part of the return for asset i. Note that $U(R_i)$ includes two components, a marketwide and a firm specific, which can be eliminated with diversification so its expected value is zero.

In equation form, expected return can be divided into three parts.

(2) $$E(R_i) = R_f + \alpha_{i1} * f_1 + \alpha_{i2} * f_2 + \alpha_{i3} * f_3 + c_i$$

Where $E(R_i)$ is the expected return on the asset i, R_f is the risk free rate, α measures the effect of the factor on the return and f are the systematic risk factors, measured as the expected changes, and c_i is the firm specific risk. Because R_f is the rate offered by U.S. Treasury bills and the c_i can be eliminated by diversification, the only portion remaining is the systematic risk portion. This portion of the return can be measured by (1) identifying the risk factors, (2) determining the extent of the effect that these factors have on the asset or investment. To determine the sensitivity--the α in equation 2--of an asset to a factor, the actual returns are regressed against the expected changes of the factors.

As noted earlier, expectations are not always accurate. After all, if one could predict the returns, there would be no risk. According to APT, the true risk of an investment is the unanticipated portion of its actual return. Moreover, the differences between the actual return and expected return are due to the unexpected or unanticipated changes of the market-wide factors. In equation form this can be expressed as follows:

(3) $$U(R_i) = \beta_{i1} * F_1 + \beta_{i2} * F_2 + \beta_{i3} * F_3.$$

Where $U(R_i)$ is the unanticipated return for asset i, the β measure the effect of the unexpected change in the factor and F are the unanticipated changes of the market-wide factors. Consequently, this portion of the return can be estimated by (1) identifying the risk factors, and (2) Regressing actual returns against the unexpected change in the factors. According to APT, these beta coefficients are a measure of risk. Unexpected changes for the factors can be estimated by employing econometric techniques.

The APT theory can best be explained with an example. Suppose an investor wants to estimate the systematic risk portion for an investment. Moreover, suppose that the

market-wide factors that affect this investment are: GDP, inflation, and interest rates. Suppose that the forecasts for next year, are as follows: GDP = 4 percent, inflation = 8 percent, and interest rates = 7 percent. With this and other information available, the expected return calculated is 12.5 percent. However, the actual return was 16.0 percent. APT stipulates that the difference between the expected and the actual can be explained by the unexpected changes of the factors affecting this asset, as seen in Table 1, column four. Thus, in this example the change in the factors was not anticipated correctly. In this example, the unanticipated changes account for 3.5 percent of the actual return. Positive rates of return are welcome news. On the other hand, the unanticipated changes can have a negative impact; the actual returns could be less than the expected returns.

Table 1. Arbitrage Pricing Theory

	Risk Factors	Expected		Betas	Unexpected		Actual
F_1	GDP	4.0		1.0	1.0		5.0
F_2	p	8.0		1.5	0.0		8.0
F_3	r	7.0		-0.5	-5.0		2.0
		12.5			**3.5**		**16.0**
		$E(R_i)$	+		$U(R_i)$	=	R_i

Again, the size of beta reflects how much that factor affects the returns. The sign of beta indicates the direction of the change. Beta of 1 indicates that returns rise and fall one for one. In this example, when GDP's unexpected rise is 1 percent, returns should rise by 1 percent as well. If the expected changes in those factors are correct, the actual return or compensation due to the risk would be 12.5 percent, as expected.

Because individuals and corporations invest in different markets (domestic and international) and each market is exposed to potentially different risks, there is not a predetermined set of factors which need to be included in a risk measurement model, nor is there agreement as to how many factors should be used. Intuition tells that the more information is include, the better the estimates should be. However, the more variables included the higher the probability of having a multicollinearity problem. That is, there may be a greater relationship among the explanatory variables. When multicollinearity is present, the coefficients are unreliable and their size and even their sign may be incorrect.

Most researchers used four to six variables. For instance, Ross (1986) used four variables to estimate the effect of the macroeconomic forces on the U.S. stock market returns. According to recent literature, the most widely used market-wide factors are gross domestic product, interest rates, inflation, and unemployment.

The most widely utilized techniques to determine what factors should be included in a model are: (1) surveying market analysts and (2) employing sophisticated econometric techniques. The advantage of the first approach is its simplicity; its disadvantage is that it is unlikely to fully specify the model. The strength of the econometric approach is that there is no preconceived view on what the factors should be. The disadvantage is its complexity and the lack of data.

Models aimed to determine the factors that affect an asset can use actual levels, expected changes or unexpected changes for the factors. For instance, if the risk factor is GDP, one can use the actual GDP, the expected GDP or the unexpected GDP. Expected and unexpected estimates for GDP can be generated with econometrics techniques. But models aimed to measure risk, must use the unexpected changes of the factors. In short, actual returns are regressed against the unexpected changes in the factors to calculate coefficients (betas) for each of the sources of systematic risk in the model. If a company's stock is positively related to the risk of inflation, then that stock has a positive inflation beta. If it is negatively related to inflation, its inflation beta is negative and if it is uncorrelated with inflation, its inflation beta is zero.

Financial theory (Ross, 1997) provides other methods for measuring the risk of assets. Risk can be measured in terms of how spread-out is the frequency distribution of expected returns and in terms of probability. The spread or dispersion of a distribution is a measure of how much a particular return can deviate from the mean return. If the distribution is very spread-out, the returns that occur are very uncertain. By contrast, a distribution whose returns are all within a few percentage points of each other is tight,

and the returns are less risky. The variance and its square root, the standard deviation, are the most common measures of variability or dispersion.

Given a frequency distribution, mean, and standard deviation of expected returns, risk can also be measured in terms of probability. For example, a 5 percent standard deviation about a mean of 16 percent can be interpreted in the following way. Assuming that expected returns are roughly normally distributed, the probability that a yearly return will fall within + or -5 percent of the mean will be approximately 68 percent or 2/3. That is, about 2/3 of the yearly returns will be between 11 percent and 21 percent. The probability that the return in any year will fall within two standard deviations is about 95 percent. That is, about 95 percent of the yearly returns will be between 6 percent and 26 percent. Moreover, one can calculate the probability of expected return to be less or greater than a specific amount.

Given that the number of investment opportunities is very large, that each investment opportunity has different levels of risk, and that each investor's tolerance of risk differs, researchers have spent a great deal of effort trying to determine what economic forces affect returns. In the next section, I summarize the findings reported by some of these researchers who used APT to answer this question.

Risk and Return in Emerging Markets

The risk-return tradeoff present in developed markets is also displayed in international emerging markets. Because emerging markets are riskier than developed markets, they must provide higher return in order to attract foreign capital.

