## Market Insight

# Macro-Sensitive Portfolio Strategies

## Macroeconomic Risk and Asset Cash-Flows

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March 2013

## Abstract:

In this paper, the second in a series, we show that cash flows earned by different equity portfolios can respond differently to persistent macroeconomic shocks to real output, and that these differences can emerge over longer time horizons. Portfolios with cash flows that exhibit a greater long-run response to macro shocks can command a higher expected return in the long run. As with any other return, the higher long-run expected return for these portfolios is compensation for risk – in this case, the risk of a persistent shock to trend growth in real GDP.

## Why This Matters:

- Many institutional investors care about the cash flow betas of their investments relative to the state of the economy.
- Significant differences can emerge in cash flow betas over long horizons that are not evident on short horizons.
- These cash flow differences can be important for effective asset allocation.

# Introduction

Over the past five years, investors have encountered a puzzling pattern: although global macroeconomic conditions have improved somewhat, developed economies have continued to experience below trend growth. By contrast, global equity markets have rebounded significantly since the financial crisis in 2008. The contrast between weak economic growth and strong equity market performance has sparked an interest in a deeper understanding of the relationship between macro economic variables and macro risk on the one hand, and asset pricing and asset risk on the other.

In our previous paper in this series, we argued that macro risk is best defined as *a persistent shock to trend growth rates*.[1] Under this definition, the effects of large shocks to the macroeconomy are only revealed over long time horizons. Consequently, to fully understand the impact of such shocks, risk analysts should use asset pricing frameworks that incorporate horizon effects. To accomplish this effectively, we also proposed that analysts should revert to first principles and look at the impact of macro shocks on asset cash flows separately from the impact on discount rates.

This paper focuses on the analysis of the impact of persistent shocks to trend growth on asset cash flows. Our analysis focuses on the US equity market and US real estate (where we use the MSCI USA Real Estate Index as a proxy for real estate). Our interest is whether some parts of the equity market respond differently than others for a given shock to real output. To that end, we consider three distinct types of equity portfolios:

1. Size and style sorted portfolios.
2. Industry portfolios.
3. Strategy portfolios (e.g., Momentum portfolios).

Our principal conclusion is that the cash flows earned by different portfolios can respond differently to persistent shocks to real output, and that these differences can emerge over longer time horizons. For example, conditioned on a positive shock to trend growth in GDP, cash flow growth may be larger for small cap portfolios than large cap portfolios and larger for financial firms than utilities. However, these differences can gradually accumulate over several years following the shock.

The long-run response of asset cash flows to pervasive macro shocks suggests that macro shocks are associated with undiversifiable financial risk. Because asset cash flows respond only over a long horizon, this risk is a *long-run risk*. As with all undiversifiable risk, this risk must be priced. Because portfolios respond differently to macro shocks, they will have different exposures to long-run risk, and consequently have different prices. We will explore asset pricing and long-run returns in the next paper in this series.

# Characterizing Asset Cash Flows

Our interest in asset cash flows is to understand the evolution across time of a persistent shock to trend output. The focus on shocks carrying a long-run impact and the evolution of asset cash flows across time means that we are interested in a dynamic model. The inclusion of several variables means that we are also interested in a multivariate model.

[1] Kurt Winkelmann, Ludger Hentschel, Raghu Suryanarayanan, and Katalin Varga, 2012, "Macro-Sensitive Portfolio Strategies: How We Define Macroeconomic Risk." MSCI Market Insight, November 2012.

The standard statistical toolkit for dynamic models is time series analysis. The vector autoregression (VAR), introduced by Sims (1980a, 1980b), is a common time series approach to multivariate models. This structure says that each variable in the system depends on its own lagged values and the lagged values of all of the other variables. Thus, a one-time shock to one variable in the system can potentially have an impact on all of the other variables in the system for many quarters or years.[2]

Our present analysis investigates the link between portfolio cash-flow growth and the persistent shocks to real output growth for 13 portfolios. We argued in our previous paper that in order to capture persistent shocks to real output growth, we require a long run risk model for real GDP growth. In that paper, we used a vector autoregression (VAR) model with two variables and two lags: the log of real GDP growth, and the log of the Corporate Profits–to–GDP ratio. It is the latter variable that helps to identify the persistent shocks to output growth. In this paper, we further build on this long-run risk model by appending a particular portfolio's log of dividend growth as a third variable in the model. Thus, for each portfolio of interest, we estimate a separate three-variable VAR with two-lags.

Besides the US equity market portfolio, we consider two styles (value and growth), two size portfolios (small cap and large cap), two strategies (momentum and minimum volatility), two cyclical industries (financial services, materials), two defensives (utilities and consumer staples), technology hardware and equipment, and real estate, which we proxy with the MSCI USA Real Estate Index.

Once the parameters in the VARs have been estimated, the VAR models can be used to understand dynamic relationships. The principal analytical tool in a VAR is the *impulse response function*. This family of functions shows the response, across time, for all of the variables in a system, including a shock to one variable, or a combination of shocks. In our analysis, we will focus on the cumulative impact on portfolio dividend growth to a positive and persistent shock to the trend growth of US GDP.

Our impulse response functions portray the term structure of portfolio cash-flow beta with respect to macro risk.[3] Assets that have a low long-term cash-flow beta to trend growth will have impulse responses that tend towards zero. By contrast, assets that have a high positive long-term beta will have impulse responses that are positive, and meaningfully different from zero in the long run. For these assets, contributions to cash-flow growth risk from macro risk will dominate in the long run.[4]

## Cash Flows Vary in Their Response to Economic Shocks

Figures 1-4 show the impulse response functions for portfolio cash flows for the 13 portfolios discussed in the previous section. Each graph shows the cumulative impact on dividend growth conditioned on a persistent and positive macroeconomic shock to trend growth in real output.

