Hedging Inflation Internationally

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Comments Welcome

Abstract

The objective of this paper is to explore and identify inflation as it is embedded in a broad range of asset classes beyond simply TIPS, Oil, Gold and Real Estate. The analysis is conducted primarily from the perspective of a United States investor however the results are validated across a range of countries that span the developed and emerging world including resource intense economies and those that have previously experienced hyperinflation. We find that an investor who is looking for a positive real return while minimizing the downside with respect to inflation will have an allocation that consists primarily of short-term bonds, longer-term bonds, some gold, some oil, and some emerging market equities. The weight of gold and oil together is less than 10% of the portfolio and is not always relevant for all countries. We also find that TIPS are only slightly effective for protecting against inflation conditional on an investor using a group of asset classes. Equities still provide the greatest average real return over the period, but with a much greater downside loss in terms of real return.

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I Introduction

Various experts, here and abroad, believe that the immediate postwar inflationary climate has now been converted into an epoch of price stability. One hopes this cheerful diagnosis is correct. However, a careful survey of the behavior of prices and costs shows that our recent stability in the wholesale price index has come in a period of admittedly high unemployment and slackness in our economy. For this reason it is premature to believe that the restoration of high employment will no longer involve problems concerning the stability of prices.—Paul Samuelson, Letter to John F. Kennedy, 1961

In order to alleviate some of the effects of the financial crisis of 2007-2008, the Federal Reserve as well as other central banks worldwide have lowered interest rates to close to zero levels and have been using other mechanisms to supply the markets with liquidity. One of the worries that market participants have is that this will eventually lead to higher inflation. Although the short-term numbers suggest we are in a period of deflation, driven in part by the reduction in housing values, transportation, and commodity prices (see Figure 1 below). Whether we have inflation in the near future or not, it brings up the question of what the average investor should do to hedge against inflation or rather what is the best way to achieve a positive real return.

[INSERT FIGURE 1 ABOUT HERE]

Despite this being such an important question to investors, there is relatively little quantitative research aimed at answering this question. There are probably several reasons for this. First, any attempt to maximize real returns is effectively the same as maximizing nominal returns. Of course, there is a lot of research on this question. Second, there is very little theoretical work on what asset classes and in what proportion should be good inflation hedges. Third, it might be very hard to find statistical models that provide a good hedge against inflation in all periods (for example, high inflation and low inflation periods).

There has been a small literature dedicated to using asset returns to forecast macroeconomic variables, such as inflation, and these studies find that there is some forecasting ability of the markets (Adrangi et al. (1999), Bodie (1976), Lamont (2001), Campbell and Ammer (1993), Cozier and Rahman (1988), Fama (1975), Hayes (1999), and Titman and Warga (1989)). Our paper approaches approaches the issue from a different perspective.

First, we do not attempt to forecast inflation or unexpected inflation. Rather, we attempt to discover which assets provide the best hedge against inflation contemporaneously. Second, we use a class of asset returns and attempt to find the relation between inflation and these asset classes

over a variety of historical investment periods beginning in 1900 for many countries. Third, we investigate the hedging approach both as a linear regression of asset returns against inflation to find the mimicking portfolio for inflation (the regression approach) and by finding the optimal portfolio which minimizes the tracking error of the portfolio versus inflation while providing a given real return (the portfolio approach).

We study the asset class hedges for a wide variety of countries, including the USA, Chile, Mexico, Argentina, Bolivia, Peru, South Korea, Japan, Singapore, Hong Kong, India, the United Kingdom, France, Germany, Italy, Spain, Brazil, Russia, China and Australia. We chose the countries both for geographical representation, as well as to represent countries with a varying degree of inflation histories.

The paper is organized as follows: section II describes the data used in this study; section III discusses the methodology for constructing both the regression and portfolio inflation hedges; section IV discusses empirical results; section **??** discusses the implications for the investing public; and section V concludes.

II Data

The data for this study was obtained from multiple data sources including Global Financial Data (GFD), Bloomberg L.P., National Association of Real Estate Investment Trusts (NAREIT), and Factset Research Systems (FRS). Some raw data items extend back to the 13th century however all data prior to 1900 was discarded for the purposes of this paper. We obtained data for 19 different countries, including Argentina , Australia , Brazil , Chile , China , France , Germany , Hong Kong , India , Italy , Japan , Mexico , Peru , Russia , Singapore , South Korea , Spain , UK , and the USA. We obtained central bank interest rates, commercial paper yields, commodity indices, commodity prices, consumer price indices, stock indices, total return stock indices, and wholesale price indices from GFD. We obtained equity sector returns for each country and exchange rates from Factset. We obtained inflation protected fixed income securities from Bloomberg. We obtained real estate investment trust returns from NAREIT. More details on the data we used can be found in the appendix to this paper.

Wherever possible, total return indices are used. All index values are transformed into percentage change for comparability with the inflation series. For the purposes of this paper, the rate of inflation is reported as the Year over Year (YoY) change in an inflation index, usually represented

by a government reported measure of consumer prices. The consumer index is comprised of a basket of goods and services that a typical household consumes including energy, food, transportation, clothing and housing. In many countries, benefits paid by the government to retirees and other beneficiaries are indexed to consumer price based indices and thus there is a criticism that consumer price based inflation measures are downwardly biased to reduce government expenditures. This paper will use the consumer price index as the primary measure of inflation. The use of the year-on-year inflation number is also to reduce seasonal and cyclical effects present in inflation numbers. To remain consistent with this convention, all of the returns of assets in this paper are computed on a year-on-year basis. Thus, the S&P 500 return is the return of the index over the last year. All returns for asset classes endemic to the country being analyzed have been extracted in local currency terms. Returns for global asset classes that are reported in U.S. Dollars (global equity, global bonds, emerging market equities, emerging market bonds, and commodities) have been converted to local currency using the prevailing exchange rate consistent with the time period of the asset return.

While gathering the raw data from multiple sources and extending back to 1900, there were several data issues that needed to be addressed and others which might be relevant to highlight. First, many series for various countries did not exist or started much too late to be included in the analysis. Second, some countries, such as Australia report consumer price inflation quarterly, thus, we filled in all three months of that quarter with the same value of the CPI variable. Third, the United Kingdom stock market was closed from May, 1914 - August, 1914 due to WWI and thus had no returns for this period. Other countries, such as Germany, had very curious behavior of their stock market series. For instance, in July 1948, Germany converted from the Reichsmark to the Deutschemark at 1:1 for currency and deposits. However, for stocks the conversion was done at 10:1. Thus, anyone who had owned or purchased stocks the day before the conversion effectively lost 90% of their wealth upon the conversion. Fourth, the oil price series that we use in this paper (West Texas Intermediate Oil) did not fluctuate very much and was constant for many months. In fact, from about 1919 until the late 1970s, oil did fluctuate much and was constant for many months. This was primarily due to two organizations. From 1919 until later in the century, the Texas Railroad Commission was widely believed to set oil prices for the world.[1] Later

[1]The Texas Railroad Commission (TRC) evolved from its founding in 1891 to a multi-divisional regulatory commission that oversaw not only railroads but also a number of other industries central to the modern American economy: petroleum production, natural gas utilities, and motor carriers.

in the century, there was also oil price fixing by OPEC (Organization of the Petroleum Exporting Countries). The price of oil began to fluctuate more during and after the 1970s (see Figure 2).

[INSERT FIGURE 2 ABOUT HERE]

[INSERT FIGURE 3 ABOUT HERE]

Fifth, due to the fixed exchange rate system based on the gold standard that was in place in many countries until the early 1970s, the spot price of Gold went through sustained periods where it did not change. For example, the price of Gold was $20.67 from before 1900 until 1933 when it was reset, over a 12 month period, to $35. The price remained in a range from $35-$40 from 1935 until 1971.

Sixth, another interesting point that can be seen from this graph is that gold is not always an inflation hedge. The typical analysis of gold is from a very US-centric position. Figure 3 shows the index of gold with respect to the dollar, yen, and euro. One can easily see that the movement of gold prices in different base currencies is very different. Thus, while gold might be a hedge against inflation at times for a US investor, it might not be for investors in other countries. Both the gold and oil stability are particularly noteworthy since they will act like a stable asset class for the inflation analysis in the period 1901 - 1970.

Seventh, the Euro became the common currency for the European Union in January of 1999. From January, 1985 until the advent of the Euro in 1999, the ECU (European Currency Unit) represented the returns of the European Union and thus we include the ECU returns in the Euro time series from 1985-1999. Prior to 1985, there was no common currency. However, as the currencies that form the European Union are represented proportionately by their economic size (e.g. GDP), we use the currency return of the largest country (German Deutschemark) to represent the EU prior to 1985. For the currencies that were replaced by the Euro in 1999 (i.e. the German Deutschemark, French Franc, Italian Lira, and the Spanish Peseta) the local exchange rate was carried forward however the monthly percent changes reflect the change in the Euro from the time that the country switched to the Euro.

The data is summarized in Tables 1 and 2. Table 1 lists the mean returns of key variables over 3 different time periods beginning January 1930, January 1970, January 1990 and all ending in May 2009 for all countries included in the paper. The key variables are CPI, PPI, Broad equities (Stock indices), government bonds, corporate bonds, high yield bonds, IP (Inflation protected bonds), real

estate, gold, silver, oil and wheat all in local currency terms. All of the variables are defined in the Appendix Section A. The number of observations with valid data is also noted for each country and each time period. Russia only has relevant data from January 1996 so there are 161 months of observations.

[INSERT TABLE 1 ABOUT HERE]

[INSERT TABLE 2 ABOUT HERE]

The reader will notice that for countries that experienced hyperinflation over this period where the mean YoY change in CPI is very high (predominantly Latin American countries), the mean return of certain assets denominated in their own currency are also very high. For example, while the price of Gold in USD would have risen an average of 11.33% on a rolling 12 month basis from 1970-2009, the price of gold denominated in Brazilian Real would have risen, on average, 320% reflecting the massive depreciation of the Brazilian currency over the same time period. It is also apparent the improving price stability across most countries in moving from the 1970s to the 1990s as there was more emphasis on price stability by the worlds central banks. For example, the average YoY change in CPI for the United States went from 4.63% from 1970-2009 to 2.88% from 1990-2009.

Table 2 follows a similar structure to Table 1 in terms of time periods, countries and key variables however the data being displayed are the average correlation of the variables with CPI. We note that PPI generally is very highly correlated with CPI. Also, the correlations tend to be higher for those countries with hyperinflation than for the other countries. Countries that experience hyperinflation will typically experience a very large depreciation (if not an outright devaluation) of their currencies. This makes the price level of the asset variables higher as they become more expensive to buy using the depreciated currency. Thus hyperinflation erodes the purchasing power of the currency and will lead to high correlations between inflation and the price level of the assets denominated in that currency. Again, this predominantly affects the Latin America countries and can significantly skew the results of the analysis.

For most other countries, the correlation of most asset classes to CPI is relatively low or negative. For example, the correlation of the YoY change in CPI with the 12 month return of the US Stock index is 0.05 from 1990-2009. A similar pattern holds for other countries and other asset classes. However, the opposite is true when looking at oil and gold where we see some higher positive correlations to the YoY change in CPI. Again, looking at the United States, the correlation of oil

and gold to the YoY change in CPI from 1990-2009 are 0.16 and 0.48 respectively. This is consistent with the general notion that gold and perhaps oil might serve as good inflation hedges for investors. We note that the relationship between PPI and CPI appears to have gotten weaker as we moved from the 1970s data set to the 1990s data set. This is true across all countries.

The correlation of the key variables to inflation is going to be important in that the co-movement between the inflation series and the key variables will impact the optimal combination of assets to construct an optimal hedge and to achieve a targeted real return. We would expect that to hedge inflation, an optimal portfolio may include assets that are more highly correlated to inflation.

III Construction of Inflation Hedges

A Theoretical Considerations

There is surprisingly very little theoretical work on what sorts of asset classes might be natural hedges against inflation. Much of the work has been focused on how stock returns relate to inflation, but disagreement on direction. This includes work by on money illusion and taxes (Modigliani and Cohn (1979), Hendershott (1981) and Summers (1981)). The authors were not able to find any paper theoretically relating gold or other asset classes to inflation. There have been a small amount of papers dedicated to studying the relationship between inflation and inflation hedging within the context of the stock market, including Patel and Zeckhauser (1987), Reilly et al. (1970), Brennan and Xia (2000) have a simple model that the optimal strategy consists of investments in cash, equity, and a single nominal bond with optimally chosen maturity. In the context of inflation protected securities, in particular TIPS, there are a series of papers that study the impacts of these instruments in one's investment portfolio, including Mamun and Visaltanachoti (2006), Roll (2004), and Siegal and Waring (2004). The empirical papers closest to our work that attempt to study this relationship on a broader set of asset classes include Attie and Roache (2009) and Nishat and Mustafa (2008).

Of course, newspaper articles and common perceptions that gold is a good hedge against inflation for a several reasons. One, is everyone believes that gold is a good hedge, then it will tend to rise as demand for gold rises with expected oncoming inflation. Also for a US investor, if inflation is accompanied by the depreciation of one's currency, then the price of a fixed asset in terms of USD will tend to rise as the currency depreciates. This might not be true for investors of other countries,

however. We might also expect other commodities to be a hedge against inflation, since sometimes inflation is supply-side drive and as inputs to production rise, so does inflation. When inflation is of this kind, one might expect that commodity prices will rise along with CPI or consumer inflation. Short-term government bonds or short-term bank deposits might also serve as a good hedge. The argument is that this cash is given a fixed interest rate for a short period of time. The interest rate will have expected inflation built into it. To the extent that there is unexpected inflation, the rates will adjust for the next period of investment and since each period of investment is so small, the investor has a better chance of keeping up with both expected and unexpected inflation, even if with a delay. Inflation protected bonds are thought of to be good investments against inflation. In fact, several advisors have noticed a massive flood of money into TIPS-related funds in 2009. These instruments promise a real return to investors. Thus, if inflation is higher than expected, the bonds adjust their interest payments to keep the investor's real return at the expected level. A principle of all fixed income instruments is that their prices are affected by movements in interest rates. Thus, if an inflation protected security is held to maturity, it will provide a desired real return, however its actual return in any sub-period may be much more volatile and fluctuate quite dramatically as interest rates change. Thus, depending on an investor's goals and investment horizon, inflation protected bonds may not be the best inflation protecting investment. The stock market measures the present discounted value of dividends or profits. To the extent that inflation pushes all prices up, one might expect that the future dividends will be bid up too as well as future profits in nominal terms and hence prices will keep pace with inflation. Naturally, there are certain types of inflation that may hinder the functioning of the economy and/or cause firms to reduce their margins, which then might offset this. Certain equity sectors of the economy might do better depending on certain types of inflation. Although it's not clear off-hand which those would be. Real-estate has always been thought of as a good hedge for inflation, since as prices of goods in the economy rise, so will the prices of a relatively scarce good, land. Thus, one would think real estate would make a good inflation hedge. Finally, foreign exchange might be a particularly good hedge for Latin American or hyperinflation countries. A country that is experiencing hyperinflation will find it difficult to find many asset classes that keep up with it. In these hyperinflation countries the exchange rate is either depreciating fast or devalued in large lumps very frequently. In fact, one of the best decisions might be to hold one's money in a stable, safe currency like the USD. This is equivalent to shorting one's own currency.

B Data Considerations

Due to natural data limitations, the choice of the historical data horizon and the instruments will be related, since some instruments simply do not have a long history. In theory, we would like to use a historical data horizon as large as possible so as to capture as many inflationary periods for each country that existed. In practice, this is very difficult since most of our main asset classes lack history prior to 1970. Thus, in this paper, we have chosen to use several historical data horizons. One from 1901 to the present, one from 1970 to the present, and one from 1990 to the present. In some senses, we will have more faith in the regressions that include the 1970s due to the high inflation in that period. Although that is no guarantee either, since one could argue that the inflation that might arise in the near future in the world will be demand drive inflation rather than supply-side drive inflation like in the 1970s. Nevertheless, by estimating our models on several patches of history, we might be able to identify key characteristics that are involved in an appropriate inflation hedged portfolio.

The relationship between inflation and asset classes might change over time. For each country, we use CPI inflation as the instrument which investors would like to hedge. We then look at various histories to estimate which asset classes might aid the investor against inflation. Although we have data going back to the 1500s for some countries, we chose 1901 as a starting point. Amongst all the major asset classes, we use any data for any country provided that it existed at the beginning of our starting period. We chose 4 periods to look at, from 1900 to the present, 1930 to the present, 1970 to the present and 1990 to the present. For Russia, sufficient data was not available until 1995 so the time period analyzed for Russia starts in January 1996. The first time period (starting January 1901) was selected to evaluate the long term relationship between the variables selected and inflation. Sufficient data is available for only 8 countries for this time period. Certainly the world has changed considerably since 1900 so shorter time periods were also selected to determine if there have been structural changes in the relationships. The second time period (starting January 1930) was selected as it covers the deflationary period from the inception of the Great Depression of the 1930's. Over the 39 month period from January 1930-March 1933, CPI for the United States fall over 26%. Many European countries also experienced significant deflation during the 1930s. The third time period (starting January 1970) was selected to coincide with the move from the gold standard and fixed exchange rate system in place from the end of World War II to the floating exchange rate system starting in 1971. Also this period contains the period of staglation in the

late 1970s. The fourth time period (starting January 1990) was selected to measure the impact of the end of the Cold War and the emergence of Eastern Europe as an important participant in the global economy.

Unfortunately, for many countries some seemingly important series are missing for the longer time periods. For example, we could only find housing related data from 1989 for most countries and even in the best case of the US, we only found it from 1972. However, analysis only using the period from 1990 to June 2009 present other challenges, since this was a period of albeit low inflation for the United States, although not necessarily for other countries, like in Latin America.

For each of the time periods and consistent across countries, we chose to use a group of investable asset classes for each country described in Section II and the appendix. For each country, we also use three exchange rates which are described in Table 3. For each time period, we use all asset classes available, for example our 1901 starting period has only that existed from 1901 until May 2009. For 1930, however we have data that existed since 1901 and data that existed since 1930. The latter being a larger set. In order to understand and minimize any bias from data availability issues, we sue both sets of data for our analysis from 1930 onwards. Thus, by 1990 there are four sets of variables we could use for the regressions from 1990-present.

[INSERT TABLE 3 ABOUT HERE]

C Hedging Methodology

C.1 Mimicking Inflation

In order to determine the best way to hedge inflation for an investor or provide the highest real return, we will use various techniques. The first basic technique will be using OLS to estimate which asset class combinations mimic inflation (CPI) the best for each country. Thus, we will estimate an equation of the following form:

$$\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k} \; t = 1, 2, ...T \tag{1}$$

where $\pi_{t,t+k}$ is CPI inflation from t to $t+k$, where k is represented in months, thus $k = 12$ would be the year-over-year inflation rate, N is the number of asset classes used to hedge inflation, $r_{jt,t+k}$ is the return of asset class j from t to $t+k$, and $\epsilon_{t,t+k}$ is the residual of the regression.

C.2 Generating Real Return Portfolios

Although it is informative to find which asset classes seem to track inflation, this does not really fit the goal of the investor. The investor will be concerned with his real return. The investor might actually be concerned with purchasing an asset that protects against unexpected inflation.

Let's suppose for a moment that computing unexpected inflation is a difficult task and we are left with providing an investment for the investor with the highest real return. This is the same as asking what investment will provide the investor the highest nominal return. And thus, there is nothing new to the analysis. There is already an entire literature on asset allocation for the individual. Thus, in order to make the objective more related to inflation, we need to specify an objective function for an investor that is preoccupied with expected or unexpected inflation. There is no unique way to specify this objective function. One such objective function would be to characterize an investor as one that would like to maximize his real return subject to some minimization of the nominal return deviation from inflation. That is,

$$\min \left[V \left(r_{P,t,t+k} - \pi_{t,t+k} \right) \right] \qquad \text{s.t.} \qquad r_{P,t,t+k} - \pi_{t,t+k} = \tilde{\mu}_P \tag{2}$$

where $r_{P,t,t+k}$ is the return of the investor's portfolio from time t to $t+k$, $\pi_{t,t+k}$ is the inflation rate from time t to $t+k$, and $\tilde{\mu}_P$ is the real return target of the portfolio ($\tilde{x}$ denotes the real return of variable x).[2]

This objective for the investor simply says that the investor s goal is to minimize the tracking error of the portfolio with inflation while achieving some desired real return. In our paper, we will want to select the group of assets for the investor that achieves this goal. Thus, the problem can be rewritten as:

[2]In cases where return distributions depart from normality, it may be more accurate to specify the investor s optimization problem in terms of minimizing downside-risk, rather than variance. One such choice is semi-variance as our measure of downside risk and thus the investor s objective function becomes:

$$\min_{w_i} \frac{1}{T} \sum_{j=1}^{T} \left[\min \left(\sum_{i=1}^{N} w_{i,t} r_{i,t,t+k} - \pi_{t,t+k}, 0 \right)^2 \right] \qquad \text{s.t.} \qquad \left(\sum_{i=1}^{N} w_{i,t} r_{i,t,t+k} - \pi_{t,t+k} \right) = \tilde{\mu}_P \tag{3}$$

.

$$\min_{w_i} \left[V \left(\sum_{i=1}^{N} w_{i,t} r_{i,t,t+k} - \pi_{t,t+k} \right) \right] \qquad \text{s.t.} \qquad \left(\sum_{i=1}^{N} w_{i,t} r_{i,t,t+k} - \pi_{t,t+k} \right) = \tilde{\mu}_P \tag{4}$$

$$\tag{5}$$

subject to some additional constraints. We can write this in matrix notation as:[3]

$$\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma} \qquad \text{s.t.} \qquad \mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k} \tag{6}$$

where $\boldsymbol{\gamma}$ is an N-dimensional vector of the covariances between individual asset returns and the inflation rate over the horizon from t to $t+k$, $\boldsymbol{\Sigma}$ is the variance-covariance matrix of returns of the asset classes and inflation, and $\mathbf{w}$ represents the weights of the portfolio of asset classes. In addition, contraints are added to prohibit short selling of asset classes and that the portfolio weights sum to 1.

$$\boldsymbol{\gamma} = \begin{bmatrix} C(r_1, \pi_{t,t+k}) \\ \vdots \\ C(r_N, \pi_{t,t+k}) \end{bmatrix} \tag{7}$$

The investment horizon also is critically important. An investor may care little or not at all about whether his portfolio beats inflation over a monthly horizon, but may be very concerned that it beat inflation over a 10 or 15 year horizon. For example, intuitively, someone who needs to protect their assets from inflation for the next 5 years might very well just purchase inflation-protected bonds, while someone that cares to maximize a real return with some protection from inflation over 20 years might choose to invest in a balance of short-term treasuries, equities, and commodities. One may wish to look at many investment horizons. However, the longer the investment horizon, the less data points we will have to measure the out-of-sample effectiveness of a particular investing strategy. In this paper, we use a twelve month horizon to evaluate performance.

