Part I

1
Intermarket Analysis

It's not that I am so smart; it's just that I stay with the problems longer.
–Albert Einstein

The basic premise of intermarket analysis is that there is both a cause and effect to the movement of money from one area to another. Consider, for example, the price of gold and the dollar. Because gold is denominated in US dollars, any significant fluctuation of the dollar will have an impact on the price of gold, which in turn will affect the price of gold mining stocks.

The strength and direction of the relationship between two markets is measured by the correlation coefficient which reflects the simultaneous change in value of a pair of numeric series over time.

Highly positively correlated markets can be expected to move in similar ways and highly negatively correlated markets are likely to move in opposite directions. Knowing which markets are positively or negatively correlated with a given market is very important for gaining an understanding of the future directional movement of the market you propose to trade.

Advancements in telecommunications have contributed to the integration of international markets. Sophisticated traders are starting to incorporate intermarket analysis in their trading decisions through a variety of means ranging from simple chart analysis to correlation analysis. Yet the intermarket relationships hidden in this data are often quite complex and not readily apparent, while the scope of analysis is virtually unlimited.

But what is intermarket analysis?

The financial markets comprise of more than 500 000 securities, derivatives, currencies, bonds, and other financial instruments – the size of a small city. All interact with each other to some extent and a seemingly unimportant event can cause a chain of reactions causing a landslide of large-scale changes to the financial markets.

Consider the following example: Let's suppose that the Bank of Japan decides to buy dollars in order to push the yen down. As a result Japanese stock prices will go up as a weak yen will help boost profits for exporters. A sharp rise of the Nikkei will in turn have a positive effect on all other Asian markets. The next morning European markets, in view of higher Asian markets and in the absence of other overnight news, will open higher. This will in turn drive US index futures higher and boost US markets at open. In addition lower yen prices will encourage the "yen carry trade", i.e. borrowing yen at lower or near zero interest rates and buying higher yielding assets such as US bonds or even emerging market equities, which in turn will push bonds and equities higher. On the other hand, a scenario for disaster will develop if the opposite happens and the yen rises sharply against the dollar. This will cause a sharp unwinding of the "yen carry trade", triggering an avalanche of sharp declines in all financial markets.

But what might cause the yen to rise? The following is a possible scenario: As we head into the economic slowdown, the carry trade money that has flowed into risky cyclical assets is likely to fall in value. As a result, speculators in these assets will cut their losses, bail out and repay their yen debts. This is a scenario for disaster because when the yen rebounds against the dollar, it often snaps back very fast and carry trades can go from profit to loss with almost no warning.

A popular chaos theory axiom (known as the "butterfly effect" because of the title of a paper given by the mathematician Edward Lorenz in 1972 to the American Association for the Advancement of Science in Washington, D.C. entitled "Predictability: Does the Flap of a Butterfly's Wings in Brazil Set Off a Tornado in Texas?") stipulates that a small change in the initial condition of the system (the flapping of the wing) causes a chain of events leading to large-scale phenomena. Had the butterfly not flapped its wings, the trajectory of the system might have been vastly different.

A financial series would appear to be chaotic in nature, but its statistics are not because, as well as being orderly in the sense of being deterministic, chaotic systems usually have well defined statistics.

The rapid progress of global communications has contributed to the integration of all international financial markets as the world has gotten smaller due to the ability to communicate almost instantaneously. Relationships that were dismissed as irrelevant in the past cannot be ignored any more as the globalization of the markets contributes to a convergence of formerly unrelated markets.

Take a look at the comparison chart in Fig. 1.1. The S&P 500 is depicted with a bold thick line. The second one however is not even a stock index. It is the Japanese yen exchange rate (USD/JPY).

The next composite chart in Fig. 1.2 is of three stock indices. The first two (depicted with a bar chart and thick line) are of the S&P 500 and the Nasdaq Composite respectively. The third chart (thin line) is the Athens General Index which, surprisingly, correlates better with the S&P 500 than its compatriot, the Nasdaq Composite.

