Getting Off Zero

Bitcoin's Role in Modern Investment Portfolios

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Wences Casares, CEO of the digital asset custodian known as Xapo, stated in an essay written in 2019 his arguments for why investors should consider an allocation to bitcoin with the following statement:

> "In today's world where every asset seems priced for perfection, it is hard, if not impossible, to find an asset that is so mispriced and where the possible outcomes are so asymmetrical. Bitcoin offers a unique opportunity for a non-material exposure to produce a material outcome. It would be irresponsible to have an exposure to Bitcoin that one cannot afford to lose because the risk of losing the principal is very real. But it would be almost as irresponsible to not have any exposure at all."
>
> WENCES CASARES, XAPO

Casares' point is one that most who own bitcoin would likely agree with and that historical data backs. Indeed, small allocations have been historically meaningful and have the potential to continue to drive worthwhile, positive portfolio outcomes. We found that the most efficient increase in risk-adjusted returns, measured using the Sharpe ratio, came from the first 50-100 basis points of bitcoin allocation from an otherwise traditional portfolio. "Getting off zero", in reference to a portfolio with a zero-percentage bitcoin allocation, is arguably one of the most important modern-day investment decisions for those who have not considered it yet.

In this piece, we cover the below topics surrounding bitcoin's role in investment portfolios:

- **Traditional Portfolios and Opportunity Cost -** Low rates and historically high embedded valuations may reduce the potential opportunity cost of allocating away from traditional assets. The current macroeconomic backdrop may also further enhance the case for considering truly alternative assets such as bitcoin.

- **The Typical Bitcoin Investment Thesis -** Bitcoin inside of a portfolio could act as an inflation hedge if negative real interest rates persist, make for useful rebalancing capital, and provide the potential for asymmetrically skewed positive returns. These characteristics combine to create a unique alternative asset which has historically proven useful in a broader portfolio context.

- **Position Sizing & Portfolio Implications -** Small allocations can be meaningful. We found that a 1% allocation over the last six years increased total returns to a traditional 60/40 portfolio by 2.60% annually and risk-adjusted returns (Sharpe) by around 20%.

- **Institutional Investor Considerations -** Institutional investors also have unique considerations given their respective situations. We provide some segmented investor analysis for (1) registered investment advisors and family offices, (2) corporate treasurers, and (3) pension funds, endowments, sovereign wealth funds and other similar institutions to consider.

TRADITIONAL PORTFOLIOS AND OPPORTUNITY COST

Today's case for the inclusion of bitcoin in one's traditional portfolio should arguably begin without the discussion of bitcoin at all. Instead, it should revolve around the default asset classes that typical investors hold and the many considerations that surround them. Only once we contemplate what traditional assets are likely to offer over the coming years can we then properly assess bitcoin and the potential role it can play in a portfolio.

The past decade has been stellar for long-only, traditional indices. Anyone holding assets that resembled anything close to a typical U.S. 60/40 has experienced returns higher than historical

averages, while also having relatively low levels of volatility. [ii] Tailwinds have been strong for investors—interest rates have trended down continually lower for the past 40 years, equity multiples have continued to expand to today's now historic valuation levels, and central policy makers have coordinated to ensure liquidity in credit and overall financial markets globally via both sovereign and private credit markets. Many of the key drivers of the returns experienced this past decade are likely unsustainable on a perpetual basis and, given the reality that unsustainable trends cannot persist forever, alternative assets with differing underlying drivers and value propositions may begin to gain increasing credibility in this environment.

Fixed Income

Interest rates play a pivotal role in the pricing of every asset on the planet. A decline in interest rates pushes up the price of assets broadly, including conventional assets like equities, bonds, and real estate. Therefore, it can be implied that a certain portion of the returns experienced over the past 40 years may have been artificially induced by central bankers suppressing interest rates globally. The U.S. 10-year treasury yield has declined in nearly linear form over the past 4 decades, starting at around 15% in 1981, and subsequently declining to today's rates of less than 1.5%.

10-YEAR U.S. TREASURY YIELD

Data Source: Federal Reserve Economic Data (FRED). Date Accessed: 07/06/2021

The problem this likely creates for investors over the coming decades is two-fold. The first issue arises from the fact that a lower yield simply implies more capital needed to meet return objectives for investors going forward. The fixed income asset class mechanically becomes less capital efficient and the ability for bonds to provide adequate income and diversification becomes impaired. The second problem results from the fact that capital gains induced by falling interest rates, at best, will unlikely be present to drive returns in the future the way they did in the past.

It is also important to differentiate between the nominal and real returns that investors expect to receive in their fixed income basket. If we simply use today's treasury-inflation protected securities yields as a proxy for forward real return expectations on bonds (–1% on 10-year U.S. fixed income), treasury yields are already negative on a real basis and buyers of this debt who hold to maturity are doing so with the known outcome of earning a negative real return on their position. [iii] The data below speaks for itself— starting yields are crucial to forward returns for bonds.

CURRENT YIELDS INFLUENCE FORWARD RETURNS

Data Source: Federal Reserve Economic Data (FRED) & Bloomberg. Data Accessed: 09/01/2021. Bond returns are represented utilizing a US Government Bond Index (LUATTRUU). Yields and returns are shown in nominal terms.

Bonds may encounter major headwinds in the coming decades. Facing the reality for possible negative real yields, the narrative of fixed income in a portfolio could potentially flip from being known for its ability to act as a portfolio ballast into becoming better known as a portfolio anchor — reducing portfolio returns, providing extremely limited upside in real terms, and displaying lower diversification benefits to portfolios.

