BRINGING CREDIBILITY BACK TO MACROECONOMIC POLICY FRAMEWORKS

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Abstract

For most of the past decade, the costs of Unconventional Monetary Policies (UMPs) are being borne by savers, renters, and younger generations. Policies that enlargen central bank balance sheets – supporting credit expansion in the economy – but have no reliable mechanism for reversal, raise the simultaneous risk of higher inflation and deflation. In this study, we argue that the lessons of the post-Global Financial Crisis period are that Quantitative Easing (QE) policies embolden central bankers, excuse political myopia, and enrich major financial institutions. We suggest that reversing the QE predicament requires robustness and neutrality in macroeconomic policy settings.

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1 Introduction

We begin by posing the question: *What is Money?* Paul Volcker, Chairman of the Federal Reserve (1979–1987), would categorise it as a reliable store of value that can be used to exchange for goods and services. This statement of fundamental principle belies the critical and ongoing duty owed by governments and policymakers to protect the integrity of the money supply. Instead, central bankers are too often anesthetised by governing authorities intent on promoting flows of money under the guise of full employment or fiscal plans. Volker's standard (Volcker and Harper, 2018), however, remains clear:

> *"It is a governmental responsibility to maintain the value of the currency they issue. And when they fail to do that, it is something that undermines an essential trust in government."*

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Volker's urging was that national governments need to maintain the robustness of their policy frameworks by enacting policies that are subject to consistent and sustainable benchmarks. Translating this into guidance for policymakers suggests, above all, that policy decisions must be in harmony with allocative efficiency, thus avoiding the distortion of portfolio allocation decisions and limiting disparities in wealth and influence.

Following Volcker's time as Chairman up to the mid–1990s, it did seem that his lessons had been absorbed by many OECD economies that were collectively framing macroeconomic policies around medium-term targets. Perhaps the most prominent example of this is the introduction of inflation targetting frameworks to guide monetary policy (Svensson, 2000) and balanced budget targets for fiscal policy (Kopits, 2001). Together, these targets provided a stable anchor for policymakers whilst permitting short-term deviations to accommodate prevailing economic conditions.

Since the late 1990s, however, the stance of monetary policy has been excessively expansionary, primarily benefitting financial asset prices. This practice (implemented by independent central banks and endorsed by the International Monetary Fund) has fueled debt-driven growth and exuberant asset price inflation. In particular, since the onset of the GFC and the more recent COVID–19 pandemic, global macroeconomic policy settings have become unhinged from sustainable foundations. What has occurred is a transition away from the price-setting objectives of traditional monetary policy to a regime of actively managing the balance sheet to significantly expand the money supply[3].

In the spirit of debate, we present arguments against the prolific and rapid increase in central bank stimulus, bringing attention to the potentially undesirable implications that QE–type policies can inflict on debt levels, asset prices, and efficient portfolio holdings. In doing so, we shed light on the necessity of neutrality when making policy decisions that may restore credibility to macroeconomic policy frameworks.

2 The Stable Anchor Test

We propose a simple test to examine macroeconomic policy settings since the GFC. The 'Stable Anchor test' examines the relative stability of major international currencies against

[3]While many advanced economy central banks have manipulated the money supply historically, QE-type policies are unmatched in terms of the scale of intervention into financial markets.

the price of real resources.

2.1 The Gold Standard for Policy

We consider the United States Dollar (USD) for this exercise. Under a fiat currency system, the value of the USD should equate to unity and maintain parity with real resources throughout time, subject to the soundness of government policies. Indeed, the USD was very stable during most of the Volcker era and well into the early 2000s. Since then, it has consistently depreciated relative to the price of gold. A similar trend is noticeable in other reserve currencies, suggesting that multiple nations are paying a price for the erosion in the credibility of macro-policy settings since the onset of the GFC (Figure 1).

[Figure 1]

Furthermore, major central bank balance sheets have aggressively expanded, potentially distorting asset prices and portfolio balancing decisions. Academics have long studied these potential effects. For instance, Chen et al. (2016) find that financially vulnerable economies, primarily those reliant on USD funding, may experience disproportionate impacts stemming from UMPs carried out by the major central banks. In a similar vein, Morgan (2011) finds evidence of significant capital flows from the U.S. into emerging Asian economies, suggesting that UMPs can foster a search for yield that distorts portfolio balancing decisions. Despite evidence of unfavorable effects stemming from unorthodox policies, global debt levels have reached new highs and are now scaling new peaks due to the COVID–19 crisis. More concerning is the narrative around the adoption of these unorthodox measures as permanent components of the central bank toolkit, contradicting the original discretionary nature of these policies (see for instance Bernanke, 2020).

2.2 Macro-Policy Conducted by Unorthodox Means

The decline in credibility for macroeconomic policy frameworks traces back to the mid-2000s, aligning to the end of the Great Moderation. This period, characterised by strong growth and stability in the business cycles of developed nations, ended with the collapse of Lehmann Brothers in October 2007. To offset the effects of this immense economic disturb-

ance, central banks made significant use of their policy headroom, quickly hitting the limits of conventional monetary policy.

In the face of a constraining zero lower bound, central banks implemented a series of unconventional measures. From 2008, the Federal Reserve (drawing on experiences by the Bank of Japan) committed to large-scale liquidity operations to support the U.S. banking system. These liquidity operations, which initially had a net-zero effect on the supply of money, evolved into Quantitative Easing (QE), promoting prodigious money supply growth. Defined as the large-scale purchase of assets funded by the creation of risk-free bank reserves, QE allowed the Federal Reserve to further ease funding costs and enhance the availability of credit (Joyce et al., 2012). Initially, purchases were concentrated into housing credit markets to address elevated risk premia. Soon, however, purchases expanded into U.S. Treasuries and since the initial implementation of QE, the Federal Reserve has increasingly expanded both the size and the depth of the assets purchased under the program (Gagnon et al., 2018).

Despite significant stimulus, most economies continued to experience lackluster economic growth following the GFC. More recently, owing to the COVID–19 pandemic, the degree of stimulus has yet again expanded, increasing major central bank balance sheets to record-breaking levels (Figure 2). Similarly, the People's Bank of China (PBOC), which traditionally operates monetary policy differently from its peers, has also experienced significant balance sheet growth (Figure 3). As these policies now seem embedded into the fabric of central bank policy, an examination of how they are working is required. Why have central bankers held so fast to adopt QE–type policies? Indeed, the desire to avert an economic catastrophe at the onset of the GFC was legitimate and understandable. But the question remains whether abnormally amplified monetary stimulus conducted through any means necessary is the right approach in all circumstances.

