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Modern Portfolio Theory 2.0 - The Most Diversified Portfolio

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A portfolio construction technique called "Maximum Diversification"

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In recent years, new portfolio construction techniques focused on risk and diversification rather than expected average returns have become quite popular. This success has been due to an increasing acknowledgment that a traditional balanced portfolio, where 60 percent is allocated in equities and the remaining 40 percent is invested in bonds, is not diversified at all.

It may look balanced from a capital allocation point of view, but it is not from a risk perspective, as equities are the main risk contributor within such a portfolio.

After we have already written about the risk parity approach in our last article[1)], we would like to review a portfolio construction technique, called "Maximum Diversification," which has shown incredible results so far and which is being updated on a regular basis on our website.

1) "Risk Parity: A Bullet-Proof Investment Strategy?" - http://seekingalpha.com/article/868521-risk-parity-a-bullet-proof-investment-strategy

Construct a portfolio that maximizes the benefits from diversification

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Since different asset classes are not perfectly correlated to each other, this ratio in general >1. In other words, a well-diversified portfolio is greater than the sum of its investments, as the overall risk of such a portfolio is less than the weighted-average risk of its component holdings. Therefore, every investor can measure the degree of diversification within its portfolio quite easily, with the following metric:

$$DR(w) = \frac{\sum_{i=1}^{N} w_i \sigma_i}{\sigma_P}$$

(wi = portfolio weight in asset i, σi = the risk of asset i, σp is the total risk of the portfolio)

We would like to review a maximum diversification portfolio

Moreover, for a given set of underlying assets, there is only one portfolio combination that has the highest diversification ratio and thus represents the most diversified portfolio. In other words, it is possible to put the maximum weight into each asset class whereas the overall portfolio volatility is not being increased at all.

In our article, we would like to review a maximum diversification portfolio with the following investment universe:

- Vanguard Total Stock Market ETF (VTI)
- Vanguard MSCI Europe ETF (VGK)
- Vanguard MSCI Emerging Markets ETF (VWO)
- SPDR Gold Shares ETF (GLD)
- Vanguard REIT Index ETF (VNQ)
- iShares Barclays TIPS Bond ETF (TIP)
- Shares Barclays 20+ Year Treasury Bond ETF (TLT)
- Shares Barclays Aggregate Bond ETF (AGG)
- Shares iBoxx $ Invest Grade Corp. Bond ETF (LQD)

