# Where the Black Swans Hide
&
The 10 Best Days Myth

Below we examine market outliers in financial markets. How much effect do these outliers have on long term performance? Can the investor prepare for these anomalies, or are they truly 'black swans' that cannot be managed? In this issue we examine numerous global financial markets on daily and monthly time frames. We find that these rare outliers have a massive impact on returns. However, these outliers tend to cluster and the majority of both good and bad outliers occur once markets have already been declining. We critique the "missing the 10-best-days" argument proffered by advocates of buy and hold investing, as we demonstrate that a significant majority of the 10 best days and the 10 worst days occur in declining markets. We continue to advocate that investors attempt to avoid declining markets where most of the volatility lies and conclude that market timing and risk management is indeed possible, and beneficial to the investor.

Thanks goes out to Prabhat Dalmia for his assistance with this project.

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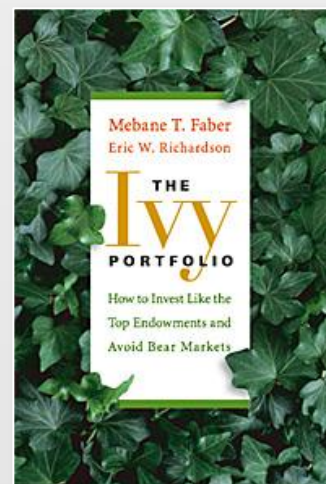
The Ivy Portfolio

Nassim Taleb, author of *Fooled by Randomness* and *The Black Swan*, popularized the concept of the black swan – namely, the occurrence of utterly unforeseeable events that are thought of as not being possible based on previous experiences.

Taleb defines a black swan as:
1) Outlier outside the realm of regular expectations because nothing in the past can convincingly point to its occurrence.
2) The event carries an extreme impact.
3) Explanations for the occurrence can be found after the fact, giving the impression that it can be explainable and predictable.

Many market commentators have latched on to this term to describe all financial market events. However, the existence of large outlier events known as fat-tailed distributions in financial market returns has been well documented for over 40 years (Mandelbrot 1963, Fama 1965). While the financial media have only recently re-visited the fat-tail concept (due largely to the occurrence of the internet bust in 2000-2003 as well as the global financial meltdown in 2008 and 2009), it has been a thoroughly studied field in finance over the past several decades.

Investors should realize that normal market returns are extreme. Individuals that continue to believe in the Gaussian (bell-shaped) distribution, or ignore empirical results will continue to be surprised by future events. Roughly 40% of all yearly returns in US stocks are greater than 10% or less than -10%. Bear markets are common, and markets can and do decline from 50-100%.

Financial market return distributions are similar to fractal systems that follow a power law distribution (which is useful in describing events like earthquakes and volcanic eruptions). Below is a chart from the book *The Failure of Risk Management* by Hubbard that illustrates the inability of the Gaussian models to account for large outlier moves in financial markets. In a normal distribution world a 5% decline in the Dow in a single trading day should not have happened in the past 100 years. In reality, it has happened nearly 100 times.
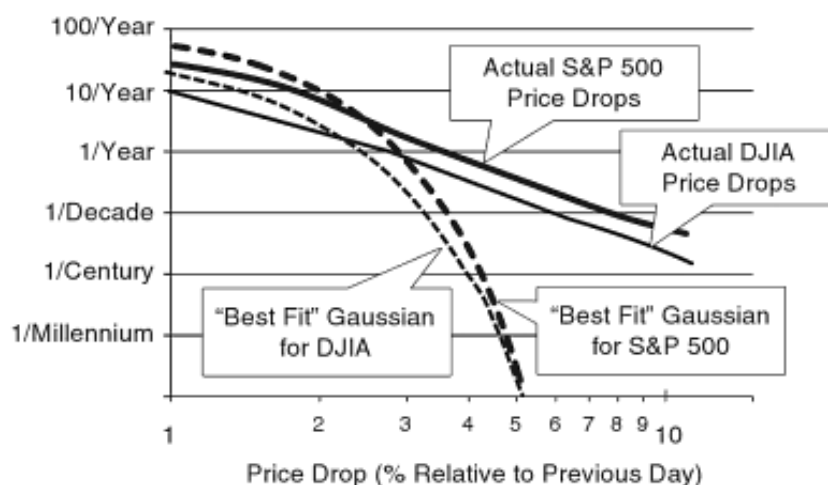
Source: The Failure of Risk Management, Hubbard (2009)

Unfortunately, many investors have come to the conclusion that rare events are impossible to predict, and therefore, there is nothing to do other than buy and hold their investments and wait out any negative outliers. However, this explanation simply rids the investor (advisor) of any responsibility – the fatalistic attitude becomes "it was a black swan, it's not my fault!"

In this article we examine market outliers, their effect, but more importantly when they occur and if the investor can do anything to protect against them.

While we are not going to spend much time on a literature review, the appendix has a list of books and papers on market bubbles, financial market return distributions, and investment history. The next few issues of Cambria Quantitative Research are going to expand on some of the topics mentioned here (bubbles, forecasting, etc).

MARKET OUTLIERS:
THE 10 BEST DAYS MYTH

We first begin our examination by taking a look at market outliers in the US stock market back to 1928.