[Figure 2 & 3]

The seminal arguments of Keynes[4] would advocate for greater fiscal stimulus in the face of a liquidity trap. While many federal treasuries followed this advice during the GFC, fiscal policies soon tightened. In contrast, central bankers continued experimenting with unorthodox measures, providing a new means through which they could continue to conduct

[4]In Chapter 25 of the General Theory, Keynes criticised economists who believed that interest rates would always equate to the flow of savings to investments. Keynes maintained that agents do not have to invest and can instead store their wealth.

discretionary monetary policy. As such, central bankers have been kept well at the forefront of macroeconomic management. Further, central banks have also been afforded the perspective that they are still overseeing the same successful inflation targeting regime they operated during the Great Moderation[5]. This continued and elevated position of power over policy decisions may have prevented more fundamental reforms and potentially, acted as a detriment to global policy coordination.

2.3 Has Unorthodox Monetary Policy Been Effective?

So why haven't QE–type policies elevated economies into a position of strong and stable growth? To answer this question, it is worth discussing what these policies were intended to achieve. These policies work mainly through the wealth and asset price transmission channels of monetary policy, enhancing the availability of credit and lowering funding costs (Gagnon, 2016). In turn, these favourable conditions entice economic agents to consume and invest sooner. This certainly worked during the GFC in terms of steadying advanced economies. However, the notion of consuming today also placed a handbrake on future growth prospects and so undermined the likelihood of a sustainable recovery. Instead, capital expenditure growth since the GFC has been the weakest since the post-WWII period[6]. As such, the prelude to the COVID–19 crisis was a decade of weak business investment in OECD economies, seemingly driven by expectations of lower future income growth, set against a backdrop of increasing asset returns.

This expectation of lower-income growth appears to have stemmed, in part, from the 'secular stagnation' identified by Summers (2018). Here, the combined effect of an aging population promoted an excess of global savings and lackluster business investment. Together, these effects led to a decline in neutral interest rates and lower trend productivity growth, accounting for around half of the measured slowing of advanced economies over the 2010s, totaling around 1.5 per cent of GDP. QE–type policies may account for much of the remainder in the reduction of GDP (Blundell-Wignall and Roulet, 2013).

[5]Viewed with the benefit of hindsight, the apparent success of inflation targeting frameworks across the OECD may have been more a function of favourable demographics, technological change, and China's entrance into the global economy. When seen in this light, it is perhaps more understandable why central bankers uphold the view that they should remain as the overseers of discretionary policymaking.

[6]It was not until the election of the Trump administration and changes to U.S. corporate taxation that capital expenditures started to increase and global GDP growth regained some impetus.

One reason QE–type policies may struggle to foster real economic growth is because they tend to inflate the demand for existing assets, which does little to drive current consumption. Instead, these policies more greatly affect investment returns. Thus, while QE–type policies have been implemented on a significant scale, real-economic impacts have remained subdued. In contrast, average returns to existing capital have risen, owning to lower funding costs that may contribute to a loss in productivity. When viewed in totality, lower capital expenditures foster a decline in trend growth rates, further decreasing private investment (Figure 4).

[Figure 4]

Another issue that stems from major central banks expanding the size and depth of their purchases is the simultaneous reduction in the supply of assets available to market participants. This reduction in supply may force investors to seek imperfectly substitute securities, increasing a broad range of asset prices. Meanwhile, private non-financial corporations have vigorously committed to equity market-buybacks, the payment of large-scale dividends, and have scaled back capital expenditures, all of which together further reduce trend productivity growth.

3 The Implications of UMPs on Debt

Several implications arise from UMPs on the level of public and private debt. Globally, government debt and measures of liquidity as a proportion of GDP have nearly doubled since 2009 (Figure 5), with Japan standing out as a key example. Japan's ultra-loose policy settings have contributed to a vast increase in the level of general government net debt to GDP, which skyrocketed from 98 per cent in late 2007 to 154 per cent just before the onset of the COVID–19 outbreak. In Australia, the figures are correspondingly significant, with a net asset position of 7 per cent to GDP converting into a net debt position of 31 per cent to GDP. For a relatively smaller open economy like Australia, such an accumlation of debt may pose serious risks in an environmental of normalising interest rates. This trend is consistent across the globe and the outbreak of COVID–19 has seen both public and private indebtedness continue to rise (Figure 6).

[Figure 5 & 6]

Corporate debt is also likewise increasing in many economies. In the United States, corporate indebtedness has reached around 74 per cent of GDP, with nearly half of the issuance rated speculative by credit rating agencies. Much of this debt has also had the distortionary effect of sustaining companies with earnings less than their interest bill. Perhaps most striking is the increase in household debt, particularly among advanced economies that have seen exponential increases in residential property prices. Australia leads the way in this sense, with the buildup of household debt exceeding 100 per cent of GDP (Figure 7).

[Figure 7]

This rapid increase in gross debt issuance also raises the question as to whether a smooth reversal in QE can occur without significant market volatility. If central banks are no longer key market participants, asset prices may decline and liquidity conditions may deteriorate without their intervention. More insidiously is the fact that a higher level of private-sector debt issuance induces a more substantial refinancing burden in the future, and without sizeable central bank support, many corporates may face elevated refinancing risk (Bordo and McCauley, 2017).

Finally, it is worth noting that concerns of smooth reversibility in unconventional policy settings stems from historical difficulties. The 'Taper Tantrum' of May 2013 is one such example, whereby signaling by the Federal Reserve of a potential future tapering in asset purchases induced significant market volatility (Kawai, 2015). Similarly, when the Federal Reserve tried to reverse out of QE from 2017 onwards (by scheduled and limited selling down of its asset holdings known as Quantitative Tightening), their actions culminated in a significant market drawdown in November 2018. This saw the Federal Reserve change back to an expansionary policy footing in January 2019. Liquidity pressures also became evident in repurchase agreements (repos) markets in October 2019, which justified further policy easing. Ultimately, an accelerated expansion in debt levels driven by extremely loose policy settings reduces flexibility and may stymie a smooth reversal, limiting the capacity for policymakers to respond to future shocks.

3.1 The Counteraction of QE Policies by Investment Firms

If QE–type policies induce a host of undesired implications, one must question why this is the case? The consensus among central bankers, however, is that their actions do not cause market prices to increase above and beyond economic fundamentals, nor that they have maintained stability at a cost of market efficiency. In contrast to this view, we argue that QE policies are inequitable in their application by favoring existing asset holders and feeding disenchantment elsewhere. More concretely, the gains of QE–type policies can be argued to mainly benefit a few privileged private financial institutions charged with controlling financial intermediation for central banks.

