READING 22: THE CASE FOR INTERNATIONAL DIVERSIFICATION

A- The Traditional Case for International Diversification

There are two motivations for global investment:

1) All else being equal, a low international correlation allows reduction of the volatility, or total risk, of a global portfolio.

2) A low international correlation also provides profit opportunities for an active investor: Because markets do not move up or down together, an expert investor can hope to adjust the international asset allocation of the global portfolio toward markets with superior expected returns. This should lead to a superior risk-adjusted performance.

1- Risk Reduction through Attractive Correlations

The objective of risk diversification is to reduce the total risk of a portfolio. The total risk of most stock markets is larger than that of the U.S. market when the dollar is used as the base currency. In part, this is caused by currency risk, which adds to the risk of a foreign investment, even though the volatility of national markets is often comparable when measured in their local currency. Nevertheless, the addition of more risky foreign assets to a purely domestic portfolio still reduces its total risk as long as the correlation of the foreign assets with the domestic market is not large.

Let’s consider a portfolio partly invested in domestic assets and partly invested in foreign assets. The proportions invested in each asset class is denoted $\omega_d$ for domestic assets and $\omega_f$ for foreign assets; they sum to 100 percent. The returns are denoted $R_p$ for the portfolio, $R_d$ for the domestic assets, and $R_f$ for the foreign assets. All returns are measured in the base currency. So, the return on foreign assets is subject to currency risk. The domestic and foreign assets have standard deviations denoted $\sigma_d$ and $\sigma_f$, respectively. The total risk of the portfolio is its standard deviation $\sigma_p$. The correlation between the two asset classes is denoted $\rho_{d,f}$. The covariance between the two asset classes is given by

$$cov_{d,f} = \rho_{d,f} \sigma_d \sigma_f$$

The expected return on the portfolio is simply equal to the average expected return on the two asset classes:

$$E(R_p) = \omega_d E(R_d) + \omega_f E(R_f)$$ \hspace{1cm} \text{Equation 1}

The variance of the portfolio is equal to

$$\sigma_p^2 = \omega_d^2 \sigma_d^2 + \omega_f^2 \sigma_f^2 + 2 \rho_{d,f} \omega_d \omega_f \sigma_d \sigma_f$$

The standard deviation is equal to the square root:

$$\sigma_p = (\omega_d^2 \sigma_d^2 + \omega_f^2 \sigma_f^2 + 2 \rho_{d,f} \omega_d \omega_f \sigma_d \sigma_f)^{1/2}$$ \hspace{1cm} \text{Equation 2}
The portfolio’s total risk $\sigma_p$ will always be less than the average of the two standard deviations: $\omega_d \sigma_d + \omega_f \sigma_f$. The only case in which it will be equal is when the correlation is exactly equal to 1.0 (perfect correlation between the two assets). Otherwise diversification benefits will show, and the lower the correlation, the bigger the risk reduction.

a. Currency Considerations

The return and risk of an asset depend on the currency used.

$$V^S = V \times S$$

where $V$ and $V^S$ are, respectively, the values in the local currency (euro) and in the dollar, and $S$ is the exchange rate (number of dollars per euro). The rate of return in dollars from time 0 to time 1 is given by

$$r^S = \frac{V_1^S - V_0^S}{V_0^S} = \frac{V_1 S_1 - V_0 S_0}{V_0 S_0} = \frac{V_1 - V_0}{V_0} + \frac{S_1 - S_0}{S_0} + \frac{V_1 - V_0}{V_0} \times \frac{S_1 - S_0}{S_0}$$

$$r^S = r + s + (r \times s)$$

where $r$ is the return in local currency, $r^S$ is the return in dollars, and $s$ is the percentage exchange rate movement.

