INSTITUTIONAL ADVISORY & SOLUTIONS

PGIM

THE DIFFERENTIAL

New Developments in Portfolio Construction

July 2023 | Issue 9

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

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

IN THIS ISSUE

Dear Investor,

The big news is that the IAS Team will be hosting our inaugural Asia Research Conference in Shanghai on 17 October at Shanghai Jiao Tong University. PGIM IAS is partnering with the prestigious Shanghai Advanced Institute of Finance (SAIF) – a leading Chinese finance and management research institution.

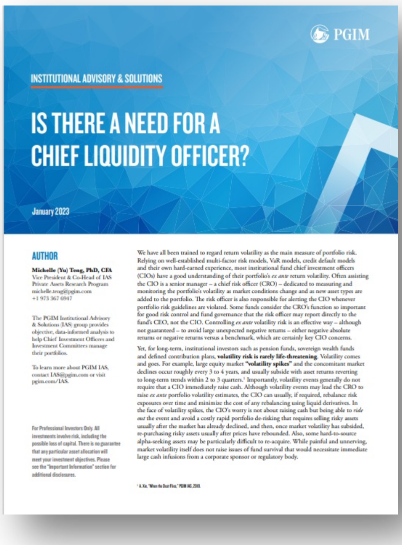
This full-day event will have presentations on current financial and business trends in China and the US as well as presentations on the latest developments in portfolio construction research. Speakers will include faculty from SAIF, PGIM IAS researchers, and industry leaders from both continents.

As with all IAS Research Conferences, the SAIF-IAS event will be highly interactive with polling questions to get and share views from the participants. It is expected to be a very lively and productive day!

Please let us know if you are interested in attending.

In other news, the Spring quarter was a busy one for PGIM IAS.

- Dr. Michelle Teng's paper ***"Is There a Need for a Chief Liquidity Officer?"*** attracted considerable industry and media attention. Over the last several months, Michelle and her IAS team members have presented this research at the [i3] Investment Strategy Forum Australia, the II Investor Summit in Bahrain, the Insurance Asset Management Association of China's 2023 roadshow (in Mandarin!) and at the CAIA Alts Conference in New York (see photo below). Investors have strong views – on both sides of this question! What are your thoughts?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INSTITUTIONAL ADVISORY & SOLUTIONS

IS THERE A NEED FOR A CHIEF LIQUIDITY OFFICER?

January 2023

AUTHOR

Michelle will also be discussing this topic as part of the Liquidity Management Panel at the upcoming 2023 Society of Actuaries Life Meeting this November. She has also been cited in Institutional Investor (Feb 13, 2023); Professional Pension (Mar 7, 2023); AsianInvestor (Mar 27, 2023); FS Super (March 2023); Investor Strategy News (April 20, 2023); GARP (Global Association of Risk Professionals, May 12, 2023); Institutional Money (May 19, 2023); and Financial Investigator (#2, 2023).

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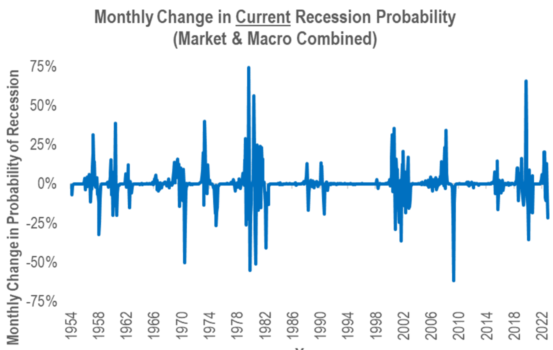
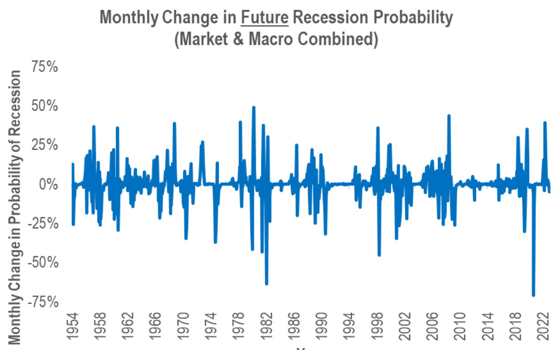
- Dr. Noah Weisberger's and Dr. Xiang Xu's recent paper ***"What to Expect When Expecting a Recession"*** was well-timed and quickly led to the publication of a related paper covering Europe and the UK.