As a central bank undertakes QE, their injection of risk-free reserves is placed onto the balance sheets of banks, investment funds, and broker-dealers. As these risk-free reserves surpass the levels needed to meet regulatory and liquidity purposes, excess reserves are expected to circulate into the broader economy, supporting the cost of borrowing and the availability of credit. The injection of reserves, however, is concentrated onto the balance sheets of large investment banks and investment funds that may act as a barrier to the flow of credit into the wider economy. These agents may be likely to use the low-cost funding to serve their objectives in generating higher-yielding returns. One such example of this process includes the use of low-cost funding to purchase government securities that serve as collateral in repo transactions. The cash obtained as part of the transaction can then be used to purchase higher-yielding financial securities such as corporate debt, potentially distorting credit risk premiums (Figure 8). The increased trading volume in repo markets may also help explain the elevated sensitivity of these markets to liquidity conditions in cash and credit markets. In essence, the use of low-cost funding to seek out higher-yielding trades can foster greater linkages among financial markets, magnifying risk spillovers.

[Figure 8]

The targets of this speculative activity by investment banks include financial corporations, information technology firms, and commercial sectors across wide-ranging assets. Whilst this repo trade has been incredibly profitable for investment banks in a 'settled' low-interest-rate environment, it remains an open question as to whether QE policies foster asset price bubbles, rather than real productive investment. Indeed, in this conception of banking, short-term

gains are magnified at the expense of greater potential volatility in the future.

3.2 Monetary Easing is Always Inflationary for Some Measure of Prices

To further examine whether QE has undermined the credibility of macro-policy settings, an examination of financial asset prices is essential. Fundamentally, the asset price channel permits QE–type policies to influence the economy by impacting the wealth of asset holders. Supporting economies through asset purchases *en masse*, however, may undermine the rational pricing of securities. Throughout the 2010s, QE policies gave rise to rapid inflation across a wide range of assets. By 2015, asset prices had hit 200-year highs across 15 major Western economies (Deutsche Bank Research, 2019). The link between growth rates in global liquidity and financial asset prices reveals the pass-through of the asset price channel (Figure 9).

[Figure 9]

Friedman (1963) warned that "*...inflation is always, and everywhere, a monetary phenomenon*". This remains true even when central banks only managed to generate anemic consumer price inflation for over a decade. So where did all the price inflation go, given the extent of QE stimulus? In this era of ultra-low-cost manufacturing, global supply chains, and temporary work visas, consumer prices have been depressed to the point where inflation is mainly revealed among asset prices. What Friedman understood was that inflation can rise within national economies through consumer prices, wages, asset prices, or by some combination of each element. As inflation rates can adjust between economies through real exchange rate appreciations or by nominal exchange rate depreciations, many economies are worse off under these policies which may devalue purchasing power through time. It certainly appears that this has been the case over the QE era.

Essentially, central banks have allowed asset prices and nominal exchange rates to absorb the monetary shocks associated with successive rounds of QE. Japan is a case in point. Its economy has long suffered deflationary pressures in terms of consumer prices since the mid–1990s, an aftermath of the asset bubble perpetuated by the Bank of Japan up to the late 1980s. In response, the Bank of Japan has vigorously implemented QE policies to stimulate its economy. The asset purchases implemented by the Bank of Japan span across the most

diverse purchases comparable to most advanced economy central banks, including purchases of private debt and equity-based Exchange Traded Funds (ETFs). Consequentially, these policies have seen the Yen depreciate against the price of gold by around 80 per cent since the mid–2000s, forestalling structural reform and undermining macroeconomic stability.

4 Key Flaws in Central Bank Thinking

Perhaps the critical error that central bankers have made is their belief that they have full authority over the supply of financial flows. Confidence in the ability to fine-tune these flows stems from standard macroeconomic models whereby money is mainly exogenous and neutral in terms of its impact on output over time. This may have been an accurate depiction of the world before the 1980s and before the emergence of mass pools of institutional capital driven by the savings of baby boomers, but in the modern sense, it lacks any realism.

In contrast, modern bank funding models and balance sheets have long evolved since the emergence of large-scale macroeconomic models. Instead, banks are no longer reliant on captive deposits provided by savers, nor do they need to lend against their deposit base. The uptake of wholesale financing through collateral and offshore credit markets is a testament to this transition in funding practices. Furthermore, with Western governments having handed most of their central banks' independence by the late 1990s, along with the adoption of explicit inflation targets in the early 2000s, it is not surprising that central banks have single-mindedly focused on achieving low-and-stable inflation goals.

To remain relevant, central banks have undertaken unorthodox and untried approaches, rather than passing authority to elected officials and national treasuries. Most disappointing has been the lack of introspection. For instance, the consistent undershooting of inflation targets, asset price imbalances, and lackluster economic growth have all resulted in questions over the efficiency of central bank policy. Alongside the effects that their policies have had on the equity and affordability of housing for families, central banks continue to expand their balance sheets to levels that appear irreversible and may have a cascading effect in terms of dampening productivity.

4.1 Right Sizing for Central Bank and Government Balance Sheets

Before the adoption of unconventional methods, central bank policy was centered on the regulation and pricing of the money supply. The critical lever of pricing, the main function of conventional monetary policy, was the cardinal tool. While balance sheet growth was important and did occur, it was utilised generally to assist and enhance the objectives pursued by pricing the money supply. In a modern sense, however, central banks can be deemed as key market participants whose purview has expanded to all facets of the money supply including its size.

The obvious result of increased central bank intervention is the distortion of financial market participants' roles and responsibilities, which was largely the intermediation of credit and the making of investments based on risk-return dynamics. Instead, QE policies have left monetary authorities managing massive balance sheets in a market place of only a handful of major financial intermediaries.

Certainly, the balance sheets of the four major central banks including the Federal Reserve, European Central Bank (ECB), Bank of Japan (BoJ), and the People's Bank of China (PBoC) is now worth $18 trillion, or some $12 trillion more than at the end of 2008 and are far larger in GDP terms (Figure 10). Simultaneously, the public indebtedness in these economies has also greatly expanded (Figure 11). For instance, the Federal Reserve's balance sheet has reached $7 trillion, or 33 per cent of GDP, and is expected to rise rapidly, with the Congressional Budget Office estimating the US federal budget deficit will reach $4.2 trillion in 2019–20, or 21 per cent of GDP. Similarly, the BoJ's balance sheet already exceeds 100 per cent of GDP, while the ECB's and PBoC's sits at around 40 per cent. The expansive growth in central bank balance sheets is not limited to only the major players. Even the Reserve Bank of Australia (RBA), a smaller but by no means an insignificant central bank, has implemented a series of unconventional tools, including a variant of QE based on yield-curve control, and has committed to buying a sizeable quantity of government debt.