Equities

A similar and related story arises when observing equities. Since all financial markets are linked, falling interest rates have had a direct impact on equities by decreasing the discount rates applied to future free cash flows. This raises current valuations and pulls returns forward that, all else equal, would not have been experienced. Reduced interest rates have also forced some level of capital to flow into equities in search of yield and total returns that can help reach return objectives. Virtually any way one chooses to cut the cake, broad U.S. equity markets appear to be at historically extreme valuations relative to underlying fundamentals.

This leads to the following logical question: What do elevated valuation levels imply about forward equity returns, and can extreme valuations relative to history be justified? If we break down the two camps that most investors fall under, it may help us to understand the potential paths that equity markets may follow over the coming decade.

1. New Normal - Higher multiples are justified

Many investors have made the case that higher multiples are warranted because the large businesses of today exhibit certain qualities that haven't existed historically such as enhanced network effects, globalization, and asset-light business models, which utilize intangibles far more than in the past. These individuals also point to the fact that ever-lowering interest rates have reduced discount rates, which has increased the present value of future cash flows and thus justifiably raised valuations. The latter justification would represent a trend that likely can't persist much longer given current interest rates, and one that mechanically leads to lower forward returns built into valuations. [iv] The former justifies a higher multiple around the fact that firms have moats and competitive advantages that

allow for higher sustainable growth rates and profit margins than those of the past. Again, this stance helps justify current valuations, but this means that multiple expansion has partially resulted from an expansion in forward growth expectations, creating a higher hurdle for firms to beat in the future that may not be sustainable and will be harder to outpace going forward. Today's higher valuations have likely already reflected these lower interest rates and higher future growth expectations, making continued valuation expansion an uphill battle. If today's U.S. equity valuations are warranted for the reasons mentioned above, it seems unlikely last decade's returns can continue at the same pace into the future.

2. Normalization - Higher multiples are not justified

If multiples pullback to their lower historic levels, then equity returns must give back what they've taken to reach today's levels. This could occur in two ways, direct repayment via a sharp drawdown or slow underlying growth of businesses relative to stagnant equity prices for a prolonged period. A full normalization would imply painful equity returns over the coming years. Grantham Van Otterloo, a Boston-based hedge fund known for their asset class forecasts utilizing normalization techniques, imply forward returns for U.S. large-cap equities of -8% annually over the coming seven years if valuations were to trend towards their historic norms. [v]

It isn't necessarily important where one falls in their view of today's valuations. It's simply hard to make a case that investors should believe forward equity returns will be similar to what has been experienced over the past decade. Overall, the reduction in interest rates has had a positive impact on all assets and has caused investors to feel that the returns that have been experienced in the recent past are normal, when historically speaking they are not. Investors who believe that forward returns may be lackluster relative to history would view the overall opportunity cost of allocating to alternatives as temporarily reduced.

Current Macro Backdrop

The current macroeconomic backdrop is the direct result of the past 40+ years. Many of the problems facing the financial system today are the result of the increase in fragility associated with a leveraged

system. Today's exorbitant debt levels have created a system that is largely ill equipped to handle any significant slowdowns in economic growth, which has led to a direct increase in the dependence on central policy makers to stabilize the economy over time.

U.S. PUBLIC DEBT TO GDP

Data Source: Federal Reserve Bank of St. Louis. Date Accessed: 08/16/2021.

Debt levels have metastasized globally, with the largest pickup occurring on sovereign balance sheets. Deficit spending has transitioned over time from a question of "if?", to "how much?" Today's U.S. public debt to GDP level of around 130% is rivaled in United States history by only one period in time, the post-World War II era. Other countries are experiencing a similar expansion in sovereign debt relative to the underlying economy that finances it.

These observations exclude the fact that many social programs promised by large countries are recorded as off-balance sheet liabilities that will ultimately become due soon. One of the main culprits in the U.S. is large entitlement spending such as the promises made to the 75 million baby boomers in the United States via programs like Social Security and Medicare, which has led many to estimate United States off-balance sheet liabilities in excess of $70 trillion, trouncing current on-balance sheet debt levels of $28 trillion. [vi]

The biggest problem associated with large public debt burdens is simply the harsh reality that the current financial system has exhibited an inability to effectively handle signs of slowing economic growth or deflationary pressures. Economic slowdowns increase the burden associated with large debt levels by reducing growth in the economy and increasing the real cost of financing debt. As these debt levels grow larger, the fragility of the financial system increases and progressively becomes more reliant on central policy makers to step in and prevent larger scale deleveraging. This response mechanism has become reflexive over time and led to increasingly larger levels of debt, lower interest rates and more reliance on monetary and fiscal policy tools.

The growth in central policy makers becoming a larger part of the system really began in 1987, following the Black Monday stock market crash. In what would later be referred to as the "Greenspan Put", the chair of the Federal Reserve, Alan Greenspan, intervened in markets by pushing down the federal funds rate and purchasing securities on the open market. [vii] The subsequent policy responses from central bankers has grown in size with each successive economic slowdown. More recently the action of fiscal policy makers has played an increasingly important role in maintaining economic stability. This reliance on central policy makers over the past 40 years has led the financial system to where it now sits today.

The path towards normalization of the system revolves around current sovereign debt levels, as much of the instability today is a direct result of historic policy responses and the tools utilized at the time. A 2011 IMF paper titled "The Liquidation of Government Debt" provides a useful historical analysis, giving context to today's current debt/GDP and potential outcomes. [viii] We can summarize the given paths into three simple categories that could produce debt normalization over the long-term: real economic (GDP) growth, restructuring and debt default (deflationary), and financial repression (inflationary). As noted in the paper, high levels of public debt are often associated with lower future growth, and when combined with the current demographic shifts underway, real GDP growth appears an unlikely driver of debt normalization. Policy makers around the globe thus far have made it clear that default is not an option for sovereign nations that control their own currency. Debt ceilings have been continually raised, and financing debt at low interest rates has not been an issue as central banks have grown their balance sheets in virtual lockstep. As the paper referenced here alludes, financial repression appears a most likely candidate for long-term normalization of the system. Repressing returns of financial assets, particularly fixed income, becomes a tool of taxation for the state. If this is the case, deeply negative real interest rates would likely create an entirely different investment

environment than what investors have grown accustomed to over the past four decades.

