INSTITUTIONAL ADVISORY & SOLUTIONS

PGIM

THE DIFFERENTIAL

New Developments in Portfolio Construction

July 2021 | Issue 2

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 in IAS are looking forward to working on-site later this fall. We are also eagerly anticipating a return to in-person meetings with you to share our portfolio research.

As we have learned over the past 15 months, many aspects of *producing* research can be efficiently performed regardless of physical location, though the lack of informal brainstorming and problem-solving "white board" sessions does make the work a bit less joyful.

In contrast, *delivering* implementable research effectively to CIOs relies more heavily on in-person interactions. Delving into a topic, engaging in open-ended debate, and being challenged to explore new lines of inquiry are all more likely when sitting together around a table. These interactions have a flywheel effect, creating ever more research questions – questions that come directly from you, questions that are top of mind, and questions that are, therefore, most critical to address. This is the lifeblood of IAS and we are eager to renew that process.

After a very productive 2020, we have had a very strong start to 2021. We have held numerous one-on-one virtual meetings and presented at virtual conferences across Asia, Australia, Europe and North America; we have completed several bespoke projects using our OASIS framework to analyze the portfolio implications of larger allocations to illiquid private assets; and completed another bespoke client project using our RASA framework to construct customized commodity indices that match CIO objectives better than off-the-shelf benchmarks.

We also published three new research papers (summarized below) on US stock-bond correlation, the rapidly growing core+ real estate debt private asset class and harnessing the potential of illiquid private assets for DB plans. We have several more papers forthcoming in the quarter ahead as well.

Given the recent improvement in pension plan funded status, this edition of *The Differential* features a conversation between PGIM IAS' Michelle Teng and Eitan Gazit, Director of Global Product and Market Solutions, at Prudential Financial, Inc. (PFI), on recent developments in the pension risk transfer (PRT) market.

Finally, we are planning our 2022 IAS research conferences in North America and Europe that will highlight our recent and upcoming work. The IAS Research Conference is designed to be *highly interactive* and is intended to spark some spirited (but friendly) debate among conference participants and presenters, all packed into a half-day format. We look forward to sharing details with you as we finalize them.

Until then, yours truly,

Bruce D. Phelps, PhD, CFA

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

IN THIS ISSUE

IN CASE YOU MISSED IT

The Differential | Issue 1

RESEARCH ROUNDUP

Access Additional IAS Insights →

IAS research is organized into four major streams: ***Real Assets, Portfolio Construction, Manager Allocation and Selection, and Illiquid Private Assets.*** The common thread throughout is our focus on addressing emerging challenges facing CIOs and asset allocators that affect long-term portfolio performance. Striving to incorporate the full complexity of multi-asset portfolio management, the long-term objectives, and the short-term constraints that CIOs face, we attempt to offer concrete, data-driven, actionable answers to critical questions. Recent examples are highlighted below.

ILLIQUID PRIVATE ASSETS

Harnessing the Potential of Private Assets: A Framework for Institutional Portfolio Construction

By Junying Shen, Michelle Teng, Ding Li (GIC) and Grace (Tiantian) Qiu (GIC), June 2021

Defined benefit plans are increasing allocations to illiquid private assets. However, for asset allocators, liquidity risk is one of the most critical but least quantified risks. In collaboration with the GIC, we developed a cash-flow-driven asset allocation framework (OASIS™) that can help CIOs analyze how their top-down asset allocation decisions and their bottom-up private investing activities interact and affect their portfolio's ability to respond to liquidity demands in a multi-asset, multi-period setting. In examining three "what-if" scenarios: (1) an asset allocation glide path that more gradually increases LDI; (2) higher contributions from the plan's corporate or public sponsor; and (3) superior CIO private equity fund-selection skill, we illustrate the tradeoffs between expected performance and various liquidity risks (such as funding ratio variability, glide path changes, corporate actions, and sustained liquidity drawdowns) that are inherent in portfolios that include illiquid private assets.