Investors are keen to track current and future recession probabilities, and these probabilities have been on the move!

	Current Combined	Current Market	Current Macro	Future Combined	Future Market	Future Macro
Apr-23	56%	48%	20%	97%	95%	46%
May-23	34%	22%	23%	96%	92%	48%
Jun-23	**15%**	**7%**	**26%**	**92%**	**82%**	**50%**
Jun vs. May	-20%	-15%	3%	-5%	-10%	2%

Large declines in the estimated probabilities of a *current* recession are largely due to strong trailing 12m S&P 500 returns (+11%), with other inputs mostly flat. Keep in mind that as of April 2023, the S&P had been *down* on a trailing 12m basis, followed by a very sharp equity market rally since. This has also modestly reduced the probability of a *future* recession, from 97% in April to "only" 92% now. Looking back over time, as the charts below show, the 20ppt decline in current recession probability (combined market and macro model, left hand panel) is quite dramatic (a 3rd percentile event), whereas the 5ppt decline in probability of future recession (right hand panel) is big but not massive (15th percentile).





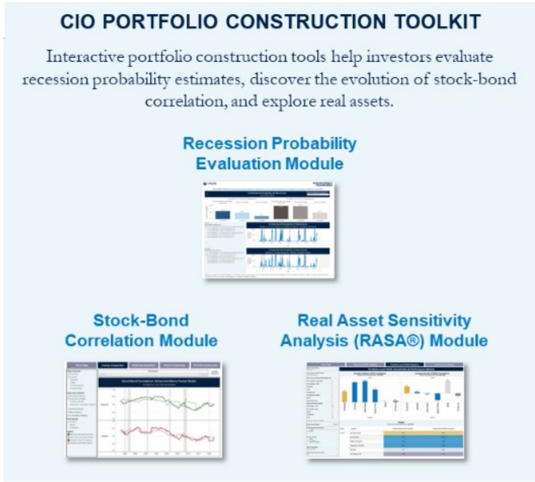
Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (NBER defined) and 0 otherwise; regressors are contemporaneous values of SP500 (trailing 12m S&P 500 returns), YC (yield curve, defined as 10y Treasury yield – effective Fed funds rate), IP (trailing 12m percent changes in industrial production) and PAY (trailing 12m percent changes in private non-farm payrolls); models are estimated using monthly data from 1954-2019. Source: Bureau of Labor Statistics, Federal Reserve Board, Haver Analytics, NBER, Standard & Poor's and PGIM IAS. For illustrative purposes only.

While the Current Recession Probability model suggests that a soft landing seems increasingly likely, the probability of a recession in the next 12m remains high, though it has moderated a bit. Signs of moderation, even at high levels, are worth noting. Indeed, as we highlight in the paper, for forward equity and bond returns the *change* in recession probability has been more informative than the level, with declining recession probability readings historically associated with robust forward returns.

Despite the decline in recession probability, we remain cautious regarding future equity returns. We recognize that there is some circularity here, with an improving equity market itself the main driver of the recent decline in recession probabilities. Absent signs of improvement beyond just equity returns, we are left to wonder how much risk remains to wring out of equity markets given current valuations, without further confirmation that the outlook is improving.

- Given client interest in regular updates to our research publications and analysis, IAS has expanded its CIO Interactive Portfolio Construction Toolkit.

  We launched the toolkit 2 years ago with a portfolio construction tool focused on real assets and their macro and market sensitivities ("RASA™"). Since then, two more modules have been added, the **"Stock-Bond Correlation"** module, and, just in the last week or so, the **"Recession Probability Evaluation"** module, with more modules to come in the near-term. The purpose of these modules is to give CIOs important up-to-date information for their portfolio construction activities. Learn more at www.pgim.com/cio-toolkit



We also have some exciting papers forthcoming this Fall:

- ***"Estimating Periodic Private Equity NAVs: A Study of LP Approaches"** – September 2023, expected.*
- ***"Inflation Regimes, Investor Beliefs and the Role of Real Assets in a Balanced Portfolio"** – September 2023, expected.* A brief peek of this paper is available in the next section.

Finally, in this edition of *The Differential,* we include Ms. Junying Shen's interview with Mr. Tony Coletta, Managing Director, in PGIM Private Credit. As investors know, private credit is a fast-growing part of the alternatives market. PGIM has long had a presence in this asset class and we are delighted to get Tony's views on how this market has developed, current trends, and what to look out for in the year or two ahead.