One of the most common rhetorical bulwarks in the defense of buy and hold is investing is to demonstrate the effects of missing the best 10 days in the market, and how that would affect the compounded return to investors. This is perhaps one of the most misleading statistics in our profession (another being the Brinson asset allocation study misquote). A number of academic papers have examined the effects of missing both the 10 best as well as the 10 worst days (Gire (2005) and Ahrens (2008) are two good ones).

Below we examine the S&P 500 (and the broad market predecessor) from 1928-2010. We use price history only as dividends will not have a meaningful impact on the daily return data.

FIGURE 1
US STOCKS DAILY RETURNS
9/1928-2010, PRICE ONLY

S&P 500 September 1928 – 2010	ALL
Number of Days	21729
Number of Years	86
Average Return	0.03%
Median Return	0.04%
Total Return	5869%
Annualized Return	4.86%
Annualized Volatility	18.34%

Source: Global Financial Data

What about the outlier returns? Below is a table for the best and worst 1% of all days, which equates to only about 2 or 3 days per year.

FIGURE 2
US STOCKS 1% BEST AND WORST DAYS
9/1928-2010, PRICE ONLY

	WORST	BEST
Number of 1% Days	217	217
Average Return	-4.85%	4.91%
Median Return	-4.27%	4.29%
Volatility	29.68%	30.41%
Max	-3.32%	16.60%
Min	-20.47%	3.27%

Source: Global Financial Data

Since 1928 one can expect these days to occur a handful of times every year. Much to the displeasure of the fear mongering media, -4% and +4% days are fairly regular.

To really examine the blackest of swans, below is the best and worst 0.1% of all days. They occur on average only once every few years.

FIGURE 3
US STOCKS 0.1% BEST AND WORST DAYS
9/1928-2010, PRICE ONLY

	WORST	BEST
Number of 0.1% Days	22	22
Average Return	-8.95%	9.45%
Median Return	-8.21%	8.65%
Annualized Volatility	45.48%	36.64%
Max	-6.85%	16.60%
Min	-20.47%	7.26%

Source: Global Financial Data

Days of -8% and +8% are fairly rare as are the -20% and +16% days. Exactly how big of an impact do these outliers have on performance? Massive. Below is a table that shows the annualized returns if the investor missed some of the best and worst days. If you missed the best 1% of all days your return gets crushed from 4.86% down to -7.08% per annum. However, the converse is true, if you

miss the worst 1% of returns your returns explode to 19.09% a year. And take special note that if you miss both the best and worst 1% of days your return is higher than buy and hold.

FIGURE 3
MISSING THE BEST AND WORST DAYS
ANNUALIZED RETURNS 9/1928-2010, PRICE ONLY

Miss Worst 0.1%	7.42%
Miss Best 0.1%	2.48%
Miss Both 0.1%	4.98%
Miss Worst 1%	19.09%
Miss Best 1%	-7.08%
Miss Both 1%	5.48%
All Days	4.86%

Source: Global Financial Data

Most analysts, unfortunately, stop here and throw up their hands. They proclaim buy and hold to be the only way to ensure being in the market for these best days. Because these events are so rare, and they have such as massive impact, there is infinitesimally small chance of predicting when they will occur and therefore the effort is useless. They take the ball all the way down to the five yard line but stop there.

What are they missing?

THE HUMAN ELEMENT

Markets are a collection of humans, and being human, a collection of human emotions. Greed, fear, jealousy, pride, and envy all manifest themselves to the fullest in capital markets.

When you are making money you are thinking about the new car you are going to buy, how smart you are (and how much smarter you are than your neighbor), the vacation you are going to take, and the (2nd, 3rd, 4th) house you are going to buy. The part of the brain that is firing nonstop here is the same region that gets stimulated by cocaine or morphine.

However, when you are losing money you are probably not opening your account statements, you are thinking about how dumb you are (and how stupid you were to listen to your neighbor), how you are going to pay for that second house, and you likely feel significant revulsion to even thinking about investing. The brain processes portfolio losses in the same region that is stimulated by the flight response.

For a longer discussion on your behavioral biases check out the appendix as well as this great Andrew Lo video "*Technical Analysis: An Academic Perspective*". To demonstrate this effect Table 4 examines the returns, but more importantly the volatility when the market is appreciating versus declining (as defined as above or below the 200 days simple moving average).

FIGURE 4
MISSING THE BEST AND WORST DAYS
9/1928-2010, PRICE ONLY

	WORST	BEST
Number of 1% Days		
Advancing Market (> 200 SMA)	30.41%	21.66%
Declining Market (< 200 SMA)	69.59%	78.34%
Number of 0.1% Days		
Advancing Market (> 200 SMA)	36.36%	22.73%
Declining Market (< 200 SMA)	63.64%	77.27%

Source: Global Financial Data

What about the outliers -- where do they occur? The vast majority, roughly 60-80%, of the best and worst days occur after the market has already started declining. The simple reason is that markets are more volatile when they are declining, and when the really volatile events and days occur they tend to cluster together.

Our central argument is that returns improve and volatility is reduced when an investor is invested in uptrending markets thus avoiding the volatility and clustering of best and worst days inherent in declining markets. As you can see in Figure 5, in declining markets returns are much lower and volatility is much higher.