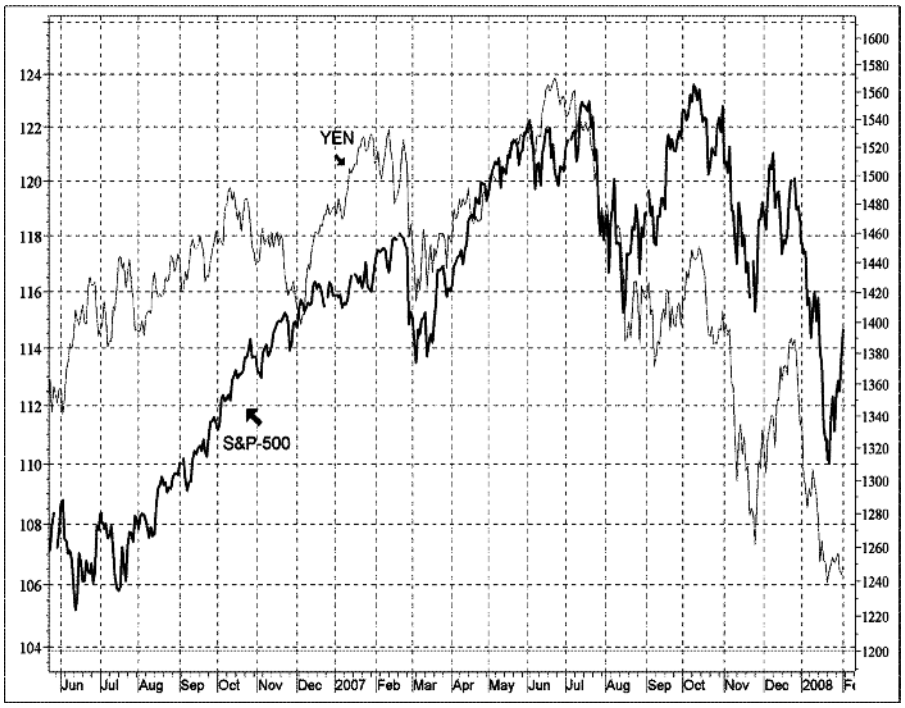

Figure 1.1 Comparison chart of the S&P 500 (in bold with the scale on the right Y-axis) and the yen (USD/JPY) (with the scale on the left axis) from June 2006 to January 2008.

The above examples are included to illustrate that the integration of global markets can extend beyond the obvious relations.

I often hear CNBC guests suggesting investing in international markets as a means of diversifying one's portfolio away from the US equity markets. Although some emerging markets may have relatively medium to low correlation with US markets, one important question to ask is whether diversification works when it is needed most. Evidence from stock market history suggests that periods of negative shocks and poor market performance were associated with high, rather than low, correlations. The events of 21 January 2008 are still fresh in my mind, when a 2.9 % correction in the S&P 500 was followed the next day by a devastating 7.2 % drop in the German DAX, wiping out nine months of profits in a day. Emerging markets sunk even more with the Jakarta Composite falling more than 12 % in two days while Brazil's Bovespa lost more than 8.5 %. Indeed, investors who have apparently relied upon diversification in the past to protect them against corrections of the market have been frequently disappointed.

Figure 1.2 Weekly comparison chart of the S&P 500 (thick line with the scale on the right Y-axis), the Nasdaq (in bold with the scale on the left axis) and the Greek Athens General Index (ATG) from 1999 to 2008.

The only effective method of diversifying one's portfolio is by including asset classes with low or negative correlation to stocks such as cash, foreign exchange or commodities. Whatever the relationship is – leading, lagging, or divergent responses to economic conditions – a strong negative correlation coefficient between two markets is a suggestion that these markets will move against each other sometime in the future. And, of course, the higher the absolute value of the coefficient of correlation, the higher the diversity of their performances.

Although intermarket analysis has been classified as a branch of technical analysis, it has not been embraced fully by analysts. The majority of traders continue to focus on only one market at a time and they tend to miss the forest for the trees. No market exists in a vacuum, and traders who focus on the bigger picture portrayed through all international markets tend to be the ones that deliver better performance.