Figure 1 focuses on size and style portfolios. The exhibit plots the response of dividend growth for value, growth, small cap and large cap portfolios to a shock to trend growth in real output. For comparison purposes, the impulse response for the market portfolio is also included.

It is evident from Figure 1 that the immediate impact on dividend growth rates is close to zero for all portfolios, and that it is difficult to meaningfully distinguish between the portfolios. Put differently, if

[2] See Appendix A for a more detailed description of VAR models and their use.

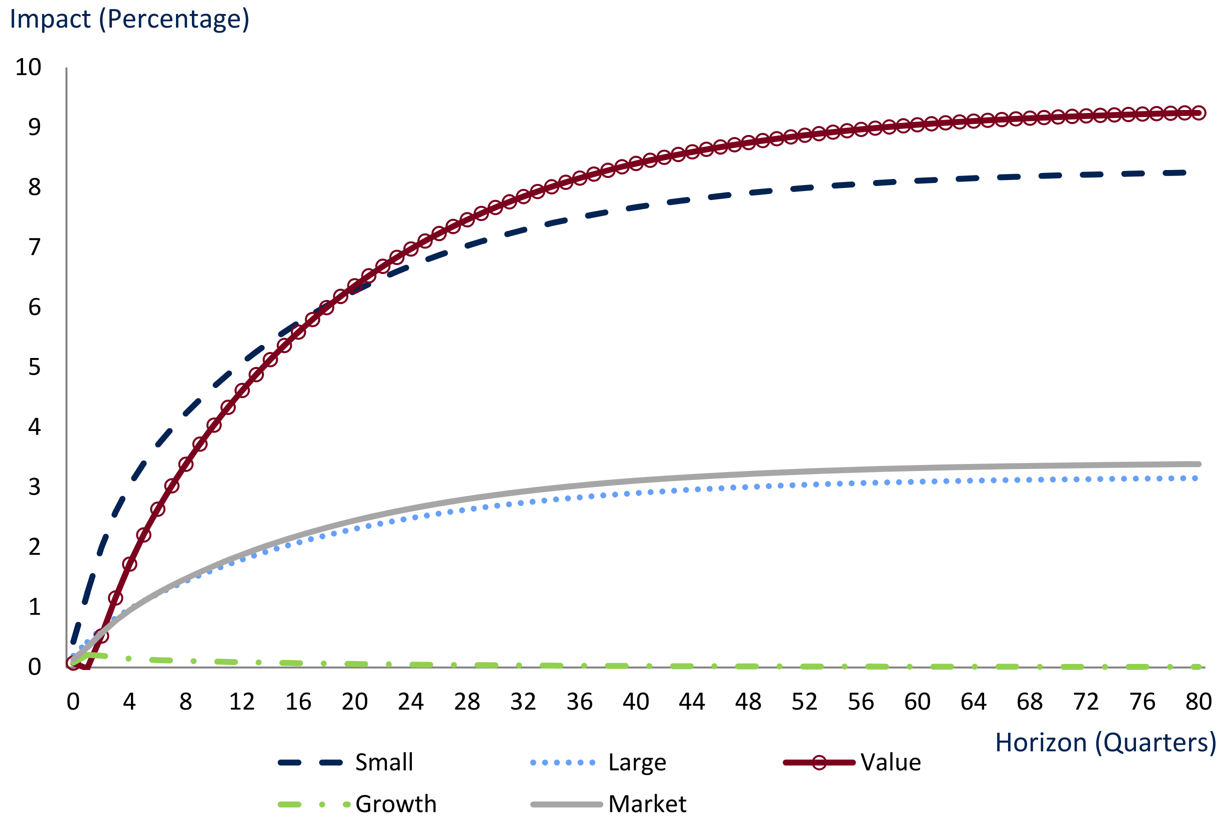
[3] The notion of cash-flow beta is similar to that described in Campbell and Vuolteenaho (2004). They consider a one-period beta, measuring it relative to *market* risk. Following and extending the analysis in Hansen, Heaton, and Li (2008), we measure the betas over different investment horizons, relative to *macro* risk.

[4] The Appendix presents a decomposition of portfolio cash-flows into a long-run component and a short-run component.

real output increases dramatically one quarter, dividends are unlikely to show much of an immediate response, regardless of size and style.

Across time, however, cash flows to the market portfolio grow by roughly the same amount as the original GDP shock and meaningful differences emerge across the size and style sorted portfolios.  After five years (twenty quarters), dividends for the value and small cap portfolios have grown roughly four times as much as those for the market portfolio; dividends for the large cap portfolio have grown at about the same rate as the market portfolio; and the growth portfolio dividends remain unaffected by the positive shock to trend growth.  Thus, value and small cap portfolios have a much higher long-term cash flow beta to macro risk than growth and large cap portfolios.