Finally, we will have to consider the estimation horizon. For this study, we estimate the in-sample regressions and optimizations from the beginning of the period (1901, 1930, 1970, or 1990) to May 2009. For the out-of-sample regressions and estimations, we estimate from the beginning of the period (1901, 1930, 1970, or 1990) plus five additional years. This estimate is used to construct

[3] See Chincarini and Kim (2006).

inflation hedges or portfolios for the next month. We then roll the estimation forward by one month and re-estimate and form new hedges and portfolios. We continue this process until the very last month of April 2009. In order to correct the standard errors of the regression for the overlapping data, we will use the Newey-West methodology with 12 lags.[4]

IV Empirical Results

A The United States

A.1 In-Sample Results

Regressions

The regression results for the United States are contained in Table 4. As explained earlier, each time period runs a regression with sets of variables that existed at different points. Thus, column (1) is the regressions from 1901-2009 using variables that existed in 1901. Columns (2) - (3) are the regressions over the time period 1930-2009 using variables that existed in 1901 and 1930 respectively. Columns (4) - (6) are the regressions over the time period 1970-2009 using variables that existed in 1901, 1930, and 1970 respectively. Columns (7) - (10) represent the regressions over the time period 1990-2009 using variables that existed in 1901, 1930, 1970, and 1990 respectively. A . indicates that a variable was not available for the regression, while a 0 indicates the variable was available but received a coefficient of 0. Generally, one can see from the $\bar{R}^2$ that it became easier to replicate inflation in later time periods. First, more instruments were available that hedged inflation better in the later periods. For example, in the 1990 regressions, the $\bar{R}^2$ increases from 0.545 to 0.809 just being able to use instruments available only after 1990 versus the instruments available after 1901. Second, the later time periods have more stable inflationary periods. For example, the period starting in 1901 contains the high inflation of both World War I and World War II, as well as the massive deflations of the 1920s and 1930s. In a rough sense, each of these reasons (more instruments and more stable periods) contribute to about half of the improved estimation.

[INSERT TABLE 4 ABOUT HERE]

For most of this analysis we will focus on the 1930 and 1970 periods. Column (3) shows the estimates for each asset class that best mimicks inflation for the 1930 period. Generally, the

[4]The twelve lags represent the 12 months for the year-over-year computations.

important asset classes are government t-bills, corporate bonds, and oil. The fit is not very high with an $\bar{R}^2$ of 0.304. Column (6) shows the mimicking asset classes for the 1970 period using 1970 variables. The important asset classes are government t-bills, 10-year government bonds, oil, gold, and short world equity. Finally, column (10) shows the mimicking assets for the 1990 period. It seems that the finance sector, the industrial sector, government t-bills, shorting corporate bonds, high yield bonds, commodities, gold, silver, short wheat, world equity, emerging bond, and emerging equity all play a role. This regression has many more explanatory variables and they are helping to better mimick inflation. Perhaps a surprising result is that real-estate, although having a positive coefficient, is not statistically significant.

Optimizations

The primary exercise of the regressions was to find asset classes that co-moved with inflation so as to get some indication as to what might mimick inflation. An investor's objective, however is to invest so as to achieve a given real return while minimizing the possibility of negative real returns. Table 5 contains the results from the in-sample optimizations. The table shows the portfolios with minimum tracking error to inflation for a given annual target return of 0.5%, 2.5%, or 4.5%. There are periods for which such a return cannot be met. In such cases, we chose a target return as close to our target return as possible. We chose to optimize over four time periods using the full set of variables for each time period. As before, a . indicates that a particular variable A . was not available for the regression, while a 0 indicates the variable was available but received a coefficient of 0. For this discussion, we focus on the target real return of 4.5% per year. For the 1901 period, there were few asset classes and a portfolio of 38% equities, 6% government t-bills, 40% 10-year government bonds, and 16.5% oil accomplished this goal. This portfolio had a large tracking error of 10.1% and a return/risk profile of 0.44. For the 1930 period, the same target return was achieved with 9% equities, 9.2% government t-bills, 55% corporate bonds, 9.3% oil, 1.2% gold, 2% silver, and 14.2% emerging equity. For the 1970 period, the appropriate allocation was 32% corporate bonds, 6% oil, 4% gold, 49% LIBOR and 9% emerging equity. The tracking error of the position was 4.6% per year with a 0.98 return/risk ratio. Finally, the 1990 period called for 8% energy stocks, 8.5% 10-year government bonds, 18.2% 30-year governement bonds, 5.7% in corporate bonds, 5.1% in gold, 5.8% silver, and 45.3% LIBOR.

[INSERT TABLE 5 ABOUT HERE]

[INSERT FIGURE 4 ABOUT HERE]

A very consistent them in all of the regressions and optimizations is that a large part of the portfolio should be held in short-term fixed income instruments, either government t-bills or USD LIBOR. Another fairly common theme is that a smaller fraction of less than 10% should be held in gold and oil. Also a good portfolio should be held in a combination of government bonds, 10-year bonds, 30-year bonds, and corporate bonds. Perhaps the most surprising result is the small role that equity plays in the allocations. For many this will seem counterintuitive and contrary to a commonly held belief that equities are a great hedge against inflation. However, this is not as counterintuitive as it first seems given our objective function. Our goal is to earn a target real return while minimizing the deviation from inflation over any given yearly horizon. Thus, for a 4.5% real reurn, there are other combinations of asset classes that achieve this goal while providing the portfolio with much less risk than equities. For example, corporate bonds provide a very high return while having lower risk than equities.

Performance

Ultimately, the performance of these allocations is what will matter to investors. Tables 6 and 7 show the performance of the regression and optimization analysis over the entire period. We will focus this discussion on the asset allocation models, since the primary goal of the regression models was to mimick inflation. The performance statistics for the United States are located towards the bottom of both tables for the 1930 and 1970 periods. For 1970, the mean yearly real return was 4.72% and the standard deviation of real returns was 4.56%.[5] The worst real return of this allocation was -13.38% for the year ending in October 2008. This model produced a negative real return in 4.57% of the periods (see column Numbers$\leq \pi$). The mean absolute error (MAE) of this allocation, that is, the absolute return of the portfolio minus inflation averaged over the whole period, was 0.43%.

[INSERT TABLE 6 ABOUT HERE]

[INSERT TABLE 7 ABOUT HERE]

In order to help an investor better understand these results, we also produced three benchmarks that they might be more familiar with. One is an all equity allocation, another is an all bond allocation, and the third is an allocation that is 50% bonds and 50% equities. These are produced at the bottom of Table 7. The all equity portfolio had a higher mean return of 6.38%, however this

[5] *Note*: This is also the tracking error with respect to inflation.

increase came at a cost. In particular, this portfolio had a much larger volatility around inflation of 18.43%. The worst year-on-year real return for the portfolio was -50.89% for the year ending in June 1932. It also produced a negative real return of -50.89% in the year ending in September 1974. In 31.71% of the periods it produced a negative real return. The MAE is almost 9 times as large as the optimal allocation.

Taking the other extreme of 100% bond allocation leads to a slightly lower mean real return of 4.22%, but surprisingly a much higher volatility around inflation of 11.85%, a worst year-on-year return of -27.57%, and a negative real return 38.69% of the time. The 50% equity and 50% bond compromise provides a better mean real return of 5.30%, but a much higher volatility of 12.56%, a worst case return of -31.51%, and underperforms inflation 36.58% of the time.

Thus, the optimized 1970 allocation produced a portfolio with a reasonable real return versus standard alternatives but with a much lower downside with respect to inflation.

A.2 Out-of-Sample Results

Regressions

In order to more appropriately create a strategy that a US investor could emulate, we constructed out-of-sample regression and optimization techniques. Every month starting 5 years after the beginning of the period, we run the regressions (and optimizations) and use the estimated parameters to construct the portfolio for the next monthly period. We then roll the month forward and reestimate and form new portfolios. Tables 8 report the average regression coefficients for various countries in our sample, including the United States, for the periods 1930 and 1970. We focus our discussion on the 1970 results. On average over this period, government t-bills, 10-year government bonds, general commodities, gold, silver, the euro-dollar exchange rate, and emerging equities seem to play a role in mimicking inflation for the United States. The average $\bar{R}^2$ over the period was 0.682.

[INSERT TABLE 8 ABOUT HERE]

Optimizations

Tables 9 contains the average out-of-sample optimal weights for various countries, including the United States. The average allocation from the rolling optimizations is 5% government bills, 23% corporate bonds, 6% oil, 3% gold, 52% LIBOR, 1% world bond, and 10% emerging equity. The results are somewhat similar for the 1930 period, but due to the absence of a LIBOR rate, more

weight was distributed to the other asset classes especially bills, 10-year government bonds, and corporate bonds.

[INSERT TABLE 9 ABOUT HERE]

Performance

The performance of the out-of-sample regressions and optimizations is contained in Tables 10 and Table 11. As before, we focus our discussion on the optimized portfolios. It should be apparent from this table the difficult of managing a portfolio against inflation in real time. From Table 11 we observe that the target real return of 4.5% was not achieved, rather a negative real return of -0.45% with a volatility of 5.61% was the average result. The percentage of months with negative real returns was higher than the in-sample case at 14%.

Comparing this out-of-sample performance to more common allocations shows that a 100% equity position has an 8.11% average return over the same period. The all equity allocation still underperforms in the worst case by 43.56% and 28% of the time. One could argue that for many investors, this allocation is preferable to the dynamic optimization results.

Some of the poor performance of the out-of-sample optimizations may be due to the time period (remember five years are used for the initial estimation) right before the high inflationary period of the late 1970s. Some of it may be due to the instability of the parameters and thus reestimating the weights every period is not an ideal strategy. Finally, some of it ight be due to the difficulty of finding appropriate hedges against next period's unknown inflation rate.[6]

[INSERT TABLE 10 ABOUT HERE]

[INSERT TABLE 11 ABOUT HERE]

A.3 TIPS Results

In Section A we discussed the pros and cons of using inflation protected bonds in a portfolio to hedge against inflation. Treasury Inflation Protected Securities (TIPS) were introduced in the United States in January 1997. We obtained return data from the Lehman TIPS index from February 1997 to June 2005. This TIPS index has a duration of approximately 4. In order to examine what

[6]Further research might consider less frequent re-optimizing intervals, examining other periods of study, and using a rolling window to optimize than continually adding data to the window. We also think a method of using a constrained regression may provide more useful information and perform better out-of-sample.

role TIPS might play in our investor's universe, we performed both the mimicking regressions as well as the optimizations from February 2007 - May 2009 including the TIPS total return index. The results are displayed in Table 12. Columns (1) - (4) include TIPS in the analysis, while Columns (5) - (8) do not. Columns (1) and (2) are the in-sample and out-of-sample parameter estimates. Columns (3) and (4) are the in-sample and out-of-sample optimization estimates. Columns (5), (6), (7), and (8) are the analogs but without including TIPS in the estimations.

[INSERT TABLE 12 ABOUT HERE]

In both the in-sample and out-of-sample regressions, the $\bar{R}^2$ is slightly higher when including TIPS. We fail to reject the hypothesis that the in-sample estimate on the TIPS is insignificant. However, it seems less relevant in the out-of-sample regressions. The in-sample optimal allocation does not put a large weight on the TIPS. In fact, the weight is a mere 0.7%. The dynamic out-of-sample optimization puts a large weight on the TIPS. We are still investigating this result. Ultimately, it matters to compare the performance of the two. Table 13 contains the performance of the various models. We will restrict our attention to the optimal portfolio allocations. As would be expected, there is virtually no difference in results between the in-sample TIPS and no TIPS, but this was to be expected given the small weight on the TIPS. For the out-of-sample results, it is less clear cut. The average real return of the TIPS model is 1.54% versus 1.33%, however the volatility around inflation is also higher at 4.79% versus 3.08%.

Thus, overall although TIPS may add a slight benefit to a multi-asset portfolio in terms of hedging inflation, the benefit is likely to be very small.

[INSERT TABLE 13 ABOUT HERE]

A.4 Horizon Length

The main analysis of the paper considers an investor attempting to mimick or outperform the year-on-year inflation rate. One might argue that most investors will have a slightly longer horizon. Although not reported in this paper, but contained in the supplemental appendix, we considered two other horizon; a five year (60-month) and a 10-year (120 month) horizon. We found that the qualitative nature of the results did not change. An investor would choose an asset mix of 50% treasury bills or LIBOR, 31% 10-year bonds, around 8% in oil and gold, and some real estate for the 5-year horizon to achieve a 22.5% total real return over the period (or 4.5% annualized). For the

10-year horizon, about 8.3% equities, 52% treasury bills, 2.1% 30-year government bonds, 16.1% general commodities, 15% oil, silver, and gold, and about 5.7% real estate for a return of 45% (or 4.5% annualized).

A.5 Downside Risk and Short-Sales Results

We mentioned in Section C.2 that alternative optimizations might be considered. In particular, one may wish to perform the optimization allowing for short-selling of asset classes and minimizing downside risk, rather than tracking error. Table 14 contains the results for the in-sample optimization with short sales. Table 15 contains the optimization with down side risk. Although there is slight variation, the results are qualitatively very similar to the other optimizations.

[INSERT TABLE 14 ABOUT HERE]

[INSERT TABLE 15 ABOUT HERE]

B European Countries

B.1 In-Sample Results

Regressions

The European countries we studied were France, Germany, Italy, Spain, and the United Kingdom. We focus on the 1970 results for all countries discussed below. The regression coefficients of the countries are contained in Tables 16 - 18. Generally, the $\bar{R}^2$s are quite high for all countries, with a high of 0.828 for Italy and a low of 0.653 for Spain. For the most part, these countries are similar to the US in the sense that government bills or LIBOR, government bonds, oil, gold, and world bonds are important for mimicking inflation. One very different item is the importance of foreign exchange rates for hedging inflation. In particular, FX1 and FX2 seem to be valuable. For all of the currencies, FX1 is their own currency versus the dollar. Thus, the estimates suggest that a short position in their own currency might help to hedge against inflation.

[INSERT TABLE 16 ABOUT HERE]

[INSERT TABLE 17 ABOUT HERE]

[INSERT TABLE 18 ABOUT HERE]

Optimizations

The in-sample optimizations for the five European countries are contained in Tables 19 - 19. The allocations are similar to those of the US. France has 53% in government bills, 28% in 30-year government bonds, 6% in oil, 6% in gold, and 7% in emerging equity. Germany has 41% in 30-year government, 4% in oil, 2% in gold, 45% in LIBOR, and 8% in emerging equities. Italy has 64% in government bills, 8% in 30-year government bonds, 7% oil, 7% gold, 1% world bond, and 13% emerging equity. Spain has 15% government bills, 47% 30-year government bonds, 11% oil, 8% gold, and 19% emerging equity. The UK has 41% 10-year government bonds, 6% oil, 5% gold, 40% LIBOR, and 8% emerging equity.

[INSERT TABLE 19 ABOUT HERE]

[INSERT TABLE 20 ABOUT HERE]

[INSERT TABLE 21 ABOUT HERE]

Performance

As in the US case, most of the optimization portfolios achieve their target returns with low volatility (see Table 7). The countries that do less well in terms of protecting the investor are Italy and Spain. Even though the downside for these countries looks worse than the US and other European countries, these still may be better policies that simply holding equities or bonds.

B.2 Out-of-Sample Results

Regressions Optimizations Performance

[INSERT TABLE 22 ABOUT HERE]

[INSERT TABLE 23 ABOUT HERE]

C Latin American Countries

C.1 In-Sample Results

Regressions

The Latin American countries in our sample are Argentina, Brazil, Chile, Mexico, and Peru. The hyperinflation experiences of the Latin American countries make them both extremely valuable

to study from the perspective of investors in those countries, but also extremely difficult to study. Table 1 shows that since 1970, these countries have had average annual inflation rates of 347%, 345%, 56%, 28%, and 343% respectively. These extremely high rates of inflation with high volatility will make attempts at hedging very difficult. Again, we focus our analysis on the 1970 period. It should probably come as no surprise that the important asset classes for hedging are very different than for Europe and the United States. Some of this is due to that nature of the high inflation rates, but some of this is also due to the lack of available instruments to hedge with. For example, Argentina and Chile do not even have an equity index to use for this period. Many of them have no bond indices over this period, although Chile and Mexico do have a 30-year government bill index. Without bonds and bills, the hedging problem becomes more difficult. The only bond markets *available* to investors in these countries is the world bond index in local currency.

For Argentina, the important factors are short Wheat, short the peso versus the US dollar, long the peso versus the Brazilian Reale, and short emerging equity markets. For Brazil, the important factors are general commodities, oil, short wheat, and short the Brazilian Reale versus the Argentinian peso. For Chile, the important factors are government bills and short the Chilean peso versus the US dollar. For Mexico, the important factors are govertment bills and general commodities. For Peru, the important factors are equities and general commodities.

Optimizations

The asset class optimizations over the 1970 period, like the regressions, are quite dissimilar to that of Europe and the US. Argentina's optimal weight is 80.29% world bond and 18.93% FX2, which is essentially short the Argentinian peso versus the Brazilian Reale. Brazil's optimal weight is 49.79% oil, 8.38% FX1, and 13.09% world bond, and 28.75% world equity. Chile's optimal weight is 61.33% government bills, 9.81% oil, 16.56% world equity, 4.99% world bond, and 7.31% emerging equity. Mexico's optimal position is 83.05% government bills, 2.67% general commodities, 3% oil, 5.95% gold, 1.98% silver, 2.92% wheat, and 0.42% FX3. Peru's allocation is 75% equities and 25% emerging equities.

In the cases of Argentina, Brazil, Chile, and Peru the tracking error is huge, as high as 1240% for Argentina. Essentially, for these countries attempting to build a portfolio to provide a positive real return while protecting the investor from inflation is virtually impossible. This is primarily due to the large hyperinflation episodes, which make hedging inflation impractible with available instruments. The lack of bills and bonds in these countries makes it that much harder to find an

asset class that keeps up with inflation especially during extreme inflation periods. Mexico does much better with a tracking error of 10.2%, in part due to the availability of many other instruments and the lower severity of the inflationary period.

Performance

Although in many cases, it is hard to find investments that adequately track inflation, some investments provide sufficient real returns. For Argentina, and 80% weighting in bonds and shorting the domestic currency leads to a real return of 4314% over the time horizon (see Table 7). The standard deviation or tracking error of these returns is enormous. Overall, with few domestic instruments, the best option for a domestic investor in a hyperinflation country is to short his currency and invest in other currencies.[7] For Brazil, Chile, and Peru, the story is similar to Argentina's. They can achieve the average real return of 4.5%, but are not really tracking inflation and at times are underperforming it by large amounts. Mexico, on the other hand, seems to achieve a 7.36% real return over the period, with a reasonable management of the downside risk with respect to inflation.