Overall Forward Outlook

In analyzing potential forward returns implied by asset class fundamentals, one thing is clear — investors would be wise to objectively consider what the future has in store for their existing holdings and may give some consideration to alternative assets. If traditional assets are set up to deliver returns lower than normal, then the implied opportunity cost of looking differently than one's peers necessarily would be lowered. Given today's macro backdrop, the drivers of investment returns from the past may not be present in the future.

THE BITCOIN INVESTMENT THESIS

As this piece expands upon how we can model bitcoin within a portfolio, let's first ensure we understand the common drivers that encourage one to consider bitcoin having a potential role in the first place.

The investment case for bitcoin typically contains some combination of the following three unique elements: bitcoin as digital gold, a portfolio diversifier, and a venture-like investment. These characteristics help to display the important role that bitcoin, as an alternative asset, could potentially play in traditional portfolios over the coming years. The investment case for bitcoin should be viewed from the context of a broader portfolio, rather than simply as a standalone asset. The unique characteristics inherent in bitcoin can potentially help drive more robust overall portfolio outcomes.

Bitcoin as Digital Gold and an Inflation Hedge

Bitcoin often receives the title of "digital gold" by many of its proponents because of its hard supply cap of 21 million coins, giving the asset absolute scarcity. Physical gold has long been presumed to be a safe way to store value across time and hedge against inflation. When considering inflation, most individuals reference the Consumer Price Index (CPI) as their preferred metric to gauge current inflation levels. While this certainly is one measurement of inflation, another often overlooked inflation

metric that has become increasingly popular to acknowledge is overall asset inflation in the context of expanding central bank balance sheets. We'll review bitcoin with reference to both of these types of inflation.

Monetary & Broad Financial Asset Price Inflation

Many have theorized that expansionary monetary policy has greatly influenced the growth in asset prices. As a result, understanding any potential relationships between balance sheet expansion of major central banks and the subsequent influence on particular asset classes may be important. Bitcoin has displayed a historic ability to hedge against monetary expansion. Over almost any lengthy period of time bitcoin has outpaced the expansion of the Federal Reserve's balance sheet and the returns experienced from broad market indices. The year 2020 was a particular standout moment for monetary expansion amidst the global pandemic. According to Bloomberg data, as the Federal Reserve grew its balance sheet by 76% in 2020, the S&P 500 returned over 18% by year's end, and bitcoin rose 210%. Thus far, bitcoin has shown an ability to function as a hedge against monetary debasement and broad financial asset price inflation.

Real Economic (CPI) Inflation

Being that it's still early in bitcoin's adoption curve, and consumer inflation expectations have yet to move materially higher across the decade-long lifespan of bitcoin, it's still hard to make a data-driven claim that bitcoin is or is not a true inflation hedge. Logic would also presume that a scarce, sought-after asset would indeed develop similar macroeconomic sensitivities to that of precious metals like gold.

SCARCITY & NEGATIVE REAL INTEREST RATES

Data Source: Federal Reserve Economic Data (FRED). Date Accessed: 08/01/2021.

The reality for gold is that it functions less as a direct consumer inflation hedge, and more as a hedge against overall financial repression. As expectations of real interest rates are driven lower, fixed income becomes less attractive relative to a scarce asset like gold, or potentially bitcoin. As bitcoin is driven into more hands, external macroeconomic variables will likely become more important. Thus, given enough time, bitcoin too will likely be seen as an alternative store of value hedge against financial repression.

Bitcoin as a Portfolio Diversifier

One of the most recognized characteristics of bitcoin, in regard to its role in a portfolio, is its ability to provide noncorrelated returns when placed alongside traditional assets. Its supply scarcity and network effects drive medium- and long-term returns that are idiosyncratic from that of the broad equity and credit markets. This has led to reduced correlations to other assets and has created a historically complimentary asset for many traditional portfolios.

	XBT	SPY	QQQ	IEMG	AGG	GLD
XBT	1	0.26	0.21	.018	0.07	0.04
SPY	0.26	1	0.92	0.73	-0.05	0.01
QQQ	0.21	0.92	1	0.68	0.03	0.01
IEMG	0.18	0.73	0.68	1	0.11	0.22
AGG	0.07	-0.05	0.03	0.11	1	0.53
GLD	0.04	-0.01	-0.01	0.22	0.53	1

Data Source: Bloomberg. Date Accessed: 07/11/2021. Period Studied: 01/01/2015-06/30/2021. Monthly Total Returns.

The historical correlation coefficients over the period studied between bitcoin and traditional assets were low — the S&P 500 (SPY) correlation coefficient was 0.26, bitcoin and U.S. bond's (AGG) correlation coefficient was 0.07, and gold's (GLD) was 0.04. Portfolio allocators are constantly looking for assets with positive expected returns and low correlation to their portfolio. Bitcoin has historically fit the bill, exhibiting no meaningful correlation to any major asset class, and producing extremely advantageous returns for investors.

Those in opposition of bitcoin as a legitimate asset point towards its inability to provide diversification benefits during large equity drawdowns. It is true that many of the large, risk-off events experienced throughout bitcoin's existence have led to short-term volatility in bitcoin. This asset certainly isn't a cure all, but it has idiosyncratic risks and characteristics that have historically shown an ability to complement investment portfolios.

