

Structural Diversification for All Seasons

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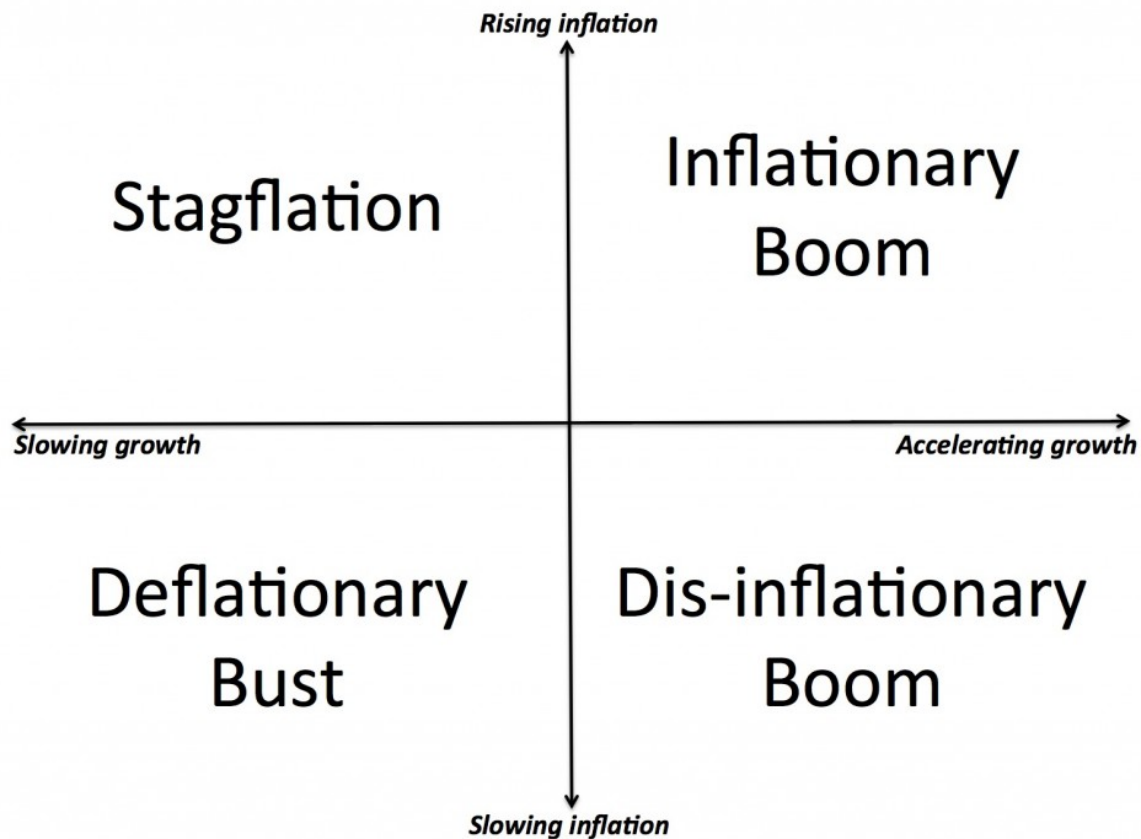
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Now that we are hip deep in our Dynamic Asset Allocation for Practitioners series (Parts [I](#), [II](#) and [III](#)), it's become evident that we may have skipped over some fundamental concepts in our rush to explore the more juicy material. This next series of posts is intended to lay the groundwork for how we think about the broader asset allocation problem. First, we start with a coherent formulation of the traditional 'policy' portfolio, which is intended to accommodate the more strategic approach of a typical institution.

For those managers who are charged with defining a policy portfolio, it is important to consider the sources of risk premia in a framework of structural diversification so that the portfolio is well balanced in its response to all possible economic regimes. In our observation, the ubiquitous 60/40 policy portfolio (60% stocks / 40% bonds) is really only suited to one of the four economic regimes that the world is likely to experience over the typical institutional investment horizon, which lasts several decades. While it was uniquely well suited for the disinflationary growth period experienced from 1981 through 2000, it proved relatively ineffective during the inflationary boom period from 2003 – mid 2008. Also, while one must admit that the world's central banks' attempts to re-catalyze a 'boom' regime has done wonders for select equity markets, we have not yet seen how this cycle ends – with a whimper, or with a bang.

