An Introduction to **Inflation-Linked Bonds**

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Inflation-linked bonds have gained notoriety in recent years. The global volume has increased tenfold in the past decade, with the United States, the United Kingdom, and France among the largest issuers of these securities. Inflation-linked bonds (commonly known as linkers) are a unique asset class in that it is one of the few that offers a nearly perfect (direct) hedge against inflation, while also having a low correlation to other risk assets. Therefore, these securities provide diversification for many portfolios; in particular, blending stocks and linkers in a portfolio is viewed as optimal.

In this paper, we examine the key features of the asset class. Specifically, inflation-linked bonds are an important investment vehicle for investors whose liabilities are indexed to changes in inflation or wages. However, these securities are less liquid than traditional bonds. In the past decade, inflation-linked bonds have had favorable performance and lower volatility relative to other risk assets. The private market for linkers remains undeveloped outside of banks; sovereign issuers dominate the market. Given the current indebtedness of many governments in the wake of the global financial crisis, we emphasize the importance of credit analysis for inflation-linked government bonds. Research has shown that country bankruptcies and inflation can occur simultaneously, and as a consequence, inflation-linked bonds may not offer the protection that is typically assumed by investors.

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Introduction

Inflation protection is one of the central goals of strategic asset allocation, and not only since the beginning of the hyper-expansive monetary policy witnessed during the financial crisis of the past five years. The stagflation of the 1970s clearly illustrates the devastating effect inflation can have on investments. During that period, the hazard of asset classes offering only indirect protection against inflation became apparent given that their returns are theoretically tied to real growth. Therefore, income from government bonds and stocks (i.e., traditional investment vehicles for most institutional investors), was disappointing across the board in the 1970s.

Thus, the development of inflation-linked bonds has expanded around the globe in recent years and they have become integrated in many portfolios.

The goal of inflation-linked bonds is to ensure purchasing power by directly linking returns to inflation for the bond's entire term. Linkers therefore contain two forms of payment: the real interest that is fixed at the beginning of the term, and compensation for the loss of purchasing power. In an inflation-linked bond, the real income over the term is certain, whereas the nominal income is determined ex post. Thus, the asset class presents an ideal opportunity for a broad range of investors for protection against inflation.

The Market for Inflation-Linked Bonds

The practice of linking interest payments on debentures to price indices is relatively old. As early as 1742, in the United States, Massachusetts (then known as the Massachusetts Bay Colony) issued money market securities that were linked to the price of silver on the London Stock Exchange. In more recent times, inflation-linked bonds were first issued in the international capital markets by [redacted] in 1955.

Among the major industrialized countries, the United Kingdom was the first to supplement its government bond issue program with inflation-linked bonds in 1981. This was followed by Australia in 1985, Canada in 1991, Sweden in 1994, the United States in 1997 (which created treasury inflation protected securities, or TIPS), France in 1998, Italy in 2003, Japan in 2004 (in spite of its deflationary environment), and Germany in 2006.

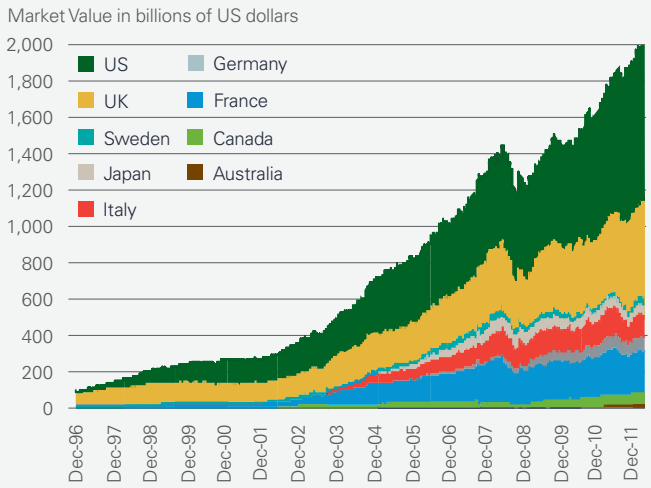
In recent years, the linker market has also grown sharply in the emerging markets (particularly in Brazil, Mexico, Turkey, and South Africa). In addition, there are several issues of inflation-linked bonds by private issuers, mostly banks or pension funds. However, governments are by far the largest issuers of these securities. In Exhibit 1, we show the growth of the linker market, since the mid-1990s, based on the Barclays Capital World Government Inflation-Linked Bond Index (WGILB).

As of April 2012, the global market value of inflation-linked government bonds was approximately $2.0 trillion. The United States is the largest issuer with $866 billion, followed by the United Kingdom with £338 billion ($549 billion), France with €177 billion ($235 billion), and Italy with €100 billion ($132 billion), but only in the United Kingdom do inflation-linked bonds comprise a substantial share of the country's total issues. Germany was a latecomer to the market for these securities in 2006, but it currently has €45 billion (about $60 billion) outstanding, as shown in Exhibit 2.

Why Inflation-Linked Bonds?

