Morgan Stanley

WEALTH MANAGEMENT

SPECIAL REPORT

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The Case for Cryptocurrency As an Investable Asset Class in a Diversified Portfolio

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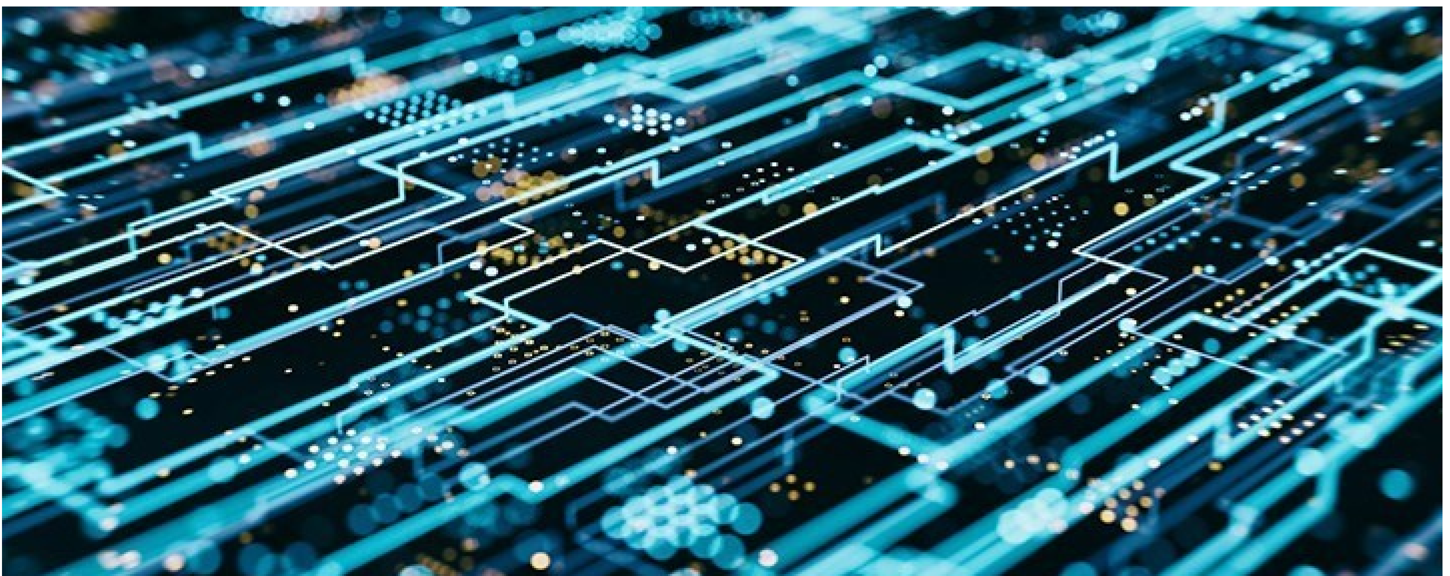
For speculative investment opportunities to rise to the level of an investable asset class that can play a role in diversified investment portfolios requires transformational progress on both the supply and demand sides. With cryptocurrency, we think that threshold is being reached. A firming regulatory framework, deepening liquidity, availability of products and growing investor interest—especially among institutional investors—have coalesced. They come together at a time when the challenges to conventional cash/stock/bond diversification are rising against a shifting macroeconomic backdrop. Like all speculative asset classes, the risks are multifold while the long-run investment implications are yet to be determined. We suggest investors begin to get educated on this new arrival to the investing landscape.



For additional information about the risks of cryptocurrencies, please see the Important Information in the Disclosure section of this report.

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Executive Summary

Periodically, technology/product innovation—in tandem with policy and regulatory evolution—converges with the demands of the macroeconomic backdrop to pave a path for the emergence of a new investable asset class. This was the case with gold nearly 45 years ago, and is currently the case with cryptocurrency, which has crossed the critical thresholds of market liquidity, regulatory scrutiny and institutional acceptance at a time when managing cash and achieving portfolio diversification has become ever more challenging and meaningful.

On the one hand, our recognition of cryptocurrency as a likely permanent investment category is an acknowledgement of its potential to power decentralized, tamper-resistant, anonymous transactions on blockchains leveraged for myriad applications. That is undeniably exciting. On the other hand, cryptocurrency represents a radical new invention lacking a known sponsor, a centralized standards-setting body or an actual physical incarnation that continues to search for the "killer app" or best applications and could ultimately prove challenging to sovereign governments, climate advocates and market regulators. Thus, in acknowledging cryptocurrency as a viable asset class, we nonetheless are suggesting that qualified* investors approach it as speculative. As with any asset class still in its speculative phase, there are a multitude of risks—some predictable, some identified and some yet to be uncovered. Such risk characteristics limit prudent advice to having exposures in small positions in a highly diversified form, akin to how one might approach venture capital investing. Our initial modeling, replicated in spirit by a recently published CFA Institute study, suggests diversification benefits from the low correlation of cryptocurrency to other assets and that Sharpe ratio improvements can be achieved with positions no greater than 2.5%. It is important to keep in mind that we are only in the top of the first inning.

Our approach to cryptocurrency as an asset class should not be misconstrued for endorsement of any particular coin ownership. To the contrary, we see direct coin ownership, whether through private closed brokerages or cash app services, as still being in its infancy, with many questions yet to be answered about the achievability of low-cost best execution, central clearing, accurate and timely market data, and transparent and integrated custodial services.

Understanding the Controversy

For most of its existence, cryptocurrency—and Bitcoin, specifically—has proven a challenge for investors, regulators and asset allocators. Unlike other nontraditional arenas that have initially attracted faddish financial speculation, cryptocurrency ("crypto") has proven particularly vexing as it lacks a known sponsor, a centralized standards setting-body or even a physical embodiment.

In many ways, it is the ultimate incarnation of an increasingly globally interconnected, communal and virtual world; an invention of distributed computer coding. Beyond the impediments surrounding its intangibility, there has been the controversy around defining the use case for this digital creation. Is it simply a technology component that embodies the value creation of computer coding that enables anonymous, decentralized and tamper-resistant transactions to be recorded on a blockchain ledger? Is it a transaction medium or cash currency with reliable exchangeability for goods and services? Is it a commodity, essentially delivering a long-run store of real (net after inflation) value, like digital bullion? Is it a new means of payments processing? Or is it simply an investable asset? Equally daunting for regulators and central banks to ponder have been issues of governance and investor protection, especially given the potential for borderless and anonymous transactions—a factor that sometimes associates cryptocurrencies with illegal and illicit activities.**

Another demanding factor for investors has been the unique risks around ownership rights and the transferability of the "coins" themselves. Coin ownership is anonymous, connoted by a complex, long and computer-generated password. If the "private key" (password) is lost or stolen, the coin can be stolen, with no recourse to recovery. Custodians must ensure that no one person has the entire password and that passwords are protected from hackers. In a world highly sensitized to cybersecurity risks, the claim that something is "unhackable" has proven a tall order, begging credulity. While insurance is available, it is not yet standardized and can be quite expensive. Finally, the largest exchanges in crypto are typically vertically integrated, closed systems: They are not interconnected through regulated centralized clearing mechanisms and do not necessarily follow the best practices of traditional securities-based finance that breaks exchanges into independent brokers, market makers and custodians, which help to guarantee best execution. While crypto exchanges are evolving rapidly, they remain in their infancy.