But first, what do we mean by 'economic regimes'? Generally we can say that the global economy is defined by four regimes, each of which combines a growth vector with an inflation vector. A period of accelerating growth in combination with rising inflation might be termed an 'inflationary boom', while a combination of accelerating growth simultaneous with falling inflation might be represent a 'disinflationary boom'. On the other side of the axis, a period of slowing growth combined with rising inflation is often termed 'stagflation', and finally we might call a period of decelerating growth concurrent with falling inflation a 'deflationary bust'.

Figure 1. Four Economic Regimes



Structural diversification relates to the fact that different *types* of assets react in different but logical ways to each of the different economic regimes. The behavior of these assets in response to economic regimes is structural because of the inherent pricing mechanics embedded in each asset, as described in Figure 4.

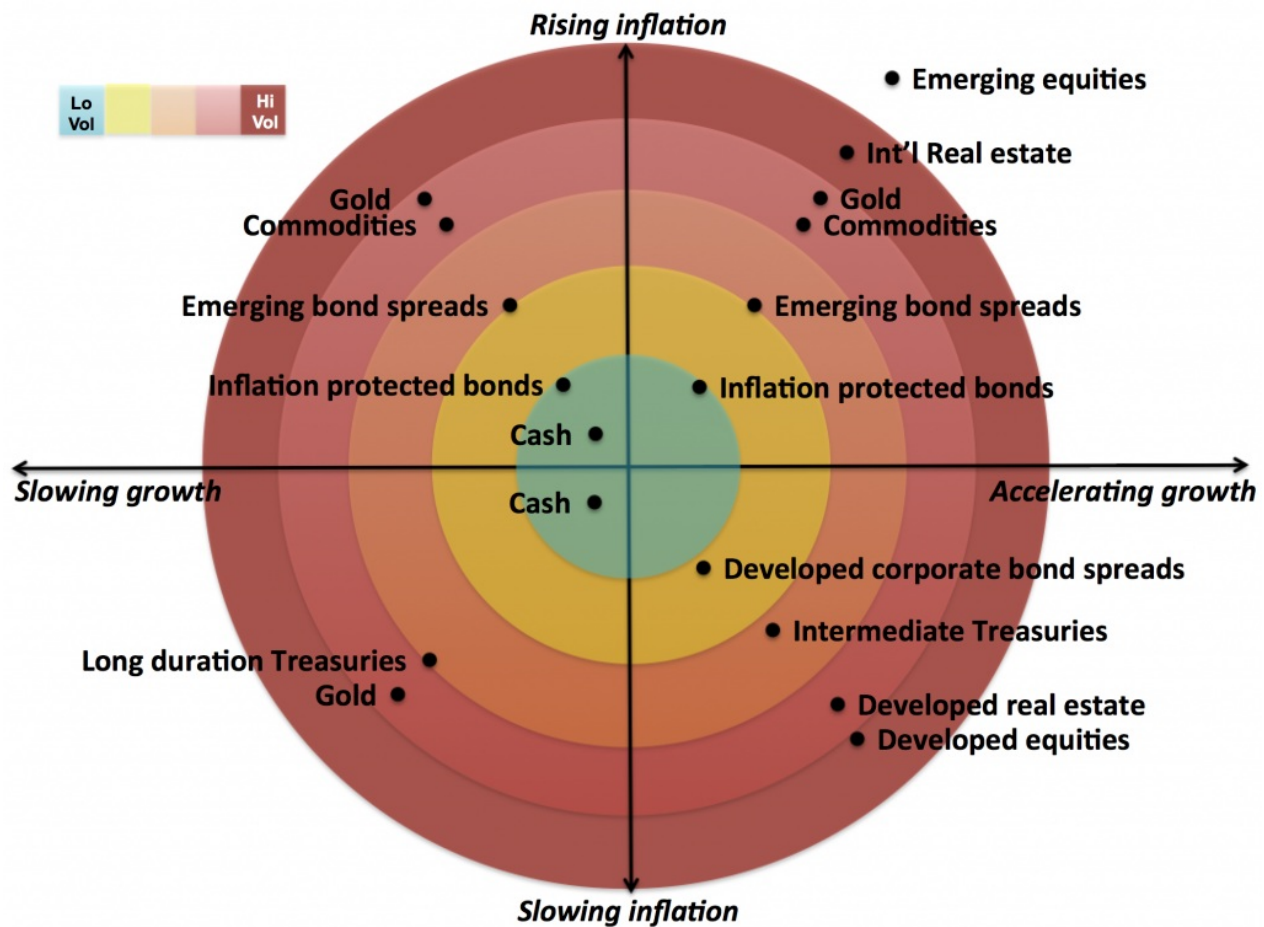
For example, interest rates respond predictably to inflation. When inflation is expected to decline, interest rates will soon follow, which causes bond prices to rise. When inflation is rising in response to monetary policy actions, gold, real estate and commodity prices will hold their value relative to a weakening currency. In nominal terms it will seem to investors like the prices of these assets are rising. Meanwhile bond prices will decline as rates rise, though coupon payments often materially outweigh this drop in prices.

