(Systematic) Investing in Emerging Market Debt

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Abstract

We extend the analysis of systematic investment approaches to emerging market (EM) fixed income. We focus on hard currency bonds issued by emerging sovereign and quasi-sovereign entities. We find that systematic exposures linked to carry, defensive, momentum and valuation themes are well compensated and lowly correlated in EM markets. A transaction-cost and liquidity aware long-only portfolio generates an Information Ratio above 1. We further show that excess of benchmark returns for a broad set of EM managers are (i) largely explained by passive exposures to EM corporate credit excess returns and EM local currency returns, and (ii) have non-trivial macroeconomic exposures (growth, inflation, volatility and liquidity). A systematic approach to EM debt may be a powerful diversifier.

JEL classification: G12; G14; M41
Key words: emerging market bonds, fixed income funds, systematic investing

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1. Introduction

Emerging market (EM) fixed income has seen considerable growth over the last couple of decades. EM bonds are those issued by entities (corporate and sovereign) domiciled in emerging markets and can be issued in local and 'hard' (typically USD) currency. J.P. Morgan's global EM indices, which capture the investible section of EM markets, have increased from around 350 billion USD in 2002 to nearly 2.5 trillion by the end of 2018. This paper is a specific application to a fixed income asset class with some unique features, but the framework and results will echo evidence from previous research in other fixed income markets (e.g., Houweling and van Zundert, 2017; and Israel, Palhares and Richardson, 2018 for corporate bonds).

Our purpose is to lay out a framework to understand the risk and return drivers of hard currency bonds issued by emerging sovereign and quasi-sovereign entities. These bonds have two sources of risk. First, they inherit exposure to sovereign rates from the 'hard' currency they are issued in (typically USD). Second, they contain exposure to a relatively unique source of credit risk, and hence return. The credit risk for hard currency bonds issued by a sovereign entity is the potential inability for it to service the foreign currency obligation from locally generated cash flows. Our focus is to understand cross-sectional determinants of this second 'credit risk' component of hard currency EM bond returns.

In contrast, local currency bonds from corporates have a similar risk and return profile for bonds issued by companies domiciled in developed markets which have been examined in depth previously (e.g., Houweling and van Zundert, 2017; and Israel, Palhares and Richardson, 2018). Likewise, local currency bonds from emerging sovereigns exhibit a similar rate risk and reward profile to bonds issued by developed sovereigns, again which has been examined in depth previously (e.g., Brooks, Palhares and Richardson, 2018, and Brooks and Moskowitz, 2019).

As of December 31, 2018, the J.P. Morgan EMBI Global Diversified Index contained 679 bonds from 66 sovereign and 76 quasi-sovereign issuers with an aggregate value of 873 billion USD. For this set of hard currency bonds, we describe a set of systematic 'factors' that can help explain cross-sectional variation in the credit excess returns of these bonds. The characteristics that we examine include carry, defensive, value and momentum which have been examined extensively in other asset classes (see e.g., Asness, Moskowitz and Pedersen, 2013 for value and momentum; Koijen et al, 2018 for carry; and Frazzini and Petersen, 2014 for defensive). We show that these characteristics (i) both individually, and in combination, are significantly associated with future credit excess returns of EM hard currency bonds, and (ii) translate to economically meaningful excess of benchmark returns in the context of a systematic long-only, transaction cost aware, portfolio. Kang, So and Tziortziotis (2019) also find evidence that simple measures of value and momentum can explain cross-sectional variation in EM bond (excess of cash, not credit excess) return variation, and that these simple measures can be incorporated into an optimized long-only portfolio. We extend the set of measures examined (both for value and momentum, as well as for carry and defensive investment themes) and further examine exposures of a broad set of EM managers to both traditional market risk premia and our selected systematic factors.

To assess whether systematic exposures to carry, defensive, value and momentum are potentially useful in an emerging market bond context, we construct long/short portfolios using 5-year credit default swaps (CDS). Over the 2004-2018 period, we can measure the four systematic investment themes over 25 emerging sovereign reference entities. Sharpe ratios of long/short portfolios range from 0.3 for carry to 0.6 for momentum. Given the low correlation across the four themes (carry and defensive are strongly negatively correlated, value and momentum are moderately negatively correlated), a portfolio allocating risk equally across the four themes has a Sharpe ratio of 1.1.

While this sounds exciting, these long-short portfolios may not be implementable. They are, however, a necessary condition to demonstrate the potential efficacy of a systematic investment approach in emerging market debt. We construct long-only portfolios by limiting ourselves to more liquid EM bonds (e.g., sufficiently high trading volumes and sufficiently low bid-ask spreads) within the J.P. Morgan Emerging Market Bond Index. Our long-only portfolio seeks to maximize exposure in a risk-aware, and market neutral, manner to a roughly equal allocation across measures of carry, defensive, value and momentum. We use multiple measures for each investment theme and combine views on both the country (level) and maturity (slope) dimensions. For the long-short CDS portfolio this was not possible as only the 5-year point is sufficiently liquid. Our long-only portfolio targets an annualized tracking error of around 2 percent. After accounting for transaction costs this long-only portfolio generates an excess of benchmark return of around 2.5 percent with a realized tracking error of 1.5 percent, which translates to an Information Ratio of about 1.7. This suggests that it may be possible to build a long-only EM bond portfolio seeking exposure to systematic investment themes.

We then examine the returns of a broad set of 64 long-only active EM managers with an explicit emerging markets bond index over the 2004-2018 time period. Like recent research documenting attractive excess of benchmark returns for fixed income managers (see e.g., Baz, Mattu, More and Guo, 2017; and Brooks, Gould and Richardson, 2019), we find that the average active EM manager has an excess of benchmark return of 0.8 percent and an Information ratio of 0.36. Collectively, active EM managers have generated attractive risk-adjusted returns over the last two decades.

We conduct two further sets of analyses. First, we assess whether these positive excess of benchmark returns are indeed ‘alpha’ and not an exposure to traditional risk premia. In the case of hard currency EM active managers, the most natural traditional risk premia

would be exposures to EM local currency debt and EM corporate debt. We find that these traditional risk premia explain more than half of the aggregate, and individual, active EM manager returns. This has important implications for asset owners in understanding the nature of positive excess of benchmark returns, particularly for broader asset allocation decisions and fee discussions. Notably, given the commonality in traditional risk premia exposures across active EM managers there is a heightened pairwise correlation of excess of benchmark returns across managers. We show that our long-only portfolio targeting market neutral exposure to carry, defensive, value and momentum has not only minimal exposure to traditional risk premia (i.e., it is market neutral), it also has very low correlation to the set of active EM bond managers. An allocation to a systematic EM manager alongside a traditional discretionary active EM manager therefore has the potential to be a powerful diversifier. As we, and others, have argued elsewhere, neither systematic nor discretionary approaches are, or even need to be, inherently superior (see e.g., Palhares and Richardson, 2019; and Baz, Devarajan, Hajo and Mattu, 2018). If both are well executed and charge fair fees, they may complement each other very well in an overall active EM mandate.

Second, we examine the consequences of traditional risk premia explaining excess of benchmark returns. If excess of benchmark returns are primarily attributable to traditional sources of risk (especially credit risk), this can introduce macroeconomic sensitivities into the active returns. We show that active EM bond managers both individually, and in aggregate, have non-trivial exposures to macroeconomic variables. Specifically, we show that excess of benchmark returns for active EM bond managers are positively related to (i) changes in growth expectations, (ii) changes in inflation expectations, (iii) changes in real yields; and negatively related to changes in volatility. This is, perhaps, not too surprising as traditional market risk premia are exposed to these macroeconomic variables. In contrast, our long-only portfolio targeting market neutral exposure to carry, defensive, value and momentum has

only minimal exposure to macroeconomic variables. This emphasizes a general benefit of a systematic investing approach as it allows you to control ex ante for exposures to traditional risk premia and macroeconomic variables.

The remainder of this paper proceeds as follows. Section 2 explains our data sources, measures of systematic investment themes for EM bonds, and our sample-selection criteria for EM bond funds. Section 3 describes our empirical analyses, and Section 4 concludes.

2. Data and Methodology

2.1 Emerging Market Bonds

The purpose of this section is to describe the investment universe for 'emerging market debt'. We use data from the relevant J.P. Morgan indices. These indices are designed to capture the investible universe of EM bonds globally. Figure 1 and Table 1 show the growth in EM bonds over the 2004-2018 time period. We examine three EM bond indices from J.P. Morgan that cover both 'local' and 'hard currency' bonds issued by both sovereign and corporate issuers. The J.P. Morgan Emerging Markets Bond Global Index (EMBI Global) tracks returns for traded external debt (hard currency) instruments issued by emerging sovereign (and related) entities. The J.P. Morgan Government Bond Index – Emerging Markets (GBI-EM) tracks returns for local currency bonds issued by emerging sovereign entities. The J.P. Morgan Corporate Emerging Markets Index (CEMBI) tracks the returns of USD denominated bonds used by emerging market corporate entities. For all J.P. Morgan indices we use their 'Global' versions which are intended to be an investable benchmark that only includes countries that are accessible to a foreign investor.

