

46.20	22.40	11.91	23.74
42.13	20.41	10.84	21.79
37.97	18.41	9.77	19.84
33.72	16.38	8.71	17.88

# Cedarwinds Quarterly

Performance Updates and Market Commentary for Long-Term Investors

Vol. 2 Q4-06

## Asset Class % Returns\*

	2006	Annualized Returns**	
		3 Years	5 Years
<b>Bonds</b>			
Short-Term	4.78	2.64	2.69
Two-Year	4.46	2.36	2.85
Five-Year	4.51	2.66	4.43
Intermediate	3.89	2.83	4.33
<b>Domestic Stocks</b>			
Large Market	15.71	10.33	6.06
Large Value	20.18	16.14	12.37
Small Cap	16.61	13.40	12.30
Small Value	21.55	18.00	18.90
Micro Cap	16.16	13.27	15.16
Real Estate	35.26	26.44	23.35
<b>International Stocks</b>			
Int'l Large Value	34.15	25.82	22.26
Int'l Small	24.88	25.86	26.40
Int'l Small Value	28.39	28.72	30.30
Emg Mkts	29.17	29.65	25.88
Emg Mkts Value	37.93	36.04	34.25
Emg Mkts Small	37.31	30.56	30.87
Continental Small	45.83	32.46	30.78
Japanese Small	-12.07	16.61	20.00
Asia Pacific Small	39.31	23.14	26.95
UK Small	45.60	27.81	23.67

## Description of DFA Index Funds

		TICKER
Short-Term Bonds	1-Year Fixed Fund	DFIHX
Two-Year Bonds	2-Year Global Fixed Fund	DFGFY
Five-Year Bonds	5-Year Government Fund	DFFGX
Intermediate Bonds	5-Year Global Fixed Fund	DFGBX
Large Market	Large Company Fund	DFLCX
Large Value	US Large Value Fund	DFLVX
Small Cap	Small Cap Fund	DFSTX
Small Value	US Small Value Fund	DFSVX
Micro Cap	US Micro Cap Fund	DFSCX
Real Estate	Real Estate Fund	DFREX
Int'l Large Value	International Value Fund	DFINVX
Int'l Small	International Small Fund	DFISX
Int'l Small Value	International Small Value Fund	DISVX
Emg Mkts	Emerging Markets Fund	DFEMX
Emg Mkts Value	Emerging Markets Value Fund	DDEVX
Emg Mkts Small	Emerging Markets Small Fund	DEMFX
Continental Small	Continental Small Company Fund	DFCSX
Japanese Small	Japanese Small Company Fund	DFJSX
Asia Pacific Small	Asia Pacific Small Company Fund	DFRSX
UK Small	United Kingdom Small Company Fund	DFUKX

\*Source: Dimensional Fund Advisors ([www.dfaus.com](http://www.dfaus.com))

The information contained herein is obtained from sources we believe are reliable, but we cannot guarantee its accuracy.

\*\* Calculated based on calendar year results.

Past performance does not guarantee future returns.

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## THE RISK - RETURN RELATIONSHIP

### Part 2: Measuring Portfolio Risk

*"You can't manage what you can't measure."*

Peter Drucker, business consultant

#### Introduction

The old adage, *"what you don't know won't hurt you,"* could not be further from the truth when it comes to managing the risk in investment portfolios. If we invested based on "gut instinct" or made assumptions without knowing the facts, you can bet we would run into problems quickly. Peter Drucker had it right when he said, *"you can't manage what you can't measure."* Fortunately, there are a few key metrics that help address the question of how to *measure* portfolio risk in order to effectively *manage* that risk. We use standard deviation as our primary risk measurement tool.

#### Standard Deviation: The Calculus of Portfolio Risk

In mathematical terms, standard deviation is defined as the square root of the variance (which in turn is a measure of the dispersion of a variable around its mean). In essence, standard deviation is a statistical measure of volatility. Intuitively, the higher the standard deviation of portfolio returns, the greater the risk of returns being away from their average. When applied to "normal distributions" (the bell-shaped curve) of returns, standard deviation helps predict the concentration of observations (68% of observations fall within one standard deviation from the average, 95% within two standard deviations). Simply stated, portfolios having higher standard deviations are riskier because they have more volatility in price movement compared to their average.