The sources of risk in developed and developing economies are similar--they are political and economic--but their magnitude is different. Again, political risk is not being

considered in this paper. With regard to economic risk, in both developed and emerging markets there are risks of slow economic growth, high inflation, and unemployment. There are three reasons for additional economic risk in foreign emerging markets. First of all, most emerging markets are in small open economies. This makes them subject to external shocks. Second, emerging markets often lack the capital needed to fund large domestic projects. This forces them to rely heavily on international agencies to obtain capital. The Inter-American Development Bank provides low interest rate loans to build highways and electric plants. Third, the industry itself may not be able to compete with a larger well-established industry in another country. For instance, management in an emerging market may not be able to keep up with the latest techniques used to increase production or to market the products and may not have access to well-established financial markets. Consequently, emerging markets are riskier than developed markets.

Returns from investments in emerging markets have been at times superior to those in industrialized countries (Errunza, 1994). FDI returns for the 1988-97 period for the four countries included in this study are not necessarily higher but they are competitive. The highest annual average return reported was Brazil's in 1993 (29.9 percent); the lowest was Argentina's in 1989 (-8.3 percent). The average return for the 10 years included in my sample was 17.1 percent, while the S&P 500 return for the same period was about 20 percent. The highest ten-year average return was reported by Chile and Brazil (about 18 percent each), followed by Mexico (17.6 percent) and Argentina (14.3 percent).

Prior Studies

Most of the empirical studies in the APT framework have utilized U. S. data, but as it became more popular, researchers in other countries began to use it as well. This section describes three studies. Two of them use the APT to measure the effect of various market-wide factors on stock returns and prices. The other one simply describes the risk and benefits of investing in emerging markets. The first study uses data from the U.S. and the second one uses data from Finland. The latter study is especially relevant for this paper. It addresses some of the risk factors that are especially relevant for small economies, like the ones included in this paper, but may not be relevant for large economies, such as the U.S.

Chen, Roll, Ross (1986) tested whether unexpected changes in market-wide factors are risks that are rewarded in the U.S. stock market. They used traditional financial theory to select the factors that systematically affect stock market returns. By the diversification argument that is implicit in capital market theory, only general economic state variables will influence the pricing of stocks. Any systematic variables that affect the economy's pricing operator (interest rates) or that influence dividends would also influence stock market returns. Additionally, any variables that are necessary to complete the description of the state of nature will also be part of the description of the systematic risk factors. An example of such a variable would be one that has no direct influence on current cash flows but that does describe the changing investment opportunity set. Stock prices can be expressed as a function of expected discounted

Table 2. Chen, Roll, and Ross APT model

$$R = \beta_0 + \beta_1 MP + \beta_2 DEI + \beta_3 UI + \beta_4 UTS + \mu$$

Where

R =	Return on the equally weighted NYS index
MP =	Monthly growth rate in industrial production
DEI =	Change in expected inflation
UI =	Unanticipated inflation
UTS =	Unanticipated change in interest rates

dividends. It follows that the systematic forces that influence returns are those that change discount factors and expected cash flows. Based on that reasoning, they chose the following variables: unexpected changes in the level of real production, inflation, and interest rates.

They used a complex econometric procedure to estimate unexpected changes for each factor. Table 2 contains the list of factors included in their model. Notice that for the first factor, industrial production, the actual change was used instead of the unexpected change estimated. The reason provided is that the estimate for the unexpected changes estimated offered no discernible advantage over the actual change. Their model shows that unanticipated changes in inflation, interest rates, and industrial production were significant in explaining stock returns. Both inflation and industrial production had a positive relationship with stock return, while interest rates had a negative correlation. Chen, Roll, and Ross concluded that these sources of risk are reflected in the price of stocks.

In the second journal article, Junttila (1997) provides an overview of recent Finnish studies considering the relationship between macroeconomic factors and Finish stock market. He notices that recent Finnish studies, using the APT framework, were claiming significant results, but sometimes these results were contradicting one another. Thus, he decided to review and compare 6 of these studies, to see if there was a common link or message among them. In other words, his objective was to determine if there was agreement as to what factors have a greater impact on stock returns.

In his review, he discovers that most Finish models use essentially the same risk factors. Real activity (economic growth), inflation, money supply, interest rates, and exchange rates--these factors were present in all six studies. Both expected and unexpected changes were included. Of these, only two factors--real activity and inflation--were statistically significant in all 6 studies. Each study reported a strong positive correlation

between stock returns and economic growth. For inflation, however, some studies reported a negative relationship, while others reported a positive relationship. Junttila does not provide information as to how these factors were measured in various studies, but he noted that these results were based on different data sets. He also found that money supply (M1 and M2) growth rate was a good replacement for the inflation growth rate (CPI).

The argument for including a variable that measures real activity is the hypothesis that asset pricing should reflect expectations of future earnings, which are likely to be influenced by the overall real activity in the economy. Industrial productions, real gross national product, gross capital formation, employment, and exports--all have been used to measure real activity.

The hypothesis for a negative correlation between inflation and stock returns is as follow. High inflation usually means higher interest rates. High interest rates may slow or even lower economic growth. This simultaneously implies a drop in stock prices and hence, returns.

On the other hand, researchers that found a positive correlation argued that inflation would be good rather than bad news for the stock market in Finland. Low to moderate levels of inflation indicate that the economy is growing at a normal pace with no interest rates increases, so business activity may expand. Furthermore, as inflation increases, bonds become less attractive to investors so more funds are diverted into the stock market. This in turn increases stock prices.

After reviewing and comparing the results of the various studies, Junttila concluded that macro economic risk factors might not be very good determinants of the stock returns in the Finnish market. Nonetheless, in spite of the rather mutually contradictory results, the common feature seems to be that two factors--real activity and inflation--affect stock

returns. Therefore, some kind of measure of the overall activity and inflation should be included in APT models.

In a large economy such that of the United States, changes in the exchange rate usually are very small and less important than in small economies, so generally they do not affect stock returns (Junttila, 1997). In a small open economy, foreign trade factors, such as exchange rates, tend to fluctuate much more. Depreciation of a currency improves the competitive position of domestic firms, while an appreciation of the currency reduces it. One may assume that unanticipated changes in exchange rates have a systematic effect on the value of domestic firms. The underlying economic factors behind exchange rate changes may also affect stock prices. If the exchange rate changes are caused by a deteriorating domestic economy, they should have an adverse effect on the local stock market. Junttila noted that the stock market is sensitive to contemporary changes in the exchange rate of the Finish's currency. However, there was not a statistically significant relationship between changes in the exchange rate and stock returns.