[Figure 10 & 11]

Given this exuberant growth in asset holdings, it is worth discussing what the optimal size for central bank balance sheets could be and its interconnection to the government. For central banks, optimality is a flexible balance sheet with countercyclical peaks and troughs.

This flexibility in being able to swiftly adjust holdings is conducive to the smooth operation of the financial system. Problems, however, begin to emerge when central banks dominate the financial system or certain markets in a manner that cannot be easily unwound. In this sense, central banks should avoid sending out excess liquidity to banks through reserves.

For governing authorities, optimality is a stable level of GDP growth through time, providing adequate fiscal space to deal with unexpected shocks. Stability in economic growth also alleviates the future tax burden for households and minimizes the potential crowding out of private investment. This is not to say that circumstances will not require governments to accept deviations in balance sheets to accommodate external shocks such as the current COVID–19 within reasonable bounds.

4.2 The Risks of Incorrectly Sized Balance Sheets

What are the implications of central banks facilitating the grossing up of public balance sheets for households, businesses, and investors? Given that financial markets are supposed to operate under the assumption that prices are determined competitively by many participants, the large-scale intervention of central banks has interfered in this respect. Increasingly, the role of central banks has moved beyond "lenders of last resort" to instead become major determinants of market prices.

The significant scale of intervention by central banks in financial markets also perpetuates moral hazard by providing market participants with an offsetting trade. More concretely, as asset prices come under pressure, central banks have been quick to further ease policy settings, amassing more assets on their balance sheets. For instance, the BoJ holds JPY 478 trillion or 42 per cent of all Japanese Government Bonds (JGBs) and more than JPY 30 trillion of all Nikkei-indexed ETFs. The Federal Reserve likewise owns $2 trillion or around 19 per cent of outstanding US Mortgage-Backed Securities. As central banks have ramped up buying all types of assets (including funding SMEs and even pay-cheque loans) they have implicitly become the largest underwriter of credit risks in their respective economies.

4.3 An Application of Gibbons, Ross, & Shanken (1989)

Incorrectly sized central bank balance sheets may lead to significant difficulties in constructing mean-variance efficient portfolios. To explore this dillemma, we propose a two-period

model whereby a reduction in the risk-free rate shifts the ex-post effienct frontier. To conduct this analysis, we draw on the seminal work of Gibbons et al. (1989) (GRS) who construct a robust multivariate F test of ex-ante portfolio efficiency. Within their framework, the authors propose an intuitive test of the Capital Asset Pricing Model (CAPM) pioneered by Sharpe (1964) and Lintner (1965), and in the context of this study, the framework provides a simple and visually intuitive explanation of the suboptimal portfolio rebalancing that takes place as QE-type policies are enacted, highlighting the potential efficiency loss. To begin, we state the mathematical tautology of Markowitz (1959), whereby the efficient frontier can be spanned by any two portfolios that fall upon it:

$$E\left[R_i\right] = E\left[R_{z,p}\right] + \beta_{i,p} E\left[R_p - R_{z,p}\right] \quad \forall i \tag{1}$$

Equation (1) illustrates that the expected return on any portfolio i is a function of an efficient portfolio, R_p, and a portfolio with zero covariance known as the zero-beta portfolio, $R_{z,p}$, multiplied by the beta coefficient. Similarly, the CAPM is expressed as:

$$E\left[R_i\right] = R_f + \beta_{i,m} E\left[R_m - R_f\right] \quad \forall i \tag{2}$$

Where R_f is the risk-free instrument and R_m is the market portfolio. As can be inferred from Equation (2), the CAPM is virtually identical to Equation (1), albeit, with R_p set equal to the market portfolio. Thus, to satisfy the mathematical tautology of the mean-variance efficient frontier, the market portfolio must also be efficient. That is, the market portfolio must minimise risk at a given level of return to be able to span the frontier and serve as one of the infinite ex-post portfolios that satisfy Equation (1). To test this theory, GRS propose a testable null hypothesis by commencing with an assumption about the existence of a risk-free rate of return, $R_{f,t}$ that is used to calculate the excess returns on asset i:

$$r_{i,t} = \left(R_{i,t} - R_{f,t}\right) \quad \forall i = 1, \ldots, N \tag{3}$$

GRS then consider the following multivariate regression of the excess return on asset i projected onto the excess return of a portfolio, $\tilde{r}_{p,t}$, that serves as the portfolio that will have its efficiency tested. It is assumed that the disturbance term, $\tilde{\varepsilon}_{i,t}$, is distributed as a multivariate normal. This assumption implies that the excess return of asset i is distributed as

$\tilde{r}_{i,t} \sim MVN$ and holds for all N assets:

$$\tilde{r}_{i,t} = \alpha_{i,p} + \beta_{i,p}\tilde{r}_{p,t} + \tilde{\varepsilon}_{i,t} \quad \forall i = 1, \ldots, N \tag{4}$$

The variance-covariance matrix of the disturbance term is expressed as $E\left[\tilde{\varepsilon}_{i,t}, \tilde{\varepsilon}'_{i,t}\right] = \Sigma \otimes I$ where Σ represents the matrix of contemporaneous covariances of the disturbances across each N asset:

$$\Sigma = \begin{bmatrix} \theta_{11} & \cdots & \theta_{1N} \\ \vdots & \ddots & \vdots \\ \theta_{N1} & \cdots & \theta_{NN} \end{bmatrix} \tag{5}$$

Taking the expectation of Equation (4) gives the following relation:

$$E\left[\tilde{r}_{i,t}\right] = \alpha_{i,p} + \beta_{i,p}E\left[\tilde{r}_{p,t}\right] \quad \forall i = 1, \ldots, N \tag{6}$$

If the portfolio, $\tilde{r}_{p,t}$, is indeed mean-variance efficient, then the following necessary first-order condition of the Sharpe (1964)–Lintner (1965) CAPM must hold:

$$E\left[\tilde{r}_{i,t}\right] = \beta_{i,p}E\left[\tilde{r}_{p,t}\right] \tag{7}$$