Bitcoin as a Venture-Like Investment

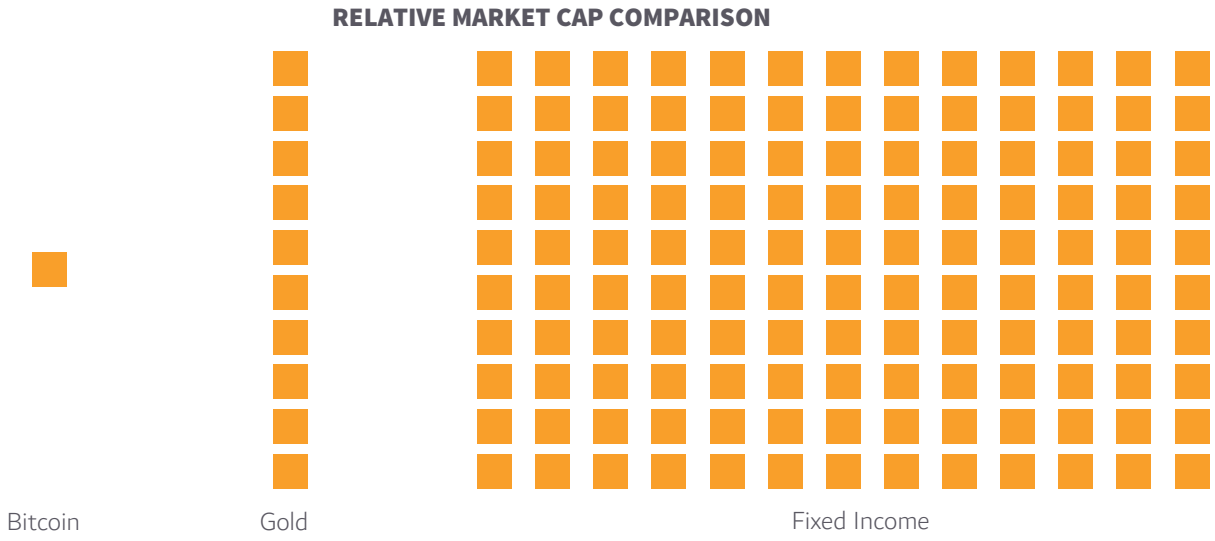
The current opportunity set presented by bitcoin offers extremely skewed and asymmetric returns that could be similar in nature to what one would expect with a venture capital investment. Alternative investments with heavily skewed return profiles create excellent investment opportunities, as one does not need to hold a large position to receive meaningful portfolio benefits.

MONTHLY RETURN DISTRIBUTION
(OCCURANCES)

Data Source: Bloomberg. Date Accessed: 07/11/2021. Period Studied: 01/01/2015-06/30/2021. Equities are represented using the Standard & Poor's 500 Index. Bitcoin is represented using the Lumos Bitcoin Index.

The monthly returns of Bitcoin and the S&P 500 display the differing return profiles that investors experienced when holding each of these respective assets. Bitcoin has been noticeably more volatile, and positively skewed in its returns on a monthly basis. Its current size is no impediment to the

potential continuation of these large, positively-skewed returns either. Bitcoin currently has a market capitalization under $1 trillion. [ix] Meanwhile, other store of value assets such as gold and global fixed income enjoy market sizes of roughly $10 trillion and $130 trillion, respectively. [x] [xi]



POSITION SIZING AND PORTFOLIO IMPLICATIONS

For an investor that feels adequately informed of the bitcoin investment thesis and comes to their own conclusion that making an allocation is right for their portfolio, the next steps entail a decision on the actual logistics of allocating. We discussed in our previous piece, Channels for Exposure to Bitcoin, the different options currently available for institutional investors to gain exposure to bitcoin. Here, in what is usually the final choice one must make, we will construct a step-by-step framework for considering the tradeoffs of position sizing, portfolio implementations, and rebalancing. An intentional game plan that acknowledges the tradeoffs one is making when choosing their particular implementation process for the inclusion of bitcoin is critical.

Step 1: Position Sizing

The historical impact of bitcoin inside of a portfolio can make the return asymmetry that is possible with this asset quite clear. Position sizing appears directly linked to the tradeoff between volatility and

return. Shown below are the historic returns for a traditional 60/40 portfolio with an allocation made to bitcoin in 2015. All portfolios are rebalanced annually, and the bitcoin exposure in this example is taken equally from equities and fixed income.

	BITCOIN EXPOSURE					
Allocation to Bitcoin	**0%**	**1%**	**3%**	**5%**	**7%**	**10%**
Annual Return	9.89%	12.49%	17.24%	21.54%	25.52%	31.01%
Annual Volatility	8.70%	9.23%	11.26%	13.72%	16.19%	19.71%
Sharpe Ratio	1.03	1.23	1.4	1.43	1.44	1.43
Maximum Drawdown	-11.16%	-11.43%	-11.96%	-12.49%	-13.01%	-13.78%

Data Source: Bloomberg. Date Accessed: 07/11/2021.Period Studied: 01/01/2015-06/30/2021. Stocks are represented using the Standard & Poor's 500 Index. Bonds are represented using the Bloomberg Barclays Aggregate Index. Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced annually.

The incremental gain from owning no bitcoin, to simply putting on a 1% position appears substantial within the analyzed time period. A 1% position in bitcoin led to 2.60% in additional annualized returns and would've compounded a portfolio to more than 30% greater than the benchmark over the period. Meanwhile the maximum drawdown only increased 0.27% and the portfolio's risk-adjusted Sharpe ratio rose almost 20%.