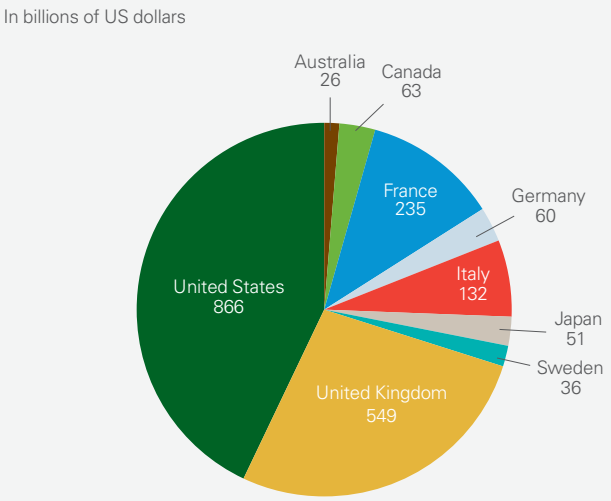
In the past, the advantages and disadvantages of inflation-linked bonds have been discussed primarily from the perspective of government issuers. There are two primary arguments for why most countries hesitate to issue inflation-linked bonds. First, there are fears that too many different issues could significantly fragment the market. As a result, the liquidity and marketability of individual issues would decline,

Exhibit 1
Growth of the Inflation-Linked Bond Market
WGILB Index breakdown by issue type



As of April 2012
Source: Barclays Research

Exhibit 2
Snapshot of the Current Global Linker Market



As of April 2012
Source: Barclays Research

and issuers would ultimately have to pay liquidity premiums on these bonds. This explanation has been weakened in light of the sharp increase in government-issued bonds in recent years.

The second point of criticism came particularly from the central banks, which have fundamentally rejected inflation indexing in most countries in the past. In Germany, for example, the Currency Act of 20 June 1948 generally prohibited the indexing of contracts until its abolition in 1998. The central banks feared that businesses and other market participants could become accustomed to high inflation rates, which would undermine the credibility of economic policy. This argument was propagated in particular by the *Deutsche Bundesbank* (Germany's central bank) and is the primary reason why Germany was so late in issuing inflation-linked bonds. From our perspective, this argument is plausible—in light of the hyper inflationary experience of the Weimar Republic when wages and contracts were indexed to inflation—but is out of touch with reality with respect to the indexing of state debt ratios.

We believe that inflation-linked bonds enhance the credibility of central banks and countries.[1] In times of high public debt, the capital markets brew speculation that a country could lower its debt commitments by reflation. By issuing inflation-linked bonds as a larger share of total debt, these fears of reflation could be substantially alleviated, because the government, as the debtor, would not benefit from rising inflation rates.

There are also several other reasons in favor of using inflation-linked bonds. They provide a tool for inflation protection; are usable (or risk-minimizing) vehicles for retirement planning; have lower interest rates (and thus lower financing costs) due to the elimination of inflation risk premiums compared to traditional bonds; and have a strong relationship to the state's inflation-driven tax revenue, or, in other words, they offer more effective asset-liability matching (Garcia 2007 and Kopcke 1999).

How do Inflation-Linked Bonds Work?

Inflation-linked bonds are securities that protect the purchasing power of the investment. The bond is provided with a fixed real coupon. The nominal coupons and the nominal face amount (and thus the repayment of the principal) are calculated by increasing the real quantities based on the increase in the (non-seasonally adjusted) inflation rate. More precisely, a quotient is calculated from the current status of the reference inflation index on the coupon date or principal repayment date and the reference inflation rate on the security's issuance date (this quotient is referred to as the "index ratio"), which is then multiplied by the real quantities:

$$Index\ Ratio = \frac{Price\ Index_{current}}{Price\ Index_{t=0}}$$

The nominal coupon and nominal amount are thereby linked to changes in the inflation index. In order to make this connection clear, and to work out the differences between traditional and inflation-indexed bonds, we will use the example of two 10-year bonds, regular and inflation-adjusted, each with a nominal value of $1,000. For the inflation-linked bond, we will assume a real coupon of 3% and a constant inflation rate of 2% over 10 years. The coupon of the traditional bond is selected at 5.06%, such that the expected real income of the bond corresponds to the real coupon of the inflation-indexed bond. Exhibit 3 displays a table with the cash flows corresponding to real and nominal payments associated with the traditional bond compared to the inflation-indexed bond.

For the traditional bond, the nominal face value of the bond and the nominal coupon remain unchanged over the entire time period. The real value of the payments (i.e., the value of the nominal payments discounted to t=0, accounting for the loss of purchasing power) falls with the rise of the inflation index. Thus, the real value of the nominal value and the coupon payment in year t arises from the formula:

$$Real\ Value_t = \frac{1{,}000}{1.02^t}$$

$$Real\ Coupon_t = \frac{50.6}{1.02^t}$$

Exhibit 3
Comparing Cash Flows of an Inflation-Linked to a Traditional Bond

	Traditional Bond				Indexed Bond			
Year	Nominal Value of Principal	Real Value of Principal	Nominal Interest Payment	Real Value of Interest Payments	Nominal Value of Principal	Real Value of Principal	Nominal Interest Payment	Real Value of Interest Payments
1	$1,000.00	$980.39	$50.60	$49.61	$1,020.00	$1,000.00	$30.60	$30.00
2	$1,000.00	$961.17	$50.60	$48.64	$1,040.40	$1,000.00	$31.21	$30.00
3	$1,000.00	$942.32	$50.60	$47.68	$1,061.21	$1,000.00	$31.84	$30.00
4	$1,000.00	$923.85	$50.60	$46.75	$1,082.43	$1,000.00	$32.47	$30.00
5	$1,000.00	$905.73	$50.60	$45.83	$1,104.08	$1,000.00	$33.12	$30.00
6	$1,000.00	$887.97	$50.60	$44.93	$1,126.16	$1,000.00	$33.78	$30.00
7	$1,000.00	$870.56	$50.60	$44.05	$1,148.69	$1,000.00	$34.46	$30.00
8	$1,000.00	$853.49	$50.60	$43.19	$1,171.66	$1,000.00	$35.15	$30.00
9	$1,000.00	$836.76	$50.60	$42.34	$1,195.09	$1,000.00	$35.85	$30.00
10	$1,000.00	$820.35	$50.60	$41.51	$1,218.99	$1,000.00	$36.57	$30.00