As always, IAS's goal is to deliver pragmatic and implementable research to help CIOs and their Investment Committees make better-informed portfolio management decisions.

Warm regards,

Bruce D. Phelps, PhD, CFA

FORTHCOMING RESEARCH

PGIM IAS currently has four research streams: Real Assets, Strategic Portfolio Construction, Manager Allocation & Selection and Asset Allocation with Illiquid Private Assets. The common thread throughout is to address new and emerging issues that CIOs and asset allocators are facing that could affect long-term portfolio risk and performance. As always, we attempt to offer pragmatic, data-driven, actionable answers to critical questions.

STRATEGIC PORTFOLIO CONSTRUCTION

Inflation Regimes, Investor Beliefs, and the Role of Real Assets in a Balanced Portfolio

By Noah Weisberger, PhD & Xiang Xu, PhD
September 2023, expected

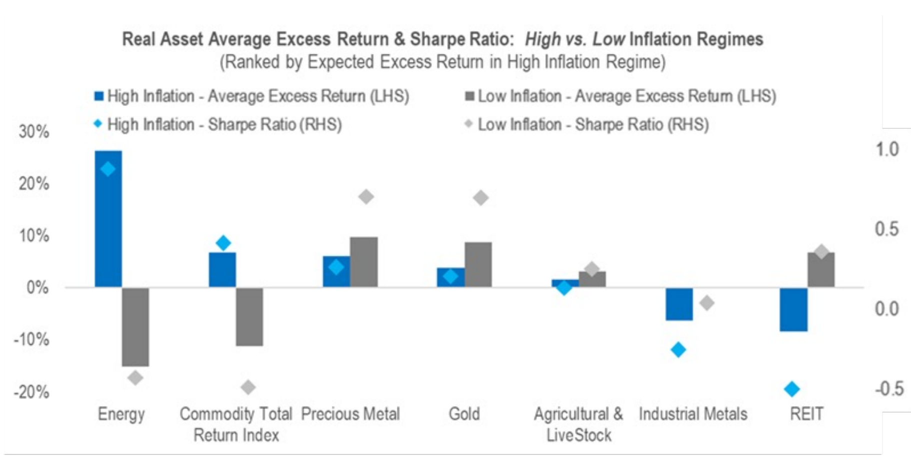
It is common to argue that real assets belong in a balanced portfolio as a hedge for other (public) assets during inflationary periods. Looking back over the last 50y, that seems to be the case. Commodities can deliver outsized returns when inflation is running high, offsetting headwinds elsewhere in the portfolio.

However, to benefit from an allocation to real assets, investors also need to express a forward view on inflation and time their allocation decisions appropriately. An allocation to real assets that *helps* performance during inflationary regimes can *hinder* performance during non-inflationary periods.

Given that inflationary regimes deliver starkly different asset performance relative to non-inflationary regimes, the optimal allocation to real assets depends critically on a CIO's views about the likelihood and length of any future inflationary regime over their investment horizon.

In real time, investors will experience portfolio performance that comes from *either* inflationary periods *or* non-inflationary periods; over most investment horizons, portfolio performance is unlikely to reflect the long-run distribution of asset returns that does not condition on inflation. Capital market assumptions and allocation decisions ought to account for uncertainty about the future inflation regime.

In this paper, we (1) examine the role of real assets in a balanced portfolio during both inflationary and non-inflationary regimes; (2) quantify the impact of uncertainty about the forward inflation regime on the optimal allocation to real assets; and (3) explore differences across a range of real assets (*e.g.,* a broad commodity index, energy, precious metals, industrial metals, agriculture and livestock, real estate, etc.) in their ability to enhance the performance of a balanced portfolio in both inflationary and non-inflationary times.



Note: Inflation is defined as the trailing 12m change in CPI; high inflation regimes are readings above the 75th percentile and low inflation regimes are readings below the 25th percentile, 1948-2023. Excess return is monthly real asset total return less 3-month LIBOR using data until June 2023 with varying starting dates. Annualized averages are presented. Source: Bureau of Labor Statistics, Dow Jones, Haver Analytics, Intercontinental Exchange, Standard & Poor's, U.S. Treasury and PGIM IAS. For illustrative purposes only.