FIGURE 5
MISSING THE BEST AND WORST DAYS
9/1928-2010, PRICE ONLY

S&P 500 September 1928 - 2010	ALL	Decling Market (< 200 SMA)	Advancing Market (> 200 SMA)
Number of Days	21,729	7,648	14,081
% of Time	100%	35.20%	64.80%
Average Return	0.03%	-0.01%	0.04%
Median Return	0.04%	0.00%	0.07%
Annualized Return	4.86%	-4.45%	10.29%
Annualized Volatility	18.34%	24.03%	14.32%

Source: Global Financial Data

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Mandelbrot provides an insightful passage on volatility clustering and timing in his book *The Misbehavior of Markets*:

> "What matters is the particular, not the average. Some of the most successful investors are those who did, in fact, get the timing right."

This effect also plays out on the monthly timeframe as well. For a look at other markets including real estate, bonds, and foreign stocks on the monthly timeframe back to 1972 you can view a blog post here titled *"Your Irrational Brain"*.

EVIDENCE IN FOREIGN MARKETS

Any investment property or anomaly should be demonstrable in most if not all markets otherwise the results are likely from data mining and spurious. Estrada (2007) examined the evidence from 15 international markets and finds that "on average across all 15 markets, missing the 10 best days resulted in a portfolio 50.8% less valuable than a passive investment; and avoiding the 10 worst days resulted in a portfolio 150.4% more valuable than a passive investment." He then goes on to the conclusion that, "given that 10 days represent less than 0.1% of the days considered in the average market, the odds against successful market timing are staggering."

Below we recreate the prior tables with the Estrada dataset updated through 2010. We find similar statistics to the US data, namely, a small amount of outliers have a massive impact on performance and the best and worst outliers tend to cluster when the market is already declining. However, if you miss the best and worst days *in every case* your compound return is higher than buy and hold.

FIGURE 5
MISSING THE BEST AND WORST DAYS, VARIOUS DATES

Country	# of Days	# of Years	Annualized Return	Miss 1% Best Days	Miss 1% Worst Days	Miss Both
Australia	13278	52	6.79%	-1.40%	17.56%	8.56%
Canada	8761	34	7.73%	-1.55%	20.46%	10.11%
France	10477	41	6.51%	-4.20%	19.79%	7.75%
Germany	12932	51	4.06%	-7.47%	17.90%	4.86%
Hong Kong	10110	40	12.61%	-6.80%	38.06%	14.28%
Italy	9766	38	5.28%	-6.41%	20.90%	7.50%
Japan	15296	60	5.52%	-5.27%	18.97%	6.82%
New Zealand	10158	40	4.90%	-2.86%	14.63%	6.16%
Singapore	10607	42	7.83%	-3.37%	21.33%	8.74%
Spain	9056	35	6.33%	-4.99%	19.97%	7.20%
Switzerland	10451	41	4.41%	-4.70%	16.32%	6.19%
Taiwan	12207	48	9.70%	-3.90%	26.87%	11.17%
Thailand	8800	34	7.78%	-7.63%	25.93%	7.93%
United Kingdom	10583	41	7.70%	-2.79%	19.94%	8.26%
United States	21530	85	4.63%	-7.36%	18.92%	5.30%

Source: Global Financial Data

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The volatility clustering below the long term moving averages confirms the United States results, and on average 76% of the worst days and 67% of the best days occur after the market is already declining. Lengthy summaries on all of the foreign markets are in the appendix.

CONCLUSIONS

For those investors pondering how they can attempt to avoid these highly volatile periods in markets, we invite you to download a few of our other white papers here: *"A Quantitative Approach To Tactical Asset Allocation"* and *"Relative Strength Strategies for Investing"*.

Astute market analysts must also realize the drawbacks and downsides of any indicator or investment approach. In the case of a trendfollowing approach there are two main drawbacks. First, in trendless markets whipsaws can occur that have negative effects on the portfolio. Second, and perhaps more important, a trendfollowing approach does not guarantee the investor from missing a black swan event in an uptrend. A very sharp move against the trend will not allow the investor or model time to react and protect against such a move. Investors looking for protection against this sort of event can use derivatives such as options to protect the portfolio when fully invested (so-called tail risk insurance), or consequently, to gain long exposure when mostly in cash and bonds (risk of missing out). This process could be a net cost (insurance) to the portfolio.

That is the point of risk management – understanding and trying to account for as many risks as you can.

Summary:

1. The stock market historically has gone up about two-thirds of the time.
2. All of the stock market return occurs when the market is already uptrending.
3. The volatility is much higher when the market is declining.
4. Most of the best **and** worst days occur when the market is already declining. Reason: see #3. Markets are much riskier than models assuming normal distributions predict.
5. The reason markets are more volatile when declining is because investors use a different part of their brain making money than when losing money.

