

THE DIFFERENTIAL

Portfolio Construction – Adapting to the New Investment Environment

March 2022 | Issue 4

PGIM’s Institutional Advisory and Solutions Group provides objective, data-informed analysis to help Chief Investment Officers and Investment Committees manage their portfolios.

Dear Investor,

We have several exciting new and upcoming papers to share with you:

- *Super Funds & Master Trusts in a World of Member Switching, Early Access Schemes & Climate Calamities*
- *Stock-Bond Correlation: Global Synchronicity*
- *What Do Various Inflation Measures Tell a CIO?*
- *The Rebalancing Conundrum: Private Equity Valuations and Market Dislocations*

Investors typically must make investment decisions subject to a variety of investment constraints: “No Baa-rated bonds in the portfolio,” “No use of futures contract markets for hedging,” “No more than a 15% private equity allocation,” “Always be prepared for a sudden 20% withdrawal to support a strategic corporate initiative,” etc. While these constraints serve a purpose, they impose a cost, sometimes a “hidden cost,” on portfolio performance which is generally not quantified nor explicitly accounted for when imposing the constraint. A key IAS research area is to identify and quantify investment constraints to allow CIOs and their Investment Committees to make more informed business decisions.


In this vein, Dr. Michelle Teng and Ms. Aili Chen’s paper on “Super Funds & Master Trusts” is sure to attract global investor attention. CIOs are increasingly aware that retirement plans are no longer “just for retirement” as regulatory authorities are open to announce “early release schemes” often with little warning. In addition, governments are looking to retirement pools as sources of capital to finance a country’s infrastructure, including the energy transition. As Michelle and Aili discuss, these two trends work together to intensify a CIO’s liquidity management challenges. Michelle and Aili quantify the portfolio cost of “early release schemes” which is borne by all plan participants. This cost arises from the fiduciary response by CIOs to adjust the portfolio’s liquidity risk by holding safer, but lower yielding, assets.

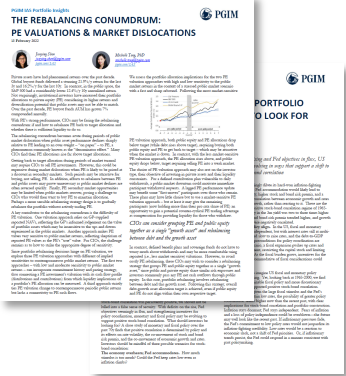
In addition to summarizing our forthcoming research, this issue of *The Differential* features a conversation on real asset investing between the Head of IAS’ Real Assets Research Program, Dr. Harsh Parikh, and Mr. Syed Haque, Chief Investment Officer of Novant Health, Inc. Given recent inflation trends, the role of real assets as an inflation hedge is probably the hottest area of CIO interest. You will find Harsh and Syed’s conversation informative and helpful.

Looking forward a wee bit, we eagerly anticipate that travel restrictions will ease heading into the springtime and we are already planning several trips and conference presentations. Of interest is the **1st Annual IAS EMEA Research Conference**, to be held at the London School of Economics in May. This half-day conference is designed to promote highly interactive roundtable conversations with asset allocators and their research teams as IAS researchers present and discuss their current research on portfolio construction and risk management.

Finally, IAS is pleased to announce our new [IAS Research Bylines](#). Each IAS research paper will have an accompanying Research Byline – a one-page synopsis, written in an engaging, conversational style – that highlights the motivation, findings, and CIO takeaways of the research. We hope you will find *IAS Research Bylines* fun and informative.

Warm regards,


Bruce D. Phelps, PhD, CFA



IN THIS ISSUE

- [Forthcoming Research](#)
- [In Conversation with IAS](#)
- [What We’re Reading](#)
- [Meet IAS](#)



To learn more about PGIM IAS, contact IAS@pgim.com or visit pgim.com/IAS.

FORTHCOMING RESEARCH

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IAS research is currently organized into four major streams: **Real Assets**, **Strategic Portfolio Construction**, **Manager Allocation & Selection**, and **Illiquid Private Assets**. The common thread throughout is our focus on addressing new and emerging issues that CIOs and asset allocators are facing and that could affect long-term portfolio risk and performance. As always, we attempt to offer concrete, data-informed, actionable answers to critical questions.

ILLIQUID PRIVATE ASSETS

Super Funds & Master Trusts in a World of Member Switching, Early Access Schemes & Climate Calamities

By Michelle (Yu) Teng & Aili Chen;
March 2022

As corporations migrate to defined contribution (DC) plans, asset allocators are increasingly interested in incorporating illiquid private assets in these retirement funds to offer participants the same investment strategies as used by defined benefit (DB) plans. In addition, governments are encouraging plans to bolster retirement outcomes and support national economic growth by investing in illiquid private assets such as private equity, venture capital and infrastructure. These illiquid assets pose well-known liquidity management challenges: uncertain cash flows, asset pacing, and rebalancing.