Developed market equity prices react to declining inflation expectations – which means lower discount rates – but they react more profoundly to economic growth, which generates growth in corporate earnings and book values. Low inflation also means lower industrial and labor input costs, which fattens profit margins.

On the other end of the spectrum, during periods of surging global growth that are accompanied by rising inflation expectations, emerging market stocks will tend to dominate. This has much to do with the fact that many emerging economies supply the commodities that are consumed during a global boom, while commodity prices are rising on the back of strong demand and rising inflation expectations.

Lastly, during periods like the Great Depression, there are negative GDP prints coupled with price deflation so that cash preserves its value relative to other goods and assets, while low and declining interest rates boost long duration Treasury bond prices. Historically, gold has served a role in this regime as authorities roll out the printing presses in their quest to conquer the prevailing deflationary forces. Figure 2 maps the orientation of asset classes within each of the four regimes along with a concentric heat-map to illustrate where assets fall on the risk spectrum.

Figure 2. Growth | Inflation Axis with Volatility Heat-Map



The simple two-dimensional framework described in Figures 1. and 2., with axes on growth and inflation, is the inspiration behind Harry Browne's Permanent Portfolio, as well as Ray Dalio's now ubiquitous 'All Weather' risk parity concept. Of course, the Permanent Portfolio is much less complicated than risk parity, but there is considerable elegance in its simplicity. As we will see, a very well specified universe can obviate many of the more sophisticated portfolio allocation methods that are required for 'messier' universes.

So how do we translate the framework above into actual portfolio allocations to take best advantage of structural diversification? The first step is to count the number of assets that react favorably to each regime. As a first approximation, each asset might receive equal weight within its individual quadrant. For example, we count four assets in the bottom right (disinflationary growth) quadrant of Figure 2., so each asset in the quadrant would receive $\frac{1}{4}$ or 25% of the capital that is allocated to that quadrant. In the same way, each of the two assets in the lower left quadrant (deflationary bust) would receive 50% of the capital allocated to that quadrant.

The next step is to decide how to weight allocations across each of the four quadrants. To the extent that we are able to assign a relative probability to each regime over our rebalance horizon, we can bias our allocations in favour of some regimes over others. Unfortunately, it is very difficult to know with any confidence which regime we are actually in at any point in time, and much harder still to predict when the regime will change, and the direction of transition. If we were to assume that each of the four regimes is equally likely at any point in time, we might be wise to allocate 25% to each quadrant.

25% of what though? Harry Browne would suggest allocating 25% of total portfolio *capital* to each quadrant in order to replicate his permanent portfolio concept. However, Ray Dalio and advocates of 'risk parity' would suggest that capital allocation within a portfolio often does not calibrate to the actual distribution of *risk* in a portfolio. We will explore this concept in some detail later.

To keep things simple, as a first approximation we will assume that we want to equally distribute *capital* across the four quadrants in order to ensure the portfolio is equally resilient to all four major states of the world via structural diversification. Figure 3. helps to illustrate how one might translate this concept of structural diversification into a well-balanced portfolio of core global asset classes. Note that where gold and commodities are together in a quadrant, we have aggregated them into a single asset class for weighting purposes.