The most powerful message that we can take away from the data shown above is that the first 50-100 basis points had the most efficient risk-adjusted portfolio impact. Once investors get off zero allocation, they must then determine their overall risk tolerance to decide if a higher allocation makes sense. There is a direct relationship in the historical data between increased bitcoin exposure, annual returns, and annual volatility.

Step 2: Portfolio Implementation

Assuming one has made a decision surrounding the rough allocation they wish to direct towards bitcoin, the next step is deciding where it fits amongst the rest of their portfolio. This can be looked at in one of three ways:

Reduce risk-on assets to add bitcoin exposure, broadly characterized here as equity

In this case, one would make the claim that bitcoin's volatility profile is such that they wish to include it amongst their risky asset bucket and reduce other risky assets to make room for this new exposure.

Reduce risk-off assets to add bitcoin exposure, broadly characterized here as fixed income

This solution would likely result from the fact that fixed income could potentially lag in the coming years due to where yields are currently positioned, and adding a small amount of bitcoin alongside fixed income could enhance returns and reduce potential portfolio drag.

Reduce equal parts risk-on and risk-off assets

This final option is a hybrid approach. Reducing equal parts of the portfolio to make way for exposure to this alternative is an agnostic approach and balances the two strategies.

		Equity Replacement			Bond Replacement			Equal Replacement		
	0%	1%	3%	5%	1%	3%	5%	1%	3%	5%
Annual Return	9.89%	12.43%	17.08%	21.28%	12.54%	17.40%	21.81%	12.49%	17.24%	21.54%
Annual Volatility	8.70%	9.16%	11.09%	13.49%	9.29%	11.43%	13.95%	9.23%	11.26%	13.72%
Sharpe Ratio	1.02	1.23	1.4	1.44	1.23	1.39	1.43	1.23	1.4	1.43
Maximum Drawdown	-11.16%	-11.33%	-11.65%	-11.98%	-11.53%	-12.27%	-13.01%	-11.43%	-11.96%	-12.49%

Data Source: Bloomberg. Date Accessed: 07/11/2021.Period Studied: 01/01/2015-06/30/2021. Stocks are represented using the Standard & Poor's 500 Index. Bonds are represented using the Bloomberg Barclays Aggregate Index. Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced annually.

The differences, historically, have not been that meaningful. As one would expect, volatility and returns are highest amongst those that chose to reduce bonds, lowest amongst those that chose it as an equity replacement, and in-between for those that chose to replace equally. A larger allocation towards bitcoin makes the decision for which asset to reduce more meaningful. For instance, with a 1% position the difference between replacing bonds and equity was only 0.11% in return and 0.13% in volatility

versus a 5% position with differences of 0.53% in return and 0.46% in volatility. The number that stands out the most is the 0% allocation benchmark, which highlights the fact that the most important decision is the actual allocation to bitcoin and everything else is secondary.

Step 3: Rebalancing Plans

Finally, the last step in making a bitcoin allocation is to plan for future rebalancing. There are two main types of rebalancing that most investors are familiar with: rebalancing on a regular calendar basis and rebalancing based on allocation bands. Shown below are the results for a hypothetical 60/40 portfolio making a 1% and 5% allocation to bitcoin, replacing equal parts equity and fixed income, and rebalanced according to their respective columns.

1% BITCOIN POSITION

	Quarterly	Semi	Annually	5% Bands	10% Bands
Annual Return	11.48%	11.54%	12.49%	11.89%	13.13%
Annual Volatility	8.89%	9.00%	9.23%	9.15%	9.73%
Sharpe Ratio	1.16	1.16	1.23	1.18	1.23
Maximum Drawdown	-11.43%	-11.43%	-11.43%	-11.61%	-12.59%

5% BITCOIN POSITION

	Quarterly	Semi	Annually	5% Bands	10% Bands
Annual Return	17.05%	17.80%	21.54%	16.17%	16.97%
Annual Volatility	10.78%	11.30%	13.72%	10.81%	12.05%
Sharpe Ratio	1.44	1.43	1.43	1.36	1.29
Maximum Drawdown	-12.49%	-12.49%	-12.49%	-12.49%	-13.75%

Data Source: Bloomberg. Date Accessed: 07/11/2021.Period Studied: 01/01/2015-06/30/2021. Stocks are represented using the Standard & Poor's 500 Index. Bonds are represented using the Bloomberg Barclays Aggregate Index. Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced annually.

The word tradeoff comes to mind again. When viewed in the context of historical data, those more comfortable with increased volatility may wish to rebalance on a less frequent basis to allow their position to compound, as shown with the longest rebalancing window (annually) and the largest rebalancing bands (10%) having the highest annual return and highest volatility compared to lower timeframes or band ranges. Similar to deciding what position to replace with bitcoin, rebalancing appears to be a secondary concern compared to the overall decision to make an allocation.

INSTITUTIONAL INVESTOR CONSIDERATIONS

Institutional investors come in all shapes and sizes, with varying client types, time horizons, and goals. As a result of these differences, many of the unique considerations for asset allocation differ greatly based on their respective circumstances, which is shown in bitcoin allocations as well. A number that may make sense for one institution can be unsuitable for another. In this section we consider a few institutional investor types who could be considering bitcoin allocations and address what may be viewed as their largest respective concern or consideration.