Studies on International Investing

Several well-known studies on international investing suggest there are substantial benefits to investment in emerging markets. The earliest published work, by Levy and Sarnat (1970), uses local stock market indexes published by the International Monetary Fund (IMF) for the period 1951-67. Lessard (1973) uses individual firm data on a group of Latin American markets for the period 1958-68 to report on the benefits of Latin American securities markets. More recently, Baily and Lim (1990) studied the benefits of diversification. These researchers used efficiency frontiers, factor analysis, and asset pricing models to test their hypotheses. There is robust evidence of the benefits of emerging market diversification over the last two decades for different set of markets. Vinhang Errunza (1994) summarized the benefits and risks of investing in emerging markets. His major findings are the following:

- Emerging Markets (EM) diversification is beneficial in terms of both increased returns and reduced risk.

- The domestic systematic risk has been higher than in the major developed markets (DMs), but not necessarily as high as the smaller developed markets.

- The return correlation vis-à-vis developed markets has been low, and at times negative. Among themselves, the EMs are essentially uncorrelated.

Regarding risk, Errunza wrote "if we view riskiness as the contribution of the security to the risk of the investor's portfolio, the evidence overwhelmingly suggests that emerging securities (portfolios) are very low-risk assets." Then he added "with respect to currency risk, the evidence suggests that the currency factor does not contribute toward increased risk of emerging markets investments. In a mildly segmented market structure with local investors as principal holders of local securities, a well-diversified global investor would earn abnormal returns." Last year's financial crisis in Asia and this year's crisis in Brazil call into question Errunza's conclusions about the risk of investing in emerging markets.

As stated at the beginning of this section, many researchers have used the APT approach to measure stock returns. The next section develops an APT model that attempts to capture the effect of Latin America's market-wide factors on FDI returns.

The Empirical Model

Based on the theory and studies in sections 2 and 3, a multi-factor Arbitrage Pricing Model is developed to measure the systematic risks of investing in four of Latin America's emerging markets: Argentina, Brazil, Chile, and Mexico. Three of the four factors included in the model are selected by following the analysis done by Chen, Roll, and Ross (1986) and the Junttila (1997). The fourth factor is selected to capture a specific situation in Latin America's emerging markets. To repeat, the goal is to include factors that would depict the domestic economic conditions under which the investments have been operating as well as any exposure to international economic shocks. The latter is particularly important since the countries included in the study are small open economies. The four systematic risk factors which clearly affected the economic activity in Latin America during the past decade are the following.

As indicators of the domestic economic conditions, the nominal **Gross Domestic Product (GDP) and inflation (M1)** are employed. As a proxy for inflation, the annual average of the money supply (M1) as a percent of GDP is included. The money supply growth rate is also an indicator of the emerging market's government policies. The expected sign of the coefficient associated with GDP is positive. The hypothesis is that as output grows corporate profits increase and consequently returns are expected to increase as well. The expected sign for the money supply's coefficient can be either positive or negative. High levels of inflation create inefficiencies which tend to reduce corporate profits and returns, other things being equal. On the other hand, one can argue that a moderate level of inflation simply inflates returns so a positive relationship can be established.

Exposure to international risk is captured by the annual growth rate of **exports (X)**. Considering that about sixty percent of the FDI is invested in industries which export

their products, changes in the rate of exports would be an important determinant of returns. Thus, a positive relationship is expected.

The fourth variable included is the **external debt (D)**. As a country receives loans--for example, from the IMF--large projects are funded. This in turn generate jobs and thus fosters economic growth. The initial effect on the economy is positive. If the borrowed funds are used properly and kept under control, it should remain positive. However, the larger the debt the higher the probability that these countries may not be able to pay the interest. A balance of payment crisis may arise and this will obligate the domestic authorities to implement restrictions on profit remittance and/or capital repatriation. For example, in both Argentina and Mexico the debt became so large that in 1993 and 1995, respectively, they could not pay the interest. When this happens, both domestic and foreign capital are likely to flee the country for fear of devaluation. The sign of this variable can be positive or negative. During the period being evaluated, the sign of the coefficient is expected to be positive because the benefits of providing capital to get the economy going should outweigh the cost incurred during the unfortunate and rare years when the foreign debt must be refinanced. (Appendix A provides further background information as to why these four factors are included in the model.)

Return = F (GDP, Money Supply, Exports, External debt)

This equation states that return on FDI depends on the sensitivity of that investment to movements in these four economic factors.

To measure risk, APT requires that the actual returns be regressed against unexpected or unanticipated changes in these risk factors.

The model:

$$R_{it}=\beta_0 + \beta_1(UGDP_{it}) + \beta_2 (UM1_{it})+ \beta_3 (UX_{it}) + \beta_4 (UD_{it}) + \mu_{it}$$

Where $\boldsymbol{R_{it}}$ is the actual rate of return, the $\boldsymbol{\beta}$s measure the effect of each factor on the return, and ***UGDP, UM1, UX, UD***, are the unexpected changes. (Measuring units: million of nominal dollars, i = country, t = year)

The rate of return on U.S. direct investment in those four countries was calculated as "income (year t) over the average of the position (year t) and the position (year t-1).

$$R_{it} = \{income_{(t)} / [position_{(t)} + position_{(t-1)}]/2\}*100$$

where position is the amount invested that year and income is the amount earned that year by the position.

There is no universally accepted procedure to determine the expected and unexpected changes for the macroeconomics factors. It is, however, possible to estimate expected changes using conventional econometric procedures. These estimates can be used in conjunction with actual data to estimate unexpected changes. To avoid any systematic bias or non-spherical disturbances in the estimation, a multiple step procedure is used. Subsequently, expected changes are tested for autocorrelation of the residuals. A detailed explanation follows.

The first task is to estimate expected changes for each of the factors in the model. To this end, a first difference autoregressive model is used. The assumption is that expected changes of GDP, M1, X, and D are revised by a fraction of the discrepancy between the observed variables in the current period and what its anticipated value had been in the prior period. Moreover, the explanatory factors in the model are assumed to be nonstochastic (or at least uncorrelated to the disturbance term μ_t), and pre-determined. If we can assume that the resultant error terms are uncorrelated with a constant variance, then ordinary least squares (OLS) can be applied. Therefore, expectations for next year's

growth rate are set at this year' growth rate, plus a fraction of the first difference between this year's and last year's growth rates.

The second task is to derive unexpected changes for all four factors. To estimate the unexpected changes, the expected change is subtracted from the actual or observed changes. Finally, to measure risk, the actual returns are regressed against the unexpected changes of the four factors.