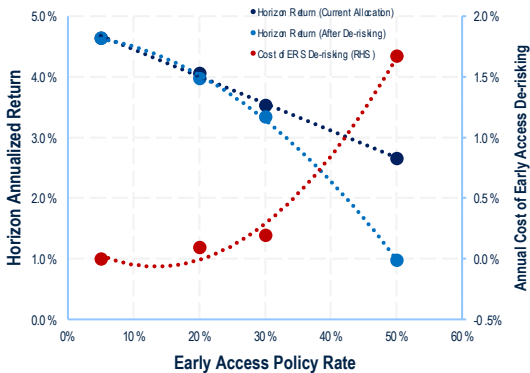
CIOs, especially those managing multi-employer DC plans, are also increasingly aware that retirement plans have evolved to no longer be “just for retirement” as regulatory authorities have announced “early release schemes” allowing participants to suddenly withdraw assets in response to economic downturns and climate calamities.

The confluence of these two trends – more illiquid assets and liberal early access programs – portends heightened portfolio management challenges. In this paper, we analyze how CIOs might adjust their asset allocations when faced with the possibility of different levels of early access permissioning. CIOs will need to “de-risk” their plans to manage the heightened liquidity uncertainty by holding more lower-risk, lower-return assets. However, these adjustments are likely to incur a cost to portfolio performance.

This “hidden-cost” will be continually borne by all fund participants. This paper offers CIOs a framework to quantify this hidden cost for different levels of early access permissioning. CIOs can also evaluate how their portfolio’s liquidity and performance might change under different early access scenarios. As shown below, as the generosity/size of early access programs increases, the potential hidden cost to all plan participants can increase at an accelerating rate, reflecting the ever-increasing portfolio conservatism required by CIOs to maintain an adequate level of liquidity.

By examining the potential trade-off between the liberality of the early access programs and portfolio performance, we help CIOs become more confident in making portfolio allocation decisions and help regulators identify possible portfolio allocation consequences and costs of contemplated rule changes.

The Hidden Cost of Early Access Programs



Source: PGIM IAS. For illustrative purposes only.

STRATEGIC PORTFOLIO CONSTRUCTION

Stock-Bond Correlation: Global Synchronicity

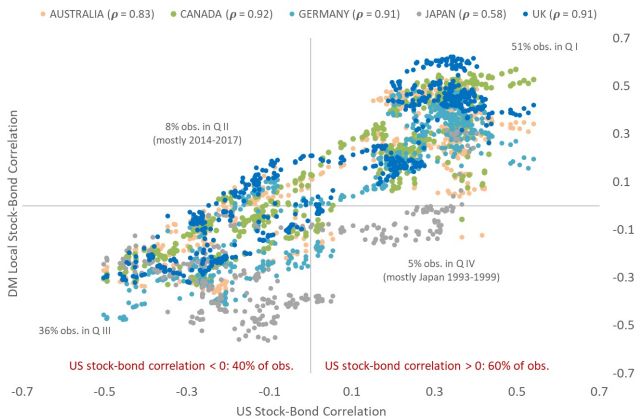
By Noah Weisberger and Xiang Xu; forthcoming May 2022

For the last 20y, developed market stock-bond correlations have, by and large, been negative, matching the US experience. Because portfolio holdings tend to be tilted toward local assets, from the perspective of a local investor, the implicit hedge that (local) stocks and (local) bonds provide to one another – by virtue of their negative correlation – has become an important building block of the portfolio construction and asset allocation process. A shift to positive stock-bond correlation would alter how CIOs and allocators need to think about portfolio construction.

This paper examines stock-bond correlation from a global perspective. We demonstrate that DM stock-bond correlation is, in large part, a global phenomenon. Local stock-bond correlation is driven by both local macroeconomic conditions and by macroeconomic conditions in the US, a proxy for global factors, suggesting that if US fiscal and monetary policy settings become more supportive of positive US stock-bond correlation, a widespread shift in developed market stock-bond correlations would likely follow.