**Figure 1: Value and Small Cap are More Highly Sensitive to the Real Economy Relative to Growth, Large Cap, and the Market.**

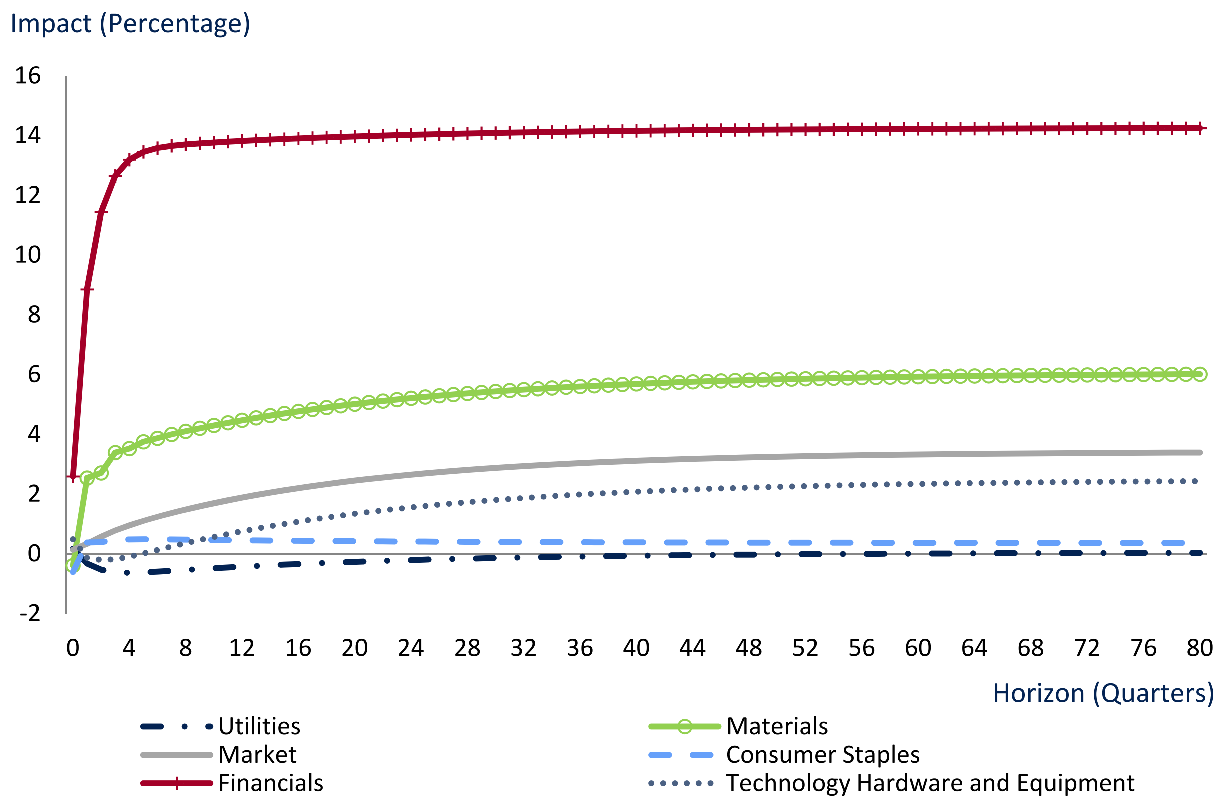



*The Figure depicts the cumulative impact of a 1.5 percent permanent increase in real output on Small Cap, Large Cap, Value, and Growth, and the Market portfolio dividends. The style portfolios are long only, respectively sorted by size and book-to-market. The portfolio dividends are constructed from total return and price return series available from Kenneth French's website.  The impulse responses are based on quarterly data for portfolio dividends, real GDP, and real aggregate corporate profits, from 1950 to 2011.*

Figure 2 shows the impulse responses for the industry-sorted portfolios.  The industries analyzed include financial services, materials, technology equipment, utilities and consumer staples. The chart plots the impulse responses for these five industries and again contrasts the industry responses to the market portfolio.

In common with the size and style portfolios, differences in the responses of dividend growth only emerge after several years. Virtually all portfolios show very little change in dividend growth rates in the quarter immediately following a shock to trend growth. However, by five years (twenty quarters), dividend growth rates are meaningfully different across industries. Cyclical industries such as financial services and materials show a persistently high dividend growth rate that exceeds that of the market portfolio, and these industries exhibit a high cash-flow beta.[5] By contrast, dividend growth rates for defensives such as utilities and consumer staples show virtually no change, with a nearly zero cash-flow beta. Finally, dividend growth in technology equipment mirrors the market, albeit at a slightly lower rate[6].

**Figure 2: Cyclicals Carry Higher Economic Exposure Relative to Defensives and to the Market.**




*The chart depicts the cumulative impact of a 1.5 percent permanent increase in real output on the MSCI USA Utilities, Consumer Staples, Materials, Financials, and Technology Hardware and Equipment Index, and the Market portfolio dividends. The impulse responses are based on quarterly data for each industry portfolio dividends, real GDP and real aggregate corporate profits, from 1995 to 2012.*

