

HOW GLOBAL INVESTORS MIGHT RID THEMSELVES OF ASIAN-TYPE CRISES

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Recent debate about reforming the international financial architecture to handle financial crises in emerging markets typically focuses on the relationship between officials. That is, what will finance ministers from developed countries and officials in international financial institutions agree to tell finance ministers in emerging economies? However, in recent times, the motives for this may be ill-conceived as Schwartz (1998: 255) notes, “U.S.-backed bailouts protect investors who lent money to governments or private-sector institutions, not the people who suffer the consequences of unsound policies.” Meanwhile, as a currency or sovereign-debt crisis unfolds it may spread to other asset classes and across countries, and the official response may be delayed.

What follows is a summary of proposals that some global investors might eventually find useful for managing the risk of a country’s exposure to a crisis with derivatives, without having to sell-off the country’s real and primary financial assets. To do this requires (1) creating an index that quantifies the risk in question, (2) instituting a derivative security that can be priced, which pays out when the risk is affecting investments, and (3) finding a way to guide trading strategies. The indexes explored are a country’s beta, measuring the risk added to global investments from an additional dollar invested in the country, and a country’s alpha, measuring how well the country performs relative to average global investments, after adjusting for global systematic risk. Such derivatives may spell the end of the transmission of future Tequila and Asian Crisis risks.

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Resolving Emerging Financial Market Crises: A Myriad of Potential Policies or One, More Complete, Market?

Identifying the causes of emerging market financial crises and how such crises can be stopped has been the subject of much debate in recent years. There are presumably many relevant policies to prevent financial crises. Yet, there may be one simple market solution to dampen the effects that financial crises have on our wealth. The economist's task is to figure out how to create a more "complete" market in the sense of making financial risk *economically* irrelevant. The complete markets methodology is described in the next section and then applied to hedging emerging market investments against financial crises.

Arrow's World

Kenneth Arrow (1953 in French, 1964 in English) proposes an elegant theory that defines the concept of a world of complete markets, in which shocks have no effect on the economy. In that world, the likelihood of any uncertainty can be quantified and priced, without giving up any resources because, by assumption, contracts are costless to create and enforce. When markets are complete, risk factors may affect our lives but not our livelihoods. Likewise, if risk affects our wealth, then it must be the case that markets are incomplete. The instruments used to complete markets are called state-contingent securities because they pay out a specified amount of money only if a particular state of nature is realized and nothing otherwise. As an example, imagine that we knew that tomorrow there would be an earthquake, a hurricane, or a calm, sunny day. Markets would be complete if we each owned a security that paid us one dollar if there is an earthquake and zero otherwise, a second security that paid us one dollar if there is a hurricane and zero otherwise, and a third that only paid us one dollar for sunshine and zero otherwise. The values of these securities would be tied to the probability of each event's occurrence. Arrow even proved that markets would be complete if we did not have all securities as long as the missing ones could be recreated from the ones we did have. For example, if only the second and third securities existed, the economic impact of the earthquake could still be neutralized if those two securities were combined in such a way that the payoff from the missing earthquake security could be mathematically recreated.

Arrow proposes a world in which earthquakes or hurricanes may happen, but everyone gets one dollar no matter what happens. In fact,

Arrow's contribution is too impractical to ever be implemented as he saw it, but it is important because his vision of complete markets identifies the best we can hope to see for the uncertain world in which we live, where resources are scarce. Furthermore, derivatives, such as futures and options, are special state-contingent securities that make completing markets possible and feasible.

Options and the Complete Markets World of Black and Scholes

Derivative markets have existed at least since the 17th century.¹ One recurring problem has always been to value them fairly so they can be sold off in the marketplace. A number of authors have attempted to price stock options.² Fischer Black and Myron Scholes (1973), along with Robert Merton (1973), figured out how to price a call option, a financial contract that gives the owner the right to buy shares of a certain company's stock from the party who wrote it, assuming the underlying stock price follows a certain probability law. They did this by assuming an investor can create a risk-free portfolio by buying stock and selling options. Since the holder of the portfolio owns the risk that comes with owning the stock and can sell off that same risk when he sells the call options on the stock, in theory he bears no risk. Thus, Black and Scholes, like Arrow, describe a world in which risk has no economic impact on wealth, so by definition the market for this stock is complete.