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*Please check specific investment documents, if applicable, for eligibility requirements.

**Fueled in part by its anonymity and disparate regulatory regimes, the financial crime-associated risks of cryptocurrencies are significant. Digital assets may have an illicit history or come from the proceeds of illegal activity. There is increasing evidence of countries using cryptocurrency to evade or violate economic sanctions laws. These abuses, and related enforcement actions, could impact the stability or legitimacy of digital assets.

Acknowledging the Opportunity

Despite such challenges, crypto's unique attributes are unassailable and its value proposition must be acknowledged. (See "Update: Bitcoin, Crypto and Digital Currencies," Morgan Stanley & Co., Feb. 10, 2021 and "Cryptoassets: The Guide to Bitcoin, Blockchain and Cryptocurrency for Investment Professionals" by Matt Hogan and David Lawant and published by the CFA Institute Research Foundation*). Most simply, cryptocurrencies are the "award metric" or economic incentive for work done to process and validate transactions on a distributed ledger network (or blockchain). Because every transaction is independently and publicly validated by each network node, error and fraud are reduced and processing costs are low because the need for disintermediation is eliminated. Furthermore, cryptocurrencies can accrue value because of their scarcity, as the concept of a fixed/limited supply of coins ensures that processing continues, even as the blockchain network grows in complexity. Finally, because cryptocurrency is coded, it enables property rights information and value to be embedded on the same token, features that facilitate optimized peer-to-peer transactions. Given these provocative and innovative properties and myriad potential applications, investor interest is understandable.

On a Path Toward Financial Market Maturation

The head-spinning price appreciation, together with greatly increased trading volume, forced a material acceleration in crypto's path toward financial market maturation (see Exhibit 1). Currently, all cryptocurrencies carry a market capitalization nearly the size of the entire high yield bond market and half the size of the small-cap universe.

Exhibit 1: Cryptocurrencies Still Small but Rapidly Relevant

Asset	Market Capitalization ($ billion) December 2017	Market Capitalization ($ billion) February 2021	Daily Average Volume ($ billion) December 2017	Daily Average Volume ($ billion) February 2021
Gold (OTC + Exchanges + Gold ETFs)	7,916	11,325	129	169
Gold (Exchanges)			43	54
SMID Cap	4,896	6,577	44	89
Russell 2000	2,454	3,293	24	53
High Yield	1,339	1,595	N/A	N/A
Bitcoin	225	864	14	81
Bitcoin as percent of gold	3%	8%		

Note: Bitcoin price $46,340. Bitcoin daily average volume includes trades versus fiat, stable coins and other cryptocurrencies. CryptoCompare volume data, which excludes cryptocurrency transactions, shows volume of $6 billion and $13 billion in December 2017 and February 2021.
Source: Bloomberg, World Gold Council, Morgan Stanley & Co. Research, Morgan Stanley Wealth Management Global Investment Office as of Feb. 28, 2021

The Financial Crimes Enforcement Network (FinCEN) was the first regulator on the crypto scene in 2013. The Internal Revenue Service followed quickly, and for tax purposes defined cryptocurrency as a "property asset," not a foreign currency. It wasn't until late 2017, when Bitcoin peaked at nearly $20,000, that there was a transformational structural change in regulatory frameworks.

Since then, as illustrated in Exhibit 2, we have seen critical action by the Commodity Futures Trading Commission (CFTC) establishing rules for futures contracts trading and approval of derivatives for hedging; the Securities and Exchange Commission (SEC) declaraing that Bitcoin is not a security; and the mid-2020 decision by the Office of the Comptroller of the Currency (OCC), a bank regulator, authorizing national banks to act as custodians for digital assets.

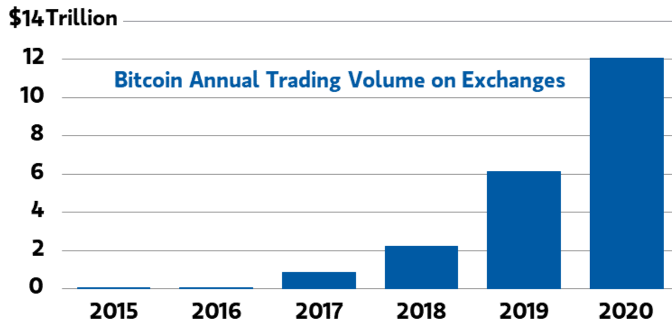
* https://www.cfainstitute.org/-/media/documents/article/rf-brief/rfbr-cryptoassets.ashx

Exhibit 2: Evolution of Regulatory Treatment of Cryptocurrency

Date	Regulatory Treatment
March 2013	Financial Crimes Enforcement Network (FinCEN) issued guidance on "Persons Administering, Exchanging, or Using Virtual Currencies," defining exchangers or administrators of cryptocurrency as money-services businesses under the Bank Secrecy Act
April 2014	Internal Revenue Service defined Bitcoin as property, not foreign currency, for tax purposes. It explained how mining profits and Bitcoin-based wages should be treated
August 2015	State of New York required a BitLicense to deal with cryptocurrency in the state
December 2017	Commodity Futures Trading Commission (CFTC) approved futures trading at the CME and CBOE
April 2018	In Congressional testimony, the chair of the Securities and Exchange Commission (SEC) stated that Bitcoin is not a security
April 2019	SEC outlined a framework for when cryptocurrencies should be considered and regulated like securities
May 2019	FinCEN provided clarification on how anti-money laundering rules should be implemented with respect to cryptocurrencies
June 2019	CFTC approved Ledger X to sell derivatives that pay out in Bitcoin
November 2019	New York Dept. of Financial Services issued a digital trust charter to Fidelity
July 2020	Office of the Comptroller of the Currency (OCC) issued an interpretive letter authorizing the custody of digital assets by national banks
January 2021	OCC issued an interpretive letter authorizing use of stable coins for payment activities

Source: Morgan Stanley Wealth Management Global Investment Office

Exhibit 3: Bitcoin Trading Surge Contributes to Liquidity



Source: Macrobond, Morgan Stanley & Co. Research as of Feb. 22, 2021

Most recently, the OCC approved so-called stable coins for payments and permits for the offer of banking services related to crypto. The result has been that in the past six months, the number of venues offering coin brokerage, custody and payment services for cryptocurrencies has multiplied.

The emergence of regulatory guidelines, in turn, is driving the swift availability of crypto products, which avoids the complexities of direct coin ownership. While there was a single publicly traded trust for investors in 2017, currently there are at least a dozen similar products that passively track crypto coin price indexes through privately placed and closed-end funds. And while there are no ETFs available in the US market yet, which would facilitate daily market liquidity, we are seeing much product innovation among both new and traditional investment managers, and we know of multiple crypto-ETF submissions to the SEC awaiting review.