#### Performance Confetti

The graphic on the following page helps illustrate why investors need an analytical technique to measure risk. This chart represents a "periodic table" of investment returns, depicting monthly performance changes during 2006 for various asset classes (funds) used in our model portfolios. The challenge facing investors is that there is no discernible pattern or trend evident in terms of relative performance. Funds go up and funds go down. The relative velocity and direction of performance are unpredictable. This uncertainty tends to be the case whether the observed time period is daily, weekly, monthly, quarterly or annually. Portrayed this way, the markets resemble a science lab experiment reflecting a kind of global Brownian movement of asset classes. With so much apparent randomness, how can we possibly know what to invest in and how much to commit to each asset class? How do we find order in what appears to be investment chaos across the global marketplace? How do we achieve a level of confidence in our decision-making process that effectively links together acceptable degrees of risk with expected levels of return? The answer lies in using standard deviation as the primary tool to measure volatility. With this metric in place at the fund level, we are then able to quantify the relationships between asset class combinations at the portfolio level. This allows us to build structural integrity and a certain degree of predictability into the risk-return attributes of our model portfolios.

#### Interpreting Standard Deviation

Let's illustrate the statistical interpretation of the term using a simple comparison of fund performance. According to the data below, the 2006 return for the US Large Cap Value Fund was 20.18% with a standard deviation of 6.94. Based on our definition of standard deviation qualified by the limited time period observed, this means that 68% of the time this fund could be expected to return between 27.12% on the high side and 13.24% on the low end.

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		2006		2006												
		Total Return	Standard Deviation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Domestic	Equity Index Funds															
	US Large Company Fund	15.71	5.61	9.65	2.82	6.43	8.72	0.51	5.53	3.43	4.17	2.89	8.17	7.43	5.43	
	US Large Cap Value Fund	20.18	6.94	9.59	1.90	6.09	8.12	0.49	0.87	2.36	3.52	2.77	7.54	7.24	4.76	
	US Small Cap Fund	16.61	13.75	9.56	1.42	5.18	6.88	0.42	0.39	2.30	3.47	2.77	6.94	6.89	4.54	
	US Small Cap Value Fund	21.55	13.22	9.52	1.35	5.06	5.96	0.29	0.35	1.89	3.40	2.57	6.27	6.37	4.03	
	US Micro Cap Fund	16.16	13.85	9.14	1.05	4.77	5.68	-1.86	0.30	1.83	3.13	2.03	5.95	6.25	3.89	
	Real Estate Securities Fund	35.26	13.04	9.09	0.93	4.61	5.03	-2.06	0.20	1.55	2.79	2.00	5.64	5.52	3.75	
International	International Value Fund	34.15	10.04	8.82	0.38	4.59	5.00	-2.86	0.13	0.69	2.78	1.40	5.62	4.83	3.64	
	International Small Company Fund	24.88	12.12	7.79	0.31	4.55	4.73	-2.99	0.05	0.68	2.65	1.35	5.45	4.76	3.51	
	Int'l. Small Cap Value Fund	28.39	11.84	7.68	0.31	4.42	4.15	-4.04	-0.12	0.62	2.61	1.30	5.43	4.52	2.82	
	Emerging Markets Fund	29.17	18.28	7.33	0.27	4.21	2.82	-4.39	-0.16	0.50	2.55	1.19	4.99	3.27	2.01	
	Emerging Markets Value Fund	37.93	18.87	6.91	0.25	3.38	1.92	-4.80	-0.59	0.43	2.44	1.01	4.42	3.03	1.61	
	Emerging Markets Small Cap Fund	37.31	19.77	6.81	0.21	1.83	1.32	-4.87	-0.69	0.39	2.37	0.95	4.39	2.51	1.40	
	Continental Small Company	45.83	14.43	6.73	0.20	1.76	0.99	-5.05	-0.70	-0.28	1.95	0.82	3.97	2.25	1.39	
	Japanese Small Company	-12.07	13.24	4.74	0.19	1.63	0.39	-5.45	-0.89	-0.36	1.82	0.74	3.96	1.89	0.87	
	Asia Pacific Small Company	39.31	12.99	4.22	-0.19	1.36	0.33	-5.65	-0.91	-1.08	1.61	0.56	3.24	1.88	0.71	
		United Kingdom Small Company	45.60	10.25	2.65	-0.31	1.25	0.31	-5.89	-1.85	-1.45	1.60	0.46	0.48	0.49	0.45
		Fixed Income Funds			0.31	-0.35	0.39	0.23	-7.09	-1.86	-3.45	0.87	0.45	0.45	0.39	0.44
		One-Year Fixed Income Fund	4.78	0.21	0.30	-0.35	0.25	0.20	-10.53	-1.92	-3.75	0.50	0.40	0.38	0.38	0.33
	Two-Year Global Fixed Income Fund	4.46	0.40	0.29	-0.63	0.13	-0.41	-10.84	-3.83	-3.84	0.48	0.38	0.30	0.36	0.26	
	Five-Year Government Fund	4.51	0.32	0.10	-6.03	-0.29	-3.78	-11.57	-4.41	-4.78	0.43	-1.78	-0.80	-0.69	-2.13	
	Five-Year Global Fixed Income Fund	3.89	1.02													