IN CONVERSATION WITH IAS

IAS's Junying Shen discusses recent trends, risks and opportunities in private credit with PGIM Private Capital Head of Investor Relations for Alternatives, Tony Coletta

Tony Coletta
SVP, Head of Investor Relations for Alternatives
PGIM Private Capital

Junying Shen, CFA
VP, Co-Head of Private Assets Research
PGIM IAS

Tony Coletta is a Senior Vice President and Head of Investor Relations for Alternatives at PGIM Private Capital. In this role, Tony interacts with investors in the Alternative strategies managed by PGIM Private Capital including Corporate Mezzanine, Energy Mezzanine, and Direct Lending. Prior to this role, he led a team responsible for marketing, originating and managing private placement and mezzanine investments in Illinois. He joined PGIM in 2002. Mr. Coletta received a BA from Duke University and an MBA from the University of Virginia's Darden School of Business.

Junying Shen is a Vice President and Co-Head of the Private Assets Research Program in the Institutional Advisory & Solutions (IAS) group, focusing on traditional and alternative assets and developing asset allocation models. She joined IAS in 2017 from the Market Risk Capital & Analysis team at Goldman Sachs where she analyzed the market risks of various assets such as syndicated loans, public equity, private equity and real estate. Ms. Shen earned her BS degrees in Finance and Mathematics from the University of Illinois at Urbana-Champaign and an MS in Mathematics in Finance from New York University.

JS: Private credit investments are an increasingly important part of institutional investor portfolios. What are the different strategies to invest in private credit?

TC: Private credit markets encompass a wide range of ways to invest within the capital structure. Direct lending is a large category which generally includes senior secured, first-lien loans and consists of financial facilities like revolvers, term loans and delayed draw term loans. Loan amounts can range from 2x to 3x the borrower's EBITDA with more conservative lenders, or up to 6x with more aggressive lenders. Historical gross yields in direct lending have been in the high single-digit range (base rate plus 500 – 700bp of spread) and are significantly higher today due to a higher base rate. Unitranche financing involves lenders offering more leverage to borrowers, with these lenders effectively combining senior and subordinated positions, extending loan amounts that may range from 5-7x the borrower's EBITDA, and historically seeking floating rate yields in 9-12% range. Mezzanine financing involves providing subordinated debt along with preferred or common equity. Mezzanine lenders assume a subordinated position to senior lenders in exchange for receiving a higher promised yield (usually fixed rate) which typically ranges from 12-18%. In addition to these categories, there are literally dozens of other "niches" and specialized strategies in the private credit markets today.

JS: What drives the growth of private credit and the increasing allocation in institutional portfolios? Do you see this trend continuing?

TC: For many years, institutional investors could access debt only by buying public bonds. Public bonds make sense only for very large borrowers, since issuing debt (or, borrowing by issuing public bonds) generally requires a company's borrowing need to be in the billions of dollars to ensure float and justify large issuance fees. So, before the last twenty or so years, investors simply did not have access to smaller private company debt – since most of the debt to these companies was historically extended and held by commercial banks. There are hundreds of thousands of great private companies in the US and abroad, with annual revenues of $50 million to over $1 billion, which are great candidates for debt investors. But investors could not previously access these borrowers because banks so dominated the smaller company lending market.

Things changed following the GFC in 2008-09. Following that crisis, the regulation of commercial banks accelerated, and it became more difficult for borrowers to get higher-leverage loans. Private credit funds were formed and experienced large growth between 2010 and today as they moved in to fill the leveraged loan void left by the banks. These private credit funds now provide credit to thousands of middle market borrowers. Private credit funds are largely concentrated on supporting the M&A activities of private equity funds, which have also been experiencing significant growth and need higher leverage to make their equity returns work as they buy companies. Private equity funds love to use these private credit funds to provide financing to support the purchase and operation of the middle market companies since these funds are largely unregulated and have the ability to offer flexible terms and attractive pricing, while also offering higher leverage than commercial banks would consider.

From the investor's perspective, private credit offers institutional investors such as pensions and endowments higher yields relative to public bonds and other forms of more liquid credit – many funds target returns of about 2-3% higher than what is available in the broadly syndicated loan (BSL) market. If an investor is comfortable with the lack of liquidity that comes with investment in these private loans, and if that investor is investing in managers with diversified pools of well-underwritten loans, private credit can be a very attractive, higher-yielding complement to an overall investment portfolio.