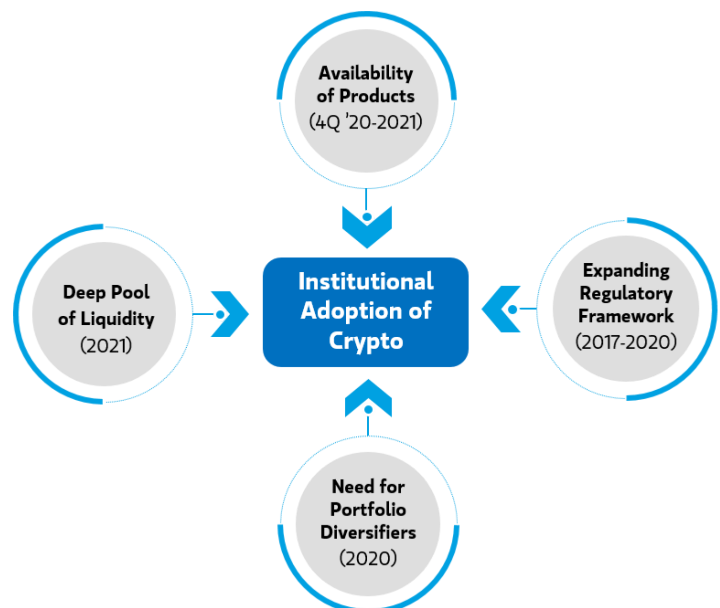
Alongside the availability of packaged products for investors, the expansion of trading venues from the large regulated exchanges to leading fintech firms that have integrated commission-free crypto purchasing into their desktop and mobile trading and payment apps, has supported a deepening of daily market liquidity. Based on recent analysis by the Morgan Stanley & Co. fintech team, annual trading volume in Bitcoin doubled in 2020 from the previous year, reaching $12 trillion (see Exhibit 3); a staggering $539 billion in value was transacted in the first week of January 2021. That compares with a total market capitalization for outstanding Bitcoin that has recently been between $900 billion and $1 trillion.

2020: Policymakers and the Pandemic Create Inflection Point

That said, it was not until the 2020 COVID-19 pandemic that cryptocurrency's viability as a financial investment option for qualified investors was cemented. Specifically, we see four catalytic forces that have coalesced in the past six months to create what we see as a genuine inflection point: the broader adoption of digital wallets/payment systems by dint of the need for contactless business models during the COVID crisis; a surge of policymaker-driven global liquidity that rendered most traditional asset classes fully valued in a historical context; a dwindling list of diversifying and uncorrelated assets; and rising risks of debasement of traditional fiat and reserve currencies. Not only has rampant, unprecedented and unconstrained global central bank money printing fueled the appreciation of most financial assets, but the backdrop of hugely negative real yields for both cash and debt (bond instruments) held in traditional fiat currencies has raised the specter of long-run debasement—implicitly, a structural punishment for savers and cash owners. Consider, US M2 growth in the 12 months through January 2021 is a staggering 25.8%. At the same time, even with the recent backup in global interest rates, there is still close to $16 trillion in negative nominal yielding debt outstanding. The aggressive use of fiscal stimulus has exacerbated matters, pressuring national debts and deficits to levels unsustainable in the intermediate term and raising the odds that higher inflation becomes not only a tactical aspiration of the Fed but a necessary strategic tool for national governments.

Long-term investors, pension funds with long-dated liabilities and corporate treasurers naturally have begun to seek out new "stores of value," and cryptocurrency has emerged as an option (see Exhibit 4). Consider that in 2020 alone we saw publicized interest in crypto soar from multiple corners (see Exhibit 5).

Exhibit 4: Four Catalytic Forces Drive Institutionalization of Cryptocurrency



Source: Morgan Stanley Wealth Management Global Investment Office

Exhibit 5: Announced Institutional Endorsements Have Multiplied

Date	Institutions Adding to Crypto
September 2019	BAKKT launched physically delivered futures
August 2020	Fidelity Custody launched inaugural Bitcoin fund for wealthy investors
August 2020	MicroStrategy, a software company, announced that it had purchased $250 million Bitcoin for its corporate treasury
October 2020	Square invested $50 million in Bitcoin
October 2020	PayPal announced a cryptocurrency service. The company said it would allow domestic and international customers to buy Bitcoin through its existing apps and website
December 2020	MassMutual, a 169-year-old insurance company, announced its purchase of $100 million in Bitcoin
December 2020	MicroStrategy announced it would issue convertible bonds so it could buy Bitcoin. The deal was oversubscribed and upsized due to strong demand from fixed income investors looking for a call option on Bitcoin
December 2020	BAKKT launched Bitcoin options on futures
January 2021	BlackRock filed registration for two funds to invest in Bitcoin
January 2021	Visa backed credit card with Bitcoin rewards
February 2021	Guggenheim Partners allocated $500 million to invest in the Grayscale Bitcoin Trust
February 2021	Tesla invested $1.5 billion in Bitcoin
February 2021	Miller Opportunity Trust allowed its Opportunity Fund to buy into the Grayscale Bitcoin Trust
February 2021	Mastercard said it will allow merchants to accept Bitcoin over its network
February 2021	Bank of New York said it will allow cryptocurrency custody in new product
February 2021	BlackRock said it started to "dabble" in Bitcoin
February 2021	Square purchased another $170 million in Bitcoin

Source: Morgan Stanley Wealth Management Global Investment Office

We view such interest as a type of necessary validation, confidence and "institutionalization" that ends up being self-reinforcing, ensuring that cryptocurrencies continue to scale and evolve. Combined with an expanding regulatory framework, the availability of liquid and insured products, and a sufficient pool of liquidity, the involvement of a wide swath of well-known market participants, in our opinion, helps cross a threshold that enables cryptocurrencies to achieve and maintain the status of a unique asset class.

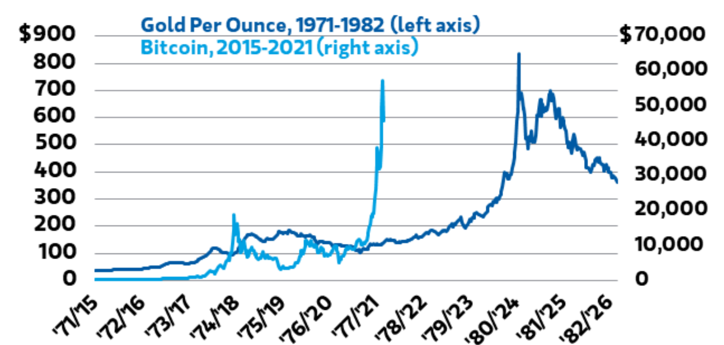
Classically defined, that means that they constitute a grouping of investments that exhibit similar characteristics, legal definitions and regulations, and that they are potential viable sources of capital returns and possess unique and low-to-negative correlations with the major traditional investment asset classes (cash, bonds and stocks). Consequently, the Global Investment Committee believes the time has come for qualified* investors to consider it a viable portfolio asset class.

A Speculative Asset Class Emerges

Finding new asset classes is few and far between, but not without precedent. In the mid-1980s, baby boomers added gold to their mix amid the 1982-2000 bull market, and in the early 2010s, master limited partnerships (MLPs) emerged as an investor favorite with unique tax treatment of dividend pass-throughs. Of the two instances, gold may serve as a better analogy, as its "institutionalization" was spurred by the same anti-inflation, rampant central bank money growth narrative we are currently hearing about Bitcoin (see Exhibit 6).