For illustrative purposes only.
Source: Wrase (1997)

Conversely, the real coupon and the real face value remain unchanged at $30 and $1,000 in the case of the inflation-linked bond, but the nominal face value and the nominal coupon increase over time with the rising inflation index (i.e., the inflation-adjusted face values and coupons). The nominal coupon and the nominal value of the bond in year t result from the following formula:

$$Nominal\ Value_t = 1{,}000 * 1.02^t$$

$$Nominal\ Coupon_t = 30 * 1.02^t$$

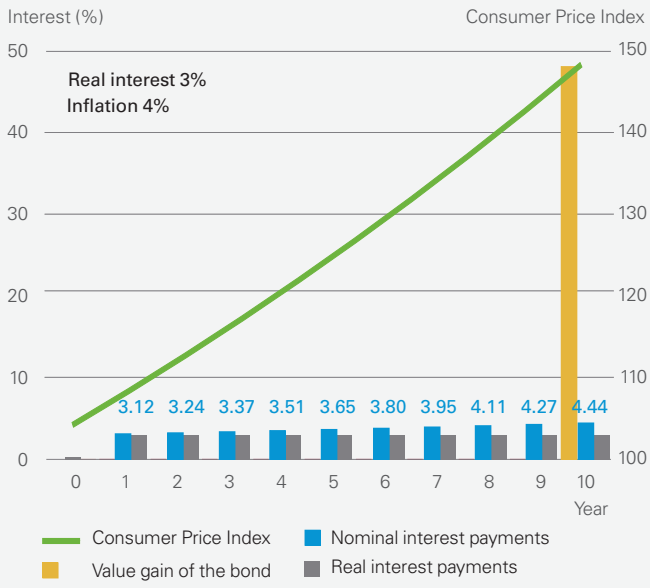
If we state the inflation index at the time of issuance of the bonds at 100, the index ratio at a point in time t is calculated as:

$$Index\ Ratio_t = \frac{Price\ Index_t}{Price\ Index_{t=0}} = \frac{100 * 1.02^t}{100}$$

Thus, it is a characteristic of inflation-indexed bonds that the real quantities of coupons and principal are constant over time, whereas the nominal quantities are adjusted upward with the rise of the inflation index.

But Exhibit 3 shows another important difference between the traditional bond and the inflation-linked one. Although the example was selected such that both securities retroactively achieved the same real yield, the cash flow structure is completely different. While the indexed bond yields less regular interest each year than the traditional bond, this is offset by the much larger principal repayment at maturity. In Exhibit 4, we show the real and nominal cash flow of an inflation-linked bond using a time axis. This was calculated with 3% real interest and inflation of 4%.

Exhibit 4
Cash Flow Structure of an Inflation-Linked Bond



For illustrative purposes only.
Source: Federal Association of German Banks

Exhibit 4 illustrates the prominence of the principal repayment relative to interim cash flows as a result of the adjustment to reflect the inflation rate. The rise in the nominal value of the bond is clearly sharper than in the previous example, because a higher inflation rate is assumed.

A Few Technical Details

In order to correctly understand trading and valuation for inflation-indexed bonds, it is necessary to examine some technical details. We wish to highlight two points, namely, the calculation of the index ratio and protection against deflation.

A vital attribute of any inflation-linked bond is the index ratio for characterizing price trends since the issuance of the bond. This index ratio is calculated by the issuer on a daily basis and made available for bond trading (via Bloomberg, Thomson Reuters, or other data services).

An important factor for the index ratio calculation is which inflation index is selected. For government bonds in the United States, for example, the consumer price index (CPI) is used, while the United Kingdom uses the retail price index (RPI). France has bonds outstanding that are linked to the national consumer price index ex-tobacco, as well as bonds that are linked to the euro zone harmonized index of consumer prices ex-tobacco (HICP ex-tobacco). Thus, the bonds are always linked to a fixed inflation index. This can mean different levels of preservation of purchasing power, depending on the index selected.

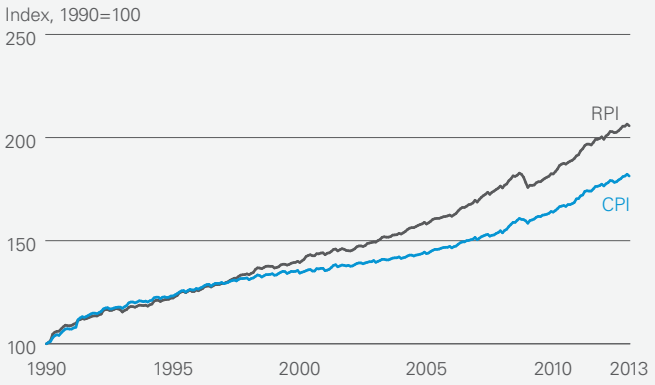
The question as to which price index is selected as the basis for linker calculations is more than a theoretical consideration. The inflation protection the investor attains relates to the highly specific composition and calculation methodology of the basket that serves as the base for the price index.