The most noticeable pattern from Figure 1 and Table 1 is the huge increase in issuance from entities domiciled in emerging markets. Index sizes are reported in billions of USD. Across the 3 indices, there is a 430 percent increase in the market value of EM bonds

over the last two decades, with corporate issuance experiencing the largest percentage growth (over 1400 percent growth). At the start of our time period the secondary market value of investible EM bonds was 577 billion dollars and at the end of our time period this market has grown to nearly 2.5 trillion dollars.

As discussed in the introduction, our focus is on the EMBI Global index. This index contains USD bonds issued by EM sovereign and quasi-sovereign issuers. These bonds contain two distinct sources of risk and return. First, there is a 'risk-free' component of returns. This is exposure to U.S. risk free rates (which itself includes exposure to term premium). Second, there is a 'risky' component attributable to the credit risk implicit on servicing foreign currency commitments. The first 'rates' component can be approximated by multiplying the key rate duration exposure of each EM bond by the respective (negative) change in U.S. yields. The second 'credit' component is then the difference between the total return for the EM bond and its 'rate' return. This additive decomposition of returns reveals over the 2004-2018 time period, the rate and credit component of EM bond returns are approximately equal in importance. However, a variance decomposition of returns reveals that the rate (credit) component accounts for 18 (82) percent of the total return variation. Defining the rates component of EM index returns as r_r, the credit component of EM index returns as r_c, and the return on the EM index as r_p (noting that $r_p = r_r + r_c$), the return variation attributable to the rates (credit) component can be computed as $\frac{\sigma_r^2 + \rho_{r,c}\sigma_r\sigma_c}{\sigma_p^2}$ ($\frac{\sigma_c^2 + \rho_{r,c}\sigma_r\sigma_c}{\sigma_p^2}$). The credit component is the most important driver of hard currency EM bond returns and that is the focus for the rest of the paper.

Table 2 provides greater details on our sample of EM hard currency bonds. In 2004 the EMBI Global index contained 187 EM bonds with a market value of 271 billion reflecting 28 (9) sovereign (quasi-sovereign) issuers. At the end of our sample the EMBI

Global index covers a much greater set of EM bonds: 679 bonds across 66 (76) sovereign (quasi-sovereign) issuers. Across our time period there is a growing trend of increased issuance by (i) quasi-sovereign issuers, (ii) IG rated issues, and (iii) issuers domiciled in Asia relative to Latin America (the traditional EM hard currency issuer). Like other growth sensitive assets there is the expected counter-cyclical relation between credit spreads and overall market conditions: spreads widen in periods of economic stress, most noticeably around the crisis period of 2008.

2.2 Emerging Market CDS

For our initial empirical analysis on the efficacy of EM systematic investing we focus on liquid 5-year credit default swaps (CDS). We begin our analysis with EM CDS instruments, rather than EM bonds, as CDS are standardized, liquid contracts that allow for relatively easier cross-country comparisons and long/short implementation. These CDS contracts provide insurance against the likelihood of non-payment of USD hard currency reference bond obligations by emerging sovereign reference entities. We use 5-year 'on the run' CDS contracts linked to (i) reference entities that are 'emerging sovereign', (ii) have reference obligations denominated in USD, and (iii) are sufficiently liquid as captured by membership in the J.P. Morgan Global EMBI+ index (this index requires each bond to be at least 500 million and meet additional stringent secondary market liquidity requirements).

Table 3 summarizes our sample of EM CDS contracts. There is a relatively stable universe of EM reference entities over our time period with a reasonable stable split between IG and HY rated entities, although there is an increase in HY rated entities toward the end of our sample. The geographic breakdown across Latin America, Asia and EMEA is also relatively stable over our sample period. Finally, as we saw with the cash bond index data in

section 2.1, there is the expected temporal variation in credit spreads, with spreads widening in periods of economic stress (e.g., 2008).

2.3 Measuring systematic investment themes for emerging market debt

For our systematic investment themes, we rely on an extensive academic and practitioner literature that has documented pervasive evidence of robust associations between measures of carry, defensive, momentum and value and future excess returns across multiple asset classes. Koijen, et al (2018) show pervasive evidence for 'carry' across asset classes and long time periods. Frazzini and Pedersen (2014) provide pervasive evidence for the defensive theme across multiple asset classes and time periods. Asness, Moskowitz, and Pedersen (2013) show strong evidence of the combined efficacy of value and momentum across multiple asset classes and time periods. Our aim is to introduce intuitive measures of these four themes anchored to the credit risk embedded in EM bonds. As such we introduce measures that are deliberately simple. While this approach has the benefit of transparency and replicability, it comes with a potential cost that it may not reflect the depth of analysis (measures and portfolio construction choices) used in actual portfolios. This may limit the potential efficacy of the systematic investment approach that we describe below.

Carry is the tendency for higher-yielding assets to outperform lower-yielding assets. Carry is the expected return if nothing changes with the passage of time (i.e., the discount and hazard rate curves remain unchanged). Of course, as time passes there will be changes in expectations of credit risk, with coincident changes in discount rates and hence returns. Carry is a source of risk, but one that has generated a positive risk adjusted return across many asset classes and time periods (e.g., Koijen et al, 2018). We measure carry as the spread of the 5-year CDS contract at the start of each month, where we prefer to sell protection on

CDS contracts with higher spread levels. This is a simple implementation of carry as it ignores roll-down and higher-order measures of curve shape.

Defensive is the tendency of safer, lower-risk assets to deliver higher risk-adjusted returns relative to their low-quality, higher-risk counterparts. Unlike carry, defensive is a multi-faceted construct and as such we use multiple measures capturing different dimensions of this theme. While data may be more challenging for sovereign entities than it is for corporate entities, we wish to measure similar aspects as we would for corporates (e.g., high, and more stable, levels of profitability; lower levels of leverage). For our EM issuers we measure the defensive theme with two distinct measures. First, we use a measure of sovereign quality as indicated by its ability to achieve low, and stable, levels of inflation. We think of this as a reduced form measure reflecting the quality of macroeconomic policy of the sovereign entity. A lower level of forecasted inflation is an indicator of higher quality macroeconomic risk management by the sovereign. We use a constant 12-month ahead forecast of inflation from Consensus Economics. We prefer to sell protection on CDS contracts where there is a lower level of expected inflation. Second, we use a measure designed to capture the overall indebtedness of the sovereign entity (i.e., Asset/Debt ratio). We compute an 'Asset' value for the sovereign which combines foreign reserves (obtained from Thomson Reuters International Comparable Economics, TRICE) and the level of GDP grossed up by expectations of GDP growth for the next 12 months (GDP growth expectations are obtained from Consensus Economics). Estimating 'Debt' precisely for sovereign entities is a challenging task as there are oftentimes many implicit government guarantees linked to government sponsored entities. We take a simple approach and compute a 'Debt' value as the sum of government external debt and 50 percent of non-government external debt (reflecting the contingent nature of external private sector debt, which may be assumed by the sovereign in the event of default). External debt data is obtained from TRICE. We then take

the log of Asset/Debt as our measure of sovereign indebtedness. The defensive theme is then an equal weighted combination of forecasted inflation and indebtedness.

Momentum is the tendency for an asset's recent performance to continue, leading to outperformance of recent winners relative to recent losers. Recent performance can be measured using return data from the asset itself as well as return data from other related assets. We measure momentum as an equal weighted combination of three return-based metrics: (i) 6-month trailing EM CDS returns, (ii) 6-month trailing FX returns, and (iii) 6-month trailing country equity returns. Kang, So and Tziortztiotis (2019) use a risk-adjusted measure of FX momentum, noting that it has superior performance relative to other choices. We have chosen to stick with simpler measures of momentum (trailing 6-month returns) across the direct asset (EM CDS) and closely related assets to help mitigate data over-fitting problems. We prefer to sell protection on CDS contracts with positive CDS returns, positive local currency returns relative to USD, and positive country equity returns.

Value is the tendency for relatively cheap assets to outperform relatively expensive assets on a risk-adjusted basis. For value we need a credible fundamental anchor to compare against quoted market spreads. A cheap EM bond (or CDS contract) is one where the credit spread is wide relative to fundamental credit risk. Contingent claims models (e.g., Merton, 1974) suggest distance to default as the theoretical anchor for credit spreads. While prior research examining value measures for corporates has generated relatively sophisticated distance to default measures using a variety of market and fundamental sources (e.g., Correia, Richardson and Tuna, 2012; Correia, Kang and Richardson, 2018), it is difficult to compute a clean measure of distance to default for EM sovereigns. Instead, we use a reduced form specification linked to third party estimates of credit risk (credit ratings) and market-based estimates of credit risk (volatility of country equity returns). These two measures help capture the essential ingredients of distance to default (leverage and volatility). To construct our

value measure we regress credit spreads onto credit ratings (an ordinal rank of sovereign issuer ratings) and equity volatility. This regression is estimated on an expanding window basis including time fixed effects. We require at least three months of data to estimate this expanding panel regression (and hence use data in 2003 to help seed the estimation). The country-specific residual from the expanding window regression is our value measure.

While we have tailored the respective measures of carry, defensive, momentum and value to be relevant to the economic risks embedded in EM bonds, our belief in the efficacy of these investment themes is the same as we have for other asset classes. A combination of risk-based, cognitive error and market frictions gives rise to the positive risk-adjusted returns associated with each of these investment themes (see e.g., Asness, et al, 2015). The fact that these factors work in government bond, corporate bond, FX and now emerging bond markets is both a potential boon to fixed income investors and a wonderful "out-of-sample" test of the original equity-centric results, enhancing our belief that the efficacy of these factors is the result of real forces and not random data mining.

