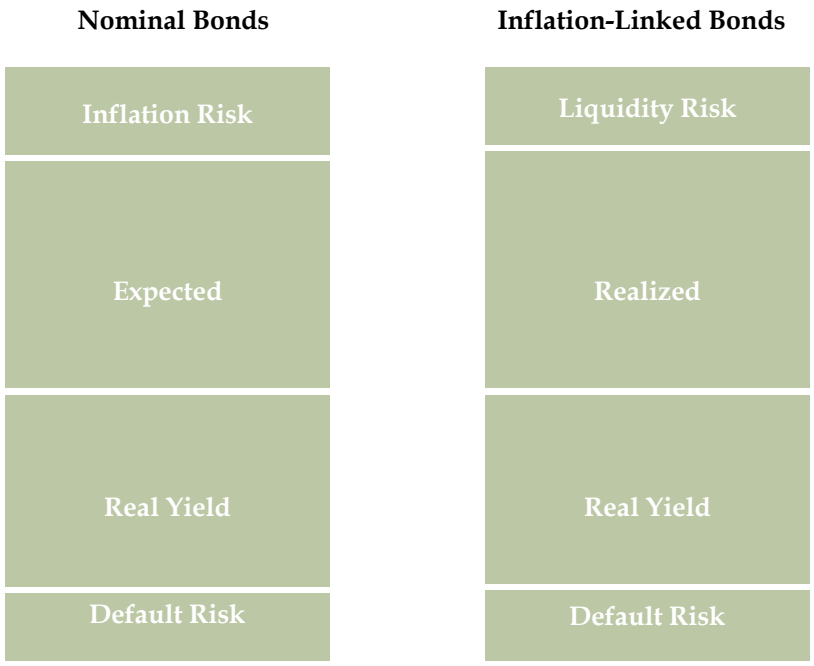
ABSTRACT

Investors have increasingly allocated assets to emerging markets in the past decade. This primarily took the form of investment in the sovereign debt of, and stocks based in, these countries. As these markets have evolved, sub-components have emerged as viable investment options. This includes a universe of inflation-linked bonds issued by emerging market governments. Because of the real yields they offer and the potential for higher inflation in some emerging market countries, these bonds may be particularly appealing to U.S. investors who are looking for relatively high yields and less sensitivity to U.S. interest rates, and protection from inflation and currency risks in emerging markets.

INFLATION-LINKED BONDS

Unlike nominal bonds, inflation-linked bonds provide an inflation-adjusted return if held to maturity. The expected nominal yield for a government bond consists of four components: the expected rate of inflation, the inflation risk premium, the real interest rate, and the credit risk premium of a default by the sovereign issuer. Because an inflation-linked bond eliminates the risk associated with uncertainty over inflation, its yield does not include the inflation risk premium. However, inflation linked bonds are usually less liquid than their nominal counterparts, thus potentially introducing a liquidity premium.[1]

Components of Yield



[1] Both the liquidity risk premium and inflation risk premium can vary by country and through time. Note that at their introduction, inflation-linked bonds are usually far less liquid than their nominal counterparts (see Carlstrom and Fuerst, 2004).

History of Inflation-Linked Bonds

The UK first issued inflation-linked bonds in 1981, while Australia and Canada followed suit in 1985 and 1991, respectively. The U.S. government first issued Treasury Inflation-Protected Securities (TIPS) in 1997. Several emerging market (EM) countries followed suit in quick succession from 2002 to 2004, including Chile, Argentina, South Africa, Brazil, Colombia, and Poland. Presently, more than twenty countries now offer some form of inflation-linked bonds, with roughly half of them being emerging market countries.