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Australian Equity (1958 - 2011)	All
Number of Days	13278
Number of Years	52
Average Return	0.03%
Median Return	0.04%
Total Return	3092.59%
Annualized Return	6.79%
Annualized Volatility	14.15%

	Worst	Best
Number of 1% Days	133	133
Average Return	-3.64%	3.21%
Median Return	-3.00%	2.79%
Volatility	36.29%	17.19%
Max	-2.30%	7.27%
Min	-24.99%	2.26%

	Worst	Best
Number of 0.1% Days	14	14
Average Return	-8.15%	5.76%
Median Return	-6.99%	5.63%
Volatility	78.11%	12.81%
Max	-5.47%	7.27%
Min	-24.99%	4.78%

Miss Worst .1%	9.29%
Miss Best .1%	5.22%
Miss Best and Worst .1%	7.68%
Miss Worst 1%	17.56%
Miss Best 1%	-1.40%
Miss Best and Worst 1%	8.56%

Australian Equity (1958 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	13278	4424	8854
% days	100.00%	33.32%	66.68%
Average Return	0.03%	-0.08%	0.08%
Median Return	0.04%	-0.06%	0.09%
Total Return	3092.59%	-57.27%	7371.74%
Annualized Return	6.79%	-4.73%	13.06%
Annualized Volatility	14.15%	18.25%	11.49%

	Worst	Best
Number of 1% days		
< 200 SMA	66.92%	72.18%
> 200 SMA	33.08%	27.82%
Number of 0.1% days		
< 200 SMA	85.71%	92.86%
> 200 SMA	14.29%	7.14%

Canada S&P/TSX 300 Composite	All
Number of Days	8761
Number of Years	34
Average Return	0.03%
Median Return	0.07%
Total Return	1230.97%
Annualized Return	7.73%
Annualized Volatility	15.27%

	Worst	Best
Number of 1% Days	88	88
Average Return	-4.23%	3.63%
Median Return	-3.52%	3.15%
Volatility	26.40%	22.04%
Max	-2.88%	9.82%
Min	-11.13%	2.41%

	Worst	Best
Number of 0.1% Days	9	9
Average Return	-8.23%	6.96%
Median Return	-8.12%	7.03%
Volatility	22.27%	25.32%
Max	-6.91%	9.82%
Min	-11.13%	5.32%

Miss Worst .1%	10.17%
Miss Best .1%	5.88%
Miss Best and Worst .1%	8.27%
Miss Worst 1%	20.46%
Miss Best 1%	-1.55%
Miss Best and Worst 1%	10.11%

Canada S&P/TSX 300 Composite	All	< 200 SMA	>200 SMA
Number of Days	8761	2729	6032
% days	100.00%	31.15%	68.85%
Average Return	0.03%	-0.09%	0.09%
Median Return	0.07%	-0.04%	0.11%
Total Return	1230.97%	-26.31%	1706.05%
Annualized Return	7.73%	-2.78%	12.85%
Annualized Volatility	15.27%	20.27%	12.26%

	Worst	Best
Number of 1% days		
< 200 SMA	72.73%	65.91%
> 200 SMA	27.27%	34.09%
Number of 0.1% days		
< 200 SMA	100.00%	100.00%
> 200 SMA	0.00%	0.00%

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

France SBF 250

France SBF 250	All		
Number of Days	10477		
Number of Years	41		
Average Return	0.03%		
Median Return	0.01%		
Total Return	1277.70%		
Annualized Return	6.51%		
Annualized Volatility	17.97%		

	Worst	Best	
Number of 1% Days	105	105	
Average Return	-4.46%	4.28%	
Median Return	-3.93%	3.68%	
Volatility	24.31%	24.70%	
Max	-3.19%	10.76%	
Min	-12.93%	2.98%	

	Worst	Best	
Number of 0.1% Days	11	11	
Average Return	-8.04%	8.00%	
Median Return	-7.50%	8.08%	
Volatility	31.48%	24.22%	
Max	-6.24%	10.76%	
Min	-12.93%	6.06%	

Miss Worst .1%	8.92%
Miss Best .1%	4.37%
Miss Best and Worst .1%	6.73%

Miss Worst 1%	19.79%
Miss Best 1%	-4.20%
Miss Best and Worst 1%	7.75%

France SBF 250	All	< 200 SMA	>200 SMA
Number of Days	10477	3699	6778
% days	100.00%	35.31%	64.69%
Average Return	0.03%	-0.10%	0.11%
Median Return	0.01%	-0.09%	0.09%
Total Return	1277.70%	-62.32%	3556.06%
Annualized Return	6.51%	-6.43%	14.32%
Annualized Volatility	17.97%	23.14%	14.26%

	Worst	Best
Number of 1% days		
< 200 SMA	81.90%	79.05%
> 200 SMA	18.10%	20.95%
Number of 0.1% days		
< 200 SMA	90.91%	81.82%
> 200 SMA	9.09%	18.18%

Germany DAX 30 (1960-2011)

Germany DAX 30 (1960-2011)	All		
Number of Days	12932		
Number of Years	51		
Average Return	0.02%		
Median Return	0.03%		
Total Return	670.03%		
Annualized Return	4.06%		
Annualized Volatility	19.35%		

	Worst	Best	
Number of 1% Days	130	130	
Average Return	-4.74%	4.72%	
Median Return	-4.36%	4.09%	
Volatility	23.27%	28.31%	
Max	-3.32%	12.75%	
Min	-12.81%	3.18%	

	Worst	Best	
Number of 0.1% Days	13	13	
Average Return	-8.05%	8.80%	
Median Return	-7.23%	7.63%	
Volatility	27.09%	31.32%	
Max	-6.66%	12.75%	
Min	-12.81%	7.08%	