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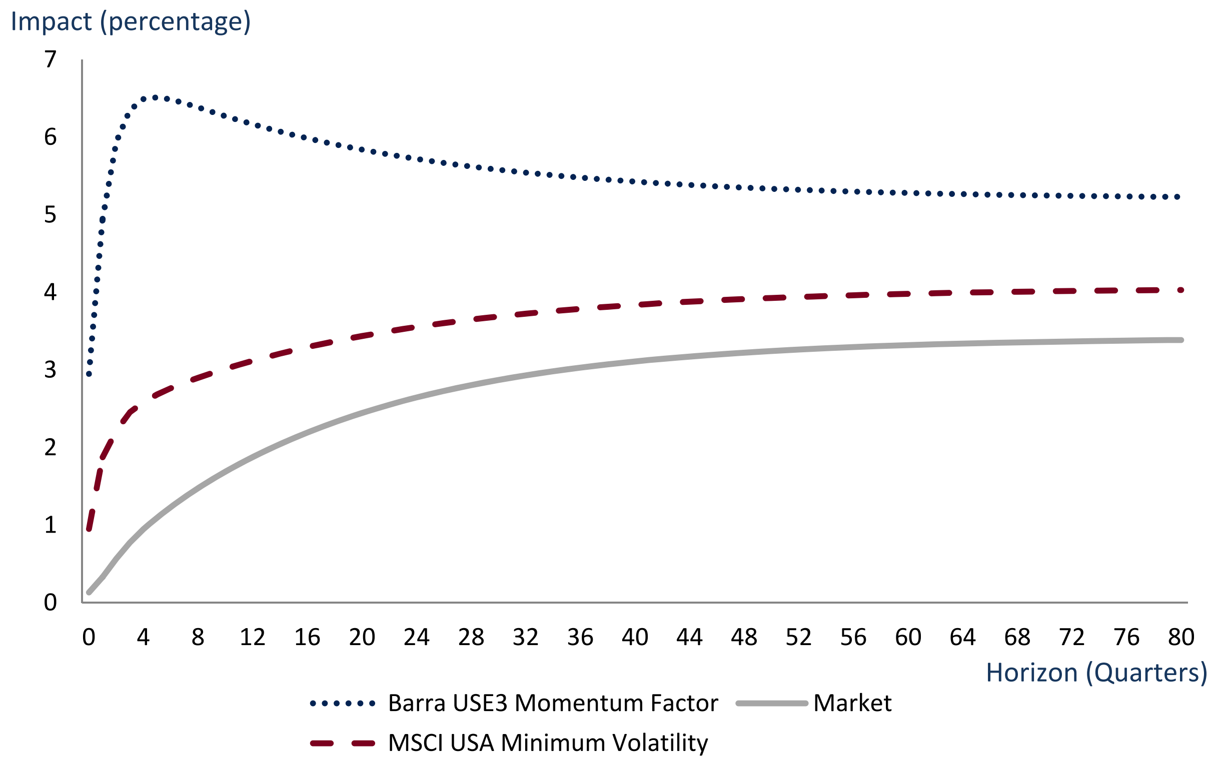
[5] The global recession and financial crisis of 2008 are important events in our sample and had dramatic effects on financial service firms. The true long-run response of dividend growth for financial firms, estimated from a much larger sample with less influence from financial crises, may be less dramatic than we show in the figure. This is especially true if financial firms generally employ less leverage than was common immediately before the financial crisis.

[6] Figure 6 in Appendix B shows the impulse responses for additional sectors: Consumer Discretionary, Energy, Information Technology, Health Care, Telecommunication Services, and Industrials. These responses exhibit a similar pattern: differences across industries emerge over longer horizons. In particular, Health Care and Telecoms dividends exhibit a lower response in the long run relative to Market. The Industrials dividend growth response more closely mirrors that of the market over longer horizons, although at a lower rate, Consumer Discretionary dividend growth is more responsive relative to market.

Figure 3 plots the impulse response functions for the two strategy portfolios, momentum (long/short) and minimum volatility. As with the other exhibits, the responses of the two strategy portfolios are compared to the market portfolio. Again, quite pronounced differences with the market portfolio emerge over longer time horizons. Just like the value and small cap portfolios, both minimum volatility and momentum portfolios have a high long-term beta with respect to trend growth.

What is different about the two strategy portfolios, however, is the immediate short-term effect a shock to trend growth of GDP has on dividend growth. In these cases, a shock to trend growth leads to a relatively fast increase in dividend growth rates. In other words, the two strategy portfolios seem to have a high beta to real economic growth over both short and long horizons.

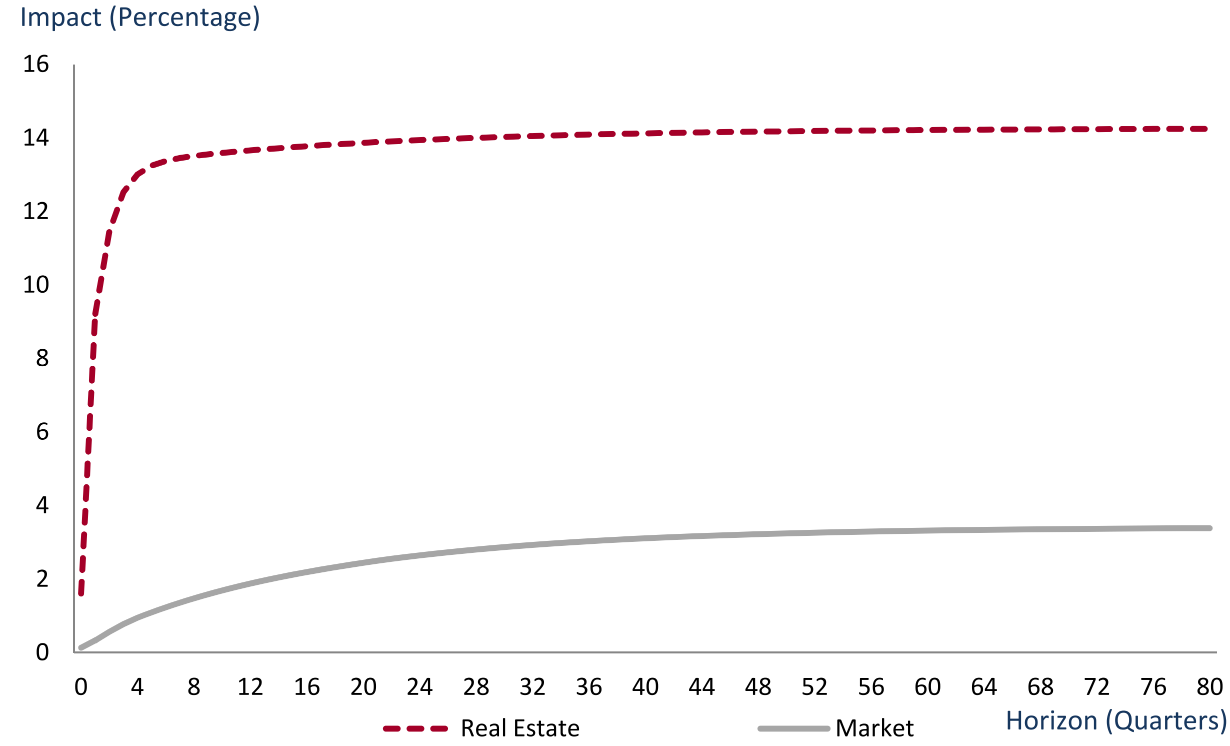
**Figure 3: Strategy Portfolios are Exposed to Economic Trend Growth Shocks.**