Mechanics

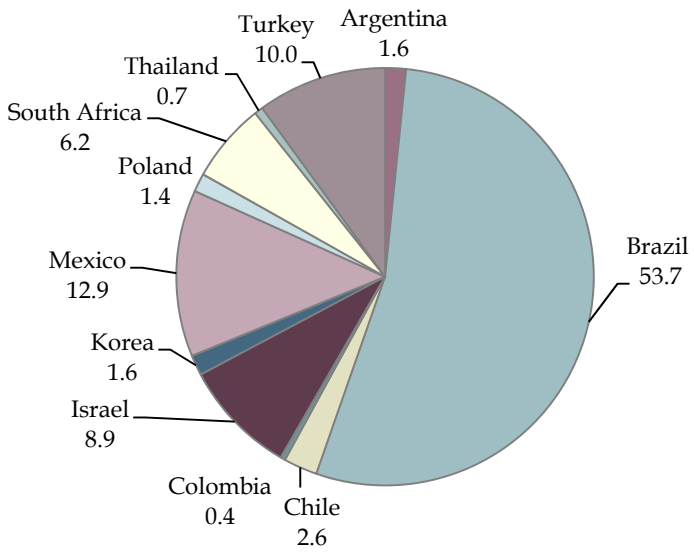
Though the mechanics of each country's inflation-linked bonds differ, the concept is the same: investors receive an inflation-adjusted return. Often, inflation-linked bonds pay real (i.e., inflation adjusted) income and return the real value of the owner's principal at the stated maturity date. And, as with traditional sovereign bonds, the full faith and credit of the sovereign government backs these issues. However, unlike that of a nominal bond, the principal value—and thus the coupon payment—of an inflation-linked bond is adjusted to reflect local inflation, usually measured by an equivalent to the Consumer Price Index in the U.S.

THE OPPORTUNITY SET

The most broad-based index of inflation-linked bonds in emerging markets is the Barclays Emerging Markets Government Inflation-Linked Bond (EMGILB) index. It represents the full opportunity set available to investors in that it includes every emerging market issue exclusive of its size, credit quality, or liquidity. As of March 2013, it included 79 bonds worth approximately $550 billion. Importantly, all bonds are issued in "local" currency, that is, in the home currency of the issuer.

Because many of the investors who would consider an allocation to the emerging markets debt asset class may already be invested in nominal emerging market bonds, it is helpful to compare the two universes. The EMGILB index is weighted according to the outstanding market value of each bond. Consequently, it is dominated by the largest issuers, many of which are based in Latin America, with the largest being Brazil (see the following chart). This contrasts markedly with the nominal emerging market debt universe, which is heavily weighted to issuers in Asia.

Regional Composition of EM Inflation-Linked Bonds



The credit quality of the inflation-linked bond index also differs from that of the nominal emerging market debt universe (see the table below). Because the EMGILB index is dominated by Brazil, which has a "BBB" rating, the inflation-linked bond index is heavily weighted in this rating category. Still, it is predominantly an investment grade-rated composite. The highest rated issuer is Chile (rated "AA"), and the lowest rated issuer is Argentina (rated "B").

Credit Quality of Emerging Markets Debt[2]

Rating	ILB's	Nominal
AA	2.9%	26.4%
A	11.6%	29.8%
BBB	73.8%	37.9%
BB	10.0%	4.9%
B	1.6%	1.0%

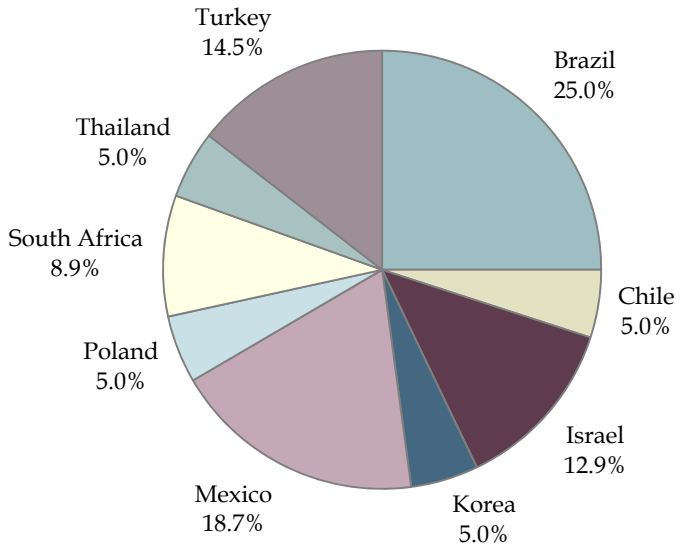
Finally, the maturity structure differs from that normally observed with nominal bonds. The average life of the composite is 11.6 years, with three issues having a maturity of more than thirty years, including a Brazilian issue maturing in 2050.