2.4 Emerging Market Bond Funds

For our analysis of the return drivers of incumbent active EM bond funds, we identify strategies in the eVestment database that fall within the EM universe. This sample includes live and graveyard strategies. The initial sample contains 133 distinct EM benchmarked strategies. We filter this sample by retaining funds that have (i) a stated benchmark that is either J.P. Morgan Global Diversified, J.P. Morgan EMBI Global or J.P. Morgan EMBI+ (deletes 18 strategies), (ii) at least 60 months of returns data (deletes 37 strategies), and (iii) USD share classes (deletes 8 strategies). We further remove four strategies that appear to be duplicates and two strategies where the tracking error exceeds the volatility of the stated benchmark (these are likely mis-specified EM benchmarked strategies). After applying these

filters 64 EM benchmarked strategies remain. The included funds represent 75 percent of the total assets managed by EM bond funds within the eVestment database. The 69 excluded funds tend to be smaller in size (the average AUM of excluded funds is $1,257 million compared to $3,987 million for the 64 included funds). Total return and excess-of-benchmark data are provided by eVestment and are gross of fees. The average EM bond fund in our sample exists for 143 months.

3. Results

3.1 Long/short CDS portfolios

Our first set of analyses examines the potential efficacy of applying systematic investment themes to EM 5-year CDS contracts. The CDS contract is exposed to the credit risk of the emerging sovereign so CDS returns map neatly to our framework. Using our sample of approximately 25 emerging sovereign CDS contracts, we build a long/short portfolio each month. Our long (short) positions are achieved by selling (buying) protection on the relevant 5-year EM sovereign contract. At the start of each month we rank the universe on our four investment themes, either individually or in aggregate, as described in section 2.3. We form beta-neutral views for each investment theme (and composite). A beta-neutral view implies that the notional exposures on the long and short side of the portfolio are equal in beta (not dollar) amounts. To estimate beta, we use an asset-by-asset variance-covariance matrix, modelling correlation and volatility separately. Portfolios are scaled to 10 percent volatility, are rebalanced monthly but do not account for transaction costs. The purpose of this analysis is to show the potential for our systematic approach (i.e., these characteristics are associated with future credit excess returns). We will address implementability issues in section 3.2.

Table 4 summarizes the main results for the long/short portfolios. Panel A of Table 4 reports the correlations of the returns accruing to each of the four investment themes. These correlations are quite intuitive. Carry and defensive are strongly negatively correlated (wider spreads represent riskier, lower quality, issuers), and value and momentum are moderately negatively correlated. Perhaps less intuitively, but consistent with other asset classes, value and carry are essentially uncorrelated. While value measures anchor the spread level to fundamentals, and the spread level itself is our measure of carry, the two are lowly correlated. Similar to prior research from other asset classes, the investment themes are lowly correlated to each other, creating the potential for a combination across the four investment themes to be highly diversifying.

Panel B of Table 4 reports a variety of return statistics for each long/short portfolio. All portfolios realize a volatility close to 10 percent as they are targeting 10 percent ex ante (momentum slightly under-realizes volatility in this time period). Sharpe ratios for the four individual themes range from 0.34 for carry and defensive to 0.63 for momentum and, given the low correlation across investment themes discussed above, the composite portfolio that targets an equal allocation across the four themes realizes a Sharpe ratio of 1.04. Panel B of Table 4 also reports α and β from a full-sample regression for a given long-short portfolio's return onto the EMBI index return. Across the four individual investment themes we see muted exposures to the market (carry is positively correlated to the market and defensive and momentum are mildly negatively correlated) and the composite has a mild negative correlation to the EM market. Most importantly the regression intercept (α) continues to be strongly positive for the composite long/short portfolio (unreported t-statistic of 4.47).

Figure 2 plots the cumulative returns across the four investment themes as well as the composite long/short portfolio. There are a few observations to note. First, the carry portfolio retains some sensitivity to periods of market volatility (sharply lower returns around

the financial crisis period and over the latter period of our sample). Given the negative correlation between carry and defensive it is not surprising to see the defensive portfolio generating positive returns in those same periods. Second, the diversification potential of a risk-balanced exposure to multiple systematic investment themes is evident in the relatively smooth cumulative return profile of the composite portfolio. We will revisit this point on minimal macroeconomic sensitivities formally in section 3.3.

3.2 Long only bond portfolios

While the analysis in section 3.1 supports the case for systematic investing within EM, it is subject to various criticisms related to implementation. Could exposures to systematic investment themes generate positive excess of benchmark returns when faced with real world constraints? Many investors do not allow the use of leverage and/or are hesitant to use credit derivative instruments. We now turn to examine the potential for our four systematic investment themes to identify attractive USD bonds issued by EM sovereigns in the context of a long-only, risk-aware and liquidity-aware portfolio.

To build a long-only portfolio we first start with the constituents of the EMBI Global index described in section 2.1. At the start of each month we first apply a variety of filters to retain only a subset of bonds that we deem to be sufficiently liquid. Our liquidity filters span multiple measures including expected trading volumes and quoted bid-ask spreads. Bonds passing these filters are typically larger in size, have tighter bid-ask spreads, have less concentrated holdings, have more, and higher quality, pricing sources and have higher expected volumes as reported by Bloomberg. The typical universe of USD bonds that remain after these liquidity filters is about (70) 30 percent of the issuers (issues) contained in the EMBI Global Index. The typical liquid bond is about 15 percent larger and has a bid-ask spread about 20 percent tighter than the typical bond in the index.

In contrast to our CDS long/short portfolios we have an additional dimension to take active risk when trading EM bonds. The only consistently liquid CDS contract is the 5-year contract which meant we could only compare emerging countries relative to each other, and we did not have the ability to express views along the maturity dimension. With our long-only EM bond portfolio, we have enough liquidity to include multiple bonds for each emerging sovereign entity, allowing us to incorporate both country level and maturity views. Prior research has shown that security selection can span both the level and slope of fixed income securities to better extract available investment opportunities (see e.g., Brooks and Moskowitz, 2019). To do this, we start with a combined score for each liquid bond and we then aggregate (roll-up) these scores to form an aggregate asset. We have two types of aggregate assets, one for country and one for maturity. For country level views we roll-up across multiple issues proportional to the inverse of spread duration. For example, if an issuer has 3 bonds with spread duration of 2, 5 and 7 the weights for the country asset would be 59, 24 and 17 percent respectively. If there are liquid bonds linked to either sovereign or quasi-sovereign entities within the same country, we keep both types of bonds. For emerging countries that have at least two liquid bonds we are also able to form maturity views, for which we can define a country specific 'steepener' that is spread duration neutral for each country. We then assign an overall score that is a weighted combination of country level (70 percent) and maturity (30 percent) views. These weights are selected as, similar to other fixed income assets, the first principal component of return variation (level shifts in credit spreads) explains the majority of credit excess returns, and in an unlevered long-only portfolio it is difficult to fully capture slope and curvature dislocations. Similar to the long/short CDS portfolios described in section 3.1, we convert these scores to a market-neutral view, and, target around 2 percent tracking error relative to the EMBI Global index. As a final step the hypothetical portfolio also subtracts an estimate of transaction costs.

Table 5 summarises the performance of this hypothetical long-only portfolio relative to the EMBI Global Index (benchmark). Figure 3 reports the cumulative returns for the hypothetical long-only portfolio and the benchmark separately. The systematic long-only portfolio generates an annualized return of 8.4% relative to 5.8% for the benchmark with a very similar level of volatility. The Information Ratio is around 1.7 (again noting this is after an estimate of transaction costs). The IR of our long-only portfolio is higher than the IR of our long/short portfolio. At first glance this seems unusual, but the difference is primarily attributable to (i) a larger cross section (we have over 40 emerging issuers in our long-only universe and about 25 emerging entities in our long/short universe, as discussed in Tables 2 and 3), and (ii) our ability to express views along the country and maturity dimension in our long-only portfolio and only the country dimension for our long/short portfolio.

It is also interesting to note that the excess of benchmark ('Active') return has more muted tails, especially relative to the left-tail embedded in the benchmark itself. This is a deliberate feature of the beta-neutral implementation incorporated into the portfolio. A full sample regression of the long-only portfolio excess of U.S. 3-month T-Bill returns onto the EMBI index excess of U.S. 3-month T-Bill returns reveals an intercept of 0.0023 with a slope coefficient of -0.03. This is equivalent to an annualized 'alpha' of 2.75 percent, slightly higher than the active returns reported in Table 5 as the EM markets generated a positive return over our sample period and the long-only portfolio was marginally short that traditional market risk premium. As we will see in the next section, careful attention to portfolio construction can remove, or mitigate, exposures of portfolio excess of benchmark returns to either traditional market risk premia or to other macroeconomic state variables.