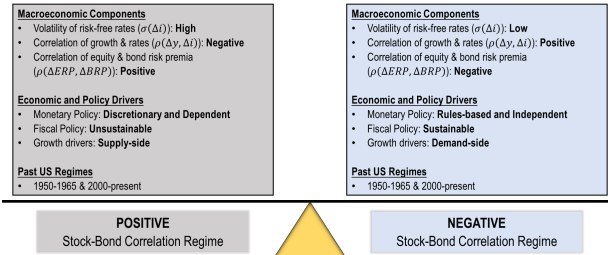
For CIOs a shift in local stock-bond correlation regime from negative to positive would change the expected risk-reward characteristics of a balanced portfolio of local assets. Moreover, such a regime shift would likely not be isolated to a single market; rather, it is likely to manifest across developed markets, making it difficult to find low-risk fixed income assets with equity hedging properties.

Local stock-bond correlation vs. US stock-bond correlation (1970-2021)



Note: MSCI Country Equity Local Currency Total Return Indices; Country Benchmark Long-Term Sovereign Bond Local Currency Total Return Indices; 1m returns; 5y, centered, rolling correlation window; Australia, Canada, Germany, Japan, UK, & US; 1970-2021. 1m returns, 5y centered, rolling correlation window. Source: DataStream, MSCI, FRED, Federal Reserve Bank of St. Louis, OECD, PGIM IAS. For illustrative purposes only.

Stock-Bond Correlation, Macroeconomic Components and Economic Policy Drivers



Source: PGIM IAS. For illustrative purposes only.

REAL ASSETS

What Do Different Inflation Measures Tell a CIO?

By Harsh Parikh; forthcoming May 2022

CIOs worry about inflation and its potential adverse effects on stock and bond returns. But should CIOs worry about an increase in realized inflation (*i.e.*, an increase in CPI inflation) or the market becoming worried about inflation (*i.e.*, an increase in inflation expectations)? Inflation expectations can be either market-based (implied Treasury breakevens, B/E) or survey-based (from Survey of Professional Forecasters, SPF). Realized inflation and inflation expectations often provide conflicting signals about future inflation. On which measure should a CIO rely to help structure their portfolios?

A CIO worried about long-term inflation might wish to rely on the inflation measure that does the best job forecasting future realized inflation. We show that only today’s SPF, not today’s CPI nor 10y B/E, has a significant and positive relationship with future CPI. So, a CIO worried about inflation over the next 10y may want to estimate sensitivity of asset returns to changes in survey-based inflation expectations.

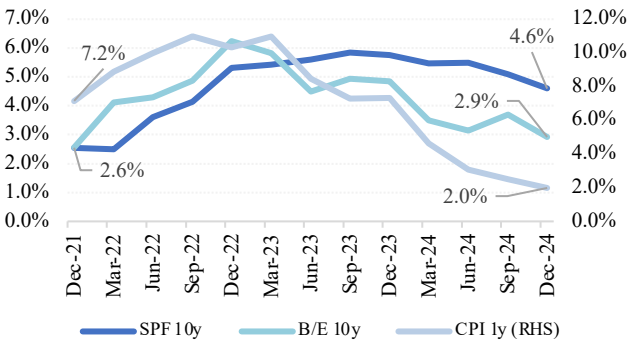
A sudden pickup in inflation has a spillover effect on future realized inflation and inflation expectations. How might inflation dynamics over the next 3y affect future asset returns? Below we show how various inflation variables may look over the next 3y following the recent increase in CPI to 7%/y (as of December 2021) from 1.3%/y at the beginning of that year. Barring any future unexpected changes in inflation, CPI is expected to be 2.0%/y by the end of 3y (December 2024) with an average CPI of 6.6%/y over those 3 years. During the same period SPF increases by 2pp (from 2.6% at the beginning of the 3y period to 4.6% at the end). We see that 10y SPF increases but with a lag from the current increase in CPI. B/E increases by 0.4pp (from 2.6% at the beginning of the 3y period to 2.9% at the end). These values help a CIO understand how these inflation measures may evolve.

Using these forecasted values for the various inflation measures, we measure the likely impact on asset returns. The expected stock total returns over the next 3y due to the expected 2pp increase in SPF would be -16%/y and expected bond total returns would be -7%/y.

A CIO worried about inflation may consider rebalancing to inflation-sensitive assets before survey-based inflation expectations adjust to higher realized inflation.

3y Projections for Inflation Variables Given Current Realized Inflation

| | SPF | B/E | Realized CPI |
|------------------------|--------|--------|--------------|
| Beginning of 3y Period | 2.6%/y | 2.6%/y | 7.2%/y |
| End of 3y Period | 4.6%/y | 2.9%/y | 2.0%/y |
| Change over 3y | +2pp | 0.4%/y | -5.2pp |
| Average over 3y | 4.7%/y | 4.3%/y | 6.6%/y |



Note: As of December 2021, 10y SPF and B/E inflation expectations are 2.6%. YOY CPI averaged at 7.2%. Using VAR model with six lags we forecast subsequent 12q of changes in SPF, BE and CPI. VAR model is fitted using ΔSPF, ΔB/E, ΔCPI and %ΔOIL price data from January 1992 to December 2021.