Figure 30: "What-if" Analysis Summary

Performance	Baseline	Higher Contributions	Alternative GP (Lower LDI%)	Superior Fund-Selection Skill
Avg. Horizon "Return" (Net of Benefit Payments)	0.3%/y	0.7%/y	0.6%/y	0.8%/y
Avg. Funding Ratio (YE 10)	103%	107%	106%	107%
% of Simulation Runs Reach GP4 by YE 10	59%	68%	61%	67%
Expected GP4 Arrival Month	72	71	72	71

Risk		Baseline	Higher Contributions	Alternative GP (Lower LDI%)	Superior Fund-Selection Skill
"Assured Cash" Drain	Probability of Hitting "Early Alert Line" (Use up 1% of All Liquid Assets)	2.7%	1.4%	2.9%	1.8%
Rebalancing Failures	% of Simulation Runs with "X" Rebalancing Failures over 10y	22	24	5	28
Funding Ratio Variability	95% Confidence Interval Band (YE 10)	[69%, 134%]	[74%, 139%]	[70%,145%]	[73%, 142%]
	Avg. Funding Ratio Variability (YE 10)	4.2%	4.3%	4.7%	4.4%
12m Liquid ("Assured Cash") Drawdown	Avg. Frequency of Violation over 10y (-5% threshold)	20.4%	18.7%	20.1%	18.9%
	Avg. Frequency of Violation over 10y (-10% threshold)	7.3%	6.5%	6.8%	6.6%
	Avg. Maximum Drawdown %	-15.0%	-14.7%	-14.6%	-14.7%
	"Global" Worst-case Drawdown %	-34.9%	-34.6%	-35.0%	-34.9%

Source: GIC TPS & PGIM IAS. Provided for illustrative purposes only.

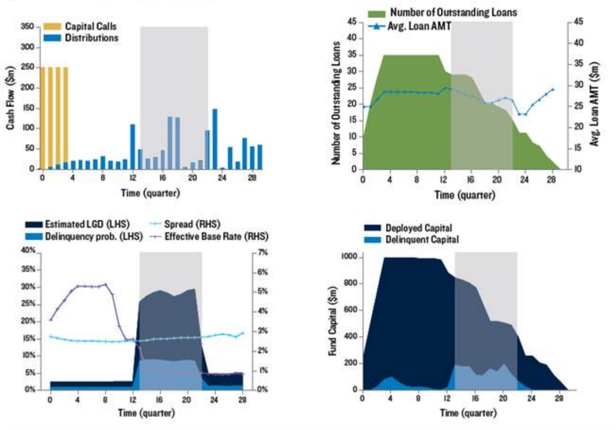
ILLIQUID PRIVATE ASSETS

A Rising Private Asset Class: Core+ Real Estate Debt

By Michelle Teng, Wenbo Zhang (QMA) and Jonathan Kohana (PGIM Real Estate) – July 2021

Institutional allocations to global core+ private real estate debt are on the rise. This paper models the cash flows and valuations of core+ real estate debt funds to help CIOs better understand how these investments affect their portfolio's cash flow characteristics and liquidity risk. Building up from the individual loan level, we model core+ real estate debt fund cash flow dynamics using practitioner supplied assumptions and incorporate sensitivity to the economic environment, both at fund launch and over the fund's life. The core+ real estate debt cash flow model can be used in conjunction with other multi-asset portfolio analysis tools (such as OASIS) to help CIOs evaluate the diversification and liquidity management potential that private core+ real estate debt investments can bring to their portfolios.

Figure 16: Fund II – Economic Regime Shifts during Fund's Life



Fund II	
Annualized IRR	6.1%/y
Fund Life	7.3y
Loan-AMT-weighted avg. spread	2.6%
Loan-AMT-weighted avg. effective base rate	3.1%

Note: Bad economy period is shaded in grey. Source: PGIM IAS, PGIM Real Estate. Provided for illustrative purposes only.

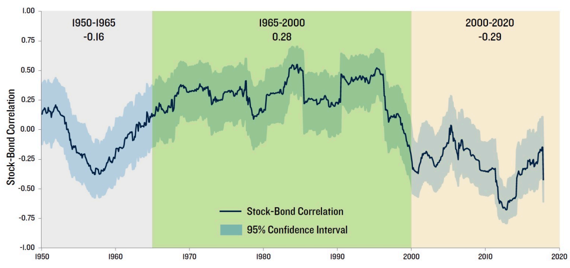
PORTFOLIO CONSTRUCTION

US Stock-Bond Correlation: What Are the Macroeconomic Drivers?