C.2 Out-of-Sample Results

Regressions Optimizations Performance

D Asian Countries

D.1 In-Sample Results

Regressions

The Asian countries in our sample include Australia, China, India, Hong Kong, Japan, Russia, Singapore, and South Korea. Again, we will focus on the 1970 period. For Australia the important factors seem to be govertment bills, government bonds, and commodities. Unfortunately, we do not have inflation data for China until 1979 and thus, we have no results for this period. In our supplemental appendix, we have the regressions for China for the 1990 period. Even then, we have very limited data. For example, we don't have government bills, equities, or bonds. The important factors are oil, FX1 and FX3. But the fit of these regressions is not very high. In Hong Kong, the important factors are government bills and short world equities. In India, ... In Japan, the

[7]The late Rudiger Dornbusch used to tell students of Latin American countries right after crises to ask their parents where there money was. The answer was always Miami. It was actually perfectly rational for them to do this and perhaps their only option.

important factors are governement bills, general commodities, oil, FX3 (which is the Yen versus the Chiense Yuan) and short world bond. Unfortunately, Russia does not have any substantial data for any asset classes until the 1990s. In the supplemental appendix, we ran the regressions for Russia from January 1996 to May 2009. In those regressions, short equity, long government bills, gold, short FX1 (Ruble versus dollar), short FX2 (Ruble versus Euro), long FX3 (Ruble versus Yen), short world equity, long world bond, and long emerging equity. In Singapore, the important factors are short equities, government bills, oil, gold, wheat, and short world bond. In South Korea, the main factors are government bills and oil.

Optimizations

The optimal allocation for Australia involves 56% government bills, 14% 30-year government bonds, 7.80% oil, 4.57% gold, 6.30% world bond, and 11.73% emerging equity. Unfortunately, China does not have any data over this period. Hong Kong's optimal allocation is 25% government bills, 8% oil, 7% gold, 42% world bond, and 17% emerging equity. India's optimal allocation was 57% government bills, 6% oil, 12% gold, 21% world bond, and 3% emerging equity. Japan's optimal allocation consists of 77% 10-year government bonds, 11% oil, 5% gold, and 7% emerging equity. Unfortunately, Russia's data is missing for this period. Singapore's allocation is 2% equity, 27% government bills, 11% oil, 7% gold, 5% wheat, 35% world bond, and 13% emerging equity. South Korea's allocation is 85% government bill, 6% oil, 2% FX1 (Korean Won versus Yen), and 7% FX3 (Korean Won versus Chinese Yuan).

Performance

D.2 Out-of-Sample Results

Regressions Optimizations Performance

V Conclusion

In this paper, we study the possibility of hedging inflation by using a set of available asset classes. We examined this from the perspective of investors in 19 different countries. Countries that included hyper-inflationary episodes as well as countries that did not. We also examined this for different sets of time periods and as far back as 1901. We used two primary techniques to find inflation-hedging portfolios for the investor; a regression approach and an optimized approach.

Our study found that for an investor that wishes to minimize the deviation from inflation on

the downside, the best approach usually did not involve investing in equities, but rather in some combination of government bills or LIBOR, government bonds, some gold, some oil, and some emerging market equity. We also found that although inflation-protected bonds may be good instruments for hedging inflation when held to maturity and when the majority of one's portfolio, they seem to be less important when combined with a group of other asset classes. We also found that while gold is important in providing a real return while considering the downside with respect to inflation, it's value is about 5% of one's portfolio and no more than 10%. We found that oil also plays a small role of about 5% in one's portfolio. We found that countries that experience massive hyperinflations offer fewer options for investors in those countries. Their best alternatives are to short their own currency, buy some kind of world bond index, and buy treasury bills. It is still true that over long-horizons, equities outperform many of the asset class combinations that we found useful, but at a larger cost in terms of downside with respect to inflation in any given year. Thus, ultimately an investor must decide what is his or her appetite for negative real returns. To the extent that this appetite is smaller, he may decide to choose an allocation with less equities, more government and corporate bonds, some gold, some oil, some world equity, and a substantial portion in short-term debt securities. For a US investor, an allocation for a 4.5% real return might look like that shown in Figure 5.

[INSERT FIGURE 5 ABOUT HERE]

VI Appendix

A Data Sources and Description

Data obtained from Global Financial Data (GFD):

Central Bank Interest Rates: Central banks set interest rates for the rest of the economy. Historically, the discount rate was the most important. There are three types of discount rates which central banks use to influence domestic financial markets: discount rates for loans to banks, Lombard rates for discounting private paper, and Repurchase Agreement (Repo) rates for overnight intervention. This was the rate at which the central bank would buy discounted government paper from banks and was one of the principal tools of the central bank. As private financial markets evolved, this rate became irrelevant. Today, the principal rates used by the central bank include the deposit rate for central banks, the lending rate for central banks, and the repo rate. The repo rate has replaced the discount rate as the principal tool of central banks to influence national interest rates. With the introduction of the Euro in 1999, the European Central Bank replaced domestic central banks, and a single discount rate and a single repo rate were introduced for the Euro zone.

Commercial Paper Yields: Historically, commercial paper yields were the best measure of money market yields. However, the development of the interbank market has largely replaced the discounted yields on commercial paper as a source of information on money market yields. The contango rate was the paid by a buyer of shares for deferring the purchase of stocks and shares. The agio was the discount rate on future currency transactions.

Commodity Indices: Commodity indices are a composite of different commodities to determine the general direction of commodity prices. The indices are usually weighted according to the size of the market for each commodity.

Commodity Prices: Commodity prices are in US Dollars unless otherwise indicated. Since commodities are substitutes for one another, allowing for transportation costs and qualitative differences, the price of a commodity should be the same throughout the world, so the price of gold, for example, should not differ greatly from one country to the other. Whether the price is in cents or dollars and what the underlying measure is (ounces, pounds, kilograms, tons, etc.) is indicated by the commodity name.

Consumer Price Indices: Consumer Price Indices are the most commonly used measure of the cost of living and thus inflation. GFD includes the primary CPI for each country, but no sub-indices, although most governments calculate dozens or even hundreds of sub-indices. Consumer price indices were first introduced in the 1920s, so any data before 1920 has been put together

using historical prices. Europe has introduced harmonized consumer price indices that exclude housing costs since these can differ widely from one country to another and can bias intercountry comparisons. Generally, wholesale and producer price indices measure input prices while consumer price indices measure output prices.

Stock Indices: Size and Style: Stock market analysts separate stocks by size and style. The size refers to whether stocks are large cap, midcap or small cap. The style refers to whether stocks are growth or value stocks. Value stocks are divided into whether they pay any dividends or whether they are dividend achievers paying significant dividends.

Total Return Indices, Bills: Total Return Bill indices are based upon the yields on 3-month Treasury Bills. It is assumed that the price of the bills does not change so the indices reflect the returns to cash. Historically, not all countries issued treasury bills. In those cases, either the central bank discount rate or commercial paper yields have been used as a substitute for the yields on treasury bills.

Total Return Indices, Bonds: Total Return Bond indices are based upon the yields on 10-year Government bonds unless otherwise indicated. Bond indices assume that investors have both capital gains and capital losses as bond prices change. It is assumed that interest payments are made and reinvested at the end of each month for monthly data or when bond payments are made for daily indices. Where no 10-year bond was available, the bond closest to a 10-year bond was used.

Total Return Indices, Stocks: Total Return Stock Indices include both the changes in the price of the stock and the dividends that are paid to investors and then reinvested. It is assumed that dividend payments are made and reinvested at the end of each month for monthly data and on a daily basis when actual dividends are paid for daily data. Historical data have been calculated using dividend yield data and stock price index data for the broadest index available for each country.

Wholesale Price Indices: Wholesale price indices principally include commodities while producer price indices include any goods that are used as inputs by businesses. Where both indices are available, GFD has chosen to provide the producer price index since this is a broader category. However, most indices before World War II were wholesale price indices rather than producer price indices. Generally, wholesale and producer price indices measure input prices while consumer price indices measure output prices.

Data obtained from Factset:

Equity Sectors: FactSet Aggregates are time series composite price and return indices based on proprietary country, sector, and industry classifications. The aggregates include stocks domiciled in a given country and whose primary business is principally related to a particular sector. For example, banks and capital market firms would be included in the Financials sector while pharmaceutical companies would be included in the Health Care sector. Aggregates are valuable benchmarks for company analysis, and can also be used to compare trends at the industry, sector, and country level. FactSet Aggregates includes regions and country-level aggregates. Each country can potentially be broken out into 20 sectors and 128 industries (for a possibility of 149 identifiers per country).

Exchange Rates: FactSets exchange rate data comes from the WM/Reuters and are all quoted as local currency per U.S. Dollar. For countries that use the Euro, the local exchange rate was carried forward however the monthly percent changes reflect the change in the Euro from the time that the country switched to the Euro. This was January 1999 for most countries. For each country, 3 foreign currencies were selected as asset classes. For all countries except the United States, the primary foreign currency is the U.S. Dollar. The other 2 currencies (all 3 currencies for the United States) were selected on the basis of the physical proximity of the countries and /or the use of the currency as a basis for international trading. Cross rates were calculated for each using the U.S. Dollar as the crossing currency. The currencies selected for each country are detailed in Table 3.

US Treasury Inflation-Protected Securities (TIPS): is a type of Treasury securities that provides protection against inflation and real return. To provide inflation protection, the principal of a TIPS increases with inflation (and decreases with deflation) as measured by the Consumer Price Index (CPI). Like other Treasuries, TIPS pay interest at a fixed rate twice a year. The rate is applied to the adjusted principal, as such, the interest payments rise with inflation and fall with deflation. At the maturity, you receive the adjusted principal or the original principal, whichever is greater protecting you against both inflation and deflation. For the United States, we used the Barclays Capital (formerly Lehman) US Aggregate Government Treasury Inflation Notes Index. This index is composed of a representation of Treasury Inflation Protected notes across the yield curve. There are approximately 28 issues representing over $500 billion in market value outstanding in the index with an average maturity of approximately 4.00 years (as of November 2009 Source: Factset Research Systems).

Data obtained from Bloomberg:

Non-US Treasury Inflation-Protected Securities (TIPS): Non US: For international coun-

tries, we used the Generic bond series for different maturities (i.e. 10 year, 20 year, etc.). A generic bond series represents the current Government bond which the market considers to be the benchmark issue. For example, for a 10-year generic bond, there will be a single government bond with 10 years to maturity that will be selected to be the benchmark issue. Every month or quarter (depending on the issuance schedule of the government), another single bond with 10 years remaining until maturity will be selected to replace the previous bond as the benchmark issue. The returns for the individual bonds are geometrically linked to create a continuous return series. The resulting series will always have 10 years to maturity and thus is considered to be the benchmark for the 10 year bond.

Data obtained from NAREIT:

Real Estate Investment Trusts (REITS): A security that sells like a stock on the major exchanges and invests in real estate directly, either through properties or mortgages. REITs receive special tax considerations and typically offer investors high yields, as well as a highly liquid method of investing in real estate.

B Tables

Table 1: Inflation and Nominal Returns of Asset Classes in Various Countries

		Inflation		Equities	Fixed Income			Real Estate	Commodities			
Country	nobs	CPI	PPI	Main	Govt.	Corp.	H. Yield	I.P.	Main	Gold	Silver	Oil	Wheat
						1930-							
						1930-							
Argentina	953.00	180.73	174.63	.	.	.	.	.	.	.	.	.	.
Australia	953.00	4.71	4.64	7.40	.	.	.	.	.	.	.	.	.
Brazil	953.00	181.69	.	.	.	.	.	.	.	.	.	.	.
Chile	953.00	38.62	55.24	.	.	.	.	.	.	.	.	.	.
China	.	.	.	.	.	.	.	.	.	.	.	.	.
France	953.00	8.50	7.77	.	.	.	.	.	.	.	.	.	.
Germany	953.00	2.32	.	9.78	.	.	.	.	.	.	.	.	.
Hong Kong	.	.	.	.	.	.	.	.	.	.	.	.	.
India	953.00	5.91	6.90	.	.	.	.	.	.	.	.	.	.
Italy	953.00	12.91	12.08	17.76	.	.	.	.	.	.	.	.	.
Japan	953.00	14.40	13.90	16.06	6.53	.	.	.	.	.	.	.	.
Mexico	953.00	17.68	16.58	.	.	.	.	.	.	.	.	.	.
Peru	953.00	174.45	.	200.72	.	.	.	.	.	.	.	.	.
Russia	953.00	30.56	.	.	.	.	.	.	.	.	.	.	.
Singapore	.	.	.	.	.	.	.	.	.	.	.	.	.
South Korea	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	953.00	7.48	6.98	.	.	.	.	.	.	.	.	.	.
UK	953.00	4.52	5.04	7.15	.	.	.	.	.	.	.	.	.
USA	953.00	3.32	.	11.13	5.69	7.05	.	.	.	6.67	8.03	7.47	.
						1970-							
Argentina	473.00	347.69	334.69	.	.	.	.	.	.	382.10	373.40	429.53	360.99
Australia	473.00	6.06	5.68	8.22	.	.	.	.	.	12.22	12.03	14.72	7.68
Brazil	473.00	345.43	351.65	417.47	.	.	.	.	.	320.43	325.96	321.36	307.04
Chile	473.00	55.74	88.37	.	.	.	.	.	.	100.51	102.85	123.72	100.29
China	473.00	.	.	.	.	.	.	.	.	13.66	13.34	16.92	10.09
France	473.00	5.05	4.07	.	.	.	.	.	.	10.55	10.73	14.79	7.40
Germany	473.00	2.98	.	6.63	.	.	.	.	.	7.88	7.84	11.81	4.81
Hong Kong	473.00	5.87	.	.	.	.	.	.	.	11.77	11.83	14.82	8.24
India	473.00	7.93	7.60	.	.	.	.	.	.	16.00	15.71	19.18	12.79
Italy	473.00	7.68	7.58	13.46	.	.	.	.	.	13.33	13.36	17.38	10.08
Japan	473.00	3.23	1.89	8.83	6.57	.	.	.	.	8.27	9.10	12.21	4.76
Mexico	473.00	27.92	27.53	57.30	.	.	.	.	.	39.33	39.97	39.37	32.72
Peru	473.00	343.19	.	403.21	.	.	.	.	.	130.42	125.13	152.70	144.01
Russia	473.00	52.67	.	.	.	.	.	.	.	.	.	.	.
Singapore	473.00	3.09	.	11.81	.	.	.	.	.	8.79	8.81	11.82	5.08
South Korea	473.00	8.22	7.11	.	20.07	.	.	.	.	16.36	15.88	18.19	11.55
Spain	473.00	8.09	6.53	.	.	.	.	.	.	12.60	12.61	15.99	8.89
UK	473.00	6.29	6.14	9.52	10.31	.	.	.	.	11.98	11.67	15.38	8.77
USA	473.00	4.63	4.03	11.01	8.85	9.76	.	.	.	11.33	11.06	14.24	7.71
						1990-							
Argentina	233.00	381.79	336.08	.	.	.	.	.	.	317.33	274.91	359.48	274.29
Australia	233.00	2.87	2.45	6.21	.	.	.	.	.	5.57	6.75	10.91	5.28
Brazil	233.00	530.42	541.96	592.85	.	.	.	.	.	480.90	495.31	473.33	449.21
Chile	233.00	7.07	8.84	.	.	.	.	.	.	9.67	10.45	15.53	9.46
China	233.00	5.02	.	.	.	.	.	.	.	9.01	10.62	15.34	9.14
France	233.00	1.87	0.70	6.18	.	.	.	.	.	3.84	5.35	10.02	3.99
Germany	233.00	2.03	.	6.46	.	.	.	.	.	3.90	5.41	10.12	4.06
Hong Kong	233.00	3.35	.	.	.	.	.	.	.	5.32	6.68	11.66	5.88
India	233.00	7.43	6.72	.	.	.	.	.	.	11.32	12.57	17.13	11.91
Italy	233.00	3.31	3.10	8.69	.	.	.	.	.	5.63	7.20	11.65	5.70
Japan	233.00	0.55	0.06	-1.46	4.56	4.34	.	.	.	3.87	5.37	9.68	4.57
Mexico	233.00	13.12	12.72	29.90	.	.	.	.	.	15.52	16.55	21.74	16.54
Peru	233.00	413.21	368.63	535.92	.	.	.	.	.	72.34	66.47	90.33	61.11
Russia	161.00	23.98	23.62	42.60	.	.	.	.	.	29.85	31.21	40.94	26.99
Singapore	233.00	1.76	0.83	7.26	4.07	.	.	.	.	3.58	5.07	9.41	3.81
South Korea	233.00	4.50	2.65	.	12.73	.	.	.	.	9.15	10.87	14.08	9.09
Spain	233.00	3.72	2.72	9.22	.	.	.	.	.	5.68	7.36	11.62	5.66
UK	233.00	2.60	2.30	5.06	8.52	.	.	.	.	5.73	6.72	11.19	5.89
USA	233.00	2.88	2.28	9.72	8.21	7.88	8.10	.	11.22	5.35	6.70	11.66	5.89

Note: This table reports mean returns for various asset classes in various countries from the beginning of the listed period until May 2009. Means are reported in percentage terms.

Table 2: Correlation of Asset Classes with CPI Inflation in Various Countries

		Inflation	Equities	Fixed Income			Real Estate		Commodities			
Country	nobs	PPI	Main	Govt.	Corp.	H. Yield	I.P.	Main	Gold	Silver	Oil	Wheat
					1930-							
					1930-							
Argentina	953.00	0.98	.	.	.	.	.	.	.	.	.	.
Australia	953.00	0.83	-0.02	.	.	.	.	.	.	.	.	.
Brazil	953.00	.	.	.	.	.	.	.	.	.	.	.
Chile	953.00	0.91	.	.	.	.	.	.	.	.	.	.
China	.	.	.	.	.	.	.	.	.	.	.	.
France	953.00	0.91	.	.	.	.	.	.	.	.	.	.
Germany	953.00	.	0.02	.	.	.	.	.	.	.	.	.
Hong Kong	.	.	.	.	.	.	.	.	.	.	.	.
India	953.00	0.83	.	.	.	.	.	.	.	.	.	.
Italy	953.00	0.94	0.31	.	.	.	.	.	.	.	.	.
Japan	953.00	0.93	-0.03	-0.06	.	.	.	.	.	.	.	.
Mexico	953.00	0.97	.	.	.	.	.	.	.	.	.	.
Peru	953.00	.	0.95	.	.	.	.	.	.	.	.	.
Russia	953.00	.	.	.	.	.	.	.	.	.	.	.
Singapore	.	.	.	.	.	.	.	.	.	.	.	.
South Korea	.	.	.	.	.	.	.	.	.	.	.	.
Spain	953.00	0.56	.	.	.	.	.	.	.	.	.	.
UK	953.00	0.80	0.11	.	.	.	.	.	.	.	.	.
USA	953.00	.	0.05	-0.09	-0.03	.	.	.	0.30	0.28	0.36	.
					1970-							
Argentina	473.00	0.98	.	.	.	.	.	.	0.68	0.64	0.67	0.69
Australia	473.00	0.89	-0.06	.	.	.	.	.	0.34	0.21	0.33	0.05
Brazil	473.00	1.00	0.72	.	.	.	.	.	0.97	0.93	0.97	0.94
Chile	473.00	0.91	.	.	.	.	.	.	0.75	0.75	0.75	0.69
China	473.00	.	.	.	.	.	.	.	.	.	.	.
France	473.00	0.64	.	.	.	.	.	.	0.42	0.28	0.35	0.15
Germany	473.00	.	-0.13	.	.	.	.	.	0.37	0.24	0.32	0.26
Hong Kong	473.00	.	.	.	.	.	.	.	0.32	0.27	0.23	0.30
India	473.00	0.80	.	.	.	.	.	.	0.40	0.25	0.37	0.26
Italy	473.00	0.80	0.09	.	.	.	.	.	0.44	0.31	0.32	0.12
Japan	473.00	0.82	-0.02	-0.05	.	.	.	.	0.37	0.25	0.50	0.21
Mexico	473.00	0.99	0.54	.	.	.	.	.	0.61	0.53	0.50	0.63
Peru	473.00	.	0.94	.	.	.	.	.	0.61	0.57	0.66	0.47
Russia	473.00	.	.	.	.	.	.	.	.	.	.	.
Singapore	473.00	.	-0.10	.	.	.	.	.	0.45	0.31	0.57	0.45
South Korea	473.00	0.89	.	0.23	.	.	.	.	0.41	0.30	0.44	0.12
Spain	473.00	0.88	.	.	.	.	.	.	0.39	0.24	0.24	0.11
UK	473.00	0.92	0.14	0.20	.	.	.	.	0.33	0.25	0.29	0.01
USA	473.00	0.91	-0.12	-0.33	-0.34	.	.	.	0.44	0.35	0.47	0.13
					1990-							
Argentina	233.00	0.98	.	.	.	.	.	.	0.68	0.70	0.66	0.69
Australia	233.00	0.73	-0.26	.	.	.	.	.	0.24	-0.17	0.29	0.09
Brazil	233.00	1.00	0.70	.	.	.	.	.	0.97	0.93	0.97	0.94
Chile	233.00	0.43	.	.	.	.	.	.	-0.10	-0.06	0.18	0.08
China	233.00	.	.	.	.	.	.	.	0.42	0.41	0.09	0.41
France	233.00	0.04	-0.26	.	.	.	.	.	-0.02	-0.18	0.13	0.10
Germany	233.00	.	0.02	.	.	.	.	.	0.01	0.07	-0.06	0.20
Hong Kong	233.00	.	.	.	.	.	.	.	-0.22	-0.12	-0.24	-0.02
India	233.00	0.62	.	.	.	.	.	.	0.12	0.05	-0.26	0.16
Italy	233.00	0.54	-0.31	.	.	.	.	.	-0.15	-0.23	-0.10	0.06
Japan	233.00	0.36	-0.27	0.18	0.19	.	.	.	-0.28	-0.20	-0.16	-0.22
Mexico	233.00	0.97	0.17	.	.	.	.	.	0.21	0.13	0.23	0.28
Peru	233.00	1.00	0.96	.	.	.	.	.	0.69	0.65	0.76	0.58
Russia	161.00	0.66	-0.17	.	.	.	.	.	0.80	0.78	0.77	0.81
Singapore	233.00	0.18	-0.08	0.02	.	.	.	.	-0.05	-0.16	0.10	0.09
South Korea	233.00	0.48	.	-0.04	.	.	.	.	0.14	0.14	-0.08	0.04
Spain	233.00	0.37	-0.27	.	.	.	.	.	-0.07	-0.12	0.09	0.10
UK	233.00	0.51	-0.04	0.29	.	.	.	.	-0.09	-0.25	-0.12	-0.04
USA	233.00	0.80	0.05	-0.03	0.02	-0.02	.	0.05	0.16	-0.04	0.48	0.04

Note: This table reports the correlation of asset class returns and PPI inflation with the CPI inflation of each country from the period of concern to May 2009. Russian correlations are computed from the beginning of January 1996.