If derivative contracts can be priced fairly, they can be an effective means of getting rid of risk. The most predominant form of risk that derivatives have been used to neutralize is price volatility. For instance, wheat farmers can protect themselves against a fall in wheat prices after a bumper-crop year by selling wheat futures contracts to lock in at a certain price. In owning the wheat and selling to someone else the obligation to buy that wheat with a futures contract, the price is effectively fixed. Similarly, investors who believe that the price of a company's stock may fall can buy a put option, a contract that gives the owner the right to sell shares of stock to the put option writer for

¹See Stringham (2003) and references therein for a detailed description of the Dutch market, and Wakita (2001) and references therein on the effectiveness of perhaps the world's first futures market, for rice, in Tokugawa-era Japan.

²At the turn of the century, Louis Bachelier (1900, 1964) produced early results on pricing stock options, though among the limitations of his effort is that his framework allows stock prices to be negative, which is impossible. Zimmermann and Hafner (2004) have recently summarized work on option pricing by a relatively unknown actuarial science professor Vinzenz Bronzin (1908). Black and Scholes (1973) list a number of earlier attempts from the 1960s to find an option pricing formula. Robert Merton (1973) extends their results to other related probability laws and option contracts.

a certain price.³ If the price falls below the exercise price specified by the put contract, the writer of the put will lose money in the sense that he is obliged to purchase the shares of stock from the put buyer at the put's specified, higher price, instead of at the lower, realized market price.

In the last decade, financial experts have also figured out how the same concepts can be applied to insuring against risks that are not associated with price fluctuations, such as earthquakes in California, hurricanes in Florida, and precipitation across the United States.⁴ In each case, the key to completing the market is to figure out how to quantify the risk before figuring out how to price it. It seems the same steps could be taken to neutralize the effects of an emerging market financial crisis, defined as an episode in which investors suddenly, correctly or incorrectly, perceive a change for the worse in their investment opportunities that causes them to liquidate their positions. Emerging market investors might render the next Asian Crisis economically irrelevant if they could trade derivative assets on a country's financial instability instead of the real and financial primary assets of that country. Three ingredients are required to have such a market: (1) an index that quantifies the risk in question, (2) an appropriate pricing formula for a derivative security, which pays out when the risk is affecting investments, and (3) a way to guide trading strategies.

Quantifying the Risk of the Asian Crisis

Imagine there was some way to quantify and then fairly price the risk of emerging economy capital flight during a financial crisis. More specifically, what would happen if there was a publicly available index that measured the effects of a financial crisis on a particular developing country's assets, which rose (or fell) during a crisis and fell (or rose) when it was over? Investors could then write a derivative contract on such an index and after finding a way to price it the underlying risk could be sold off in the market.

Two potential candidates are inspired by an international capital asset pricing model (or international CAPM) applied to countries, proposed by Solnik (1974). The CAPM predicts (1) "nothing ventured, nothing gained" and (2) "don't put all your eggs in one basket" (see Bernstein 1992: 44). At the level of the nation-state, this means countries that earn higher expected returns must also be riskier, or

³A similar strategy would be to sell a call option, as Black and Scholes (1973) explore.

⁴See the Artemis website (www.artemis.bm) for links to the alternative risk transfer industry.

else there will be an arbitrage opportunity. It also means that prudent investors should diversify their portfolios across countries. Related to the first prediction is the idea that if there were no global profit opportunities, any two countries should perform identically, after adjusting for their contribution to global financial market risk. Accordingly, two indexes that might just work to quantify the effects of a financial crisis on a particular country are discussed.