By Noah Weisberger and Junying Shen – May 2021

For the last 20y, the correlation between stock and bond returns has been negative, enabling CIOs to increase stock allocations, with bonds acting as a hedge, while still satisfying a given risk budget. However, 70y of data reveals that US stock-bond correlation regimes do change. To understand what drives stock-bond correlation regimes, we break down correlation into its macroeconomic components and relate these components to economic policy settings. We argue that sustainable fiscal policy, and independent, rules-based monetary policy support negative stock-bond correlation, while unsustainable fiscal policy, discretionary monetary policy, and monetary-fiscal policy coordination support positive correlation.

Figure 3: US Stock-Bond Correlation
Correlation of monthly stock and bond returns (5y-centered, rolling window, 1950-2020)



Note: Stock-bond correlation is calculated with 5y rolling window of monthly stock and bond total returns centered at the time of calculation.
Source: DataStream, FRED, NBER, Robert J. Shiller online data and PGIM IAS. For illustrative purposes only.

Given the current potential for significant changes in monetary and fiscal policy settings, prudence dictates being attuned to a possible change in the correlation regime. A shift to positive stock-bond correlation would alter the tradeoff between portfolio expected return and risk, and hence CIOs' asset allocation decisions too.

RESEARCH ROUNDUP CONTINUED

REAL ASSETS

Introducing *RASA*™ *Interactive*

By Harsh Parikh – July 2021

Inflation worries have prompted investors to re-examine the role of real assets in their portfolios. CIOs can now do so from their desktops using ***RASA Interactive,*** a web application based on IAS' Real Asset Sensitivity Analysis framework and research findings. *RASA Interactive* allows CIOs to compare and contrast 14 real assets, both public and private, based on various performance metrics and estimated exposures to macroeconomic themes. *RASA Interactive* provides CIOs with an objective basis for determining the optimal mix of real assets to meet specific investment objectives. RASA Interactive can be used to construct custom benchmarks, examine the macro and market sensitivities of an existing real asset portfolio, compare real asset portfolios to other assets, and perform scenario analyses to better align a real asset portfolio with investor objectives.

For illustrative purposes only.

Click here to access *RASA Interactive*

IN CONVERSATION WITH IAS

Recent Trends in the Pension Risk Transfer Market

Eitan Gazit
Director
Global Products & Market Solutions
Prudential Financial, Inc.

Michelle Teng PhD, CFA, CAIA
Vice President
PGIM IAS

Dr. Michelle Teng discusses trends in the pension risk transfer (PRT) universe with Mr. Eitan Gazit, Director of PFI's Global Product and Market Solutions team.

Michelle Teng (MT): US corporate pension funded status has been improving. The Milliman 100 Pension Funding Index funded ratio increased to 98.8% (nearly fully funded) in May 2021.[1] I recall the funded ratio was above 100% during two earlier periods (around 2000 and just prior to the global financial crisis). Given that the funding level significantly affects the likelihood of executing a PRT transaction and that the PRT market is now much deeper compared to when plans were last fully funded, how do you think the market will react? What has changed since the GFC and what remains the same?

Eitan Gazit (EG): You're right. We had average funded status over 100% pre-2000 before the tech bubble burst, and in early 2008 before the GFC. Shortly following both of those events, however, we saw massive declines in funded status. In both periods, plan sponsors did not view the PRT market as deep enough to absorb large transactions and many believed that funded status was not volatile enough to warrant the expense (and trouble) of risk transfer. However, the GFC demonstrated just how risky pension plans can be, sparking many subsequent PRT conversations. The GM and Verizon deals in 2012, worth a combined $33 billion, demonstrated the market's ability to efficiently transfer large amounts of risk off a plan sponsor's balance sheet.

Today, nearly 10 years after those transactions, there is a very robust PRT market in both the UK and US. In the UK, there is significant and established competition in the PRT market, while in the US, insurers continue to enter the market and expand their capacity. Plan sponsors in both countries have spent the last 10 years moving further along in their de-risking journey through asset de-risking, plan closures, and plan freezes.[2]

Now, many plans are well-positioned to take the next step of partial risk transfer or full plan termination. With funded status at its highest point since the GFC, I suspect a lot of plan sponsors will look to transfer pension risk to an insurer.

In terms of what remains the same, that's an interesting question as well. The risk inherent in these plans has not changed. Pension obligations are guaranteed, but the assets used to back them are risky. We know what happened to pension plans in 2000 and 2008, and the market volatility we saw during the pandemic was another stark reminder.