Below is a description of the econometric technique used to estimate unexpected or unanticipated changes in the four factors included in the model. The process described below is for GDP. The reader can simply follow the same steps to derive the unexpected changes for M1, X, and D. The process consist of six steps:

Step 1. Calculate the actual percent change of GDP. This step is straightforward so it does not require further explanation. Table 3 contains the actual percent changes for GDP, M1, X, and D.

$$Actual \qquad GDP_{(it)} = [(GDP^{l}_{(it)} - GDP^{l}_{(it-1)})/ GDP^{l}_{(it-1)}] * 100$$

Where GDP^{l} is the GDP level.

Step 2. Take the first difference. For GDP this is equal to the percent change of GDP in year t less the percent change in year t_{-1}. Table 4 contains the first difference for GDP.

$$Y_{it} = GDP_{(it)} - GDP_{(it-1)}$$

Step 3. Fit the first differences. This is done with an autoregressive model. Regress the first difference calculated for year t (in step 2) against the first difference in year t_{-1}. Table 5 contains the fitted first difference for GDP.

$$Y_{it} = \beta_0 + \beta_1 Y_{(it-1)} + \mu_{it}$$

$$EY_{it} = \hat{\beta}_0 + \hat{\beta}_1 Y_{(it-1)}$$

Step 4. Validate the estimates for the first difference. Test for autocorrelation. In other words, the residuals from the estimated or fitted first difference from one period should not be affected by the residuals from the first difference in another period. This can be tested using the estimated residuals. To obtain the residuals, subtract the estimated first difference from the actual first difference (calculated in step 2). Then, regress the residual in year t against the residual in year t_{-1}. The R square should be zero. Table 6 contains the estimated first differences and test for autocorrelation.

$$\mu_{it} = Y_{it} - EY_{it}$$

Step 5. Calculate the expected percent change in GDP. The expected percent change in year t is equal to the sum of the estimated first difference for year t and the actual percent change year t_{-1} (calculated in step 1). Table 7 contains the expected percent change in GDP.

$$\textit{Expected} \qquad EGDP_{(it)} = EY_{it} + GDP_{(it-1)}$$

Step 6. Calculate the unexpected percent change in GDP. The unexpected percent change in GDP for year t is equal to the difference between the actual percent

change in GDP t less the expected GDP t. Table 7 contains the unexpected percent change in GDP.

$$Unexpected \quad UGDP_{(it)} = GDP_{(it)} - EGDP_{(it)}$$

Table 3. Actual percent change GDP, M1, Exports, and Debt

Country	Year	GDP	M1	X	D
Chile	88	11.3	6.3	19.6	-18.1
Chile	89	14.5	6.3	0.0	-19.6
Chile	90	7.7	6.1	-3.8	-1.0
Chile	91	11.5	6.4	-4.3	-16.3
Chile	92	14.1	7.4	-1.9	-6.6
Chile	93	9.1	6.8	-15.7	-1.1
Chile	94	6.7	6.6	18.2	12.2
Chile	95	11.1	7.0	25.2	-6.9
Chile	96	9.2	7.2	-12.9	-1.4
Chile	97	7.5	7.9	2.4	-3.2
Argentina	88	1.6	2.2	41.4	-4.1
Argentina	89	-3.1	0.9	8.1	8.7
Argentina	90	2.9	1.9	25.4	-10.9
Argentina	91	14.9	2.8	-15.6	-9.6
Argentina	92	13.3	4.2	-9.9	-7.9
Argentina	93	9.1	4.7	-1.7	9.2
Argentina	94	11.1	5.2	8.7	-1.3
Argentina	95	-2.4	5.3	35.6	18.4
Argentina	96	6.2	5.9	6.9	4.9
Argentina	97	9.8	6.0	-27.3	-0.4
Mexico	88	5.0	4.2	5.9	-13.7
Mexico	89	7.7	3.8	6.4	-12.1
Mexico	90	9.0	4.2	6.2	2.1
Mexico	91	7.8	5.3	-2.7	1.4
Mexico	92	5.6	9.1	2.5	-6.8
Mexico	93	3.3	9.7	8.7	13.4
Mexico	94	7.0	9.3	9.7	-0.5
Mexico	95	-4.0	6.2	36.1	23.4
Mexico	96	7.1	6.3	12.7	-2.2
Mexico	97	9.0	6.8	5.5	-8.0
Brazil	88	3.5	2.4	24.5	-3.1
Brazil	89	7.5	1.4	-5.3	-11.7
Brazil	90	0.0	4.0	-8.6	-0.2
Brazil	91	4.3	2.8	-3.5	-4.7
Brazil	92	1.9	2.0	11.1	10.8
Brazil	93	6.9	1.2	3.5	2.6
Brazil	94	8.5	2.5	2.5	1.4
Brazil	95	6.6	3.2	-1.1	-1.2
Brazil	96	4.9	3.9	-2.2	-3.2
Brazil	97	4.9	2.8	5.8	-4.0

Table 4. First difference for GDP

Country	Year	GDP	GDP_{t-1}	Y_{it} $GDP-GDP_{t-1}$
Chile	88	11.3		
Chile	89	14.5	11.3	3.2
Chile	90	7.7	14.5	-6.8
Chile	91	11.5	7.7	3.8
Chile	92	14.1	11.5	2.6
Chile	93	9.1	14.1	-5.0
Chile	94	6.7	9.1	-2.3
Chile	95	11.1	6.7	4.3
Chile	96	9.2	11.1	-1.8
Chile	97	7.5	9.2	-1.8
Argentina	88	1.6	7.5	-5.9
Argentina	89	-3.1	1.6	-4.7
Argentina	90	2.9	-3.1	6.0
Argentina	91	14.9	2.9	12.0
Argentina	92	13.3	14.9	-1.6
Argentina	93	9.1	13.3	-4.3
Argentina	94	11.1	9.1	2.1
Argentina	95	-2.4	11.1	-13.5
Argentina	96	6.2	-2.4	8.6
Argentina	97	9.8	6.2	3.6
Mexico	88	5.0	9.8	-4.8
Mexico	89	7.7	5.0	2.7
Mexico	90	9.0	7.7	1.4
Mexico	91	7.8	9.0	-1.3
Mexico	92	5.6	7.8	-2.2
Mexico	93	3.3	5.6	-2.2
Mexico	94	7.0	3.3	3.6
Mexico	95	-4.0	7.0	-11.0
Mexico	96	7.1	-4.0	11.1
Mexico	97	9.0	7.1	1.9
Brazil	88	3.5	9.0	-5.5
Brazil	89	7.5	3.5	4.0
Brazil	90	0.0	7.5	-7.5
Brazil	91	4.3	0.0	4.4
Brazil	92	1.9	4.3	-2.4
Brazil	93	6.9	1.9	5.0
Brazil	94	8.5	6.9	1.6
Brazil	95	6.6	8.5	-1.9
Brazil	96	4.9	6.6	-1.7
Brazil	97	4.9	4.9	0.0