3.3 Active EM bond managers

Our final analysis is to examine the excess of benchmark returns for a broad set of EM bond funds. The sample selection criteria are described in detail in section 2.3. We conduct two sets of analyses for the 64 EM bond funds that meet our selection criteria. First, we document whether EM bond funds, both individually and in aggregate, 'beat' the benchmark. Recent research has shown that various classes of active managers within fixed income tend to beat their benchmarks (e.g., Brooks, Gould and Richardson, 2019; and Baz, Mattu, Moore and Guo, 2017). Is this pattern also evident for EM bond funds? Second, we document the determinants of excess of benchmark returns, with a specific focus on whether EM bond funds have "alpha," defined as the ability to generate positive active returns after adjusting for passive exposures to traditional risk premia. Recent research has documented a pervasive behaviour of active FI managers to seek returns outside of their stated benchmarks through exposure to higher yielding and riskier credit sensitive assets (see e.g., e.g., Brooks, Gould and Richardson, 2019; and Baz, Mattu, Moore and Guo, 2017). Third, we document the macroeconomic sensitivity of EM bond funds. If their excess of benchmark returns contains non-trivial exposure to traditional market risk premia, it is likely that the excess of benchmark return will also inherit potentially undesirable macroeconomic sensitivities. As a point of contrast, we also assess the 'alpha' and macroeconomic sensitivity of the hypothetical systematic long-only portfolio described in section 3.2.

Panel A of Figure 4 reports the distribution of annualized excess of benchmark returns for our 64 EM bond funds. The super-imposed line shows a normal distribution with mean zero and standard deviation equal to that of the sample's annualized excess of benchmark returns. The probability mass of this distribution is clearly to the right of zero. The average EM bond fund has (i) an annualized excess of benchmark return of 80 basis points, (ii) a tracking error of 2.6 percent, and (iii) an Information Ratio of 0.36. The inter-quartile range

of IR is between 0.19 to 0.58, and a test-statistic of 5.28 strongly rejects the null hypothesis that excess of benchmark returns for EM bond funds is equal to zero. Similar to previous research examining active fixed income managers, we find that the majority of active EM bond funds beat their respective benchmarks.

To assess whether the positive excess of benchmark return is indeed 'alpha' we regress excess of benchmark returns onto a contemporaneous measure of traditional market risk premia relevant for EM bonds. We do this individually for each fund using the entire return time series for that fund. The explanatory variables are (i) the credit excess returns for the Bloomberg-Barclays Emerging Markets Corporate index (EM-CORP), and (ii) the excess of US cash returns for the J.P. Morgan Government Bond Index – Emerging Markets, GBI-EM, (EM-LOCAL). We use the Bloomberg-Barclays index for EM corporates because we require duration-adjusted credit returns which we do not have access to from J.P. Morgan. The annualized intercept from this regression is 'alpha', which we report in panel B of Figure 4.

Our reported regression results are estimated using non-overlapping three-month windows. This choice is deliberate to help mitigate concerns of potential staleness in reported fund returns that may dampen any measured correlations or volatilities. In unreported analysis we have repeated our regression analyses using two alternative approaches. First, we use monthly return observations and include two lags of our independent variables. This approach has the benefit of allowing differential loadings across contemporaneous and lagged returns. Second, we use overlapping three-monthly returns and explicitly account for potential dependence introduced by that repeated sampling choice. Our inferences are unaffected by these alternative regression choices and we choose to report the simplest method.

For the sake of brevity, we describe some high-level details of the regression results across the set of 64 EM bond funds. The average (inter-quartile range) adjusted R^2 is 39 (24 to 58) percent, suggesting that a significant fraction of excess of benchmark returns can be explained by passive exposure to traditional market risk premia. The average loading on EM-CORP (EM-LOCAL) across the 64 funds is 0.13 (0.04) and 53 (48) out of 64 EM bonds funds have positive exposure to EM-CORP (EM-LOCAL) respectively. Panel B of Figure 4 reports the annualized alphas for our 64 EM bond funds. The super-imposed line shows a normal distribution with mean 0 and standard deviation equal to that of the sample's annualized 'alpha'. A standard t-statistic for the null hypothesis that the 'alpha' is equal to zero is 0.62 (0.28) for an equal weighted composite across the 64 EM bond funds (for the average individual EM bond fund). The distribution has clearly shifted to the left and the average EM bond fund has (i) an annualized 'alpha' of 20 basis points, (ii) a standard deviation of 1.5 percent, and (iii) an Information Ratio of 0.18. The inter-quartile range of IR across the 64 funds is -0.21 to 0.62. The 'alphas' are about 75 percent lower than the excess of benchmark returns and are not significantly different from zero (reported t-statistic of 1.26). The clear takeaway from Figure 4 is that most of the active returns can be explained by passive exposure to traditional market risk premia.

The commonality in the positive association between excess of benchmark returns and traditional market risk premia is perhaps more clearly shown in Figure 5. Panel B of Figure 5 reports the distribution of full sample contemporaneous correlation between excess of benchmark returns and EM traditional market risk premia across the set of 64 active EM managers. EM traditional risk premia is calculated as a 50/50 blend of (i) the credit excess returns of the Bloomberg-Barclays Emerging Markets Corporate index (EM-CORP), and (ii) the excess of cash returns of the J.P. Morgan Government Bond Index – Emerging Markets, GBI-EM, (EM-LOCAL). Returns are measured over quarterly non-overlapping windows.

The average correlation in panel B of Figure 5 is 0.36, consistent with the analysis shown in Figure 4, there is a strong association between excess of benchmark returns and traditional market risk premia. A consequence of this hidden beta across EM bond funds is shown in panel A of Figure 5, which reports the distribution of correlations between each EM bond fund excess of benchmark return and the contemporaneous equal weighted average excess of benchmark returns across the set of 64 EM bond funds. The average correlation is 0.52 which suggests that the commonality in hidden beta reduces the potential diversification benefit of allocating across multiple EM bond funds.

As a point of contrast, we highlight (in red) the relevant bin where the hypothetical systematic long-only portfolio would reside. The potential diversification benefits from a systematic approach become readily apparent. First, the excess of benchmark return is not positively correlated with EM traditional risk premia (the correlation is -0.18). Second, the systematic long-only portfolio is very lowly correlated with other EM bond funds (correlation is -0.06). Like what previous research has suggested in the context of active credit managers (e.g., Palhares and Richardson, 2019), a well implemented systematic approach may provide powerful diversification benefits to an overall EM allocation.

An alternative way to assess the potential diversification benefit from a systematic investment approach is to assess whether the excess of benchmark returns exhibit any macroeconomic sensitivity. Our priors are that any macroeconomic sensitivity should be small as the excess of benchmark return is designed to be market neutral. We use five measures to capture the macroeconomic environment. Each is measured in changes to capture shocks to the underlying macroeconomic variable. ΔGROWTH is the quarterly revision in one-year ahead real U.S gross domestic product growth forecast as captured by Consensus Economics. ΔINFLATION is the quarterly revision in one-year ahead U.S. Consumer Price Inflation forecasts as captured by Consensus Economics. ΔREAL_YIELD is the quarterly

change in the real 10-year bond yield measured as the difference between the yield on the 10-year benchmark bond from Bloomberg and the 10-year inflation expectation from Consensus Economics (measured at the start of the quarter). ΔVOLATILITY is the average of quarterly percentage changes in bond (MOVE) and equity (VIX) volatility indices. ΔILLIQUIDITY is the quarterly change in the TED spread (the spread between 3-month T-Bill rates and the London Interbank Offered Rate).

Figure 6 reports the simplest exercise to assess macroeconomic sensitivity. Using non-overlapping three monthly periods form 2004-2018 we group the 60 quarterly periods into 'up' vs. 'down' across the five measures. We then report the Sharpe ratios for the respective EM strategy across those two sub-periods. Panel A (B) of Figure 6 reports results for the hypothetical systematic long-only portfolio (an equal weighted composite across the 64 individual EM bond funds). Risk-adjusted returns are essentially flat for the systematic portfolio across macroeconomic environments (unreported t-statistics fail to reject the null hypothesis of return equality across 'up' and 'down' periods). In contrast, panel B shows clear evidence of macroeconomic sensitivity for the set of 64 EM bonds funds, especially for changes in real yield and changes in volatility (unreported t-statistics reveal returns are different across 'up' and 'down' periods for these two partitions). Discretionary EM bond funds tend to outperform in periods of rising real yields (at least during the 2004-2018 time period) and underperform during periods of heightened volatility.

An alternative way to assess macroeconomic sensitivity is via regressions. Using the full sample of non-overlapping three month returns we regress excess of benchmark returns onto contemporaneous continuous measures of our five macroeconomic variables. Table 6 reports regression results averaged across the set of 64 EM bond funds as well as for the systematic long-only portfolio. We do not report the intercept as it is not interpretable as 'alpha' because the included explanatory variables are not tradable portfolios. Our focus is

the magnitude and significance of the regression coefficients which directly quantify macroeconomic exposures.

Across the set of 64 EM bond funds there is a consistently positive exposure to (i) changes in inflation expectations, and (ii) changes in real yield; and a consistently negative exposure to changes in volatility. The positive sensitivity to changes in growth expectations and changes in illiquidity is only evident in the simple (multiple) regression specification respectively. The final column in Table 6 reports the multiple regression specification for the systematic long-only portfolio, and consistent with the prior results on the diversifying nature of that portfolio's excess of benchmark returns, there is minimal macroeconomic exposure (there is only a negative sensitivity to changes in illiquidity).

4. Conclusion

We undertake a comprehensive analysis of the determinants of hard currency bonds issued by EM sovereign entities. We find strong evidence that well-known systematic investment themes such as carry, defensive, momentum and value are associated with future credit excess returns of hard currency EM bonds. A long/short portfolio designed to capture exposure to these systematic themes generated a Share Ratio of 1.1 and a liquidity aware long-only portfolio generated an Information Ratio of 1.7 after accounting for transaction costs.

