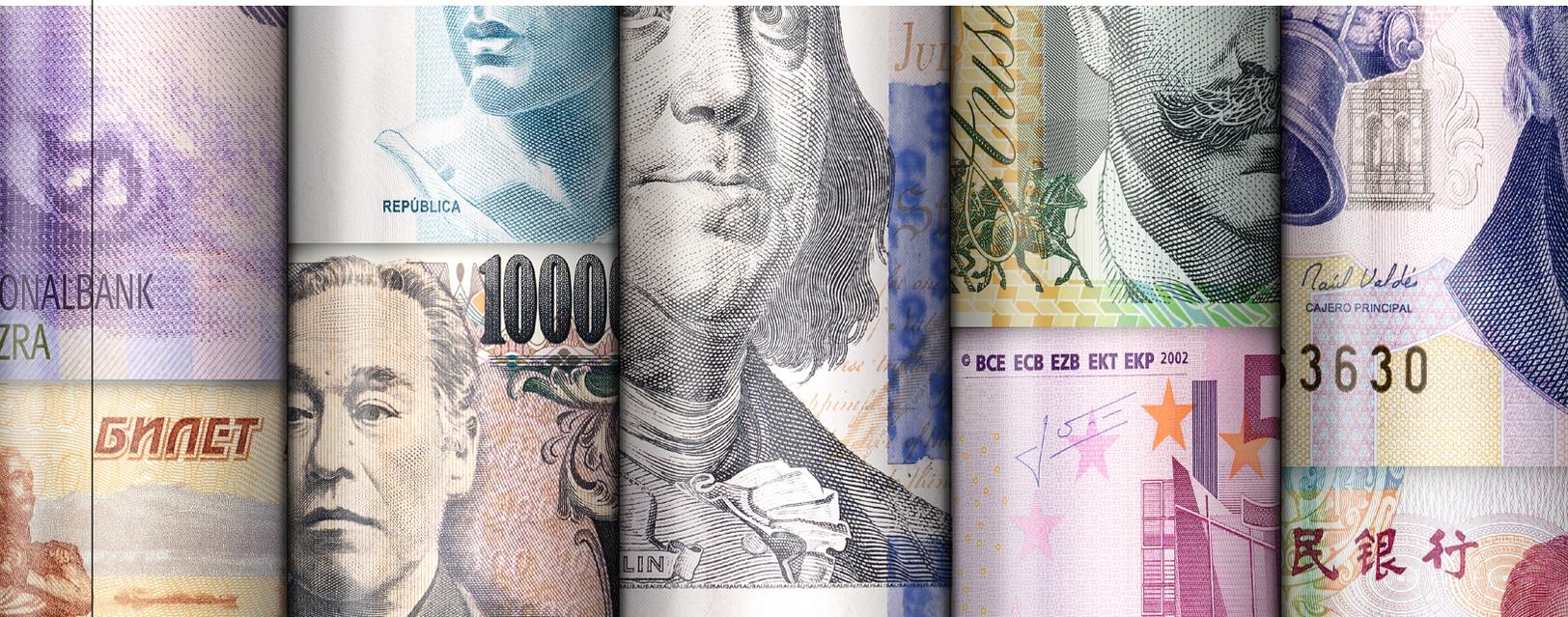


## Currency Management: The Case for Fundamental Investing



In this paper, we challenge consensus wisdom that fundamental value is a less reliable concept for currencies than it is for markets. Our results show that exchange rates tend to revert to value over slightly shorter time horizons than prices in markets and are equally likely—with high statistical confidence—to revert. This argues for an at least equal reliance on the use of value/price investment signals in dynamic currency management as for asset-class management, which is likely in opposition to what may be judged to be appropriate by the consensus wisdom of global investors.