Likely because this index is so distorted by the weighting of Brazil, Barclays created an alternative index that better represents the kind of portfolios that investors in these markets are likely to construct. This index, called the Barclays EM Tradable Government Inflation-Linked Bond (EMTIL) Index, invests in a subset of the more liquid issuers of the

[2] ILB's are proxied by the Barclays EMGILB index and nominal bonds by the Barclays EM Local Currency Government index, as of March 2013.

above index. Specifically, it excludes Argentina and Colombia. In addition, it caps the max weighting at 25% and introduces a floor weighting of 5%. The result is a composite that appears to make more sense as an investable benchmark (see chart below).

Regional Composition of EM Tradable Government ILB Index



Unfortunately, this benchmark is also much more concentrated by issue, holding only 14 bonds as of this writing.[3] This concentration level is partly mitigated during the index construction process, as Barclays generally includes the most liquid issues for each country and maturity bucket.[4]

PERFORMANCE CHARACTERISTICS

There is limited historical data available to assess the performance for EM inflation-linked bonds. While the data only dates back to 2007, this does include the Global Financial Crisis (GFC), which provides some evidence of how EM inflation-linked bonds might be expected to perform in future periods of financial stress.

The following table compares the performance of EM ILBs to that of several other broad market indices. It shows that EM ILBs have been far more volatile than U.S. investment grade bonds, but less volatile than equities. Their correlation with equity markets has been relatively high, while their correlation with U.S. bonds has been relatively low. Perhaps

[3] Barclays rebalances the index annually, at the end of March.

[4] For each eligible market, the index will include a minimum of one bond and a maximum of three bonds per country. The number of bonds selected per country is determined by a formal set of rules, the full methodology for which can be found in the guide that is available at the Barclays Live website: *https://live.barcap.com/BC/barcaplive?menuCode=MENU_AR_IND_BI_IL_EC*.

unsurprisingly, their correlation with U.S. TIPS has been higher than with U.S. nominal bonds, despite dramatically different inflation expectations for part of this period.

June 2008[5] - February 2013	EM TILB	EM Local Govt	EM Hard Cur Agg	Barclays Agg	Barclays U.S. TIPS	Russell 3000
Average Annualized Return	8.7%	6.6%	9.8%	6.1%	6.3%	6.3%
Standard Deviation	15.6%	14.5%	13.8%	3.6%	7.3%	19.8%
Correl w/ EM TILB	1.00	0.96	0.84	0.31	0.56	0.82
Correl w/ EM Local Govt	0.96	1.00	0.79	0.37	0.52	0.80
GFC (Aug 08 - Feb 09)	-28.7%	-26.6%	-17.5%	2.8%	-6.7%	-41.7%
3Q-4Q 2008	-19.9%	-11.9%	-16.7%	4.1%	-6.9%	-29.5%

EM inflation-linked bonds have experienced more volatility than nominal EM bonds since inception, and they have been slightly more correlated with most other public markets. That is, they have not provided much additional diversification benefit for investors who were already invested in nominal EM bonds (especially local currency debt).

Still, a significant part of the investment case for EM inflation-linked bonds is based on their link to inflation in emerging markets. Alas, the above time frame did not include any periods of sustained inflation or deflation fears for emerging markets, so it remains to be seen how these bonds will perform in either extreme environment.