Table 3: The Currency Returns used for Various Countries

Country	Local Currency Code	FX1	FX2	FX3
Argentina	ARS vs.	USD	BRL	MXN
Australia	AUD vs.	USD	JPY	EUR
Brazil	BRL vs.	USD	ARS	MXN
Chile	CLP vs.	USD	BRL	MXN
China	CNY vs.	USD	JPY	EUR
France	FRF vs.	USD	EUR	GBP
Germany	DEM vs.	USD	EUR	GBP
Hong Kong	HKD vs.	USD	CNY	JPY
India	IND vs.	USD	CNY	JPY
Italy	ITL vs.	USD	EUR	GBP
Japan	JPY vs.	USD	EUR	CNY
Mexico	MXP vs.	USD	ARS	BRL
Peru	PEN vs.	USD	MXN	BRL
Russia	RUB vs.	USD	EUR	JPY
Singapore	SGD vs.	USD	JPY	CNY
South Korea	KRW vs.	USD	JPY	CNY
Spain	ESP vs.	USD	EUR	GBP
United Kingdom	GBP vs.	USD	EUR	JPY
United States	USD vs.	JPY	EUR	GBP

Note: The acronyms for the currencies are the following: BRL for Brazilian Real, JPY for Japanese Yen, ARS for Argentine Peso, EUR for the Euro, and CNY for China Renminbi.

Table 4: In-Sample Estimation of Inflation Hedges in the United States

Independent Variables	1901-	1930-			1970-			1990-		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.011	0.012	0.009	0.007	0.005	0.005	0.009	0.007	0.005	0.007
	(1.22)	(1.19)	(0.98)	(1.64)	(1.35)	(1.42)	(2.09)	(1.75)	(1.58)	(3.43)
Equity Index	0.002	0.013	-0.028	-0.017	0.025	0.033	-0.003	0.007	0.009	0.029
	(0.09)	(0.54)	(-0.69)	(-1.77)	(1.58)	(1.61)	(-0.49)	(0.39)	(0.79)	(1.60)
Small-Cap	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.010
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(-1.06)
Value	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Growth	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
S. CD	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.009
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(1.71)
S. CS	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(0.21)
S. Energy	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(0.94)
S. Finance	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.010
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(2.73)
S. Health	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(0.29)
S. Indust.	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.008
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(2.03)
S. IT	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.012
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(2.28)
S. Material	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.033
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(-3.37)
S. Telcomm	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.014
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(3.60)
S. Utility	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(0.32)
Bill Govt.	0.503	0.524	0.533	0.691	0.708	0.628	0.393	0.443	0.634	0.418
	(3.64)	(4.38)	(4.52)	(10.25)	(10.98)	(5.77)	(4.02)	(5.55)	(5.70)	(4.22)
10-Yr Govt.	0.117	-0.019	-0.002	-0.085	-0.174	-0.144	0.001	-0.099	-0.050	0.038
	(1.10)	(-0.21)	(-0.01)	(-2.49)	(-2.82)	(-2.33)	(0.03)	(-1.99)	(-1.13)	(0.89)
30-Yr Govt.	-0.159	-0.042	-0.059	0.019	0.055	0.035	0.010	0.060	0.039	-0.011
	(-1.77)	(-0.61)	(-0.80)	(0.78)	(2.15)	(1.39)	(0.37)	(2.39)	(1.73)	(-0.57)
Corp. Bond	NA	NA	0.101	NA	-0.013	-0.039	NA	-0.013	-0.084	-0.127
	(NA)	(NA)	(1.67)	(NA)	(-0.22)	(-0.92)	(NA)	(-0.42)	(-2.10)	(-2.77)
HY Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.037
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(3.38)
IP Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Commodity	NA	NA	NA	NA	NA	0.002	NA	NA	0.029	0.032
	(NA)	(NA)	(NA)	(NA)	(NA)	(0.14)	(NA)	(NA)	(4.22)	(4.90)
Oil	0.033	0.022	0.022	0.013	0.011	0.011	0.015	0.012	0.003	-0.001
	(2.62)	(2.89)	(2.81)	(3.15)	(3.31)	(2.56)	(3.11)	(3.31)	(0.83)	(-0.37)
Gold	-0.022	0.014	0.015	0.035	0.039	0.038	0.030	0.022	0.029	0.039
	(-0.95)	(0.83)	(0.84)	(3.03)	(3.66)	(3.46)	(2.79)	(2.01)	(2.89)	(4.12)
Silver	0.034	0.011	0.011	-0.003	-0.004	-0.002	-0.008	-0.003	-0.003	-0.010
	(2.20)	(1.04)	(0.99)	(-0.50)	(-0.70)	(-0.38)	(-1.19)	(-0.72)	(-0.70)	(-2.39)
Wheat	NA	NA	NA	NA	NA	-0.012	NA	NA	-0.016	-0.016
	(NA)	(NA)	(NA)	(NA)	(NA)	(-2.08)	(NA)	(NA)	(-5.72)	(-5.66)
FX1	NA	NA	NA	NA	NA	0.004	NA	NA	-0.010	0.000
	(NA)	(NA)	(NA)	(NA)	(NA)	(0.19)	(NA)	(NA)	(-0.93)	(0.06)
FX2	NA	NA	NA	NA	NA	0.027	NA	NA	0.009	-0.007
	(NA)	(NA)	(NA)	(NA)	(NA)	(0.92)	(NA)	(NA)	(0.63)	(-0.84)
FX3	NA	NA	NA	NA	NA	-0.034	NA	NA	-0.034	-0.024
	(NA)	(NA)	(NA)	(NA)	(NA)	(-1.14)	(NA)	(NA)	(-2.12)	(-2.01)
LIBOR	NA	NA	NA	NA	NA	0.067	NA	NA	-0.144	-0.012
	(NA)	(NA)	(NA)	(NA)	(NA)	(0.71)	(NA)	(NA)	(-1.67)	(-0.20)
R. Estate	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(1.54)
World Eq.	NA	NA	0.048	NA	-0.056	-0.063	NA	-0.031	-0.028	-0.065
	(NA)	(NA)	(0.97)	(NA)	(-3.48)	(-2.80)	(NA)	(-1.65)	(-1.91)	(-5.60)
World Bond	NA	NA	-0.103	NA	0.077	0.090	NA	0.066	0.112	0.095
	(NA)	(NA)	(-1.65)	(NA)	(1.91)	(1.52)	(NA)	(2.48)	(3.36)	(4.66)
Emerge Eq.	NA	NA	0.000	NA	0.004	0.009	NA	0.009	0.012	0.006
	(NA)	(NA)	(0.03)	(NA)	(0.54)	(1.14)	(NA)	(3.00)	(4.34)	(2.51)
Emerge Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
$\bar{R}^2$	0.249	0.291	0.304	0.732	0.748	0.759	0.545	0.624	0.731	0.809

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation. Regressions are estimated from inclusive of January of the starting period until May 2009.

Table 5: Asset Class Real Return Optimizations for the United States

	1901-			1930-			1970-			1990-		
	Real Return Target											
Asset Class	0.75	2.50	4.50	0.55	2.50	4.50	0.50	2.50	4.50	0.50	2.50	4.50
Equity Index	0.0	17.1	37.4	0.0	5.1	9.2	0.0	0.0	0.0	-0.0	-0.0	0.0
Small-Cap	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0	0.0
Value	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Growth	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
S. CD	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.0	0.0
S. CS	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.4	0.3
S. Energy	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	1.9	7.9
S. Finance	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0	-0.0
S. Health	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.0	0.2
S. Indust.	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.6	-0.0
S. IT	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0	-0.0
S. Material	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.0	-0.0
S. Telcomm	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	-0.0	-0.0
S. Utility	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	-0.0	0.0
Bill Govt.	100.0	58.5	6.5	100.0	56.0	9.7	82.0	50.1	0.0	72.0	38.6	0.0
10-Yr Govt.	0.0	13.7	39.5	0.0	0.0	0.2	0.0	0.0	0.0	-0.0	1.1	9.5
30-Yr Govt.	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	-0.0	7.1	17.8
Corp. Bond	NA	NA	NA	0.0	23.8	54.3	-0.0	6.9	31.5	0.0	5.4	4.2
HY Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0	-0.0
IP Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Commodity	NA	NA	NA	NA	NA	NA	2.4	-0.0	-0.0	2.8	-0.0	0.0
Oil	0.0	9.1	16.6	0.0	5.5	9.4	0.8	2.6	6.3	-0.0	2.4	5.1
Gold	0.0	0.0	-0.0	0.0	1.2	1.0	0.0	3.5	3.8	0.0	5.7	5.6
Silver	0.0	1.6	0.0	0.0	1.7	2.1	0.3	0.0	0.0	-0.0	0.0	-0.0
Wheat	NA	NA	NA	NA	NA	NA	0.0	-0.0	0.0	-0.0	0.0	0.0
FX1	NA	NA	NA	NA	NA	NA	0.0	-0.0	-0.0	10.8	2.7	-0.0
FX2	NA	NA	NA	NA	NA	NA	-0.0	0.0	0.0	0.0	0.0	-0.0
FX3	NA	NA	NA	NA	NA	NA	14.6	0.0	0.0	14.4	0.0	0.0
LIBOR	NA	NA	NA	NA	NA	NA	0.0	34.4	49.5	-0.0	33.5	46.1
R. Estate	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.0	0.1	-0.0
World Eq.	NA	NA	NA	0.0	-0.0	-0.0	-0.0	0.0	-0.0	0.0	-0.0	-0.0
World Bond	NA	NA	NA	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
Emerge Eq.	NA	NA	NA	0.0	6.7	14.2	-0.0	2.6	8.9	0.0	0.6	3.3
Emerge Bond	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tracking Error	4.9	6.1	10.2	4.1	5.1	8.3	2.4	2.3	4.6	1.9	1.4	2.8
Return/Risk	0.15	0.41	0.44	0.13	0.49	0.54	0.21	1.10	0.99	0.26	1.83	1.59

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error. Optimal portfolios are estimated from inclusive of January of the starting period until May 2009.

Table 6: In-Sample Real Return Inflation Regression Results by Country and Period

				Max		Min					
Country	Period	Mean	S.D.	Value	Date	Value	Date	Number $\leq \pi$	MAE	MSFE	nobs
Argentina	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Argentina	1970	-0.00	476.48	2660.27	1990:02	-30.37	1990:01	17.69	2265.51	282.77	473.00
Australia	1930	0.00	4.72	19.18	1931:09	-21.09	1951:12	28.26	0.22	3.29	953.00
Australia	1970	-0.00	2.89	4.97	1986:07	-8.79	1975:11	13.75	0.08	2.13	473.00
Brazil	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Brazil	1970	-0.00	116.75	630.74	1990:11	-24.07	1990:03	19.05	136.02	52.03	473.00
Chile	1930	0.00	76.96	149.35	1976:05	-669.78	1974:04	16.44	59.16	32.08	953.00
Chile	1970	-0.00	53.89	172.04	1974:04	-36.43	1974:07	13.75	28.98	28.18	473.00
China	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
China	1970	.	.	.	1899:12	.	1899:12	.	.	.	.
France	1930	0.00	13.53	28.79	1932:06	-73.57	1946:10	26.19	1.83	8.97	953.00
France	1970	0.00	2.03	4.36	1987:04	-6.33	1976:02	16.36	0.04	1.58	473.00
Germany	1930	0.00	3.55	15.09	1932:06	-16.79	1949:01	32.95	0.13	2.14	953.00
Germany	1970	-0.00	1.04	3.50	1991:05	-5.06	1981:01	16.67	0.01	0.79	473.00
HongKong	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
HongKong	1970	0.00	4.04	13.37	1999:08	-20.66	1973:10	20.28	0.16	3.17	473.00
India	1930	0.00	8.78	27.88	1931:06	-59.43	1943:04	34.56	0.77	5.34	953.00
India	1970	-0.00	4.51	18.99	1976:05	-12.00	1974:09	17.59	0.20	3.25	473.00
Italy	1930	0.00	35.07	76.88	1947:04	-412.56	1944:12	22.89	12.29	16.04	953.00
Italy	1970	-0.00	2.51	9.20	1993:03	-17.66	1975:02	19.66	0.06	1.82	473.00
Japan	1930	0.00	63.35	38.77	1930:11	-619.29	1946:07	9.45	40.10	20.63	953.00
Japan	1970	0.00	2.34	6.76	1990:09	-10.97	1974:11	17.13	0.05	1.88	473.00
Mexico	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Mexico	1970	-0.00	8.45	27.64	1983:01	-18.86	1983:08	15.59	0.71	6.08	473.00
Peru	1930	-0.00	309.26	5467.15	1990:09	-3286.04	1990:08	17.20	955.44	79.64	953.00
Peru	1970	0.00	353.23	3664.47	1990:09	-45.43	1990:08	18.74	1245.07	131.05	473.00
Russia	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Russia	1970	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1970	0.00	3.06	6.66	2003:02	-21.90	1973:11	16.97	0.09	2.30	473.00
SouthKorea	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
SouthKorea	1970	-0.00	4.24	9.72	1987:03	-11.50	1975:10	16.59	0.18	3.16	473.00
Spain	1930	0.00	8.66	19.74	1932:12	-65.96	1940:03	26.50	0.75	5.13	953.00
Spain	1970	-0.00	3.41	10.20	1993:05	-19.64	1975:07	16.28	0.12	2.44	473.00
UK	1930	0.00	4.47	10.11	1930:12	-19.21	1940:08	26.80	0.20	3.23	953.00
UK	1970	-0.00	3.25	9.39	1998:03	-12.19	1975:07	16.90	0.11	2.26	473.00
UnitedStates	1930	0.00	3.49	13.05	1932:08	-17.84	1947:03	33.79	0.12	2.23	953.00
UnitedStates	1970	-0.00	1.44	3.42	1984:05	-13.36	1975:04	16.36	0.02	1.12	473.00

Note: The table reports in-sample statistics from the linear regression models reported in Table 4. Model is the set of variables used in the regression, Period represents the time period over which the regression was estimated and performance computed, Mean is the monthly average of the difference between year-on-year inflation and the model's return, S.D. is the standard deviation of the different in the model's value and year-on-year inflation, Max and Min are the largest (smallest) monthly difference between year-on-year inflation and the model s value, Number $\leq \pi$ is the percentage of months where the model s value is lower than the year-on-year inflation for that month, MAE is the mean absolute error of the errors, MSFE is the mean squared forecast error between model values and year-on-year inflation, and nobs is the number of monthly observations used to compute the performance statistics. All values are multiplied by 100, except for nobs.

Table 7: In-Sample Real Return Portfolio Results by Country and Period

					Max		Min					
Country	Period	T.R.	Mean	S.D.	Value	Date	Value	Date	Number $\leq \pi$	MAE	MSFE	nobs
Argentina	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Argentina	1970	4.50	4314.83	18837.54	2.39e+05	1990:03	-30.37	1999:09	3.22	3.73e+06	4316.87	473.00
Australia	1930	3.13	3.73	12.47	103.54	1932:09	-24.04	1974:07	30.57	1.69	8.61	953.00
Australia	1970	4.50	4.83	5.44	23.28	1990:01	-8.79	1975:03	7.45	0.53	5.84	473.00
Brazil	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Brazil	1970	4.50	629.82	1541.82	11329.20	1990:04	-24.07	2008:12	2.29	27688.47	631.16	473.00
Chile	1930	-14.42	15.31	40.86	334.96	1976:05	-107.46	1974:04	12.79	19.02	19.19	953.00
Chile	1970	4.50	40.94	85.47	685.94	1974:02	-36.43	1974:10	1.86	89.65	41.91	473.00
China	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
China	1970	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
France	1930	-1.55	0.09	17.06	43.51	1935:01	-86.06	1948:02	31.84	2.91	11.14	953.00
France	1970	4.50	4.73	4.48	20.34	1993:08	-6.33	1975:02	4.66	0.42	5.16	473.00
Germany	1930	4.50	4.68	7.79	48.85	1932:11	-19.07	1948:12	18.71	0.82	6.98	953.00
Germany	1970	4.50	4.60	3.45	14.60	1993:08	-5.06	1995:01	4.23	0.33	4.89	473.00
HongKong	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
HongKong	1970	4.50	5.00	8.44	30.18	2000:02	-20.66	2009:02	10.84	0.96	7.60	473.00
India	1930	0.55	1.26	11.24	59.47	1933:02	-44.37	1943:04	38.70	1.28	7.65	953.00
India	1970	4.50	5.01	6.34	25.02	1992:03	-12.00	1975:02	8.21	0.65	6.48	473.00
Italy	1930	4.50	10.86	43.57	539.10	1947:04	-136.12	1944:12	31.33	20.14	26.64	953.00
Italy	1970	4.50	4.98	6.16	28.76	1993:08	-17.66	1975:02	7.11	0.63	6.23	473.00
Japan	1930	1.66	12.14	38.26	209.00	1949:01	-214.19	1946:07	27.52	16.10	25.55	953.00
Japan	1970	4.50	4.69	5.81	20.80	2000:02	-10.97	1974:11	7.62	0.56	6.12	473.00
Mexico	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Mexico	1970	4.50	7.36	11.54	56.25	1987:03	-18.86	1983:08	8.81	1.87	8.74	473.00
Peru	1930	26.27	730.00	3980.26	54980.70	1990:09	-47.56	2008:10	8.55	1.64e+05	733.77	953.00
Peru	1970	4.50	1332.97	5028.87	47930.36	1990:09	-45.43	2008:10	3.56	2.70e+05	1335.61	473.00
Russia	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Russia	1970	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1970	4.50	4.73	7.24	25.98	1980:01	-21.90	2008:12	6.86	0.75	6.98	473.00
SouthKorea	1930	0.00	.	.	.	1899:12	.	1899:12	.	.	.	.
SouthKorea	1970	4.50	4.88	4.51	16.93	1997:12	-11.50	1975:10	4.32	0.44	5.60	473.00
Spain	1930	-0.50	0.17	8.27	17.91	1932:12	-61.49	1940:03	32.26	0.68	5.01	953.00
Spain	1970	4.50	5.25	9.21	38.22	1993:08	-19.64	1975:02	12.19	1.12	8.21	473.00
UK	1930	2.63	3.53	19.84	116.32	1975:12	-73.61	1974:11	32.77	4.06	15.74	953.00
UK	1970	4.50	4.79	4.54	16.69	2000:02	-12.19	1975:05	4.57	0.44	5.55	473.00
UnitedStates	1930	4.50	4.78	8.25	44.79	1933:06	-23.01	1947:05	18.63	0.91	7.31	953.00
UnitedStates	1970	4.50	4.71	4.54	16.41	1983:06	-13.36	2008:10	4.66	0.43	5.45	473.00
All Equity												
USA	1930	.	7.81	21.90	167.23	1933:06	-57.92	1932:06	33.37	5.40	17.90	953.00
USA	1970	.	6.38	18.43	58.60	1983:06	-50.89	1974:09	31.71	3.80	16.03	473.00
Equity/Bond 50/50												
USA	1930	.	5.09	12.78	90.90	1933:06	-31.51	1974:09	34.84	1.89	10.45	953.00
USA	1970	.	5.30	12.56	48.10	1983:06	-31.51	1974:09	36.58	1.86	10.62	473.00
All Bond												
USA	1930	.	2.37	9.66	45.88	1986:03	-27.57	1980:03	39.35	0.99	7.07	953.00
USA	1970	.	4.22	11.85	45.88	1986:03	-27.57	1980:03	38.69	1.58	9.31	473.00

Note: The table reports in-sample statistics from the optimization models reported in Table 4. Model/Period is the set of variables and time period used in the optimization, Target Return represents the target real return that the portfolio was optimized to achieve while minimizing the tracking error with inflation, Mean is the monthly average of the difference between year-on-year inflation and the model's return, S.D. is the standard deviation of the different in the model's value and year-on-year inflation, Max and Min are the largest (smallest) monthly difference between year-on-year inflation and the model's value, Number $\leq \pi$ is the percentage of months where the model's value is lower than the year-on-year inflation for that month, MAE is the mean absolute error of the errors, MSFE is the mean squared forecast error between model values and year-on-year inflation, and nobs is the number of monthly observations used to compute the performance statistics. All values are multiplied by 100, except for nobs.