To simplify notations, it is usually assumed that the cross product $r \times s$ is small relative to $r$ and $r$ and can be ignored for risk calculations. Hence, the variance of the dollar return is simply equal to the variance of the sum of the local currency return and the exchange rate movement:

$$\text{var}(r^S) = \text{var}(r + s) = \text{var}(r) + \text{var}(s) + 2 \text{cov}(r, s)$$

Or,

$$\sigma_f^2 = \sigma^2 + \sigma_s^2 + 2 \rho \sigma \sigma_s$$

where $\sigma_f^2$ is the variance of the foreign asset measured in dollars, $\sigma^2$ is its variance in local currency, $\sigma_s^2$ is the variance of the exchange rate, and $\rho$ is the correlation between the asset return, in local currency, and the exchange rate rate movement. As the correlation is never greater than 1.0, the asset and currency risks are not additive, and we have

$$\sigma_f \leq \sigma + \sigma_s$$

The difference between $\sigma_f$ and $\sigma$ is called the contribution of currency risk

b. Efficient Portfolios

Combining all domestic and international stocks in an efficient mean–variance fashion, we derive the global mean–variance-efficient frontier. The global efficient frontier is to the left of the domestic efficient frontier, showing the increased return opportunities and risk diversification benefits brought by the enlarged investment universe.
Although the correlation coefficients between markets vary over time, they are always far from unity. For the portfolio manager, this means that there is ample room for successful risk diversification.

c. Equity

The degree of independence of a stock market is directly linked to the independence of a nation’s economy and governmental policies. To some extent, common world factors affect expected cash flows of all firms and therefore their stock prices. However, purely national or regional factors seem to play an important role in asset prices, leading to sizable differences in the degrees of independence between markets. It is clear that constraints and regulations imposed by national governments, technological specialization, independent fiscal and monetary policies, and cultural and sociological differences all contribute to the degree of a capital market’s independence. On the other hand, when there are closer economic and government policies, one observes more commonality in capital market behavior. In any case, the covariation between markets is still far from unity, leaving ample opportunities for risk diversification. There is little difference between stock market correlations when we look at hedged and unhedged returns.

d. Bonds

The general observation is that national monetary/budget policies are not fully synchronized. The relative independence of national monetary/budget policies, influencing both currency and interest rate movements, leads to a surprisingly low correlation of U.S. dollar returns on the U.S. and foreign bond markets. Hence, foreign bonds allow investors to diversify the risks associated with domestic monetary/budget policies.

There exists a correlation between currency movements and bond yield movements (and hence bond returns). For example, some countries practice a “leaning against the wind” policy, whereby they raise their interest rates to defend their currencies. So the correlation of two national bond markets would be different if we look at hedged returns or at currency-adjusted returns.
e. Leads and Lags

Some investigators have attempted to find leads or lags between markets. For example, they studied whether a bear market in February on Wall Street would lead to a drop in prices on other national markets in March. **No evidence of a systematic delayed reaction of one national market to another has ever been found, except for daily returns, as outlined later.** The existence of such simple market inefficiencies is, indeed, unlikely, because it would be easy to exploit them to make an abnormal profit.

One must take into account the time differences around the world, however, before assessing whether a given national market leads or lags other markets. New York and Tokyo official trading hours never overlap. London and New York trading hours generally overlap for two hours. If the markets are efficient, international news should affect all markets around the globe simultaneously, with markets closed at that hour reflecting the news immediately on opening.

2- Portfolio Return Performance

*Global investing should increase the Sharpe ratio because of the reduction in risk.* Investing in foreign assets allows a reduction in portfolio risk (the denominator of the Sharpe ratio) without necessarily sacrificing expected return (the numerator of the Sharpe ratio). Both domestic and foreign investors can see their Sharpe ratio increase if they diversify away from purely local assets. As long as the expected returns on domestic and foreign assets are comparable, both types of investors would benefit from international risk reduction compared to a portfolio of purely local assets. **The second argument for an increase in the Sharpe ratio is that more profitable investments are possible in an enlarged investment universe.** Higher expected returns may arise from faster-growing economies and firms located around the world, or simply from currency gains. These advantages can be obtained by optimizing the global asset allocation.

a. An Ex Post Example
The potential profits are large, but optimizing them requires some forecasting skills. Therefore, all we can conclude is that the opportunities for increased risk-adjusted returns are sizable and that the performance gap between optimal global asset allocations and a simple world index fund is potentially quite wide.

b. Different Market Environments

It is important to stress that the expected benefits of global investing in terms of risk and return of a portfolio are different. Because of the low (less than 1.0) correlation across different national assets, the volatility of a portfolio is less than the average volatility of its components. Risks get partly diversified away. However, the return on a diversified portfolio is exactly equal to the average return of its components. By definition, the return on the world index is the average return of all national markets. In other words, some countries will outperform the world index, whereas others will underperform the world index.