December 2021

**Dynamic Allocation  
Strategies Team**

Our team is particularly active in global currencies: Currency is expected to contribute a material portion to the risk taken—and to potentially generate a commensurate return—in our multi-asset portfolios over the longer term. That is, the active risk budget devoted to currency exposure often approaches equality to, and in some cases exceeds, the active risk budget allocated to equity and bond markets exposures over time.

One reason for this significant allocation of the risk budget to currency is the diversification benefit that a dynamically managed currency strategy is expected to provide within a broader, global multi-asset portfolio. Over the long term, currencies have little to no correlation with assets/markets and, therefore, should be expected to deliver performance that is generally uncorrelated with market-oriented exposures. This relationship between currencies and markets is embodied in our team’s long-term, forward-looking Equilibrium risk model. Over shorter horizons, and embodied in the team’s shorter-term, forward-looking Outlook risk model, correlations between currencies and markets can be non-zero, but they tend to still be low relative to, say, the correlation of one equity market with another, or one bond market with another. This means that even if the active currency risk is large in isolation, its contribution to total portfolio risk should typically be low because of diversification effects. This has been our team’s experience for more than two decades. Inclusion of currency thus has the potential to “punch above its weight” in respect of contributions to return and contributions to risk of a dynamically managed multi-asset portfolio, and this argues for an active currency strategy to be employed meaningfully over time, even though there are fewer currencies in the investable universe than there are markets (there are more than 30 currencies in our team’s investment universe, as compared to more than 75 different equity and fixed income “buckets,” which represent countries, sectors, and credit categories).

“Inclusion of currency thus has the potential to “punch above its weight” in respect of contributions to return and contributions to risk of a dynamically managed multi-asset portfolio, and this argues for an active currency strategy.”

**Dynamic Allocation Strategies Team**

### Data

We conducted simple tests involving 19 currencies (18 exchange rates). For assets, we analyzed 14 national equity markets (treating the eurozone as one market) and four government bond markets. We used monthly data from mid-1971 to mid-2021 (50 years) where available, or as much data as possible where it was not.

Another reason for the generous use of currency strategy in our team's portfolios is the efficacy of exchange rate reversion to fundamental value. The foundation of our team's investment process is the determination of fundamental values for asset classes, markets, sectors, and currencies, and the identification of investment opportunities defined as significant discrepancies between prices and these fundamental values. Adherence to the reversion of price to value is a cornerstone of the justification of major investment exposures in our team's portfolios as well as the belief that value exerts an inexorable pull on price over the medium term. Fundamental value is a discounted cash flow concept for markets, and a relative purchasing power parity concept for currencies, and our team's valuation methodology is described in two papers available upon request.

We observe that the pull of value on price is at least as powerful for currencies as it is for assets, which means that attractive fundamental opportunities can be identified and exploited within currencies. While this finding is supported by rigorous academic research (for example Jorion and Abuaf (1990) or Rogoff (1996)), it is contrary to the consensus of many investment professionals who are often skeptical about the possibility of adding value by investing in currencies.

This paper summarizes our findings: We observe an equally robust cycle of reversion to fundamental value for currencies as we do for markets. With respect to the analysis referenced herein, the findings are for a selection of developed and emerging equity markets, developed bond markets, and developed and emerging currencies. Broadly noted, the time taken for exchange rates to revert to fundamental value is equal or shorter for currencies than for assets. Accordingly, the probability of reversion to value, looking forward from any point in time, is as large for exchange rates as it is for equity and bond markets. And if currencies revert to fundamental values over horizons similar in length to equities and bonds, or shorter, we believe this property of currencies is an additional reason why active currency management should be materially utilized.

# Estimating Fundamental Value

We determine fundamental values of all currencies and equity markets with models that were developed more than 30 years ago and refined since then, and that require multiple qualitative inputs as described in two previously published papers. For the purpose of this paper, we wish to avoid our team’s fundamental valuation inputs and assumptions from influencing the results, and we do not attach the team’s actual valuation estimates to the sampled history of exchange rates and market prices. Instead, we employ a simple log-linear trend regression to impute from each price history a stable “equilibrium” level against which we test the efficacy of reversion.