By equating Equations (6) and (7), it is shown that for the equality to hold, the intercept term, $\alpha_{i,p}$, must be equal to zero for all N assets:

$$\begin{aligned} &\alpha_{i,p} + \beta_{i,p}E\left[\tilde{r}_{p,t}\right] = \beta_{i,p}E\left[\tilde{r}_{p,t}\right] \\ &\Rightarrow \alpha_{i,p} = 0 \quad \forall i = 1, \ldots, N \end{aligned} \tag{8}$$

From Equation (8), GRS shows that the parameter restriction on $\alpha_{i,p}$ can be represented as the null hypothesis that allows for a test of the ex-ante efficiency of the portfolio:

$$H_0 : \alpha_{i,p} = 0 \quad \forall i = 1, \ldots, N \tag{9}$$

The distributional assumption of multivariate normality in Equation (4) permits the null hypothesis to be tested using an intuitive multivariate F test[7]. GRS estimate the multivariate regression and show that the estimated intercepts have a multivariate normal distribution that

[7]While the multivariate normality assumption is problematic, there are variants of the GRS framework that permit testing under more robust conditions. For instance, MacKinlay and Richardson (1991) & Harvey and Zhou (1993) propose estimating the test statistic through the use of alternative distributional settings. They find the applicability of the GRS model still holds under more relaxed assumptions.

is conditional on $\tilde{r}_{p,t}$:

$$\sqrt{\frac{T}{1+\hat{\theta}_p^2}}\hat{\alpha}_p \sim N\left\{\sqrt{\frac{T}{1+\hat{\theta}_p^2}}\alpha_p, \Sigma\right\} \tag{10}$$

Where T equals the number of observations, $\hat{\alpha}_p$ is a vector of the intercept terms for each N equation, and $\hat{\theta}_p = \frac{\overline{r}_p}{\hat{s}_p}$, where $\overline{r}_p$ is the sample mean of the portfolio's excess return and $\hat{s}_p$ is the sample variance. Borrowing from the work of Anderson (1962) and Morrison (1976), GRS derive the F test statistic:

$$\begin{aligned} F &= \tfrac{T}{T-2}\left(\tfrac{T-N-1}{N}\right)\left(\tfrac{1}{1+\hat{\theta}_p^2}\right)\hat{\alpha}_p'\hat{\Sigma}^{-1}\hat{\alpha}_p \sim F_\lambda(N, T-N-1) \\ F &= \tfrac{T}{T-2}\left(\tfrac{T-N-1}{N}\right)\frac{\overbrace{\hat{\alpha}_p'\hat{\Sigma}^{-1}\hat{\alpha}_p}^{W}}{1+\hat{\theta}_p^2} \sim F_\lambda(N, T-N-1) \end{aligned} \tag{11}$$

Equation (11) shows that the test statistic is distributed as a non-central F distribution with a non-centrality parameter λ, and degrees of freedom N & $(T-N-1)$. The non-centrality parameter is:

$$\lambda = \left(\frac{T}{1+\hat{\theta}_p^2}\right)\hat{\alpha}_p'\hat{\Sigma}^{-1}\hat{\alpha}_p \tag{12}$$

The intuition of the non-centrality parameter stems from the fact that under the null $\hat{\alpha}_p = 0$, which implies that $\lambda = 0$, and thus the test statistic is distributed as a central F distribution. Departures from centrality thus imply an invalidation of the null hypothesis and potentially, mean-variance inefficiency of the given portfolio. GRS show that the W parameter in Equation (11) can be rearranged as follows:

$$W = \left[\frac{\sqrt{1+\hat{\theta}^{2*}}}{\sqrt{1+\hat{\theta}_p^2}}\right]^2 - 1 \equiv \psi^2 - 1 \tag{13}$$

Where $\hat{\theta}^*$ is the maximum excess sample mean return per unit of sample standard deviation, and $\hat{\theta}_p = \frac{\overline{r}_p}{\hat{s}_p}$. Under the null hypothesis, ψ^2 should be in proximity to unity (and thus W should be close to zero), which implies the portfolio is mean-variance efficient. From this representation of the W parameter, GRS illustrates a graphical depiction of efficiency that is reconstructed in Figure 12:

[Figure 12]

In the first period, the curve represents the ex-post mean-variance efficient frontier of risky assets. A combination of risky securities and the risk-free instrument transforms the frontier into a straight line commencing from the origin at $[0, 0]$ and eventually falling tangent with the frontier at point m_1. In the second period, as the risk-free rate is suppressed by an easing of policy settings, the expected return of the frontier portfolio is equally reduced and falls to point m_2, capturing the efficiency loss. The implication of this model aligns with empirical studies that find evidence of reduced expected future asset returns due to QE (see for instance Shah et al. (2018) & Joyce et al. (2020)). Correspondingly, the zero-beta portfolio is shown at point b and is defined as the portfolio that is orthogonal to the original optimal portfolio at point m_1. Finally, points c and d correspond to the slopes of $\hat{\theta}^*$ and $\hat{\theta}_p$ at a standard deviation of excess return equal to one.

4.4 Will the Operational Independence of Central Banks Hold?

In the face of the COVID–19 pandemic, the United States, Japan, and most of Europe are facing years of significant budget deficits, while their respective central banks continue to ease policy settings. Australia is also part of this agenda, having adopted yield-curve controls to suppress the cost of borrowing. Only the operational independence of central banks stops them from cutting out the middleman and directly funding government deficits, so dispensing with the 'unnecessary' step of supporting new issues of public debt through secondary markets purchases.

One may argue that this step is more than unnecessary. It remains as the final obstacle standing in the way of direct monetisation of government debt. But for how long will this separation be maintained? The reality of modern politics is that global emergencies bless incumbents with unbridled power reinforced with the incontrovertible logic of protecting the community. Already, it seems that the US government has decided that it faces no constraints on its future spending, with the Federal Reserve essentially monetising government borrowing. The BOE is not far behind, providing direct liquidity to the government under an expanded overdraft facility, not much more than an acceptable euphemism for printing money.

4.5 Avoiding Free Money Schemes

Presumably, the next step in the end game of currency erosion is what Milton Friedman

entitled Helicopter money. This notion can take many forms but usually sees central banks depositing cash into bank accounts of private corporations or households directly. Helicopter money would signal a final transformation of central banks into major financial market participants as directly intermediating credit.

This policy would no doubt come with arguments asserting how we can trust the independence of the central banks and their fearless disinterest to make the right calls. Indeed, as central banks continue on their current trajectory, they may evolve into a position of directly financing underlying assets. For example, many policy-market experts such as Sheard (2020) have been articulate advocates for freeing up central banks to fund infrastructure projects. Certainly, in theory, it is acceptable for a government to borrow from the future provided the returns from that investment are net positive. Of course, Helicopter money does not reflect the gravity of such lofty policy objectives. "Modern Monetary Theory" (MMT), the present-day incantation, is far more appropriate.