While investors have for many years accessed private markets by investing in private equity managers, investing in private credit managers can be a way to access private markets at a less risky level. While private equity funds hold equity in the companies they buy, private credit funds invest (or lend) at the senior debt level. If a troubled company is liquidated or sold, senior debt has priority and typically must be repaid completely before subordinated debt and equity holders receive dollars back from their investment. Private credit funds (who are essentially lenders) usually have covenants that allow them to take precautionary or protective measures if a company underperforms, including increasing pricing to compensate for higher risk, mandating the use of a business management consultant, changing payment schedules, taking collateral, requiring equity injections, or in the more difficult situations, forcing a sale or taking equity. As a result of covenants and the priority position held by senior lenders in the capital structure, private credit funds should generally have fewer losses than private equity funds. By investing in a mix of private equity and private credit managers, investors can now diversify their private company exposure, staggering risk and return across multiple capital structure levels.

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IN CONVERSATION WITH IAS (continued)

JS: As you mentioned, a significant part of the private credit market is loans made to support portfolio company acquisitions by private equity (PE) sponsors. What are the benefits of working with PE sponsors?

TC: Working with PE sponsors offers numerous benefits. First, PE sponsors conduct thorough due diligence before they make equity investments, and typically share this diligence with prospective lenders. PE sponsors also provide valuable governance by overseeing management, appointing new managers if necessary, and creating more active boards of directors, all in an effort to improve financial performance. Since they tend to have additional fund capital on hand, sponsors also have the ability to inject additional capital into companies that are running into trouble. All of these activities can be very beneficial to senior debt holders – though as a note of caution: lenders are aware that sponsors ultimately make moves that they feel will benefit their equity, and these moves sometimes conflict with the best interests of the lenders.

While PE sponsors provide many benefits to the lenders in their deals, there are some aspects of sponsored lending that investors should be aware of. PE sponsors excel at running auctions when selecting their lenders, sometimes soliciting term sheets from 10 or more private lenders who are competing for the business. As a result, the "winning" lenders for sponsor-led deals often end up with the lowest pricing and the least creditor-friendly terms and covenants – concessions they had to make to get more loan volume.

Investors in private credit funds should be focused on understanding where their managers' deal flow is coming from, and how reliant these managers are on bidding aggressively to win non-relationship sponsored business, which leads to weaker structures and pricing. Moreover, institutional investors should assess how reliant their private credit managers may be on a small set of PE sponsors for a significant portion of their deal flow – some lenders may be inclined to take on riskier deals to ensure continued deal flow from their PE sponsor relationships, highlighting the importance of a broad group of PE sponsors as a source of deal flow. With senior debt investing, which has no equity upside, just a few losses can very negatively impact returns!

JS: How has private credit performed in the rising rate environment of the past 18 months? Are you seeing signs that rising rates have affected borrowers' ability to service debt? Do you see more defaults as a result?

TC: A higher interest rate environment is a double-edged sword. Private credit, which generally consists of floating rate loans, performs well from a yield point of view in a rising rate environment. With SOFR (the base rate) approaching 5% and with a bit of spread widening, private senior loan yields are solidly double-digit now. For investors, this is a good thing.

On the flip side, a fund's borrowers now face the challenge of significantly higher interest payments even when maintaining the same amount of debt. These companies will have to balance the effects of interest payments that may have doubled or tripled with needs to make other short- and long-term capital investments. It's simple math: all else equal, a private credit manager with a preponderance of borrowers that are aggressively leveraged, at say 5-6x those borrowers' EBITDA levels, will have many more borrowers facing cash flow challenges compared to a manager with average leverage in the 3-4x range. While some larger borrowers with more diversified customer bases may be able to handle more leverage, the impacts of higher interest rates affect all companies regardless of size.

Over the past decade, private credit has exhibited strong performance due to a robust economy, with borrowers generally generating consistent performance and strong cash flows that allow them to handle higher leverage. So far, even as interest rates have risen, we and other private credit managers have seen borrowers fare reasonably well in most industries, as the economy has remained resilient. We have not yet seen meaningfully higher default rates (in terms of missing interest or principal payments), but we are beginning to see more borrowers experience covenant-related defaults (e.g., maintaining the required interest expense coverage ratio) which tend to occur before actual payment defaults. Good lenders who have experience in up and down markets, and who have been disciplined in negotiating good covenants for their deals, should be able to move more quickly to work with borrowers, protect their debt, and achieve better outcomes for their investors in more challenging environments.

JS: How would you expect a recession to "play out" in the private credit market compared to the public market?