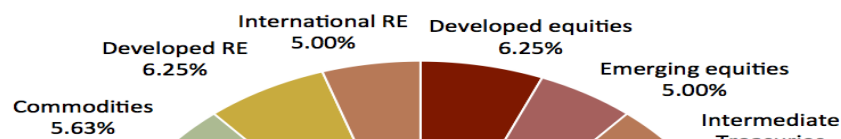
Figure 3. A Portfolio for All Seasons

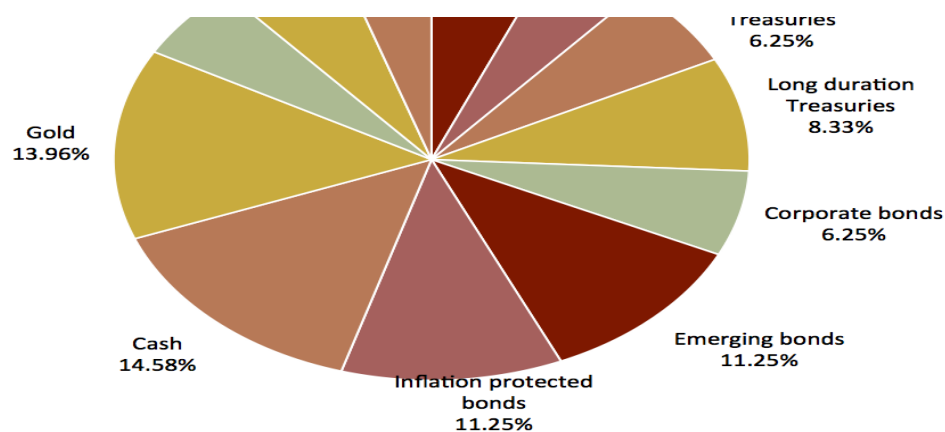
Portfolio Derivation • Economic Regime Allocation

	Inflationary Boom	Dis-inflationary Boom	Deflationary Bust	Stagflation
Regime Probability	25%	25%	25%	25%
Accelerating Growth				
Inflation protected bonds	20%	-	-	-
Developed corporate bond spreads	-	25%	-	-
Emerging bond spreads	20%	-	-	-
Intermediate Treasuries	-	25%	-	-
Gold	10%	-	-	-
Commodities	10%	-	-	-
Developed real estate	-	25%	-	-
Developed equities	-	25%	-	-
Int'l real estate	20%	-	-	-
Emerging equities	20%	-	-	-
Slowing Growth				
Cash	-	-	33%	25%
Inflation protected bonds	-	-	-	25%
Emerging bond spreads	-	-	-	25%
Long duration Treasuries	-	-	33%	-
Gold	-	-	33%	12.5%
Commodities	-	-	-	12.5%
Rising Inflation				
Cash	-	-	-	25%
Inflation protected bonds	20%	-	-	25%
Emerging bond spreads	20%	-	-	25%
Gold	10%	-	-	12.5%
Commodities	10%	-	-	12.5%
Int'l real estate	20%	-	-	-
Emerging equities	20%	-	-	-
Slowing Inflation				
Cash	-	-	33%	-
Gold	-	-	33%	-
Developed corporate bond spreads	-	25%	-	-
Intermediate Treasuries	-	25%	-	-
Long duration Treasuries	-	-	33%	-
Developed real estate	-	25%	-	-
Developed equities	-	25%	-	-

Allocation Weighted • Target Portfolios (probability weighted)

Developed equities	-	6.25%	-	-
Emerging equities	5%	-	-	-
Intermediate Treasuries	-	6.25%	-	-
Long duration Treasuries	-	-	8.33%	-
Corporate bonds	-	6.25%	-	-
Emerging Bonds	5%	-	-	6.25%
Inflation protected bonds	5%	-	-	6.25%
Cash (T-bills)	-	-	8.33%	6.25%
Gold	2.5%	-	8.33%	3.13%
Commodities	2.5%	-	-	3.13%
Developed real estate	-	6.25%	-	-
Int'l real estate	5%	-	-	-