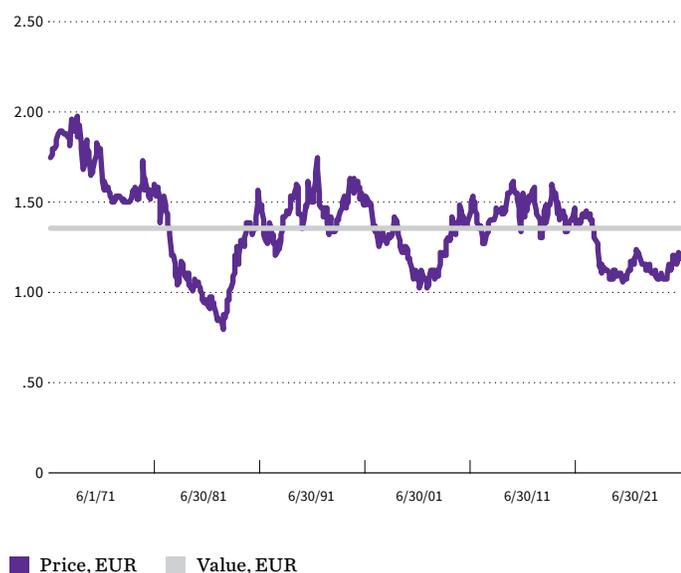
Fundamental value for currencies is defined by their real exchange rate (purchasing power). Therefore, the exchange rate histories were converted from nominal to real exchange rates by backing out differential inflation (one country’s historical inflation less the other’s) from

the nominal series. In real exchange rate space, the equilibrium exchange rate that we impute from the data—the unbiased proxy for fundamental value—should be a stationary constant level. We estimate the fundamental value proxy such that the sum of the squares of the discrepancies between price and value is minimized.

Similarly to currency, we proxy value for asset markets (i.e., bond and equity markets) by minimizing the square of the differences between the log of the price and the log of the value. We assume that value is growing at constant growth rate (i.e., a constant real total return) for equities, and that value is represented by a constant real yield for bonds. Exhibits 1 and 2 show an example of price (real exchange rate) and value for the euro/U.S. dollar history, and the resulting value/price discrepancy over the same history.

EXHIBIT 1

## Price and Value for Euro vs. U.S. Dollar



Source: William Blair, as of June 30, 2021.

EXHIBIT 2

## Value/Price Discrepancy for Euro vs. U.S. Dollar



Source: William Blair, as of June 30, 2021.

# Estimating Fundamental Value (continued)

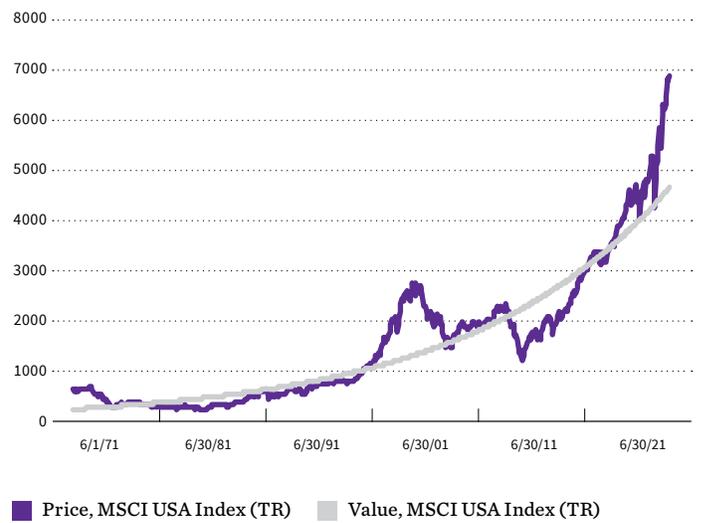
Exhibits 3 and 4 show an example of price and value (constant real growth trend) for the U.S. equity market, and the resulting value/price discrepancy over the same history.