Miss Worst .1%	6.30%
Miss Best .1%	1.86%
Miss Best and Worst .1%	4.06%

Miss Worst 1%	17.90%
Miss Best 1%	-7.47%
Miss Best and Worst 1%	4.86%

Germany DAX 30 (1960-2011)	All	< 200 SMA	>200 SMA
Number of Days	12932	5195	7737
% days	100.00%	40.17%	59.83%
Average Return	0.02%	-0.10%	0.11%
Median Return	0.03%	-0.10%	0.10%
Total Return	670.03%	-54.94%	1608.97%
Annualized Return	4.06%	-3.79%	9.69%
Annualized Volatility	19.35%	23.90%	15.43%

	Worst	Best
Number of 1% days		
< 200 SMA	89.23%	77.69%
> 200 SMA	10.77%	22.31%
Number of 0.1% days		
< 200 SMA	100.00%	100.00%
> 200 SMA	0.00%	0.00%

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Hong Kong Hang Seng Composite (1970 - 2011)			
Hong Kong Hang Seng Composit	All		
Number of Days	10110		
Number of Years	40		
Average Return	0.07%		
Median Return	0.06%		
Total Return	11612.40%		
Annualized Return	12.61%		
Annualized Volatility	30.13%		
	Worst	Best	
Outlier 1% of all days	102	102	
Average Return	-7.51%	7.72%	
Median Return	-6.57%	6.88%	
Volatility	55.75%	40.17%	
Max	-5.18%	18.82%	
Min	-33.33%	5.31%	
	Worst	Best	
Outlier 0.1% of all days	11	11	
Average Return	-14.64%	13.68%	
Median Return	-11.48%	13.20%	
Volatility	110.56%	30.86%	
Max	-10.41%	18.82%	
Min	-33.33%	11.71%	
Miss Worst .1%	17.73%		
Miss Best .1%	8.73%		
Miss Best and Worst .1%	13.68%		
Miss Worst 1%	38.06%		
Miss Best 1%	-6.80%		
Miss Best and Worst 1%	14.28%		

Hong Kong Hang Seng Composit	All	< 200 SMA	>200 SMA
Number of Days	10110	3404	6706
% days	100.00%	33.67%	66.33%
Average Return	0.07%	-0.13%	0.17%
Median Return	0.06%	-0.12%	0.12%
Total Return	11612.40%	-28.15%	16201.97%
Annualized Return	12.61%	-2.42%	21.10%
Annualized Volatility	30.13%	38.33%	24.80%

	Worst	Best
Number of 1% days		
< 200 SMA	68.63%	65.69%
> 200 SMA	31.37%	34.31%
Number of 0.1% days		
< 200 SMA	54.55%	63.64%
> 200 SMA	45.45%	36.36%

Italy BCI Global (1973-2011)			
Italy BCI Global (1973-2011)	All		
Number of Days	9766		
Number of Years	38		
Average Return	0.03%		
Median Return	0.01%		
Total Return	634.66%		
Annualized Return	5.28%		
Annualized Volatility	20.95%		
	Worst	Best	
Number of 1% Days	98	98	
Average Return	-5.24%	4.75%	
Median Return	-4.85%	4.19%	
Volatility	23.40%	25.72%	
Max	-3.75%	11.56%	
Min	-11.20%	3.40%	
	Worst	Best	
Number of 0.1% Days	10	10	
Average Return	-8.53%	8.52%	
Median Return	-8.15%	8.12%	
Volatility	18.27%	24.45%	
Max	-7.25%	11.56%	
Min	-11.20%	6.97%	
Miss Worst .1%	7.74%		
Miss Best .1%	3.09%		
Miss Best and Worst .1%	5.50%		
Miss Worst 1%	20.90%		
Miss Best 1%	-6.41%		
Miss Best and Worst 1%	7.50%		

Italy BCI Global (1973-2011)	All	< 200 SMA	>200 SMA
Number of Days	9766	4179	5587
% days	100.00%	42.79%	57.21%
Average Return	0.03%	-0.11%	0.13%
Median Return	0.01%	-0.06%	0.11%
Total Return	634.66%	-73.57%	2679.38%
Annualized Return	5.28%	-7.71%	16.18%
Annualized Volatility	20.95%	23.47%	18.70%

	Worst	Best
Number of 1% days		
< 200 SMA	67.35%	51.02%
> 200 SMA	32.65%	48.98%
Number of 0.1% days		
< 200 SMA	30.00%	60.00%
> 200 SMA	70.00%	40.00%

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Japan Nikkei 225 (1955 - 2011)	All		
Japan Nikkei 225 (1955 - 2011)	All		
Number of Days	15296		
Number of Years	60		
Average Return	0.03%		
Median Return	0.05%		
Total Return	2512.58%		
Annualized Return	5.52%		
Annualized Volatility	18.03%		

	Worst	Best
Number of 1% Days	153	153
Average Return	-4.57%	4.36%
Median Return	-4.02%	3.78%
Volatility	26.72%	25.80%
Max	-3.25%	14.15%
Min	-14.90%	3.14%