MT: It looks like 2021 is shaping up to be a busy year for US PRT, including some large upcoming deals. What can we expect to see? What is it about current conditions that is motivating plan sponsors to consider these very large transactions, and what makes them attractive to insurers? How robust is the market for smaller transactions?

EG: 2021 is expected to be one of the biggest years for the US PRT market, which is not surprising given the high funded status levels that you mentioned earlier. Plan sponsors do not want to wait for funded status to drop again and then be left wondering why they did not act when they had the chance.

The market for smaller deals continues to be very robust. There are almost 20 PRT insurers in the US and eight in the UK. This competition may be one reason for the pricing improvements seen over the past several years, as measured by consultants like Milliman in the US or LCP in the UK. Different insurers will often specialize in different sectors of the market. While the largest deals will continue to get the most headlines, there is plenty of insurer appetite and competition for deals of all sizes.

1. Milliman 100 Pension Funding Index. "Milliman analysis: Funded status continues its crawl to full funding in May (https://www.milliman.com/-/media/milliman/pdfs/2021-articles/6-4-21-pfi_may.ashxi, June 2021)."
2. Cenland Corporation (I) – The CIO and the Closing of the DB Plan, PGIM IAS, December 2019; Cenland Corporation (II) – The CIO and the Freezing of the DB Plan, PGIM IAS, December 2020.

IN CONVERSATION WITH IAS CONTINUED

Some of the larger deals coming to market in 2021 are being driven by plan sponsors who want to move towards full plan termination. One trend I expect to continue is more and larger plan terminations. Many plan sponsors have been considering termination for years, and with funded status at such high levels, they are likely to feel that now is the right time. In the US we'll see buy-ins[3] continue to be used in strategic ways to lock in price. Since a full termination typically takes 18m to 2y, a sponsor can use a buy-in strategy to secure the price and capacity of the risk transfer at the beginning of the process, then convert to a full buy-out[4] and complete the termination when ready. One other trend I want to mention is transformation. Many companies are undertaking a transformation journey more broadly. Whether they aim to grow, become leaner, or change strategy, I believe PRT can be part of that long-term plan, furthering the company's broader goals.

MT: Interest rates have been quite low. What if we get a stock market sell-off and/or a bond market sell-off, causing a drop in funded status? What might corporate treasurers think then?

EG: This is a great question–what happens if a plan sponsor doesn't take advantage of the current environment of high funded status and robust insurer PRT appetite? Eventually one of these conditions is likely to change. If a market event reduces funded status, I think we'll see two distinct camps: those who de-risked before the market event and those who didn't.

The de-riskers will be happy, of course. Corporate treasury departments who terminated their plan or closed a PRT transaction for a portion of their plan will not be impacted as badly as they otherwise would have been. There will be less capital needed for required contributions which can be used for other strategic initiatives. Those who chose to keep pension risk on their balance sheet will potentially be left wondering why they didn't de-risk sooner.

MT: Last year, you led the execution of the first PFI funded reinsurance transaction with a UK insurer. I know it was a multi-year product innovation. Back when I was in Retirement, I was involved with the early stages of this initiative. What are the unique characteristics of UK Funded Reinsurance deals compared with traditional UK longevity risk transfer? What kind of benefits will Funded Reinsurance provide to UK pension schemes?

EG: Funded reinsurance is an exciting new chapter in the UK de-risking market. In the UK PRT market, insurers have historically reinsured only longevity risk. As the PRT market volumes have increased, there is an increased demand to reinsure both asset and longevity risk to global reinsurers through funded reinsurance. Funded reinsurance allows UK insurers more capital and indirect access to a reinsurer's asset management capabilities, which could include asset types or strategies that are novel to the UK insurer. By providing both capital and access to different asset classes, I believe funded reinsurance could help fuel continued growth in the UK PRT market.

MT: Where do you think the US PRT market will go over the coming years?

EG: In the US, insurers continue to find innovative solutions to expand capacity, optimize pricing and achieve capital efficiencies. As I think about the longer horizon, I wonder if there is appetite for public plans or Multiple Employer Plans (MEPs) to de-risk their plans using risk transfer solutions. The underfunding of these plans is a well-known problem. Recently, as part of the American Rescue Plan Act of 2021, financial assistance worth an expected $86 billion was earmarked for significantly underfunded MEPs. As funded status of these plans improve, they are likely to increase focus on de-risking. While it's impossible to predict, it is a large potential new market.