Recall that gold as an investment was illegal in the US until 1974, though dollars could be redeemed for gold in Europe until 1971. COMEX gold futures first began trading in 1974. The gold price had been fixed at $35 per ounce since 1933. At the start of 1971, gold stood at $37.44 per ounce. But the historic Bretton Woods agreement, which sought to create an international monetary system that would ensure exchange rate stability, prevent competitive devaluations and promote economic growth, unraveled. Gold rose nearly 500% to $184 by the end of 1974, and then lost nearly half its value in a two-year bear market.

Exhibit 6: Crypto Asset-Class Maturation Twice as Fast as Gold's



Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Feb. 26, 2021

That first decline was just a preview, however, as gold rose 541% to its new monthly high close of $850 in January 1980, a record that would stand for more than 25 years.

From the mid-1970s to the early 1980s, gold became widely available through brokerages and retail-oriented products. In 1989, "Gold and Gold Stocks as Investments for Institutional Portfolios" was published by Wharton's Jeffrey F. Jaffe in the *Financial Analyst Journal*. Gold had completed its 18-year transition from new asset to a recognized part of an institutional portfolio. Over that time, the dynamics around the volatility and correlations have matured, with gold consistently and predictably moving inversely with the trade-weighted US dollar and US real interest rates.

Understanding the Investment Case Within a Portfolio

So how should investors begin to think about this speculative asset class in the context of portfolios? With a full business cycle and 12 years' worth of history, academics and Wall Street analysts have begun to make some initial observations that may prove useful. For starters, crypto indexes and the two largest coins by market capitalization, Bitcoin and Ethereum, have had modest three-year trailing correlations with major portfolio asset classes, as illustrated in Exhibit 7. This is extremely interesting right now, given the rising and positive correlations that many asset classes have shown with mega-cap tech stocks, wherein many portfolios are now passively overweight. Additionally, with Treasuries increasingly prone to rising underlying rates, their diversifying power may be impaired on a multiyear basis.

As an initial exercise, we have modeled the impact of adding a small allocation to a diversified portfolio sourced through the GIC's typical allocation to real assets/commodities. Exhibit 8 illustrates our analysis from the period January 2014 through September 2020, when the price of Bitcoin rose to $10,000. We specifically chose that period to eliminate the most recent exponential surge in price. Assuming a 2.5% allocation to Bitcoin was added to a traditional 60%/40% equity/bond portfolio, with monthly rebalancing, the simulated portfolio improved returns on both an absolute and risk-adjusted basis in five of the past seven years. It improved annualized returns by 164 basis points without significantly increasing volatility or maximum drawdowns. It also positively affected the portfolio even in periods when the price of Bitcoin declined due to high volatility and regular rebalancing. Those preliminary findings—albeit premised on the unique backdrop of the past decade of financial repression and the global pandemic and recession—suggest some reason to be constructive on crypto's addition in a diversifying buy-and-hold portfolio context.

Exhibit 7: Crypto Indexes Have Exhibited Low Correlations with Traditional Assets

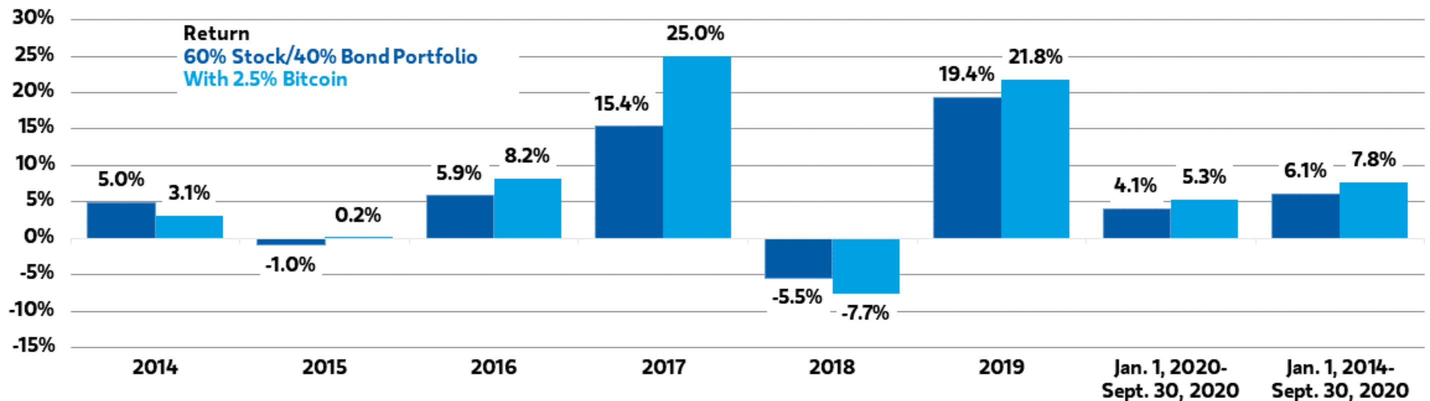
Daily Correlations for Three Years Ending Feb. 26, 2021

	Cryptocurrency Indexes				Cryptocurrencies	
	BGCI	HODL5	BITX	CCMIX	Bitcoin	Ethereum
US Dollar	-0.06	-0.11	-0.09	-0.06	-0.07	-0.05
S&P 500	0.18	0.10	0.03	0.17	0.16	0.18
Barclays Aggregate	-0.03	0.03	0.00	-0.01	-0.02	-0.13
Broad Commodity	0.18	0.17	0.03	0.18	0.18	0.17
Gold	013	0.14	0.07	0.14	0.16	0.13
Precious Metals	0.16	0.15	0.06	0.17	0.19	0.16

Note: Bitwise 10 Large Cap Crypto Index (BITX); Bloomberg Galaxy Crypto Index (BGCI); Crescent Crypto Market Index (CCMIX); 21 Shares Crypto Basket Index (HODL5)
Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Feb. 26, 2021

Importantly, a study published by the CFA Institute Research Foundation in January directionally corroborated our findings, even when rebalanced quarterly and reviewed in one-, two- and three-year rolling periods. That is instructive because the shorter durations between 2014 and 2019 include many windows of strong Bitcoin drawdowns of as much as 84%. Overall, the study suggests that the impact of a median 2.5% allocation to the 60%/40% portfolio over a rolling three-year window (between January 2014 and September 2020) increased total portfolio returns by 15% cumulatively, while improving the portfolio's Sharpe ratio by 41% on average, adding 0.48 to the risk-adjusted return.