Data Source: Dimensional Fund Advisors ([www.dfaus.com](http://www.dfaus.com))

In comparison, the Emerging Markets Value Fund returned 37.93% with a standard deviation of 18.87. This means that 68% of the time, this fund could be expected to return between 56.80% on the high side and 19.06% on the low end. The comparison suggests that for 2006 the Emerging Markets Value Fund, with a standard deviation of 18.87, was nearly three times as volatile, or risky, as the US Large Cap Value Fund, with a standard deviation of 6.94. However, for the additional risk, there was also a 17.75% higher return with the Emerging Markets Value Fund. In this case, the higher risk/higher expected return relationship was in evidence.

Now, let's examine volatility at the portfolio level using the specific example of our Growth model portfolio to illustrate how we use standard deviation as a tool to help gauge relative risk. The chart below represents a time series analysis reflecting the performance of our Growth portfolio compared to a common market benchmark, the S&P 500 Index. (Note: this performance data appears on our website, [www.cedarwinds.com](http://www.cedarwinds.com), and is updated monthly.) The returns have been divided up according to one, three, five, ten, fifteen and twenty year time periods. Returns over these separate periods have also been calculated by their standard deviations, referenced as "Risk - SD."

Model Portfolio (Asset Allocation %)	Annualized Returns						
	1 Year Ending 12/31/06	1 Year Ending 12/31/05	3 Years 2004 - 2006	5 Years 2002 - 2006	10 Years 1997 - 2006	15 Years 1992 - 2006	20 Years 1987 - 2006
Growth of \$1	1.20	1.10	1.56	2.01	2.93	5.56	10.06
Growth Return--%	19.84	9.77	15.92	14.95	11.36	12.12	12.24
Growth Risk - SD (80% Equity / 20% Fixed)	7.61	8.01	5.44	16.22	12.45	11.14	11.80
S&P 500 Growth of \$1	1.16	1.05	1.35	1.35	2.24	4.56	9.31
S&P 500 Return--%	15.80	4.91	10.44	6.19	8.42	10.64	11.80
S&P 500 Risk - SD (100% Equity)	5.64	7.92	5.45	18.79	19.14	17.42	16.61

Looking at results over the three year period from 2004 - 2006, the Growth model returned an average of 15.92% per year compared to the S&P 500's average of 10.44% while the standard deviation for the two was the same. In other words, the Growth portfolio outperformed the S&P by over 50% each year at the same level of risk. Over the 20 year period from 1987 - 2006, the Growth portfolio delivered annualized returns averaging 12.24% compared to the S&P's 11.80% with about half the volatility of the index. Unlike the fund level comparison above where higher returns were achieved with higher risk, investment returns with our Growth portfolio were higher but with *lower risk* compared to a standard market benchmark, the S&P 500 Index.

Continued on next page . . .

### Dispersion Analysis

Another method used to measure portfolio risk, or volatility, is known as dispersion analysis. A simple way to demonstrate this is through a framework that compares the range of returns and the frequency of occurrences into which those returns fall over a period of time. The longer the historical time period covered, the more statistically valid the predictability of the dispersion pattern becomes.