IN CONVERSATION WITH IAS

Hospital system portfolio management and investing in real assets against a backdrop of high inflation and rising rates

“ Over the long-term there is a tug-of-war between big deflationary forces like shifting demographics and technological innovations against inflationary forces like de-globalization and pandemic-led changes. This competition between forces may cause both realized inflation and expected inflation to be at a different level, perhaps higher from before. ”

Harsh Parikh, Head of IAS' Real Assets Research Program, and Syed Haque, CIO at Novant Health, discuss hospital system investment portfolio management, investing in real assets, and investment portfolio decisions in the context of high inflation and rising rates.



Harsh Parikh

Principal and Head of Real Assets Research Program
PGIM IAS

Previously Harsh was a VP, Portfolio Manager & Strategist at BNY Mellon's Investment Strategy & Solutions Group where he was a co-portfolio manager on BNY Mellon's Real Assets Strategy. Harsh has a PhD in finance from EDHEC Business School, an MS in mathematical finance and an MS in computer science from University of Southern California.

HP: Before becoming CIO at Novant Health, you were head of public markets at a corporate pension plan. How has your approach to managing investment portfolios changed?

SH: A corporate pension plan portfolio is managed in context of a well-defined liability stream. In contrast, for a hospital system, the asset pool has a long investment horizon and is managed as a total return portfolio with no defined liabilities. Investment portfolios at hospital systems have a risk profile similar to endowments and foundations, but with different cash outlays. The purpose of our investment portfolio is to maintain a good credit rating, provide for future capex spending or M&A activity, and act as a rainy-day fund. Due to the possibility of unexpected cash outlays, we at Novant have a much higher allocation to liquid assets (80%) vs. illiquid assets (20%). Liquidity is very important for a hospital system, both for possible operating purposes and to support its credit ratings, so a key portfolio allocation question for us is, what is the right mix of liquid vs. illiquid assets?

Once we have the right liquidity allocation, we can take more risk than a typical corporate pension plan because we have a long horizon and we do not have regular cash outlays for operating activities. Also, our earnings are only modestly sensitive to changes in the economic environment since we are not in a cyclical industry, so we can take market-sensitive risk for which we feel, at times, we are well compensated. Yet, determining the amount of risk is a balancing act because the investment portfolio returns, even if unrealized, impact the hospital's income statement.

My industry has changed a lot over the past 20y. Hospital systems used to have a small pool of assets managed through a CFO's office but now they have become bigger with over



Syed Haque, CFA

Chief Investment Officer
Novant Health

Syed Haque, CFA is a Chief Investment Officer at Novant Health. Syed previously held different investment roles at UPS Investment Group, where he was most recently Head of Public Markets. He was a Sr. Investment Risk Analyst at Emory Investment Management before joining UPS Investment Group. Syed has his MBA from The Fuqua School of Business, Duke University, MS in computer science from George Mason University and BTech in civil engineering from IIT (BHU), Varanasi.

\$5-\$10 billion in assets. In addition, the systems have become more institutional with a CIO and an investment team to manage the investment portfolio.

HP: What are your current investment objectives? What is your portfolio's asset allocation and how do real assets fit in your portfolio?

SH: At Novant, our investment objective is to have a total rate of return that exceeds the company's weighted average cost of capital and, as a secondary objective, to exceed our policy benchmark over a five-year horizon.

Asset allocation is tilted to economic growth, with over 50% in both global public and private equity investments. Less than 15% is in Treasuries, and we have about 15% each in hedge funds and real assets. The remainder is in cash.

To classify real assets as a single asset class is very difficult as gold, commodity-sensitive equities, commodity futures indexes, TIPS, and farmland are all different in terms of their market risks and inflation and growth exposures. Each type of real asset has a specific investment purpose. Commodity-sensitive equities have more growth and inflation exposure and are meant for inflation-protection but with a growth bias.

Our allocation to gold, when its opportunity cost is low, is meant for providing protection in a deflation scenario or when VIX is high. In contrast, real estate is meant for diversification purposes and generally offers inflation protection.

HP: How do you interpret the current market and economic environment, with inflation already high, and the Fed set to tighten, but perhaps by less than expected given shifting geopolitical risks?