The first is a measure of a country's contribution to global financial market risk, frequently called a country beta. It measures the amount of risk that is added to a global investor's portfolio by investing an additional dollar in a particular country. It can also be thought of as an elasticity measuring how sensitive a country's stock market index is to changes in the global financial market. That is, when a country's beta (its contribution to global financial risk) is positive and greater (less) than one, it is riskier (safer) than the average investment opportunity around the world. If it is equal to one, it is just as risky as what's found in the world market. Finally, if it is negative, the country acts like insurance, because when the global investment opportunities on average go down (up) in value, the country's investments go up (down) in value. The second potential index is a country variant of Jensen's (1968) alpha, which measures the average profit (loss) from investing in a country relative to a global index that people use as a benchmark, after adjusting for the country's contribution to global systematic risk. This measure actually tells an investor something useful. If a country's alpha is positive (negative) that means there will profits (losses) from investing more in the assets that make up the country's index, relative to global investment opportunities, and they should be bought (sold) until prices of those assets rise (fall) to the point at which those profits (losses) disappear. These two parameters, alpha and beta, can be estimated from a single statistical regression framework.

Solnik (1974) proposes a regression model, which applied to the case of Mexico becomes:

$$(1) \quad r_{Mexico,t} = \alpha_{Mexico,t} + \beta_{Mexico,t} r_{MSCI,t} + \varepsilon_{Mexico,t}$$

where

$$(2) \quad r_{Mexico,t} = (I_{Mexico,t} - I_{Mexico,t-1}) / I_{Mexico,t-1}$$

is the weekly rate of return on Mexico's investable equity index, $I_{Mexico,t}$, reported by Standard & Poor's Emerging Markets Database;

$$(3) \quad r_{MSCI,t} = (I_{MSCI,t} - I_{MSCI,t-1}) / I_{MSCI,t-1}$$

is the rate of return on a Morgan Stanley Capital International's All Country World Index;

$I_{MSCI,t}$ $\alpha_{Mexico,t}$ is the week t risk-adjusted profit on Mexico's investment opportunities;

$\beta_{Mexico,t}$ is the week t measure of the Mexican market's sensitivity to changes in the global market; and

$\varepsilon_{Mexico,t}$ is the part of Mexico's index return that is not explained by changes in the global index.⁵

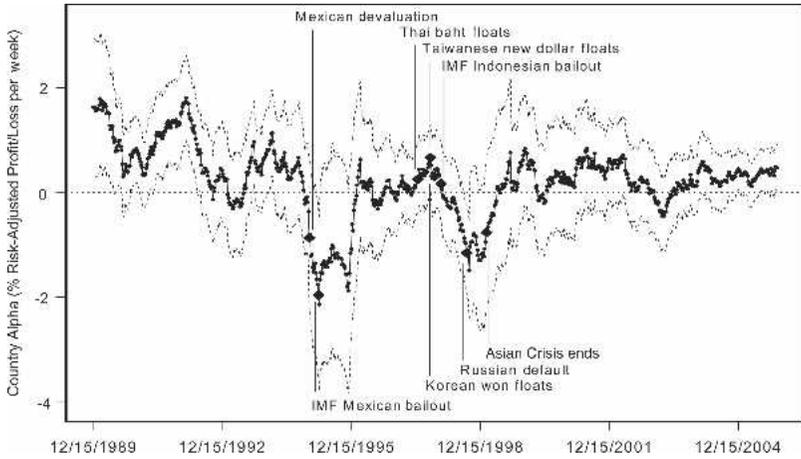
It is natural to expect that country risk should change over time. In fact, during a global financial crisis, and sometimes during a domestic financial crisis, a country's contribution to worldwide risk actually rises, and falls afterward. Since the beta in a regression is negatively related with the alpha, and because the country betas rose during the Asian Crisis, and in countries affected by the Tequila Crisis, country alphas fall and become negative during that same period for those countries. This association between events and measured country risks, and/or country performance is sufficient to quantify the effects of a financial crisis.

To illustrate how these estimated indexes might be useful in completing the market against emerging financial crisis risk, it is first necessary to show that their movements coincide with events taking place. The statistical estimation should ideally be done with daily data, as in Miller (2005a, 2005b), or perhaps eventually with intradaily data so that a particular market's systematic risk and performance can be monitored at relatively high trading frequencies. However, for a large number of emerging markets, daily data are not available before 1995. Weekly data are available before 1995 and are accordingly used. So-called rolling country alphas and country betas are depicted in Figures 1 and 2 for Mexico between December 15, 1989, and November 11, 2005.