*The chart depicts the cumulative impact of a 1.5 percent permanent increase in real output on the Barra USE3 Momentum Factor portfolio, and the MSCI USA Minimum Volatility Index, and the market portfolio dividends. The impulse responses are based on quarterly data for each portfolio dividends, real GDP, and real aggregate corporate profits, from 1998 to 2012.*

The final set of impulse response functions are shown in Figure 4. This chart plots the response of dividend growth in equities and real estate conditioned on a shock to trend growth. Real estate cash flows are modeled here as listed real estate cash flows. As is evident from Figure 4, equity market and real estate cash flows differ meaningfully in their responses to shocks to trend growth, and these differences are evident over both short- and long-horizons. This chart can be interpreted as saying that real estate cash flows exhibit a higher economic exposure relative to equity cash flows.[7]

**Figure 4: Real Estate Exhibits High Sensitivity to the Real Economy.**




*The Figure depicts the cumulative impact of a 1.5 percent permanent increase in real output on the MSCI USA Real Estate Index, and the Market portfolio dividends. The impulse responses for Real Estate are based on quarterly data for the MSCI USA Real Estate Index dividends, real GDP, and real aggregate corporate profits, from 1995 to 2012.*

## Historically, the VAR Model Has Performed Well

The premise of this paper is that different portfolios can exhibit different cash flows in response to large, unusual shocks to the economy but that these differences may only be observable over longer time horizons. A reasonable question to ask is how well our VAR model fits the historical cash flow responses following large macro shocks.

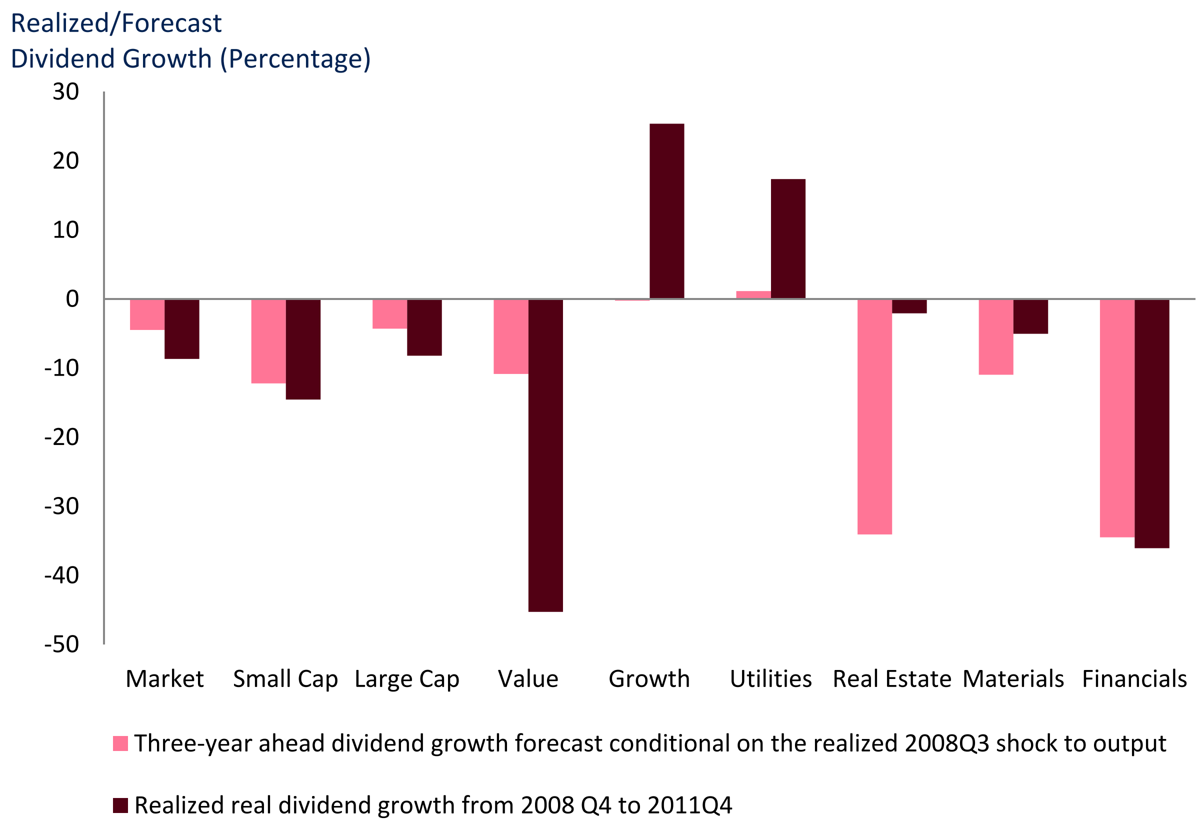
By definition, large shocks do not occur frequently. Moreover, our interest is in the long period following the shocks. Consequently, we are limited in the number of actual experiences that we can use to validate the model using the available sample period.

