Are Stocks Real Assets? Sticky Discount Rates in Stock Markets

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Abstract

Local stock markets adjust sluggishly to changes in local inflation. When the local rate of inflation increases, local investors subsequently earn significantly lower real returns on local stocks, but not on local bonds or foreign stocks. We argue that local stock market investors use sticky long-run nominal discount rates that are too low when inflation increases, because they are slow to update inflation expectations in response to news, consistent with Mankiw and Reis' (2002) model of sticky information. Provided that inflation is sufficiently persistent, small amounts of stickiness in inflation expectations suffice to match the real stock return predictability induced by inflation in the data.

Keywords: Inflation, Hedging, Inflation Expectations, Sticky Information.

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1 Introduction

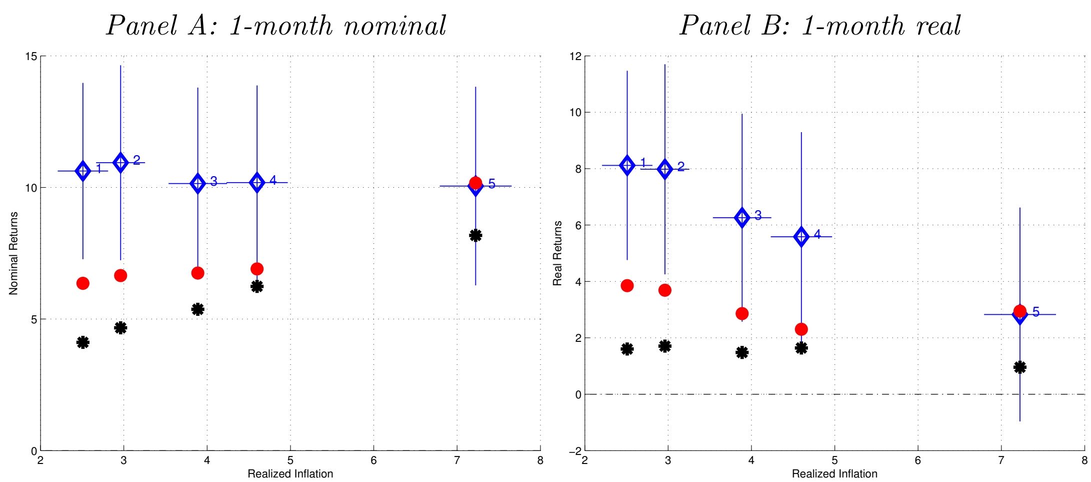
Local stock market investors seem slow to adjust nominal discount rates in response to news about the future path of local inflation. The nominal returns on a country's value-weighted stock market index do not increase after a country-specific increase in past inflation. As a result, country-specific inflation lowers local real stock returns roughly by the deviation of that country's rate of inflation from the global average. We do not detect symptoms of nominal discount rate stickiness in bond markets. Bonds are better expected inflation hedges than stocks at short maturities. To emphasize the differences across asset classes, Figure 1 plots nominal and real returns against realized inflation for the five quintiles of countries sorted by lagged inflation. We consider stocks, bonds and T-bills. Countries with higher lagged inflation do experience higher subsequent inflation, but the nominal stock returns in Panel A (denoted by 'diamonds') do not reflect that. However, the returns on nominal bonds and bills (denoted by 'circles' and 'stars') clearly increase from the first to the fifth quintile. Nominal returns on different asset classes are compressed by inflation. These effects persist over time. Real stock returns, shown in Panel B, decline almost one-for-one with realized inflation.

The pass-through of locally expected inflation to nominal discount rates used by local stock market investors is slow and incomplete, but there is less evidence of nominal stickiness in T-bill and bond markets after changes in inflation. The nominal returns on local short-term and long-term government bonds respond immediately to changes in inflation.[1] So do exchange rates. As a result, an increase in the local rate of expected inflation shrinks the local equity premium over bills and bonds, but not the equity premium on a basket of foreign stocks, because the local currency depreciates.

Stock investors seem to discount projected nominal cash flows to value equities. If stock market investors sluggishly adjust to new information when setting long-run nominal discount rates, then the rates overweight long-run, historical inflation and underweight current inflation: Nominal discount rates are sticky. We show that in a version of the Mankiw and Reis (2002)

[1] Our cross-country findings are the cross-sectional analogue of the well-known Fama and Schwert (1977) time-series results for the U.S.

Figure 1: Realized Inflation and Asset Returns for Lagged-Inflation-Sorted Portfolios



Notes: The figure plots the time-series average of log nominal (real) returns (annualized) against the time-series average of log inflation (annualized) in the top (bottom) panel at the 1-month horizon for portfolios sorted by the one-month lagged year-over-year inflation rate ($\pi_{t-13\rightarrow t-1}$). The left panel plots nominal returns. The right panel plots real returns. We plot stock returns ('diamonds'), bond returns ('circles'), and returns on T-bills ('stars'). The lines denote two standard error bands. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K and the U.S. The sample starts with 9 countries in 1950, and ends with 30 countries in 2012.

model of sticky information, lagged inflation predicts lower real stock returns. As inflation increases, investors are increase to update their nominal discount rates, leading to high current valuations and low subsequent real stock returns. Even small departures from rational inflation expectations deliver substantial real stock return predictability that is quantitatively similar to that in the data: Small mistakes have large effects because stocks are high duration assets and inflation is persistent.