Registered Investment Advisors & Multi-Family Offices – Tracking Error

One of the key considerations for investment advisors and multi-family offices is ensuring that clients can stick to their outlined investment plan when volatility and negative news headlines surrounding their investments comes to light. Underperformance relative to peers is often not tolerated for long periods of time. This well-known problem throughout delegated asset management can be dealt with through proper position sizing. If the position of any given asset is small enough, such that any drawdown has a minimal impact on the overall portfolio relative to its benchmark, known as tracking error, then clients are far more likely to stick to their stated investment strategy. As a result, this should be one of the main considerations used when determining the proper position size an investment advisor could potentially make to an asset such as bitcoin.

Below, we utilize a specific method of portfolio optimization that considers tracking error relative to a

given benchmark over the period studied. For this example, we use a 60/40 benchmark portfolio that aims for maximum excess returns, while constraining the annualized tracking error relative to the 60/40 benchmark to different levels that an advisor and client may find acceptable.

TRACKING ERROR OPTIMIZED PORTFOLIO RESULTS

ALLOWABLE ANNUALIZED TRACKING ERROR (%)

	0%			1%			3%			5%		
	Stocks	**Bonds**	**Bitcoin**	**Stocks**	**Bonds**	**Bitcoin**	**Stocks**	**Bonds**	**Bitcoin**	**Stocks**	**Bonds**	**Bitcoin**
Allocation	60.00%	40.00%	0%	60.00%	38.78%	1.22%	60.00%	36.33%	3.67%	60.00%	33.88%	6.12%
Annualized Return	9.98%			11.32%			14.00%			16.69%		
Annualized Volatility	8.80%			9.11%			10.00%			11.18%		
Annualized Sharpe	1.03			1.13			1.28			1.36		
Max Drawdown	-11.54%			-11.93%			-12.70%			-13.47%		

Data Source: Bloomberg. Data analyzed using Portfolio Visualizer. Date Accessed: 07/12/2021. Period Studied: 01/01/2015-06/30/2021. Stocks are represented using the Standard & Poor's 500 Index. Bonds are represented using the Bloomberg Barclays Aggregate Index. Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced monthly per optimization technique.

This example shows that small positions in bitcoin can be meaningful to overall returns, while also preventing the position from overpowering the portfolio and having outsized tracking error implications. For instance, a 1.22% bitcoin position added 1.34% annualized returns relative to the benchmark, while producing an annualized tracking error of just 1% and only increasing the maximum drawdown of the portfolio by 0.39% during the period studied.

The above chart also makes the message clear that small incremental increases in annualized returns compound over time and create significant performance dispersions. The portfolio that allowed for a 5% tracking error returned 172.63% versus the benchmark at 85.63%, more than double the return over the period studied.

Rather than simply writing off the asset class entirely for being too volatile, advisors and other delegated asset managers should instead consider a more methodological approach and run the numbers. Historically, even when done with conservative position sizing, bitcoin allocations have still had a meaningful impact on traditional portfolio returns.

Corporate Treasurers – Strategic Long-term Capital Allocation

The year 2020 marked the first step in the adoption of bitcoin for public company balance sheets. MicroStategy, Tesla and Square have been the most notable corporate bitcoin adopters. Despite each company having their own take on the bitcoin value proposition, they have all come to a similar conclusion that bitcoin can be useful for corporate treasuries. This adoption is showing that bitcoin can play a meaningful role in the capital allocation process for corporate treasuries.

There appears to be multiple narratives surrounding the exact role that bitcoin can play for corporate treasuries. The first, more conservative and likely a more realistic starting point for many, is the idea that a small bitcoin allocation can help remove much of the negative returns associated with large, cash-dominated treasuries. The second, more unconventional, is to view bitcoin as a true reserve asset that can be used as an entirely new capital allocation tool for treasurers. We will review the merits of both.

Bitcoin Improving a Typical Cash-Dominated Treasury

The traditional corporate treasury has evolved over the past decade as a result of the financial crisis. This has driven an emphasis on the liquidity and safety of assets held in corporate treasuries, and most companies now hold nearly all of their balance sheet treasury in cash and fixed income securities. The typical benchmark for corporate treasurers contains a mix of rolling treasury bills and intermediate-

term government and corporate credit. In a world of low yielding fixed income instruments, these treasuries can become burdensome for shareholders. A small allocation to bitcoin on a corporate balance sheet can potentially provide a capital efficient hedge against negative real rates. Not to mention, bitcoin itself is a liquid asset that trades 24/7 across the globe, albeit with volatility. In periods of financial repression, cash and high-quality bonds represent non-volatile and safe places to store capital in the very short-term but become risky places to hold assets over the long-term as inflation erodes purchasing power. Bitcoin is also a true bearer asset that can be verifiably custodied without embedding trust in counterparties, as opposed to cash or bonds that are quite simply someone else's liability.

Below, we create a treasury benchmark utilizing a 20% position in a short-term government bond index, and an 80% position in an intermediate-term bond index. The model portfolios are rebalanced annually and the respective bitcoin allocation was used as a replacement for that portion of the intermediate-term bond index.

	0% BTC Treasury	1% BTC Treasury	3% BTC Treasury	5% BTC Treasury
Annual Return	2.09%	4.80%	9.84%	14.38%
Annual Volatility	1.18%	2.70%	6.85%	10.47%
Sharpe Ratio	1.01	1.44	1.28	1.26
Maximum Drawdown	-0.99%	-0.87%	-2.21%	-3.78%

Data Source: Bloomberg. Date Accessed: 07/11/2021. Period Studied: 01/01/2015-06/30/2021. Short-term government fixed income is represented using the ICE BofA 9-12 Month US Treasury Bill Index (G0B4 Index). Intermediate-term fixed income is represented using the Bloomberg Barclays 1-5 Year Gov/Credit Total Return Index (LD04TRUU Index). Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced annually.

