Stock Shocks And The Dollar

We learn throughout the course of our lifetime despite what you may think after taking a look around the room at your compatriots. Traders learn, too, which you might find even more incredible. Without detouring too much into various forms of educational psychology, most of which best are used to wrap fish, suffice it to say it is our negative experiences that are most influential. If we may summarize the one article that has ever been written and recycled endlessly about trader psychology, the pain of loss is about three times the intensity of the pleasure of gain.

What about intermarket associations? Those old enough to recall the October 1987 stock market crash remember how bonds, which had hit their low for the year on the morning of October 19, 1987, and which had risen only somewhat during the remainder of the day, went up by their three-point limit for the next three trading days. The memory of that association has been so strong that each and every hiccup in the stock market since then has been accompanied by short-covering in bonds.

The Federal Reserve, which had been engaging in a policy of supporting the dollar via higher short-term interest rates reversed its stance immediately after the 1987 Crash. The dollar fell into early 1988 in reaction to this policy change. A similar downturn in the dollar occurred after the Federal Reserve began to drive interest rates lower in response to the 2001-2002 bear market.

Is there a knee-jerk association between stock market downturns and the course of the dollar? And, just to keep the question symmetric, are there similar reactions to large rallies in stocks?

Data And Methodology

The daily data for the S&P 500, Canadian dollar, British pound, Japanese yen, and the Deutsche mark both as an independent currency and as part of the euro were examined from January 1973 onwards. Each market was converted into daily returns, to be mapped against the sorted returns on the SPX. As the SPX has had average daily returns of .02868% ± a standard deviation of 1.0106% since January 1973, the 95% confidence band lies at daily returns of 2.009% and -1.952%, marked on the chart with green lines.

In addition, please note that all charts will truncate the SPX' return scale to eliminate the October 1987 Crash. Not only was that event extreme, but we have banned its future occurrence via a system of trading curbs and market shutdowns. The datum is part of the statistics, but it is not displayed simply to preserve graphic scale.

The S&P 500's Distribution of Returns
January 1973 Onwards
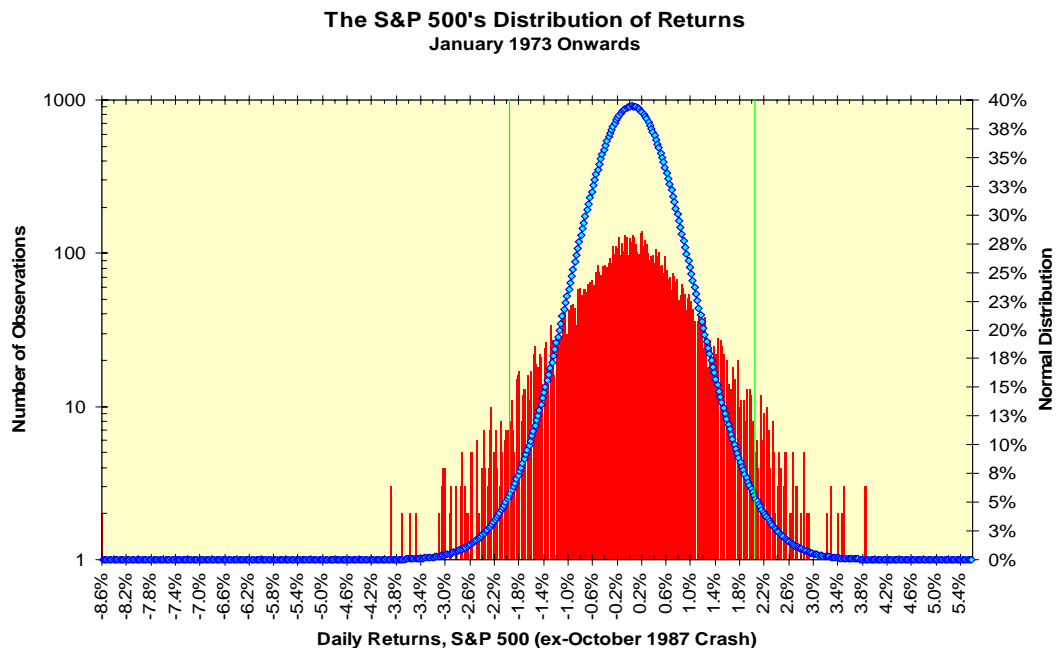
We will ignore the slice in the middle, which contains 95% of the observations, and focus on the two 2.5% slices of large down and up days. For curiosity's sake if nothing else, there are 208 large down-days and 210 large up-days in the sample.