Expected Returns

A simple way to estimate the expected nominal return for an inflation-linked bond is to add its current real yield to the expected rate of inflation over its life. For example, as of March 2013, the real yield for the Brazilian ILB maturing in 2017 was approximately 3.4%. Using a reasonable estimate for inflation of 4.7%[6], a buyer of this investment could expect a nominal return of (3.4 + 4.7 =) 8.1% over the life of this bond, if held to maturity.

We constructed a fundamental model for expected returns over a ten-year horizon for nominal and inflation-linked EM debt. The models are quite similar, with minor adjustments made for differing currency exposures and default probability based on the quality differences. This approach required creating an input for expected inflation for each country[7] in the EMTIL index and multiplying it by their weight in the benchmark. The result was an inflation expectation of 3.9% (see the table below).

[5] The start date of 2008 was selected as this reflects the inception for the Barclays EM Local Currency Government index.

[6] This estimate was based on inflation estimates provided in the IMF's October 2012 World Economic Outlook.

[7] These estimates were based on inflation estimates provided in the IMF's October 2012 World Economic Outlook.

Inflation Estimates	5-Year
Brazil	4.7
Chile	3.0
Israel	2.1
Korea	2.9
Mexico	3.3
Poland	2.6
South Africa	5.0
Thailand	3.0
Turkey	5.8
Weighted Average	*3.9*

Using these inflation assumptions, adding the real yield of 1.8% for the EMTILB as of March 2013, and making minor adjustments for default probability and currency movements, we arrived at an expected return of 5.9% for the EMTILB index. In fact, EM inflation-linked bonds appear to have the highest expected returns of the three EM debt categories (see the table below).

Asset Class	E(R)
EM ILBs (local)	5.9%
EM Bonds (local)	5.3%
EM Bonds (major)	3.7%

Focusing on the first two (which are composed solely of local currency bonds), the difference in expected returns between the nominal bonds and ILB's is attributable to various risk factors, including differences in: 1) country exposures (e.g., no Russian ILBs), 2) term structure exposure (duration of 7.7 for ILBs vs. 5.0 for nominal bonds), 3) quality exposure (72% BBB and lower for ILBs vs. 53% for nominal bonds), and 4) inflation expectations between the market and our estimates (i.e., the IMF's economists). Quantifying these differences is difficult, but we think it is reasonable that most of the difference is due to second and third factors (i.e., lower quality and longer maturity of the ILB benchmark). In other words, the higher expected return for investing in ILBs is due to the additional risk investors are taking on when investing in them.

The Inflation Factor

Given the inflationary history of many emerging markets, it is reasonable to believe that there is more potential for an upside inflationary shock in emerging markets than there is in most developed markets (and vice versa for deflation). For example, if Brazil finds itself in a bout of hyperinflation, as it did less than twenty years ago, investors in the inflation-linked bonds issued by that country would find themselves the beneficiaries of outsized returns (assuming their currency risk was hedged and the sovereign was able and willing to make

good on its debt). Hence, the return profile is more beneficially asymmetric (i.e., there is greater potential for positive "fat tails") for EM ILBs than there is for nominal EM bonds.

Of course, part of the motivation behind a government issuing inflation-linked bonds is that it provides them an incentive to keep inflation under control, else their inflation-linked debt payments could grow beyond their ability to service them. Hence, the very existence of inflation-linked bonds in a country may substantially reduce the odds of it experiencing future hyperinflation.

NATURE OF RISKS

Three many risks that affect investors in the emerging market bonds. Primary among these are interest rate risk, currency risk and credit risk. Although these risks are also seen in many other bond markets, the nature of these risks and their interactions are unique for the emerging market inflation-linked bond universe.

Interest Rate Risk

For investors in high quality bonds, interest rate risk is the primary risk they face. As yields go up, bond prices decline; thus, a rising rate environment causes losses to bond portfolios. How sensitive a bond is to changes in interest rates is usually measured by its duration. As noted earlier, there is greater tendency toward longer-maturity issues among ILBs, and the duration of the aggregate ILB universe was several years longer than that of the nominal bond benchmark. Thus, the ILB universe is likely more sensitive to changes in nominal interest rates.