“Fundamental value for currencies is defined by their real exchange rate (purchasing power).”

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EXHIBIT 3

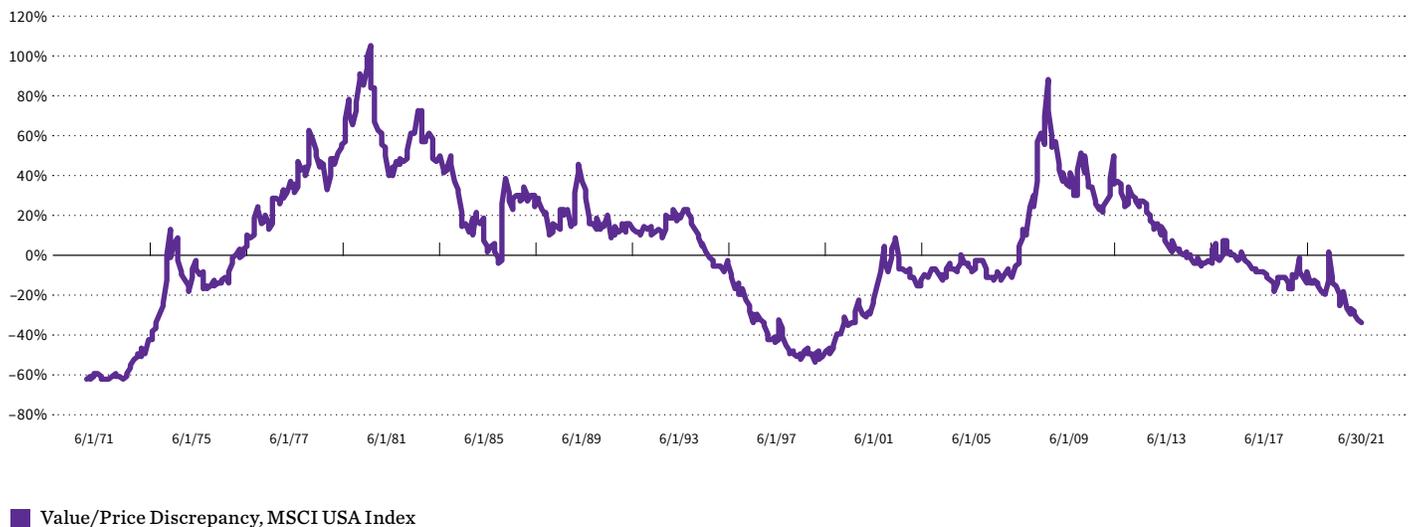
## Price and Value for MSCI USA Index



Source: William Blair, as of June 30, 2021.

EXHIBIT 4

## Value/Price Discrepancy for MSCI USA Index

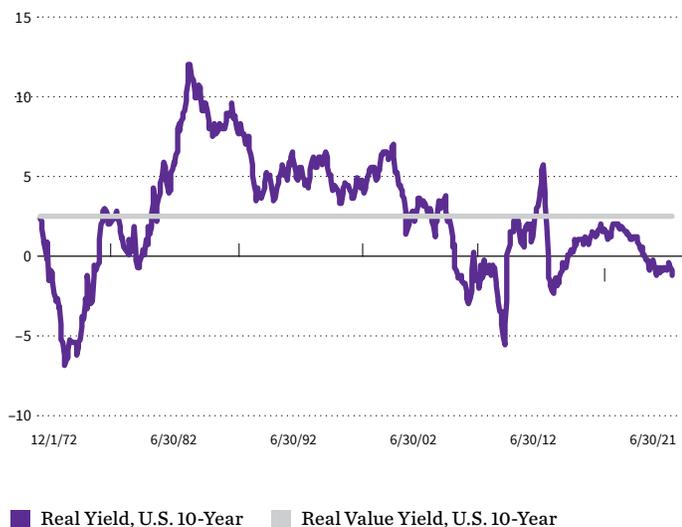


Value/Price Discrepancy, MSCI USA Index

# Estimating Fundamental Value (continued)

EXHIBIT 5

## Price and Value for U.S. Government Debt



Source: William Blair, as of June 30, 2021.