MT: How is the development in the PRT market going to affect the way CIOs think about their asset allocation and the role of illiquid private assets (e.g., private equity) in their portfolios?

EG: In a PRT transaction, plan sponsors pay a single premium to an insurance company using cash, asset-in-kind transfers or a mixture of the two. Traditionally, plan sponsors gearing up for plan termination would let their illiquid assets wind down, as it is much easier to pay for PRT with cash or liquid assets. However, there have been transactions where private assets were used to pay a portion of a PRT premium. I do not think it's the best solution for every CIO to move away from illiquid private assets and the performance benefits they provide. I certainly don't need to tell you, Michelle, that the risk/return profile for illiquid assets can be better than public assets.

If a CIO has a plan with an allocation to illiquid assets, I think an insurer may be willing to take some of it as part of a transaction. It would have to be a large enough transaction to justify the complication of accepting illiquid assets, but it's a potential option if plan sponsors would value it. Plan sponsors considering their options should reach out to experienced insurers to discuss illiquid assets.

MT: What did I not ask you that I should have asked?

EG: One thing we did not discuss was deferred participants (*i.e.*, active participants who are still working and vested terminated participants who are no longer with the company but have yet to commence their benefits). It's easier to transact on a retiree population both in the US and UK. But one thing that continues to evolve is insurer capacity for deferred participants. As plan terminations become more and more prevalent, deferred participants are becoming a bigger portion of the PRT market. Plan sponsors may be hesitant to transact because they still have a lot of deferred participants, but it's not the obstacle that it used to be. Those who reach out to advisors or insurers may be surprised at the options available to them.

Eitan is a Director for the Global Product and Market Solutions team within PFI where he works on product and market development in the Pension Risk Transfer space. Eitan holds a bachelor's degree in applied mathematics from York University. He is a Fellow of the Society of Actuaries, a Fellow of the Canadian Institute of Actuaries, and a CFA® Charterholder.

Michelle is a Vice President in PGIM IAS. She joined IAS from the Investment & Pension Solutions group in PFI. 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.

3. **A buy-in:** The insurer makes a monthly bulk payment to the DB plan to cover the plan's actual benefits payments to participants, while the plan maintains the liability and holds the buy-in contract as a plan asset.
4. **A buy-out:** That is to say, the plan transfers pension liabilities together with assets to an insurance company and "walks away" with no more obligations to the participants.

WHAT WE'RE READING

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

The Risks of Safe Assets

The Risks of Safe Assets

Yang Liu * Lukas Schmid† Amir Yaron‡§

First Draft: December 2018
This Draft: July 2019

US government bonds exhibit characteristics often attributed to safe assets: They are liquid and readily accepted as collateral. A long literature documents significant convenience yields in scarce US Treasuries, suggesting that rising Treasury supply and government debt comes with a declining liquidity premium and a fall in firms' relative cost of debt financing. In this paper, we empirically document and theoretically evaluate a dual role for government debt. Through a *liquidity channel* an increase in government debt improves liquidity and lowers liquidity premia by facilitating debt rollover, thereby reducing credit spreads. Through an *uncertainty channel*, however, rising government debt creates policy uncertainty, raising default risk premia. We interpret and quantitatively evaluate these two channels through the lens of a general equilibrium asset pricing model with risk-sensitive agents subject to liquidity shocks, in which firms issue defaultable bonds and the government issues tax-financed bonds that endogenously enjoy liquidity benefits. The calibrated model generates quantitatively realistic liquidity spreads and default risk premia, and suggests that rising government debt reduces liquidity premia, but crowds out corporate debt financing and investment, and creates endogenous tax volatility, reflected in higher credit spreads, risk premia, and consumption volatility. Therefore, increasing safe asset supply can be risky.

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§Conference draft. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Bank of Israel. We thank Daniel Andrei, Espen Henriksen, Hanno Lustig, Harald Uhlig, Stan Zin and participants at the Backus Memorial Conference, SED, LBS Summer Symposium, NBER Capital Markets, and CEPR Summer Symposium Gerzensee for helpful comments and discussions.