However, duration can theoretically be broken into two components: sensitivity to changes in real interest rates and sensitivity to changes in the expected inflation rate. Since ILBs provide an inflation-adjusted return, their sensitivity to the latter should be zero. Hence, the duration for inflation-linked bonds measures only their sensitivity to a change in real interest rates.

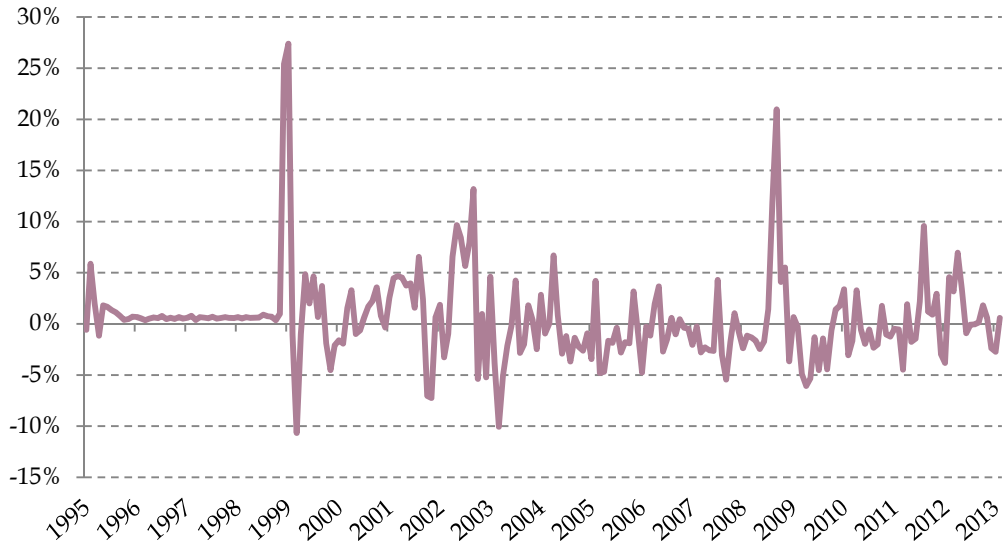
Unfortunately, an investor cannot discern in advance the root cause of a shift in nominal rates. In other words, it is impossible to accurately predict the sensitivity of a portfolio of ILBs to a change in nominal interest rates.

Importantly, because these bonds are issued outside the U.S. and in their own currencies, they are not directly impacted by changes in U.S. interest rates. Rather, they are primarily affected by their home country interest rates, changes in which may not necessarily coincide with changes in U.S. interest rates due to different economic environments, monetary and fiscal policies, etc. Hence, emerging market bonds (nominal and ILBs) offer some diversification benefits for investors whose primary bond exposure is to high quality U.S. bonds.

Currency Risk

Investors in any foreign currency security are subject to the risk of the foreign currency declining relative to the investor's domestic currency. Should the U.S. dollar strengthen relative to emerging markets currencies, emerging market debt strategies may lag their domestic counterparts. In local currency debt, currency moves can be a large driver of shorter-term returns (see the following chart), so it is important for investors to understand currency risk.

Monthly Change in Exchange Rate: Brazilian Reals vs. U.S. Dollars



The effect of currency movements can be mitigated or even eliminated by purchasing the appropriate hedging instruments, such as forward contracts, futures contracts, or options. While currency hedges eliminate the currency portion of a foreign security's return volatility, the cost of even partially hedging exposure to a particular currency will diminish the investment's return. Generally, the hedger pays both a bid-ask spread and an implicit interest cost, depending on the currency pair traded. Typical bid-ask spreads average around ten basis points, and implicit interest costs can be significantly higher.[8] In addition, hedging eliminates a portion of the diversification benefit of international investing.