Exhibits 5 and 6 show an example of price and value (represented by constant real yield) for the U.S. government bond market, and the resulting value/price discrepancy over the same history.

With price, fundamental value (or an unbiased proxy thereof), and the discrepancy between price and value, we are thus equipped to test the efficacy of reversion of price to value.

EXHIBIT 6

## Value/Price Discrepancy for U.S. Government Debt



Source: William Blair, as of June 30, 2021

# Half-Life

In the context of discrepancies between price and value, the half-life is a statistical measure of the time required for the discrepancy to contract by half of its starting value. At any point in a price history, the half-life is therefore an expected horizon over which 50% of the reversion to value will occur.

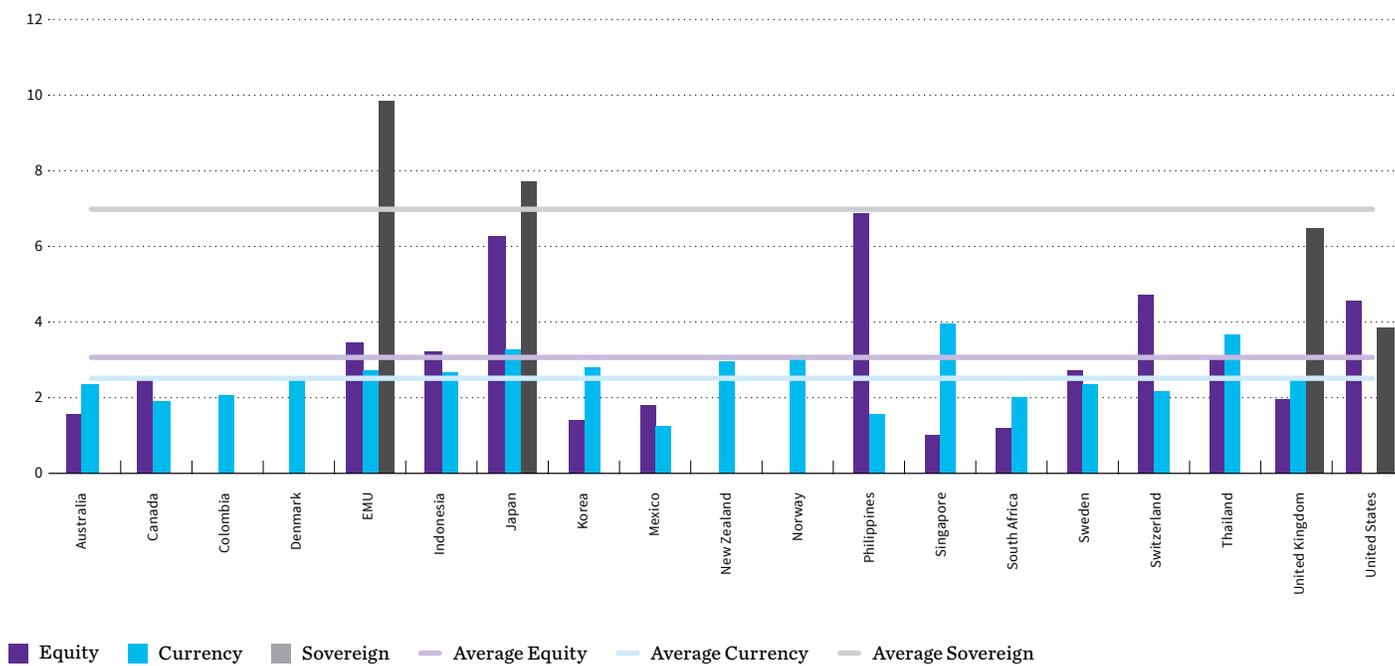
We model the value/price discrepancy history with an autoregressive function of order one [AR(1)] in which the series is described by the model as one in which random shocks (noise) produce non-zero value/price discrepancies, which then evolve with a single dependence on each value from the previous time period. The half-life estimate then suggests the average time over which the value/price discrepancy decays to half its

starting (shocked) level from each point in the history. Specifically, over the 50-year sample (or as much data as we have), we compute the median of the rolling 30-year half-life estimate. The results of the half-life test, measured in years, are shown in Exhibit 7.