An analysis of a broad set of EM bond funds reveals that while most have positive excess of benchmark returns, the vast majority of that can be explained by passive exposure to traditional market risk premia (EM corporate bond credit excess returns and EM local bond total returns). We further find significant macroeconomic exposures across the set of 64 EM bond funds. In contrast, our systematic long-only portfolio has no exposure to traditional market risk premia and only minimal macroeconomic sensitivity. This suggests there is

potentially a large diversification benefit for a well-crafted systematic long-only portfolio of EM bonds.

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Figure 1: The Emerging Market Debt Universe

The figure below shows the growth in the size of the emerging market fixed income universe broken down into three distinct categories from 2004 through to 2018. The J.P. Morgan Emerging Markets Bond Global Index (EMBI Global) tracks returns for traded external debt (hard currency) instruments issued by emerging sovereign (and related) entities. The J.P. Morgan Government Bond Index – Emerging Markets (GBI-EM) tracks returns for local currency bonds issued by emerging sovereign entities. The J.P. Morgan Corporate Emerging Markets Index (CEMBI) tracks the returns of USD denominated bonds used by emerging market corporate entities. For all J.P. Morgan indices we use their 'Global' versions which are intended to be an investable benchmark that only includes countries that are accessible to a foreign investor. Index sizes are reported in billions of USD.

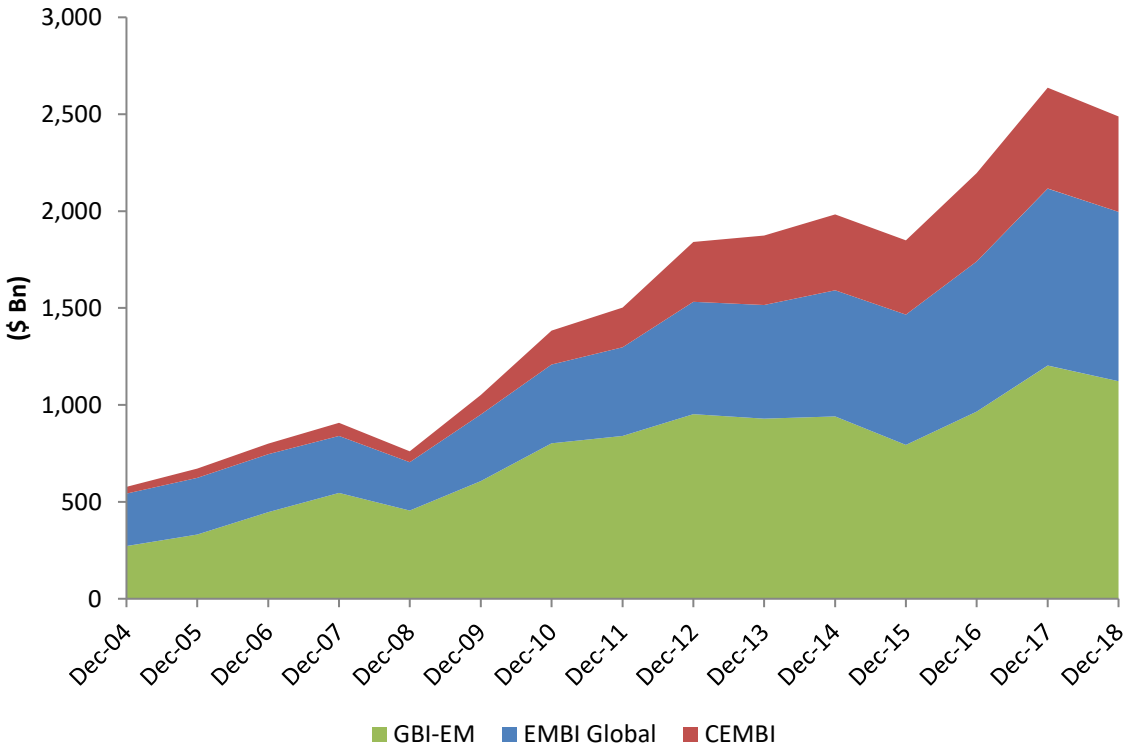


Figure 2: Performance of long-short systematic investment portfolios in CDS universe

The figure below shows cumulative returns for long-short EM CDS portfolios that target constant volatility (10 percent) across four systematic investment themes: carry, defensive, momentum and value. Carry is measured as the spread of the respective CDS contract at the start of the month (preferring EM debt with higher spread levels). Defensive is measured as an equal weighted combination of forecasted inflation (preferring EM debt with lower expected levels of inflation) and Asset/Debt ratio (preferring EM debt with higher assets relative to external debt). 'Assets' are the sum of foreign reserves and GDP, and 'Debt' is government related external debt (data obtained from Thomson Reuters International Comparable Economics). Momentum is measured as an equal weighted combination of 6-month trailing EM CDS returns, 6-month trailing FX returns, and 6-month trailing country equity returns (preferring EM debt with positive CDS returns, positive local currency returns relative to USD, and positive country equity returns). Value is measured as the residual from a regression of credit spreads onto credit ratings (an ordinal rank of sovereign issuer ratings) and equity volatility. This regression is estimated on an expanding window basis including time fixed effects. We build portfolios individually for each theme and a composite portfolio that allocates equal risk across each theme. Portfolios are rebalanced monthly over the 2004-2018 time period. We form beta-neutral views for each theme (and composite) and use an asset-by-asset variance-covariance matrix to scale positions to target 10 percent ex ante volatility.

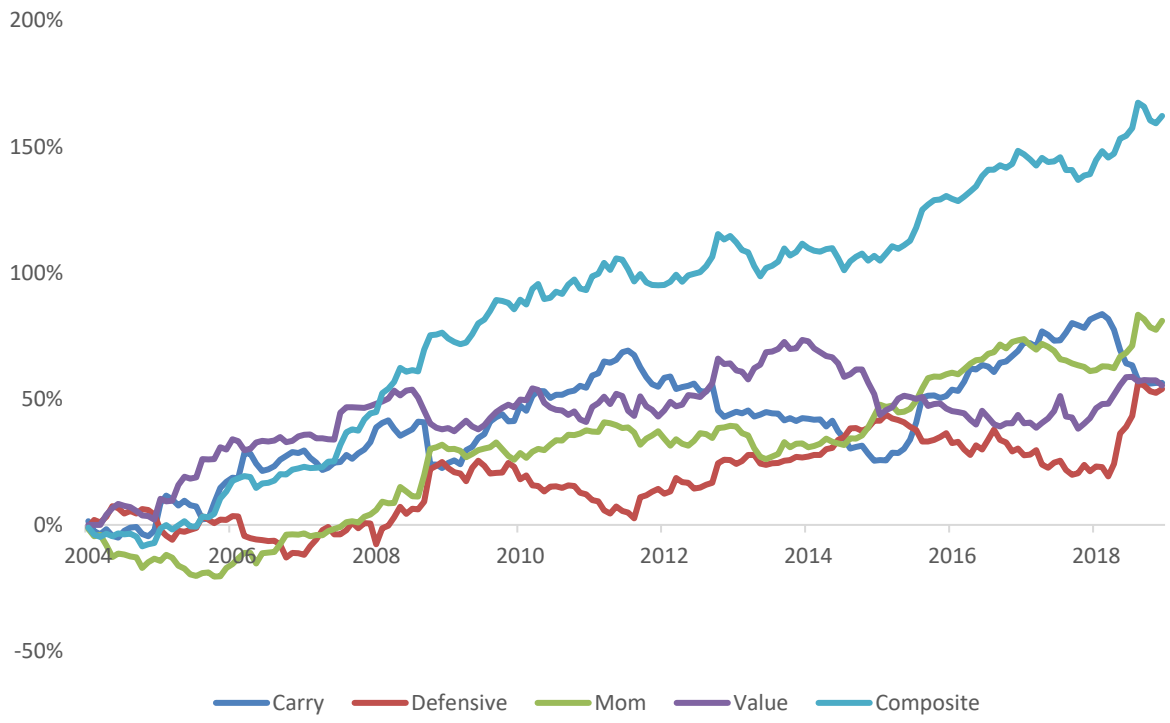


Figure 3: Performance of long-only systematic investment portfolios in EM bond universe

This figure shows the cumulative performance of a long-only hypothetical portfolio that explicitly targets exposure to a weighted combination of the four systematic investment themes (carry, defensive, momentum and value). Measures for the investment themes are described in earlier tables. Each month we identify a liquid subset of constituents of the J. P. Morgan Emerging Markets Bond Global Index (EMBI Global). Liquidity filters span multiple measures including trading volumes and quoted bid-ask spreads. We incorporate both country level and maturity views in the portfolio. Country level views are expressed by first selecting weights across all liquid bonds for a given emerging entity (weights are selected to ensure spread duration is equal across different sections of the curve) and we then rank each country based on a combined across investment themes. Maturity views are expressed by first defining a country specific 'steepener' that is spread duration neutral within each country. Individual bonds are the assigned scores based on a combination of country level and maturity views. These scores are then used to form beta-neutral views, and, as a final step, an asset-by-asset variance-covariance matrix scales positions to target around 2 percent tracking error to the EMBI Global index. The hypothetical portfolio also subtracts an estimate of transaction costs.

