Top-Down Portfolio Implications of Climate Change

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ABOUT QMA

QMA began managing multi-asset portfolios for institutional investors in 1975. Today, we manage systematic quantitative equity and global multi-asset strategies as part of PGIM, the global investment management businesses of Prudential Financial, Inc. (PFI). Our investment processes, based on academic, economic and behavioral foundations, serve a global client base with $120.3 billion in assets under management as of 12/31/2020.

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The physical risks of climate change have potential consequences for long-term investors.

Key Findings

- Environmental changes throughout the remainder of the 21st century will undoubtedly influence economic trends. To assess the top-down impact of climate change for strategic asset allocation, we consider both optimistic and pessimistic scenarios.
- Our analysis suggests that growth-oriented assets, such as equities, would be directly impacted by climate change. This impact is likely to vary significantly across countries, with the most sizable impact expected in certain emerging markets.
- A top-down climate risk-aware portfolio would tilt away from regions and assets that are expected to be adversely affected for better risk-adjusted returns.
- In our globally integrated world of cross-border revenue and supply chain links, we believe that combining both bottom-up and top-down views of the economic impacts of climate change is critical, as this may provide better opportunities for desired portfolio outcomes.

This brief summarizes the research paper with the same name by Yesim Tokat-Acikel, PhD; Marco Aiolfi, PhD; Lorne Johnson, PhD; John Hall, CFA and Jessica (Yiwen) Jin.

Please also see PGIM's megatrends white paper: "Weathering Climate Change: Opportunities and Risks in an Altered Investment Landscape." www.pgim.com/megatrends/climate-change

Introduction

The macroeconomic implications of the physical risks of climate change are expected to lead to adverse growth outcomes for investors. In our analysis, we find that certain asset classes and countries are more vulnerable than others.

Countries that face more material environmental challenges face higher physical risks of climate change. The costs of dealing with these risks will be borne by local economies and societies. It is generally accepted that the Energy, Utilities, Materials and Industrials sectors will feel the greatest impact. Demand-side shocks could be related to mortality or growth impacts of climate change, particularly over the longer term. Such shocks are not always easy for central banks to disentangle from the business cycle, which can make them more difficult to respond to.

Study Design

To gauge the impact climate change will have on widely-held asset classes, we incorporate the impacts of both optimistic and pessimistic climate change scenarios into QMA's long-term Capital Market Assumptions (CMAs). Since our CMAs have a 10-year horizon and the impacts of climate change are expected to be much longer, we supplement our current process with steady-state estimates for asset class returns to produce long-term assumptions.

Asset Class Implications

Equities

Our models predict both slowing earnings growth and weaker equity returns in both the US and Japan in the pessimistic climate scenario. However, European equity returns are expected to be modestly positive. Compared to developed markets, the impact of climate change on emerging markets equity returns has larger cross-sectional variation. With already elevated temperatures, future global warming in India is forecast to have a significant negative impact on equity returns over the long term. Brazil and South Africa are also expected to be negatively impacted. China and Taiwan may experience more modest drags, while the effect in Korea is mixed. Aggregating the impact across all emerging market countries by market capitalization reveals a net negative impact.

Fixed Income

Climate change is expected to cause significant long-term global macroeconomic impact in the pessimistic climate scenario. We expect both US and global fixed income indexes to experience climate shocks through corporate credit channel. As a result, high yield bonds have lower returns in the climate scenario than in our long-term CMAs. Investment grade and aggregate bonds also have lower returns, though they are impacted more modestly.

Real Assets

Mitigation responses to climate change are likely to affect individual commodities in different ways at the micro level. For example, certain industrial metals that are used in green energy production will likely command higher prices, while fossil fuel prices will likely suffer from low demand alongside wider use of electric cars. Individual Real Estate Investment Trusts (REITs) may face varying levels of physical risk from climate change based on their location. There is no impact on (Treasury Inflation-Protected Securities) TIPS in our pessimistic climate change scenario.

Portfolio Allocation

We focus on a growth-oriented investor benchmarked against a policy portfolio consisting of 70% equities, 20% fixed income and 10% real assets. After adjusting return and volatility expectations to incorporate the impacts from climate change, our optimizer increases the developed markets ex-US position, while reducing the allocation to emerging markets equities, as shown in Figure 1, below.

Figure 1. Optimal Portfolio in Optimistic and Pessimistic Scenarios for a Growth-Oriented Investor

	Optimistic Portfolio	Pessimistic Portfolio	Diff
US Equities	40.00%	40.00%	0.00%
Developed International x USA Equities Unhedged	10.00%	18.00%	8.00%
EM Equities Unhedged	13.00%	5.00%	-8.00%
US AGG	25.00%	25.00%	0.00%
US TIPS	4.00%	4.00%	0.00%
US Reits	7.00%	7.00%	0.00%
Commodities	1.00%	1.00%	0.00%

Source: QMA. As of Mar 9, 2021. Notes: Benchmark policy portfolio has 45% US stocks, 15% developed ex-US stocks, 10% emerging markets stocks, 20% US aggregate bonds, 2% TIPS, 5% REITs, 3% commodities. We allow for +/-5% deviations from the policy portfolio in the Sharpe ratio maximization optimization, subject to these deviations; no shorting, and no leverage limit.

Return assumptions in the pessimistic climate scenario are weaker for emerging markets and stronger, on balance, for developed markets excluding the US. In fixed income, the return of US aggregate bonds is assumed to be modestly lower in the pessimistic climate scenario, primarily due to higher defaults among the credits.

Conclusion

From the perspective of a long-term investor, climate change is a source of considerable uncertainty. The transition to a sustainable economy in various climate change scenarios poses significant physical risks for investors' portfolios. Transition risks, which include the financial impact of changes to regulation and policies as a result of climate change, will be discussed in a future publication.

Our top-down cross-asset analysis suggests that the most direct impact will be on growth-oriented assets, such as equities and corporate credit. We find that the impact on developed sovereign bonds, REITs and commodities is likely to be more localized at the micro level of individual securities, rather than at the asset-class level.

A climate risk-aware portfolio should tilt away from regions and assets that are expected to be adversely affected for better risk-adjusted returns. Additionally, we believe that such macroeconomic views should be combined with specific microeconomic and firm-level implications, to more fully measure the impact of climate change within a sufficiently broad framework.

PURSUIT OF OUTPERFORMANCE