Yet again on display is the clear benefit that a portfolio can gain from adding a small amount of bitcoin. Adding 1% to our treasury benchmark reduced the overall drawdown, more than doubled the return, and increased the Sharpe ratio by over 40% during the period studied. Larger positions greatly enhanced returns, while trading off this increase in return for increases in volatility and drawdown.

Considering many CFOs take a conservative approach towards treasury allocations, a small position may be prudent to help reduce balance sheet drag associated with their respective treasury while still being able to keep the majority of assets in highly liquid, non-volatile, cash-like instruments.

Bitcoin as an Entirely New Capital Allocation Tool

Capital allocation is one of the most important jobs that CEOs and CFOs are responsible for. Allocation strategies are never "all-or-nothing", and often incorporate a diversified use of free cash flows that typically includes increasing current liquidity, reducing future liabilities, returning value to shareholders, and making investments in the underlying business. While each of these are important for capital allocators to consider, none of the typical capital allocation strategies can preserve capital on the balance sheet over the long-term during periods of negative real interest rates. This is where bitcoin can potentially shine for corporate treasurers who are willing to be unconventional.

Strategy	**Maintain Balance Sheet Liquidity**	**Maintain Balance Sheet Capitalization**	**Attempt to Reduce Balance Sheet Drag**	**Financial Repression & Debasement Hedge**
Business Reinvestment		X	X	
Return of Capital			X	
Traditional Treasury Allocation	X	X		
Debt Paydown		X	X	
Bitcoin Balance Sheet Allocation	X	X	X	X

Below is a broad overview of the typical capital allocation strategies utilized:

Business Reinvestment

Companies may choose to use excess free cash flow to reinvest in their business by enhancing their line of products and services or to acquire competitors, often attempting to create synergies that can drive shareholder value. Reinvesting in the underlying business helps to prevent inertia of capital on the balance sheet, however, there are only so many positive net present value projects for a business to deliver upon for shareholders. Eventually, marginal returns in unventured projects

begin to lack the returns necessary to warrant investment, which presents the need for allocators to utilize other capital allocation strategies.

- **Return of Capital (Share Buybacks and Dividends)**

  Returning capital to shareholders is a common use of free cash flow for profitable firms. In recent years, buybacks have become the preferred mechanism for returning cash to shareholders, as it is often a more tax efficient way to return capital than dividends. While returning capital to shareholders may make sense in an effort to reduce the drag of an otherwise cash rich balance sheet, these tactics end up reducing the firm's overall capitalization of their balance sheet and do not help the operating business through periods of inflation and financial repression.

- **Traditional Treasury Allocations (Cash, Cash Equivalents, Bonds)**

  Typical treasury allocation practices emphasize the liquidity of assets by holding cash and fixed income to help offset future liabilities. This can be useful for short-term planning to ensure adequate balance sheet liquidity. Today, many companies maintain large, low-yielding fixed income balances over sustained periods of time, creating a balance sheet drag on shareholder returns. This could also become increasingly problematic during periods of financial repression, where interest rates are held deeply negative on a real basis.

- **Debt Paydown**

  Paying down future liabilities is an easy strategy to help reduce the drag on a balance sheet that holding cash can have. Today's historically low interest rates and potential for sustained negative real interest rates may make early debt paydown a less attractive strategy. Debt paydown, particularly longer-duration, also reduces the amount of liquidity that a firm has immediately available.

Bitcoin can potentially play a new role for corporations as a long-term strategic balance sheet asset. The biggest item missing from the current capital allocation stack is a strategy that can help hedge the given businesses balance sheet from inflation and financial repression over the long-term,

maintain a reasonable level of liquidity and reduce the drag on a balance sheet that low-yielding fixed income may deliver going forward. Luckily, this capital allocation unicorn may now exist for corporate treasurers willing to think outside the box. Given the combination of bitcoin's short-term volatility and long-term return asymmetry, it could function as a new strategic reserve asset when viewed in the right context.

To date, bitcoin is still largely unadopted by most traditional public corporate treasuries. The current accounting treatment being applied to digital assets on corporate balance sheets may be one of the leading causes for the lack of corporate adoption thus far. A lack of clarity around unique accounting treatment for digital assets has led them to be categorized as "indefinite-lived intangible assets." [xii] As such, these assets are accounted for at their cost basis and subject to impairment, making it effectively impossible to show positive outcomes on traditional financial statements. Although this doesn't actually reduce the economic value that digital assets can potentially provide, traditional businesses have noted that it makes them less appealing as it cannot help, and only hurt, GAAP earnings as reported. The discussion surrounding these accounting issues has become a large topic of discussion as more corporations seriously consider the space which may force the Financial Accounting Standards Board (FASB), responsible for guiding Generally Accepted Accounting Principles (GAAP), to more formally address the topic. [xiii]

A few bold CEOs and CFOs have decided to make the move, but each has done so in their own unique way. Bitcoin can potentially accrue shareholder value for corporations in a plethora of ways—from building a monetizable business that grows revenue on the income statement, to holding small balances within a corporate's cash-dominated treasury, or as a new-era long-term strategic balance sheet asset. Bitcoin isn't one size fits all, and it's value proposition lies in the eye of the beholder.

Pension Plans, Endowments & Sovereign Wealth Funds – Return per Unit of Risk

Large institutions with long-term time horizons can also benefit from their consideration of bitcoin. Large institutions tend to view assets in various risk buckets, with some assets falling into the risk-on, return-seeking bucket and other assets falling into the risk-off, liability-hedging bucket. Many institutions, such as pension plans, adjust their asset allocations based on their funding ratio. As pensions become better funded, their asset allocation becomes more risk-averse and their assets shift out of their return-seeking bucket and towards their liability-hedging bucket. This is where bitcoin could potentially be extremely useful for allocators. The inclusion of bitcoin can allow allocators to reduce the size of their risk-on bucket, increase the size of their risk-off bucket, and maintain a similar return expectation.