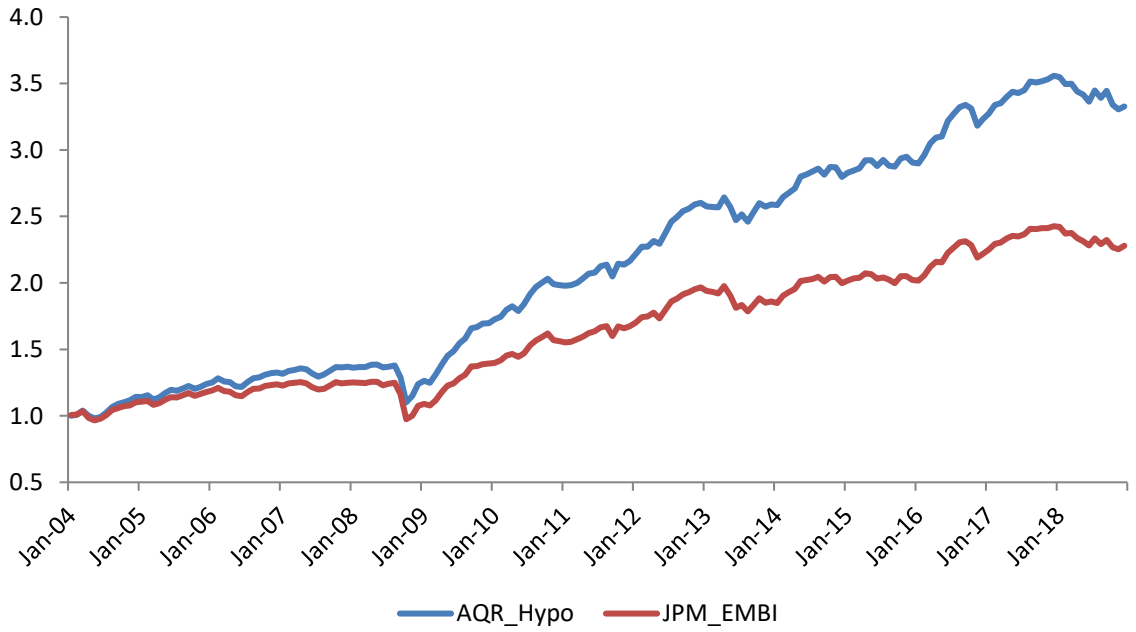


Figure 4: Distribution of Excess of Benchmark (Active) Returns and 'Alpha' across active EM bond funds

The panels below report the distribution of active EM bond fund excess of benchmark (alpha) returns in panel A (B). Returns are reported gross of fees. We start with 133 active EM bond funds that are covered in the eVestment dataset (covering both live and dead funds). We limit ourselves to funds that (i) clearly mention on the of the relevant J. P. Morgan EMBI indices as their benchmark EMBI (Global Diversified, EMBI Global or EMBI Global+), (ii) have at least 5 years of monthly return observations, and (iii) have USD share classes. This leaves us with a set of 64 active EM bond funds that represent 75 percent of the total assets managed within the EM universe covered by eVestment. Alphas are estimated by regressions to remove passive exposures to traditional market risk premia. We do this individually for each fund using a full sample regression of quarterly non-over-lapping excess of benchmark returns onto (i) the credit excess returns of the Bloomberg-Barclays Emerging Markets Corporate index (EM CORP), and (ii) the excess of cash returns of the J.P. Morgan Government Bond Index – Emerging Markets, GBI-EM, (EM-LOCAL). The annualized intercept from this regression is 'alpha'. The line in each figure shows a normal distribution with mean 0 and standard deviation equal to that of the respective return distribution. The table on the bottom shows the full-sample distribution of the relevant return metrics.

Figure 4A: Distribution of annualised excess of benchmark returns

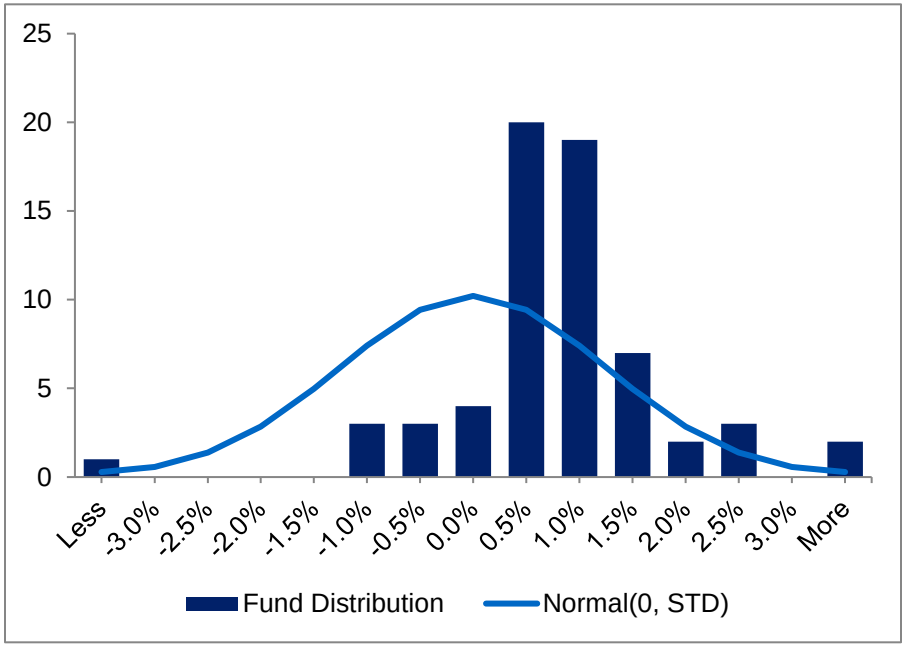
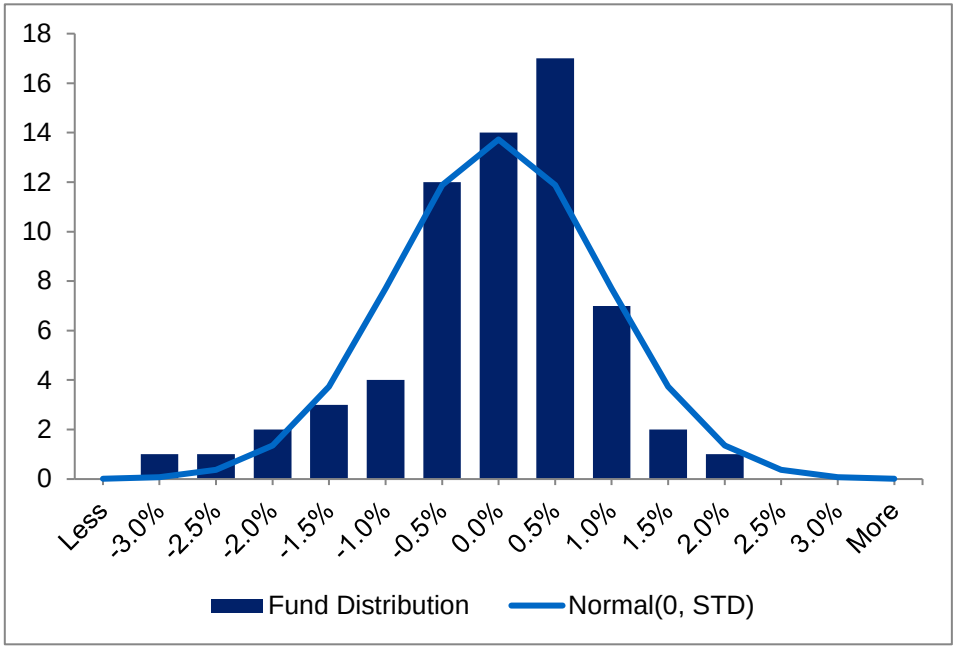


Figure 4B: Distribution of 'alpha'



	Excess of Benchmark Returns			Alphas		
	Active Return	**Volatility**	**Information Ratio**	**Alpha**	**Volatility**	**Information Ratio**
Mean	0.8%	2.6%	0.36	0.2%	1.5%	0.18
Std. Dev	1.3%	1.3%	0.38	1.0%	0.9%	0.65
Q1	0.4%	1.8%	0.19	-0.2%	1.0%	-0.21
Q3	1.2%	3.0%	0.58	0.7%	1.7%	0.62
T-Stat	5.28			1.26		

Figure 5: Correlation of Active EM Manager Excess of Benchmark Returns to Traditional Market Risk Premia

The frequency histograms below report the full sample contemporaneous correlation between excess of benchmark returns and EM traditional market risk premia across the set of 64 active EM managers. Returns are reported gross of fees. We start with 133 active EM bond funds that are covered in the eVestment dataset (covering both live and dead funds). We limit ourselves to funds that (i) clearly mention on the of the relevant J. P. Morgan EMBI indices as their benchmark EMBI (Global Diversified, EMBI Global or EMBI Global+), (ii) have at least 5 years of monthly return observations, and (iii) have USD share classes. This leaves us with a set of 64 active EM bond funds that represent 75 percent of the total assets managed within the EM universe covered by eVestment. EM traditional risk premia is calculated as a 50/50 blend of (i) the credit excess returns of the Bloomberg-Barclays Emerging Markets Corporate index (EM CORP), and (ii) the excess of cash returns of the J.P. Morgan Government Bond Index – Emerging Markets, GBI-EM, (EM-LOCAL). Our sample covers funds for the period 2004-2018. Returns are measured over quarterly non-over-lapping windows. The figure on the left shows correlations of each fund's excess of benchmark returns to the equal weighted average excess of benchmark returns across the set of 64 active EM managers. The figure on the right shows correlations of each fund's excess of benchmark returns to the EM traditional risk premia defined above. The highlighted red bar is where the hypothetical long-only portfolio targeting exposure to systematic investment themes (carry, defensive, momentum and value) resides.