In times of mistrust of governments and fears of financial repression, it seems advisable to consider whether the bond selected really offers protection or whether the underlying price index is subject to manipulation via the transition to "holistic price indices." For example, in the United States, improvement in the quality of products is included in the index calculation, and thus the inflation rate can be kept "artificially" low.

An example of this uncertainty is the current discussion in the United Kingdom concerning a change in the price indicator used in the indexing of linkers from RPI to the CPI. This is significant because the two indices have substantially different patterns over the long term owing to the different treatment of ancillary rental costs and interest costs, as shown in Exhibit 5 (Johnson 2012 and AXA 2011).

In calculating the index ratio, it must be noted that official inflation indices are not calculated on a daily basis, but only monthly and with a time lag (Mussche 2001 and Garyo, March 2003). Depending on the index, the consumer price for a specific month is not published until one to three months later. Therefore, precise methods for the daily calculation of the index ratio depend on specific rules regarding which reference index level is to be taken as the "current" index ratio (referred to as "indexation lag").

Exhibit 5
Retail Price Index against the Consumer Price Index in the United Kingdom



As of January 2013
Source: Haver Analytics

In the French (and Greek) euro zone HICP indexed OATs (*Obligations assimilables du Trésor*, or French government bonds), the reported level of the HICP ex-tobacco three months prior is taken as the current index status (a bond today would not take into account the price increases from the immediate prior three months). In calculating the index ratio on a precise daily basis during the month (relevant for purposes of the calculation of accrued interest), a linear interpolation is calculated between the index status three months prior and the status two months prior (Madsen 2006 and Garyo, March 2003). In special situations, such as when an index calculation is absent or rebased, or if the index must be completely replaced by another index, a detailed explanation addressing these concerns are generally found in the bond prospectus.

Another factor to consider is that inflation-linked bonds differ in the procedure for addressing deflation (Richards 2003). In Japan, for example, negative price increases can occur even over longer time periods, such that the index ratio would fall below unit. This means that the nominal coupon would be smaller than the real coupon, or the nominal value of the inflation-linked bonds would fall below 100.

There are different issuer provisions for a deflationary environment. Inflation-linked bonds in the United States, France, Italy, Sweden, and Germany maintain what is referred to as a floor, or a nominal face value floor, at 100. Thus, the nominal face value is protected against deflation. Nevertheless, the coupons remain exposed to the negative effects of deflation. In the United Kingdom and most of the emerging markets, there is no nominal face value floor, with the consequence that both the coupon and principal are affected by deflation. Since the floor represents a built-in option, the nominal value floor plays a role in the valuation of inflation-linked bonds.

Inflation-linked bonds and traditional bonds are similar in nearly all other trading modalities. In most countries, 10-year terms dominate the market for these bonds, but 5-year and 30-year linkers are also issued. As with traditional bonds, there are issues with annual coupons, as well as semiannual and quarterly payments of interest. Trading with accrued interest (and the calculation of a "dirty price") occurs in a manner similar to regular bonds, because, as a result of the current calculation of the index ratio on the basis of the time lags, a current daily nominal coupon of the securities is also always specified. Exhibit 6 displays the most important features of the major markets of inflation-linked bonds.

Exhibit 6
Key Features of Inflation-Linked Bonds across Global Markets

Index	Known as	Amount Outstanding ($ billions)	Inflation Index	Index Lag (months)	Floor Protection
US	TIPS	618	US CPI Urban NSA	3	Yes
UK	IL gilt	281	UK RPI	3 / 8	No
Brazil	NTN-B/ NTN-C	250	IPCA/IGP-M	N/A	No
France	OATei/i	195	Euro zone HICP ex-tobacco/ French CPI ex-tobacco	3	Yes
Italy	BT Pei	147	Euro zone HICP ex-tobacco	3	Yes
Germany	Bundei/ OBLei	59	Euro zone HICP ex-tobacco	3	Yes
Japan	JGBi	57	Japan CPI	3	No
Mexico	UDIBONOS	45	UDI	N/A	No
Turkey	TURKGB CPI	33	Turkey headline CPI	2–3	Yes
Canada	CANi	31	Canada CPI NSA	3	No
Sweden	SGBi	26	Sweden CPI	3	Yes
South Africa	SAGB I/L	21	South Africa CPI	3	Yes
Greece	GGBei	20	Euro zone HICP ex-tobacco	3	Yes
Israel	Galil	18	Israel CPI	1	No
Australia	CAIN	15	Weighted average of eight capital cities	6	Yes
Argentina	ARGENT – DIS	14	Argentina CER Spot	N/A	No
Korea	KTBi	4	Korea headline CPI	3	Yes
Thailand	iLB	1	Thailand headline CPI	3	Yes
Hong Kong	iBond	1	Hong Kong headline CPI	N/A	Yes