Unfortunately, experience suggests that Governments are likely to invest in outdated technologies, diminishing their ability to make the right decisions for asset allocation choices. In other words, Governments may build assets that do not belong in mean-variance efficient portfolios with low social benefit-to-cost ratios. MMT does not represent judicious borrowing from the future, but rather, it is more akin to the questionable distribution of valuable resources or worse, unconstrained public spending. Ultimately, such a policy framework may lead to higher future taxes or public debt reaching unsustainable levels. It sends an insidious message that there is no effective limit today to spend to fund either current consumption or projected future capacity. MMT suggests there is no theoretical upper limit to the size of central bank balance sheets, nor are their efficiency costs imposed on other economic agents (banks, businesses, and households) from central bank activities. It may be a misguided solution that boldly asserts resources can be employed overtime at zero opportunity cost and therefore a zero-discount rate.

The pedigree of these policies within broader OECD economies is not great either. The last time Helicopter money was employed in Europe was in Germany during the Weimer Republic and the 1930s Third Reich. The aftermath of these policies is quite memorable – both in terms of inflation and productivity. It has been some years since inflation was a problem in the OECD, with rates last soaring in the developed world in 1979. This is when Paul Volcker was called to the Federal Reserve to address the prolific inflation problem. In

contrast to today, political leaders and policymakers back then saw balanced budgets and some form of monetary targeting as the appropriate policy response. The risk today is that policymakers' support of fanciful policies is likely to condemn us to economic servitude.

5 Implications for Savers and Policy

As in all things, there is no free lunch. Someone always pays for unsound policies. For most of the past decade, the costs of unorthodox policy have been borne by savers, renters, and younger generations.

5.1 Implications for Portfolio Allocation

Asset bubbles have arisen in key global asset markets as monetary authorities have bid down term premia on government bonds. This implies that recent purchases of bond holdings and other correlated assets may be mispriced. Therefore, the owners of these asset pools may face serious mark-to-market losses in the future. Meanwhile, valuations placed on the so-called 'FANG' stocks have reached exuberant levels, with many portfolios holding large positions in these assets. Should the market reprice these stocks in the face of a normalising policy environment, losses may be magnified. Already, some implications of the ultra-loose policy environment on portfolio allocation decisions have been brought to light during the recent COVID–19 shock. Between February and March 2020, market volatility was intensified to levels beyond historical norms. Such amplified movements can be expected in the future if the policy environment normalises.

5.2 Implications for Policy Decisions

Policies that enlarge central bank balance sheets, without a reliable mechanism for smooth reversal, raise the simultaneous risk of higher inflation and deflation, where prices are broadly in the Friedman sense. As part of this paper, we have argued that the lessons of the post GFC period are that QE policies embolden central bankers, excuse politicians' myopia, and enrich major financial institutions (and incumbent asset holders). This is occurring at the expense of investors, the young, and future generations. Policies like Helicopter money and MMT are well-meaning but are naïve in terms of broader allocative and dynamic efficiency considerations.

The reignition of productivity growth in OECD economies may only begin with a macroeconomic regime that promotes sound central bank policies and stable balance sheets. Central banks may benefit from developing rules to smooth monetary and credit aggregates through time, in congruence with strong and stable nominal GDP growth, rather than discretionary policy frameworks. If they are to target prices, they should capture a broad set of asset prices and nominal exchange rate movements, rather than just consumer prices.

Reversing the QE predicament requires robustness and neutrality in macro-policy settings over the medium-to-longer term to support rising productivity growth rates. We have argued that QE does not create currency stability and sound monetary practices in a way that Paul Volcker would agree. What it does do is impose undue burdens on the poor and on savers who bear the losses from credit defaults. An interesting inquiry would be to empirically assess the efficiency losses incurred since the adoption of UMPs, however, we leave this to the work of future academics.

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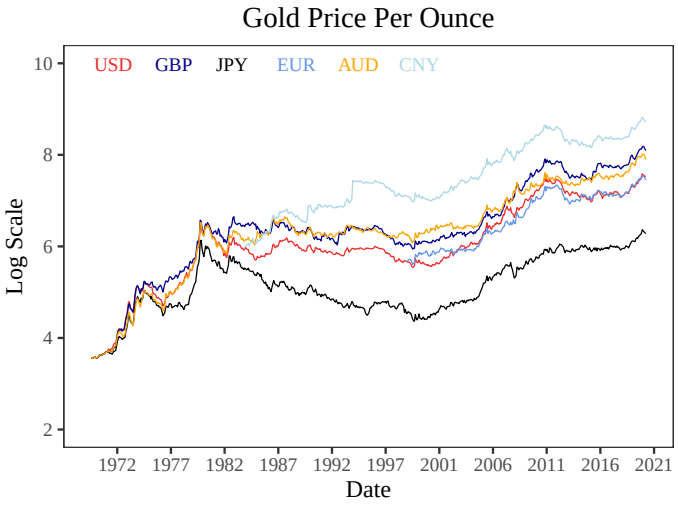
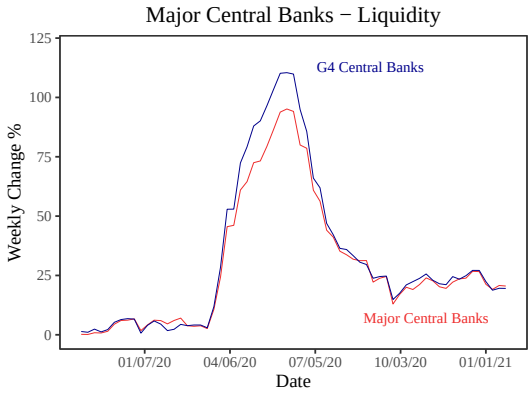
Figures



Reserve Bank of Australia (2021b)

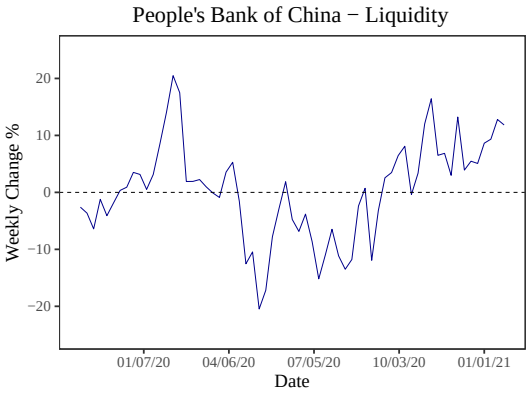
Figure 1: Gold Price Per Ounce in Selected Countries

Note. Gold prices are expressed in natural logarithm and rescaled for comparison with the USD as the base currency.