IN CONVERSATION WITH IAS CONTINUED

SH: It is possible that we are in a high inflation and low growth environment. Supply chain disruptions will eventually resolve but it is anyone's guess when, as it may take one year or even longer to resolve. What is crucial now is, how much do inflation expectations change if inflation is more persistent than earlier expected?

Over the long term there is a tug-of-war between big deflationary forces like shifting demographics and technological innovations against inflationary forces like de-globalization and pandemic-led changes. This competition between forces may cause both realized inflation and expected inflation to be at a different level, perhaps higher from before, for the next five years.

HP: When constructing a portfolio of real assets do you take a more top-down (*i.e.*, first allocating to risk factors) or bottom-up view, focused on individual assets, themes (*e.g.*, water, sustainability, etc.), or investment opportunities (*e.g.*, a specific infrastructure project)?

SH: Our investment process takes a more top-down approach for asset allocation.

We first decide on the risk budget; how much equity, bond, and liquidity risk do we want. Depending on our views of the economic environment (like stagflation), we decide how much inflation and growth exposure we desire, and given our risk-adjusted return assumptions of the real assets, we decide what proportion to allocate to the various real asset types. There is always a risk of having an altogether different economic environment, say if the Fed overtightens or if there is stagnation, and so, allocations to real assets should be well-diversified.

HP: A board member, becoming concerned about high inflation, may ask, what is the portfolio's sensitivity to inflation? How would you estimate it?

SH: Discussion about inflation was on the back burner for many CIOs, as deflation was the fear following the Global Financial Crisis. But now, due to the unprecedented amount of fiscal and monetary stimulus, there is a concern of high inflation and its portfolio impact that is now discussed at every CIO's board meeting.

Besides evaluating inflation sensitivity of real assets,

sensitivities of other assets in the portfolio like equities also need to be determined. The inflation impact on the equity portfolio would be different depending on whether current high inflation comes down over 1y vs. 3y. Within equities, the impact of inflation also depends on whether companies have pricing power or not. Similarly, inflation sensitivity depends on the duration of the fixed income portfolio and the amount of TIPS exposure. However, there is also a concern that TIPS may lose value if real rates were to rise.

The impact to the portfolio from high short-term inflation numbers may not be as much, as we have not seen a change in long-term inflation expectations. If inflation expectations were to move up it would negatively impact both equity and fixed income portfolios. This is a scenario where a CIO might benefit from an allocation to inflation-sensitive real assets.

HP: How do you benchmark real assets?

SH: We individually look at asset-level benchmarks like S&P Global Natural Resource Index or NCREIF Property Index. RASA® Interactive helps us in evaluating macroeconomic and market exposures at different investment horizons for our real assets portfolio and we compare our portfolio to several investment-objective driven real assets portfolios.

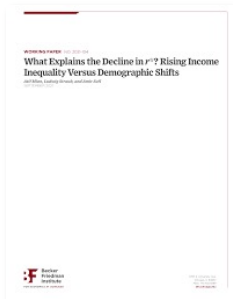
It would be useful to construct and monitor real assets benchmarks depending on the investment objective like inflation protection or low growth protection or those tailored for specific economic environments like stagflation or stagnation. A CIO can compare these benchmarks with their own portfolios and evaluate what portfolio changes might be required for desired inflation and growth exposures.

HP: What other asset classes are you looking to invest in if rates were to rise?

SH: We are looking to add to our currently small allocation in private credit as they offer floating rate plus spread exposure. Of course, private credit is correlated with equities and may sell off with equities and can have increased rates of default. Yet the risk in private credit is lower and an allocation to private credit can help with portfolio diversification.

WHAT WE'RE READING

Trending research and literature to add to your reading list, with some key takeaways.



What Explains the Decline in r^* ? Rising Income Inequality Versus Demographic Shifts

By Atif Mian, Ludwig Straub and Amir Sufi

Becker Friedman Institute for Research in Economics, University of Chicago, Working Paper, 2021

Despite inflation at 1980s levels, US Treasury yields remain at the bottom of their historical range, with real yields negative. Low equilibrium short-term real interest rates (a.k.a. “ r^* ”) seem inexorable, with profound implications for asset allocation.

Two leading explanations for low r^* are (1) demographics and (2) income inequality.

The demographic hypothesis, championed by Goodhart and Pradhan (their book, *The Great Demographic Reversal*), was reviewed in the July 2021 issue of *The Differential*, is that baby boomers passing through their high-saving middle-age years cause excess economywide savings, lowering r^* . However, as boomers advance into retirement, they will dissave, with r^* consequently rising.