It is unlikely that any single market will under- or overperform the other markets in all time periods. Hence, passive global diversification is wise in terms of risk, but it does not provide a “free lunch” in terms of return. Similarly, the ex post optimal allocation will depend on the period under study.

c. Forward Looking Optimization

In the long run, the performance of stock markets can be explained by national economic factors for example real growth. Economic flexibility is also an important factor in investment performance, which may explain differences between past and future performances among emerging countries. Wage and employment rigidity is bad for the national economy.

Economic forecasting is a useful exercise, but it should be stressed that scenarios that are widely expected to take place should already be impounded in current asset prices. So, investors forecasting economic growth rates must take into account the market consensus about future growth rates.

Because of the great uncertainty of forecasts, it is always better to spread risk in the fund by diversifying globally across markets with comparable expected returns. This ensures a favorable risk–return trade-off or, in the jargon of theory, higher risk-adjusted expected returns. If managers believe that they have some relative forecasting ability, they will engage in active investment strategies that reap the benefits of international risk diversification while focusing on preferred markets.

3- Currency Risk Not a Barrier to International Investment

Currency fluctuations affect both the total return and the volatility of any foreign currency–denominated investment. From time to time, in fact, the effects of currency fluctuations on the investment return may exceed that of capital gain or income, especially over short periods of time. Empirical studies indicate that currency risk, as measured by the standard deviation of the exchange rate movement, is smaller than the risk of the corresponding stock market (roughly half). On the other hand, currency risk is often larger than the risk (in local currency) of the corresponding bond market.
(roughly twice). In a global portfolio, the depreciation of one currency is often offset by the appreciation of another. Indeed, several points are worth mentioning regarding currency risk.

- First, market and currency risks are not additive. The correlation between changes in the exchange rate and the asset price is an important element in assessing the contribution of currency risk. The lower the correlation, the smaller the contribution of currency risk to total risk.
- Second, the exchange risk of an investment may be hedged for major currencies by selling futures or forward currency contracts, buying put currency options, or even borrowing foreign currency to finance the investment. So, currency risk can easily be eliminated in international investment strategies. But currencies can also provide some attractive profit opportunities.
- Third, the contribution of currency risk should be measured for the total portfolio rather than for individual markets or securities, because part of that risk gets diversified away by the mix of currencies represented in the portfolio.
- Fourth, the contribution of currency risk decreases with the length of the investment horizon. Exchange rates tend to revert to fundamentals over the long run (mean reversion).

B- The Case against International Diversification

Several impediments to international portfolio investing are often mentioned. First, the case for international diversification presented earlier has been attacked on the basis that it strongly overstates the risk benefits of international investing. Second, skeptics also look at the historical performance of their domestic market relative to other foreign markets. Third, there are numerous physical barriers to international investing.

1- Increase in Correlations

There is no reason for the correlation between two equity markets to remain constant over a long period of time. Indeed, it has been observed that international correlations have trended upward over the past decade. It has also been observed that international correlation increases in periods of high market volatility.

a. Correlations Have Increased over Time

Economies and financial markets are becoming increasingly integrated, leading to an increase in international correlation of asset prices. Economic and financial globalization observed at the turn of the millennium can be witnessed in many areas.
- Capital markets are being deregulated and opened to foreign players. Markets that used to be segmented are moving toward global integration.
- Capital mobility has increased, especially among developed countries.
- National economies are opening up to free trade. Hence, national economies are becoming more synchronized.
- As the economic environment becomes global, corporations become increasingly global in their operations. They achieve this global strategy through increased exports, international organic growth, and foreign acquisitions.
As corporations become more global, it is not surprising to see the correlation between their stock
prices increase. The legal nationality of a corporation becomes less important. As a firm competes
globally and derives a significant part of its cash flows from abroad, its value is affected by global factors,
not primarily by the location of its headquarters. Hence, it is not surprising to find that country factors
become less important and that the correlation among national stock markets tends to increase.

b. Correlation Increases When Markets Are Volatile

A major criticism addressed to the mean–variance framework used to present the case for international
diversification is that it assumes “normality.” In statistical terms, all returns are supposed to have a
“joint multivariate normal distribution.” In real life, returns are not exactly drawn from normal
probability tables with constant correlations across assets. Three deviations from market “normality”
are most often mentioned:

- Distributions of returns tend to have fat tails (leptokurtic distribution). In other words, the
  occurrence of large positive or negative returns is more frequent than expected under normal
distributions.
- Market volatility varies over time, but volatility is “contagious.” In other words, high volatility in
  the U.S. stock market tends to be associated with high volatility in foreign stock markets, as well
  as in other financial markets (bond, currency).
- The correlation across markets increases dramatically in periods of high volatility, for example,
  during major market events such as the October 1987 crash.