Table 5. Estimated first difference for GDP

	Y_{it}	Y_{it-1}			EY_{it}
	3.2		SUMMARY OUTPUT		
Chile	-6.8	3.2	*Regression Statistics*		-1.4
Chile	3.8	-6.8	Multiple R	0.34	2.0
Chile	2.6	3.8	R Square	0.12	-1.6
Chile	-5.0	2.6	Adjusted R Square	0.09	-1.2
Chile	-2.3	-5.0	Standard Error	5.23	1.4
Chile	4.3	-2.3	Observations	38	0.5
Chile	-1.8	4.3			-1.8
Chile	-1.8	-1.8	ANOVA		0.3
Argentina	-5.9	-1.8		*df*	0.3
Argentina	-4.7	-5.9	Regression	1	1.7
Argentina	6.0	-4.7	Residual	36	1.3
Argentina	12.0	6.0	Total	37	-2.4
Argentina	-1.6	12.0			-4.4
Argentina	-4.3	-1.6		*Coefficients*	0.2
Argentina	2.1	-4.3	Intercept	-0.31	1.2
Argentina	-13.5	2.1	X Variable 1	-0.34	-1.0
Argentina	8.6	-13.5			4.3
Argentina	3.6	8.6			-3.3
Mexico	-4.8	3.6			-1.5
Mexico	2.7	-4.8			1.3
Mexico	1.4	2.7			-1.2
Mexico	-1.3	1.4			-0.8
Mexico	-2.2	-1.3			0.1
Mexico	-2.2	-2.2			0.4
Mexico	3.6	-2.2			0.5
Mexico	-11.0	3.6			-1.5
Mexico	11.1	-11.0			3.4
Mexico	1.9	11.1			-4.1
Brazil	-5.5	1.9			-1.0
Brazil	4.0	-5.5			1.6
Brazil	-7.5	4.0			-1.7
Brazil	4.4	-7.5			2.3
Brazil	-2.4	4.4			-1.8
Brazil	5.0	-2.4			0.5
Brazil	1.6	5.0			-2.0
Brazil	-1.9	1.6			-0.9
Brazil	-1.7	-1.9			0.3
Brazil	0.0	-1.7			0.3

Table 6. Test for autocorrelation for expected GDP

	Y_{it}	EY_{it}	μ	μ_{t-1}
	3.2		3.6	
Chile	-6.8	-1.4	-5.4	3.6
Chile	3.8	2.0	1.8	-5.4
Chile	2.6	-1.6	4.2	1.8
Chile	-5.0	-1.2	-3.8	4.2
Chile	-2.3	1.4	-3.8	-3.8
Chile	4.3	0.5	3.8	-3.8
Chile	-1.8	-1.8	0.0	3.8
Chile	-1.8	0.3	-2.1	0.0
Argentina	-5.9	0.3	-6.2	-2.1
Argentina	-4.7	1.7	-6.4	-6.2
Argentina	6.0	1.3	4.7	-6.4
Argentina	12.0	-2.4	14.3	4.7
Argentina	-1.6	-4.4	2.9	14.3
Argentina	-4.3	0.2	-4.5	2.9
Argentina	2.1	1.2	0.9	-4.5
Argentina	-13.5	-1.0	-12.5	0.9
Argentina	8.6	4.3	4.3	-12.5
Argentina	3.6	-3.3	6.8	4.3
Mexico	-4.8	-1.5	-3.3	6.8
Mexico	2.7	1.3	1.3	-3.3
Mexico	1.4	-1.2	2.6	1.3
Mexico	-1.3	-0.8	-0.5	2.6
Mexico	-2.2	0.1	-2.3	-0.5
Mexico	-2.2	0.4	-2.7	-2.3
Mexico	3.6	0.5	3.1	-2.7
Mexico	-11.0	-1.5	-9.4	3.1
Mexico	11.1	3.4	7.6	-9.4
Mexico	1.9	-4.1	6.0	7.6
Brazil	-5.5	-1.0	-4.5	6.0
Brazil	4.0	1.6	2.4	-4.5
Brazil	-7.5	-1.7	-5.9	2.4
Brazil	4.4	2.3	2.1	-5.9
Brazil	-2.4	-1.8	-0.6	2.1
Brazil	5.0	0.5	4.5	-0.6
Brazil	1.6	-2.0	3.6	4.5
Brazil	-1.9	-0.9	-1.0	3.6
Brazil	-1.7	0.3	-2.1	-1.0
Brazil	0.0	0.3		-2.1

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.1
R Square	**0.0**
Adjusted R Sc	0.0
Standard Errc	5.3
Observations	37.0

ANOVA

	df
Regression	1.0
Residual	35.0
Total	36.0

	Coefficients
Intercept	0.0
X Variable 1	-0.1

Table 7. Calculations for expected and unexpected changes in GDP

	GDP_{it}	EY_{it}	GDP_{t-1}	Expected $EGDP_{it}$	Unexpect. $UGDP_{it}$
Chile	7.7	-1.4	14.5	13.1	-5.4
Chile	11.5	2.0	7.7	9.7	1.8
Chile	14.1	-1.6	11.5	9.9	4.2
Chile	9.1	-1.2	14.1	12.9	-3.8
Chile	6.7	1.4	9.1	10.5	-3.8
Chile	11.1	0.5	6.7	7.2	3.8
Chile	9.2	-1.8	11.1	9.3	0.0
Chile	7.5	0.3	9.2	9.5	-2.1
Argentina	1.6	0.3	7.5	7.8	-6.2
Argentina	-3.1	1.7	1.6	3.3	-6.4
Argentina	2.9	1.3	-3.1	-1.8	4.7
Argentina	14.9	-2.4	2.9	0.6	14.3
Argentina	13.3	-4.4	14.9	10.5	2.9
Argentina	9.1	0.2	13.3	13.6	-4.5
Argentina	11.1	1.2	9.1	10.2	0.9
Argentina	-2.4	-1.0	11.1	10.1	-12.5
Argentina	6.2	4.3	-2.4	1.9	4.3
Argentina	9.8	-3.3	6.2	3.0	6.8
Mexico	5.0	-1.5	9.8	8.3	-3.3
Mexico	7.7	1.3	5.0	6.3	1.3
Mexico	9.0	-1.2	7.7	6.4	2.6
Mexico	7.8	-0.8	9.0	8.2	-0.5
Mexico	5.6	0.1	7.8	7.9	-2.3
Mexico	3.3	0.4	5.6	6.0	-2.7
Mexico	7.0	0.5	3.3	3.8	3.1
Mexico	-4.0	-1.5	7.0	5.4	-9.4
Mexico	7.1	3.4	-4.0	-0.6	7.6
Mexico	9.0	-4.1	7.1	3.0	6.0
Brazil	3.5	-1.0	9.0	8.0	-4.5
Brazil	7.5	1.6	3.5	5.1	2.4
Brazil	0.0	-1.7	7.5	5.8	-5.9
Brazil	4.3	2.3	0.0	2.2	2.1
Brazil	1.9	-1.8	4.3	2.5	-0.6
Brazil	6.9	0.5	1.9	2.4	4.5
Brazil	8.5	-2.0	6.9	4.9	3.6
Brazil	6.6	-0.9	8.5	7.7	-1.0
Brazil	4.9	0.3	6.6	7.0	-2.1
Brazil	4.9	0.3	4.9	5.2	-0.3

Below are the formulas used to estimate unexpected percent changes in M1, X, and D. All the corresponding tables are in appendix B.