Three separate comparisons of associated currency returns on those extreme days will be made, those for the same day of the stock shock, those for the same day plus the next day, and those for the following week. The latter two comparisons are made to see how the shock is absorbed over time in the currency markets.

Same-Day Results

The first question to be asked is whether the currency returns on those big days are statistically different from the population as a whole. We can do this on two bases. The first is a Student's T-test to assess the probability the means of the small samples, those for currency returns mapped to the SPX' big days, are the same as the mean of the remainder of the population. The second is an F-test to compare the small samples' variances against those of the remainder of the population.

We can look at the table below and say with near 100% certainty that the same-day returns on the CAD on extreme SPX days are different from those on normal days. The only place a question of equivalence even arises is for the JPY on big up-days for the SPX; here there is a 77.4% probability the two samples are equivalent. Restated, when the SPX had a big rally, the JPY traded normally.

Same-Day Tests

	CAD	DEM	GBP	JPY
Probability Large Down Mean = Remainder Mean	0.0%	0.5%	2.3%	1.8%
Probability Large Down Variance = Remainder Variance	0.0%	0.0%	2.6%	0.0%
Probability Large Up Mean = Remainder Mean	0.2%	6.4%	8.6%	77.4%
Probability Large Up Variance = Remainder Variance	0.0%	0.0%	17.3%	0.0%

What is striking about the distribution of returns for the currencies on the big SPX down-days (red markers on all charts) and the big SPX up-days (blue markers) is the lack of pattern. You simply do not see a linear, a curvilinear or an exponential relationship between currency returns and SPX returns. You do, however, see statistically significant differences in the sample means as a function of big SPX returns.
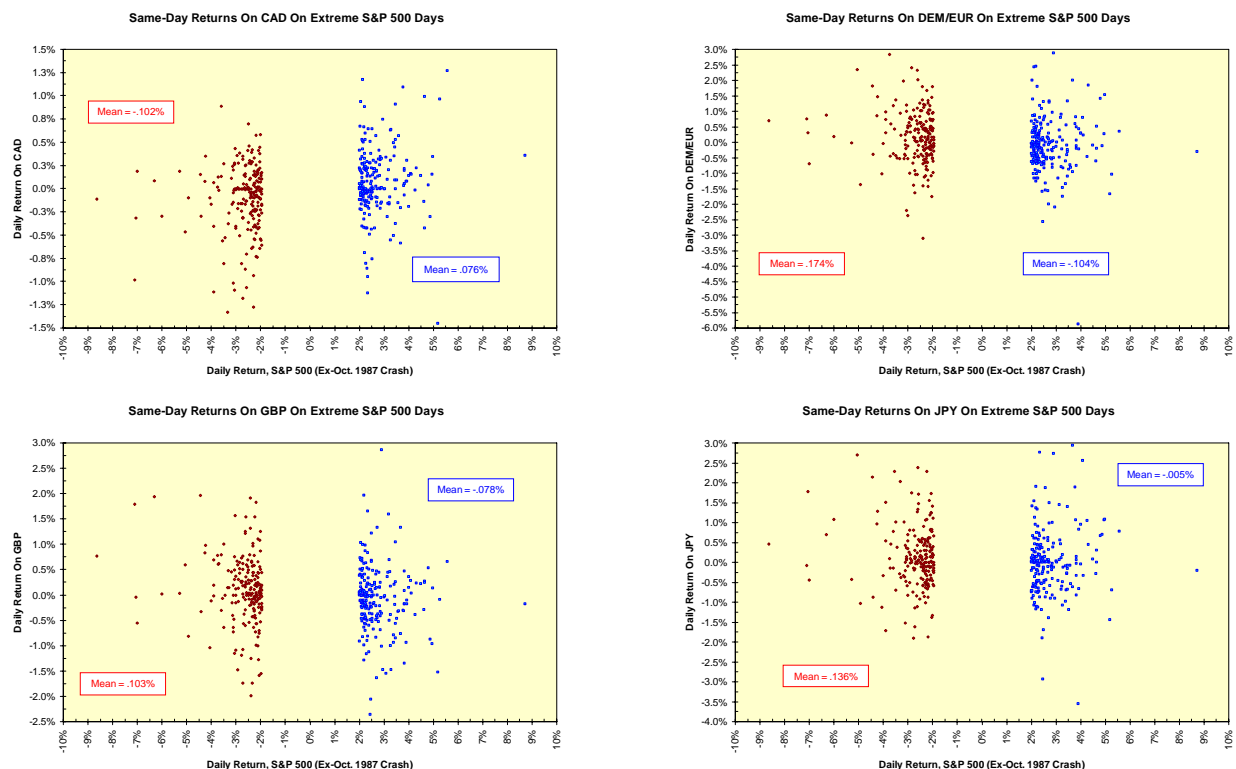
The CAD tends to fall when the SPX has a big down-day and rise when the SPX has a big up-day. As the U.S. and Canadian equity markets tend to move together in the short-term and most definitely trade in the same time slot, we can attribute this common reaction to foreign investors in both markets reacting similarly.