Table 8: Out-of-Sample Estimation of Inflation Hedges for Various Countries (Avg. Weights)

	Russia		Singapore		South Korea		Spain		UK		USA	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
Constant	.	.	.	0.025	.	0.049	0.228	0.037	0.021	-0.020	0.037	0.004
	(.)	(.)	(.)	(-1.71)	(.)	(4.00)	(-0.21)	(5.82)	(-0.01)	(1.37)	(-1.40)	(1.77)
Equity Index	.	.	.	0.025	.	.	.	.	0.021	-0.020	0.037	0.004
	(.)	(.)	(.)	(0.25)	(.)	(.)	(.)	(.)	(1.80)	(-1.32)	(1.50)	(0.63)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	.	.	.	-0.025	.	0.049	0.228	0.037	-0.003	0.047	-0.061	0.064
	(.)	(.)	(.)	(-1.71)	(.)	(1.83)	(2.51)	(1.67)	(-0.01)	(1.37)	(-1.40)	(1.77)
10-Yr Govt.	.	.	.	.	.	0.552	.	.	.	0.766	0.364	0.843
	(.)	(.)	(.)	(.)	(.)	(4.00)	(.)	(.)	(.)	(3.83)	(2.35)	(6.12)
30-Yr Govt.	.	.	.	.	.	.	.	0.688	.	.	-1.632	-0.124
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(5.82)	(.)	(.)	(-0.75)	(-2.41)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	0.543	0.003
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(-0.11)	(-0.27)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	.	.	-0.081	.	-0.023	.	-0.007	.	0.246	.	-0.027
	(.)	(.)	(.)	(2.07)	(.)	(-1.19)	(.)	(-0.11)	(.)	(2.43)	(.)	(-0.33)
Oil	.	.	.	0.060	.	-0.085	.	0.008	.	-0.026	0.138	0.005
	(.)	(.)	(.)	(1.37)	(.)	(-2.76)	(.)	(0.06)	(.)	(-0.78)	(1.49)	(1.10)
Gold	.	.	.	0.065	.	0.061	.	0.010	.	0.027	0.044	0.012
	(.)	(.)	(.)	(6.24)	(.)	(4.02)	(.)	(0.89)	(.)	(2.28)	(2.69)	(2.62)
Silver	.	.	.	0.024	.	0.026	.	0.046	.	0.060	-0.117	0.030
	(.)	(.)	(.)	(1.37)	(.)	(1.10)	(.)	(1.97)	(.)	(2.54)	(-1.48)	(2.95)
Wheat	.	.	.	-0.013	.	-0.005	.	-0.016	.	-0.015	.	-0.004
	(.)	(.)	(.)	(-1.66)	(.)	(-0.54)	(.)	(-1.01)	(.)	(-1.20)	(.)	(-0.79)
FX1	.	.	.	0.055	.	-0.017	.	-0.022	.	-0.019	.	-0.016
	(.)	(.)	(.)	(3.08)	(.)	(-0.93)	(.)	(-0.84)	(.)	(-1.02)	(.)	(-2.66)
FX2	.	.	.	-0.393	.	0.407	.	0.101	.	0.263	.	0.006
	(.)	(.)	(.)	(-2.59)	(.)	(3.37)	(.)	(1.56)	(.)	(2.58)	(.)	(-0.07)
FX3	.	.	.	-0.034	.	-0.015	.	0.319	.	0.197	.	0.014
	(.)	(.)	(.)	(-0.56)	(.)	(-0.01)	(.)	(4.67)	(.)	(1.96)	(.)	(0.05)
LIBOR	.	.	.	.	.	.	.	.	.	-0.052	.	-0.005
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(-0.93)	(.)	(-0.47)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	.	.	-0.074	.	0.017	.	-0.126	.	0.192	0.045	0.030
	(.)	(.)	(.)	(-1.22)	(.)	(0.20)	(.)	(-1.50)	(.)	(0.83)	(2.34)	(0.37)
World Bond	.	.	.	-0.034	.	0.064	.	0.011	.	0.007	0.118	-0.074
	(.)	(.)	(.)	(-0.83)	(.)	(1.72)	(.)	(0.39)	(.)	(0.20)	(1.70)	(-2.04)
Emerge Eq.	.	.	.	-0.031	.	-0.208	.	-0.098	.	-0.231	-0.035	0.093
	(.)	(.)	(.)	(-0.81)	(.)	(-3.25)	(.)	(-2.24)	(.)	(-2.44)	(-0.45)	(1.61)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	.	.	.	0.792	.	0.732	0.104	0.632	0.206	0.682	0.374	0.804

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 9: Out-of-Sample Asset Class Real Return Optimizations by Country (Avg. Weights)

	Russia		Singapore		South Korea		Spain		UK		USA	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970	1930-	1970	1930-	1970
						Real Return Target						
Asset Class	.	.	.	4.50	.	4.50	2.19	4.50	1.74	4.50	4.50	4.50
Equity Index	.	.	.	4.11	.	.	.	.	87.84	0.95	14.97	0.74
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	.	.	.	43.76	.	79.90	100.00	31.56	12.16	0.00	8.82	4.65
10-Yr Govt.	.	.	.	.	.	0.43	.	.	.	40.76	7.67	0.00
30-Yr Govt.	.	.	.	.	.	.	.	16.23	.	.	0.23	0.00
Corp. Bond	.	.	.	.	.	.	.	.	.	.	45.37	22.48
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	.	.	1.27	.	0.00	.	0.00	.	0.00	.	0.00
Oil	.	.	.	12.06	.	7.59	.	10.37	.	8.56	5.37	6.31
Gold	.	.	.	4.95	.	0.00	.	8.63	.	6.44	0.37	2.83
Silver	.	.	.	0.00	.	0.00	.	0.00	.	0.00	3.15	0.02
Wheat	.	.	.	6.38	.	0.00	.	0.01	.	0.00	.	0.00
FX1	.	.	.	0.00	.	4.33	.	0.00	.	0.08	.	0.00
FX2	.	.	.	0.00	.	0.03	.	0.00	.	0.00	.	0.17
FX3	.	.	.	0.00	.	3.64	.	0.00	.	0.00	.	0.00
LIBOR	.	.	.	.	.	.	.	.	.	27.31	.	51.53
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	.	.	0.00	.	2.60	.	1.92	.	0.18	3.99	0.00
World Bond	.	.	.	14.54	.	1.48	.	4.68	.	0.70	0.00	1.09
Emerge Eq.	.	.	.	12.94	.	0.00	.	26.61	.	15.02	10.06	10.18
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	.	.	.	6.7	.	5.4	11.5	10.5	17.4	6.3	9.7	4.6
Return/Risk	.	.	.	0.67	.	0.84	0.19	0.43	0.10	0.71	0.46	0.99

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

Table 10: Out-of-Sample Real Return Inflation Regression Results by Country and Model

				Max		Min					
Country	Period	Mean	S.D.	Value	Date	Value	Date	Number $\leq \pi$	MAE	MSFE	nobs
Argentina	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Argentina	1970	56.78	1137.87	12687.22	1990:02	-1.64e+04	1990:03	13.06	12948.33	322.24	412.00
Australia	1930	-1.08	4.78	6.67	1954:09	-17.33	1951:11	33.49	0.24	3.72	892.00
Australia	1970	2.25	2.39	8.77	1985:11	-11.21	1979:12	4.30	0.11	2.71	412.00
Brazil	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Brazil	1970	-11.44	221.19	2893.70	1990:04	-2558.40	1990:03	20.58	489.39	66.68	412.00
Chile	1930	13.86	82.67	552.85	1975:10	-428.95	1973:10	26.50	70.19	37.60	892.00
Chile	1970	21.49	60.60	430.49	1975:09	-148.60	1982:09	8.37	41.26	39.84	412.00
China	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
China	1970	.	.	.	1899:12	.	1899:12	.	.	.	.
France	1930	-1.86	13.88	33.28	1950:01	-73.55	1946:10	31.26	1.96	10.18	892.00
France	1970	0.99	2.00	5.99	1993:06	-3.48	2003:03	9.98	0.05	1.78	412.00
Germany	1930	-1.01	3.57	29.41	1948:06	-16.92	1949:01	36.25	0.14	2.36	892.00
Germany	1970	1.48e+10	3.00e+11	6.09e+12	1985:02	-2.61	1992:09	9.14	9.00e+20	1.48e+10	412.00
HongKong	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
HongKong	1970	0.82	4.27	14.74	1999:08	-8.22	1981:10	17.36	0.19	3.19	412.00
India	1930	-2.60	8.62	19.38	1976:02	-56.05	1943:04	42.93	0.81	5.95	892.00
India	1970	-0.85	5.05	11.73	1990:09	-23.61	1987:08	16.21	0.26	3.89	412.00
Italy	1930	7.07	37.05	256.84	1947:04	-225.51	1944:12	24.04	14.21	22.83	892.00
Italy	1970	0.71	2.71	11.93	1993:03	-5.03	1981:01	15.13	0.08	2.09	412.00
Japan	1930	12.47	66.41	406.92	1950:01	-566.11	1946:06	12.44	45.61	30.89	892.00
Japan	1970	0.38	2.64	13.18	1980:03	-7.74	1994:02	13.98	0.07	2.04	412.00
Mexico	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Mexico	1970	4.00	8.93	37.89	1989:01	-35.14	1982:06	9.14	0.96	6.66	412.00
Peru	1930	0.83	410.05	9791.15	1990:09	-2007.42	1990:12	39.63	1679.56	79.61	892.00
Peru	1970	-4.65	588.10	8774.99	1990:09	-4167.97	1990:08	14.82	3450.45	151.22	412.00
Russia	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Russia	1970	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1970	-0.28	3.44	8.18	1990:09	-12.50	1980:03	15.59	0.12	2.78	412.00
SouthKorea	1930	.	.	.	1899:12	.	1899:12	.	.	.	.
SouthKorea	1970	1.07	4.62	17.17	1987:03	-11.73	1986:03	13.67	0.22	3.84	412.00
Spain	1930	2.08	8.79	25.68	1942:10	-53.65	1940:01	14.52	0.82	6.01	892.00
Spain	1970	2.64	2.81	12.14	1993:05	-5.67	1976:05	4.15	0.15	3.03	412.00
UK	1930	-0.21	4.63	8.54	1986:06	-20.09	1940:08	31.03	0.21	3.63	892.00
UK	1970	1.96	3.62	35.82	1975:02	-7.79	1979:12	8.99	0.17	2.91	412.00
UnitedStates	1930	-0.63	3.73	10.71	1950:06	-22.46	1941:10	38.25	0.14	2.64	892.00
UnitedStates	1970	0.90	1.38	5.17	1990:09	-3.36	1986:03	7.76	0.03	1.31	412.00

Note: The table reports the out-of-sample statistics from the linear regression models. The regression is a rolling regression that begin 5 years after the beginning period listed, parameters are estimated via regression, and the parameters are used for the next period s hedging portfolio. Model is the set of variables used in the regression, Period represents the time period over which the regression was estimated and performance computed, Mean is the monthly average of the difference between year-on-year inflation and the model's return, S.D. is the standard deviation of the different in the model's value and year-on-year inflation, Max and Min are the largest (smallest) monthly difference between year-on-year inflation and the model's value, Number $\leq \pi$ is the percentage of months where the model's value is lower than the year-on-year inflation for that month, MAE is the mean absolute error of the errors, MSFE is the mean squared forecast error between model values and year-on-year inflation, and nobs is the number of monthly observations used to compute the performance statistics. All values are multiplied by 100, except for nobs.

Table 11: Out-of-Sample Real Return Portfolio Results by Country and Model

		Ex-Ante			Max		Min					
Country	Period	Target	Mean	S.D.	Value	Date	Value	Date	Number $\leq \pi$	MAE	MSFE	nobs
Argentina	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Argentina	1970	4.81	-449.28	2591.72	2998.53	1983:07	-3.58e+04	1990:03	23.61	69025.44	516.56	412.00
Australia	1930	3.00	-3.95	17.60	64.24	1987:07	-75.30	1974:09	40.47	3.25	12.57	892.00
Australia	1970	4.50	0.14	9.03	22.38	1985:11	-27.97	1975:02	13.97	0.81	6.69	412.00
Brazil	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Brazil	1970	4.50	-388.80	1028.62	162.91	1999:11	-8964.81	1990:03	25.44	12066.61	399.49	412.00
Chile	1930	14.87	-56.24	164.15	62.83	2009:05	-1428.05	1974:04	54.82	300.76	59.91	892.00
Chile	1970	4.50	-24.62	80.25	51.05	2009:05	-539.11	1975:02	20.12	70.31	30.69	412.00
China	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
China	1970	.	.	.	.	1899:12	.	1899:12	.	.	.	.
France	1930	6.39	-11.65	32.09	40.45	1986:08	-182.05	1948:04	43.74	11.64	18.34	892.00
France	1970	4.50	0.26	6.87	16.83	1980:01	-20.41	1982:05	14.12	0.47	5.07	412.00
Germany	1930	4.50	1.04	9.28	26.32	1949:12	-39.91	1948:12	30.14	0.87	7.04	892.00
Germany	1970	4.50	2.07	4.24	19.37	1980:01	-9.98	1981:10	8.88	0.22	3.78	412.00
HongKong	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
HongKong	1970	4.50	-0.03	12.35	45.86	2000:02	-31.52	1981:10	17.31	1.52	9.58	412.00
India	1930	1.78	-8.00	17.35	29.60	1976:05	-117.07	1943:04	50.04	3.65	13.09	892.00
India	1970	4.50	-2.64	9.30	29.80	1976:05	-36.25	1975:02	19.59	0.93	7.24	412.00
Italy	1930	3.86	-9.86	77.79	488.71	1947:04	-869.04	1944:12	36.60	61.42	37.19	892.00
Italy	1970	4.50	-2.84	8.85	20.91	1993:08	-37.62	1975:02	19.13	0.86	7.00	412.00
Japan	1930	5.28	-15.87	136.41	164.83	1949:09	-1318.33	1946:07	34.62	188.38	41.98	892.00
Japan	1970	4.50	3.01	7.92	26.34	2000:02	-24.13	1975:02	9.11	0.72	6.70	412.00
Mexico	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Mexico	1970	4.50	-22.46	32.66	20.25	1989:09	-181.34	1988:02	26.65	15.68	23.96	412.00
Peru	1930	9.85	-158.55	915.53	775.33	1986:03	-1.31e+04	1990:08	51.18	8623.95	200.41	892.00
Peru	1970	4.47	-406.59	1611.66	390.71	1993:08	-1.58e+04	1990:08	20.73	27564.60	446.04	412.00
Russia	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Russia	1970	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
Singapore	1970	4.50	2.10	8.00	29.64	2000:02	-27.34	2008:10	11.69	0.68	6.05	412.00
SouthKorea	1930	.	.	.	.	1899:12	.	1899:12	.	.	.	.
SouthKorea	1970	4.50	-2.65	9.71	15.05	1987:03	-42.74	1975:12	17.16	1.01	6.64	412.00
Spain	1930	2.19	-8.89	17.34	17.86	1935:06	-139.96	1940:03	49.81	3.79	10.66	892.00
Spain	1970	4.50	-1.80	13.63	35.71	1993:08	-36.15	1975:02	17.31	1.88	10.63	412.00
UK	1930	1.74	-2.56	20.69	86.33	1975:12	-95.54	1974:11	34.85	4.34	15.62	892.00
UK	1970	4.50	-0.44	9.95	19.76	2000:02	-41.39	1975:08	13.52	0.99	7.06	412.00
UnitedStates	1930	4.50	0.47	10.72	40.58	1979:12	-39.63	1947:03	28.55	1.15	8.01	892.00
UnitedStates	1970	4.50	-0.45	5.61	12.91	1986:04	-16.68	2008:10	14.12	0.32	4.20	412.00
All Equity												
USA	1935	.	8.35	19.43	83.04	1936:03	-50.89	1974:09	30.83	4.47	17.02	892.00
USA	1975	.	8.11	17.50	58.60	1983:06	-43.56	2009:02	28.16	3.71	15.78	412.00
Equity/Bond 50/50												
USA	1935	.	5.14	11.95	48.10	1983:06	-31.51	1974:09	33.41	1.69	10.22	892.00
USA	1975	.	6.50	11.94	48.10	1983:06	-18.07	1980:03	33.74	1.84	10.42	412.00
All Bond												
USA	1935	.	1.92	9.73	45.88	1986:03	-27.57	1980:03	41.48	0.98	6.94	892.00
USA	1975	.	4.89	12.15	45.88	1986:03	-27.57	1980:03	34.95	1.71	9.65	412.00

Note: The table reports out-of-sample statistics from the optimization models. The optimization was performed on rolling window that begins 5 years after the beginning period listed, optimal weights are chosen and used to create a portfolio for used for the next period s hedging portfolio. Period is the set of variables and time period used in the optimization, Ex-Ante Target represents the target real return that the portfolio was optimized to achieve while minimizing the tracking error with inflation, Mean is the monthly average of the difference between year-on-year inflation and the model's return, S.D. is the standard deviation of the different in the model's value and year-on-year inflation, Max and Min are the largest (smallest) monthly difference between year-on-year inflation and the model's value, Number $\leq \pi$ is the percentage of months where the model's value is lower than the year-on-year inflation for that month, MAE is the mean absolute error of the errors, MSFE is the mean squared forecast error between model values and year-on-year inflation, and nobs is the number of monthly observations used to compute the performance statistics. All values are multiplied by 100, except for nobs.

Table 12: In-Sample and Out-of-Sample Estimation of Inflation Hedges in the United States with and without TIPS. February 1997 - May 2009

Independent Variables	With TIPS				Without TIPS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.008	0.012	.	.	0.012	0.016	.	.
	(2.58)	-2.12	.	.	(3.81)	-1.37	.	.
Equity Index	0.108	0.012	0	0	0.145	0.016	0	0
	(1.70)	-2.9	.	.	(1.55)	-3.99	.	.
Small-Cap	0.037	0.074	0	0	0.004	0.062	0	0
	(3.20)	-2.12	.	.	(0.41)	-1.37	.	.
Value	-0.121	0.025	0	0	-0.095	0.009	0	0
	(-2.60)	-2.34	.	.	(-1.84)	-0.85	.	.
Growth	-0.059	-0.135	0	0	-0.063	-0.135	0	0
	(-1.53)	(-4.22)	.	.	(-1.20)	(-3.70)	.	.
S. CD	-0.014	-0.075	0	0.46	-0.003	-0.066	0	0.46
	(-1.65)	(-3.74)	.	.	(-0.33)	(-2.78)	.	.
S. CS	0.035	0.003	5	4.34	0.014	0.012	5	2.98
	(3.00)	-0.88	.	.	(0.87)	-2.02	.	.
S. Energy	0.030	0.032	0	0.75	0.016	0.023	0	0
	(2.73)	-3.8	.	.	(1.35)	-2.82	.	.
S. Fi.nce	0.006	-0.001	0	0	0.009	-0.005	0	0
	(0.80)	(-0.17)	.	.	(1.12)	(-0.81)	.	.
S. Health	-0.001	0.001	2.2	3.34	0.002	0.005	2.2	1.94
	(-0.26)	-0.21	.	.	(0.34)	-0.82	.	.
S. Indust.	-0.003	0.003	0	0	0.006	0.004	0	0
	(-0.63)	-0.74	.	.	(0.98)	-0.89	.	.
S. IT	-0.008	0.01	0	0	-0.005	0.013	0	0
	(-1.58)	-2.37	.	.	(-0.87)	-3.66	.	.
S. Material	0.021	-0.011	0	0	-0.018	-0.009	0	0
	(1.12)	(-2.99)	.	.	(-0.60)	(-2.30)	.	.
S. Telcomm	0.030	0.033	0	0	0.022	0.029	0	0
	(3.40)	-2.96	.	.	(2.35)	-2.78	.	.
S. Utility	-0.000	0.028	0	0.64	0.009	0.028	0	0
	(-0.05)	-5.25	.	.	(0.96)	-5.14	.	.
Bill Govt.	0.269	-0.004	35.7	19.65	0.250	0.002	35.8	38.24
	(2.11)	(-0.99)	.	.	(1.99)	-0.41	.	.
10-Yr Govt.	-0.073	-0.019	26.4	8.74	0.036	-0.016	27.1	24.94
	(-1.70)	(-0.25)	.	.	(0.78)	(-0.17)	.	.
30-Yr Govt.	0.014	-0.025	11.5	0.67	-0.017	-0.003	11.2	0.55
	(0.79)	(-0.74)	.	.	(-0.88)	(-0.08)	.	.
Corp. Bond	-0.159	-0.01	0	0	-0.170	-0.01	0	13.42
	(-3.89)	(-0.82)	.	.	(-3.57)	(-0.55)	.	.
HY Bond	-0.004	-0.035	0	0	0.031	-0.019	0	0
	(-0.18)	(-1.28)	.	.	(1.13)	(-0.51)	.	.
IP Bond	0.210	-0.027	0.7	38.89	.	.	.	.
	(7.44)	(-2.67)	.	.	(.)	(.)	.	.
Commodity	0.032	0.118	0	0	0.059	-0.022	0	0
	(3.22)	-4.33	.	.	(6.12)	(-2.19)	.	.
Oil	-0.009	0.024	2	2.07	-0.011	0.035	2	4.42
	(-2.36)	-2.68	.	.	(-2.68)	-4.27	.	.
Gold	0.030	-0.008	10.5	3.94	0.033	-0.009	10.5	4.09
	(3.17)	(-3.31)	.	.	(2.88)	(-3.07)	.	.
Silver	-0.019	0.01	0	0	-0.018	0.006	0	0
	(-3.37)	-1.47	.	.	(-2.89)	-0.82	.	.
Wheat	-0.016	-0.015	0	0.89	-0.014	-0.014	0	0
	(-4.07)	(-4.09)	.	.	(-3.39)	(-3.96)	.	.
FX1	-0.030	-0.009	0	0	-0.029	-0.007	0	0
	(-3.29)	(-3.30)	.	.	(-2.61)	(-2.29)	.	.
FX2	0.027	0.011	0	0	-0.030	0.021	0	0
	(1.78)	-1.91	.	.	(-1.70)	-3.23	.	.
FX3	-0.042	0.007	0	0	-0.045	-0.019	0	0
	(-2.51)	-0.47	.	.	(-2.67)	(-1.28)	.	.
LIBOR	0.025	-0.01	0	13.9	0.032	-0.007	0	1.24
	(0.24)	(-0.67)	.	.	(0.30)	(-0.44)	.	.
R. Estate	0.002	0.171	0	1.48	0.013	0.159	0	4.8
	(0.33)	-3.02	.	.	(1.41)	-2.49	.	.
World Eq.	-0.021	0.012	0	0	-0.045	0.015	0	0
	(-0.90)	-1.5	.	.	(-2.28)	-1.91	.	.
World Bond	0.034	0.031	0	0	0.155	0.019	0	2.04
	(0.85)	-2.03	.	.	(5.68)	-1.19	.	.
Emerge Eq.	-0.007	-0.024	0	0	-0.005	0.027	0	0.61
	(-1.08)	(-0.55)	.	.	(-0.74)	-0.67	.	.
Emerge Bond	-0.009	-0.01	6.1	0.22	0.001	-0.008	6.2	0.26
	(-1.00)	(-2.39)	.	.	(0.15)	(-1.81)	.	.
$\bar{R}^2$	0.835	0.868	.	.	0.785	0.848	.	.
Target Return	. .	4.5	4.5	. .	4.5	4.5		
Tracking Error	. .	2.4	2	. .	2.4	1.8		
Return/Risk	. .	1.85	2.27	. .	1.85	2.56		