Traditional technical analysis indicators such as moving averages are lagging indicators calculated from past data and are limited in assessing the current trend. Regardless of the hours spent in back-testing, there is a limit beyond which a system based on a lagging indicator can be improved further. Thus the addition of leading indicators that anticipate reversals in trend direction is essential and beneficial to

the system's performance. These can only be created by taking into consideration directional movements of correlated markets.

The use of intermarket correlation analysis can help you improve on your trading system by avoiding trades against the prevailing direction of correlated markets, but can also be used on its own to develop a complete system based on divergences between two or more highly correlated markets. Knowing the correlation of the market you propose to trade with other markets is very important for predicting its future direction. In addition, short-term traders can take advantage of the time difference between world markets and anticipate the next day's movement. Asian markets are the first to start trading, followed by the European markets. For a US trader the insight gained from all preceding markets is a valuable tool in predicting at least the opening in his local market.

I have found that the most accurate economist is the market itself. It is far easier to forecast economic activity from the behavior of markets themselves than it is to forecast the capital markets from lagging economic statistics such as the unemployment index. The market is a discounting mechanism. It interprets the impact of economic news some time in the future. Of course, this is only a guess and guesses are not always right. But the truth is that the market is a much better guesser than any of us are, as it represents the average opinion of all the economists in the world.

There appears to be no end to the conclusions that can be drawn if a little understanding, imagination, and pure common sense are applied. Major changes in commodity prices affect the bond markets of different countries in different ways, depending upon their economic structure.

What sectors are affected first? Which asset class will provide the best potential profits? If opportunities dry up in one sector, where is the money heading to take advantage of the next cycle? This is what intermarket analysis can tell you if you learn what to look for, which makes it a grand endeavor and a continuing challenge but always worth the effort.

Intermarket analysis can also be useful in estimating the duration and state of the business cycle by watching the historic relationship between bonds, stocks and commodities as economic slowing favors bonds over stocks and commodities.

Near the end of an economic expansion bonds usually turn down before stocks and commodities and the reverse is true during an economic expansion. Bonds are usually the first to peak and the first to bottom and can therefore provide ample warning of the start or the end of a recession. Bonds have an impressive record as a leading indicator for the stock market, although this information cannot be used in constructing a trading system as the lead times can be quite long, ranging from one to two years.

You can see in Fig. 1.3 that bonds peaked in October 1998, 18 months before stocks peaked in March 2000 and 29 months before the official start of the recession in March 2001. The Commodity Research Bureau (CRB) index was the last to peak, making a complex triple top formation with the last peak coinciding with the start of the recession.