Exhibit 8: Preliminary Portfolio Modeling With a Small Bitcoin Allocation Is Constructive



	2014		2015		2016		2017		2018		2019		Jan. 1, 2020-Sept. 30, 2020		Jan. 1, 2014-Sept. 30, 2020	
Volatility (%)	5.0	5.1	7.5	7.5	7.5	7.3	3.4	4.4	7.3	7.5	5.5	5.5	17.9	18.3	8.4	8.5
Sharpe Ratio	1.0	0.6	-0.1	0.0	0.8	1.1	4.3	5.6	-1.0	-1.3	3.1	3.6	0.2	0.3	0.6	0.8
Max Drawdown (%)	-5.2	-5.7	-9.2	-8.8	-6.1	-6.2	-1.0	-1.4	-11.6	-12.9	-2.9	-3.1	-21.4	-21.8	-21.4	-21.8

Note: For illustrative purposes only. Equities are represented by the MSCI All Country World Index (USD-Unhedged), net of dividend withholdings. (For US-based investors, certain dividends are not paid or available due to the tax withholdings in foreign jurisdictions. As such, net of dividends is a more appropriate comparison in this instance.) Bonds are represented by the Bloomberg Barclays US Aggregate Index. The Bitcoin price is sourced from Bloomberg's XBTUSD Currency series, with a daily frequency. We utilized the 2014-2020 time frame, providing a comparative analysis to the CFA Institute Research Foundation's cryptoassets analysis (as cited on page 3 of this report) over the same time period. Past performance is no guarantee of future results. Estimates of future performance are based on assumptions that may not be realized. This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy.
Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office

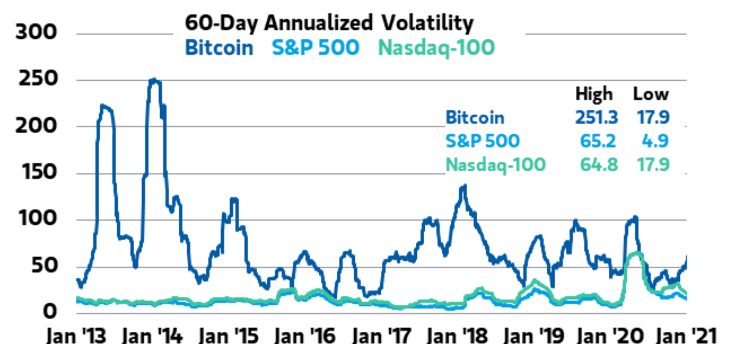
Risks Are Both Familiar and Unique

Unequivocally, our acknowledgement of crypto as an investable asset class and potential tool in the context of a diversified portfolio should not be taken as a blanket endorsement or as an assertion that the asset class has matured beyond its speculative phase. Investing in burgeoning asset classes carries specific risks that require ongoing monitoring. For one, daily market drivers are not fully mature, with supply and demand dynamics still in their adolescence. This manifests in the lack of reliable and consistent market-wide information and ongoing challenges of data gaps and opacity. Equally, if not more important, valuation paradigms are also shifting. Consider that initially Bitcoin was priced by the electricity cost to mine it, then relative to its transaction value to data processing networks, then as a substitute for gold and more recently, in its market capitalization relative to the money supply of fiat currencies.

Even for those unconcerned by the intangible nature and radical decentralization of Bitcoin, the volatility is critical. Twenty percent moves are relatively common, and Bitcoin has experienced four crashes of more than 80% since 2011 and 16 crashes greater than 30%. Even during the past year, a time period when Bitcoin appreciated tenfold from its March 2020 trough through its most recent high in February 2021, average monthly volatility was more than two to three times that of the S&P 500 and Nasdaq Composite (see Exhibit 9).

Lastly, cross-asset correlations might continue to remain unstable. Bitcoin has behaved like both a risk-on and risk-off asset. Over a longer period, while its correlation with a 60%/40% stock/bond portfolio has been very low, there have been stretches when it has exhibited high correlations to other assets: at times being correlated or uncorrelated to equities or gold or inversely correlated with the dollar.

Exhibit 9: Crypto Volatility Is at Least Three Times That of Stocks



Source: Bloomberg, Morgan Stanley Wealth Management Global Investment Office as of Feb. 24, 2021

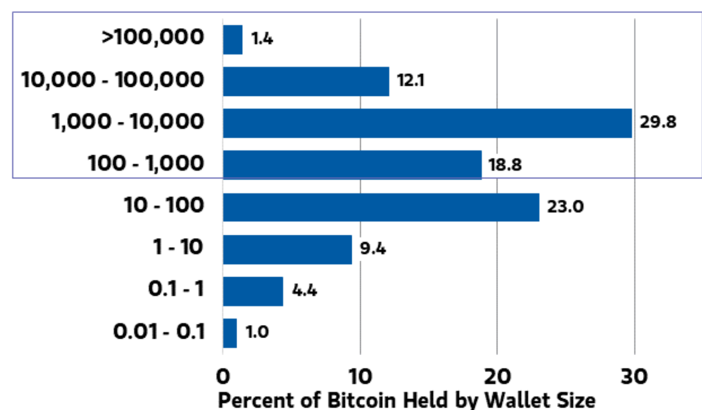
Thus, it is hard to predict how it will fit into a tactically managed portfolio measured over short time frames. These features limit prudent advice to owning cryptocurrencies in small positions in a highly diversified form.

Furthermore, our acknowledgement of asset class viability should not be confused with a reduction in other risks related uniquely to cryptocurrencies that have been noted over the years. The most obvious is that technological challenges present a new kind of risk. Bitcoin depends on encryption, and encryption does not typically last forever. It is more a matter of when, not if it will be broken, as processing power and mathematical skill increase through the use of quantum computing. A failure of encryption could allow coins to be stolen, or an update of the code to improve encryption could lead to a split in the currency if two or more rival encryption updates are proposed. These issues could arise suddenly and create uncertainty with regard to the ultimate outcome. Another technological risk is a severe coding error than has yet to be discovered. There have been two large bugs in the past, one of which was exploited in 2010. The 2010 bug required a rollback in the blockchain and changes to the code that were easier when the total value of Bitcoin was much lower. Other cryptocurrencies have experienced similar issues. A bug in the code could cause a significant decline in the value of Bitcoin or other cryptocurrencies.

Another risk consideration is the threat and conflict that cryptocurrencies likely pose to clean/green energy and environmental, social and governance (ESG) investment mandates. Bitcoin and other cryptocurrencies require an extremely high amount of energy as do all systems that rely on computing power. The proof-of-work mechanism places huge upfront electricity costs on miners before they can successfully mine any bitcoin. As prices rise, it encourages more would-be miners to spend more on electricity. A recent report published by the International Electricity Association (IEA) estimated that bitcoin mining consumed 100 terawatts (TWh) annually, or between 0.2% and 0.5% of global electricity consumption. They noted that these figures can appear large when compared to single countries such as Ireland (26 TWh) or emerging technologies such as electric vehicles (58 TWh in 2018), but small when compared to other end uses like global cooling/air conditioning (2,020 TWh in 2016). But unlike other types of electricity consumption, crypto-mining energy usage tends to scale linearly with price/value of the coins and exponentially with the number of coins harvested. Such a large increase in electricity consumption by miners on associated grids could quickly become a public policy issue with electric utility regulators and local municipalities and communities. Equally critical is that nearly 60% of crypto-mining is done in China, where coal is still a major source of power. According to the Digiconomist Bitcoin Energy Consumption Index, the current carbon footprint of Bitcoin mining is 37.1 metric tonnes of CO_2, comparable to New Zealand's annual carbon footprint.

Another unique risk relates to the concentration of Bitcoin's global ownership. Although daily trading volume is deepening, actual liquidity growth may stall out as Bitcoin addresses —or "wallets"—that hold more than $1 million worth of the cryptocurrency have been rising. Consider an analysis by Morgan Stanley & Co. Research that suggests that more than 60% of total issued bitcoin is held in digital wallets that already hold at least 100 coins, and 30% of wallets own between 1,000 and 10,000 coins (see Exhibit 10).