Equations for actual, expected, and unexpected M1 growth rate

$M_{(it)} = (MS1_{it} / GDP^{l}_{it})$

where MS1 is the money supply

Actual $M1_{(it)} = [(M_{(it)} - M_{(it-1)})/ M_{(it-1)}]*100$

$P_{it} = M1_{(it)} - M1_{(it-1)}$

$P_{it} = \beta_0 + \beta_1 P_{(it-1)} + \mu_{it}$

$EP_{it} = \hat{\beta}_0 + \hat{\beta}_1 P_{(it-1)}$

Expected $EM1_{it} = EP_{it} + M1_{(it-1)}$

Unexpected $UM1_{it} = M1_{(it)} - EM1_{it}$

Equations for actual, expected, and unexpected export growth rate

$F_{it} = TX_{it} / GDP^{l}_{it}$

where TX_{it} *= total exports*

Actual $X_{(it)} = \{[(F_{(it)} - F_{(it-1)})] / F_{(it-1)}\}* 100$

$C_{it} = X_{(it)} - X_{(it-1)}$

$C_{(it)} = \beta_0 + \beta_1 C_{(it-1)} + \mu_{it}$

$EC_{(it)} = \hat{\beta}_0 + \hat{\beta}_1 C_{(it-1)}$

Expected $EX_{(it)} = EC_{(it)} + X_{(it-1)}$

Unexpected $UX_{it} = X_{(it)} - EX_{(it)}$

Formulas for actual, expected, and unexpected public external debt growth rate

$T_{(it)} = TD_{it} / GDP^{l}_{it}$
where TD_{it} *= total public debt*

Actual $D_{(it)} = [(T_{(it)} - T_{(it-1)}) / T_{(it-1)}] * 100$

$F_{it} = D_{(it)} - D_{(it-1)}$

$F_{(it)} = \beta_0 + \beta_1 F_{(it-1)} + \mu_{it}$

$EF_{(it)} = \hat{\beta}_0 + \hat{\beta}_1 F_{(it-1)}$

Expected $ED_{(it)} = EF_{(it)} + D_{(it-1)}$

Unexpected $UD_{(it)} = D_{(it)} - ED_{(it)}$

The Data and Sources

Data on U. S. foreign direct investment are from the Bureau of Economic Analysis of the Department of Commerce. A rate of return on U.S. direct investment abroad may be calculated as "direct investment income" (year t) over the average of the "direct investment position at historical cost" (year t) and the "direct investment position at historical cost" (year t-1).

U.S. direct investment abroad (USDIA) is the ownership or control, directly or indirectly, by a U.S. resident of 10 percent or more of the voting securities of an incorporated foreign business enterprise. (Resident is broadly defined to include any individual, branch, partnership, associated group, association, estate, trust, corporation, or other organization.) A U.S. parent company is a U.S. business that undertakes USDIA; a foreign affiliate is a foreign business in which the U.S. parent has a direct investment interest. Direct investment income is the U.S. parents' return on capital that they have provided to their foreign affiliate. The earning component of direct investment income is computed after foreign income taxes and excludes capital gains and losses.

A U.S. direct investment position abroad is the value of the U.S. parents' equity in, and net outstanding loans to, their foreign affiliates. Funds can be supplied in three forms: equity capital, intercompany debt, and reinvested earnings.

Data on gross domestic product, money supply (M1), total exports, and total external debt are from the Inter-American Development Bank (IADB) and International Monetary Fund (IMF). The advantage of this data set is that it is in dollars. Unfortunately, only ten years of data are available for each country, but it is possible to combine the data for the largest emerging economies in Latin America. Appendix A provides background information that explains why four emerging markets are selected. Nonetheless, a brief explanation is appropriate here.

In addition to offering low labor costs and competition, emerging markets in Latin America, have provided additional incentives to attract foreign capital, during the past decade. Most Latin American nations introduced decisive measures for liberalizing and stabilizing their economies and were relatively successful in fostering economic growth. As part of their liberalization process, countries adopted programs to deal with privatization of public utilities and to open their economies to foreign markets. The stabilization programs attempted to reduce inflation and external debt. Economic reform processes are at different stages in this region, but the largest countries have embraced definitive measures for rebuilding their economies. Chile, the first to initiate a reform program, has the most solidly ingrained reforms, and therefore has achieved relative macroeconomic stability. Reform processes in Mexico, Argentina, and Brazil are more recent, but each has adopted positive measures as well. As a result, the inflow of FDI has been concentrated in those large emerging markets.

Empirical Results

The effect of the unexpected changes in macroeconomic conditions on returns is estimated using both Ordinary Least Square (OLS) and Generalized Least Square (GLS). Both the OLS and GLS results are similar. In both cases all beta coefficients have a positive sign although only two factors are significant.

With OLS, the explanatory power (R^2) is .3, which means that about 30 percent of the actual returns can be explained by unanticipated changes of the risk factors. Even though all the coefficients have the expected signs, only two of the four factors--UGDP and exports (UX)--are significant at the 5 percent with t-statistic of 2.4 and 2.1, respectively (see table 8). This supports the hypothesis that as the performance of the economy improves corporate profits and returns increase as well. Similarly, as exporters are able to sell more abroad their returns rise as well. With regard to inflation (UM1), prior studies showed that depending on its source and level, the effect on returns can be positive or negative.