Supporting this argument is the reaction of the two European currencies in the sample. When the SPX has a big down-day, the reaction is for both the GBP and the DEM/EUR to rally significantly, and vice-versa. Large up-days in the SPX are accompanied by downturns in the European currencies.

The JPY, as is so often the case, is an oddball. It tends to rally on days of major selloffs in the SPX, but it remains unaffected on the same day when the SPX enjoys sharp rallies.
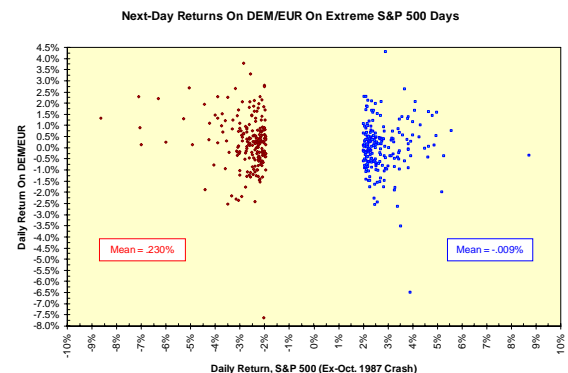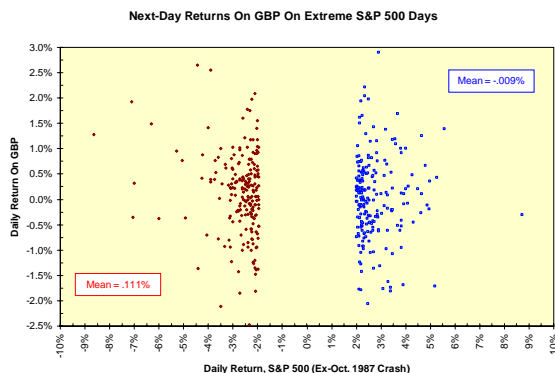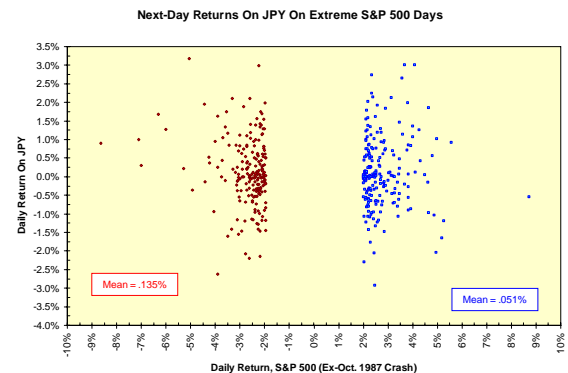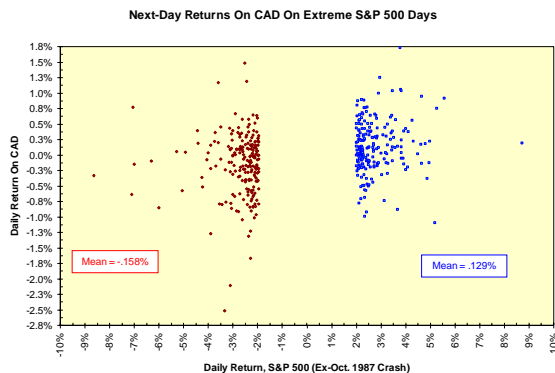
Next-Day Results
Now what happens when we add a second day to the test? After a big stock market selloff, the two-day returns on currencies remain statistically different from the remainder of the population at a high degree of confidence. Only the JPY, always the different drummer, has a double-digit probability, 10.7%, of having the same mean return as the population mean return, and only the GBP has a double-digit probability, 35.0%, of having the same variance as the population variance.