CrossBorder Capital (2021c)

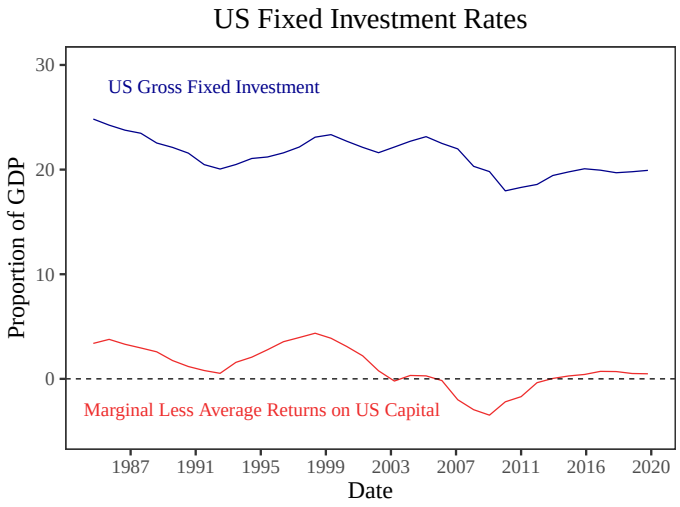
Figure 2: Major Central Banks



CrossBorder Capital (2021c)

Figure 3: People's Bank of China

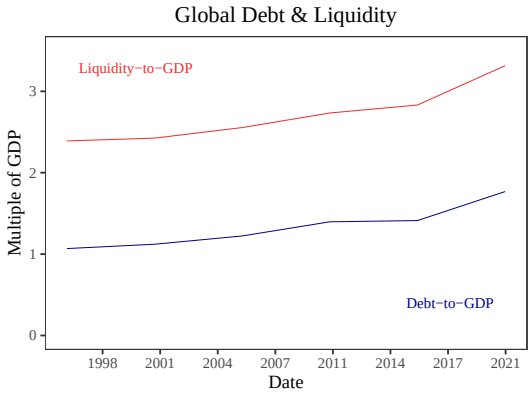
Note. This chart depicts the weekly change in the liquidity of major central banks & the People's Bank of China.



CrossBorder Capital (2021d)

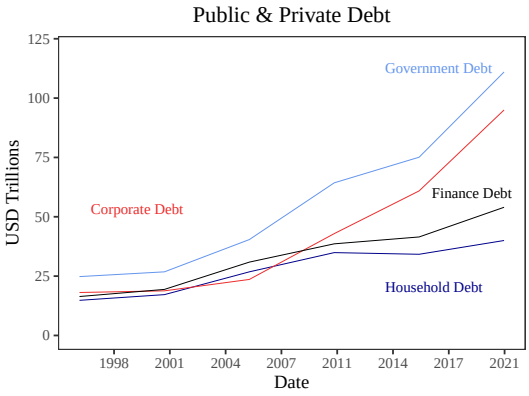
Figure 4: US Gross Fixed Investment Rates and Marginal Less Average Returns on US Capital

Note. US Gross Fixed Investment spending is measured as a proportion of GDP.



CrossBorder Capital (2021a)

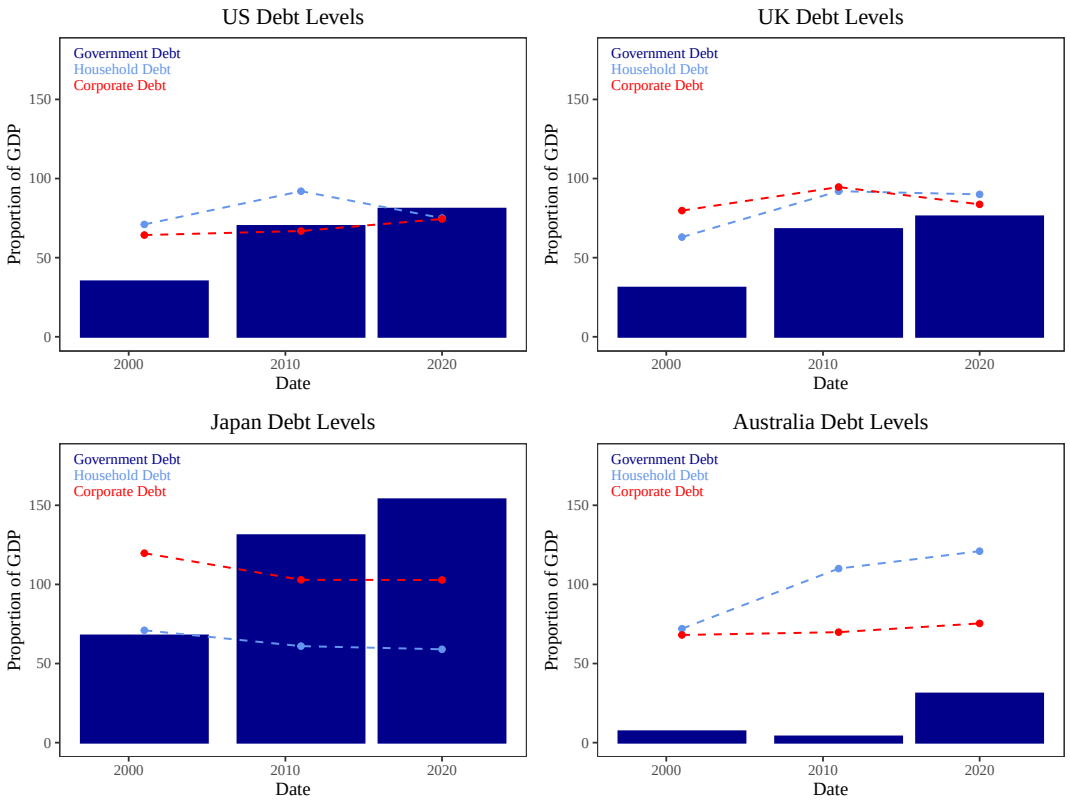
Figure 5: Global Debt & Liquidity Levels



CrossBorder Capital (2021a)