Table 8. OLS results

R^2	0.3		
	Betas	*SE*	*t Stat*
Intercept	**16.4**	**0.9**	**18.9**
UGDP	**0.6**	**0.3**	**2.4**
UM1	**0.02**	**0.0**	**1.5**
UX	**0.1**	**0.1**	**2.1**
UD	**0.1**	**0.1**	**0.5**

OLS results show a weak but positive relationship between inflation and returns. This means that the inflation experienced in these emerging markets has not slowed down the economy enough to reduce corporate profits. The t-statistic is 1.5, which is almost significant at the 5 percent level. As noted earlier, borrowing abroad can be beneficial. If uncontrolled, however, it can be harmful to the domestic economy. OLS results indicate that there is a positive relationship between returns and the external debt, but the result is insignificant. Its t-statistic is 0.5, which is far below the 5 percent significance level. The positive sign suggests that the benefits of pumping foreign capital into the domestic economy outweigh the losses incurred in the years when the domestic

government is unable to pay the interest and the debt must be refinanced. This result shows that the external debt is a factor that may be worthwhile monitoring.

Recall the assumption concerning OLS as a preferable estimator. It assumes the errors are independent and have a constant variance. The Durbin-Watson test shows that the disturbances are uncorrelated. Table 9 contains the results.

The variance is estimated by using the residuals (Kennedy, 1997). Argentina's, Brazil's, and Chile's variances are of similar magnitude, while Mexico's is smaller. Table 10 contains the calculations. Thus, there is some heteroscedasticity that could bias statistical inference. Even with heteroscedasticity, the coefficients are consistent and unbiased and may be used for forecasting purposes. Generalized Least Squares (GLS) is used to correct for heteroscedasticity. These results are discussed below.

Assuming that the variance of the disturbance is proportional to the square of M1; all the factors are divided by M1 (Kmenta, 1971). With GLS, two factors--UGDP and debt (UD)--are significant at the 5 percent level. As is the case under OLS, all the coefficients have a positive sign. Table 11 shows the GLS results. With a t-statistic of 1.2, the export variable is insignificant. On the other hand, the coefficient for the external debt factor (0.3) is significant at the 5 percent level, with a t-statistic of 5.4. This implies that when corrected for heteroscedasticity injecting foreign capital into the domestic economy has a strong positive influence on returns. Again, the benefits of borrowing and injecting foreign capital offsets the problems created--approximately every ten years--when the governments are not able to pay the debt interest. Perhaps knowing that these governments always manage to refinance the debt alleviates to some extent the otherwise negative effect of such refinancing.

Table 11. GLS results

R^2	0.2		
	Betas	*SE*	*t Stat*
Intercept	**16.7**	**0.7**	**23.0**
UGDP	**0.3**	**0.2**	**1.7**
UM1	**0.04**	**0.1**	**0.6**
UX	**0.03**	**0.0**	**1.2**
UD	**0.3**	**0.1**	**5.4**

In sum, the coefficients account for the effects of unexpected changes in macroeconomic conditions and are a measure of systematic risk. Assets with the same beta coefficients have the same level of risk exposure, thus should have the same expected return. If they do not have the same expected return, arbitrage would take place and the mispricing would not last.

Table 9. Test for auto correlation

Chile

μ	μ_{t-1}
0.8	
3.5	0.8
-2.8	3.5
-10.7	-2.8
6.6	-10.7
3.9	6.6
4.0	3.9
-5.8	4.0
	-5.8

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.2
R Square	0.1
Adjusted R S	-0.1
Standard Erı	6.4
Observation:	9

ANOVA

	df	*SS*	*MS*
Regression	1	16.8	16.8
Residual	7	286.5	40.9
Total	8	303.3	

	Coefficients	*SEE*	*t Stat*
Intercept	0.2	2.4	0.1
Chile	0.2	0.3	0.6

Argentina

μ	μ_{t-1}
-15.1	
2.0	-15.1
0.6	2.0
4.0	0.6
0.4	4.0
5.3	0.4
-3.2	5.3
-5.4	-3.2
-6.4	-5.4
	-6.4

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.3
R Square	0.1
Adjusted R S	-0.1
Standard Erı	6.5
Observation:	9

ANOVA

	df	*SS*	*MS*
Regression	1	21.5	21.5
Residual	7	300.2	42.9
Total	8	321.7	

	Coefficients	*ındard Eı*	*t Stat*
Intercept	-1.4	2.3	-0.6
Argentina	0.3	0.4	0.7

Table 9: Test for auto correlation (cont'd)

Mexico

μ	μ_{t-1}
3.8	
2.2	3.8
6.0	2.2
-0.4	6.0
-0.2	-0.4
1.5	-0.2
-7.9	1.5
1.0	-7.9
1.3	1.0
	1.3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.1
R Square	0.0
Adjusted R S	-0.1
Standard Er	4.1
Observation	9

ANOVA

	df	*SS*	*MS*
Regression	1	1.3	1.3
Residual	7	115.2	16.5
Total	8	116.5	

	Coefficients	*ndard Er*	*t Stat*
Intercept	0.7	1.4	0.5
Mexico	0.1	0.3	0.3

Brazil

μ	μ_{t-1}
5.4	
-4.7	5.4
-7.4	-4.7
-1.0	-7.4
13.5	-1.0
10.6	13.5
0.3	10.6
-0.8	0.3
-1.7	-0.8
	-1.7

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.3
R Square	0.1
Adjusted R S	0.0
Standard Er	6.9
Observation	9

ANOVA

	df	*SS*	*MS*
Regression	1	46.2	46.2
Residual	7	338.0	48.3
Total	8	384.2	

	Coefficients	*ndard Er*	*t Stat*
Intercept	0.9	2.4	0.4
Brazil	0.4	0.4	1.0

Conclusions

The objective of this paper is to determine whether investors can measure the risk of investing in foreign emerging markets. It began by defining risk and identifying its sources. Following Arbitrage Pricing Theory, it develops a model which measures systematic risk for investing in four emerging markets of Latin America. Risk was defined as the unexpected change in return stemming from the unanticipated changes in the macroeconomic conditions in the emerging markets. The model shows that at least a portion--systematic risk--of the total risk can be measured. The model confirmed the hypothesis that as the economic performance, inflation, exports, and the external debt in the home country increase, returns also increase, although not all the effects were statistically significant. Furthermore, these findings are consistent with findings reported by prior studies that used APT. The most striking result concerns the external debt factor. When adjusted for inflation, it shows that FDI returns benefit significantly from borrowing foreign capital.

The explanatory power of the model is reasonable. Therefore other researchers can use it as a basis for additional research in this area. Perhaps adding observations or including other factors will improve the model. The effect of changes in the exchange rate or balance of payments may be good candidates for additional study.

Investors should be aware that economic conditions in the emerging markets are constantly changing. Conclusions from studies conducted more than five years ago may no longer be valid. For example, the notion that the correlation between emerging and developed economies is weak and therefore investing in emerging markets greatly reduces the risk of your portfolio may no longer be correct. Research in this area needs to be done regularly.