We find that the half-life of value/price discrepancies in currencies is slightly shorter than it is in equity markets, and that both are shorter than for bond markets. The median 30-year rolling half-life for the currencies investigated is 2.5 years; for equities it is 3.1 years and for government bonds it is 7.0 years. On the basis of these results, there are grounds to assume that reversion is faster in the case of currencies than equities and bonds.

EXHIBIT 7

Average Half-Life of Currency and Asset Reversion to Price to Value (Years)



Source: William Blair, as of June 30, 2021.

# Probability of Reversion

For each historical series of value/price discrepancy in currencies and markets, we can also compute the likelihood that, from any point in our 50-year time frame, price fully reverts to value or crosses it. We compute the probability of reversion for each series over 1, 2, 3, 4, 5, and 10 years. The results measured in percentage probability are shown in the table.

We find that the probability of price reverting to value (value/price discrepancy contracting to zero) for currencies and equities is broadly similar across reversion horizons, and that the probability for bonds is lower. The probabilities of reversion in all three cases is greater than 50% over horizons of five years and longer. These results also provide grounds for assuming that the probability of price reversion to value is as high for exchange rates as for asset markets.

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## EXHIBIT 8

### Probability of Price Crossing Value vs. Time Horizon

	Average Currency	Average Equity	Average Sovereign
P (<1 Year)	27%	34%	18%
P (<2 Year)	41%	51%	29%
P (<3 Year)	52%	64%	39%
P (<4 Year)	61%	73%	49%
P (<5 Year)	69%	80%	58%
P (<10 Year)	92%	97%	85%

Source: William Blair, as of June 30, 2021.

“The probability of price reverting to value for currencies and equities is broadly similar across reversion horizons, and the probability for bonds is lower.”

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# Stationarity of Fundamental Value

Since the previous two tests for half-life of value/price discrepancy and the probability of full correction of value/price discrepancy implicitly assume that fundamental value (real exchange rates for currencies and constant growth trend for equities) is stable over the history, it is instructive to also perform a test of this stability. We've used an augmented Dickey-Fuller test for whether the autoregressive AR(1) model does or does not have a unit root. A p-value is obtained from the Dickey-Fuller test, which is the coefficient of unit root. If the p-value is close to zero, the null hypothesis that the series is not stationary can be rejected. If the p-value is closer to 50%, the series cannot be assumed to be stationary.