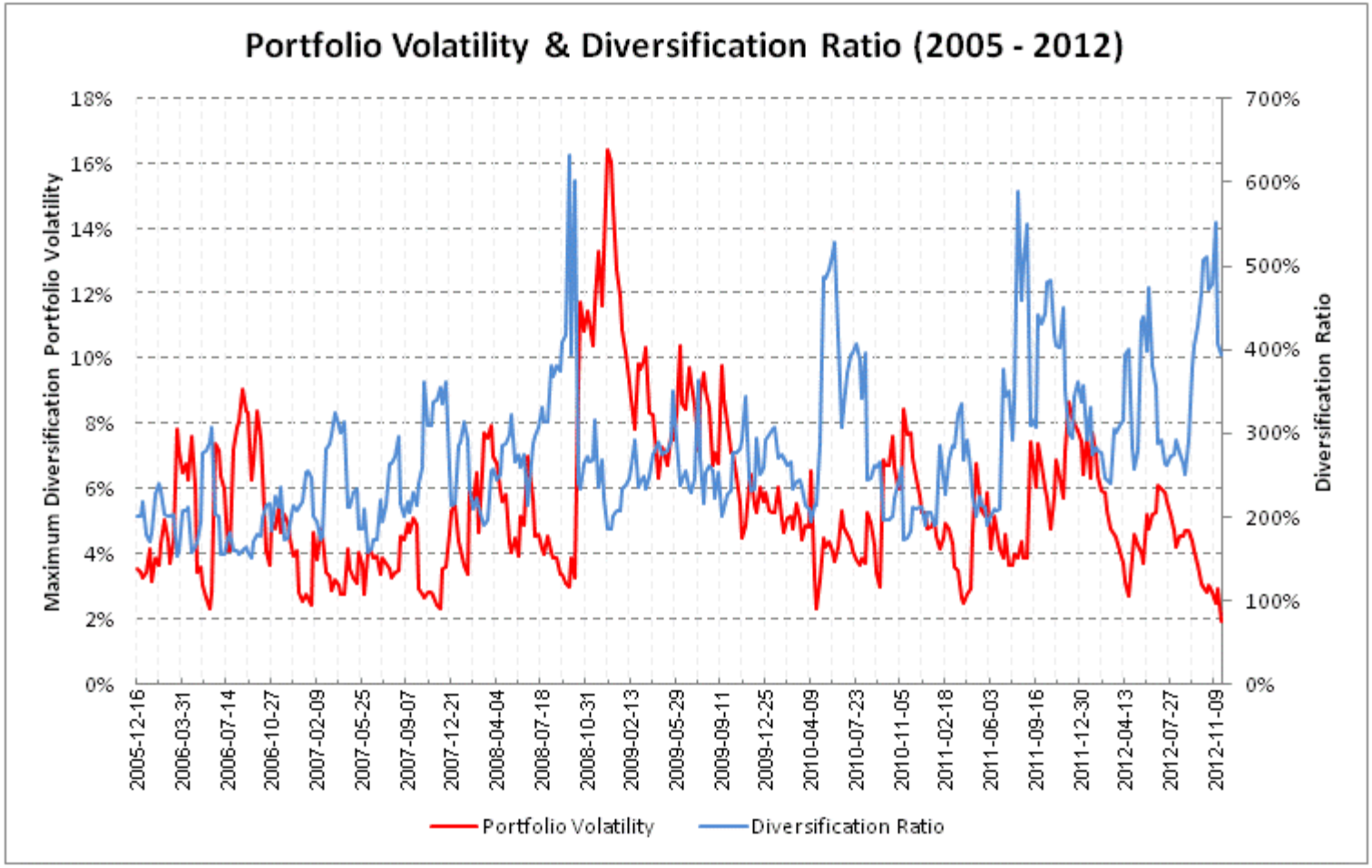
Our Approach

In our example, there is no allowance for transaction costs or brokerage fees. In order to minimize transaction costs, we rebalance the portfolio on a monthly basis, whereas 1-day slippage is included. By applying the maximum diversification approach, it is absolute necessary to determine the weightings of each asset class on a regular basis, since the correlation among asset classes is not stable over time. We have used a rolling variance/co-variance matrix to determine the optimal diversification weights.

If we have a look at the diversification benefits this portfolio has utilized in the past (Chart 1), we can see that the diversification ratio reached a maximum score of 6, meaning that the overall portfolio risk was reduced by 500 percent. In this specific time period, the correlation among the underlying asset classes was extremely low.

On average, the overall risk (Chart 1) within the portfolio was reduced by a factor of 2.7, while the minimum diversification factor had been 1.5 in September 2006. Apart from 2008, where the financial crisis hit the markets, the portfolio volatility itself swung between 2 and 9 percent, whereas the average volatility is around 5.5 percent. Since it is possible to put the most weight to each underlying asset class without increasing the total portfolio volatility, the expected returns of each security and thus the expected return of the portfolio remains unchanged.

Chart 1: Portfolio Volatility & Diversification Ratio (2005 – 2012)



The weighting of each asset class is mainly driven by its diversification characteristic