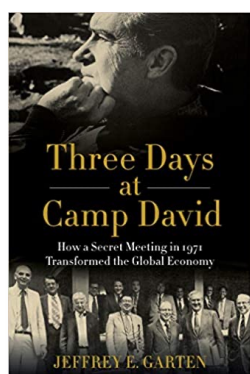
Professors Mian, Straub and Sufi agree that excess savings causes low r^* , but argue that *widening income inequality* (not demographics) is responsible for the savings glut. With high incomes growing relative to low incomes – a trend dating to the 1970s – and with high-income saving rates higher than low-income saving rates, savings have increased, pushing r^* lower. However, unlike demographic drivers that will reverse naturally as boomers age, there is no natural brake to the inequality drivers of low r^* . Worse, there is a feedback loop: income inequality leads to low interest rates, which inflate asset prices, leading to greater inequality, pushing rates lower still.

The authors present data that support the inequality explanation for low r^* and not the demographic explanation. They demonstrate that saving rates do not vary systematically by age cohort, invalidating the argument that middle-age boomers save more. In contrast, high-income saving rates are, in fact, significantly higher than low-income groups’. This fact combined with increased inequality, as the high-income share has grown, has led to increased savings.

This analysis does have weaknesses (a critique from the 2021 Jackson Hole Economic Policy Symposium is [here](#)): (i) the authors do not show, empirically, that increases in high-earner savings lead to decreases in r^* ; (ii) low r^* is a global story, while rising income inequality is mostly a US one; and (iii) the US wage gap has closed a bit following the GFC but r^* continues to decline, counter to the inequality hypothesis.

CIO Takeaway: Persistently low interest rates continue to bedevil CIOs. The profession remains divided as to possible causes and, hence, r^* ’s future trajectory. To the extent that rising income inequality has driven rates lower, downward pressure on r^* is unlikely to abate anytime soon.

- Noah W.



Three Days at Camp David

By Jeffrey E. Garten

HarperCollins, 2021

The 1944 Bretton Woods Agreement allowed foreign central banks to redeem dollars for gold at the Treasury “gold window” at a fixed price of \$35/oz, while, in return, these central banks pledged to keep their currencies at a fixed peg to the dollar. Fixed exchange rates reduced uncertainty, prevented competitive devaluations, and consequently contributed to the rapid global postwar recovery. Since the US dollar was pegged to a “real asset,” hyperinflation concerns receded as well.

Without warning, on 15 August 1971 President Nixon slammed the gold window shut (never to reopen), imposed both a sweeping 10% tariff on US imports and capital controls to stem dollar outflows and instituted domestic wage and price controls.

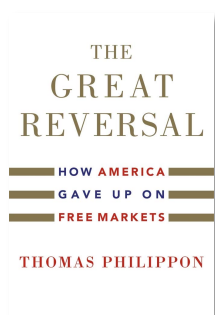
Author Jeffrey Garten, former Dean of the Yale School of Management, provides a close-up narrative of the events leading up to 15 August and the global consequences. In the years prior, US fiscal and monetary policies were coordinated and highly expansionary. While this supported global growth, the US began to run large current account deficits. Central banks with large dollar holdings became increasingly restive, as US gold holdings were insufficient to cover the \$35/oz redemption obligation. Fearing a run, President Nixon convened a who’s who of government luminaries (Connolly, Shultz, Volcker, Peterson, McCracken, and Stein) at Camp David to formulate a bold policy response. Notably, Fed Chairman Burns (averse to raising interest rates despite strong growth) was at the meeting while National Security Advisor Kissinger was not.

Garten details the personalities, motivations and oft-heated debates that ultimately led to a consensus set of policies aimed at simultaneously alleviating domestic economic pressures while supporting the President’s upcoming re-election bid. In just three days, the US unilaterally changed the international monetary system, ushering in today’s era of floating exchange rates.

CIO Takeaway: Garten provides an inside look at how major economic policy was shaped and communicated. The book may surprise CIOs with how quickly major policy changes can occur. Despite prolonged and unsustainable US economic policies that were inconsistent with fixed gold parity, and persistent denials from US authorities that it would ever abandon the fixed parity, the financial world was transformed by an unexpected 18-minute speech on a Sunday night.

- Bruce P.

WHAT WE'RE READING CONTINUED



The Great Reversal

By Thomas Philippon
Harvard University Press, 2019

This provocative book, written by an NYU Economics professor, makes three points: (i) US industrial concentration and market power has increased over the past twenty years; (ii) this decline in competitiveness is largely due to government antitrust policies, lobbying, and campaign finance activities; and (iii) the macroeconomic consequences are lower wages, investment, growth, and greater inequality.

The “great reversal” in the book’s title references the departure of the US from its long-held free market philosophy to one where industries have a few large firms with concentrated market shares.