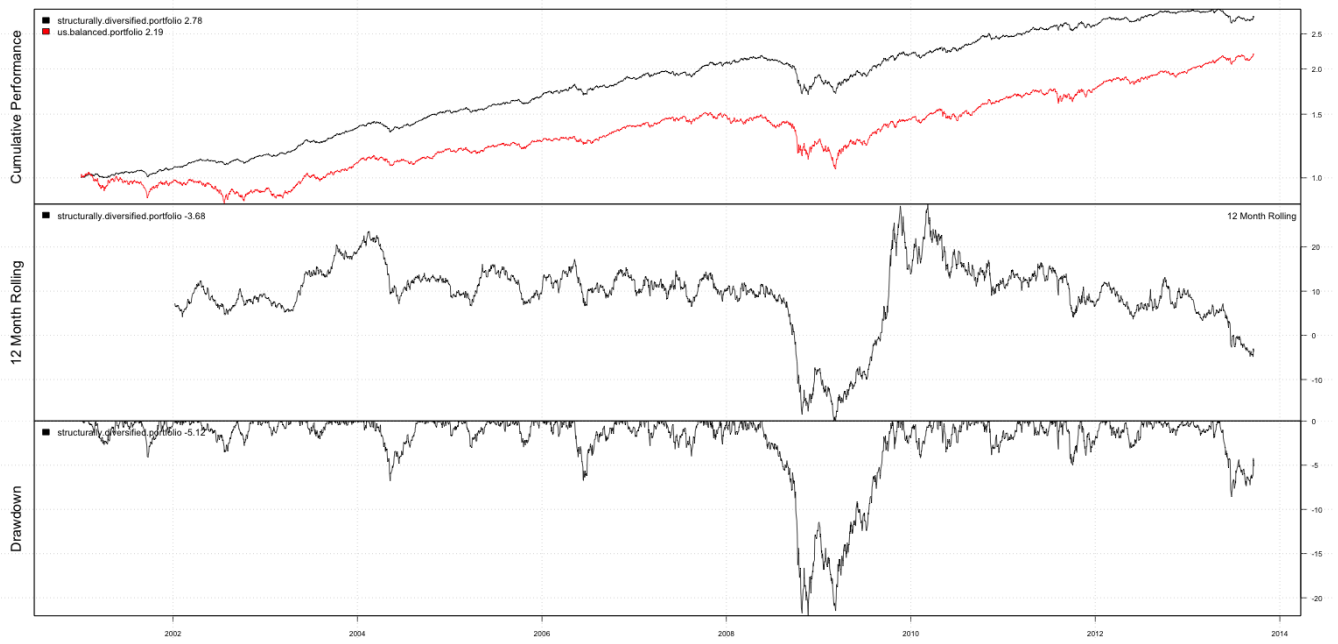
You can see that in this framework, the combination of developed and emerging market equities represent just 12.2% of the total portfolio. Real estate and equities often trade in tandem and demonstrate similar risk characteristics, so if we add the 12.2% from developed and international real estate to the pie, about 24% of the portfolio is allocated to 'equity-like' assets. About 17% is channeled to commodities and gold for their inflation hedging properties (and in the case of gold, its ability to hedge against monetary devaluation as central banks fight deflationary forces).

Meanwhile, the bulk of the portfolio is allocated among various types of fixed income and cash, with Treasuries and T-bills consuming a combined total of 32% of the portfolio. T-bills hedge against both inflation and slowing growth, which validates their relatively large allocation in the portfolio. Inflation protected bonds receive 10% of capital, while emerging and corporate debt together represent 17% to round out the category. Altogether the broad fixed income group ends up with almost 2/3 of the portfolio, though emerging bonds and lower quality corporate credit exhibit equity like properties as well over time.