The results are materially different after the SPX rallies. While the mean return of the CAD remains statistically different, those for the other currencies shift back toward their population means. We are 93.7% certain the mean return for the GBP over these two-day periods is the same as that of the entire population. The variances for the CAD and GBP shift back toward their population variances, too, with the F-test for the GBP indicating a 96.4% probability it is the same as the population variance.

Two-Day Tests

	CAD	DEM	GBP	JPY
Probability Large Down Mean = Remainder Mean	0.0%	1.2%	4.3%	10.7%
Probability Large Down Variance = Remainder Variance	0.0%	0.0%	35.0%	5.0%
Probability Large Up Mean = Remainder Mean	0.0%	72.5%	93.7%	68.5%
Probability Large Up Variance = Remainder Variance	52.8%	0.0%	96.4%	1.8%

Next-Day Returns On CAD On Extreme S&P 500 Days

Mean = -.158%   Mean = .129%

Next-Day Returns On JPY On Extreme S&P 500 Days

Mean = .135%   Mean = .051%

Next-Day Returns On GBP On Extreme S&P 500 Days

Mean = -.009%   Mean = .111%

Next-Day Returns On DEM/EUR On Extreme S&P 500 Days

Mean = .230%   Mean = -.009%

The same pattern seen before for the CAD on the same-day changes is apparent when the next day is added. A large selloff in U.S. stocks leads to a two-day decline in the CAD, and vice-versa. The reaction for the DEM/EUR is even more pronounced, with a large downturn in U.S. stocks leading to a 0.23% average two-day gain in the DEM/EUR; the reaction for the GBP is a far more tempered 0.111% average gain. Large rallies in the SPX produce only a muted two-day reaction in the European currencies – see the 72.5% and 93.7% T-test probabilities in the table above

for whether these sample means are the same as the population means – which is functionally equivalent to saying a stock rally in the U.S. does not attract continued buying from Europe. The numbers for the JPY, a .135% average two-day gain following a selloff and an average .051% gain following a rally indicate the JPY benefits from a large change in U.S. stocks regardless of the direction.