Note: The table contains the regressions and the optimizations from February 1997 - May 2009 including the TIPS total return index and without including it. Columns (1) - (4) contain the in-sample regression estimates, out-of-sample regression estimates, in-sample optimization weights, and out-of-sample optimization weights respectively. Columns (5) - (8) contain the same excluding the TIPS total return index. All standard errors are corrected by Newey-West with 12 lags. . indicates that a variable was not available for the time period of estimation. Although the estimations cover the time period February 1997 - May 2009, all of the in-sample estimates are from February 1998 since one year is needed to compute the year-on-year return, and the out-of-sample are from February 2002, since 5 years are used before first estimates are formed.

Table 13: In-Sample and Out-of-Sample Performance of Inflation Hedges with and without TIPS: February 1997 - May 2009

					Max		Min					
Country	Period	T.R.	Mean	S.D.	Value	Date	Value	Date	Number $\leq \pi$	MAE	MSFE	nobs
With TIPS												
ISReg	1997:02	.	0	0.41	1.08	2009:03	-1.53	2008:10	5.09	0	0.3	136.00
ISOpt	1997:02	4.5	4.56	2.45	10.24	2008:02	-4.26	2008:10	0.34	0.27	4.66	136.00
OSReg	1997:02	.	-0.1	0.74	2.49	2008:11	-1.84	2008:07	3.8	0.01	0.54	75.00
OSOpt	1997:02	4.5	1.54	4.79	29.41	2003:12	-12.4	2008:10	1.67	0.25	3.09	75.00
Without TIPS												
ISReg	1997:02	.	0	0.47	1.09	2002:05	-1.32	2008:10	4.71	0	0.36	136.00
ISOpt	1997:02	4.5	4.56	2.45	10.25	2008:02	-4.22	2008:10	0.34	0.27	4.66	136.00
OSReg	1997:02	.	-0.09	0.85	3.42	2008:11	-1.97	2008:07	3.95	0.01	0.6	75.00
OSOpt	1997:02	4.5	1.33	3.08	7.83	2003:05	-11.36	2008:10	1.44	0.11	2.77	75.00

Note: The table reports the performance for all the in-sample and out-of-sample regressions and optimizations contained in Table 12. Period is the set of variables and time period used in the optimization, T.R. represents the target real return that the portfolio was optimized to achieve while minimizing the tracking error with inflation, Mean is the monthly average of the difference between year-on-year inflation and the model's return, S.D. is the standard deviation of the different in the model's value and year-on-year inflation, Max and Min are the largest (smallest) monthly difference between year-on-year inflation and the model's value, Number $\leq \pi$ is the percentage of months where the model's value is lower than the year-on-year inflation for that month, MAE is the mean absolute error of the errors, MSFE is the mean squared forecast error between model values and year-on-year inflation, and nobs is the number of monthly observations used to compute the performance statistics. All values are multiplied by 100, except for nobs.

Table 14: Asset Class Real Return Optimizations for the United States w/ Short Sales

	1901-			1930-			1970-			1990-		
	Real Return Target											
Asset Class	0.50	2.50	4.50	0.50	2.50	4.50	0.50	2.50	4.50	0.50	2.50	4.50
Equity Index	1.1	17.1	37.5	1.2	5.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0
Small-Cap	.	.	.	.	.	.	.	.	.	-0.0	0.0	-0.0
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	0.0	-0.0	-0.0
S. CS	.	.	.	.	.	.	.	.	.	0.0	0.0	0.1
S. Energy	.	.	.	.	.	.	.	.	.	-0.0	1.0	7.8
S. Finance	.	.	.	.	.	.	.	.	.	0.0	0.0	0.0
S. Health	.	.	.	.	.	.	.	.	.	-0.0	-0.0	0.8
S. Indust.	.	.	.	.	.	.	.	.	.	0.8	0.8	0.0
S. IT	.	.	.	.	.	.	.	.	.	0.0	-0.0	-0.0
S. Material	.	.	.	.	.	.	.	.	.	-0.0	0.0	-0.0
S. Telcomm	.	.	.	.	.	.	.	.	.	-0.0	-0.0	0.0
S. Utility	.	.	.	.	.	.	.	.	.	0.0	0.0	-0.0
Bill Govt.	79.3	58.1	5.7	77.9	55.7	9.2	67.6	49.4	0.0	58.8	42.7	-0.0
10-Yr Govt.	-0.0	14.0	40.3	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.5	9.7
30-Yr Govt.	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0	-0.0	0.0	2.7	7.3	17.2
Corp. Bond	.	.	.	0.6	24.2	55.2	-0.0	7.0	31.9	-0.0	5.3	5.4
HY Bond	.	.	.	.	.	.	.	.	.	0.0	0.0	0.0
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	.	.	.	.	.	0.0	0.0	-0.0	-0.0	-0.0	-0.0
Oil	3.9	9.1	16.5	2.7	5.4	9.3	1.8	2.6	6.3	1.6	2.5	4.9
Gold	0.0	-0.0	0.0	1.2	1.3	1.2	3.2	3.5	3.9	3.4	5.8	6.3
Silver	2.8	1.6	0.0	1.5	1.7	2.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0
Wheat	.	.	.	.	.	.	0.0	-0.0	-0.0	0.0	-0.0	-0.0
FX1	12.9	-0.0	-0.0	12.7	-0.0	-0.0	20.6	-0.0	-0.0	29.4	-0.0	-0.0
FX2	.	.	.	.	.	.	0.7	0.0	0.0	0.6	0.0	0.0
FX3	.	.	.	.	.	.	0.0	0.0	-0.0	-0.0	0.0	0.0
LIBOR	.	.	.	.	.	.	5.9	34.9	49.1	0.0	32.0	44.9
R. Estate	.	.	.	.	.	.	.	.	.	-0.0	-0.0	-0.0
World Eq.	.	.	.	1.4	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
World Bond	.	.	.	-0.0	-0.0	-0.0	0.0	0.0	0.0	2.4	0.3	0.0
Emerge Eq.	.	.	.	1.0	6.7	14.2	0.2	2.5	8.9	0.1	0.8	2.9
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	4.5	6.1	10.2	3.7	5.1	8.4	1.7	2.3	4.6	0.9	1.4	2.9
Return/Risk	0.11	0.41	0.44	0.13	0.49	0.54	0.29	1.10	0.98	0.59	1.81	1.58

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are allowed to be positive or negative (i.e. shorting is allowed) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error. Optimal portfolios are estimated from inclusive of January of the starting period until May 2009.

Table 15: Asset Class Real Return Optimizations for the United States w/ Downside Risk

	1901-			1930-			1970-			1990-		
	Real Return Target											
Asset Class	.75	2.50	4.50	.55	2.50	4.50	.50	2.50	4.50	.50	2.50	4.50
Equity Index	.	10.7	36.4	.	2.0	.8	.	.	.	.	.	.
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.6	.1
S. Energy	.	.	.	.	.	.	.	.	.	.	7.5	8.0
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.2
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	100.0	47.6	.	100.0	46.8	.	81.5	45.6	.	71.3	39.0	.
10-Yr Govt.	.	14.5	47.3	.	2.2	4.8	.	1.7	.3	.	.2	9.6
30-Yr Govt.	.	.	.	.	1.9	4.3	.	2.6	11.1	.	8.5	17.9
Corp. Bond	.	.	.	.	26.4	57.3	.	9.5	26.6	.	1.3	4.2
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	.	.	.	.	.	.9	.	.	1.5	.	.
Oil	.	18.4	16.3	.	5.8	9.4	1.1	3.1	10.4	.	.3	5.0
Gold	.	.	.	.	4.3	4.1	.	3.4	3.3	.	4.0	5.6
Silver	.	8.8	.	.	3.8	.	.3	.	.	.	.	.
Wheat	.	.	.	.	.	.	.	.	.	.	.	.
FX1	.	.	.	.	.	.	1.1	.	.	13.8	10.0	.
FX2	.	.	.	.	.	.	.3	.	.	.	.	.
FX3	.	.	.	.	.	.	14.7	.	.	13.4	.	.
LIBOR	.	.	.	.	.	.	.	34.2	44.2	.	28.5	46.0
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	.	.	.	6.8	3.1	.	.	.	.	.	.
World Bond	.	.	.	.	.	.	.	.	.	.	.	.
Emerge Eq.	.	.	.	.	.2	16.2	.	.	4.1	.	.	3.3
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	4.9	7.6	10.2	4.1	5.4	8.6	2.4	2.5	5.1	1.9	1.8	2.8
Return/Risk	.15	.33	.44	.13	.46	.53	.21	.99	.89	.26	1.37	1.59

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly semi-variance with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error. Optimal portfolios are estimated from inclusive of January of the starting period until May 2009.

Table 16: In-Sample Estimation of Inflation Hedges for Various Countries

	Argentina		Australia		Brazil		Chile		China		France	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
Constant	.	1.341	0.035	0.017	.	-0.050	0.158	0.191	.	.	0.113	-0.009
	(.)	(2.29)	(3.45)	(1.52)	(.)	(-0.72)	(2.74)	(1.72)	(.)	(.)	(3.06)	(-1.92)
Equity Index	.	.	0.002	-0.008	.	-0.001	.	.	.	.	.	.
	(.)	(.)	(0.08)	(-0.27)	(.)	(-0.02)	(.)	(.)	(.)	(.)	(.)	(.)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	.	.	0.365	0.599	.	.	0.941	0.468	.	.	-0.083	0.784
	(.)	(.)	(3.68)	(6.95)	(.)	(.)	(3.51)	(4.83)	(.)	(.)	(-0.27)	(8.58)
10-Yr Govt.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
30-Yr Govt.	.	.	-0.101	-0.129	.	.	.	.	.	.	-0.335	0.001
	(.)	(.)	(-2.36)	(-3.15)	(.)	(.)	(.)	(.)	(.)	(.)	(-1.75)	(0.03)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	0.452	.	0.063	.	0.860	.	-0.107	.	.	.	-0.000
	(.)	(0.41)	(.)	(1.75)	(.)	(4.61)	(.)	(-0.64)	(.)	(.)	(.)	(-0.00)
Oil	.	-0.290	.	0.002	.	0.217	.	0.089	.	.	.	0.011
	(.)	(-0.46)	(.)	(0.16)	(.)	(3.34)	(.)	(0.89)	(.)	(.)	(.)	(1.78)
Gold	.	-1.544	.	0.045	.	-0.047	.	-0.114	.	.	.	0.048
	(.)	(-0.97)	(.)	(1.72)	(.)	(-0.13)	(.)	(-0.52)	(.)	(.)	(.)	(2.80)
Silver	.	1.129	.	-0.007	.	-0.065	.	-0.008	.	.	.	-0.010
	(.)	(1.02)	(.)	(-0.74)	(.)	(-0.39)	(.)	(-0.07)	(.)	(.)	(.)	(-1.16)
Wheat	.	-3.380	.	-0.009	.	-0.333	.	-0.202	.	.	.	-0.003
	(.)	(-2.50)	(.)	(-0.59)	(.)	(-4.00)	(.)	(-1.37)	(.)	(.)	(.)	(-0.33)
FX1	.	9.667	.	-0.026	.	0.812	.	2.098	.	.	.	0.081
	(.)	(2.50)	(.)	(-0.61)	(.)	(1.69)	(.)	(1.82)	(.)	(.)	(.)	(2.23)
FX2	.	-3.835	.	0.009	.	-0.256	.	0.054	.	.	.	0.154
	(.)	(-5.81)	(.)	(0.28)	(.)	(-6.27)	(.)	(0.57)	(.)	(.)	(.)	(2.28)
FX3	.	2.849	.	0.003	.	0.150	.	0.026	.	.	.	-0.026
	(.)	(4.58)	(.)	(0.09)	(.)	(0.90)	(.)	(0.12)	(.)	(.)	(.)	(-0.57)
LIBOR	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	0.889	.	0.002	.	-0.244	.	-0.371	.	.	.	0.043
	(.)	(1.07)	(.)	(0.05)	(.)	(-1.43)	(.)	(-0.88)	(.)	(.)	(.)	(1.75)
World Bond	.	-3.092	.	0.011	.	-0.362	.	-0.915	.	.	.	-0.135
	(.)	(-1.88)	(.)	(0.34)	(.)	(-1.17)	(.)	(-1.41)	(.)	(.)	(.)	(-3.19)
Emerge Eq.	.	-3.320	.	-0.022	.	0.276	.	0.119	.	.	.	-0.021
	(.)	(-9.62)	(.)	(-1.69)	(.)	(1.69)	(.)	(0.53)	(.)	(.)	(.)	(-1.95)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	.	0.904	0.109	0.495	.	0.983	0.247	0.801	.	.	0.063	0.752

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 17: In-Sample Estimation of Inflation Hedges for Various Countries

	Germany		Hong Kong		India		Italy		Japan		Mexico		Peru	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-		
Constant	0.022	-0.008	.	-0.017	0.038	0.035	0.044	-0.007	0.178	-0.005	.	0.010	0.188	0.034
	(2.75)	(-2.49)	(.)	(-1.17)	(2.00)	(2.39)	(1.11)	(-1.33)	(1.56)	(-0.97)	(.)	(0.85)	(1.15)	(0.16)
Equity Index	0.004	0.006	.	.	.	.	0.222	0.010	-0.075	-0.009	.	-0.004	0.775	0.625
	(0.26)	(0.87)	(.)	(.)	(.)	(.)	(2.19)	(1.05)	(-0.31)	(-0.64)	(.)	(-0.39)	(12.26)	(8.04)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	0.067	0.217	.	1.360	0.403	0.489	-0.052	0.885	0.101	1.304	.	0.751	.	.
	(0.30)	(2.13)	(.)	(5.10)	(1.92)	(2.71)	(-0.07)	(12.84)	(0.14)	(7.87)	(.)	(14.34)	(.)	(.)
10-Yr Govt.	.	.	.	.	.	.	.	.	-0.408	0.027	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(-1.72)	(0.65)	(.)	(.)	(.)	(.)
30-Yr Govt.	-0.033	0.089	.	.	-0.046	-0.131	0.559	-0.097	.	.	.	.	.	.
	(-0.61)	(3.71)	(.)	(.)	(-0.52)	(-2.13)	(0.80)	(-3.89)	(.)	(.)	(.)	(.)	(.)	(.)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	0.005	.	0.075	.	0.016	.	0.029	.	0.065	.	0.090	.	1.723
	(.)	(0.61)	(.)	(1.71)	(.)	(0.35)	(.)	(1.74)	(.)	(3.01)	(.)	(2.10)	(.)	(1.91)
Oil	.	0.006	.	-0.024	.	0.018	.	0.009	.	0.027	.	-0.020	.	-0.005
	(.)	(2.08)	(.)	(-1.38)	(.)	(1.05)	(.)	(1.64)	(.)	(2.37)	(.)	(-0.81)	(.)	(-0.01)
Gold	.	0.017	.	0.021	.	0.102	.	0.080	.	0.011	.	0.035	.	0.310
	(.)	(1.93)	(.)	(0.59)	(.)	(2.57)	(.)	(5.27)	(.)	(0.72)	(.)	(0.75)	(.)	(0.43)
Silver	.	-0.001	.	0.021	.	-0.022	.	-0.008	.	-0.007	.	0.041	.	-0.575
	(.)	(-0.38)	(.)	(1.47)	(.)	(-1.29)	(.)	(-1.13)	(.)	(-0.85)	(.)	(1.39)	(.)	(-1.39)
Wheat	.	0.005	.	0.027	.	0.039	.	-0.015	.	-0.005	.	0.005	.	-1.153
	(.)	(1.21)	(.)	(1.23)	(.)	(2.57)	(.)	(-1.53)	(.)	(-0.54)	(.)	(0.22)	(.)	(-1.83)
FX1	.	0.040	.	-0.051	.	0.155	.	0.046	.	-0.027	.	0.098	.	-1.022
	(.)	(1.90)	(.)	(-0.33)	(.)	(1.81)	(.)	(1.65)	(.)	(-0.60)	(.)	(0.91)	(.)	(-0.28)
FX2	.	0.350	.	-0.071	.	-0.101	.	0.071	.	0.023	.	-0.027	.	1.708
	(.)	(3.32)	(.)	(-1.53)	(.)	(-2.26)	(.)	(1.30)	(.)	(0.78)	(.)	(-1.01)	(.)	(1.15)
FX3	.	-0.055	.	0.076	.	0.023	.	-0.031	.	0.102	.	0.008	.	-0.311
	(.)	(-3.52)	(.)	(1.27)	(.)	(0.71)	(.)	(-0.77)	(.)	(2.37)	(.)	(0.23)	(.)	(-0.42)
LIBOR	.	0.374	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(5.75)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	0.005	.	-0.064	.	-0.008	.	0.008	.	-0.010	.	-0.024	.	-0.442
	(.)	(0.39)	(.)	(-2.14)	(.)	(-0.24)	(.)	(0.28)	(.)	(-0.38)	(.)	(-0.34)	(.)	(-0.48)
World Bond	.	-0.070	.	-0.048	.	-0.052	.	-0.072	.	-0.111	.	-0.046	.	1.874
	(.)	(-2.90)	(.)	(-0.76)	(.)	(-0.94)	(.)	(-1.55)	(.)	(-3.24)	(.)	(-0.53)	(.)	(0.55)
Emerge Eq.	.	0.005	.	0.028	.	-0.065	.	-0.025	.	-0.024	.	-0.045	.	-1.002
	(.)	(0.89)	(.)	(1.28)	(.)	(-3.16)	(.)	(-1.90)	(.)	(-1.57)	(.)	(-1.02)	(.)	(-1.35)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	0.002	0.710	.	0.466	0.038	0.377	0.131	0.828	0.003	0.749	.	0.934	0.893	0.927

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 18: In-Sample Estimation of Inflation Hedges for Various Countries