Depending on the cause of a depreciation of the local currency, inflation-linked bonds may offer a slightly better hedge than nominal bonds. If investors flee a country's currency as part of a broader "flight to quality," this is unlikely to be the case. However, if inflation is the cause of, or results from, the depreciation of the currency[9], inflation-linked bonds may

[8] Bid-ask spread is an estimate based on conversation with money managers. Managers will engage in hedging forwards multiple times per year, so the total bid-ask spread cost may be any multiple of this number. In addition, the implicit interest rate costs depend on the currency pair traded. If the currency to be hedged is yielding 5% and the home currency is yielding 1%, then the implicit interest rate costs will be on the order of 4% annually.

[9] See Hafer (1989), among others, for an explanation of the link between inflation and currency depreciations.

provide a partial hedge for U.S.-based investors. While an investor would lose money due to the depreciated currency, the investor would benefit from the accompanying higher inflation, and hence the inflation-linked return, depending on the relative extent of the depreciation and level of inflation.

Credit Risk(s)

In addition to the currency risk discussed above, all fixed income investors are exposed to credit risk, which includes the risk of not being repaid by a borrower (*default risk*) and the risk that spreads will widen (*credit spread risk*). While debt issued by developed market governments is often considered to be virtually risk-free, debt issued by emerging market governments has historically been considered to have greater credit risk.

The credit quality of emerging markets bonds has increased markedly over the past fifteen years. As noted previously, more than 90% of emerging market ILB issuance is rated as investment grade. This indicates that these bonds are considered to be at a lower risk of default than high yield corporate bonds, which many institutional investors have already embraced.

When the borrower is a government, credit risk also includes *sovereign risk*. Investors in all sovereign debt, whether developed or emerging, must contend with the risk of a regulatory or policy change by the issuing government. However, this risk is arguably greater in emerging markets due to political structures that are often less stable. Emerging market debt managers must evaluate both the ability and willingness of a foreign government to pay its debts.

Because countries in which ILBs comprise a large proportion of their outstanding debt have a greater interest in controlling inflation and keeping budget deficits under control, it could be argued that they are relatively more credit-worthy than those that do not. That said, the manipulation of inflation data by the Argentine government in recent years[10] proves the exception, while also providing a cautionary note about sovereign risk.

When assets are invested outside developed markets, civil insurrection, repudiation of debts, and the state seizure of private assets are *political risks* that must be considered. Even in a less extreme context, new legislation may alter tax laws, place limits on foreign ownership of domestic assets, or introduce regulatory or accounting costs to businesses.

Event risk is also relevant for emerging market debt as their returns have historically been volatile and have occasionally been subject to extreme negative results. Events such as the Asian financial crisis of 1997 led to massive investment losses and the virtual economic collapse of several developing economies. Of course, this crisis also sowed the seeds of the financial, governmental, and regulatory reforms that make emerging markets much more attractive to investors today.

[10] According to *The Economist*, official Argentine inflation has understated actual inflation by 10-15% per year since 2008. Source: *The Economist,* "The IMF and Argentina," February 9, 2013.

All securities are also subject to *liquidity risk*, or the risk that investors will have to sell a bond below its fair value as a result of a specific event or an adverse market environment. At least in the 2008-2009 crisis (the only crisis for which we have complete benchmark data), emerging market ILBs rebounded quickly.

IMPLEMENTATION ISSUES

Market Size and Liquidity

As noted earlier, the market value of the EM debt universe is roughly $550 billion. For comparison, the size of the U.S. TIPS market has grown to approximately $960 billion. EM ILBs are unlikely to be as liquid U.S. TIPS, or perhaps even the nominal bonds of the same sovereigns. Still, the size of the market implies that there is ample room for large institutional investors to allocate to this asset class.

For this paper, we surveyed 25 emerging market bond managers. They indicated that liquidity can be relatively similar to that of nominal local currency sovereign bonds. There are some local investors (e.g., pension plans and insurance companies) that buy and hold linkers, but the managers we surveyed noted that this has not negatively impacted liquidity. If fact, it may even reduce volatility in that these investors are unlikely to liquidate their ILB holdings during a financial panic, unlike the owners of hard currency or corporate bonds. Still, nearly every manager we surveyed cited liquidity as a potential concern.