TC: Public debt markets are very different from private debt markets. Public bonds generally have ample liquidity (i.e., many potential buyers) and no covenants, so holders of a company's public bonds that are concerned about that company's performance only have the option of selling those bonds, presumably at a discount, hopefully before the discount widens.

In contrast, private debt holders don't typically have the ability to sell underperforming loan positions, so lenders/managers have to use their skill to actively work with their borrowers to get better performance (repayment) on their loans. These "workouts" with underperforming companies that are not meeting their debt service requirements can sometimes take 3 years, 5 years or more. During a recession, credit managers will spend significant time with many of their borrowers – working through cash flow models, negotiating amendments to loan agreements, positioning against other lenders, negotiating with sponsors/owners about who will put in needed cash, potentially getting involved with the management of companies, writing endless memos, and getting internal approvals required to make many of these moves.

As a result of all of this, managers without robust workout teams (which is most of them) may be "out of the market" and will not have the capacity, manpower, or capital to originate new loans or investments during those times. They simply will not have the time to go out and look for new loans! Those managers with more diversified portfolios, less risky companies, more conservatively underwritten portfolios (with better covenants and lower leverage), and with experienced workout teams may be able to benefit by making new investments when capital is scarce, the ability to be selective is high, and terms and pricing are very lender-friendly.

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IN CONVERSATION WITH IAS (continued)

JS: Do you see regulatory changes (e.g., reporting transparency, oversight & supervision) on the horizon for the private credit markets?

TC: As the private credit market has grown, private credit managers have been increasing the level of transparency for their investors, with more and more data available on the financial health of their portfolios, the impacts of fund-level leverage and subscription lines, and the loan-level performance of their borrowers. Funds have been driven to increase this transparency not only by the SEC and FINRA, which make sure that managers are marketing to investors with proper disclosure, but also by competition and by institutional investors who demand more data in due diligence before they make investment commitments. I expect that fund complexes will continue to step up their transparency in these areas to ensure that they do not tempt regulators to assess fines and extend their reach.

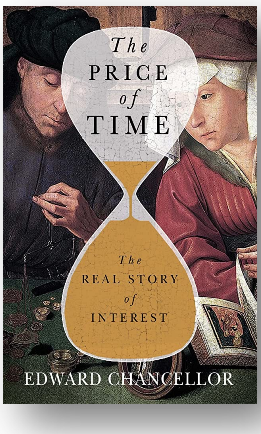
No doubt, private credit funds have encountered a much lower degree of regulation relative to banks. Obviously, pension funds – which serve everyday, hardworking (and voting) employees and retirees – make up a substantial portion of the investor base in private equity and private credit funds. We all know how our political systems work -- while it does not seem likely now, a significant failure or collapse of one or two large private credit funds that severely impacts the retirement accounts of pensioners could quickly spur actions by Congress and regulators. Time will tell.

JS: What other trends and developments are you seeing in the private credit market?

TC: Large private credit managers continue to grow in both size and influence. As they grow, they tend to target larger and larger borrowers. However, there is still space for smaller funds – and for some larger funds with unique origination capabilities – to cater to lower middle market segments which feature smaller-sized borrowers, better pricing and terms, and more relationship-based lending than in those larger markets.

JS: Thank you, Tony!

WHAT WE'RE READING



The Price of Time: The Real Story of Interest

By Edward Chancellor
Atlantic Monthly Press, 2022

The first third of *The Price of Time* traces the practice of charging interest back to the ancient Near East about 5000y ago. Over time, objections to interest have waxed and waned, reflecting the tension between the social/redistributive implications of compounding debtors' payments to lenders versus the recognition that costs of lending – repayment risk, forgone production, and the value of money today in exchange for money tomorrow – legitimize the charging of interest.

The rest of the book compellingly presents the last few centuries of economic and financial history as a series of booms and busts, with artificially low interest rates the common *causa causarum.* Underpinning this view of history is the notion that "the adverse consequences of easy money – interest rates set at two percent or less – fuel speculative manias, drive savers to make risky investments, encourage bad lending and weaken the financial system."

Zooming in on more contemporary concerns, according to Chancellor, ultra-low interest rates in the years surrounding the Great Financial Crisis have not been a *consequence* of a stagnating real economy (*i.e.,* secular stagnation) but rather a *cause.* The purposeful suppression of interest rates has muted cyclical fluctuations, distorted capital markets, depressed productivity, allowed zombie firms to proliferate, and, ultimately, sowed the seeds for successive crises. "Lower for longer" policies are responsible for a succession of catastrophes and near catastrophes from the housing bust, to the crypto bubble, to stagnating productivity, to increasing inequality with, in Chancellor's view, dovish central bankers bearing much of the responsibility.