Each point represents a regression coefficient that is estimated from 50 weeks of data leading up to the point in the graph. For example, the first point in each graph is estimated using the 50 weekly observations for the country index and global index rates of return between January 6, 1989, and December 15, 1989. The next point is

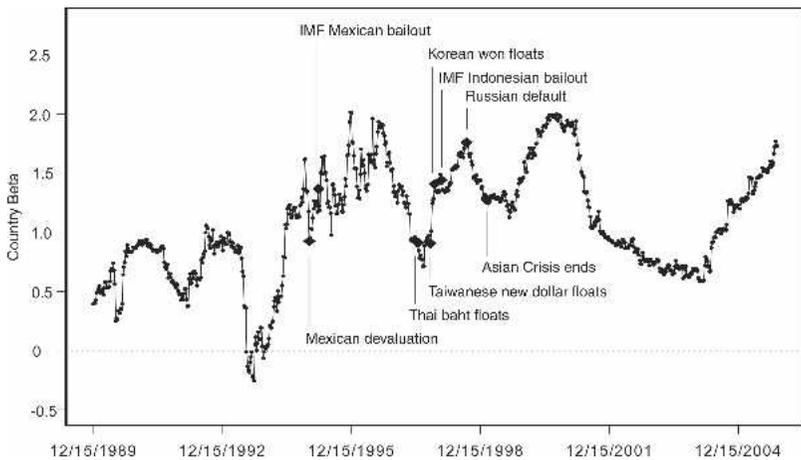
⁵The time subscripts on $\alpha_{Mexico,t}$ and $\beta_{Mexico,t}$ are due to the fact that they are estimated with roughly one year of data. The process is repeated and iterated forward through the data sample by first dropping the earliest observation in the sub-sample, and then adding the latest realization of data, so that the estimation is always done with an equal number of observations.

FIGURE 1
WEEKLY, ROLLING, COUNTRY ALPHAS FOR MEXICO,
12/15/1989–11/11/2005



estimated using observations between January 13, 1989, and December 22, 1989. The process is iterated until the last point in the sample, which in this case includes observations between December 3, 2004, and November 11, 2005. Points highlighted in the graphs represent

FIGURE 2
WEEKLY, ROLLING, COUNTRY BETAS FOR MEXICO,
12/15/1989–11/11/2005



events during financial crises that seem to have affected Mexico during the sample. As the parameters are treated as an index that all market players and monitors would accept as the truth rather than a purely statistical estimate, the standard errors are of secondary importance here. However, they are included in Figure 1 as a weak indication that there are rarely profit opportunities in a statistical sense and that the Mexican market is generally efficient.⁶ When the lower standard error band lies above zero, this suggests that there are statistically significant profits to be earned from investing in the country, while if the upper standard error band falls below zero it suggests that there are statistically significant losses from investing in the country.

Since weekly Friday closing equity index prices are used to calculate the rates of return, the points represent the nearest date after the event so that the regression coefficient can capture the effects of that event. The first and second points, labeled “Mexican Devaluation” and “IMF Mexican Bailout,” are the nearest points to the official beginning and end of the Tequila Crisis, December 20, 1994, and March 10, 1995, respectively. The remaining points represent various events during the Asian Crisis. They include the Thai baht devaluation on July 2, 1997, the Taiwan new dollar float on October 17, 1997, the Korean won float in November 17, 1997, the IMF’s Indonesian Bailout and the rollover of Korean debts on January 15 and 16, 1998, respectively, and the Russian debt default on August 17, 1998. The Asian Crisis ended by February 1999.