	Worst	Best
Number of 0.1% Days	16	16
Average Return	-8.45%	8.05%
Median Return	-7.33%	7.52%
Volatility	37.68%	39.61%
Max	-6.36%	14.15%
Min	-14.90%	6.11%

Miss Worst .1%	8.03%
Miss Best .1%	3.40%
Miss Best and Worst .1%	5.85%
Miss Worst 1%	18.97%
Miss Best 1%	-5.27%
Miss Best and Worst 1%	6.82%

Japan Nikkei 225 (1955 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	15296	5597	9699
% days	100.00%	36.59%	63.41%
Average Return	0.03%	-0.09%	0.09%
Median Return	0.05%	-0.10%	0.11%
Total Return	2512.58%	-68.88%	8294.71%
Annualized Return	5.52%	-5.12%	12.20%
Annualized Volatility	18.03%	24.05%	13.28%

	Worst	Best
Number of 1% days		
< 200 SMA	84.31%	79.08%
> 200 SMA	15.69%	20.92%
Number of 0.1% days		
< 200 SMA	81.25%	87.50%
> 200 SMA	18.75%	12.50%

New Zealand All Capital (1970 - 2011)	All		
New Zealand All Capital (1970 -	All		
Number of Days	10158		
Number of Years	40		
Average Return	0.02%		
Median Return	0.03%		
Total Return	588.93%		
Annualized Return	4.90%		
Annualized Volatility	13.44%		

	Worst	Best
Number of 1% Days	102	102
Average Return	-3.37%	3.08%
Median Return	-2.78%	2.71%
Volatility	28.97%	17.17%
Max	-2.19%	9.61%
Min	-13.45%	2.21%

	Worst	Best
Number of 0.1% Days	11	11
Average Return	-7.56%	5.44%
Median Return	-6.68%	4.93%
Volatility	46.35%	23.39%
Max	-4.75%	9.61%
Min	-13.45%	4.34%

Miss Worst .1%	7.20%
Miss Best .1%	3.41%
Miss Best and Worst .1%	5.67%
Miss Worst 1%	14.63%
Miss Best 1%	-2.86%
Miss Best and Worst 1%	6.16%

New Zealand All Capital (1970 -	All	< 200 SMA	>200 SMA
Number of Days	10158	4167	5991
% days	100.00%	41.02%	58.98%
Average Return	0.02%	-0.07%	0.09%
Median Return	0.03%	-0.04%	0.07%
Total Return	588.93%	-61.71%	1699.36%
Annualized Return	4.90%	-5.64%	12.93%
Annualized Volatility	13.44%	15.38%	11.80%

	Worst	Best
Number of 1% days		
< 200 SMA	66.67%	40.20%
> 200 SMA	33.33%	59.80%
Number of 0.1% days		
< 200 SMA	72.73%	45.45%
> 200 SMA	27.27%	54.55%

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Singapore SES All Capital (1966 - 2008)		
Singapore SES All Capital (1966 -	All	
Number of Days	10607	
Number of Years	42	
Average Return	0.04%	
Median Return	0.04%	
Total Return	2286.80%	
Annualized Return	7.83%	
Annualized Volatility	16.81%	
	Worst	Best
Number of 1% Days	107	107
Average Return	-4.45%	4.41%
Median Return	-3.88%	3.97%
Volatility	28.36%	23.66%
Max	-2.96%	10.76%
Min	-14.90%	2.91%
	Worst	Best
Number of 0.1% Days	11	11
Average Return	-8.77%	7.88%
Median Return	-8.34%	7.65%
Volatility	33.87%	20.48%
Max	-7.04%	10.76%
Min	-14.90%	6.49%
Miss Worst .1%	10.46%	
Miss Best .1%	5.72%	
Miss Best and Worst .1%	8.30%	
Miss Worst 1%	21.33%	
Miss Best 1%	-3.37%	
Miss Best and Worst 1%	8.74%	

Singapore SES All Capital (1966 -	All	< 200 SMA	>200 SMA
Number of Days	10607	4163	6444
% days	100.00%	39.25%	60.75%
Average Return	0.04%	-0.09%	0.12%
Median Return	0.04%	-0.08%	0.11%
Total Return	2286.80%	-73.23%	8816.02%
Annualized Return	7.83%	-7.67%	19.20%
Annualized Volatility	16.81%	19.20%	14.91%

	Worst	Best	
Number of 1% days			
< 200 SMA	62.62%	47.66%	
> 200 SMA	37.38%	52.34%	
Number of 0.1% days			
< 200 SMA	72.73%	54.55%	
> 200 SMA	27.27%	45.45%	

Spain Madrid SE General (1972 - 2011)		
Spain Madrid SE General (1972 -	All	
Number of Days	9056	
Number of Years	35	
Average Return	0.03%	
Median Return	0.02%	
Total Return	807.32%	
Annualized Return	6.33%	
Annualized Volatility	19.06%	
	Worst	Best
Number of 1% Days	91	91
Average Return	-4.58%	4.54%
Median Return	-4.12%	3.83%
Volatility	21.56%	27.73%
Max	-3.22%	14.73%
Min	-9.28%	3.28%
	Worst	Best
Number of 0.1% Days	10	10
Average Return	-7.50%	8.49%
Median Return	-7.25%	8.04%
Volatility	17.64%	41.40%
Max	-6.28%	14.73%
Min	-9.28%	5.89%
Miss Worst .1%	8.67%	
Miss Best .1%	3.96%	
Miss Best and Worst .1%	6.25%	
Miss Worst 1%	19.97%	
Miss Best 1%	-4.99%	
Miss Best and Worst 1%	7.20%	