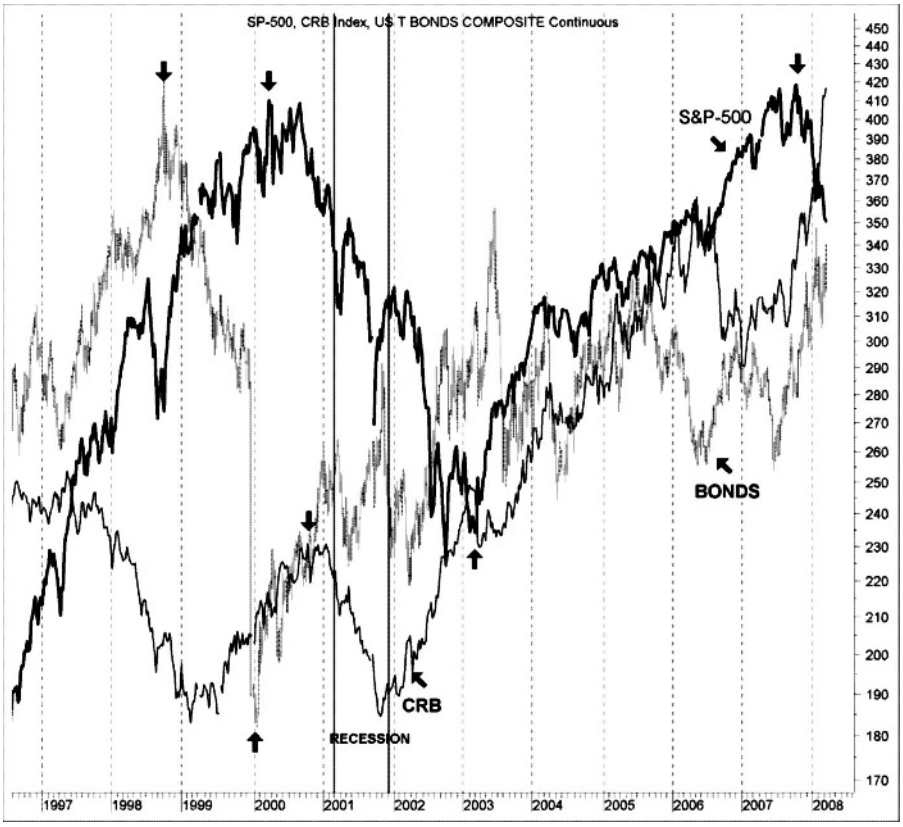

Figure 1.3 Weekly composite chart of the S&P 500 (thick line), the CRB index (thin line with the scale on the right Y- axis) and US Treasury Bonds (grey bar chart) from 1997 to 2008. Down arrows indicate major tops in stocks and bonds and up arrows bottoms.

Bonds were also the first to bottom in anticipation of the recovery, followed by commodities and then stocks. From the beginning of 2003 until the middle of 2005 all three were rising together. Commodities are usually the last to bottom during a recovery but this was not the case here as they were boosted by the weakness in the dollar. The dollar made a final peak in January 2002 and reversed direction, dropping like a rock against the euro and other major currencies. This triggered a secular bull market in gold which spread to the rest of the commodities and has continued until the end of June 2008, almost nine months after stocks peaked in September 2007.

More information on the business cycle, including sector rotation during economic cycles, can be found in John Murphy's excellent book *Intermarket Analysis: Profiting from Global Market Relationships* (see Bibliography).

1.1 DETERMINING INTERMARKET RELATIONS

The simplest and easiest method of intermarket analysis is a visual inspection of a comparison chart of one security superimposed on the chart of another. A custom indicator can also be calculated from the ratio of prices, to help assess their past relation and anticipate future direction. Both of the above methods, however, are limited to two markets and the use of the correlation coefficient is essential for an analysis of multiple markets. For predictive purposes, we wish to detect correlations that are significantly different from zero. Such relationships can then be used to predict the future course of events in trading systems or forecasting models.

In addition, linear regression can be used to predict the future price trend of a market based on its correlation with multiple related markets.

When assessing intermarket relations you should always keep in mind that these are neither fixed nor static in time. Instead they fluctuate continuously in strength and time. It is usually very difficult to determine which market is leading or lagging. A lead can shift over time and become a lag, with the markets switching positions as follower and leader. In addition, a weak positive correlation can sometimes become negative and vice versa. For this reason it is always prudent to look at the prevailing rate of change of the correlation between two related markets before reaching any important conclusions or trading decisions.

The variability of the correlation over time is more evident in Fig. 1.4, where yearly correlations between the S&P 500 and four major international indices are plotted against time from 1992 up to the end of 2007. You can see that correlations before 1996 were inconsistent and unpredictable but started to converge during the last ten-year period. The most incongruous relationship is that between the S&P 500 and Japan's Nikkei (in white) as it fluctuated from negative to positive values over time.

The recent integration of global markets has also been accelerated by a flurry of mergers, acquisitions and alliances between international exchanges, the most important being the merger between the New York Stock Exchange and Euronext, Europe's leading cross-border exchange, which includes French, Belgian, Dutch and Portuguese national markets. A few months later the Nasdaq, after a failed bid for the London Stock Exchange, announced a takeover of the OMX, which owns and operates stock exchanges in Stockholm, Helsinki, Copenhagen, Reykjavik (Iceland) and the Baltic states.