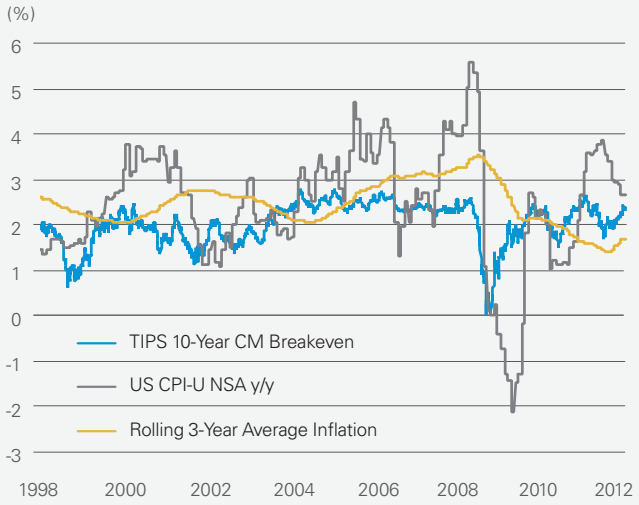
As of November 2011
Source: HSBC, National Debt Management Offices

Financial-Mathematical Aspects of Inflation-Linked Bonds

In this section, we do not intend to cover all aspects of the financial mathematics of inflation-linked bonds, but to identify relevant points for investors. Please refer to the additional literature for more details.[2]

The yield that is quoted for linkers in trading is not the regular yield to maturity, but instead is stated on a real basis. This real yield is

Exhibit 7
US 10-Year TIPS Breakeven



As of May 2012
Source: Barclays Research

calculated by taking the real coupons and the repayment of principal as cash flows without inflation compensation. The yield is, as usual, determined as an internal rate of return. In order to bring the yields of inflation-linked bonds into a methodology comparable to the nominal yield of traditional bonds, the investor must add inflation expectations to the real yield.

If one wishes to compare the attractiveness of an inflation-linked bond to that of a traditional bond with the same term, it is typical to use breakeven inflation rates. This is the assumed constant inflation rate for the term that makes the present value of the cash flows of the inflation-linked bond—discounted using the yield of the comparable traditional bond—equal to the price of the inflation-indexed bond. The breakeven inflation rate is the measure that makes the investor indifferent to owning a traditional bond versus an inflation-linked one. If the breakeven inflation rate is higher than the anticipated inflation rate, traditional bonds are more attractive than inflation-linked bonds. If the breakeven inflation rate is lower than the investor's inflation expectation, the investor will choose the linker. In Exhibit 7, we have a graphical description of breakeven rates and inflation in the United States.

In practice, it is also possible to use simpler rules for calculating the breakeven inflation rate than the aforementioned exact mathematical definition (Witzel 1999). For example, the following rule is used (where nominal yield equals the yield of the traditional bond, and real yield equals the real yield of the linker):

$$Breakeven\ Inflation \approx \frac{1 + nominal\ yield}{1 + real\ yield} - 1$$

Breakeven inflation rates are of great importance to economists, strategists, and central banks.[3] According to capital-market theory, the market should always price traditional bonds and inflation-linked bonds so that it is possible to deduce from the breakeven inflation rate the inflation expected by the market over the term of the bonds (ignoring liquidity and risk premiums).

The concept of duration can also be applied (if slightly adjusted) to inflation-linked bonds. But if it is intended that the duration be used as a measure of interest rate risk (as in traditional bonds), one should keep in mind that, as noted by Bowler (2001), in traditional bonds, duration represents an approximation of bond price change in the event of a change in nominal yields. For inflation-linked bonds, duration represents the price change when there is a change in real yields.

What is the duration of inflation-indexed bonds compared to traditional bonds, and what is the price sensitivity of different types of bonds? As we have learned, the coupons of inflation-linked bonds are (assuming equal real income) substantially smaller than those of traditional bonds, whereas the principal repayment is larger. Thus, the duration of an inflation-linked bond is greater than that of a comparable traditional bond (Hammond 2002).

However, that does not mean that the risk of price change would therefore also be greater. This is because the price-determining quantity of the linker, the real interest rate, is—as history shows—much less volatile than the price-determining quantity of the traditional bond, the nominal interest rate. Thus, the inflation-linked bond is more closely tied to changes in real interest than traditional bonds are tied to changes in nominal interest, but since real interest is much less volatile than nominal interest, it is ultimately apparent that the price volatility of ten-year linkers is approximately only as great as that of four- to five-year traditional bonds. Thus, a linker's duration is not a measure of risk for the purpose of comparing them with traditional bonds, but is instead merely a measure of the risk of linkers alone.

Concepts such as convexity can also be applied to inflation-linked bonds (the convexity is also greater), but we do not intend to go into this any further here.[4]

Finally, the inflation beta, or the inflation sensitivity of a linker, is a key measure that is frequently used as we noted in our previous paper, *Equity Investments as a Hedge against Inflation, Part 2*.

Inflation-Linked Bonds as an Investment Alternative

As an asset, we believe inflation-indexed bonds can be an ideal hedge for institutions whose liabilities fluctuate sharply with the inflation rate (Stumpp 2003). This applies, for example, to the liabilities of many defined-benefit plans whose obligations are linked to unknown future wage growth that is strongly correlated to the inflation rate. If such institutions invest mainly in traditional bonds, they run the risk that, as a result of a sharp rise in inflation, the value of their assets could fall sharply just as the value of their liabilities increases.