	Russia		Singapore		South Korea		Spain		UK		USA	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
Constant	.	.	.	0.008	.	-0.020	0.041	0.013	0.008	-0.040	0.009	0.005
	(.)	(.)	(.)	(1.23)	(.)	(-1.99)	(2.51)	(1.73)	(0.86)	(-4.85)	(0.98)	(1.42)
Equity Index	.	.	.	-0.029	.	.	.	.	0.009	0.083	-0.028	0.033
	(.)	(.)	(.)	(-2.14)	(.)	(.)	(.)	(.)	(0.29)	(2.26)	(-0.69)	(1.61)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	.	.	.	0.665	.	0.729	0.489	0.627	0.664	0.386	0.533	0.628
	(.)	(.)	(.)	(4.22)	(.)	(9.76)	(3.34)	(8.24)	(4.89)	(1.99)	(4.52)	(5.77)
10-Yr Govt.	.	.	.	.	.	0.012	.	.	.	0.215	-0.002	-0.144
	(.)	(.)	(.)	(.)	(.)	(0.53)	(.)	(.)	(.)	(2.29)	(-0.01)	(-2.33)
30-Yr Govt.	.	.	.	.	.	.	.	0.003	.	.	-0.059	0.035
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(0.05)	(.)	(.)	(-0.80)	(1.39)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	0.101	-0.039
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(1.67)	(-0.92)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	.	.	0.054	.	-0.064	.	0.014	.	0.007	.	0.002
	(.)	(.)	(.)	(1.23)	(.)	(-1.63)	(.)	(0.39)	(.)	(0.22)	(.)	(0.14)
Oil	.	.	.	0.037	.	0.062	.	0.022	.	0.023	0.022	0.011
	(.)	(.)	(.)	(2.53)	(.)	(3.27)	(.)	(2.29)	(.)	(2.05)	(2.81)	(2.56)
Gold	.	.	.	0.044	.	0.046	.	0.044	.	0.044	0.015	0.038
	(.)	(.)	(.)	(2.66)	(.)	(1.66)	(.)	(1.84)	(.)	(1.87)	(0.84)	(3.46)
Silver	.	.	.	-0.011	.	-0.012	.	-0.023	.	-0.004	0.011	-0.002
	(.)	(.)	(.)	(-1.09)	(.)	(-0.91)	(.)	(-1.54)	(.)	(-0.33)	(0.99)	(-0.38)
Wheat	.	.	.	0.046	.	-0.009	.	-0.009	.	-0.010	.	-0.012
	(.)	(.)	(.)	(2.47)	(.)	(-0.63)	(.)	(-0.55)	(.)	(-0.79)	(.)	(-2.08)
FX1	.	.	.	-0.066	.	0.113	.	0.047	.	0.202	.	0.004
	(.)	(.)	(.)	(-0.84)	(.)	(1.50)	(.)	(0.93)	(.)	(3.01)	(.)	(0.19)
FX2	.	.	.	0.038	.	-0.009	.	0.401	.	0.166	.	0.027
	(.)	(.)	(.)	(1.47)	(.)	(-0.26)	(.)	(5.18)	(.)	(1.83)	(.)	(0.92)
FX3	.	.	.	-0.039	.	0.034	.	-0.124	.	-0.025	.	-0.034
	(.)	(.)	(.)	(-1.36)	(.)	(0.65)	(.)	(-1.67)	(.)	(-0.58)	(.)	(-1.14)
LIBOR	.	.	.	.	.	.	.	.	.	0.548	.	0.067
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(3.84)	(.)	(0.71)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	.	.	-0.028	.	0.007	.	0.015	.	-0.060	0.048	-0.063
	(.)	(.)	(.)	(-0.85)	(.)	(0.20)	(.)	(0.42)	(.)	(-1.41)	(0.97)	(-2.80)
World Bond	.	.	.	-0.128	.	-0.109	.	-0.122	.	-0.198	-0.103	0.090
	(.)	(.)	(.)	(-2.64)	(.)	(-1.83)	(.)	(-2.43)	(.)	(-2.80)	(-1.65)	(1.52)
Emerge Eq.	.	.	.	-0.015	.	0.003	.	-0.009	.	0.001	0.000	0.009
	(.)	(.)	(.)	(-1.07)	(.)	(0.13)	(.)	(-0.53)	(.)	(0.05)	(0.03)	(1.14)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	.	.	.	0.646	.	0.654	0.059	0.653	0.275	0.662	0.304	0.759

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 19: Asset Class Real Return Optimizations by Country

	Argentina		Australia		Brazil		Chile		China		France	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
	Real Return Target											
Asset Class	.	4.50	3.13	4.50	.	4.50	-14.42	4.50	.	.	-1.55	4.50
Equity Index	.	.	0.00	-0.00	.	0.00	.	.	.	.	.	.
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	.	.	0.00	55.95	.	.	100.00	61.33	.	.	0.00	52.85
10-Yr Govt.	.	.	.	.	.	.	.	.	.	.	.	.
30-Yr Govt.	.	.	100.00	13.65	.	.	.	.	.	.	100.00	27.63
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	0.00	.	0.00	.	-0.00	.	-0.00	.	.	.	-0.00
Oil	.	0.00	.	7.80	.	49.79	.	9.81	.	.	.	5.81
Gold	.	0.00	.	4.57	.	0.00	.	0.00	.	.	.	6.04
Silver	.	0.00	.	0.00	.	0.00	.	0.00	.	.	.	0.00
Wheat	.	-0.00	.	-0.00	.	-0.00	.	0.00	.	.	.	0.00
FX1	.	-0.00	.	-0.00	.	8.38	.	-0.00	.	.	.	0.00
FX2	.	18.93	.	-0.00	.	-0.00	.	0.00	.	.	.	-0.00
FX3	.	0.78	.	-0.00	.	-0.00	.	0.00	.	.	.	0.00
LIBOR	.	.	.	.	.	.	.	.	.	.	.	.
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	0.00	.	-0.00	.	-0.00	.	16.56	.	.	.	0.00
World Bond	.	80.29	.	6.30	.	13.09	.	4.99	.	.	.	-0.00
Emerge Eq.	.	-0.00	.	11.73	.	28.75	.	7.31	.	.	.	7.67
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	.	1239.7	12.8	5.5	.	181.0	77.0	65.4	.	.	19.3	4.5
Return/Risk	.	0.00	0.24	0.82	.	0.02	-0.19	0.07	.	.	-0.08	1.00

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

Table 20: Asset Class Real Return Optimizations by Country

	Germany		Hong Kong		India		Italy		Japan		Mexico		Peru	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
	Real Return Target													
Asset Class	4.50	4.50	.	4.50	0.55	4.50	4.50	4.50	1.66	4.50	.	4.50	26.27	4.50
Equity Index	9.66	0.00	.	.	.	.	96.00	-0.00	100.00	0.32	.	0.00	100.00	74.58
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	11.53	0.00	.	24.86	0.00	56.95	0.00	64.45	0.00	-0.00	.	83.05	.	.
10-Yr Govt.	.	.	.	.	.	.	.	.	0.00	76.83	.	.	.	.
30-Yr Govt.	78.81	41.00	.	.	100.00	-0.00	4.00	7.58	.	.	.	.	.	.
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	0.00	.	0.00	.	-0.00	.	-0.00	.	0.00	.	2.67	.	0.00
Oil	.	4.33	.	8.17	.	6.37	.	6.53	.	11.23	.	3.00	.	0.00
Gold	.	2.00	.	7.36	.	12.20	.	6.77	.	4.64	.	5.95	.	0.00
Silver	.	0.00	.	-0.00	.	-0.00	.	-0.00	.	-0.00	.	1.98	.	0.00
Wheat	.	0.00	.	0.00	.	-0.00	.	-0.00	.	-0.00	.	2.92	.	0.00
FX1	.	0.00	.	-0.00	.	-0.00	.	-0.00	.	0.00	.	0.00	.	0.00
FX2	.	0.00	.	0.00	.	-0.00	.	-0.00	.	-0.00	.	0.00	.	0.00
FX3	.	0.00	.	0.00	.	-0.00	.	-0.00	.	0.00	.	0.42	.	0.00
LIBOR	.	44.76	.	.	.	.	.	.	.	.	.	.	.	.
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	0.00	.	0.00	.	0.26	.	-0.00	.	0.00	.	0.00	.	0.00
World Bond	.	0.00	.	42.22	.	20.94	.	1.20	.	-0.00	.	0.00	.	0.00
Emerge Eq.	.	7.90	.	17.39	.	3.28	.	13.46	.	6.98	.	0.00	.	25.42
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	7.9	3.5	.	8.6	12.0	6.5	49.3	6.2	72.8	5.9	.	10.2	403.4	387.1
Return/Risk	0.57	1.30	.	0.52	0.05	0.69	0.09	0.72	0.02	0.76	.	0.44	0.07	0.01

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

Table 21: Asset Class Real Return Optimizations by Country

	Russia		Singapore		South Korea		Spain		UK		USA	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
						Real Return Target						
Asset Class	.	.	.	4.50	.	4.50	-0.50	4.50	2.63	4.50	4.50	4.50
Equity Index	.	.	.	1.62	.	.	.	.	100.00	-0.00	9.16	0.00
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	.	.	.	27.18	.	85.23	100.00	14.62	0.00	0.00	9.72	0.00
10-Yr Govt.	.	.	.	.	.	0.00	.	.	.	41.13	0.17	0.00
30-Yr Govt.	.	.	.	.	.	.	.	47.22	.	.	-0.00	0.01
Corp. Bond	.	.	.	.	.	.	.	.	.	.	54.31	31.52
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	.	.	-0.00	.	-0.00	.	-0.00	.	0.00	.	-0.00
Oil	.	.	.	11.24	.	5.89	.	10.53	.	5.78	9.39	6.30
Gold	.	.	.	7.44	.	0.10	.	8.27	.	5.30	0.99	3.79
Silver	.	.	.	0.00	.	0.00	.	0.00	.	-0.00	2.06	0.00
Wheat	.	.	.	4.46	.	-0.00	.	0.00	.	0.00	.	0.00
FX1	.	.	.	-0.00	.	2.17	.	-0.00	.	-0.00	.	-0.00
FX2	.	.	.	-0.00	.	0.00	.	-0.00	.	-0.00	.	0.00
FX3	.	.	.	-0.00	.	6.61	.	0.00	.	-0.00	.	0.00
LIBOR	.	.	.	.	.	.	.	.	.	40.23	.	49.49
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	.	.	-0.00	.	0.00	.	-0.00	.	0.00	-0.00	-0.00
World Bond	.	.	.	34.73	.	0.00	.	0.00	.	-0.00	-0.00	0.00
Emerge Eq.	.	.	.	13.33	.	0.00	.	19.35	.	7.56	14.21	8.89
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	.	.	.	7.4	.	4.7	9.0	9.3	20.0	4.7	8.3	4.6
Return/Risk	.	.	.	0.61	.	0.97	-0.06	0.48	0.13	0.96	0.54	0.99

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

Table 22: Out-of-Sample Estimation of Inflation Hedges for Various Countries (Avg. Weights)

	Argentina		Australia		Brazil		Chile		China		France	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-
Constant	.	1.172	0.069	0.026	.	0.029	0.255	0.679	.	.	0.135	0.004
	(.)	(1.24)	(-0.74)	(-0.69)	(.)	(-0.76)	(0.36)	(3.35)	(.)	(.)	(-0.28)	(7.59)
Equity Index	.	.	0.069	0.026	.	0.029	.	.	.	.	.	.
	(.)	(.)	(5.61)	(0.43)	(.)	(2.37)	(.)	(.)	(.)	(.)	(.)	(.)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	.	.	-0.027	-0.016	.	.	0.255	0.679	.	.	0.135	0.004
	(.)	(.)	(-0.74)	(-0.69)	(.)	(.)	(3.41)	(2.28)	(.)	(.)	(1.82)	(-0.20)
10-Yr Govt.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
30-Yr Govt.	.	.	-1.480	0.822	.	.	.	.	.	.	-0.130	0.794
	(.)	(.)	(-2.83)	(5.84)	(.)	(.)	(.)	(.)	(.)	(.)	(-0.28)	(7.59)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	1.172	.	-0.088	.	-0.024	.	0.420	.	.	.	0.038
	(.)	(2.35)	(.)	(-1.88)	(.)	(-0.76)	(.)	(3.35)	(.)	(.)	(.)	(1.12)
Oil	.	0.584	.	0.070	.	0.449	.	-0.207	.	.	.	0.009
	(.)	(1.24)	(.)	(2.52)	(.)	(2.21)	(.)	(-1.06)	(.)	(.)	(.)	(0.77)
Gold	.	-0.286	.	0.013	.	0.161	.	0.036	.	.	.	0.009
	(.)	(-0.98)	(.)	(1.62)	(.)	(2.89)	(.)	(0.33)	(.)	(.)	(.)	(1.94)
Silver	.	-1.161	.	0.018	.	-0.084	.	-0.143	.	.	.	0.038
	(.)	(-0.55)	(.)	(0.74)	(.)	(-0.34)	(.)	(-0.65)	(.)	(.)	(.)	(2.54)
Wheat	.	0.727	.	-0.009	.	-0.036	.	-0.056	.	.	.	-0.006
	(.)	(0.59)	(.)	(-0.91)	(.)	(-0.55)	(.)	(-0.07)	(.)	(.)	(.)	(-0.64)
FX1	.	-2.355	.	-0.028	.	-0.177	.	-0.171	.	.	.	-0.016
	(.)	(-2.29)	(.)	(-1.81)	(.)	(-2.20)	(.)	(-1.09)	(.)	(.)	(.)	(-2.01)
FX2	.	6.236	.	-0.041	.	0.691	.	5.308	.	.	.	0.142
	(.)	(1.67)	(.)	(-0.80)	(.)	(3.60)	(.)	(3.27)	(.)	(.)	(.)	(2.84)
FX3	.	-2.876	.	-0.018	.	-0.141	.	0.200	.	.	.	0.082
	(.)	(-5.26)	(.)	(-0.35)	(.)	(-3.41)	(.)	(0.77)	(.)	(.)	(.)	(1.18)
LIBOR	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	1.615	.	0.046	.	0.089	.	-0.468	.	.	.	-0.032
	(.)	(3.32)	(.)	(1.24)	(.)	(0.13)	(.)	(-0.90)	(.)	(.)	(.)	(-0.80)
World Bond	.	0.595	.	0.045	.	-0.183	.	-0.478	.	.	.	0.041
	(.)	(0.58)	(.)	(1.04)	(.)	(-1.40)	(.)	(-1.05)	(.)	(.)	(.)	(1.79)
Emerge Eq.	.	-1.758	.	-0.045	.	-0.104	.	-3.145	.	.	.	-0.171
	(.)	(-0.77)	(.)	(-0.90)	(.)	(-0.95)	(.)	(-2.76)	(.)	(.)	(.)	(-4.17)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	.	0.876	0.370	0.566	.	0.955	0.169	0.812	.	.	0.117	0.764

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 23: Out-of-Sample Estimation of Inflation Hedges for Various Countries (Avg. Weights)

	Germany		Hong Kong		India		Italy		Japan		Mexico		Peru	
Independent Variables	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970-		
Constant	0.051	0.008	.	0.023	0.060	0.074	-0.243	-0.003	0.266	-0.049	.	-0.001	0.115	0.048
	(0.84)	(0.20)	(.)	(4.10)	(-0.72)	(1.61)	(2.94)	(0.25)	(-0.05)	(-0.91)	(.)	(-0.07)	(4.55)	(4.44)
Equity Index	0.051	0.008	.	.	.	.	-0.243	-0.003	0.266	-0.049	.	-0.001	0.115	0.048
	(3.63)	(1.10)	(.)	(.)	(.)	(.)	(-1.15)	(-0.37)	(1.42)	(-2.17)	(.)	(-0.68)	(3.31)	(0.80)
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Value	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Growth	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CD	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. CS	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Health	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. IT	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Material	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Bill Govt.	0.021	0.001	.	0.023	0.060	0.074	0.296	-0.000	-0.208	-0.008	.	-0.004	.	.
	(0.84)	(0.20)	(.)	(1.62)	(2.01)	(2.60)	(2.94)	(0.25)	(-0.05)	(-0.91)	(.)	(-0.07)	(.)	(.)
10-Yr Govt.	.	.	.	.	.	.	.	.	2.286	2.097	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(-1.14)	(5.73)	(.)	(.)	(.)	(.)
30-Yr Govt.	-0.914	0.051	.	.	-1.382	0.305	5.948	0.966	.	.	.	.	.	.
	(-1.98)	(0.47)	(.)	(.)	(-0.72)	(1.61)	(1.53)	(11.28)	(.)	(.)	(.)	(.)	(.)	(.)
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Commodity	.	0.092	.	0.777	.	-0.588	.	-0.143	.	0.055	.	1.003	.	0.362
	(.)	(4.16)	(.)	(4.10)	(.)	(-1.89)	(.)	(-4.25)	(.)	(1.20)	(.)	(12.06)	(.)	(4.44)
Oil	.	-0.002	.	0.092	.	0.043	.	0.029	.	0.086	.	0.109	.	1.145
	(.)	(-0.14)	(.)	(3.22)	(.)	(0.79)	(.)	(1.32)	(.)	(4.36)	(.)	(2.09)	(.)	(0.66)
Gold	.	0.007	.	-0.005	.	0.037	.	0.008	.	0.036	.	0.001	.	0.036
	(.)	(2.22)	(.)	(-0.36)	(.)	(2.64)	(.)	(1.33)	(.)	(5.03)	(.)	(1.59)	(.)	(0.83)
Silver	.	0.021	.	0.012	.	0.095	.	0.081	.	0.010	.	0.026	.	0.102
	(.)	(2.68)	(.)	(0.54)	(.)	(2.10)	(.)	(5.54)	(.)	(0.90)	(.)	(0.78)	(.)	(0.69)
Wheat	.	-0.005	.	0.009	.	-0.027	.	-0.012	.	-0.011	.	0.027	.	-0.326
	(.)	(-1.32)	(.)	(0.82)	(.)	(-1.38)	(.)	(-1.41)	(.)	(-1.28)	(.)	(0.60)	(.)	(-0.89)
FX1	.	0.005	.	0.036	.	0.018	.	-0.020	.	-0.012	.	-0.022	.	-0.659
	(.)	(0.84)	(.)	(2.40)	(.)	(0.68)	(.)	(-1.53)	(.)	(-1.33)	(.)	(-0.97)	(.)	(-0.51)
FX2	.	0.061	.	-0.024	.	0.086	.	0.074	.	-0.055	.	0.040	.	-0.072
	(.)	(2.27)	(.)	(-0.06)	(.)	(0.68)	(.)	(1.70)	(.)	(-1.23)	(.)	(0.10)	(.)	(2.78)
FX3	.	-8.940e+12	.	0.040	.	0.010	.	0.060	.	0.017	.	-0.019	.	0.879
	(.)	(2.19)	(.)	(0.43)	(.)	(-0.33)	(.)	(1.29)	(.)	(0.38)	(.)	(-0.73)	(.)	(-0.19)
LIBOR	.	-0.052	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(-2.77)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
World Eq.	.	0.358	.	0.024	.	0.077	.	-0.018	.	0.126	.	-0.045	.	-0.605
	(.)	(4.90)	(.)	(0.78)	(.)	(1.25)	(.)	(-0.38)	(.)	(2.41)	(.)	(-0.40)	(.)	(-2.64)
World Bond	.	0.014	.	-0.066	.	-0.088	.	0.027	.	-0.034	.	-0.040	.	-0.195
	(.)	(0.91)	(.)	(-2.27)	(.)	(-2.06)	(.)	(0.84)	(.)	(-0.77)	(.)	(-0.90)	(.)	(0.37)
Emerge Eq.	.	-0.073	.	-0.056	.	-0.104	.	-0.109	.	-0.113	.	0.021	.	0.866
	(.)	(-2.64)	(.)	(-1.53)	(.)	(-0.97)	(.)	(-2.05)	(.)	(-2.69)	(.)	(0.40)	(.)	(-0.97)
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
$\bar{R}^2$	0.233	0.726	.	0.672	0.102	0.574	0.316	0.854	0.087	0.827	.	0.937	0.320	0.897

Note: The table consist of regressions of the form: $\pi_{t,t+k} = \alpha + \sum_{j=1}^{N} \beta_j r_{jt,t+k} + \epsilon_{t,t+k}$ $t = 1, 2, ...T$, where $\pi_{t,t+k}$ represents the inflation from month t to $t+k$, $r_{jt,t+k}$ represents the return of asset class j from month t to month $t+k$, β_j represents the coefficient estimates from the regression, $\epsilon_{t,t+k}$ represents the error term, N represents the number of asset classes used in the regression, and $k = 12$ for these regressions. All standard errors are corrected by Newey-West with 12 lags. The time period for each regression is from the year listed on the top until June 2006. . indicates that a variable was not available for the time period of estimation.