Correlation moves over time for obvious reasons. There are tranquil periods during which domestic
factors dominate and markets are not strongly correlated across countries. There are times during which
global shocks affect simultaneously all economies and business cycles move in sync.

Correlation of developed stock markets tends to increase slowly over time. But what is really
troubling is that correlation seems to increase dramatically in periods of crises, so that the benefits of
international risk diversification disappear when they are most needed. This phenomenon is
sometimes referred to as correlation breakdown.

2- Past Performance is a Good Indicator of Future Performance

Another criticism of international investing is country-specific, as it is typically formulated by investors
whose markets have enjoyed a prolonged period of good performance. Skeptics point to the fact that, in
recent periods, their domestic markets have generated greater returns than most other markets, and
hence that there is no need for international investments in the future.

Simply extrapolating past performance to forecast future expected returns is questionable. It is unlikely
that one country will always outperform all others, just as one domestic sector is unlikely to continually
outperform all other domestic sectors. It could be that one economy is deemed to be more efficient
than others, but this should be reflected in higher equity prices.
3- Barriers to International Investments

a. Familiarity with Foreign Markets

Culture differences are a major impediment to foreign investment. Foreign markets and corporations are perceived as more risky simply because they are unfamiliar.

b. Political Risk

Some countries run the risk of being politically unstable. Many emerging markets have periodically suffered from political, economic, or monetary crises that badly affected the value of local investments.

c. Market Efficiency

- A first question in market efficiency is that of liquidity. An excellent performance on a local index may not translate into a similarly good performance on a specific portfolio because of the share price drop when liquidating the portfolio.
- Another liquidity risk is the imposition of capital controls on foreign portfolio investments. Such capital control prevents the sale of a portfolio of foreign assets and the repatriation of proceeds. This has never happened on any of the major capital markets of the world; the cost of such a political decision would be very high for any government because it would reduce its borrowing capacity on the international capital market. However, it is a definite risk for investments in many emerging countries. Such capital controls may be imposed in an extreme financial or political crisis, and international money managers need to carefully monitor a few high-risk countries.
- In some countries, especially emerging countries, corporations do not provide timely and reliable information on their activity and prospects.
- Another issue in market efficiency is price manipulation and insider trading.

d. Regulations

In some countries, regulations constrain the amount of foreign investment that can be undertaken by local investors. Some countries limit the amount of foreign ownership in their national corporations. This is typically the case for emerging countries, which tend to limit foreign ownership to a maximum percentage of the capital of each firm.

e. Transaction Costs

- The transaction costs of international investments can be higher than those of domestic investments. A large component of transaction costs is the price impact of a trade. For example, a large buy order will raise the price. This is a function of the size of the order. Liquidity can be limited on many national stock markets, inducing high transaction costs.
- Custody costs tend to add to the costs of international investments. Custody costs tend to be higher for international investments because here, investors engage in a two-level custodial arrangement, in which a master custodian deals with a network of subcustodians in every
country. Higher costs are also incurred because of the necessity of a **multicurrency system of accounting, reporting, and cash flow collection.**

- Management fees charged by international money managers tend to be higher than those charged by domestic money managers.

**f. Taxes**

Withholding taxes exist on most stock markets. The country where a corporation is headquartered generally withholds an income tax on the dividends paid by the corporation. This tax can usually be reclaimed after several months; this time lag creates an opportunity cost.

**g. Currency Risk**

Currency risk can be a major cause of the higher volatility of foreign assets, but is often overstated. Furthermore, it is a risk that need not be borne, because it can be hedged with derivatives. Nevertheless, currency hedging leads to additional administrative and trading costs.