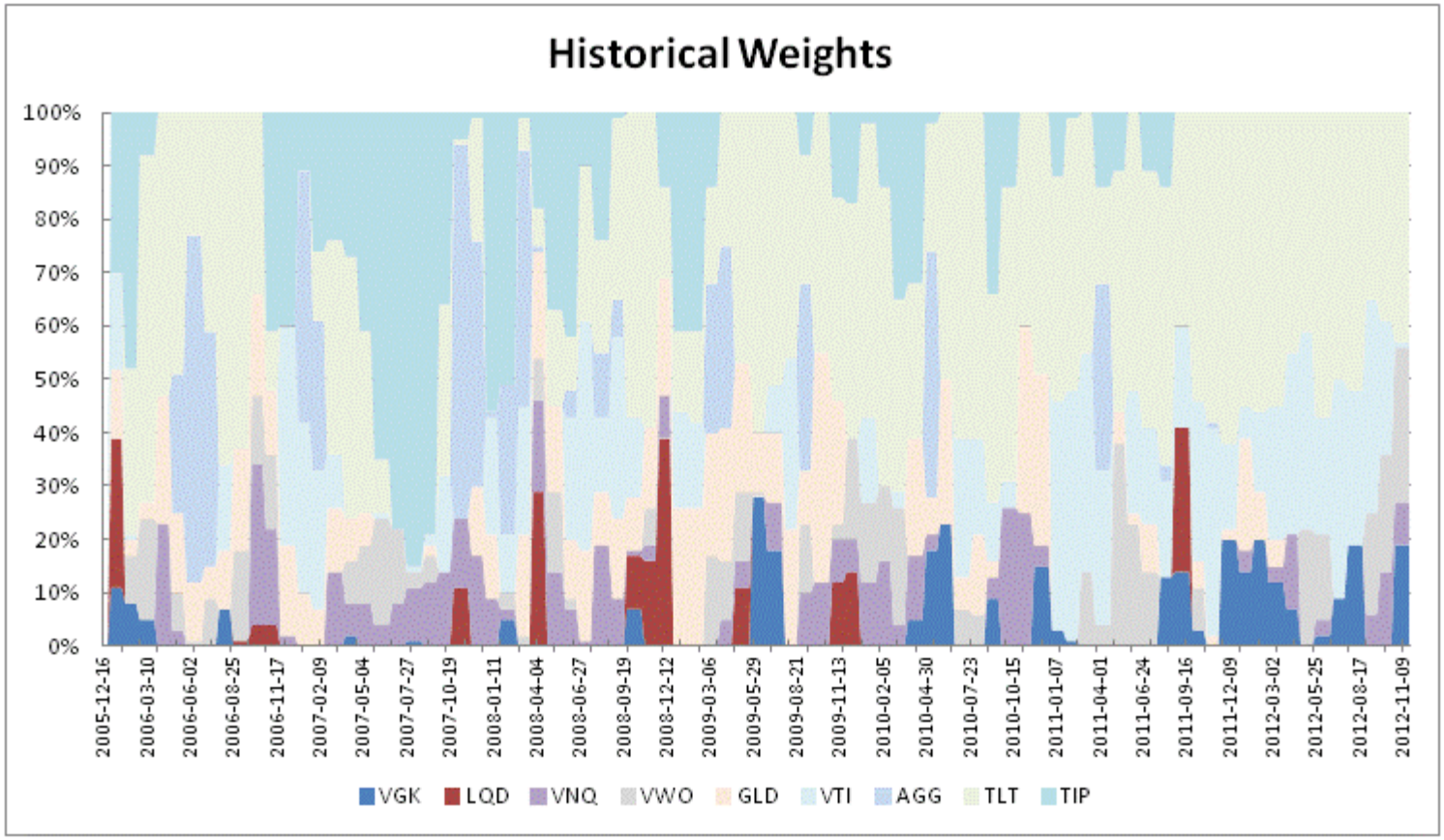
Another interesting fact is that the weighting of each asset class (Chart 2) is mainly driven by its diversification characteristic. In other words, if the correlation coefficient of an underlying security increases, the less weighting it will receive, since its diversification benefits are decreasing (according to the diversification factor).

Therefore it can be possible, that certain high correlated securities will have no weight at all, or the other way round. As a result of this, it can be theoretically possible, that equities have a higher weighting than bonds, in times when the correlation coefficient of stocks to the overall portfolio tends to be lower than bonds.

That is one of the main advantages versus the risk parity approach, where every asset class has the same contribution risk, whatever the correlation of those looks like!

Another main advantage of this "All Weather Portfolio" over a risk parity strategy is the fact that it does not need leverage to achieve an attractive return profile.

Chart 2: Historical Weights



The maximum diversification approach vs. S&P 500

Since we have only focused on risk and portfolio weightings so far, we would like to examine how this portfolio has performed so far versus the S&P 500 (IVV).

Table 1 is showing the results from December 16th, 2005 until Nov. 11th, 2012 (including one day slippage). The first column tests the maximum diversification approach while the second on represents the S&P 500.