Table 24: Out-of-Sample Asset Class Real Return Optimizations by Country (Avg. Weights)

	Argentina		Australia		Brazil		Chile		China		France	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970	1930-	1970	1930-	1970
						Real Return Target						
Asset Class	.	4.81	3.00	4.50	.	4.50	14.87	4.50	.	.	6.39	4.50
Equity Index	.	.	32.34	0.00	.	0.47	.	.	.	.	.	.
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	.	.	13.25	51.75	.	.	100.00	56.84	.	.	5.61	62.64
10-Yr Govt.	.	.	.	.	.	.	.	.	.	.	.	.
30-Yr Govt.	.	.	54.42	2.39	.	.	.	.	.	.	94.39	10.99
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	1.08	.	1.01	.	1.59	.	0.00	.	.	.	0.00
Oil	.	0.91	.	9.52	.	30.31	.	9.63	.	.	.	4.83
Gold	.	9.39	.	3.63	.	0.48	.	0.00	.	.	.	7.01
Silver	.	0.00	.	0.00	.	0.33	.	0.00	.	.	.	0.00
Wheat	.	0.40	.	0.22	.	0.52	.	0.00	.	.	.	0.00
FX1	.	0.00	.	0.11	.	8.91	.	0.00	.	.	.	0.00
FX2	.	24.08	.	0.03	.	0.49	.	0.00	.	.	.	0.00
FX3	.	16.69	.	2.08	.	3.39	.	0.00	.	.	.	0.00
LIBOR	.	.	.	.	.	.	.	.	.	.	.	.
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	0.04	.	1.20	.	0.74	.	22.80	.	.	.	0.97
World Bond	.	44.53	.	7.99	.	27.70	.	6.49	.	.	.	0.67
Emerge Eq.	.	2.87	.	20.06	.	25.09	.	4.24	.	.	.	12.88
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	.	905.8	14.8	6.7	.	120.6	49.0	100.3	.	.	21.7	5.2
Return/Risk	.	0.01	0.20	0.67	.	0.04	0.30	0.04	.	.	0.29	0.87

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

Table 25: Out-of-Sample Asset Class Real Return Optimizations by Country (Avg. Weights)

	Germany		Hong Kong		India		Italy		Japan		Mexico		Peru	
	1930-	1970-	1930-	1970-	1930-	1970-	1930-	1970	1930-	1970	1930-	1970		
	Real Return Target													
Asset Class	4.50	4.50	.	4.50	1.78	4.50	3.86	4.50	5.28	4.50	.	4.50	9.85	4.47
Equity Index	16.93	0.00	.	.	.	.	93.07	0.39	88.35	9.33	.	2.54	100.00	47.34
Small-Cap	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Value	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Growth	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. CD	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. CS	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Energy	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Finance	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Health	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Indust.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. IT	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Material	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Telcomm	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S. Utility	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bill Govt.	19.99	0.00	.	26.76	11.83	61.75	4.27	64.80	6.36	2.81	.	73.04	.	.
10-Yr Govt.	.	.	.	.	.	.	.	.	5.29	62.34	.	.	.	.
30-Yr Govt.	63.08	34.55	.	.	88.17	0.00	2.66	0.92	.	.	.	.	.	.
Corp. Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HY Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IP Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Commodity	.	0.00	.	2.93	.	0.84	.	0.00	.	0.23	.	2.58	.	1.70
Oil	.	4.16	.	10.84	.	7.35	.	5.70	.	13.94	.	8.03	.	7.16
Gold	.	3.42	.	5.21	.	10.83	.	8.65	.	2.64	.	3.97	.	1.89
Silver	.	0.14	.	0.00	.	0.00	.	0.00	.	0.00	.	1.13	.	0.00
Wheat	.	0.34	.	2.02	.	0.80	.	0.00	.	0.13	.	1.66	.	0.16
FX1	.	0.00	.	0.00	.	0.00	.	0.00	.	0.00	.	0.00	.	9.77
FX2	.	0.00	.	0.09	.	0.30	.	0.00	.	0.59	.	0.00	.	1.16
FX3	.	0.12	.	0.00	.	0.87	.	0.00	.	0.05	.	0.23	.	1.12
LIBOR	.	48.29	.	.	.	.	.	.	.	.	.	.	.	.
R. Estate	.	.	.	.	.	.	.	.	.	.	.	.	.	.
World Eq.	.	0.00	.	0.03	.	1.22	.	1.93	.	0.00	.	0.00	.	6.03
World Bond	.	0.00	.	27.88	.	13.30	.	4.33	.	0.41	.	0.00	.	8.34
Emerge Eq.	.	8.98	.	24.25	.	2.73	.	13.28	.	7.53	.	6.81	.	15.32
Emerge Bond	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tracking Error	8.7	3.7	.	8.2	13.8	6.8	54.2	6.3	83.3	6.6	.	11.0	127.2	269.4
Return/Risk	0.51	1.22	.	0.55	0.13	0.67	0.07	0.72	0.06	0.68	.	0.41	0.08	0.02

Note: The asset class weights are the weights from an optimization to minimize the portfolio returns monthly tracking error with inflation, while producing the desired real return target listed. The weights of the asset classes are constrained to be greater than 0 (i.e. no shorting) and the weights must sum to 1 (i.e. fully-invested). Mathematically, the optimization is $\min_{\mathbf{w}} \mathbf{w'\Sigma w - 2w'\gamma}$ s.t. $\mathbf{w'\mu} = \tilde{\mu}_P + \pi_{t,t+k}$. The . represents asset classes whose returns did not exist at the starting period, while 0.0 indicates an asset class whose data existed at the starting period, but the optimization led to a zero weighting. Tracking error represents the annualized tracking error of the portfolio versus inflation and Return/Risk represent the real return of the portfolio divided by the tracking error.

VII Figures

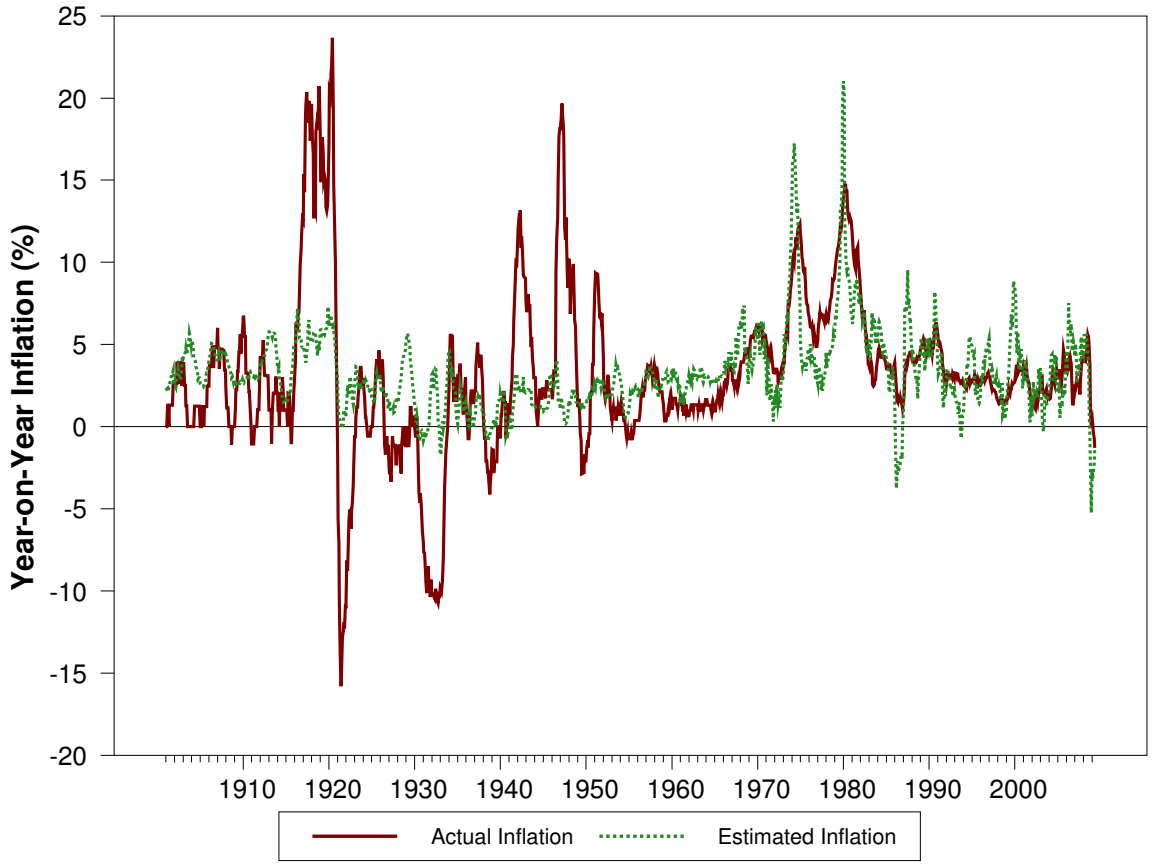

Figure 1: United States Inflation (y/y) versus Estimated Inflation from 1900 to June, 2009

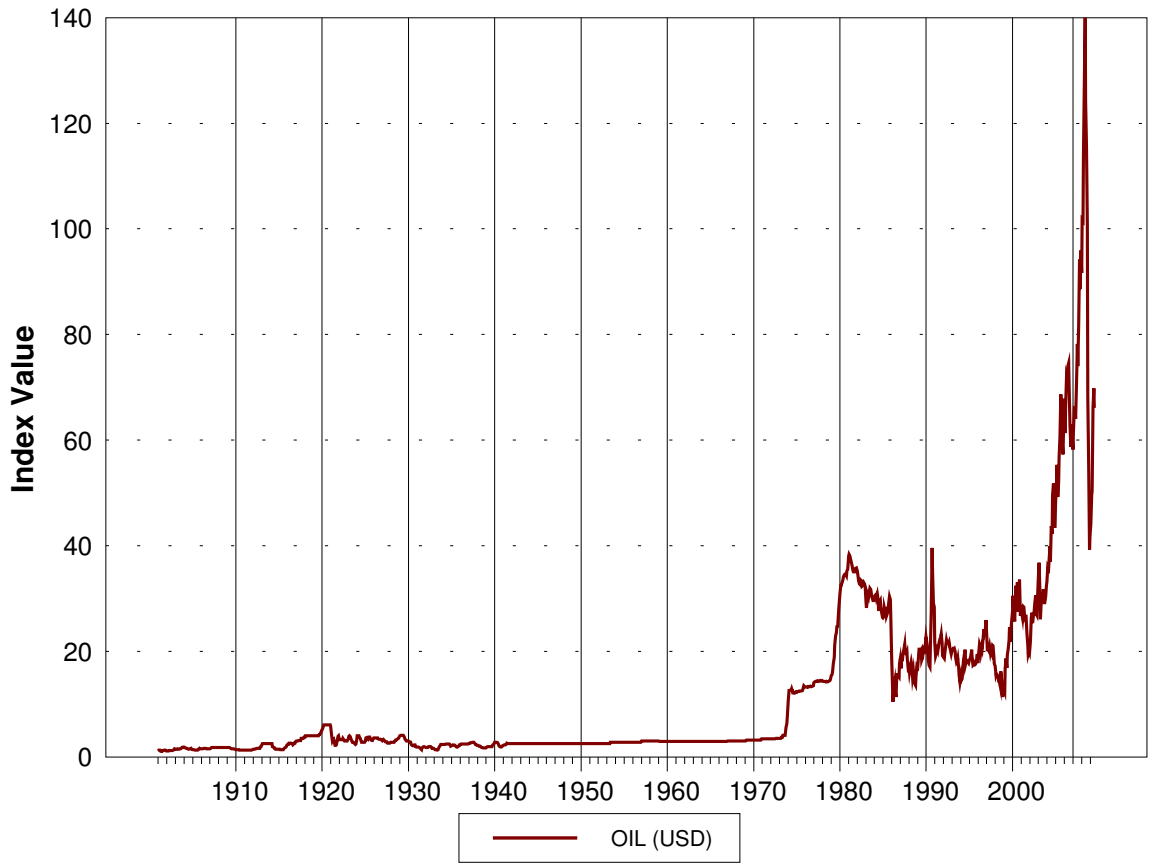

Figure 2: US Dollar Oil Prices since 1901 ($ per ounce)

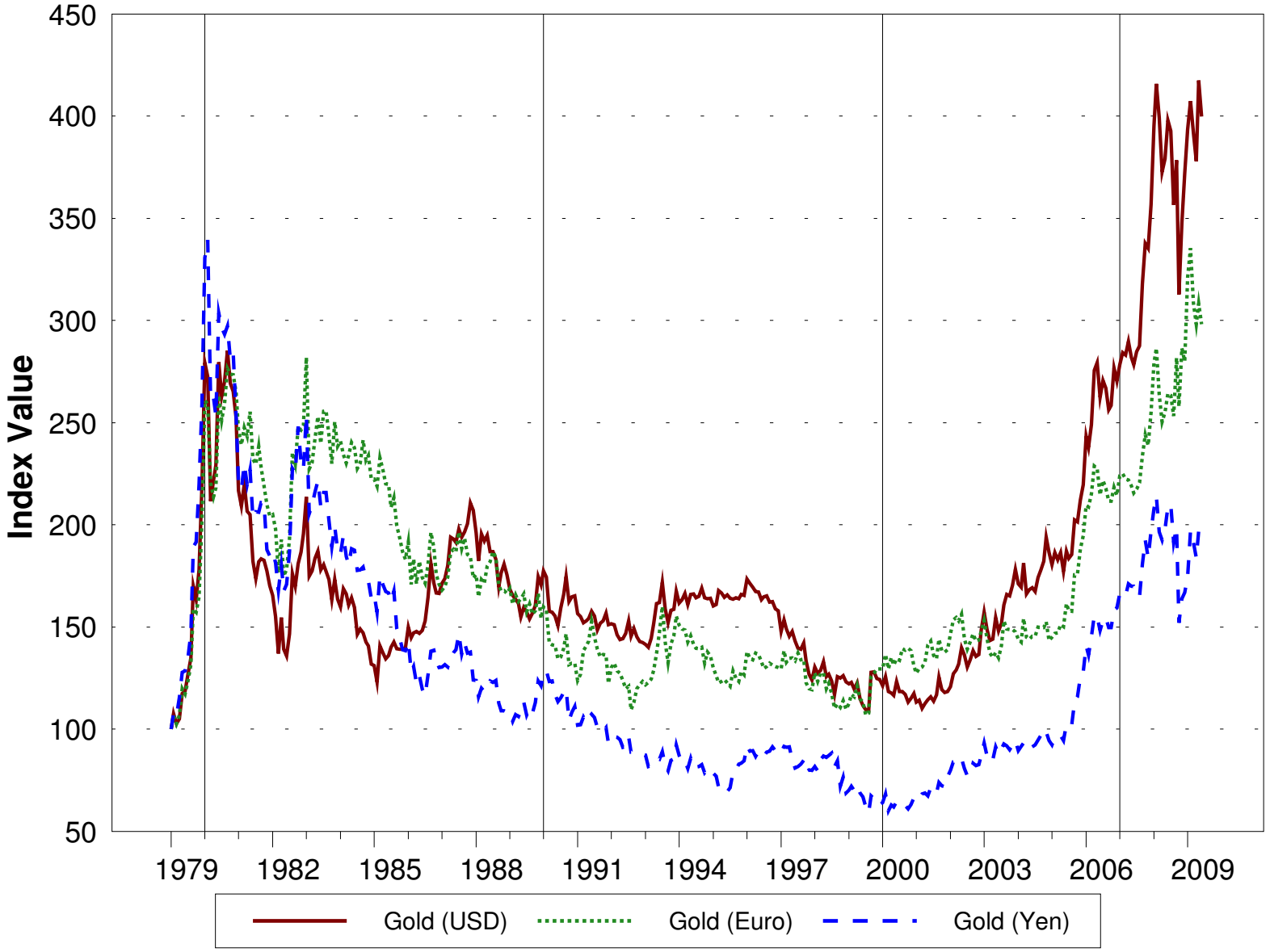

Figure 3: Gold Index in Three Reference Currencies (USD, EUR, and YEN)

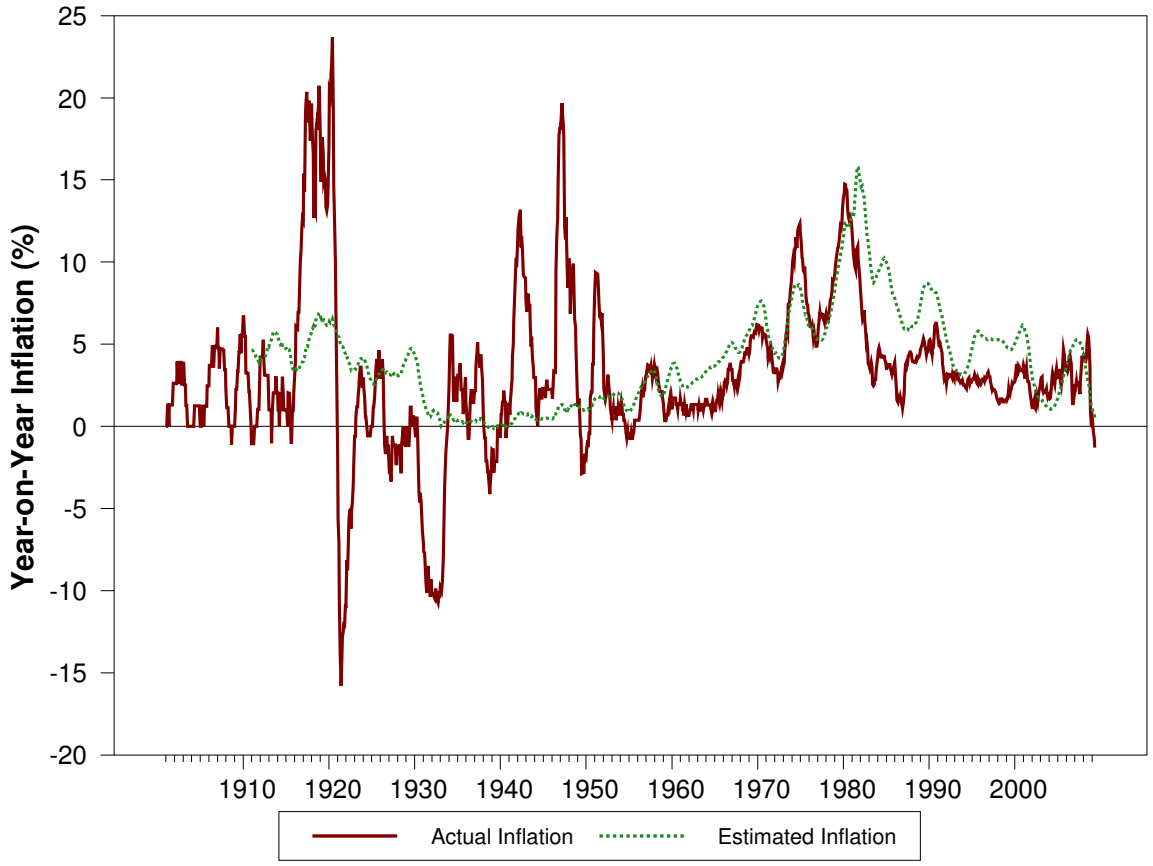

Figure 4: United States Inflation (y/y) versus Estimated Inflation from 1900 to June, 2009: Optimized Portfolios

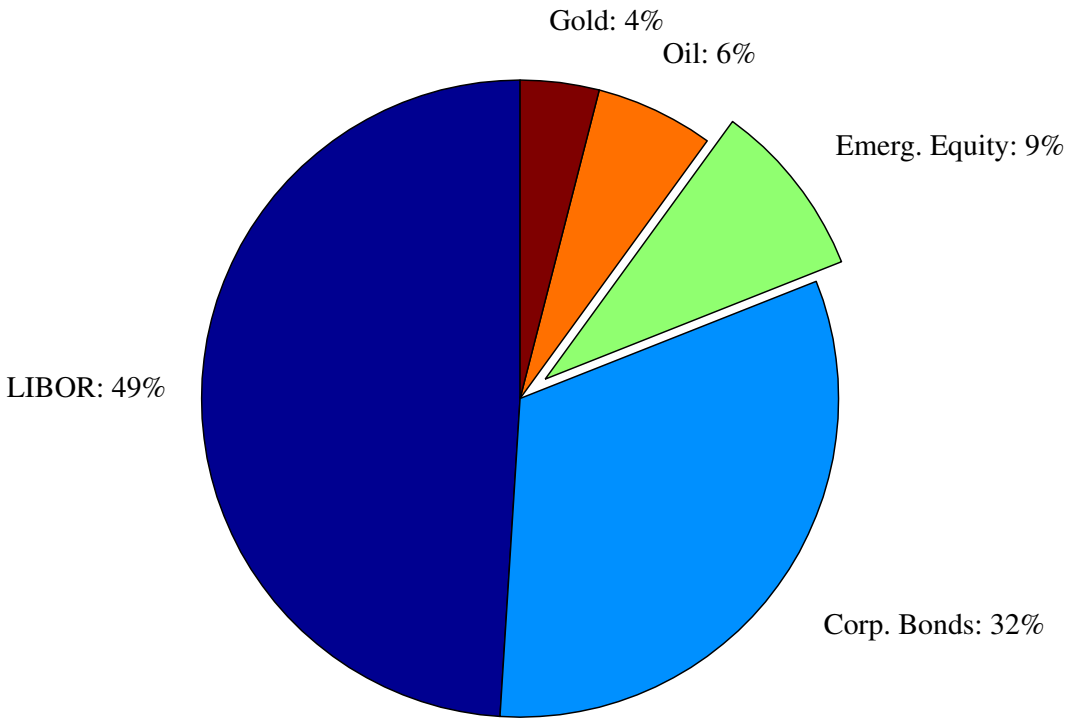

Figure 5: US Investment Allocation with Average 4.5% Real Return

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