1.2 USING INTERMARKET CORRELATIONS FOR PORTFOLIO DIVERSIFICATION

The benefits of diversification are well known: most investment managers diversify by including international equities, bonds and cash in their US stock portfolio. Less common, however, is the diversification into other asset classes such as commodities or foreign currencies (forex).

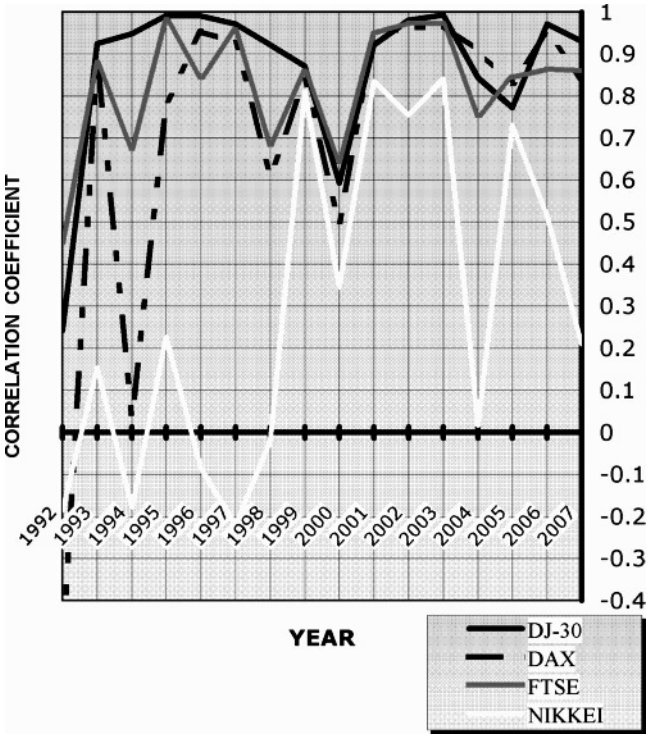

Figure 1.4 Yearly correlation variation between the S&P 500 and leading international indices from 1992–2007. The correlation with the DJ-30 is depicted by a black line, with Germany's DAX by a dashed line, with the FTSE by a grey line, and with the Nikkei by a white line. Notice the correlation volatility, especially before 1996. The Nikkei had the weakest and most volatile correlation with the S&P 500.

There is a widely held belief that, because commodities and currencies are traded on very thin margins, they are just too risky and can lead to financial ruin. Visions of wheat being delivered to the trader's front yard, margin calls or stories of consecutive "limit down days" add fuel to the fire. Claims that "over 90 % of all futures traders lose money over time" do not help either.

Because of their low correlation to equities, most commodities are attractive diversification candidates as they can lead to a large increase in return while simultaneously reducing risk. Furthermore, futures diversification is particularly effective in declining stock markets, just where it is needed most. During periods of very low or negative stock returns, commodities (except industrial metal futures) dominate the portfolio return, acting as a hedge, or buffer, in falling markets. The benefit of including foreign stocks is not so clear as the world has gotten smaller due to the ability to communicate almost instantaneously.

Unfortunately, the approach of most novice investors or even fund managers is to have no risk management at all and it becomes obvious too late that this is an extremely dangerous omission. A fund or portfolio manager should not be evaluated only by the return he has achieved. Another important criterion of his performance is the portfolio risk exposure over time. A good benchmark of that risk is the standard deviation of returns. This is a measure of how far apart the monthly or yearly returns are scattered around the average.

Correlation is a relatively simple concept but absolutely mandatory in the use of investments. It basically refers to whether or not different investments or asset classes will move at the same time for the same reason and in the same direction. To be effective, diversification must involve asset classes that are not correlated (that is, they do not move in the same direction at the same time). High positive correlation reduces the benefits of diversification. On the other hand, selecting uncorrelated or negatively correlated asset classes not only reduces the downside volatility in the performance curve of the portfolio to a minimum but can also increase overall profitability as well. An example will help illustrate the basics of diversification.