Exhibit 10: How Bitcoin Ownership Is Concentrated by Wallet Size



Source: BTC.com, Morgan Stanley & Co. Research as of Feb. 11, 2021

If buy-and-hold strategies continue to dominate at the same time that bitcoin supply creation from new mining is decelerating, availability or trading liquidity could suffer.

A final but not insignificant factor is the attitude of governments toward the asset class. With strong vested interests in support of fiat currencies and the access to tax revenues they provide, the potential for a single large government to invalidate crypto as a currency or prohibit it for certain use cases is not zero. And such limits need not come from the blunt instrument of confiscation. Rather, material disruption could come from seemingly more benign sources such as restrictive trade policies that affect miner access to mining semiconductors or chip production equipment.

Please refer to important information, disclosures and qualifications at the end of this material.

Time to Get Educated

The embrace of cryptocurrency as an asset class should not be misconstrued as a recommendation for any one coin. Like other new emergent technologies before it, first movers may not turn out to be the best or most long-lasting movers. Certainly, Bitcoin is currently dominant in cryptocurrencies, capturing roughly two-thirds of current asset class market capitalization, but the ways in which crypto can be used continue to evolve at record speed. From our vantage point, coin trading remains in its infancy. Issues around finding true price discovery and best execution are still to be addressed. We have yet to be convinced there and, therefore, advise clients to proceed with caution.

In conclusion, our recommendation is that investors get educated and consider how and whether to get exposure to this bourgeoning asset class in their portfolio. We suggest investors become familiar with the unique crypto terminology, with use cases, investment arguments, valuation regimes, investment product alternatives and risk. For those qualified* investors ready to gain exposure, we suggest starting with publicly traded products—preferably ones that are multiasset and potentially accessing the growth opportunities through a venture capital/private equity investment in the blockchain ecosystem. ■

Disclosure Section

Important Information

Buying, selling, and transacting in Bitcoin or other digital assets, and related funds and products, is highly speculative and may result in a loss of the entire investment. Risks and considerations include but are not limited to:

- Bitcoin and other digital assets have only been in existence for a short period of time and historical trading prices for Bitcoin and other digital assets have been highly volatile. The price of Bitcoin and other digital assets could decline rapidly, and ***investors could lose their entire investment***.
- Certain digital asset funds and products, including Bitcoin funds and products, allow investors to invest on a more frequent basis than investors may withdraw from the fund or product, and interests in such funds or products are generally not freely transferrable. This means that, particularly given the volatility of digital assets, including Bitcoin, an investor will have to bear any losses with respect to its investment for an extended period of time and will not be able to react to changes in the price of the digital asset once invested (for example, by seeking to withdraw) as quickly as when making the decision to invest. Such digital asset funds and products, including Bitcoin funds and products, are intended only for persons who are able to bear the economic risk of investment and who do not need liquidity with respect to their investments.
- Given the volatility in the price of Bitcoin and other digital assets, the net asset value of a fund or product that invests in such assets at the time an investor's subscription for interests in the fund or product is accepted may be significantly below or above the net asset value of the product or fund at the time the investor submitted subscription materials.
- Certain digital assets, apart from Bitcoin, are not intended to function as currencies but are intended to have other use cases. These other digital assets may be subject to some or all of the risks and considerations set forth herein, as well as additional risks applicable to such other digital assets. Buyers, sellers and users of such other digital assets should thoroughly familiarize themselves with such risks and considerations before transacting in such other digital assets.
- The value of Bitcoin and other digital assets may be negatively impacted by future legal and regulatory developments, including but not limited to increased regulation of Bitcoin or such other digital assets. Any such developments may make Bitcoin or such other digital assets less valuable, impose additional burdens and expenses on a fund or product investing in such assets or impact the ability of such a fund or product to continue to operate, which may materially decrease the value of an investment therein.
- Due to the new and evolving nature of digital currencies and the absence of comprehensive guidance, many significant aspects of the tax treatment of digital assets including Bitcoin are uncertain. Prospective investors should consult their own tax advisors concerning the tax consequences to them of the purchase, ownership and disposition of Bitcoin and other digital assets, directly or indirectly through a fund or product, under U.S. federal income tax law, as well as the tax law of any relevant state, local or other jurisdiction.
- Over the past several years, certain Bitcoin exchanges have experienced failures or interruptions in service due to fraud, security breaches, operational problems or business failure. Such events in the future could impact any fund's or product's ability to transact in Bitcoin if the fund or product relies on an impacted exchange and may also materially decrease the price of Bitcoin, thereby impacting the value of your investment, regardless of whether the fund or product relies on such an impacted exchange.
- Although any digital asset product, including a Bitcoin-related product, and its service providers have in place significant safeguards against loss, theft, destruction and inaccessibility, there is nonetheless a risk that some or all of a product's digital asset, including Bitcoin, could be permanently lost, stolen, destroyed or inaccessible by virtue of, among other things, the loss or theft of the "private keys" necessary to access a product's digital asset, including Bitcoin.
- Investors in funds or products investing or transacting in Bitcoin and/or other digital assets may not benefit to the same extent (or at all) from "airdrops" with respect to, or "forks" in, the Bitcoin (or other relevant digital asset's) blockchain, compared to investors who hold Bitcoin (or such other relevant digital asset) directly instead of through a fund or product. Additionally, a "fork" in the Bitcoin blockchain could materially decrease the price of Bitcoin.
- Digital assets such as Bitcoin or other digital asset product is/are not legal tender, and is not backed by any government, corporation or other identified body, other than with respect to certain digital currencies that certain governments are or may be developing now or in the future (of which Bitcoin is ***not*** one). No law requires companies or individuals to accept digital currency as a form of payment (except, potentially, with respect to digital currencies developed by certain governments where such acceptance may be mandated). Instead, other than as described in the preceding sentences, Bitcoin's and other digital asset products' use is limited to businesses and individuals that are willing to accept them. If no one were to accept digital currencies, Bitcoin and other virtual currency products would very likely become worthless.
- Platforms that buy and sell Bitcoin or other digital assets can be hacked, and some have failed. In addition, like the platforms themselves, digital wallets can be hacked, and are subject to theft and fraud. As a result, like other investors have, you can lose some or all of your holdings of digital assets, including Bitcoin.
- Unlike US banks and credit unions that provide certain guarantees of safety to depositors, there are no such safeguards provided to digital assets, such as Bitcoin, held in digital wallets by their providers or by regulators.
- Due to the anonymity Bitcoin and other digital assets offer, it has known use in illegal activity, including drug dealing, money laundering, human trafficking, sanction evasion and other forms of illegal commerce. Abuses could impact legitimate consumers and speculators; for instance, law enforcement agencies could shut down or restrict the use of platforms and exchanges, limiting or shutting off entirely the ability to use or trade Bitcoin or other digital asset products.
- Bitcoin and other digital assets may not have an established track record of credibility and trust. Further, any performance data relating to Bitcoin, Bitcoin-related products or other digital asset products may not be verifiable as pricing models are not uniform.
- Investors should be aware of the potentially increased risks of transacting in digital assets, including Bitcoin, relating to the risks and considerations, including fraud, theft, and lack of legitimacy, and other aspects and qualities of digital assets, before transacting in such assets.
- The exchange rate of Bitcoin or other virtual currency products versus the USD historically has been very volatile and the exchange rate could drastically decline. For example, the exchange rate of Bitcoin versus the USD has in the past dropped more than 50% in a single day. Bitcoin may be affected by such volatility as well.
- Digital asset exchanges have limited operating and performance histories and are not regulated with the same controls or customer protections available to more traditional exchanges transacting equity, debt, and other assets and securities. There is no assurance that a person/exchange who currently accepts a digital asset as payment will continue to do so in the future.
- The regulatory framework of digital assets is evolving, and in some cases uncertain, and digital assets themselves may not be governed and protected by applicable securities regulators and securities laws, including, but not limited to, Securities Investor Protection Corporation coverage, or other regulatory regimes.