Figure 5A: Correlation of active returns across mangers

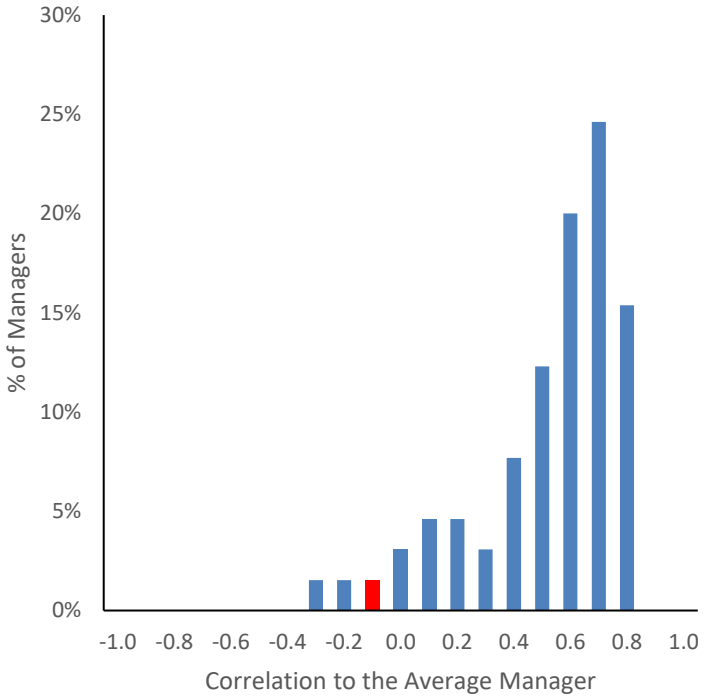


Figure 5B: Correlation of active returns to EM risk premia

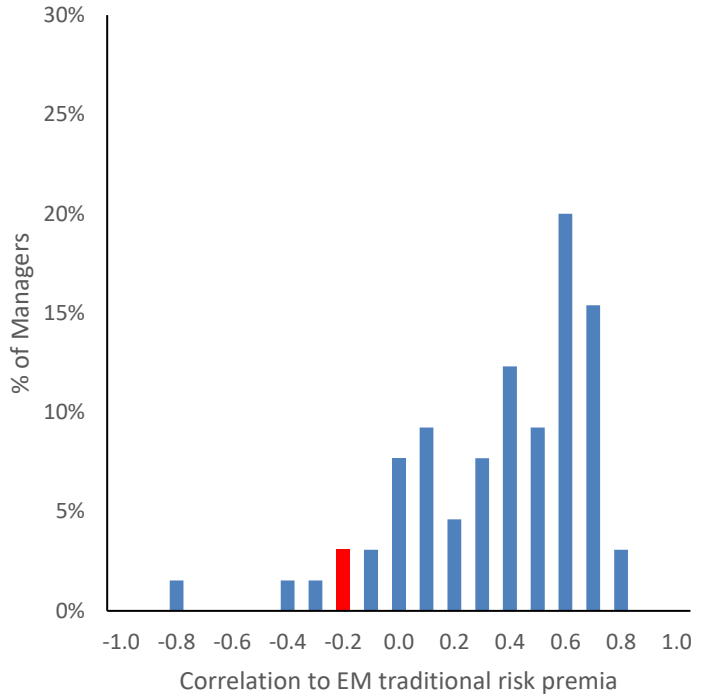


Figure 6: Macroeconomic exposures of active EM bond manager returns

This figure shows Information Ratios for active EM strategies across difference macroeconomic environments. We consider an equal weighted composite excess of benchmark return across 64 active EM bond managers (sample selection described in earlier figures). We also consider a hypothetical long-only portfolio targeting exposure to systematic investment themes (carry, defensive, momentum and value) described in Table 5. We split the full time period from 2004-2018 into 'up' and 'down' periods based on changes in five key macroeconomic variables. Each is measured in changes to capture shocks to the underlying macroeconomic variable. ΔGROWTH is the quarterly revision in one-year ahead real U.S gross domestic product growth forecast as captured by Consensus Economics. ΔINFLATION is the quarterly revision in one-year ahead U.S. Consumer Price Inflation forecasts as captured by Consensus Economics. ΔREAL_YIELD is the quarterly change in the real 10-year bond yield measured as the difference between the yield on the 10-year benchmark bond from Bloomberg and the 10-year inflation expectation from Consensus Economics (measured at the start of the quarter). ΔVOLATILITY is the average of quarterly percentage changes in bond (MOVE) and equity (VIX) volatility indices. ΔILLIQUIDITY is the quarterly change in the TED spread (the spread between 3-month T-Bill rates and the London Interbank Offered Rate). The figure on the left (right) is for the hypothetical systematic portfolio (equal weighted average across 64 active EM bond funds).

Figure 6A: Hypothetical Systematic Portfolio

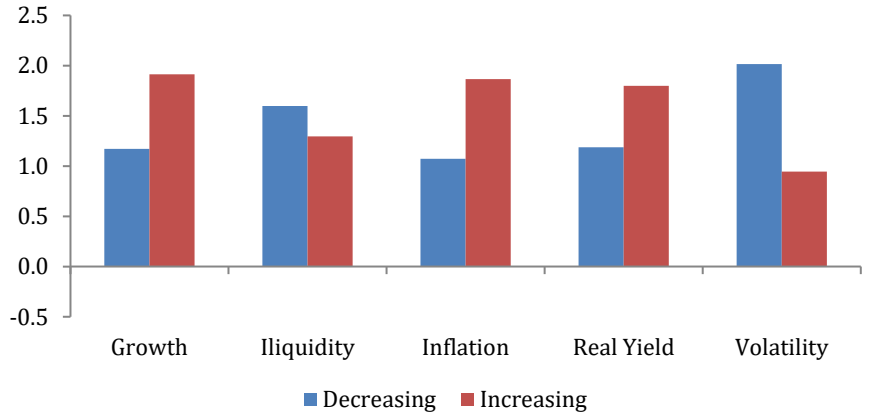


Figure 6B: Equal Weighted Average of active EM bond funds

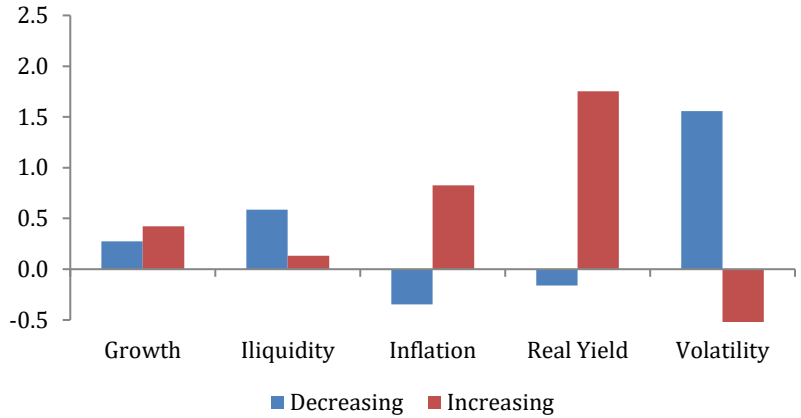


Table 1: The Emerging Market Debt Universe

The table below reports the size of the emerging market fixed income universe broken down into three distinct categories from 2004 through to 2018. The J.P. Morgan Emerging Markets Bond Global Index (EMBI Global) tracks returns for traded external debt (hard currency) instruments issued by emerging sovereign (and related) entities. The J.P. Morgan Government Bond Index – Emerging Markets (GBI-EM) tracks returns for local currency bonds issued by emerging sovereign entities. The J.P. Morgan Corporate Emerging Markets Index (CEMBI) tracks the returns of USD denominated bonds used by emerging market corporate entities. For all J.P. Morgan indices we use their 'Global' versions which are intended to be an investable benchmark that only includes countries that are accessible to a foreign investor. Index sizes are reported in billions of USD.

Year	EMBI Global	CEMBI	GBI-EM	TOTAL
2004	271	35	272	577
2005	292	49	331	672
2006	299	55	447	801
2007	295	67	545	907
2008	249	57	456	761
2009	342	102	608	1,052
2010	407	175	802	1,384
2011	457	206	840	1,503
2012	579	310	953	1,842
2013	586	358	930	1,874
2014	651	391	941	1,983
2015	672	383	793	1,849
2016	776	455	965	2,196
2017	913	521	1,203	2,637
2018	873	493	1,123	2,489

Table 2: The EMBI (hard currency) universe

This table summarizes features of hard currency bonds included in the J.P. Morgan Emerging Markets Bond Global Index (EMBI Global) which tracks returns for traded external debt (hard currency) instruments issued by emerging sovereign (and related) entities. We report the number of bonds, the number of issuers both for pure sovereign (SOV) and quasi-sovereign (QSOV) entities, the fraction of bond issued by each type of sovereign entity, a break-down across rating categories and geographies and information on the typical spread duration (SDur), remaining time to maturity (Life) and credit spreads (S, in basis points) of EM hard currency bonds.