Suppose you are considering diversifying your stock portfolio by adding an uncorrelated commodity future from the energy complex. If you invest your entire equity in either stocks or crude oil futures, and returns vary in the future as they have in the past, your equity line (in points) will be similar to the charts in the bottom window of Fig. 1.5. If, however, you invest 70 % of your initial capital in stocks and 30 % in crude oil futures, your equity line will be similar to the top chart in Fig. 1.5. You can clearly see that the portfolio's returns are not nearly as volatile as are those of the individual investments.

The reason for the reduction in volatility is that stocks did not move in the same direction at the same time with crude oil futures. Thus, a crucial factor for constructing portfolios is the degree of correlation between investment returns. Diversification provides substantial risk reduction if the components of a portfolio are uncorrelated.

In fact, it is possible to reduce the overall risk of the portfolio to almost zero if enough investment opportunities having non-correlated returns are combined together!

Maximum return, however, is also proportional to risk. Low risk investments produce low returns and speculative or riskier investments can produce higher returns. Thus reducing risk can also reduce return. Like everything else in life, the best solution is a compromise between risk and return.

The problem is therefore reduced to finding an efficient portfolio that will maximize expected return according to one's individual risk preferences. The following example will help illustrate the basics of selecting an appropriate portfolio of securities or asset classes.

Let's suppose that we want to invest in international equities but also diversify into futures and forex. For simplicity's sake I include only one sample from each asset class, for example crude oil futures to represent commodities, gold to represent

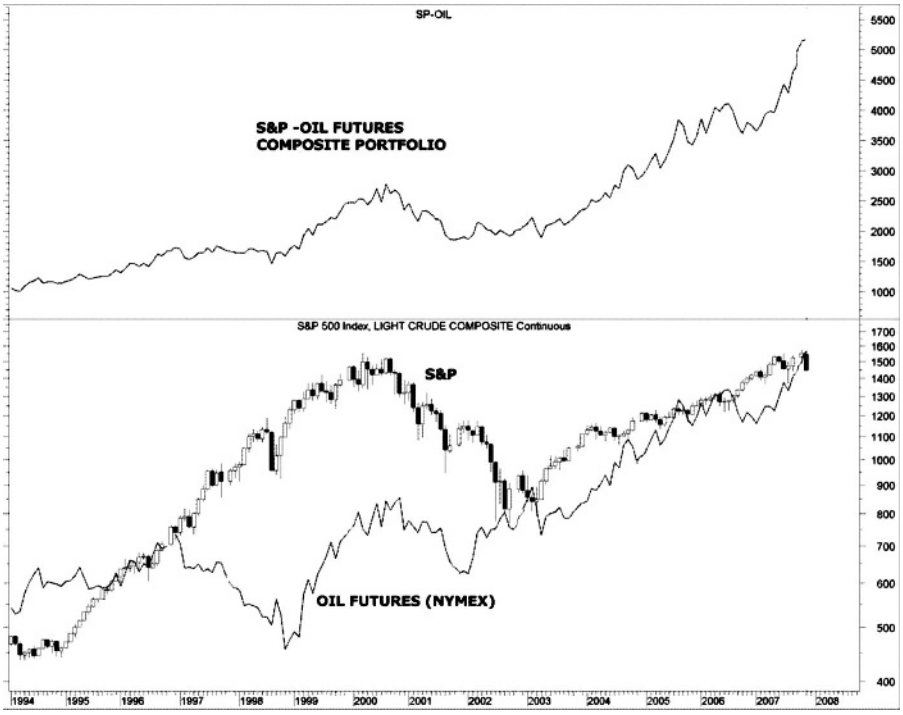

Figure 1.5 Monthly comparison chart of the S&P 500 (bar chart with the scale on the right Y-axis) and light sweet crude oil futures continuous contract (NYMEX:CL) (line chart below) from January of 1994 to January of 2008. The equity line of a composite portfolio consisting of 70 % equities (represented by the S&P 500) and 30 % oil futures is plotted in the top window. The composite portfolio produced better returns with less volatility.

precious metals and the British pound to represent foreign exchange. International equities are represented by the S&P 500 (or a stock selection tracking the S&P), one European (the FTSE 100) and one Asian (the Hang Seng) index. In Table 1.1, I have prepared the average yearly percentage returns and standard deviation of returns. I have also calculated, at the bottom of the table, the total average 10-year return and the standard deviation of returns using Excel's STDEV function.