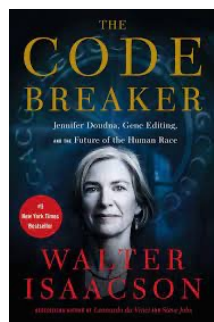
Philippon discusses two concurrent “reversals”: the US retreat from free markets and the European embrace of them. Indeed, US industrial concentration has been rising steadily since the mid-1990s, a departure from the long-held – and policy-enforced – commitment to competitive markets, while European market concentration has changed little. Consequently, although prices and corporate profits are higher in the US than in Europe, investment and productivity are lower. Surprising stuff!

The US reversal, Philippon argues, is largely due to a decline in free market entry. New companies with new technologies and new addressable markets are often quickly acquired by large companies in the same industry to prevent future competition. These so-called “killer acquisitions” – think Facebook’s purchase of WhatsApp and Instagram – have led to a decline in the share of young firms in the US economy while US regulators have turned a blind eye to these anti-competitive mergers.

Industry lobbying efforts and corporate political campaign contributions have led to this change in the US regulatory backdrop (irrespective of political party) and a decline in free entry. Philippon supports his argument with US data and by contrasting the US and European regulatory structures. In Europe, the industrial regulatory authority was established to be independent of both European and national political authorities and lobbying efforts. Ironically, the European regulatory framework was structured to better adhere to the US mantra of “free and competitive markets” compared to the US framework.

CIO Takeaway: The rise in US industrial concentration over the past two decades may come as a surprise to CIOs. While profits, and prices, are abnormally high, the longer-run consequences of reduced investment, diminished competition and decreased labor shares may pose challenges for US investors in the years ahead.

- Bruce P.



The Code Breaker: Jennifer Doudna, Gene Editing, and the Future of the Human Race

By Walter Isaacson
Simon & Schuster, 2021

Professors Jennifer Doudna and Emmanuelle Charpentier shared the 2020 Nobel Prize for Chemistry for their revolutionary gene-editing system known as CRISPR-Cas9. Using the CRISPR system, a researcher creates a small RNA guide sequence to find a specific place on genomic DNA, cuts the genome (using Cas9), and then adds or deletes pieces of genetic material using the cell’s own DNA repair machinery. During COVID, CRISPR technology has been invaluable in the development of rapid tests and RNA-based vaccines.

Prior to 2020, only five out of 184 Chemistry laureates were women, including Marie Curie. Doudna and Charpentier are the first all-female team in the prize’s history.

Walter Isaacson tells Doudna’s story, from her upbringing in Hawaii to her development of CRISPR at Berkeley, focusing on her creativity and innovative thinking. Doudna was inspired to pursue a career in science by Rosalind Franklin, her role in discovering the structure of DNA and her strength and perseverance in the face of considerable sexism that hampered her career.

Doudna combined this early inspiration with her innate curiosity, willingness to take risks and independent thinking to propel herself to the pinnacle of scientific accomplishment. Isaacson describes how, as a child in Hawaii, Doudna often paused to reflect on the causes behind the wonders of nature that she witnessed. She was curious to “peel back the layers of nature’s beauty and discover how and why things worked at the most fundamental and inner level.”

Doudna studied the RNA molecule in graduate school, rather than the more popular DNA molecule. Her advisor’s advice to “never do something that a thousand other people are doing” became Doudna’s guiding principle as she creatively forged her own path of scientific discovery.

CIO Takeaway: Isaacson provides a compelling account of the discovery of the CRISPR-Cas9 technology – a scientific revolution and investment theme that will disrupt and shape the future of many industries. But apart from a fascinating scientific chronicle, Doudna’s achievements to shatter glass ceilings are inspiring to those facing personal or professional obstacles and to a new generation of scientists.

- Aili C.

MEET IAS: Featuring Michelle Teng



Michelle (Yu) Teng

Vice President and Co-Head of Private Assets Research
PGIM IAS

Michelle joined IAS in 2018 after spending her first three years at Prudential in the Retirement business. She started her career on the sell-side in building quantitative models for the trading desk, first in London then in New York. Michelle received a PhD in electronic and electrical engineering from University College London, an MBA from Tuck School of Business at Dartmouth, and is a CFA® and CALA® Charterholder.

You started your Prudential career on the insurance side of the company with the Retirement business. What were your roles there and why did you move to PGIM, and to IAS specifically?

I started my PRU career working on the insurance side of the business with the Prudential Retirement Investment and Pension Solutions, focused on developing retirement products and solutions for corporate clients, before moving to the investment side of the business, joining PGIM IAS.