- Morgan Stanley Smith Barney LLC or its affiliates (collectively, "Morgan Stanley") may currently, or in the future, offer or invest in digital asset products, services or platforms. The proprietary interests of Morgan Stanley may conflict with your interests.
- The foregoing list of considerations and risks are not and do not purport to be a complete enumeration or explanation of the risks involved in an investment in the any product or fund investing or trading in Bitcoin and/or other digital assets.

The **Global Investment Committee (GIC)** is a group of seasoned investment professionals from Morgan Stanley & Co. LLC, Morgan Stanley Investment Management, and Morgan Stanley Wealth Management who meet regularly to discuss the global economy and markets. The committee determines the investment outlook that guides our advice to clients. They continually monitor developing economic and market conditions, review tactical outlooks and recommend asset allocation model weightings, as well as produce a suite of strategy, analysis, commentary, portfolio positioning suggestions and other reports and broadcasts.

Denny Galindo is not a member of the Global Investment Committee and any implementation strategies suggested have not been reviewed or approved by the Global Investment Committee.

Index Definitions

BITWISE 10 LARGE CAP CRYPTO INDEX (BITX) tracks the total return of the 10 largest cryptoassets as measured and weighted by free-float market capitalization.

BLOOMBERG GALAXY CRYPTO INDEX (BCGI) is a capped market capitalization-weighted index designed to measure the performance of the largest digital assets traded in US dollars.

CRESCENT CRYPTO MARKET INDEX (CCMIX) is a rules-based cryptocurrency market index that is designed to measure the performance of the largest and most-liquid cryptocurrencies.

DIGICONOMIST BITCOIN ENERGY CONSUMPTION INDEX provides the latest estimate of the total energy consumption of the Bitcoin network.

21SHARES CRYPTO BASKED INDEX (HODL5) tracks the financial performance of the top and most-liquid cryptoassets as well as provides a professional benchmark for the broader crypto asset class.

For additional index definitions referenced in this report please visit the following: https://www.morganstanley.com/wealth-investmentsolutions/wmir-definitions

Glossary

Correlation This is a statistical measure of how two securities move in relation to each other. This measure is often converted into what is known as correlation coefficient, which ranges between -1 and +1. Perfect positive correlation (a correlation coefficient of +1) implies that as one security moves, either up or down, the other security will move in lockstep, in the same direction. Alternatively, perfect negative correlation means that if one security moves in either direction the security that is perfectly negatively correlated will move in the opposite direction. If the correlation is 0, the movements of the securities are said to have no correlation; they are completely random. A correlation greater than 0.8 is generally described as strong, whereas a correlation less than 0.5 is generally described as weak.

Drawdown refers to the largest cumulative percentage decline in net asset value or the percentage decline from the highest value or net asset value (peak) to the lowest value net asset value (trough) after the peak.

M2 is a measure of the money supply that includes all elements of M1 as well as "near money." M1 includes cash and checking deposits, while near money refers to savings deposits, money market securities, mutual funds and other time deposits.

Sharpe Ratio This statistic measures a portfolio's rate of return based on the risk it assumed and is often referred to as its risk-adjusted performance. Using standard deviation and returns in excess of the returns of T-bills, it determines reward per unit of risk. This measurement can help determine if the portfolio is reaching its goal of increasing returns while managing risk.

Volatility This is a statistical measure of the dispersion of returns for a given security or market index. Volatility can either be measured by using the standard deviation or variance between returns from that same security or market index. Commonly, the higher the volatility, the riskier the security.

Risk Considerations

MLPs

Master Limited Partnerships (MLPs) are limited partnerships or limited liability companies that are taxed as partnerships and whose interests (limited partnership units or limited liability company units) are traded on securities exchanges like shares of common stock. Currently, most MLPs operate in the energy, natural resources or real estate sectors. Investments in MLP interests are subject to the risks generally applicable to companies in the energy and natural resources sectors, including commodity pricing risk, supply and demand risk, depletion risk and exploration risk.

Individual MLPs are publicly traded partnerships that have unique risks related to their structure. These include, but are not limited to, their reliance on the capital markets to fund growth, adverse ruling on the current tax treatment of distributions (typically mostly tax deferred), and commodity volume risk.

The potential tax benefits from investing in MLPs depend on their being treated as partnerships for federal income tax purposes and, if the MLP is deemed to be a corporation, then its income would be subject to federal taxation at the entity level, reducing the amount of cash available

for distribution to the fund which could result in a reduction of the fund's value.

MLPs carry interest rate risk and may underperform in a rising interest rate environment. MLP funds accrue deferred income taxes for future tax liabilities associated with the portion of MLP distributions considered to be a tax-deferred return of capital and for any net operating gains as well as capital appreciation of its investments; this deferred tax liability is reflected in the daily NAV; and, as a result, the MLP fund's after-tax performance could differ significantly from the underlying assets even if the pre-tax performance is closely tracked.

Investing in foreign markets entails greater risks than those normally associated with domestic markets, such as political, currency, economic and market risks. **Investing in currency** involves additional special risks such as credit, interest rate fluctuations, derivative investment risk, and domestic and foreign inflation rates, which can be volatile and may be less liquid than other securities and more sensitive to the effect of varied economic conditions. In addition, international investing entails greater risk, as well as greater potential rewards compared to U.S. investing. These risks include political and economic uncertainties of foreign countries as well as the risk of currency fluctuations. These risks are magnified in countries with **emerging markets and frontier markets**, since these countries may have relatively unstable governments and less established markets and economies.

Investing in commodities entails significant risks. Commodity prices may be affected by a variety of factors at any time, including but not limited to, (i) changes in supply and demand relationships, (ii) governmental programs and policies, (iii) national and international political and economic events, war and terrorist events, (iv) changes in interest and exchange rates, (v) trading activities in commodities and related contracts, (vi) pestilence, technological change and weather, and (vii) the price volatility of a commodity. In addition, the commodities markets are subject to temporary distortions or other disruptions due to various factors, including lack of liquidity, participation of speculators and government intervention.

Physical precious metals are non-regulated products. Precious metals are speculative investments, which may experience short-term and long term price volatility. The value of precious metals investments may fluctuate and may appreciate or decline, depending on market conditions. If sold in a declining market, the price you receive may be less than your original investment. Unlike bonds and stocks, precious metals do not make interest or dividend payments. Therefore, precious metals may not be appropriate for investors who require current income. Precious metals are commodities that should be safely stored, which may impose additional costs on the investor. The Securities Investor Protection Corporation ("SIPC") provides certain protection for customers' cash and securities in the event of a brokerage firm's bankruptcy, other financial difficulties, or if customers' assets are missing. SIPC insurance does not apply to precious metals or other commodities.