The correlation coefficients between the selected asset classes or indices are listed in Table 1.2. These coefficients are based on monthly percentage yields and are calculated, as part of this study, over the same 10-year period. As discussed later, the correlation coefficients play a role in selecting the asset class allocation.

You can see from Table 1.2 that the S&P 500 is correlated only with international indices. Among the other asset classes, the British pound is weakly correlated with gold ($r = 0.36$) and negatively correlated with the FTSE ($r = -0.30$) so it might be beneficial to include the pound together with the FTSE but not with gold. Gold is

Table 1.1 All stock index returns include dividends. Also foreign index returns were converted to US dollars. The bond returns were obtained from the Lehman Brothers website (http://www.lehman.com/fi/indices/) and concerned aggregate returns of the US Bond Index. British pound (GBP/USD) returns include price appreciation versus the USD and also interest income. Oil returns were obtained from the historical continuous light sweet crude oil contract (NYMEX:CL).

Annual returns								
Year	S&P 500	FTSE	Hang Seng	Bonds	GBP	Gold	Crude oil	Cash
1997	33.36	23.98	−17.3	9.65	2.31	−21.8	−31.9	5.25
1998	28.58	17.02	−2.15	8.69	6.47	−0.26	−31.7	5.06
1999	21.04	17.22	71.51	−0.82	2.37	0.00	112.4	4.74
2000	−9.10	−15.6	−8.96	11.63	−1.85	−5.55	4.69	5.95
2001	−11.9	−17.6	−22.0	8.44	1.39	2.48	−26.0	4.09
2002	−22.1	−8.79	−15.1	10.26	13.56	24.80	57.3	1.70
2003	28.68	27.60	38.55	4.10	14.35	19.09	4.23	1.07
2004	10.88	18.43	16.30	4.34	12.25	5.58	33.61	1.24
2005	4.91	9.70	7.82	2.43	−5.78	18.00	40.48	3.00
2006	15.79	27.77	37.35	4.33	18.85	23.17	0.02	4.76
Mean	10.02	9.97	10.61	6.31	6.39	6.55	16.31	3.69
St Dev	19.14	17.53	30.35	4.00	8.02	14.73	45.67	1.80

also very weakly correlated with crude oil ($r = 0.18$). As you will see later, however, in the case of low correlations the volatility and not the correlation coefficient is the dominant factor to consider in reducing portfolio risk. Bonds had very low correlation with the British pound ($r = 0.10$) and crude oil ($r = 0.11$) but were not particularly correlated with the others.

Table 1.2 Pearson's correlation of monthly percentage yields for the 10-year period from 1997 to 2006.

Correlation of monthly returns							
	S&P 500	FTSE	Hang Seng	Bonds	GBP	Gold	Crude oil
S&P 500	1	0.81	0.57	−0.06	−0.09	−0.04	−0.03
FTSE	0.81	1	0.57	−0.02	−0.30	−0.06	0.03
Hang Seng	0.57	0.57	1	0.05	0.00	0.11	0.18
Bonds	−0.06	−0.02	0.05	1	0.10	0.08	0.11
GBP	−0.09	−0.30	0.00	0.10	1	0.36	0.00
Gold	−0.04	−0.06	0.11	0.08	0.36	1	0.18
Oil	−0.03	0.03	0.18	0.11	0.00	0.18	1

Table 1.3 Risk reduction associated with asset allocation and correlations. The standard deviation of each portfolio was calculated in a separate spreadsheet by adding the annual returns of each asset class according to their percentage weights in the portfolio and then calculating the standard deviation of the annual returns for the entire 10-year period of the study.