			Issuer Split			% breakdown across categories						Avg. Values		
Year	**#Bonds**	**MCAP**	**#SOV**	**#QSOV**	**SOV**	**QSOV**	**IG**	**HY**	**ASIA**	**LATAM**	**EMEA**	**SDur**	**Life**	**S**
2004	187	271	28	9	95%	5%	32%	68%	11%	59%	30%	6.0	11.6	232
2005	188	292	30	9	94%	6%	30%	70%	14%	58%	29%	6.6	12.3	177
2006	191	299	29	13	92%	8%	31%	69%	16%	54%	30%	7.2	13.0	123
2007	196	295	34	17	90%	10%	29%	71%	17%	51%	32%	7.1	12.9	196
2008	194	249	35	17	90%	10%	48%	52%	18%	49%	33%	6.3	12.4	546
2009	219	342	37	16	86%	14%	42%	58%	20%	46%	34%	6.6	11.7	188
2010	258	407	38	26	82%	18%	41%	59%	18%	44%	38%	6.7	11.7	182
2011	288	457	42	33	80%	20%	40%	60%	18%	45%	37%	6.8	11.6	325
2012	337	579	50	44	76%	24%	52%	48%	17%	43%	39%	7.3	12.0	167
2013	412	586	55	60	73%	27%	57%	43%	17%	41%	42%	6.5	10.9	249
2014	462	651	58	65	71%	29%	59%	41%	21%	40%	39%	7.0	11.5	247
2015	513	672	60	71	70%	30%	42%	58%	23%	38%	39%	6.5	10.9	315
2016	559	776	65	75	70%	30%	46%	54%	23%	42%	35%	6.5	10.7	244
2017	643	913	67	78	70%	30%	50%	50%	25%	40%	35%	7.0	11.5	166
2018	679	873	66	76	71%	29%	55%	45%	27%	38%	35%	6.7	11.4	259
AVG	355	511	46	41	81%	19%	44%	56%	19%	46%	35%	6.7	11.7	241

Table 3: The EM CDS universe

This table summarizes features of the 5-year credit default swap (CDS) contracts linked to (i) reference entities that are 'emerging sovereign', (ii) have reference obligations denominated in USD, and (iii) are sufficiently liquid as captured by membership in the J.P. Morgan Global EMBI+ index (this index requires each bond to be at least 500 million and meet additional stringent secondary market liquidity requirements). The data cover the 2004-2018 time period. We report the number of issuers each year with a breakdown based on rating and geography and distributional information on credit spreads.

		% breakdown across categories					Spreads		
Year	**#Issuers**	**IG**	**HY**	**ASIA**	**LATAM**	**EMEA**	**Q1**	**Median**	**Q3**
2004	24	17	7	4	8	12	34	132	293
2005	24	17	7	4	8	12	36	69	213
2006	25	17	8	4	8	13	20	74	114
2007	25	17	8	4	8	13	70	99	153
2008	25	17	8	4	8	13	304	416	642
2009	24	17	7	4	7	13	131	176	246
2010	23	17	6	4	7	12	113	140	253
2011	24	17	7	4	7	13	168	279	472
2012	23	17	6	4	7	12	97	127	241
2013	24	17	7	4	7	13	118	188	283
2014	23	17	6	4	6	13	111	176	234
2015	23	16	7	4	7	12	166	204	319
2016	24	15	9	4	8	12	123	160	274
2017	25	14	11	4	8	13	67	104	164
2018	25	15	10	4	8	13	88	137	359
AVG	24	16	8	4	7	13	110	165	284

Table 4: Performance of long-short systematic investment portfolios in CDS universe

This table summarizes the correlation structure and performance of long-short EM CDS portfolios that target constant volatility (10 percent) across four systematic investment themes: carry, defensive, momentum and value. Carry is measured as the spread of the respective CDS contract at the start of the month (preferring EM debt with higher spread levels). Defensive is measured as an equal weighted combination of forecasted inflation (preferring EM debt with lower expected levels of inflation) and Asset/Debt ratio (preferring EM debt with higher assets relative to external debt). 'Assets' are the sum of foreign reserves and GDP, and 'Debt' is government related external debt (data obtained from Thomson Reuters International Comparable Economics). Momentum is measured as an equal weighted combination of 6-month trailing EM CDS returns, 6-month trailing FX returns, and 6-month trailing country equity returns (preferring EM debt with positive CDS returns, positive local currency returns relative to USD, and positive country equity returns). Value is measured as the residual from a regression of credit spreads onto credit ratings (an ordinal rank of sovereign issuer ratings) and equity volatility. This regression is estimated on an expanding window basis including time fixed effects. We build portfolios individually for each theme and a composite portfolio that allocates equal risk across each theme. Portfolios are rebalanced monthly over the 2004-2018 time period. We form beta-neutral views for each theme (and composite) and use an asset-by-asset variance-covariance matrix to scale positions to target 10 percent ex ante volatility.

Panel A: Correlations across systematic investment themes

	Carry	**Defensive**	**Momentum**	**Value**
Carry				
Defensive	-0.74			
Momentum	-0.12	0.23		
Value	0.07	0.04	-0.29	

Panel B: Return properties of systematic investment themes

	Carry	**Defensive**	**Momentum**	**Value**	**Composite**
Average	3.8%	3.6%	5.4%	3.7%	10.8%
Std. Dev.	11.2%	10.5%	8.5%	10.2%	10.1%
T-stat	1.30	1.32	2.46	1.41	4.13
Sharpe	0.34	0.34	0.64	0.37	1.07
α	1.8%	5.1%	6.5%	3.5%	11.6%
β	0.35	-0.29	-0.20	0.04	-0.15
Skewness	-0.54	0.99	1.09	0.37	0.26
Kurtosis	4.9	3.9	4.1	1.4	0.3
Max Drawdown	-36.4%	-22.7%	-17.7%	-31.2%	-15.8%

Table 5: Performance of long-only systematic investment portfolios in EM bond universe

This table summarizes the performance of a long-only hypothetical portfolio that explicitly targets exposure to a weighted combination of the four systematic investment themes (carry, defensive, momentum and value). Returns are in excess of U.S. 3-month T-Bill returns. Measures for the investment themes are described in earlier tables. Each month we identify a liquid subset of constituents of the J. P. Morgan Emerging Markets Bond Global Index (EMBI Global). Liquidity filters span multiple measures including trading volumes and quoted bid-ask spreads. Each liquid bond is scored based on the carry, defensive, momentum and value measures. We incorporate both country level and maturity views in the portfolio. Country level views are expressed by weighting liquid bonds linked to an emerging sovereign inversely proportional to their spread duration. Maturity views are expressed by first defining a country specific 'steepener' that is spread duration neutral within each country. We then form a 70/30 combination of country level and maturity views. These scores are then used to form beta-neutral views, and, the final portfolio targets around 2 percent tracking error to the EMBI Global index. The hypothetical portfolio also subtracts an estimate of transaction costs.

	Hypothetical Long-Only Portfolio	EMBI Global Benchmark	Active Returns
Average	8.4%	5.8%	2.5%
Std. Dev.	7.9%	8.0%	1.5%
SR or IR	1.06	0.73	1.68
Skewness	-1.69	-2.24	0.57
Kurtosis	10.99	14.75	0.77

Table 6: Macroeconomic exposures of active EM bond manager returns

This table reports regression results for active EM bond manager returns. Our sample covers the 64 active EM bond managers described in earlier tables. We have five measures designed to capture key macroeconomic sensitivities. Each is measured in changes to capture shocks to the underlying macroeconomic variable. ΔGROWTH is the monthly revision in one-year ahead real U.S gross domestic product growth forecast as captured by Consensus Economics. ΔINFLATION is the monthly revision in one-year ahead U.S. Consumer Price Inflation forecasts as captured by Consensus Economics. ΔREAL_YIELD is the monthly change in the real 10-year bond yield measured as the difference between the yield on the 10-year benchmark bond from Bloomberg and the 10-year inflation expectation from Consensus Economics (measured at the start of the quarter). ΔVOLATILITY is the average of monthly percentage changes in bond (MOVE) and equity (VIX) volatility indices. ΔILLIQUIDITY is the monthly change in the TED spread (the spread between 3-month T-Bill rates and the London Interbank Offered Rate). Regressions are run individually for each manager using non-overlapping quarterly observations over the time period 2004-2018. We report regression coefficient averages in the table below across individual manager regressions, with Fama-Macbeth t-statistics in parentheses. We also report regression results for the hypothetical long-only portfolio targeting exposure to systematic investment themes (carry, defensive, momentum and value) described in Table 5.

Variable	**Average across 64 active EM bond managers**					**Systematic Portfolio**
ΔGROWTH	0.0061				0.0012	0.0001
	(4.63)				(1.17)	(0.02)
ΔINFLATION		0.0069			0.0034	-0.0021
		(5.12)			(3.50)	(-0.79)
ΔREAL_YIELD			0.0085		0.0045	0.0009
			(8.53)		(6.09)	(0.42)
ΔVOLATILITY				-0.0155	-0.0147	0.0027
				(-8.48)	(-6.62)	(0.60)
ΔILLIQUIDITY					-0.0001	0.0038	-0.0076
					(-0.09)	(2.28)	(-2.83)