Figure 6: Public & Private Debt

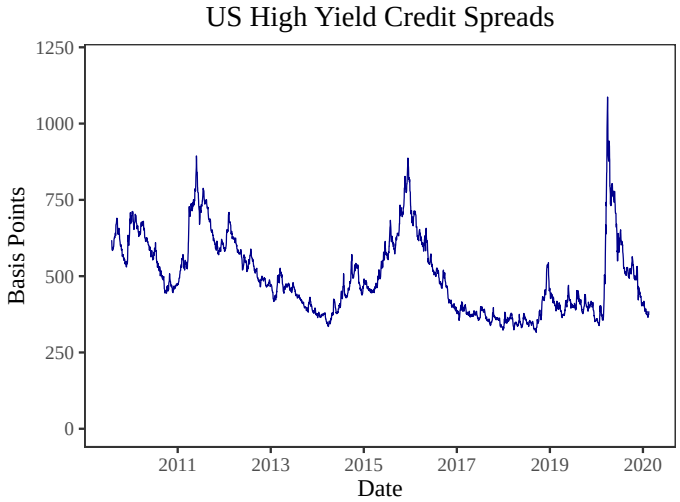
Note. The Global Liquidity-to-GDP and Debt-to-GDP ratios are expressed as a multiple of GDP. The Household, Corporate, Finance, and Government Debts are in USD Trillions.



Australian Bureau of Statistics (2020); International Monetary Fund (2020b,a)

Figure 7: General Government Net Debt, Household Debt, & Corporate Debt

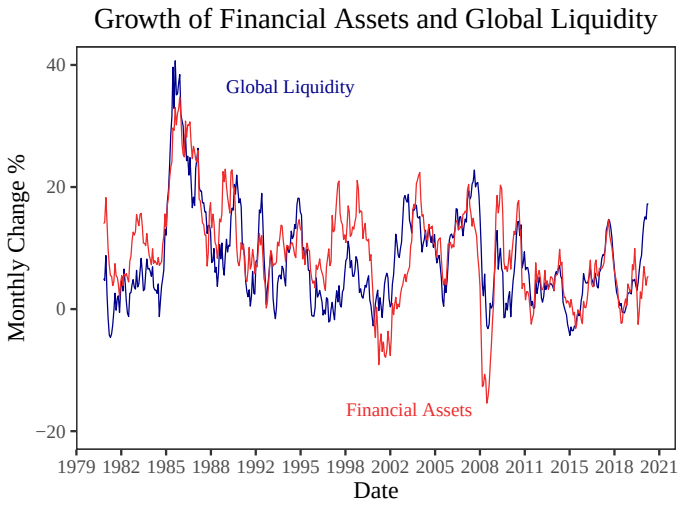
Note. General government net debt represents gross debt minus financial assets for all levels of government. Household debt includes household debt, loans, and debt securities. Finally, corporate debt includes nonfinancial corporate debt, loans, and debt securities.



Federal Reserve Bank of St. Louis (2021c)

Figure 8: US High Yield Credit Spreads

Note. Credit spreads are calculated as Option-Adjusted Spreads (OAS) relative to the spot Treasury curve.



CrossBorder Capital (2021b)

Figure 9: Growth of Financial Assets and Global Liquidity

Note. Global liquidity expressed in USD.

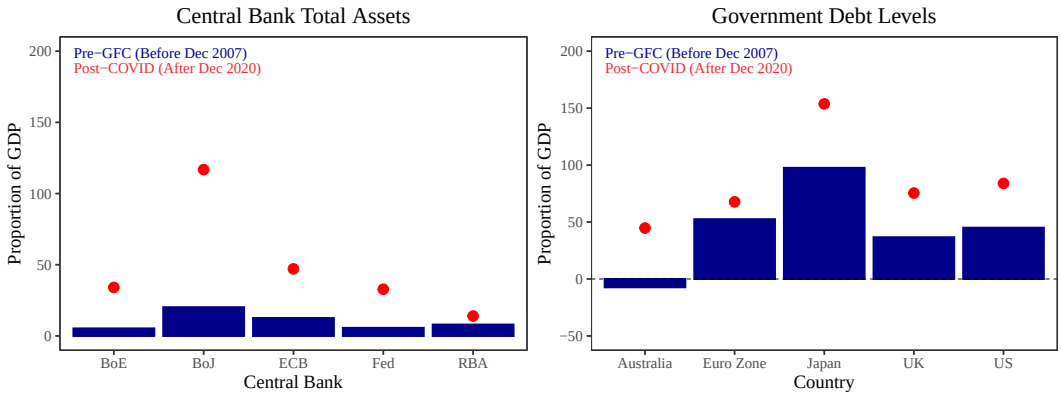
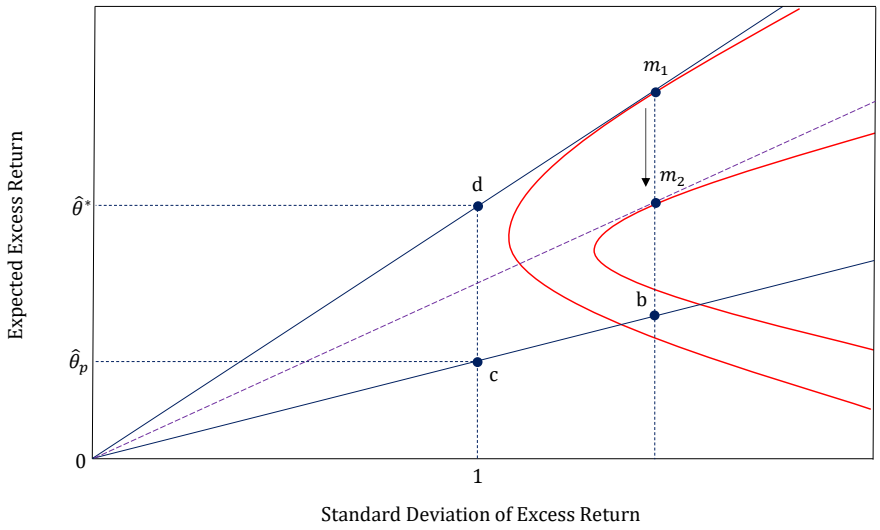


Figure 10: Central Bank Total Assets Figure 11: General Government Net Debt

Federal Reserve Bank of St. Louis (2021a,b,d); International Monetary Fund (2020b,a); Australian Bureau of Statistics (2020); Reserve Bank of Australia (2021a); CrossBorder Capital (2021b)

Note. General government net debt represents gross debt minus financial assets for all levels of government. The post-COVID figure for Australia is calculated from ABS Category: 5519.0.55.001 including a prospective fiscal stimulus of $184.5 billion. Central bank total assets refers to the total assets recorded in their balance sheets.



Gibbons et al. (1989)

Figure 12: Distorting Risk–Return Dynamics for Investors