Portfolio allocation	US stocks only	Stocks & bonds	International stocks & bonds	Stocks, bonds & futures	Minimum risk	Maximum return
S&P 500	100 %	70 %	50 %	40 %	10 %	60 %
Cash		10 %	10 %			
FTSE			10 %			
Hang Seng			10 %			10 %
Bonds		20 %	20 %	40 %		
GBP					55 %	
Gold				10 %		
CRB						
Oil				10 %	15 %	30 %
Average % Return	10.0	8.64	8.69	8.81	8.92	11.96
Standard deviation	19.1	13.1	12.5	6.86	6.38	18.70
Risk adj. return	0.52	0.66	0.70	1.28	1.40	0.64

A comparison of the returns, standard deviation and risk adjusted return of the four hypothetical passive portfolios shows the real effect of diversification (Table 1.3). The first portfolio (in the third column of Table 1.3) contained a typical allocation of asset classes found in an average US fund, i.e. 70 % equities, 20 % bonds and 10 % money market. By including uncorrelated assets such as bonds and cash (with zero correlation with the S&P), a risk reduction of 31 % was achieved with only 1.4 % reduction in returns. A further 5 % risk reduction was accomplished by including international equities (10 % British and 10 % Hong Kong equities). The main reason for including international equities was to improve on US equity returns, but this was not the case in the hypothetical portfolio as the Hang Seng underperformed the S&P 500 during the 1997–1998 Asian financial crisis. Commodities, however, were the real star of the show as they played an important role in significantly reducing risk and, at the same time, increasing return.

This is evident from the standard deviation of returns of the third hypothetical portfolio. A huge 64 % reduction in risk was achieved by including gold (10 %) and crude oil futures (10 %), even though the standard deviation (and risk) of investing in crude oil alone was more than double that of the S&P.

The fourth portfolio was obtained by finding the best allocation (highest return) with the minimum risk. This produced a portfolio consisting of 30 % US equities, 55 % bonds and 15 % oil futures. The relatively high percentage allocation of bonds

was to be expected as their standard deviation was the lowest of the group. The presence of the highly volatile oil futures in the minimum risk portfolio, however, was certainly a surprise.

This portfolio reduced risk by an astonishing 64 %, sacrificing only 1.2 percentage points in return compared to the equities only portfolio.

The relatively low performance of this portfolio was no surprise as the standard deviation is proportional to returns: the smaller the standard deviation, the smaller the risk and, of course, the smaller the potential magnitude of the return. There is therefore a limit beyond which the expected return cannot be increased without increasing risk.

Finally I used Excel's Solver to maximize return without increasing the risk more than the first (equities) portfolio. This portfolio (last column in Table 1.3) included 60 % US stocks, 10 % international equities and 30 % crude oil futures. It outperformed the S&P 500 by almost 2 percentage points with slightly less risk. Typically, futures can be added up to a maximum 30 % allocation while maintaining a risk advantage over a portfolio without futures.

In maximizing the return I had to constrain the risk to lower than the first portfolio, otherwise the solver produced a portfolio consisting of 100 % oil futures which is unacceptable. Similarly in minimizing risk (fourth portfolio) I had to specify a minimum return otherwise the solution also produced an unacceptable portfolio consisting mostly of cash and bonds. I also had to constrain the allocation percentages to positive values otherwise the solution occasionally included negative allocations indicating selling the asset short rather than buying.

Of course future performance rarely measures up fully to past results. While historical relations between asset classes may provide a reasonable guide, rates of return are often less predictable. In addition, as you can see from Fig. 1.4, correlations can also change over time.

One solution is to rebalance the portfolio on a set time period to take into account the most recent correlations in order to maintain the desired level of risk exposure. This method of asset allocation, is not the only one, however.

A different, dynamic rather than static, approach would involve changing asset weights depending on market conditions. This can be accomplished by reducing the allotment of equities in favor of cash, precious metals or foreign exchange in a down market. A dynamic asset allocation trading system is also discussed in Chapter 16 of this book.