Stylized Facts about Country Alphas and Betas during the Tequila and Asian Crises

For Mexico, the country alpha is already negative and falling by the time the Tequila Crisis begins in late 1994. Even though the two standard error bands around the alpha estimate include zero, negative alphas suggest that investors faced pressure to sell even before the Tequila Crisis officially happened. Falling alphas suggest that Mexican assets on average were selling at a faster rate than they were being purchased. In other words, it was completely rational for investors to sell, since they would have been losing money by staying in Mexico. The country alpha for Mexico falls during the Asian Crisis, though not

⁶I am grateful to Edgardo Favaro for suggesting that I consider using standard errors when estimating the alphas to make confirmatory statements about the existence of profit opportunities.

as much as it does during the Tequila Crisis. The negative values and the decline suggest once again that it would have been rational to sell Mexican assets during the Asian Crisis too. The country beta rises before and during the outbreak of the Tequila Crisis, although the peak values during the Tequila Crisis are not as high as during the Asian Crisis, when it becomes almost twice as risky as the average world investment opportunity.

Miller (2005b) shows that country betas rise in 13 emerging markets during the Asian Crisis and fall thereafter, while Miller (2005a) shows that country alphas fall and become negative during the Asian Crisis, before eventually becoming positive again. Preliminary findings by Miller (2005c) are that during the Tequila Crisis the country alphas for Argentina, Brazil, Chile, and Mexico fall and become negative, but do not fall for non-Latin American countries, while the betas for Latin American countries, and to a lesser extent Thailand, rise.

So, overall, the country alpha seems to be a good indicator of the health of a country's investment opportunities, and it could be somewhat more useful than the country beta. The reason is that the country beta simply measures a country's contribution to global systematic risk, while a country's alpha represents how far a country's excess, risk-adjusted average returns are from what they should be in a hypothetical equilibrium world. To that extent, it can be a proxy for net capital inflows, because whenever a country is positively (negatively) mispriced, as when the alpha is positive (negative), capital should be flowing in (out). Since it is currently impossible to get daily capital flow data for emerging, let alone developed, markets, it might simply be best to get a proxy for it, and the alpha may be the best proxy. So having identified an appropriate index, it is now possible to talk about completing global financial markets from Asian Crisis risk.

How Emerging Financial Market Crisis Hedging Could Be Based on a Country's Alpha

A simple way to hedge against large capital flows out of a country might be to write a swap contract, which is similar to a futures contract, on a country's alpha, as discussed in Miller (2005a).⁷ Each day, the country alpha would be estimated using a methodology similar to

⁷An alternative is a country alpha futures market. In a futures market the alpha, which might be estimated by a financial exchange, would then be adjusted, perhaps using a formula such as $100(1 + \alpha_t)$ for daily data. The strike value would also be on the same scale calculated using a formula such as $100(1 + \textit{strike})$. The reason is in the United States the Options Clearing Corporation does not allow negative values of the underlying indexes for

the one described earlier, and tracked over time as in Figure 1. Speculators and insurers would buy country alpha swap contracts from those who want to hedge against the risk. Depending on where the current alpha is, the strike value would be chosen as parties enter into the contract. For instance, assume the current alpha and strike value are zero, and that six months from now the alpha becomes negative (positive) because of an unforeseen financial crisis (boom), as the country's assets are under- (out-) performing and capital is presumably flowing out (in). Then those who wanted to protect their portfolios (speculate) would be compensated x dollars for each point below (above) the strike, where x is a constant specified in the financial contract. Big institutional investors may be worried about capital flowing out of a country even if they like the particular companies or other investments that they hold in an emerging market. A large capital outflow can make even the best and safest investments look really poor. If, on the other hand, institutional investors can disentangle a country's performance from the performance of a particular investment within an emerging market, capital flows may in effect be stabilized, or at least a country alpha's departures from zero may be reduced, bringing global financial markets closer to what a hypothetical equilibrium model predicts.

Merton (1990) has a similar proposal to write derivatives on the realized return differential between a small market and a global index, which has been revisited by Bodie and Merton (2002). However, there is no adjustment for global systematic risk, as the country alpha does, and Merton's proposal envisions an exchange between small market, domestic and global investors. While the proposals here do not exclude such exchanges, they are intended to work in worst-case scenarios in which the small market implements capital controls, or there are simply too few local investors to make such exchanges feasible. Among other things, Brealey (1999) suggests that crises could be resolved by having governments take positions in equity swaps written on either the national or regional stock market index, which likewise do not account for changes in global systematic risk.