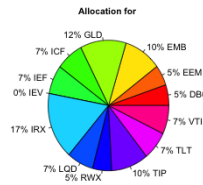
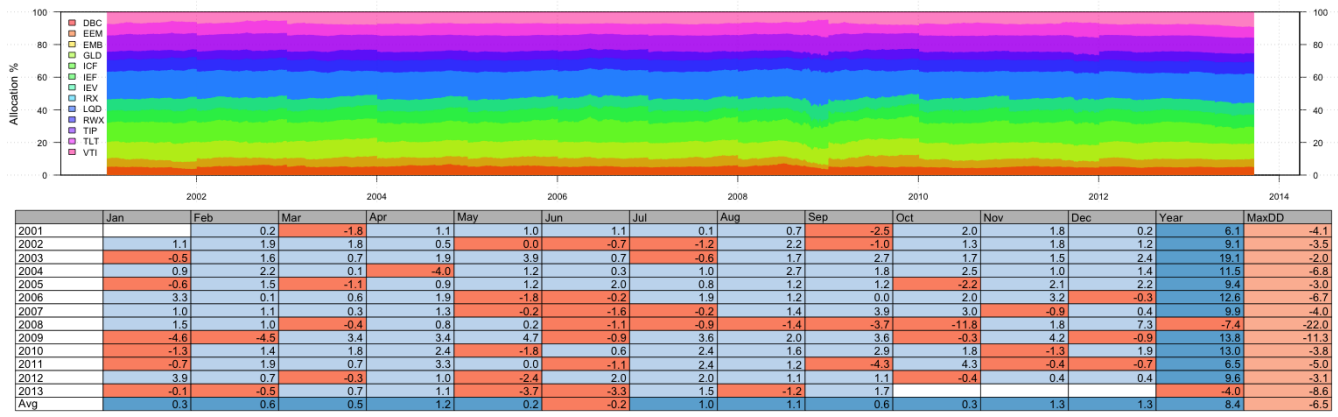
We will show in a later post how this simple framework is a relatively close approximation to what we find from the application of more quantitatively rigorous approaches. The advantage of the structural diversification framework outlined in this article is that it relies on an understanding of the various drivers of asset returns that is consistent with most financial and economic theory. These are excellent qualities so long as assets behave as they theoretically should, and the universe is coherent and thoughtfully diversified. However, managers are often faced with noisy, incoherent universes that have dramatically unbalanced exposures that would seriously impair the effectiveness of this simple approach. Further, risk characteristics and correlations can change quite dramatically through time, and a static allocation like this policy portfolio is unable to respond to these changes. As a result, this portfolio is vulnerable to extreme shocks.

Figure 4 shows the performance of the structurally diversified policy (SDP) portfolio vs. a 60/40 U.S. equity/Treasury portfolio from 2001-present. Note that the Sharpe ratio of the portfolio is about 2x the Sharpe ratio of the balanced portfolio over the period. This is the result of both higher returns in the numerator (8.4% vs. 6.4%) and lower volatility in the denominator (6.8% vs. 10.7%). Further, the drawdown of the balanced portfolio, at 30%, is almost 40% larger than the SDP's drawdown of 22% during 2008. Lastly, the SDP delivered positive performance over 90% of rolling 12-month periods vs. the 60/40 which was positive over just 80% of periods.

Figure 4. Structurally diversified policy portfolio vs. a 60/40 U.S. equity/Treasury portfolio from 2001-present