However, careful readers ought to keep three caveats in mind. First, many policy choices of the last two decades were made amidst the economic version of the "fog of war." Although perhaps suboptimal in *hindsight,* the counterfactual damage that would have been incurred had a less accommodative policy path been followed receives little consideration. Second, the possibility that demographic shifts and technological changes have contributed to low interest rates, coinciding with – but not causing – recent economic and financial stresses also receives little attention. Third, attributing many of the economic and financial calamities to a single cause strains credulity; readers of the book would do well to keep in mind that *post hoc ergo propter hoc* is the Achilles heel of historical story telling. While low interest rates are certainly part of the story, they are surely not the entire story.

CIO Takeaway: *The Price of Time* provides a cautionary – though perhaps a too simple – tale of the damage wrought by overly accommodative policy, sounding a warning about potential turbulence ahead as a result. The lessons of history suggest that financial suppression is frequently an attractive but fraught policy choice and one that CIOs, investors and other market participants ought to view with caution.

--Noah W

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WHAT WE'RE READING

HOOVER INSTITUTION
ECONOMICS WORKING PAPERS

The Safety Net: Central Bank Balance Sheets and Financial Crises, 1587-2020*

Niall Ferguson† Martin Kornejew‡
Paul Schmelzing§ Moritz Schularick¶

Economics Working Paper 23102

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February 3, 2023

This paper studies the evolution of central bank balance sheets over the past 400 years across 17 major economies. The size of central bank balance sheets has varied substantially over time relative to economic and financial activity. Major balance sheet expansions were initially associated with government finance in geopolitical emergencies, but over time liquidity provision during financial turmoil has become the key driver of balance sheet operations. We examine the historical record of such lender of last resort interventions with a novel identification strategy based on pre-determined ideological beliefs of acting central bank governors ("hawks" vs. "doves") with respect to financial sector support. Using exogenous variation in the crisis response, we estimate the effects of lender of last resort operations on the economy. History shows that liquidity support during financial crises has indeed tended to stabilize the economy successfully: crises are less severe, asset prices recover more quickly, and deflation is avoided. However, there is also evidence that the provision of central bank liquidity to financial markets raises the probability of future boom-bust episodes, pointing to potential moral hazard effects of central bank intervention.

Keywords: Central bank balance sheet, financial crises, liquidity support, moral hazard
JEL Codes: G01, G15, G21, N20

The Hoover Institution Economics Working Paper Series allows authors to distribute research for discussion and comment among other researchers. Working papers reflect the views of the authors and not the views of the Hoover Institution.

* The views expressed in this paper are solely those of the authors. We would like to thank conference and seminar audiences at the Banque de France, the CEPR Political Economy of Central Banks Conference, Yale SOM, Boston College, and at Bonn University, as well as Bill English, Andrew Metrick, Eric Monnet, Stefan Nagel, Alp Simsek, Amir Sufi and Michael Weber for their comments. We thank Klas Fregert for sharing historical data on the Riksbank's balance sheet and providing underlying context. We also thank Pablo Martin-Acena for providing helpful historical context to the Bank of Spain's balance sheet dynamics, Lilia Costabile for help with Neapolitan data, Leonardo Ridolfi for sharing new French GDP data, and Ulrich Pfister for sharing new German GDP data. Support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2126/1 – 390838866 is gratefully acknowledged.
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The Safety Net: Central Bank Balance Sheets and Financial Crises, 1587-2020

By Niall Ferguson, Martin Kornejew, Paul Scmelzing, and Moritz Schularick
Hoover Institution Economics Working Paper Series (#23102), May 2023

Unconventional monetary policies – *de rigueur* in the post-GFC era – have sparked an intense debate amongst academics and practitioners over their costs and benefits. While extraordinary easing may have been warranted to avert severe financial and economic damage, the implicit promise of a lender of last resort with a nearly unlimited balance sheet has arguably led to risk-taking excesses and potentially even more damaging crises down the road.