**h. Conclusions**

Altogether, foreign investment may not seem more costly for a resident from a high-cost country, such as Switzerland, but it is clearly more expensive for a U.S. resident. The cost is still small compared with the risk–return advantage of foreign investment. However, they could explain why an investor would want to overweight the domestic component of the portfolio compared with the world market portfolio weights. Information and transaction costs, differential taxes, and sometimes political or transfer risk give a comparative advantage to the domestic investor on the home market. This does not imply that foreign investment should be avoided altogether.

**C- The Case for International Diversification Revisited**

Many of the barriers to global investing are disappearing because of the market liberalization induced by global investors. Some of the attacks on global diversification are faulty because they are based on poor statistical analysis. More importantly, the scope of international investing has changed, and investors should adapt accordingly.

1- **Pitfalls in Estimating Correlation during Volatile Periods**

In the presence of positive correlation between two markets, we would expect that a large market drop (rise) in one country be associated with a large market drop (rise) in the other country, even if the correlation remains constant. The question is whether the simultaneous movements are so large that they indicate that correlation is truly increasing in crisis periods. To summarize, the conclusion that correlation increases in periods of crisis seems to be simply a statistical bias due to faulty econometrics.

2- **Expanded Investment Universe and Performance Opportunities**

International correlation among developed equity markets is expected to increase over time for reasons outlined earlier. Economies and markets are becoming increasingly integrated, as corporations pursue
global strategies. However, the secular increase can only be slow. In some periods, global factors dominate, but this temporary phenomenon should not be confused with a secular trend. Business cycles are increasingly synchronized, but there still exist vast regional and national differences.

The question of global investing also should be put in a broader context. Although stock markets have become more mature and integrated, the investment universe has greatly expanded beyond equity. The case for global diversification now applies to a wide range of asset classes beyond foreign stock markets. These include emerging stock markets, foreign bonds, and alternative investments such as high-yield bonds, currency, global real estate, private equity, and various arbitrage strategies.

3- Global Investing Rather than International Diversification

In the 1990s, the traditional approach to international diversification was based on the premise that country factors were the dominant factors affecting all stocks of a country. Investors were diversifying across country factors, and each stock was assigned to a country based on the location of its headquarters. The investment process was to adopt a two-step process:

- First, decide on a country allocation
- Second, select securities within countries

Today we can observe that companies compete in global industries and have extensive foreign operations. This simple process breaks down in a world where the nationality of a firm becomes fuzzy and industries cut across countries.

a. Global Industry Factors

With increased globalization, industry factors are growing in importance, while country factors see their influence reduced. Numerous studies show that industry factors have a growing influence on stock returns relative to country-specific factors. Increasingly, corporations are focusing on their core business in worldwide fashion rather than spreading domestically across many business lines.

b. Regional and Country Factors

Stock valuation of corporations reflects the geographical distribution of their activities. So, the picture is quite complex because from a market valuation perspective, we cannot simply use the location of the corporation’s headquarters to define its nationality. When we talk about country factors, we should take into account the geographical distribution of activities. The more international the corporation is, the less it is sensitive to purely domestic country factors.

c. Why Still Diversify Internationally

Country factors still have a significant influence, and because a purely domestic portfolio is poorly diversified in terms of sectorial exposure etc... recall example of Swissair.

d. Global Investing

Globalization gives more importance to industries and individual companies and less to countries. It implies that investors should be more global in their investment approach, from research to portfolio
construction. Even for a purely domestic portfolio, analysts must research the global product market of the domestic companies and their international competition. In global portfolio construction, a cross-country, cross-industry approach is required to capture the full risk benefits of international diversification, and this is rarely practiced. More fundamentally, it seems increasingly harder to justify a “nationalistic” approach to equity investment, with a separation of domestic versus foreign investments. In a world where financial markets have become very integrated across borders and where corporations pursue global strategies, investment managers should respond with truly global financial analysis and portfolio construction.

D- The Case for Emerging Markets

1- The Basic Case

Emerging economies offer attractive investment opportunities. The local risks (volatility, liquidity, and political risk) are higher, as illustrated by numerous crises, but the expected profit is large. Because of the low correlation between emerging and developed markets, the risks of investing in emerging markets get partly diversified away in a global portfolio. Hence, emerging markets can have a positive contribution in terms of risk–return trade-offs. The main factors affecting expected returns and risks that should be taken into account when including emerging markets in a global asset allocation include, volatility, correlation and currency risk.