One-Week Results
Now let's move to the one-week horizon. After large selloffs in the SPX, the mean of CAD returns remains materially different from the population mean return, while those for the DEM/EUR and JPY are starting to converge back to the population mean. The mean of GBP returns has a 57.1% probability of being equal to the population mean.
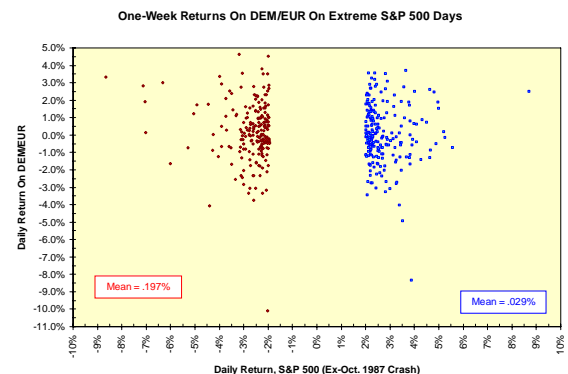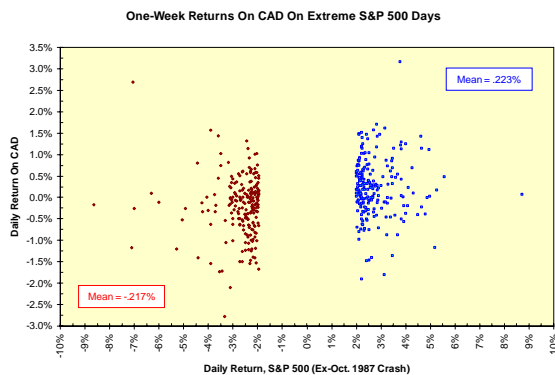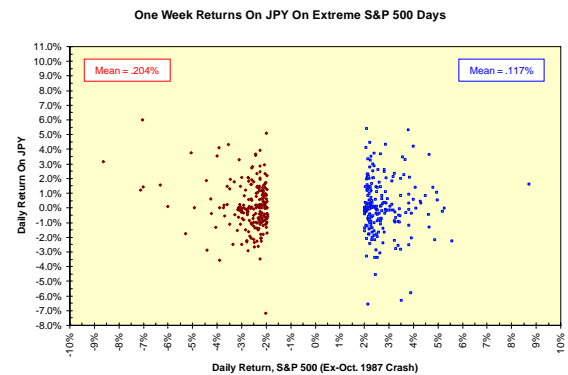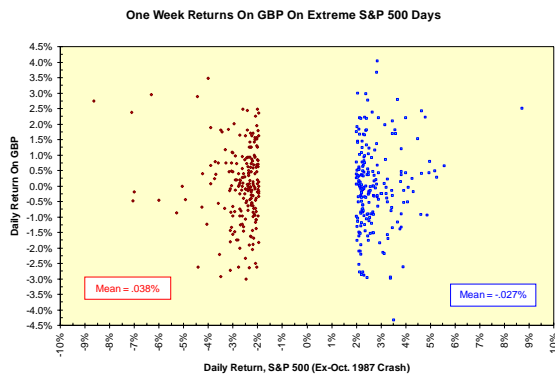
The CAD remains an outlier after a large rally, but the sample means for the DEM/EUR and GBP returns for the week following a large rally have more than 80% probabilities of being equal to the population mean, and that of the JPY has more than a 60% chance of being equal.

One week after a large move in the SPX, the CAD has a statistically significant change in the direction of the SPX move. Both the DEM/EUR and the JPY rally significantly after a large SPX selloff, while the GBP shows no persistent reaction.

One-Week Tests

	CAD	DEM	GBP	JPY
Probability Large Down Mean = Remainder Mean	0.0%	19.5%	57.1%	23.5%
Probability Large Down Variance = Remainder Variance	52.6%	0.3%	2.3%	0.0%
Probability Large Up Mean = Remainder Mean	0.0%	89.1%	86.1%	61.9%
Probability Large Up Variance = Remainder Variance	58.3%	0.7%	72.1%	0.0%

One Week Returns On GBP On Extreme S&P 500 Days

Mean = .038%   Mean = -.027%

One Week Returns On JPY On Extreme S&P 500 Days

Mean = .204%   Mean = .117%

One-Week Returns On CAD On Extreme S&P 500 Days

Mean = .223%   Mean = -.217%

One-Week Returns On DEM/EUR On Extreme S&P 500 Days

Mean = .197%   Mean = .029%

Conclusion

To toss one more hackneyed Wall Street cliché back in their face, we do not have a currency market so much as a market of currencies. The same-day reactions in currencies may not be particularly tradable given that most extreme moves in U.S. equities develop in the New York afternoon, while most extreme moves in currencies are in place by mid-day in London.

If we move to the next-day reactions, which are highly tradable, we see same-direction reactions in the CAD, and rallies in the other currencies only in reaction to big down days in U.S. stocks. By the time we get to the one-week horizon, the same-direction pattern for the CAD remains, as do the rallies for the DEM/EUR and JPY following U.S. stock market selloffs.

Those who wish to trade currencies on the basis of anticipated changes in U.S. monetary policy following a stock market shock in either direction are advised to be highly selective. Only two patterns really emerge from the data as good rules of thumb: Trade the CAD in the same direction as the stock market shock, and buy the EUR when U.S. stocks fall.

These reactions to stock price movements raise the question whether similar reactions exist for short-term interest rate movements. We will address that question next month.