In contrast, the value of inflation-linked bonds could increase in times of high inflation when the liabilities of many institutions are rising disproportionately. That means that inflation-indexed bonds are a suitable tool for easing asset-liability matching for many institutional investors, in our view.

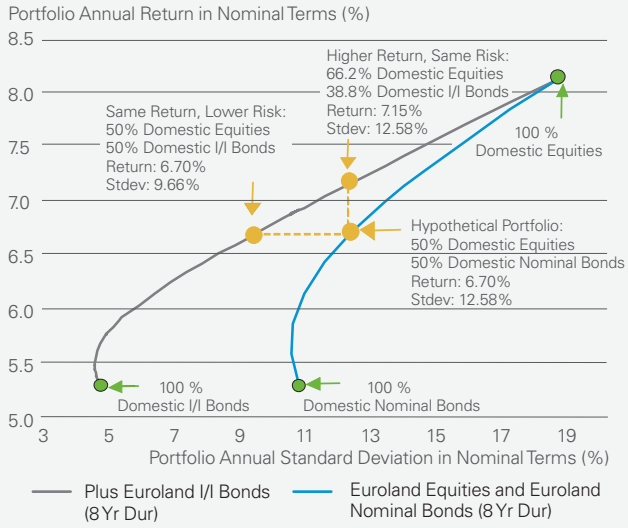
Inflation-linked bonds are directly linked to changes in inflation, whereas government bonds are negatively correlated to the inflation rate. We believe this also makes linkers attractive to conservative inves-

Exhibit 8
Asset Class Returns by Economic Environment

Economic Environment	Asset Class	Average Return (%)
Rising Growth	Equities	13.9
	Commodities	10.2
	TIPS	8.4
	Bonds	1.1
Falling Growth	TIPS	9.4
	Bonds	8.8
	Equities	5.8
	Commodities	1.2
Rising Inflation	TIPS	19.4
	Commodities	11.5
	Equities	5.9
	Bonds	3.9
Falling Inflation	Equities	12.9
	Bonds	7.1
	Commodities	-0.9
	TIPS	-1.4

For the period 1926 to 2010
Source: Bridgewater Associates

Exhibit 10
Inflation-Linked Bonds as Part of an Optimal Portfolio



Source: Bridgewater Associates

tors who strive for long-term savings and for preserving the value of their assets.

On the other hand, stocks, real estate, and commodities—asset classes that potentially offer some inflation protection—are only indirectly connected to the inflation rate, and the correlation is highly unstable. Particularly in periods of stagflation, only inflation-linked bonds offer optimal protection against inflation. Not only traditional bonds, but even stocks, real estate, and commodities are therefore inferior to inflation-indexed bonds in terms of inflation protection under certain economic environments as shown in Exhibit 8.

Inflation-linked bonds historically have a low correlation to stocks and traditional bonds over the long term as a result of the behavior of the these asset classes in periods of real growth and inflation, even though this diversification has become somewhat smaller in recent years, possibly due to the rising liquidity of the linker market as noted by Brière and Signori (2008).

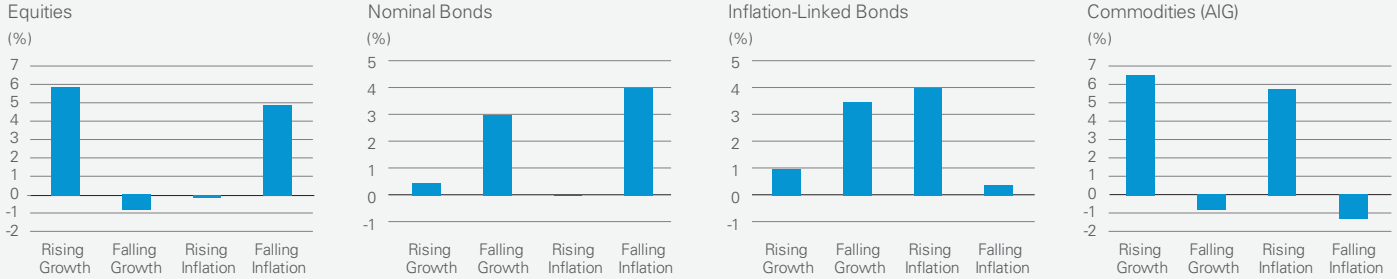
The nearly perfect combination of inflation-indexed bonds and stocks is made even clearer by the graphic in Exhibit 9. Whereas linkers have their best performance in times of declining growth rates and rising inflation, stocks perform the best in times of rising growth rates and declining inflation. As a result, a combination of the two asset classes appears to provide consistent, positive performance (Dimick 2009).

It should also be noted that, over the long term, inflation-linked bonds have approximately the same returns as traditional bonds with lower volatility. Thus, inflation-linked bonds can be, to a certain extent, superior to traditional bonds from a portfolio standpoint.

Therefore, some analyses propose that nominal-interest bonds should be completely replaced by inflation-linked bonds with respect to asset allocation, because the combination of stocks, other real assets, and inflation-indexed bonds could be optimal from a risk standpoint (Illeditsch 2009).