Bonds are subject to interest rate risk. When interest rates rise, bond prices fall; generally the longer a bond's maturity, the more sensitive it is to this risk. Bonds may also be subject to call risk, which is the risk that the issuer will redeem the debt at its option, fully or partially, before the scheduled maturity date. The market value of debt instruments may fluctuate, and proceeds from sales prior to maturity may be more or less than the amount originally invested or the maturity value due to changes in market conditions or changes in the credit quality of the issuer. Bonds are subject to the credit risk of the issuer. This is the risk that the issuer might be unable to make interest and/or principal payments on a timely basis. Bonds are also subject to reinvestment risk, which is the risk that principal and/or interest payments from a given investment may be reinvested at a lower interest rate.

Bonds rated below investment grade may have speculative characteristics and present significant risks beyond those of other securities, including greater credit risk and price volatility in the secondary market. Investors should be careful to consider these risks alongside their individual circumstances, objectives and risk tolerance before investing in high-yield bonds. High yield bonds should comprise only a limited portion of a balanced portfolio.

The market value of **convertible bonds** and the underlying common stock(s) will fluctuate and after purchase may be worth more or less than original cost. If sold prior to maturity, investors may receive more or less than their original purchase price or maturity value, depending on market conditions. Callable bonds may be redeemed by the issuer prior to maturity. Additional call features may exist that could affect yield.

Some $25 or $1000 par **preferred securities** are QDI (Qualified Dividend Income) eligible. Information on QDI eligibility is obtained from third party sources. The dividend income on QDI eligible preferreds qualifies for a reduced tax rate. Many traditional 'dividend paying' perpetual preferred securities (traditional preferreds with no maturity date) are QDI eligible. In order to qualify for the preferential tax treatment all qualifying preferred securities must be held by investors for a minimum period – 91 days during a 180 day window period, beginning 90 days before the ex-dividend date.

Yields are subject to change with economic conditions. Yield is only one factor that should be considered when making an investment decision.

Equity securities may fluctuate in response to news on companies, industries, market conditions and general economic environment.

Companies paying **dividends** can reduce or cut payouts at any time.

Besides the general risk of holding securities that may decline in value, **closed-end funds** may have additional risks related to declining market prices relative to net asset values (NAVs), active manager underperformance, and potential leverage. Some funds also invest in foreign securities, which may involve currency risk.

An investment in an **exchange-traded fund** involves risks similar to those of investing in a broadly based portfolio of equity securities traded on an exchange in the relevant securities market, such as market fluctuations caused by such factors as economic and political developments, changes in interest rates and perceived trends in stock and bond prices. Investing in an international ETF also involves certain risks and considerations not typically associated with investing in an ETF that invests in the securities of U.S. issues, such as political, currency, economic and market risks. These risks are magnified in countries with emerging markets, since these countries may have relatively unstable governments and less established markets and economics. ETFs investing in physical commodities and commodity or currency futures have special tax considerations. Physical commodities may be treated as collectibles subject to a maximum 28% long-term capital gains rates, while futures are marked-to-market and may be subject to a blended 60% long- and 40% short-term capital gains tax rate. Rolling futures positions may create taxable events. For specifics and a greater explanation of possible risks with ETFs¸ along with the ETF's investment objectives, charges and expenses, please consult a copy of the ETF's prospectus. Investing in sectors may be more volatile than diversifying across many industries.

The investment return and principal value of ETF investments will fluctuate, so an investor's ETF shares (Creation Units), if or when sold, may be worth more or less than the original cost. ETFs are redeemable only in Creation Unit size through an Authorized Participant and are not individually redeemable from an ETF.

Please consider the investment objectives, risks, charges and expenses of the fund(s) carefully before investing. The prospectus contains this and other information about the fund(s). To obtain a prospectus, contact your financial advisor. Please read the prospectus carefully before investing.

Derivatives and Leverage. Derivatives are financial contracts whose value depends on the value of underlying assets, reference rates or indices. The use of derivatives involves risks that are in addition to, and potentially greater than, the risks associated with investing directly in securities and other more traditional assets. These include imperfect correlation between the value of the derivative and the underlying asset, risks of default by the counterparty to certain transactions, magnification of losses incurred due to changes in the market value of the underlying asset, and risks that the transactions may not be liquid. Certain derivative transactions may give rise to a form of leverage, which can magnify the potential for gain and/or the risk of loss and could thus have a disproportionate impact on the performance of the fund. Leverage associated with derivative transactions may cause a fund to liquidate portfolio positions to satisfy its obligations when it may not be advantageous to do so, or may cause a fund to be more volatile than if it had not been leveraged. Commonly used derivative instruments and techniques include:

Futures. A futures contract is a standardized, exchange-traded agreement to buy or sell a specific quantity of an underlying instrument or commodity at a specific price at a specific future time. Futures contracts may be offered on agricultural commodities, energy commodities such as crude oil and natural gas, as well as on a vast array of financial instruments, including currencies, government securities, and stock indices. In addition to the derivatives risks discussed above, the prices of futures can be highly volatile. They are affected by many factors, including changes in overall market movements, speculation, real or perceived inflationary trends, index volatility, changes in interest rates or currency exchange rates and political events. Using futures can lower total return, and the potential loss from futures can exceed a fund's initial investment in such contracts.

Options. Options are contracts giving the holder the right to buy or sell a specific amount of the underlying instrument or futures contract on the underlying instrument at an agreed-upon price. Like futures, the prices of options can be highly volatile and they are impacted by many of the same factors. The use of options can also lower total returns.

Investing in smaller companies involves greater risks not associated with investing in more established companies, such as business risk, significant stock price fluctuations and illiquidity.

Stocks of medium-sized companies entail special risks, such as limited product lines, markets, and financial resources, and greater market volatility than securities of larger, more-established companies.

Value investing does not guarantee a profit or eliminate risk. Not all companies whose stocks are considered to be value stocks are able to turn their business around or successfully employ corrective strategies which would result in stock prices that do not rise as initially expected.

Growth investing does not guarantee a profit or eliminate risk. The stocks of these companies can have relatively high valuations. Because of these high valuations, an investment in a growth stock can be more risky than an investment in a company with more modest growth expectations.

Asset allocation and diversification do not assure a profit or protect against loss in declining financial markets.

The returns on a portfolio consisting primarily of **environmental, social, and governance-aware investments (ESG)** may be lower or higher than a portfolio that is more diversified or where decisions are based solely on investment considerations. Because ESG criteria exclude some investments, investors may not be able to take advantage of the same opportunities or market trends as investors that do not use such criteria.

Because of their narrow focus, **sector investments** tend to be more volatile than investments that diversify across many sectors and companies. **Technology stocks** may be especially volatile. Risks applicable to companies in the **energy and natural resources** sectors include commodity pricing risk, supply and demand risk, depletion risk and exploration risk.

Rebalancing does not protect against a loss in declining financial markets. There may be a potential tax implication with a rebalancing strategy. Investors should consult with their tax advisor before implementing such a strategy.

The **indices** are unmanaged. An investor cannot invest directly in an index. They are shown for illustrative purposes only and do not represent the performance of any specific investment.

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