Though endowments and sovereign wealth funds run an entirely different operation with differing objectives to pension plans, the end goals are similar. Pensions, endowments, and sovereign wealth funds typically have long time horizons and aim to match their assets with their future liabilities. We utilize a pension planning scenario for the example below, but the principles and portfolio risk-return implications apply to many different types of institutional investors including endowments and sovereign wealth funds.

Pension Planning Example

Pension de-risking is often a formulaic process whereby committees determine their proper asset allocation target based on their current funding ratio. We can reference a Vanguard study on pension de-risking to derive the below example for allocating between return-seeking and risk-off buckets.

Funding Level	**< 85%**	**85% to 89%**	**90% to 94%**	**95% to 99%**	**100% to 104%**	**≥ 105%**
Return-seeking Assets	60%	50%	40%	30%	20%	10%
Liability-hedging Assets	40%	50%	60%	70%	80%	90%

Source: Pension derisking: Start with the end in mind, Vanguard. Date Accessed: 08/10/2021.

Of course, pensions and other similar institutions have access to private investments, such as private equity and private credit markets. Although these are considered alternative investments, they exhibit many of the same core return drivers as traditional equity and credit markets, tending to correlate strongly with traditional assets. Bitcoin, a truly alternative asset, could help reduce the needed amount of return-seeking assets inside of a pension plan's portfolio. Bitcoin's inclusion in a portfolio has historically allowed allocators to increase their percentage of risk-off assets and still achieve a similar return objective, as we show below utilizing the S&P 500 Index and Bloomberg Barclays Aggregate Index.

We'll use the outlined guidance from the Vanguard paper and represent a hypothetical pension fund that is 85% to 89% funded. According to the example, they would likely allocate roughly half of their assets to a return-seeking bucket and half of their assets to a liability-hedging bucket. In this instance, our objective will be to maintain the same return and volatility profiles of the 50% equity – 50% bond benchmark portfolio, while increasing our ability to allocate towards assets perceived as being part of our risk-off, liability-hedging bucket.

Asset Allocation	**Stocks = 50% Bonds = 50% Bitcoin = 0%**	**Stocks = 45% Bonds = 54.75% Bitcoin = .25%**	**Stocks = 45% Bonds = 54.50% Bitcoin = .50%**	**Stocks = 45% Bonds = 54.25% Bitcoin = .75%**	**Stocks = 45% Bonds = 54% Bitcoin = 1%**
Annual Return	8.80%	8.93%	9.60%	10.26%	10.91%
Annual Volatility	7.31%	6.74%	6.90%	7.09%	7.32%
Sharpe Ratio	1.07	1.17	1.24	1.29	1.33
Maximum Drawdown	-9.08%	-8.14%	-8.23%	-8.33%	-8.42%

Data Source: Bloomberg. Date Accessed: 07/11/2021. Period Studied: 01/01/2015-06/30/2021. Stocks are represented using the Standard & Poor's 500 Index. Bonds are represented using the Bloomberg Barclays Aggregate Index. Bitcoin is represented using the Lumos Bitcoin Index. Portfolios rebalanced annually.

Given the outlined objective above, an allocation of just 25 to 100 basis points of bitcoin proved very effective. The initial incremental adoption is where the portfolio sees its biggest risk-return increase (arguably the theme of this paper). The Sharpe ratio is most convex, in regard to adding bitcoin into a portfolio, between having no allocation and a 1% allocation. The Sharpe of the 45% stock/54% fixed income/1% bitcoin portfolio increased by 0.26 (+ 24%) when compared with the 50% stock/50% fixed

income benchmark. The portfolio holding 1% bitcoin reduced the allocation to risk-seeking assets by 4%, reduced the maximum drawdown by over 60 basis points, and enhanced returns by over 200 basis points per annum. The case for a small allocation to bitcoin inside of institutional portfolios with risk-on and risk-off buckets appears worthy of consideration. Historical examples, such as the one provided here, display how valuable bitcoin's superior return per unit of risk and portfolio diversification benefits can be to a broader institutional portfolio.

NON-MATERIAL EXPOSURE, MATERIAL OUTCOME

"Getting off zero" is a phrase that many institutional boardrooms are discussing and acting upon. This rare asset class' asymmetry creates a potential return profile that is dense enough for a small position to be meaningful. In other words, a "non-material exposure producing material outcomes," to paraphrase Wences Casares. Having a bitcoin strategy is becoming increasingly important for all types of investors. Whether or not each respective investment allocator or boardroom ultimately winds up allocating to this emerging asset class depends on their unique circumstances. However, the current macro environment, overall investment thesis, and historical portfolio implications make a compelling case that the conversation may be more important today than it has ever been. Failing to acknowledge this space no longer appears to be a prudent strategy.

[i] The Case for a Small Allocation to Bitcoin

[ii] The longest Bull Market in History

[iii] Treasury Inflation Protected Securities Yields – U.S. Department of Treasury

[iv] Stock Returns and interest Rates Around the World: A Panel Data Approach

[v] GMO 7-Year Asset Class Forecast: 2Q 2021

[vi] Off Balance-Sheet Federal Liabilities

[vii] Moral Hazard and the US Stock Market: Analysing the 'Greenspan Put'

[viii] The Liquidation of Government Debt

[ix] Bitcoin Market Capitalization

[x] Gold Market Capitalization

[xi] Bond Market Size

[xii] Corporates Investing in Crypto

[xiii] FASB Launches Agenda Consultation Project