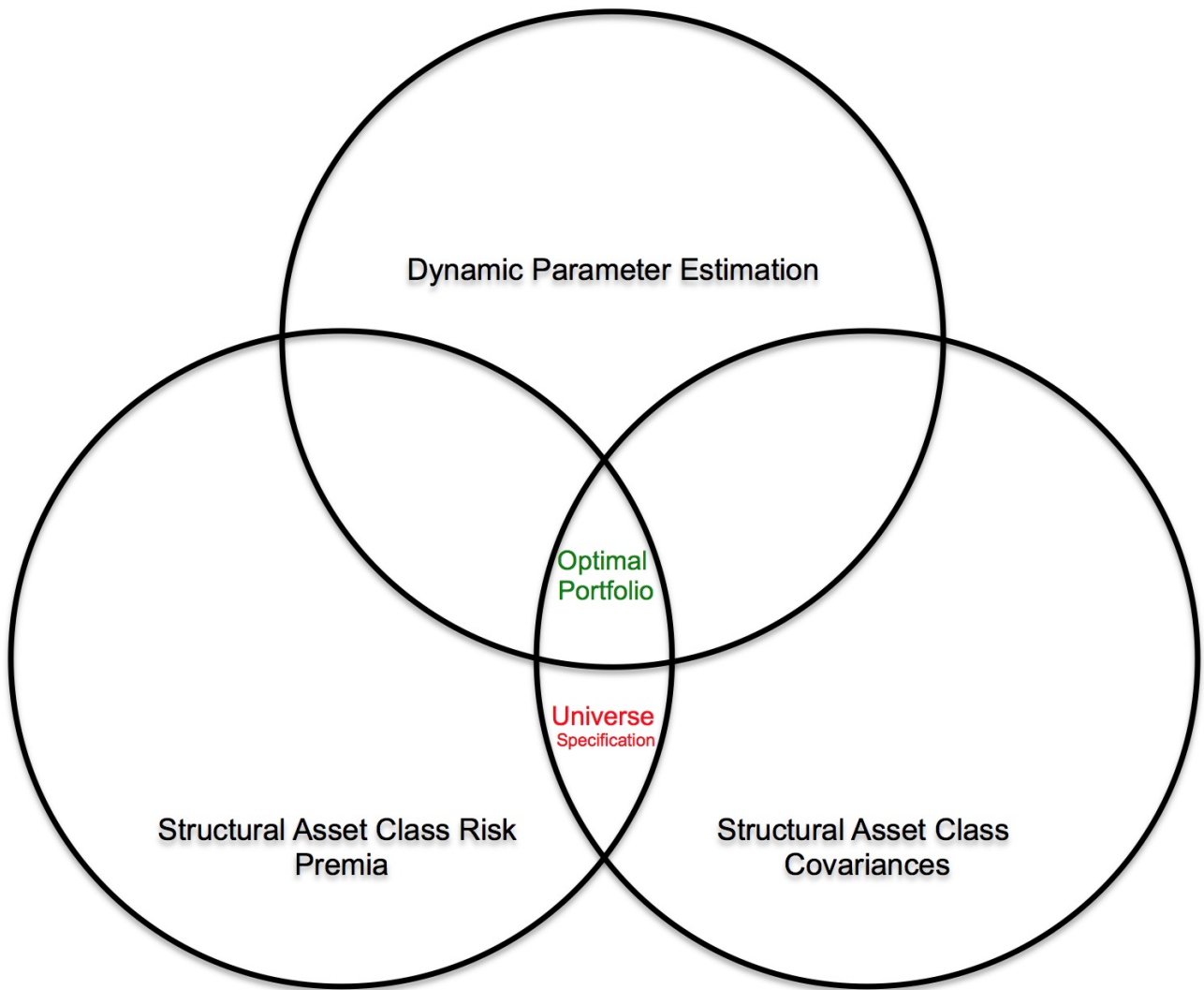
	structurally.diversified.portfolio	us.balanced.portfolio
Period	Jan2001 - Sep2013	Jan2001 - Sep2013
CAGR	8.36	6.35
MaxDD	-22.04	-30.22
MAR	0.38	0.21
Sharpe	0.99	0.48
DVR	0.96	0.42
Volatility	6.76	10.71
AvgDD	-0.88	-1.3
VaR	-0.67	-1.07
CVaR	-1	-1.55
Exposure	99.97	99.97
Pos.12Month	89.85	78.89
Turnover	11.62	11.88



Source: Bloomberg

Bear in mind that the structurally diversified portfolio as proposed is not meant to be a perfect solution. Rather, our intent is to offer a framework for investors to think about the challenge of diversification across major economic regimes. Figure 5. illustrates how a strong fundamental understanding of structural diversification for asset class risk premia can lead to a robust, well specified and coherent asset allocation. However, even the most coherent policy portfolio can be dynamically augmented in response to changing risk, return and diversification properties to create more responsive, optimal portfolios through time.

Figure 5. The Venn of Asset Allocation



In the next few posts we will explore a series of incrementally more sophisticated methods of distributing risk across asset classes. First we will investigate the concept of naive risk parity, where the focus is on each asset's individual risk contribution without regard for its contribution to portfolio diversification. Next we will introduce robust risk parity applications such as Equal Risk Contribution, Minimum Correlation and Maximum Decorrelation, and explore the power of clusters to distinguish between the different sources of risk in the portfolio. We will wrap up this 'prequel' series by demonstrating the power of minimum risk optimization, as well as some heuristic methods with simple but powerful applications.

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