In summary it can be shown—by plotting the efficient frontiers—that a mix of inflation-linked bonds and stocks leads to more (theoreti-

Exhibit 9
Returns of Equities and Inflation-Linked Bonds Are Complementary



For the period 1970 to 2009
Source: Bridgewater Associates

Exhibit 11
Inflation-Linked Bonds Favor Different Phases of the Economic Cycle
Comparison of nominal and real interest bonds

Economic Phase	Inflation Expectations + Risk Premium	Activities of the Central Bank	Effects in the Bond Market	Positive for Real or Nominal Interest Market
I. Overheating	Low, but rising	Beginning of interest rate increases	Negative	Real
II. Cooling	Over-shooting	Interest rate increases	Less negative	Real
III. Recession	High, but sinking	Beginning of interest rate reductions	Positive	Nominal
IV. Recovery	Under-shooting	Interest rate reductions	Less positive	Nominal

For illustrative purposes only.
Source: Union Investment

cally) efficient portfolios, in contrast to a portfolio that has a mix of traditional bonds and stocks. As such, inflation-linked bonds can be useful risk-reduction tools in traditional capital investment portfolios, as shown in Exhibit 10.

The theoretical considerations discussed in the preceding section, which are often based on extremely long investment horizons, should not be overstated. In practice, inflation-linked bonds remain substantially less liquid than regular government bonds, in spite of growing markets and increasing liquidity in recent years. The selection of individual instruments, terms and, naturally, the issuer, is limited in most market segments.

A more practical approach involves adding linkers as a component of a broader bond portfolio and not as a complete replacement for regular bonds. This approach seems more reasonable given that transparency and liquidity are key considerations for most investors in the wake of the global financial crisis.

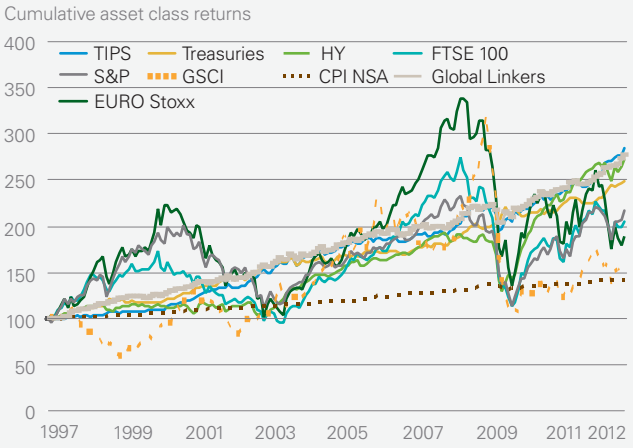
In a broadly diversified bond portfolio of traditional and inflation-linked bonds, the strategic and tactical segment allocation between these two asset classes is an important factor. The economic cycle also plays an important role. Inflation-linked bonds are more attractive in the overheating and early cooling phases (or when central banks increase interest rates); regular bonds promise outperformance in recessionary or deflationary phases and in the early phase of a recovery, when central banks use expansive policies, as illustrated in Exhibit 11.

Historical Performance, Valuation, and Risks of Inflation-Linked Bonds

Over the past decade, inflation-linked bonds have offered strong performance with low volatility, and have thereby highlighted the attractiveness of the asset class (see Exhibit 12).

What are the primary risks today for investors in inflation-linked bonds? Even though these assets offer inflation protection, they are not free from market price fluctuations (see Barra 2000 and Mannin 2003). The primary price determination factor of inflation-linked bonds is the real interest rate. Real interest rates fluctuate less sharply than nominal interest rates, but are nevertheless unstable. Real interest rates are primarily dependent on the economic dynamic, growth, and resulting capital supply-demand constellation (Berner 2004). Linkers lose value when real interest rates rise.

Exhibit 12
Cumulative Performance of Selected Asset Classes



For the period February 1997 to February 2012
Source: Barclays Research

What is the current environment? The recent inflation fears due to rising sovereign debt in OECD (Organisation for Economic Co-operation and Development) countries, the expanding monetary policy following the global financial crisis, the flight to the safety of bonds in more developed economies, and falling growth expectations have made the inflation-linked bonds of the United States, Japan, the United Kingdom, Germany, and other core OECD countries less attractively valued. The real interest rates traded on the market are now even negative, with the consequence that the direct protection against inflation of linkers is expensive (see Exhibit 13).

It appears that protection against inflation continues to remain an important requirement of institutional investors. But even if one agrees with most observers that a rising trend in savings, a diminished demand for capital, and a declining capacity for innovation will keep real interest rates in Europe and the United States low on a medium-term basis, a negative real interest rate does not seem attractive (Butler 2003).

In addition, income from inflation-linked bonds is lower than that of traditional bonds in times of falling inflation and declining inflation expectations.

Exhibit 13
US 10-Year TIPS Yield

As of 13 February 2013
Source: Haver Analytics

If the probability for deflation that emerged after the euro zone crisis increases, we may have a return to the underperformance of inflation-linked bonds that occurred in the 1990s.

Other weaknesses of inflation-indexed bonds should be mentioned. The lower cash flows (or lower regular coupons, but higher principal repayment), relative to traditional bonds, may be a disadvantage for investors who rely on regular income from capital investments.

In addition, the liquidity of inflation-linked securities is generally less than that of traditional investments, since inflation-indexed bonds are primarily bought by buy-and-hold investors. Tax aspects can also burden investments in the asset class.

Are Inflation-Linked Government Bonds the Best Example of a "Riskless" Asset Class?

The "riskless" or risk-free investment is a central concept in capital market theory, serving as the basis of many theoretical debates and models. Investors will wonder what constitutes "riskless," since none of the traditional investments is riskless in reality.