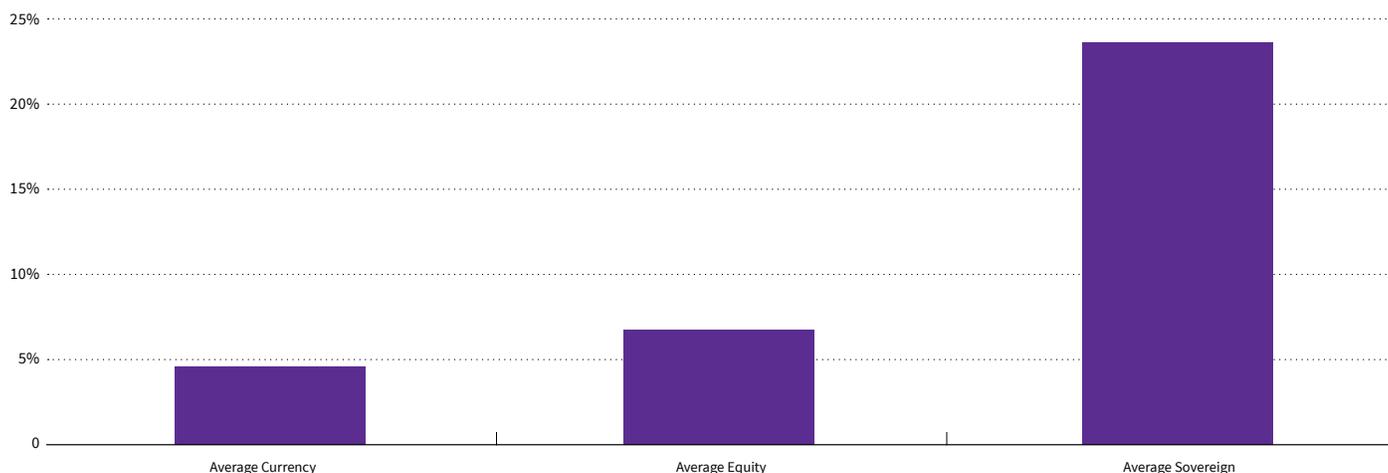
We find that the p-values are low across currencies and equities, and higher for bonds, indicating a high confidence (93% for equities, 96% for currencies) of rejection of the null hypothesis that the series are not stationary. The

p-values for bonds are somewhat higher and indicate lower confidence (76%) that non-stationarity can be rejected. This lower confidence is likely to have been influenced by the period since the global financial crisis of 2008-2009, since which central banks have intervened in bond markets to force bond yields significantly below most estimates of their fundamental value (including the estimate we use in this study) and keep them below value for many years (meaning bond prices have been forced/kept above value). This unprecedented intervention has been of long-enough standing to reduce the statistical robustness of the reversion of bond yields in a historic comparison.

Notwithstanding this, the evidence suggests that for currencies (as well as equities) we can reject the hypothesis that they do not revert to fundamental value with a very high degree of confidence, which is slightly higher in the case of currencies.

## EXHIBIT 9

### Unit Root Test: Dickey-Fuller P-Value



Source: William Blair, as of June 30, 2021.

## Emerging Versus Developed Markets and Currencies

An additional feature of our findings is that the reversion statistics for the emerging currencies and equity markets in our data set are similarly compelling as are the results for developed currencies and equity markets (emerging bond markets are not included in our data set). It is consensus wisdom (with which we agree) that the risk (volatility) inherent within emerging markets is higher than it is for developed markets, which has implications for the relative sizes of investment exposures that should be taken in emerging markets, given the magnitude of value/price discrepancy, when compared to developed markets. However, a similar efficacy of reversion to value appearing in both emerging and developed currencies and markets suggests that the former stand on equal footing to the latter with respect to inclusion in a dynamic investment management universe. Our team's investment universe comprises multiple emerging and developed markets and currencies in recognition of this.

“A similar efficacy of reversion to value appearing in both emerging and developed currencies and markets suggests that the former stand on equal footing to the latter with respect to inclusion in a dynamic investment management universe”

[Dynamic Allocation Strategies Team](#)



This paper challenges consensus wisdom that fundamental value is a less reliable concept for currencies than it is for markets. In addition, our results indicate that exchange rates tend to revert to value over slightly shorter time horizons than prices in markets, and are equally likely, with high statistical confidence, to revert.

These results argue for greater reliance on the use of value/price investment signals in dynamic currency management than may be judged to be appropriate by the consensus wisdom of global investors. It is this, coupled with the expectation of low correlation and large diversification benefits of managing currency in a global multi-asset portfolio, which is the basis for our team's long-standing decision to devote a material portion of its multi-asset portfolios' active risk to currencies.

“These results argue for greater reliance on the use of value/price investment signals in dynamic currency management than may be judged to be appropriate by the consensus wisdom of global investors.”

**Dynamic Allocation Strategies Team**

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