Finally, as noted earlier, this model only measures a portion of the risk so it cannot be used alone. Investors should keep in mind that political and unsystematic risks are very important as well, particularly when investing overseas. To obtain a more comprehensive measure of risk, this model must be used in conjunction with other models. Researchers who wish to develop such models must develop their own perspective on political, economic, and social relationships within and across markets. This may require the development of extensive and reliable databases.

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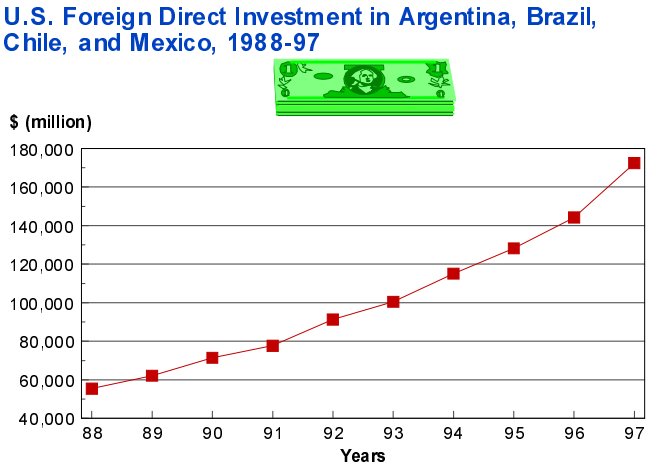
Appendix A

Overview of U.S. Foreign Direct Investment (FDI)

This section contains background information on U.S. FDI in Latin America. It covers the (1) the levels of U.S. FDI, (2) the countries with the largest share of U. S. FDI, and (3) the returns. In short, over the past ten years, U.S. FDI increased by 211 percent in Latin America (BEA, 1998). Economic reforms have played a key role in attracting foreign investors. Returns from U.S. FDI in emerging markets during 1988-97 have been competitive.

In 1988, U.S. companies held over $347 billion in FDI stocks abroad or nearly one-third of all the FDI in the world (BEA, 1998). By 1997, U.S. companies held over $860 billion in FDI stock abroad while its holdings in Latin America increased from $55 billion to over $172 billion. Among the four countries included in this study, Chile reported the largest percentage gain in FDI (686 percent, or 6.8 billion) followed by Mexico (302 percent, or 19.1 billion), Argentina (264 percent, or 7.1 billion), and Brazil (179 percent, or 23 billion).



This added inflow of FDI can be attributed to the reduction of the political risk and the creation of investment opportunities. The political risk was reduced when democratic governments were elected and the threat of communism was virtually eliminated. Investment opportunities were created when the newly elected democratic governments,

began to implement policies to foster economic growth. For instance, they have introduced reforms to privatize most of the state owned business, increase trade with both developed and developing economies and to reduce the fiscal deficit and foreign debt (IADB, 1997).

In many Latin America countries, some services--mass transportation, banking, and telecommunication--are owned and provided by the government. The privatization of these state-owned enterprises has attracted foreign investors because, in some cases, these markets will operate with little competition.

These four countries have been very successful in opening their economies. Currently, all four trade with developed and developing nations, though not in equal proportions. Ninety-one percent of Mexico's exports go to developed nations--primarily the U.S. Brazil and Chile divide their exports to developed and developing nations more evenly. Fifty-five percent of Brazil's exports is with developed nations, while Chile's export to developed nations account for 58.7 percent. Conversely, only 30 percent of Argentina's exports go to developed nations. As a percentage of GDP, in 1997, exports account for 7 percent in Argentina, 28 percent in Chile, 9 percent in Brazil, and 31 percent in Mexico. Unfortunately, the benefits of trading internationally come with a price. As small economies open their markets, they become more exposed to external economic shocks.

Inflation and at times hyperinflation can be considered the most serious threat to the continued development of Latin Americas' emerging markets. Money is frequently printed to finance government deficits. As expected, this policy increases prices and consequently it may slow a country's economic prosperity and reform process. Brazilians, Argentines, and Mexicans have first hand experience in coping with the uncertainties of inflation. Judging by the added inflow of FDI, their efforts to control inflation have had some success during the past decade. Chile's problem with inflation is minor compared to the other three nations included in here.

During the 1980's borrowing from foreign commercial banks was in style in Latin America. Countries borrowed so much that some years, they no longer could pay the interest on the debt. At that point, no one was willing to lend them a dime. All four countries made a real effort to control their external debt. With the exception of Chile, the other three have not been too successful. In absolute terms in 1996, Mexico had the largest debt ($173.5 billion), followed by Brazil ($160.8 billion), Argentina ($99.7 billion), and Chile ($27.5 billion).

These reforms have been painful for these countries, but relatively successful. Economic growth has been high during the 1990's, yet inconsistent. The largest annual per capita economic growth rate was reported by Chile in 1992 (9.2 percent), followed by Argentina's in 1991 (9.0 percent). Regarding the size of these four countries' economies, Argentina and Mexico's economies are similar. In 1997, Mexico's GDP was $293.7 billion (GDP per capita growth rate 5.2 percent) while Argentina's GDP was $214.2 billion (GDP per capita 6.4 percent). Brazil, the largest economy in Latin America and the eighth largest in the world, reported GDP for 1997 was $504.9 billion (GDP per capita was 1.7 percent). Chile's economy is the smallest of the four. It's GDP, in 1997, was $50.9 billion (GDP per capita 4.0).

Both manufacturing and service--transportation, communication, public utilities, and finance--industries have benefited from the added FDI. In Brazil and Mexico, about sixty percent of the FDI goes into manufacturing. On the other hand, in Chile and Argentina only 10 percent and 40 percent, respectively, of the FDI goes into manufacturing. By far the FDI in the financial services sector has grown the fastest. In summary, an analysis of the distribution of U.S. FDI reveals a shift in investment from sectors based on availability of mineral resources and from manufacturing into financial services, which account for about 40 percent of the total U.S. FDI position in these countries.

It is important to highlight that the four countries included in my sample have similarities in their economic development. (Their social and political development are quite similar as well.) They have had to confront the similar problems and have employed many of the same policies to correct them. Economically, they had problems with unemployment, inflation, and external debt. By reforming and opening their economies, these four countries have achieved greater macroeconomic stability, economic growth, and interdependence. Consequently, the inflow of foreign direct investment has increased tremendously. Will this political stability and economic growth continue?

U.S. Government Fostering FDI

Most investors would agree that emerging markets often provide great investment opportunities. But greater perceived risk and difficulties in doing business in those markets can diminish their attractiveness. In an effort to aid American investors to penetrate overseas markets, the U.S. government provides financial support services to encourage FDI. However, since the government philosophy is to let investment flows follow market forces, U.S. government promotional services are modest (OPIC, 1998).