Spain Madrid SE General (1972 -	All	< 200 SMA	>200 SMA
Number of Days	9056	3651	5405
% days	100.00%	40.32%	59.68%
Average Return	0.03%	-0.10%	0.12%
Median Return	0.02%	-0.13%	0.11%
Total Return	807.32%	-71.64%	3099.41%
Annualized Return	6.33%	-8.33%	17.54%
Annualized Volatility	19.06%	23.21%	15.49%

	Worst	Best	
Number of 1% days			
< 200 SMA	84.62%	74.73%	
> 200 SMA	15.38%	25.27%	
Number of 0.1% days			
< 200 SMA	80.00%	80.00%	
> 200 SMA	20.00%	20.00%	

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Switzerland Price (1969 - 2011)	All		
Number of Days	10451		
Number of Years	41		
Average Return	0.02%		
Median Return	0.04%		
Total Return	499.97%		
Annualized Return	4.41%		
Annualized Volatility	15.43%		

	Worst	Best
Number of 1% Days	105	105
Average Return	-4.11%	3.66%
Median Return	-3.65%	3.23%
Volatility	21.95%	19.43%
Max	-2.90%	10.58%
Min	-10.82%	2.58%

	Worst	Best
Number of 0.1% Days	11	11
Average Return	-7.14%	6.24%
Median Return	-6.42%	5.80%
Volatility	30.42%	23.33%
Max	-5.54%	10.58%
Min	-10.82%	5.44%

Miss Worst .1%	6.50%	
Miss Best .1%	2.76%	
Miss Best and Worst .1%	4.81%	
Miss Worst 1%	16.32%	
Miss Best 1%	-4.70%	
Miss Best and Worst 1%	6.19%	

Switzerland Price (1969 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	10451	4020	6431
% days	100.00%	38.47%	61.53%
Average Return	0.02%	-0.08%	0.09%
Median Return	0.04%	-0.06%	0.09%
Total Return	499.97%	-66.70%	1701.63%
Annualized Return	4.41%	-6.66%	12.00%
Annualized Volatility	15.43%	19.82%	11.79%

	Worst	Best
Number of 1% days		
< 200 SMA	85.71%	79.05%
> 200 SMA	14.29%	20.95%
Number of 0.1% days		
< 200 SMA	72.73%	100.00%
> 200 SMA	27.27%	0.00%

Taiwan SE Cap Weighted (1968 - 2011)	All		
Number of Days	12207		
Number of Years	48		
Average Return	0.05%		
Median Return	0.04%		
Total Return	8752.01%		
Annualized Return	9.70%		
Annualized Volatility	24.47%		

	Worst	Best
Outlier 1% of all days	123	123
Average Return	-5.48%	5.34%
Median Return	-5.42%	5.15%
Volatility	12.27%	13.76%
Max	-4.46%	9.38%
Min	-7.88%	4.36%

	Worst	Best
Outlier 0.1% of all days	13	13
Average Return	-6.76%	6.95%
Median Return	-6.68%	6.75%
Volatility	5.44%	11.59%
Max	-6.55%	9.38%
Min	-7.88%	6.72%

Miss Worst .1%	11.79%	
Miss Best .1%	7.74%	
Miss Best and Worst .1%	9.80%	
Miss Worst 1%	26.87%	
Miss Best 1%	-3.90%	
Miss Best and Worst 1%	11.17%	

Taiwan SE Cap Weighted (1968 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	12207	4943	7264
% days	100.00%	40.49%	59.51%
Average Return	0.05%	-0.12%	0.16%
Median Return	0.04%	-0.11%	0.14%
Total Return	8752.01%	-58.26%	21105.29%
Annualized Return	9.70%	-4.36%	20.42%
Annualized Volatility	24.47%	27.75%	21.78%

	Worst	Best
Number of 1% days		
< 200 SMA	78.86%	65.04%
> 200 SMA	21.14%	34.96%
Number of 0.1% days		
< 200 SMA	84.62%	84.62%
> 200 SMA	15.38%	15.38%

APPENDIX A – FOREIGN STOCKS
Source: Global Financial Data

Thailand SET General (1976 - 2011)		
Thailand SET General (1976 - 20:	All	
Number of Days	8800	
Number of Years	34	
Average Return	0.04%	
Median Return	0.01%	
Total Return	1269.89%	
Annualized Return	7.78%	
Annualized Volatility	23.61%	
	Worst	Best
Number of 1% Days	88	88
Average Return	-5.89%	6.29%
Median Return	-5.48%	5.64%
Volatility	28.32%	28.93%
Max	-4.03%	12.02%
Min	-14.84%	4.50%
	Worst	Best
Number of 0.1% Days	9	9
Average Return	-9.69%	10.38%
Median Return	-8.88%	10.73%
Volatility	32.81%	16.24%
Max	-8.06%	12.02%
Min	-14.84%	8.83%
Miss Worst .1%	10.67%	
Miss Best .1%	5.08%	
Miss Best and Worst .1%	7.89%	
Miss Worst 1%	25.93%	
Miss Best 1%	-7.63%	
Miss Best and Worst 1%	7.93%	