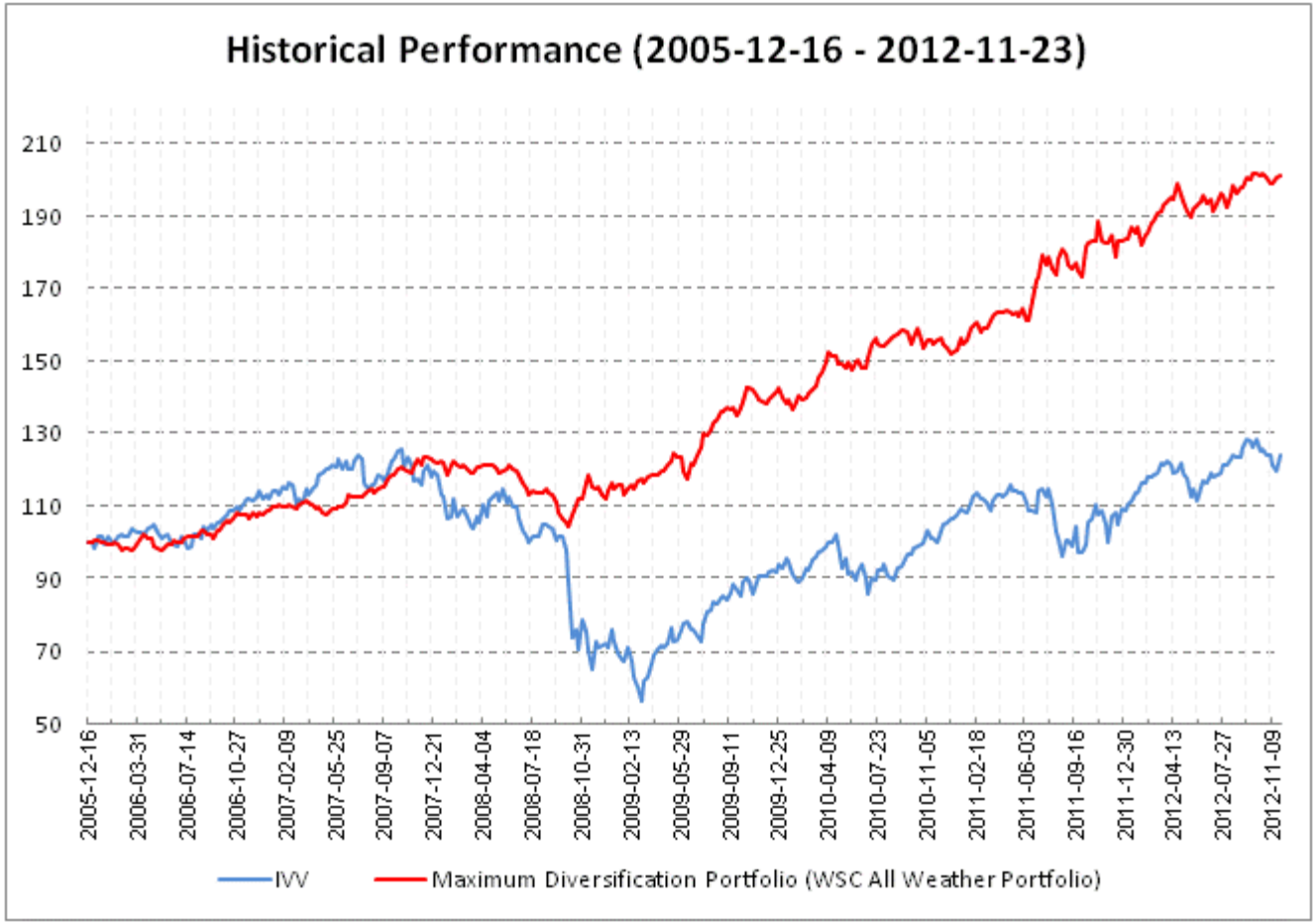
The maximum diversification approach has an annualized return of 10.6% while the S&P 500 (IVV) has only generated an annualized rate of return of 3.2%. More importantly, on a risk-adjusted basis (Sharpe Ratio), this "All Weather Portfolio" is strongly outperforming the broad benchmark.

However, it was only slightly underperforming the S&P 500 (IVV), when equity markets have been in a strong bull market (2006).