In practice, money market investments or government bonds are used as a proxy for risk-free investments, but it must be conceded that neither asset class is riskless for most investors.

For example, investments in the money market could potentially avoid the short-term risk of price changes, but viewed from a long-term perspective, neither the nominal income nor the real income from money market investments is known; therefore, money market investors run the risk of failing to meet their long-term yield goals.

Government bonds are not without risk for multiple reasons. When these bonds are purchased, the nominal amount is known to the buy-and-hold investor on a long-term basis (setting aside the credit risk, which, as we now know, is also associated with government issuers), but the securities can suffer painful price losses in the interim if interest rates increase. Thus, government bonds also have inherent risks.

Even for long-term investors who do not view intermediate unrealized losses as a risk, the real annual income of a capital investment over the long term is unknown in an environment of rising inflation rates, even if all nominal payments are made as expected. This means that buyers of traditional government bonds in an inflationary environment risk losses in purchasing power.

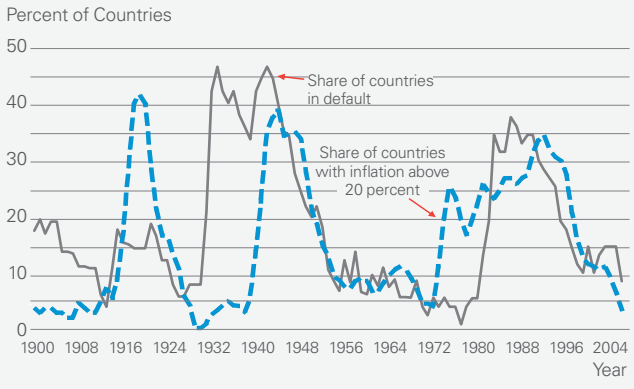
The term "riskless" is thus not clearly defined, but instead depends heavily on the investment objective. Many investment entities, such as pension funds, insurance companies, and individuals planning for retirement, must achieve the safest possible real accrual of interest on their assets, since their liabilities also have specific real growth rates (for example, through the link to wage growth, as is the case for some institutional investors).

For these investors, government bonds are not without risk, given that the securities could fail to have the previously described features of value preservation.

Thus, inflation-linked government bonds appear to come as close as possible to the idea of a riskless asset, in terms of preservation of real value. Following the financial market and sovereign debt crisis, however, we have found ourselves in a new environment, in which government bonds are no longer safe. Since most inflation-linked bonds are government bonds, they are also associated with credit risk.

We believe an additional characteristic is particularly unattractive for inflation-linked government bonds. Historically, the risk of real debt relief via inflation and state bankruptcy, have been highly correlated. In other words, inflation-linked bonds ultimately might not offer any protection against high inflation in times of severe sovereign debt crises, because the state's bankruptcy may occur simultaneously with rising inflation, as illustrated in Exhibit 14.

Exhibit 14
Inflation and State Bankruptcy Go Hand in Hand
Inflation and External default:1900–2006



Time Periods	Correlations
1900–2006	0.39
Excluding the Great Depression	0.60
1940–2006	0.75

Source: Reinhart and Rogoff (2008)

Summary

Inflation-linked bonds are a unique asset class. They may offer a nearly perfect hedge against inflation and have low correlation with other asset classes. Therefore, they have a risk-reducing effect for portfolios. In particular, some observers view portfolios mixing stocks and linkers as optimal.

For this reason, it is not surprising that inflation-linked government bonds, along with several other inflation derivatives, have gained importance in nearly all markets in recent years.[5]

In the past decade, inflation-linked bonds have had favorable performance and low volatility compared to other asset classes. However, bonds of the largest linker issuers, such as the United States, the United Kingdom, and Germany, are now priced at negative real interest rates (i.e., they are less attractively valued).

We believe inflation-linked bonds are an important investment vehicle, particularly for investors whose liabilities are closely tied to changes in inflation or wages. This feature helps to more effectively control many problems that traditional investment vehicles cannot solve. However, these securities are less liquid than traditional bonds, which may derail practical implementations.

In light of the global debt crisis, it is now necessary in our view, to place greater importance on the credit analysis of inflation-linked government bonds. Reinhart and Rogoff (2008) have also shown that, historically, state bankruptcy and high inflation often coincide, with the consequence that linkers may not offer protection against inflation that is as complete as expected by investors.

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Werner Krämer is a Managing Director of Lazard Asset Management LLC and Economic Analyst in Frankfurt. He began working in the investment field in 1990 and joined Lazard in 1999. Prior to Lazard he was affiliated with Deutsche Bank where he worked two years within the Derivatives Trading team and seven years for several Research divisions. Werner has a Diploma in Mathematics and Economics from the University of Trier. He is also a CEFA Analyst.

Notes

1 See: "Anleihen mit Inflationsschutz sind umstritten [Bonds with Inflation Protection Are Controversial]." *Handelsblatt*, November 2003.
2 See: Baz (2004), Minkin (2003), Garyo (2003), and Manning (2003).
3 See: Inflation wieder ein Thema am Bondmarkt [Inflation again a topic in the bond market], *Neue Züricher Zeitung*, 24 September 2003.
4 See: Preusser (2001) and Mountian (2003).
5 See: Oppon (2003), Nehis (1998), and Artus (2001).

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Important Information

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