What about Global Index Futures or Global Index Put Options?

There is still another possibility for more traditional hedging strategies. Today, large U.S. institutional investors can hedge their port-

futures contracts. I am grateful to Daniel Carrigan at the Philadelphia Stock Exchange for bringing this point to my attention.

folios from changes in the directions in the market through S&P 500 Index futures or put options. There is, oddly enough, no global analog of these instruments, so Miller (2005b and 2005c) discusses possible strategies that could be used to hedge against changes in global systematic risk, once these securities are marketed. Perhaps the U.S. market is so large in terms of market capitalization that S&P 500 derivatives are sufficient for hedging much global systematic risk, but if this is not the case, then global index derivatives are also worth considering.

Neutralizing the Effects of an Emerging Financial Market Crisis

It is easier to think who might wish to be hedged from an Asian Crisis—namely, investors who sold their asset holdings during the Asian Crisis. The most likely market suppliers of Asian Crisis risk hedges are the big insurance companies, like AIG, that have historically dealt in emerging market political risk insurance. In the context of derivatives-based, political risk insurance, Alington (1999: 11) writes:

What is lacking in order to develop a derivatives market . . . is an index (or indexes) of political risk. It is the equivalent indexes for earthquakes, hurricanes and other forms of weather that make derivatives in these areas feasible. No precise equivalent exists for political risk. There are of course measurable economic factors, such as exchange rates and interest rates, which can be indexed. There is however no direct correlation between these and the type of political risks which could impact upon an infrastructure project. A better method of indexing sovereign risk could use the ratings of agencies such as Standard & Poor's or Moody's as the basis. Again, however these ratings are more closely related to the ability of the government to honor its foreign debt obligations than the risk of expropriation or war. The solution may be to have a different index for each type of risk. This is an area in which there would seem to be good prospects for further development.

Because the alphas and betas are associated with certain kinds of political events, this might be enough to entice political risk insurers to take the other side of the position. The other characteristic of country alphas that might entice political risk insurers is the fact that they are frequently above zero, so that supplying insurance to investors with hedging demands by taking a long position in country alpha futures is not always a losing proposition, and is frequently a winning bet.

International financial institutions could also get involved in this market. If political risk insurers are going to be involved in this market, the Multilateral Investment Guarantee Agency (MIGA), the World Bank's political risk insurance agency, may do so. Alternatively, the International Monetary Fund, perhaps in conjunction with MIGA, might also be involved in shoring up funds to head off a fire sale of assets, using market instruments. IMF Chief Economist Raghuram Rajan (2005) notes that crises today are associated less with balance of payments, or flow, problems, and more associated with about-face changes in the direction of capital flows, which he calls a stock problem, because the stock of a country's wealth is no longer demanded by foreigners. Country alphas and betas seem to give a good summary of the current health of emerging economies, in good and bad times, and could thus be among the indicators that IMF staff might monitor. By taking long positions on country alpha futures the IMF might foster *ex ante* crisis management, rather than *ex post* lending arrangements, which receive a disproportionate share of the criticism levied toward activities of the international financial institutions.

Conclusion

It may be time to create financial crisis risk hedging markets so that global investors can protect themselves before they happen, instead of asking for bailouts after they happen. In the aggregate this would increase the transparency of the way financial crises are managed, reduce firm-specific market risk, and may increase the complexity of operational risk. Black (1995) argues that governments often create systemic risk by paying the costs of risky human behavior with taxpayer dollars. In such cases, the best way to eliminate the systemic risk is to stop risky human behavior. When it comes to emerging financial market crises, the best way to avoid them in the long run is through institutional reform, establishment of a rule of law, and macro stability. Since no one knows when such reforms will become effective, smoother capital flows might still be possible with the creation of appropriate capital flight risk hedging instruments.

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