Performance Ratios (2005-2012)		
	MDP	IVV
Annualized Return	10.6%	3.2%
Annualized Std Dev	8.9%	20.6%
Annualized Sharpe (Rf=3%)	0.825	0.005
Max. Drawdown	-16%	-55%
Worst Week	-3.2%	-17.0%
Best Week	4.6%	12.0%

Table 1

Historical Performance (2005-12-16 to 2012-11-23)



Comparison of the diversification benefits

If we have a closer look on the diversification benefits (reducing risk during turbulent market conditions), we can see that this amazing portfolio construction approach has also shown significant lower draw-downs in the past.

The maximum draw down for the so called "All Weather Portfolio" was only 15.6 percent, compared with 56.2 percent for the S&P 500 (IVV). That makes roughly 3.5 times more.

In total, the maximum diversification portfolio was reaching a new high after 76 weeks while the S&P 500 (IVV) is still struggling to reach its latest high in 2007.

Largest Drawdowns MD Portfolio [2005-2012]

	From	Trough	To	Depth	Length	To Trough	Recovery
1	12/06/2007	10/02/2008	05/14/2009	-15.7%	76	44	32
2	05/21/2009	06/11/2009	07/09/2009	-5.7%	8	4	4
3	11/10/2011	12/08/2011	03/01/2012	-5.4%	17	5	12
4	04/26/2012	05/17/2012	09/13/2012	-4.7%	21	4	17
5	10/29/2009	01/21/2010	03/11/2010	-4.6%	20	13	7
6	10/21/2010	12/23/2010	02/10/2011	-4.4%	17	10	7
7	04/20/2006	05/18/2006	08/10/2006	-4.3%	17	5	12
8	08/25/2011	09/29/2011	10/06/2011	-4.2%	7	6	1
9	03/29/2007	05/03/2007	06/21/2007	-3.3%	13	6	7
10	07/14/2011	08/04/2011	08/18/2011	-3.3%	6	4	2

Largest Drawdowns IVV ETF [Weekly Basis 2005-2012]

	From	Trough	To	Depth	Length	To Trough	Recovery
1	10/19/2007	03/06/2009	no new high	-56.2%	258	71	
2	07/20/2007	08/03/2007	10/05/2007	-7.7%	12	3	9
3	05/12/2006	07/14/2006	09/29/2006	-6.8%	21	10	11
4	02/23/2007	03/16/2007	04/20/2007	-4.7%	8	4	4
5	06/08/2007	06/22/2007	07/13/2007	-2.2%	6	3	3
6	01/20/2006	01/20/2006	02/24/2006	-2.0%	6	1	5
7	12/30/2005	12/30/2005	01/06/2006	-1.6%	2	1	1
8	12/22/2006	01/05/2007	01/12/2007	-1.2%	4	3	1
9	03/24/2006	03/31/2006	04/21/2006	-1.0%	4	2	2
10	11/03/2006	11/03/2006	11/10/2006	-1.0%	2	1	1

The bottom line

This asset allocation approach is perfectly suitable for investors who are searching for compound returns instead of a strategy that tries to capture every gain when equity markets are strong

The maximum diversification approach is a perfect tool if investors are searching for a highly diversified portfolio, which tends to perform reasonably well in every market environment.

Since it can fully utilize the benefits of diversification, so then the portfolio is able to reduce draw-downs considerably, especially in times of market turbulence.

Therefore this asset allocation approach is perfectly suitable for investors who are searching for compound returns instead of a strategy that tries to capture every gain when equity markets are strong. Nevertheless, the outcome of the strategy depends mainly on chosen asset classes, as this investment strategy allocates the most to those ETFs that have the lowest correlation coefficient.

Thus, please bear in mind that any approach is only as good as the expected future value of its underlying asset classes as well as their future diversification characteristics.

Interested In Diversified Market Timing? We Would Recommend You To Consider The Following Steps:

Get Familiar With The Principles Of WallStreetCourier.com

☑ **The Most Diversified Portfolio (WSC All Weather Portfolio) is being updated on a regular basis on our website.**

☑ **Download And Read Our Free Publications:** This is the best way to get familiar with our investment philosophy and our technical market indicators!

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- **The "E-Book of Technical Market Indicators 2.0"**
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