For the purposes of this paper, we will restrict our comparison to the global economic shock experienced in 2008 and the four years following that shock. Since the macroeconomic shock was

[7] As for financial firms, the sample period of our data may be important for real estate. Because our sample starts in 1995, it omits a prior collapse in real estate but includes the period of the real estate bubble and its collapse around the time of the 2008 global recession. Both of these effects could raise our long-term correlation estimates between real estate cash flows and the real economy beyond the level that would be evident with a longer history.

negative, our model predicts that cash flow growth should also be negative in the four year period following the shock. Figure 5 contrasts the predicted change in cash flow growth with the observed cash flow growth for the period 2008-2012.

**Figure 5: Actual Experience is in Line with the Model.**




*The chart compares, for each portfolio, its realized cumulative dividend growth from 2008Q4 to 2011Q4, to the model forecasted dividend growth, conditional on the realized shock to real output in 2008Q3.*

Figure 5 illustrates that, for the most part, actual cash flow growth was roughly in line with the predictions of the VAR model. The model predicted that dividend growth for the market portfolio would be negative, and it has been. Moreover, the model predicted that small cap dividend growth would be worse than large cap dividend growth, and it has been. Finally, the model predicted that a severe economic contraction would have adverse consequences for dividend growth in financials, which is in line with actual experience.

The biggest differences between the model predictions and actual experience are in real estate, and growth versus value. For real estate, the model predicted a much larger decline in dividends than was actually realized. As discussed above, the real estate equation may be sensitive to the choice of time periods. And real dividends declined by about 30 percent in the year following the shock to real output, followed by a material rebound thereafter as the real estate market recovered. As for dividend growth in value and growth stocks, the model predicted a much less dramatic swing than what was actually observed. The model predicted that dividend growth for value would contract, and dividend growth for growth would be neutral. The actual experience was a much more significant contraction in dividend growth rates for value, and an expansion in dividend growth rates for growth. Overall, though, it is fair to conclude that the VAR model's predictions are mostly in line with the realized values.

## Conclusion

In this paper, we have focused on the impact of macroeconomic shocks to real output on portfolio cash flows. We have shown that the response of portfolio cash-flows to persistent shocks to GDP trend growth (our definition of macro risk) can emerge over long time horizons. Furthermore, we have shown that the responses of various equity portfolios to shocks to trend growth can be quite different over long horizons, even though there are few meaningful differences over short horizons.

Because there are meaningful differences in how asset cash flows respond to macro shocks, we would anticipate differences in long-run returns. In particular, we would anticipate that those assets whose cash flows have a higher long-run beta with respect to economic trend growth should also have a higher long-run return. As with any other return, the higher long-run return for these assets is compensation for an undiversifiable risk – in this case, the risk of a persistent shock to trend growth in real GDP.

To more fully analyze the asset pricing and risk implications of shocks to trend growth, we must complement our analysis of asset cash flows with a similar analysis of discount factors. Discount factors, long-run returns and implications for portfolio risk are the subject of the next paper in this series.

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# Appendix A: Vector Autoregressions (VARs)

Vector autoregression models (VARs) are the common statistical tools used to capture and analyze the joint evolution over time of multiple financial and economic variables.

## Definition

In their most general specification, each variable in the system is related to its lags, and the lags of all the other variables. A VAR model with *n* variables and *p* lags is expressed as:

$$Y_t = \mu + \Phi_1 Y_{t-1} + \Phi_2 Y_{t-1} + \ldots + \Phi_p Y_{t-p} + e_t \qquad (1)$$

where:

- $Y_t$ contains the time *t* observations for the *n* variables of interest stacked below each other. $p$ is the number of lags.
- $\mu$ is the intercept and contains a different value for each element of $Y_t$.
- $(\Phi_k)_{k=1,\ldots,p}$ are the $n$-by-$n$ VAR coefficient matrices. These matrices give the sensitivities of each variable to their own lags and the lags of all the other variables. For example, the first row of each coefficient matrix $\Phi_k$ gives the sensitivities of the first variable to its *k*-th lag (first column) and the *k*-th lag of all the other variables. More generally the *i*-th row and *j*-th column of $\Phi_k$ gives the sensitivity of the *i*-th variable in $Y_t$ to the *k*-th lag of the *j*-th variable.
- $e_t$ is the time *t* model residual and contains a different value for each element of $Y_t$. We assume the model residual to be serially uncorrelated over time.

## Long-run risk model for real output growth

The long-run risk model we use to identify persistent shocks to real output growth also allows us to study the relationship between portfolio cash-flows and the economy. Following Hansen, Heaton, and Li (2008), this model is a VAR with two lags and two variables: the log of real output growth and the log of aggregate real corporate profits to real output ratio.[8]

Formally, we define the dependent variable in the VAR system as:

$$Y_t^* = \begin{pmatrix} g_t - g_{t-1} \\ cp_t - g_t \end{pmatrix} \qquad (2)$$

where $g_t$ is the log of real GDP at time t, and $cp_t$ is the log of aggregate corporate profits at time *t*.

[8] We replace the aggregate real consumption series used in Hansen, Heaton, and Li (2008) by the real GDP series.