More generally, quantitative research has always been at the heart of my career. But to be impactful, complex models need to be communicated clearly and simply, and I enjoy the writing, communicating and client-interaction aspects of the job, too. In that sense, IAS is a great platform to put all that together as IAS research tackles critical problems, is pragmatic and actionable, and is ever evolving. Talking with CIOs to learn about their emerging issues is what helps shape the IAS research agenda. And our goal is to help them think through the asset allocation and portfolio construction challenges that they are facing.

Much of your research focuses on asset allocation with illiquid private assets using IAS' OASIS framework.

What are some of the common themes that emerge from your research that are most important for clients?

In working with a wide range of institutional investors, many CIOs worry about having insufficient liquidity during a sustained downturn, especially as they increase their allocations to illiquid private assets. Facing this potentially existential risk, some CIOs become overly cautious in their illiquid asset allocations and may hold more liquid stocks and bonds than needed. The OASIS framework provides CIOs with a total portfolio view on liquidity risk and performance over a multi-year horizon and can help them make more efficient asset allocation decisions.

OASIS' real strength is its ability to incorporate the specific liquidity needs, constraints and concerns of individual CIOs and to provide them with customized analysis. For example, we help corporate DB CIOs think through many aspects of their "end-state" issues, including the impact of potential corporate actions such as pension risk transfer (PRT), which can lead to a "forced" and sudden increase in the portfolio's allocations to illiquid assets as it is the more liquid assets that need to be used to make a one-time payment of premium. OASIS helps CIOs evaluate how these strategic actions impact portfolio liquidity and performance so that they can consider adjusting their allocations accordingly.

Where does this research go next? Is there a new set of questions that you think the OASIS framework can help to answer?

Private asset classes are increasingly an investor focus. They are different from public assets, and very different from one another, and we continue to work to integrate them into OASIS. To incorporate private assets, we need to develop cash-flow models that are nuanced and realistic but, at the same time, general enough to be intuitive and that can be tweaked to match a specific clients' needs and circumstances. In fact, we recently wrote a paper in collaboration with the PGIM Real Estate Group to model cash flows of core+ real estate debt, a rising asset class.

OASIS can also be adapted to address regulatory, policy and even climate change risks, which introduce new sources of liquidity demands and risk that CIOs need to incorporate when constructing their portfolios. For example, in a forthcoming paper, we try to help CIOs quantify the cost of allowing participants early access to their retirement assets, such as the early release scheme that the Australian government announced in 2020.

What broader lessons have you learned in the process of building out the OASIS framework?

Developing OASIS has been a true learning process for us on so many levels, which is both challenging and enjoyable. For example, by collaborating with the PGIM Real Estate Group on core+ real estate debt research we were able to leverage their practitioner knowledge and expertise and combine that with our broader, multi-asset liquidity risk research.

Actually, *building* the OASIS infrastructure was an altogether different learning experience. As our cash flow models became more sophisticated and realistic, the computing became nearly impossible to do on our desktops – processing simulations for a single graph would take eight hours or more on four computers! At that point, we quickly embraced cloud computing, which effectively accelerated running our OASIS portfolio analytics and was adopted to help facilitate other projects at IAS and elsewhere at PGIM.

You have authored three IAS case studies centered on the fictional Cenland Corporation and the portfolio allocation challenges facing its CIO, Dan Woodbridge, as he navigates the transition of the firm's DB plan to a DC plan. What motivated you to write case studies?

The Cenland cases stem from our participation in the PGIM IRG Ascent Program for up-and-coming CIOs. But these cases are of interest to anyone who is concerned with asset allocation and the evolution of corporate pension plans. They encourage readers to think like a CIO – in fact, CIOs are often readers, too!

The case study method was a foundational part of my MBA study at Tuck and is familiar to many of our clients. They help put highly quantitative research questions into a real-world, actionable setting, and often motivate deep client conversations, neatly dovetailing with the broader IAS mission.

Writing cases also allows me to deepen my PGIM and Prudential ties. In working on the Cenland cases, I consulted with my former Retirement colleagues to stay current with global retirement market developments. Looking ahead, we are shifting focus from DB to DC plans, and I engaged with PGIM DC experts both in the UK and in the US to help craft the new Cenland (III) case study.

What else can you tell us about yourself?

I have lived, studied, and worked on three different continents: Asia, Europe and now here in North America. My global experiences have been very influential, particularly in terms of my cooking and baking (and eating), allowing me to explore and experiment with many new flavor palates, cuisines and dishes. I also try to never make exactly the same dish twice; instead of following recipes I like to improvise!

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