Thailand SET General (1976 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	8800	3709	5091
% days	100.00%	42.15%	57.85%
Average Return	0.04%	-0.13%	0.16%
Median Return	0.01%	-0.09%	0.12%
Total Return	1269.89%	-50.95%	2692.99%
Annualized Return	7.78%	-4.72%	17.92%
Annualized Volatility	23.61%	26.21%	21.32%

	Worst	Best	
Number of 1% days			
< 200 SMA	62.50%	62.50%	
> 200 SMA	37.50%	37.50%	
Number of 0.1% days			
< 200 SMA	66.67%	55.56%	
> 200 SMA	33.33%	44.44%	

UK FTSE All Share (1968 - 2011)		
UK FTSE All Share (1968 - 2011)	All	
Number of Days	10583	
Number of Years	41	
Average Return	0.04%	
Median Return	0.06%	
Total Return	2155.43%	
Annualized Return	7.70%	
Annualized Volatility	17.04%	
	Worst	Best
Number of 1% Days	106	106
Average Return	-4.09%	4.14%
Median Return	-3.58%	3.66%
Volatility	22.86%	22.80%
Max	-2.94%	9.36%
Min	-11.23%	2.86%
	Worst	Best
Number of 0.1% Days	11	11
Average Return	-7.43%	7.47%
Median Return	-7.16%	7.53%
Volatility	28.63%	20.88%
Max	-5.39%	9.36%
Min	-11.23%	5.86%
Miss Worst .1%	9.92%	
Miss Best .1%	5.70%	
Miss Best and Worst .1%	7.87%	
Miss Worst 1%	19.94%	
Miss Best 1%	-2.79%	
Miss Best and Worst 1%	8.26%	

UK FTSE All Share (1968 - 2011)	All	< 200 SMA	>200 SMA
Number of Days	10583	3271	7312
% days	100.00%	30.91%	69.09%
Average Return	0.04%	-0.10%	0.10%
Median Return	0.06%	-0.08%	0.11%
Total Return	2155.43%	-30.72%	3155.67%
Annualized Return	7.70%	-2.79%	12.75%
Annualized Volatility	17.04%	22.69%	13.68%

	Worst	Best	
Number of 1% days			
< 200 SMA	85.85%	69.81%	
> 200 SMA	14.15%	30.19%	
Number of 0.1% days			
< 200 SMA	90.91%	54.55%	
> 200 SMA	9.09%	45.45%	

APPENDIX B – READING LIST

Stock Distributions

- *Why Stock Markets Crash: Critical Events in Complex Financial Systems* - Didier Sornette
- *The Misbehavior of Markets* by Benoit Mandelbrot
- *Fooled by Randomness* and *The Black Swan: The Impact of the Highly Improbable* by Taleb
- *Finding Alpha* – by Eric Falkenstein
- *Market Volatility* – Robert Shiller
- *Optimal Portfolio Modeling* – Philip McDonnell
- *Fractal Market Analysis* - Edgar Peters
- *More Than You Know: Finding Financial Wisdom in Unconventional Places* - Michael Mauboussin
- *The Failure of Risk Management: Why It's Broken and How to Fix It* – Douglas Hubbard

Market Bubbles

- *Manias, Panics, and Crashes* by Charles Kindleberger
- *Extraordinary Popular Delusions and the Madness of Crowds* by Charles MacKay
- *Irrational Exuberance* – by Robert Shiller
- *A Short History of Financial Euphoria* and *The Great Crash 1929*- John Kenneth Galbraith
- *The Panic of 1907: Lessons Learned from the Market's Perfect Storm* - Mark Bruner

History of Markets

- *Triumph of the Optimists: 101 Years of Global Investment Returns* by Elroy Dimson, Paul Marsh, and Mike Staunton
- *Stocks for the Long Run* by Jeremy Siegel
- *Reminiscences of a Stock Operator* by Edwin LeFèvre
- *When Genius Failed* by Roger Lowenstein
- *Capital Ideas*, *Capital Ideas Evolving,* and *Against the Gods* by Peter Bernstein
- *Ibbotson Yearbook* by Ibbotson Associates
- *The CRB Commodity Yearbook* by Commodity Research Bureau
- *The Essays of Warren Buffett* by Warren E. Buffett and Lawrence A. Cunningham
- *Fortune's Formula* by William Poundstone
- *The Myth of the Rational Market* - Justin Fox
- *The Great Game: The Emergence of Wall Street as a World Power: 1653-2000* – John Gordon

Additional Papers

- Ahrens, Richard (2008). "Missing the Ten Best Days." Technical Analysis of Stocks and Commodities, 26:4 (56-57).
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- Gire, Paul (2005). "Missing the Ten Best." The Journal of Financial Planning,
- Jansen, Dennis, and Casper de Vries, (1991). "On the Frequency of Large Stock Returns: Putting Booms and Busts into Perspective." Review of Economics and Statistics, 73, 18-24.
- Mandelbrot, Benoit (1963). "The Variation of Certain Speculative Prices." Journal of Business, 36, 394-419.

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