To illustrate, the accompanying table represents the frequency of returns for our Growth portfolio covering a 20 year time period broken down into months, or 240 individual monthly periods. It is readily apparent that the average monthly return is somewhere in the 0% - 2% range and, in fact, the average turns out to be 1.02%. As might be expected over this longer time period, there were a few months of outlier performance where returns positively or negatively skewed greater than 6%; however, these only represented a total of 14 out of 240 months, amounting to less than 6% of the monthly periods. In developing this dispersion data across all our model portfolios, the following general conclusions are supported:

- The average monthly return of each model portfolio is tightly correlated to the standard deviation (volatility) of that portfolio
- Higher levels of volatility result in higher monthly returns
- Each model portfolio is profitable about 70% of the time when measured on a monthly basis

### Growth Model Portfolio\*

20 years (1987- 2006)

240 monthly periods

Range of Returns	Frequency
8% to 10%	1
6% to 8%	6
4% to 6%	25
2% to 4%	66
0% to 2%	73
0% to -2%	34
-2% to -4%	26
-4% to -6%	2
-6% to -8%	3
-8% to -10%	2
-10% to -12%	
-12% to -14%	1
-14% to -16%	
-16% to -18%	1

Avg. Monthly Return	1.02%
Standard Deviation	3.13
%Profitable	71%

### Caveats in the Calculus

There are number of limitations in our analysis. First, performance outliers (a few abnormal observations) and different time periods measured may significantly impact the data set used to arrive at our conclusions. Second, return distributions are not always normal or symmetric. We have seen recently how random events (e.g., acts of terrorism, hurricanes) can create uncertainty and have significant impact on performance, skewing investment returns up or down, especially over shorter time periods. What this implies is that the measurement of risk is most effective when there is a "law of large numbers" at work. This means that higher confidence levels are achieved with multiple observations (hundreds) taken over longer time periods (20 years is a good proxy) and across multiple asset classes.

### Summary

There is one essential truth about this business: *investment management is risk management*. In order to effectively manage risk, we need a basic tool to objectively measure risk. The calculation of standard deviation is the primary tool we use to measure investment volatility. We use this tool and apply it to what matters most to investors: how individual asset classes and their risk attributes *correlate* with each other. Our view is that successful investment management requires managing the risk-return correlations of asset classes *in combination* as part of a cohesive, holistic portfolio asset allocation strategy. Now that we have explained how we *measure* risk, the focus of the next [Cedarwinds Quarterly](#) will turn to explaining how we *manage* the key risk elements that ultimately determine portfolio performance.

**\*IMPORTANT NOTE:** Cedarwinds Investment Management, LLC, a registered investment advisor incorporated in March 2004, established its first independent client investments in late 2004. Performance data shown represents hypothetical time-weighted results of Cedarwinds' model portfolios. These portfolios have been constructed using a strategic blend of up to 15 underlying index mutual funds managed by Dimensional Fund Advisors, Santa Monica, CA, and have been designed to seek certain risk-return relationships. Along with live data, simulated data has been used for performance reporting periods prior to the inception date of the underlying mutual funds used in the construction of the model portfolios. Simulated fund returns do not represent trading in actual accounts. The simulated performance results do not represent the impact that material economic and market factors might have had on the fund management decision-making process compared to the fund manager actually managing client money during that period. Simulated performance also differs from actual performance because it is achieved through the retroactive application of a strategy

designed with the benefit of hindsight. Performance results reflect annual rebalancing. Results have not been audited or reviewed by any third party. Average annual total returns of live data at the underlying fund level are net of DFA fees and include reinvestment of dividends and capital gains. Indexes and simulated data used prior to fund inception date do not reflect deduction of DFA fees, trading and other expenses. At the model portfolio level, performance results reflect the monthly pro-rata deduction of Cedarwinds' standard annual investment management fee of 40 basis points; monthly fee deduction is a requirement of our software used for backtesting. Actual Cedarwinds' advisory fees are deducted quarterly, in advance. Transaction costs and account maintenance charges are not considered. The composition and variability of the S&P 500, an unmanaged market value-weighted index, and the composition and volatility of the models managed by Cedarwinds are materially different. Factors such as the size and performance of specific positions in accounts, the length of time certain positions are held, the timing of purchases and sales, client objectives, cyclical securities price trends, market trends and other factors all influence performance results materially and therefore actual client performance for any portfolio may only match model performance by coincidence. Past performance is no guarantee of future results and current performance may be higher or lower than the performance shown. The investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. Please contact Cedarwinds Investment Management ([info@cedarwinds.com](mailto:info@cedarwinds.com)) for additional information on fund and portfolio performance results, data sources and descriptions, fund prospectus and fees. Data Source: Dimensional Fund Advisors ([www.dfaus.com](http://www.dfaus.com))