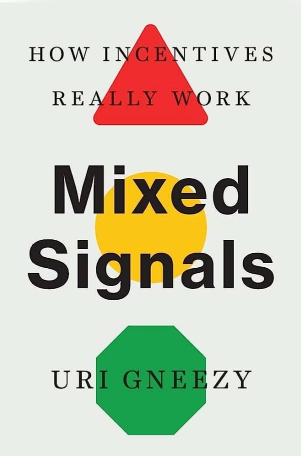
To evaluate the efficacy of central bank balance sheet expansion, Niall Ferguson (Senior Fellow at Stanford's Hoover Institution, Stanford University) and his academic co-authors collect five centuries of central bank balance sheet data and identify some 540 central bank balance sheet expansion events across 17 countries. Prior to the 1800s, most expansions were in response to war or revolution. Since then, balance sheet expansions have tended to be in response to financial stress – market crashes, bank runs, liquidity needs and other threats to financial sector health.

Mining this rich and newly exposed vein of information for relevant lessons regarding recent monetary policy developments, the authors illustrate that current central bank balances are high but within the historical range *when scaled by public debt or by private credit* (they are making new highs when scaled to GDP). While it is comforting to know we are *not* in uncharted territory, previous episodes when bank balance sheets were as large are they are now coincided with an aligning of monetary and fiscal policy and less central bank independence.

More central to the paper, the authors evaluate both the benefits of balance sheet expansion in terms of mitigating financial and economic risks and the "moral hazard" costs of being a lender of last resort, finding significant evidence of both effects. On the one hand, they find that "liquidity support during financial crises substantially cushion(s) negative effects on output." Liquidity support also helps to avert disinflationary episodes, does not lead to runaway inflation, and boosts investment spending, deepening the capital stock and sowing the seeds of future productivity growth. On the other hand, there is also ample evidence over the long term that balance sheet expansion encourages riskier behavior and amplifies the credit "boom-bust" cycle. In the wake of central bank liquidity provision, credit-to-GDP ratios tend to first rise significantly, followed by an increased probability of a subsequent financial crisis.

CIO Takeaway: This paper is an always timely reminder that there are no free lunches. Extraordinary easing was a critical factor in helping to stabilize the financial system and global economy in recent years but it has also likely heightened the risks of a boom-bust credit cycle and may also reflect an erosion of central bank independence. Are the benefits accrued worth the forward risks? Only time will tell.

--Noah W



Mixed Signals: How Incentives Really Work

By Uri Gneezy
Yale University Press, 2023

We all know that incentives influence behavior. However, we also know that incentives can go awry, producing negligible or perverse behavioral results. Using experimental and real-world case studies, this volume lays out the features of good incentive design.

Besides the direct effect of incentives (*i.e.,* "pay me more to do X and I will be more likely to do X"), incentives also have indirect effects: social signaling (*i.e.,* what others will think of me by my actions) and self-signaling (*i.e.,* what I will think of myself by my actions). The interaction of these indirect signals affects the efficacy of incentives.

The author discusses how good incentive design can win markets. For example, in the early days of EVs, both Honda (Civic) and Toyota (Prius) introduced relatively expensive hybrids. Consumers were willing to pay more for a hybrid to help the environment (self-signaling). However, Honda deliberately made its EV Civic to look like its non-EV Civic, whereas Toyota gave its Prius a highly distinctive design. Only Prius drivers could then socially signal to passersby that they were environmentally-conscious. Toyota's decision helps explain its EV market success over Honda.

Supported by research-based evidence, the author offers thoughts for effective incentive design. To encourage innovation, punish *inaction* but not *failure* by rewarding researchers to abandon projects with low likelihood of success (*i.e.,* "make mistakes faster"). To encourage motivated and collaborative employees, offer employees a reward for quitting (*i.e.,* "paying to quit" makes it expensive to linger as a dissatisfied employee). To encourage desired employee behavior, lean on the "loss avoidance" lesson from behavioral psychology by giving employees a lump sum at the outset and make deductions as employees deviate from target rather than pay more as the target is met.

A challenging area of incentive design is getting people to adhere to "good" habits. Evidence indicates that many of us revert to "bad" habits not long after the incentive is removed. While the author suggests some commitment devices, much work remains to get "good" habits to stick.

Finally, the author illustrates how incentive design can be used to change long-established cultural habits such as the Maasai warriors' killing of lions as a rite of passage. Young warriors are now incentivized by elders to protect lions by scouting them and diverting them away from valuable livestock.

CIO Takeaway: Our society is undergoing significant structural changes (e.g., energy sources, trade patterns and industrial policy). Businesses and governments will rely heavily on incentives. The design of these incentives will affect their success and should help inform investment decisions.

--Bruce P.

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