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By Yang Liu (The University of Hong Kong), Lukas Schmid (University of Southern California – Marshall School of Business) and Amir Yaron (University of Pennsylvania – Wharton School of Business and the Bank of Israel), Working Paper, September 2020

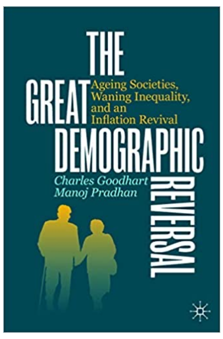
The long-term impact of an increase in US Government debt on Treasury yields and corporate credit risk is a critical issue for investors. The authors argue that, in theory, there are two distinct channels through which an increase in Treasury supply could affect yields: the "liquidity channel," which pushes yields lower as the supply of safe assets increases and transaction costs fall, and the "uncertainty channel," which pushes yields higher as an increase in government debt leads to a reevaluation of future fiscal policy outcomes and an increase in default risk. The empirical evidence suggests that both channels are, indeed, in operation. An increase in government debt tends to: (1) decrease the liquidity premium component of Treasury yields; (2) increase credit risk premia; (3) widen credit spreads; and (4) increase expected excess corporate bond returns.

Critically, given the current environment, the authors show that the balance between these two channels depends on the existing level of government debt. When debt-to-GDP is already high, the uncertainty channel dominates the liquidity channel and yields tend to rise. Under these circumstances, the authors note that a further increase in the supply of safe assets is actually "quite risky," leading to higher interest rates, greater default risk and lower economic growth.

CIO Takeaway: An increase in the supply of Treasuries lowers the liquidity risk premium. At the same time, it also puts upward pressure on the cost of capital and downward pressure on economic growth, leading to an increase in default risk premia, credit spreads and forward excess corporate bond returns. At high levels of debt-to-GDP, the forces that push yields up and increase the risk of default dominate the reduction in liquidity risks.

-Noah W.

The Great Demographic Reversal: Ageing Societies, Waning Inequality, and an Inflation Revival



Charles Goodhart and Manoj Pradhan, August 2020

The past 30y has witnessed two global trends: (1) a large positive labor supply shock as China joined the global economy and (2) a relatively stable global dependency ratio (the number of non-working age "dependents" per worker). Both trends led to falling global inflation and interest rates that investors enjoyed. Since these demographic trends have persisted for so long, investors may now take them for granted. However, both are now changing (the "Great Reversal"), making the past a poor guide for the future. Global labor supply is now declining (China included), with future supply growth in India and Africa not enough to offset the downtrend, and the dependency ratio is increasing rapidly with added medical costs. Consequently, unlike the past 30y, and barring an unlikely surge in global productivity, global demand will begin to exceed supply and labor's bargaining power will strengthen, leading to upward pressure on prices. Central banks will be slow to respond to rising inflation as higher interest rates would produce punishing debt-service ratios.

Some argue against this prediction citing Japan's deflation and low interest rates starting in 1990 as evidence of what happens to an economy with declining labor supply and a rising dependency ratio. However, the authors counter that Japan's experience is a special case as unfavorable demographic dynamics there coincided with quite favorable demographic developments elsewhere, specifically China, underscoring the global nature of these types of demographic trends and financial market linkages.

CIO Takeaway: In a globalized economy, it is important for investors to examine global trends, not just home-country trends. As the world ages, global labor supply is in rapid decline and the dependency ratio is rising–both opposite to trends of the past 30y. The consequences of the "Great Reversal" are likely to be slower economic growth, higher inflation, and more accommodative fiscal and central bank policies.

-Bruce P.

文明、现代化、价值投资与中国 (Civilization, Modernization, Value Investing and China)*

Lu Li, April 2020

China's unique cultural and political heritage present a challenge in evaluating China's economic potential. In this collection of essays by Lu Li, a long-term investor in Chinese markets and founder of Himalaya Capital, Li projects the likely future path of Chinese economic development based on patterns evident in centuries of global socioeconomic history. Li argues that the forces that give rise to successive stages of development are universal in nature and transcend "local" cultural and political conditions Hence, China's likely path towards what Li calls "Civilization 3.0"(characterized by sustained economic growth, free market principles, and the centrality of science and technology) will have elements resembling historical patterns seen elsewhere. With this ongoing transformation as a tailwind, and consistent with historical patterns, Chinese potential growth looks to remain quite high.