The main motivation for including the second variable is that it captures a weak but highly persistent component to real output growth. Indeed, ( $cp_t - g_t$ ) is highly and positively correlated with its own lags. Thus, it helps to identify the persistent shocks to real output growth we are interested in.

### Integrating portfolio cash-flow growth dynamics

Following Hansen, Heaton, and Li (2008), we model the link between portfolio cash-flow growth and real GDP growth, by appending a particular portfolio cash-flow growth as a third variable to the long run risk model (2):

$$Y_t = \begin{pmatrix} Y_t^* \\ d_t - d_{t-1} \end{pmatrix} \qquad (3)$$

where $d_t$ is the log of portfolio dividends.

With two lags, our VAR model can be expressed as:

$$Y_t = m + \Phi_1 Y_{t-1} + \Phi_2 Y_{t-2} + e_t \qquad (4)$$

In addition, we impose the restriction that portfolio dividends do not “Granger-cause” real GDP and corporate profits. This means that surprise changes to a particular portfolio’s dividends do not affect real GDP, nor aggregate corporate profits. On the other hand, portfolio cash-flow growth remain driven by surprise changes to the two other macro variables.

We can implement the Granger causality restriction by constraining the first two rows of the third column of the coefficient matrices $(\Phi_k)_{k=1,2}$ to be zero.

### Identifying a persistent shock to real output growth

VARs can be used to study the impact over time of shocks to a given variable or a combination of variables on all variables in the dynamic system. In order to do this, however, one must identify the shocks of interest. In our case, we want to identify three shocks in the VAR, specified in equation (4), such that:

- One of the shocks captures a persistent shock to real output growth, as our focus is to study the impact of this persistent shock on portfolio cash-flows.
- The second shock has only a transitory effect on real output growth.
- The third shock is a shock to the portfolio dividend growth, unrelated to real GDP growth and corporate profits.
- All three shocks each have a variance of one, and are uncorrelated with each other, so that we can measure the pure impact of each shock (say, the persistent shock).

Unfortunately, the model residuals $e_t$ themselves are not the relevant candidates. In particular, they do not satisfy the third condition, as the elements of $e_t$ are correlated with each other, unless a restriction is imposed.

However, we can find our shocks of interest ( $u_t$ ) to be linear combinations of the model residuals. That is, $u_t$ will be in the form:

$$u_t = Qe_t, \quad (4)$$

for an appropriately chosen matrix $Q$.

One can show that the following choice of $Q$ fits the bill[9]:

$$Q = \left(Chol(B\Sigma_e B')\right)^{-1} B \quad (5)$$

where:

$B = (I - \Phi_1 - \Phi_2)^{-1}$,

$\Sigma_e$ is the covariance matrix of the VAR residuals $e_t$,

$A'$ denotes the transpose of a matrix $A$, and $Chol(A)$ denotes the lower triangular matrix in the Choleski decomposition of matrix $A$.

**Impulse responses**

Once the shocks of interest have been identified, we can assess the cumulative impact of these shocks on all variables in the system, at any horizon. It is convenient to re-write the VAR in its "state-space" form:

$$X_t = \mu + AX_{t-1} + \Sigma u_t, \quad (6)$$

where:

$$X_t = \begin{pmatrix} Y_t \\ Y_{t-1} \end{pmatrix} \qquad \mu = \begin{pmatrix} m \\ 0_{3\times1} \end{pmatrix} \qquad A = \begin{pmatrix} \Phi_1 & \Phi_2 \\ I & 0_{3\times3} \end{pmatrix} \qquad \Sigma = \begin{pmatrix} Q^{-1} \\ 0_{3\times3} \end{pmatrix}$$

$I$ denotes the identity matrix and $0_{n\times l}$ denotes a *n*-by-*l* matrix of zeros.

The cumulative impacts of shocks $u_t$ to all the variables, at horizon *h*, can be compactly extracted from the first three rows and columns of

$$\Gamma_h = \sum_{j=0}^{h} A^{j-1}\Sigma \quad (7)$$

The first column identifies the impact of the persistent shock on all the variables in $X_t$. The second column identifies impact of the transitory shock. And the impact of the shock to portfolio dividend growth is given by the third column.

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[9] This choice of *Q* is similar to one used by Blanchard and Quah (1988) to identify supply and demand shocks in their VAR model for real output and unemployment. Their assumption was that demand shocks carry no long run effect on real output, while supply shocks may affect real GDP in both the short and the long run.

For example, the cumulative impact of the persistent shock to real output growth on portfolio cash-flow growth, at horizon *h*, is given by the third row of the first column of $\Gamma_h$.

## Impulse responses and long run risk dynamics

The "state" space representation (6) and the impulse responses given by (7) allow us to conveniently decompose the process for real output growth and portfolio cash-flow growth in terms of a long-run component and a transitory component. Indeed, following Hansen, Heaton, and Li (2008), one can rewrite real (log) output and (log) portfolio cash-flows as:

$$\begin{aligned} g_t &= \underbrace{\mu_g t + \gamma_g \sum_{\tau=1}^{t} u_\tau}_{\text{Long-Run}} + \underbrace{\alpha_g X_t}_{\text{Transitory}} \\ d_t &= \underbrace{\mu_d t + \gamma_d \sum_{\tau=1}^{t} u_\tau}_{\text{Long-Run}} + \underbrace{\alpha_d X_t}_{\text{Transitory}} \end{aligned} \qquad (8)$$

where $\gamma_g$ and $\gamma_d$ are the limiting impulse responses of real output and portfolio dividends to shocks $u_t$ (impulse responses when the horizon is infinite):