2- Volatility, Correlations, and Currency Risk

a. Volatility

1) The volatility of emerging markets is much larger than that of developed markets. Furthermore, the distribution of returns is not symmetric, and the probability of a shock (a large price movement) is higher than would be the case if the distribution of returns were normal. This finding implies that the standard deviation is not a sufficient measure of market risk. Investment risk in emerging economies often comes from the possibility of a crisis.

2) The development of many emerging markets stems from the winds of political reform and liberalization.

3) The infrastructure can limit growth.

4) Corruption is a rampant problem everywhere but may be more so in some emerging countries.

b. Correlations

International correlation tends to increase in periods of crises, and emerging markets are subject to periodic large crises. Crises on emerging markets tend to be more prolonged than crises on developed markets, and tend to spread to all emerging markets in the region. It is often the case, however, that a crisis affecting one emerging country does not spread to other emerging countries, especially outside its region.

c. Currency Risk

Another observation is the correlation between stock and currency returns. Developed markets sometimes exhibit a negative correlation with the value of their currencies. Namely, the local stock
market tends to appreciate when the value of the local currency depreciates; the argument is based on an improvement in the international competitiveness of the local firms. This is not the case for emerging stock markets. Both the stock market and the currency are affected by the state of the economy. In periods of crisis, both drop significantly.

3- Portfolio Return Performance

Emerging markets have a vocation to become developed markets. To emerge, an equity market has to move from an embryonic stage to that of a truly active market attracting international investors. If successful, the market will grow, become more mature, and reach the stage of becoming a developed market. This process should lead to high returns. Clearly, a major argument for investing in emerging economies is their prospective economic growth. Portfolio managers want to find countries that will exhibit in the future the type of growth witnessed by Japan between the 1960s and the 1980s. Most analysts expect emerging economies to grow at a higher rate than developed nations, given the liberalization of international trade. Arguments frequently mentioned are lower labor costs, lower level of unionization and social rigidities, delocalization of production by high-cost developed countries, and rapid growth in domestic demand. The arrival of foreign capital helps those countries develop at a rapid pace and to compete on the world goods market. The transition to a more democratic political system with less corruption, more efficient regulation of the financial industry and other sectors, promotion of free enterprise, and application of the rule of law should strongly benefit local stock markets. Some specific factors could also affect the local stock markets. For example, pension funds have recently been created in many Latin American countries and are likely to invest heavily in their local stock markets. Many countries are pursuing an active program of privatization, and more local firms are attracted by the financing potential of stock markets. Under pressure from international investors, emerging markets are becoming more efficient, providing more rigorous research on companies and progressively applying stricter standards of market supervision. Accounting standards that conform with international accounting standards (IFRS) have been adopted in most countries and are being progressively implemented. Most of these markets have automated their trading and settlement procedures, using computer software tested on developed markets. High returns can be expected in emerging economies that are successful in achieving this transition.

4- Investability of Emerging Markets

Foreign investors face restrictions when investing on many emerging markets. Although many emerging countries are very liberal toward foreign capital, investability is somewhat restricted in other countries. Restrictions can take many forms:

- **Foreign ownership** can be limited to a maximum percentage of the equity capital of companies listed on the emerging market.
- **Free float is often small because the local government is the primary owner of many companies.** Even though the total market cap of a company looks large, the float available to foreign or domestic private investing is limited.
- **Repatriation of income or capital can be somewhat constrained.**
- **Discriminatory taxes**
• **Foreign currency restrictions are sometimes applied.** For example, China applied a dual-currency system for residents and for foreign investors.

• **Authorized investors are the only investors allowed to invest in some emerging countries**

• Another major problem with investing in emerging markets is **the lack of liquidity.**

5- **Segmentation versus Integration Issue**

In integrated markets, assets with identical risk should command identical return, regardless of location. In segmented markets, the expected returns on similar assets from different countries should not be related. In practice, emerging markets are somewhat segmented from the international market. Segmented asset pricing is attractive to the global investor. It implies that assets are mispriced relative to their “international” value.

Despite all the problems of emerging economies, which create higher investment risks, emerging stock markets are an attractive asset allocation opportunity. Again, the idea is that investors should be willing to buy emerging markets, which are inherently very volatile, because some of them are likely to produce very high returns. Altogether, the contribution of emerging markets to the total risk of the global portfolio is not very large because of their low correlation with developed markets.