Since China's financial markets are still maturing and economic inefficiencies remain, alpha opportunities abound for investors with a long-horizon orientation. This backdrop is particularly conducive to value investing in ways that are familiar to many Western investors.

CIO Takeaway: China's unique cultural and political heritage should not be an impediment for Western investors. As China moves toward the Civilization 3.0 paradigm, value-oriented strategies are likely to be a beneficiary, particularly for those with the foresight to see these long-term dynamics play out.

-Junying S.

**English translation is not yet available.*

MEET IAS: FEATURING HARSH PARIKH

Principal and Head of the PGIM IAS *Real Assets Research Program*

Dr. Harsh Parikh joined PGIM IAS in 2015 from BNY Mellon where he was a Portfolio Manager and Strategist. Harsh earned a BE in computer engineering from Gujarat University, an MS in computer science and an MS in mathematical finance from USC, and a PhD in finance from EDHEC Business School.

Why did you choose a career in research?

Earlier in my career, I was fortunate to have had a wide range of roles, from trading analytics, to risk management, to manager selection, to portfolio construction. Many of these roles included a research component. So, in joining PGIM IAS, with its singular focus on research and institutional solutions, I was able to leverage my background and understanding of the practical research needs of asset allocators and CIOs. Digging into topics that are critical to real-world client problems and trying to solve them is both rewarding and intellectually challenging. The issues are always changing, so the IAS research agenda continuously evolves. What is most exciting to me, is that many of the research topics that we take on allow us to explore uncharted territory, so we don't know in advance what the outcome will be.

You have recently written several papers on real assets. How should institutional investors think about the risks and rewards of real asset investments?

"Real assets" means different things to different investors. So, one of the biggest challenges is to help investors think critically about their real asset program and specifically the "why" behind it. Real assets are unique in that they have both micro and macro linkages. For example, to understand agriculture as an asset, there are many things to take into consideration such as: weather and geography, harvesting and irrigation technologies, and consumption trends in emerging economies. That is quite a wide range of interesting issues that need to be considered when investing in real assets.

Given how broad the real asset space is, what can investors do to think more systematically about their real asset programs?

Many investors use the real asset portion of their portfolio to diversify, to hedge against, or to gain exposure to specific economic risks. Off-the-shelf indices are often used as benchmarks and even as investment vehicles. In our view, a more customized approach is warranted which requires an understanding of the differences and similarities of individual assets within the real asset space. One of our key messages is that real assets are diverse in terms of their risk/reward characteristics, returns, and ultimately what sort of incremental exposure these assets bring to the portfolio. The centerpiece of our Real Assets Research program, a framework that we call "RASA" (**R**eal **A**ssets **S**ensitivity **A**nalysis), does just that. RASA provides estimates of each asset's exposure to a set of macroeconomic risks, allowing the construction of customized real asset portfolios with desired macroeconomic characteristics for managing and taking risk.

We recently launched a web-based platform for investors to interact with RASA directly (summarized on page 3). With *RASA Interactive*, a CIO can select assets and portfolio weights and then instantly see a suite of metrics analyzing the inherent macroeconomic and risk profile of the resulting portfolio. This should provide CIOs, risk managers, and asset allocators an intuitive, interactive, and direct way to evaluate the potential efficacy of their real asset program.

You write a regular blog for IAS. Why do you like the blog format and what do you anticipate writing about next?

Blogging helps me communicate less formally and more frequently with investors and the broader IAS community. The blog format also allows me to deliver key messages quickly, succinctly and in a plainspoken way to our clients. It is a great forum for highlighting, in real time, how our research can be impactful and insightful regarding the key market debates of the day. It also keeps me focused on changing market conditions and relevant research issues that are always bubbling to the surface. For instance, our most recent blog post on inflation received a lot of comments, leading to a whole new set of issues for us to consider. That is always the best outcome, when good research or a blog post is not the definitive last word, but instead initiates deeper and more nuanced conversations.

Inflation and its implications remain top of mind for us and will likely be a topic for future posts. And with the upcoming COP26, you may also see me writing about carbon risks and climate-related opportunities.

What are some interesting hobbies or talents that most people may not know about you?

I like to cook, golf, and study Eastern philosophy. I learned cooking while in school away from home, and I picked up golf when I moved to Los Angeles. All three activities allow me to de-stress, gain focus, and more importantly, have fun!

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