$$\gamma_g = \delta_g \left( \sum_{j=0}^{+\infty} A^{j-1} \Sigma \right) \qquad \gamma_d = \delta_d \left( \sum_{j=0}^{+\infty} A^{j-1} \Sigma \right),$$

with $\delta_g = [1,0,0,0,0,0]$ and $\delta_d = [0,0,1,0,0,0]$

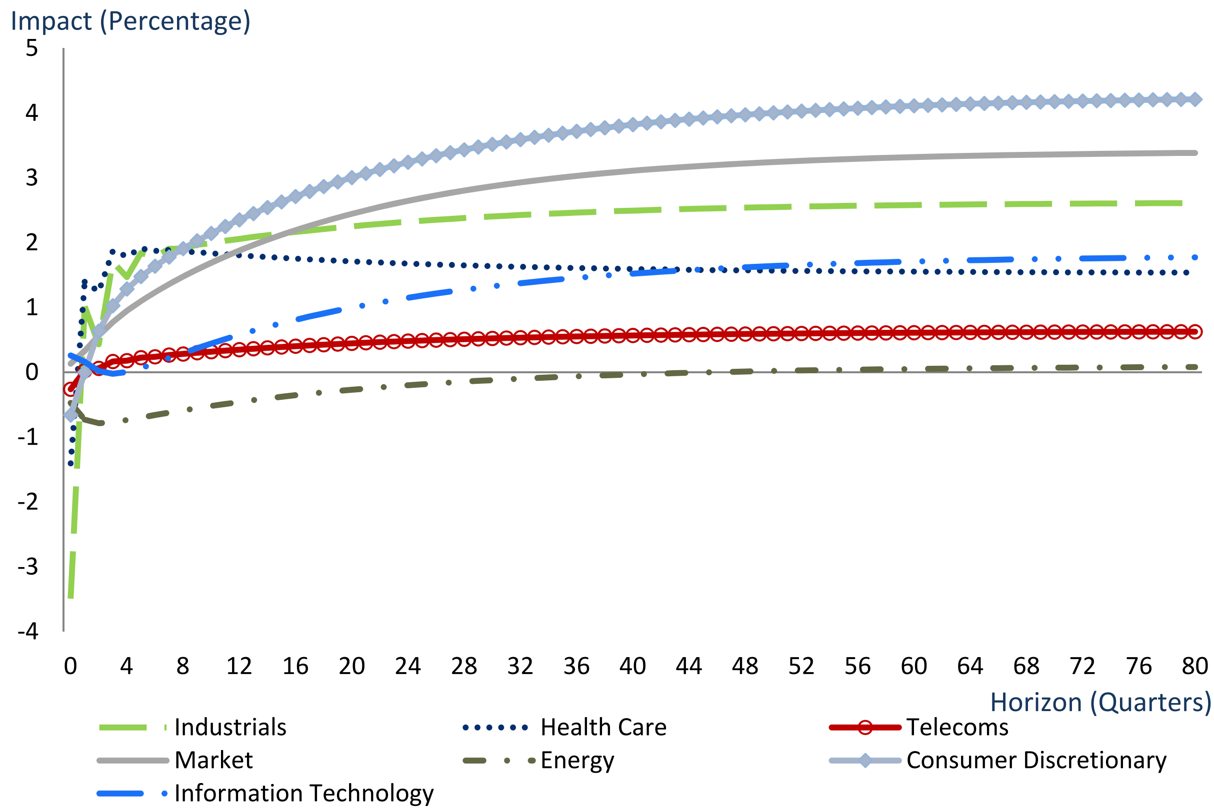
$\mu_g$ and $\mu_d$ are the mean real output growth and portfolio cash-flow growth

$\alpha_g = -\delta_g (I - A)^{-1}$ and $\alpha_d = -\delta_d (I - A)^{-1}$ are the sensitivities to the transitory "state" $X_t$

As time (*t*) grows, and as the residuals $u_t$ are serially uncorrelated, the long-run component explains a larger fraction of the real output and cash-flow growth risk. In this sense, $\gamma_g$ and $\gamma_d$ are measures of long-run risk to real output and portfolio cash-flow growth. Macro risk dominates portfolio cash-flow growth risk in the long run for those portfolios that are sensitive to persistent shocks to real output growth.

# Appendix B: Impact of a Shock to Real Output Trend Growth on Selected MSCI Sector Index Dividends

**Figure 6: Industrials, Health Care, and Telecoms Exhibit Lower Exposure to Trend Growth Shocks Relative to Market over Long Horizons.**




*The chart depicts the cumulative impact of a 1.5 percent permanent increase in real output on the MSCI USA Consumer Discretionary, Industrials, Energy, Information Technology, Industrials, Health Care, Telecommunication Services Index, and the Market portfolio dividends. The impulse responses are based on quarterly data for each industry portfolio dividends, real GDP and real aggregate corporate profits, from 1995 to 2012.*

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The company's flagship product offerings are: the MSCI indices with close to USD 7 trillion estimated to be benchmarked to them on a worldwide basis[1]; Barra multi-asset class factor models, portfolio risk and performance analytics; RiskMetrics multi-asset class market and credit risk analytics; IPD real estate information, indices and analytics; MSCI ESG (environmental, social and governance) Research screening, analysis and ratings; ISS governance research and outsourced proxy voting and reporting services; FEA valuation models and risk management software for the energy and commodities markets; and CFRA forensic accounting risk research, legal/regulatory risk assessment, and due-diligence. MSCI is headquartered in New York, with research and commercial offices around the world.

[1]As of March 31, 2012, as published by eVestment, Lipper and Bloomberg in September 2012. *Jan 2013*