Passive and Active Management

To our knowledge, there are no ETFs or index funds currently available that offer passive exposure to EM inflation-linked bonds. The quirky construction of the EMTIL index makes it a more questionable benchmark than that for nominal EM bonds. Moreover, we believe that it will be easier than normal for managers to "game" the benchmark (e.g., via maturity arbitrage) and hence "outperform" it.

Even as there is apparently no passive option, the choices available via active management are relatively limited. As of this writing, we found fewer than ten active managers of dedicated EM inflation-linked bond strategies, all in separate accounts. These managers already had existing strategies in nominal EM bonds, and their fees were on par with or exceeded those usually available for traditional EM debt managers (typically more than fifty basis points).

Interestingly, many of the EM debt managers who run local or mixed currency portfolios already invest opportunistically in inflation-linked bonds. These allocations ranged from 4% to 15%, despite the fact that ILBs are not included in their respective benchmarks.

SUMMARY AND RECOMMENDATION

Inflation-linked emerging market bonds share many characteristics with their nominal brothers. To date they have been issued exclusively in local currency, they are predominantly rated investment grade, and they share the same level of sovereign risk. Their performance during and since the GFC closely resemble nominal EM debt. Under normal economic and market conditions, we expect their return to be fairly similar.

However, the EM inflation-linked bond opportunity differs in many ways, especially by the geographical location of the underlying issuers. Further, an investment in inflation-linked bonds would likely produce attractive gains in a rising or unstable inflation environment. This provides the potential for an asymmetric return that is beneficial to investors, while also potentially hedging against inflation-induced currency depreciation.

Unfortunately, there are currently several limitations facing investors who are considering a dedicated exposure to EM inflation-linked bonds. These drawbacks include the dearth of managers, lack of a passive alternative, and limited opportunity set for building a diversified portfolio. Therefore, we believe an allocation should be implemented via a broader emerging markets bond mandate. This would likely require providing direction to an EM debt manager on how much of their portfolio to invest in inflation-linked bonds as well as modifying their benchmark to one that includes inflation-linked bonds. We recommend that institutional investors consider allowing their EM debt managers to invest up to 30% of their EM debt portfolios in inflation-linked bonds.

Appendix

Glossary of Terms

Linkers: a colloquial term for inflation-indexed bonds (or linked bonds), the bonds for which the principal is indexed to inflation.

Sovereign: Sovereign debt refers to debt issued by a national government. Some investors consider sovereign debt to be only that portion of government debt that is issued in a foreign currency, but we do not make that distinction in this paper.

Risk premium: A risk premium is the additional return a risky asset has produced or is expected to produce above a risk-free asset. It represents what investors expect to be paid as compensation for taking on the risk of investing in the asset.

Hyperinflation: hyperinflation occurs when a country experiences very high, accelerating, and perceptibly "unstoppable" rates of inflation. In such a condition, the general price level within an economy rapidly increases as the currency quickly loses real value. Unlike regular inflation, where this process is protracted and not generally noticeable except perhaps by studying past market prices, hyperinflation sees a rapid and continuing increase in the supply of money and the cost of goods.

Deflation: a decrease in the general price level of goods and services. Deflation occurs when the inflation rate falls below 0% (i.e., a negative inflation rate). Deflation increases the real value of money – the currency of a national or regional economy. This allows one to buy more goods with the same amount of money over time. Economists generally believe that deflation is a problem in a modern economy because it increases the real value of debt, and may aggravate recessions and lead to a deflationary spiral.

Flight to Quality: a financial market phenomenon occurring when investors sell what they perceive to be higher-risk investments and purchase safer investments (e.g., U.S. Treasuries). More broadly, flight-to-quality refers to a sudden shift in investment behaviors in a period of financial turmoil where investors seek to sell assets perceived as risky and instead purchase safe assets. This is considered a sign of fear in the marketplace, as investors seek less risk in exchange for lower profits.