For sticky discount rates to explain our findings, the inflation expectation in nominal discount rates need to be stickier than those embedded in firm-level cash flow forecasts. Given the large ratio of firm-level cash flow to inflation variance, it is natural that stock investors with a limited capacity to process information would update firm-level nominal cash flow forecasts more frequently than economy-wide inflation forecasts.

Consistent with the sticky discount rate hypothesis, we find that the difference in real stocks returns between the lowest and highest inflation quintile countries is larger in countries which have only recently experienced high/low inflation; the spread also increases when inflation increases in the high inflation countries, relative to the rate of inflation in the low inflation countries. Our results are not consistent with the standard notion of money illusion (see Modigliani and Cohn, 1979): Investors who are subject to money illusion use nominal discount rates to discount real cash flows. Money illusion predicts that stocks are expensive in low inflation environments. We find the opposite result. In addition, we find that the decrease in inflation persistence in the 90s coincides with a large decrease in the real stock return spread between low and high inflation countries, consistent with the sticky discount rate hypothesis. However, we do not find evidence that positive inflation surprises instantaneously increase stock market valuations, as predicted by the sticky discount rate hypothesis. This could be due to time aggregation: Our sticky information model predicts that this increase is immediately reversed after the release of inflation news as agents start to update their inflation expectations.

In a standard neoclassical asset pricing model with constant real discount rates and perfectly rational agents, local stocks are perfect hedges against increases in the cost of the local consumption basket, because they are claims to real cash flows that are produced domestically.[2] But real discount rates applied by stock investors can vary over time. If the local risk price is lower in higher-than-average inflation countries,[3] a negative relation between expected inflation and real stock returns emerges. In this view of our empirical findings, local investors fully expect to earn lower returns on stocks when local inflation is higher than in other countries, because that is when their appetite for stock market risk is highest.

We cannot rule out time-variation in real discount rates as an explanation of our findings. However, this explanation faces three challenges. First, in the U.S. and around the developed world, the covariance between stock and bond returns is robustly positive for most of the sample, suggesting that higher inflation expectations increase the real discount rates on stocks. Second,

[2] While sticky prices in product markets can explain incomplete pass-through of surprise inflation to nominal stock returns, (see Gorodnichenko and Weber (2013) for evidence on the effects of sticky prices in stock markets around Fed announcements), they cannot account for incomplete pass-through of expected inflation.

[3] This is a cross-sectional version of Fama (1981)'s proxy hypothesis; inflation proxies other macro-economic variables that affect how investors discount cash flows. Geske and Roll (1983) develop a fiscal version of this argument.

the negative cross-sectional relation between real returns and expected inflation weakens at the end of the 90s, when the covariance between bond returns and stock returns turns negative in the U.S. (see Baele, Bekaert and Inghelbrecht (2010) and Campbell, Sunderam and Viceira (2013a)) and all around the developed world. This is exactly when countries with abnormally low inflation should yield the highest real returns in a model with time-varying discount rates.[4] Third, the time-varying discount rate hypothesis is hard to reconcile with the negative cross-sectional relation between realized real stock returns and inflation surprises that we document. All else equal, a decrease in local inflation should increase discount rates and hence produce lower real returns. We find the opposite.

Thus, our results present a challenge to leading asset pricing models which impute rational inflation expectations to its agents. In a rational expectation model, the agents inside the model possess knowledge that real-world investors do not have (see, e.g., Sargent (2002)): Real-world investors need to solve a complicated inference problem to develop inflation expectations. Different classes of investors may respond differently to this challenge. Recently, a number of authors have documented evidence of heterogeneity in inflation expectations across households that is shaped by their personal experiences (Piazzesi and Schneider (2009a) and Malmendier and Nagel (2015)).

Seminal work by Mankiw and Reis (2002) and Sims (2003) has explored the implications of information rigidities in macroeconomics. Coibion and Gorodnichenko (2015) find direct evidence in inflation surveys that supports the sticky information hypothesis; average survey forecast errors are forecastable consistent with the predictions of sticky information models. We find that the inflation expectations of local stock market investors seem slow to adjust to new information, at least substantially slower than those of bond and currency market investors. Given that inflation is not one of the main drivers of stock return variation, but it is for bonds and currencies, this finding may reflect rational inattention: Investors specialized in stock valuation may decide not to continuously monitor inflation, allocating limited bandwidth elsewhere, while

[4] Campbell, Pflueger and Viceira (2013b) and David and Veronesi (2014) develop explanations for the time-variation in the stock-bond correlation. Song (2014) reconciles the upward sloping nominal yield curve with a negative stock-bond correlation in a regime switching model.

bond and currency market investors do. Bacchetta, Mertens and van Wincoop (2009) and Piazzesi and Schneider (2009b) connect forecast errors in survey forecasts to return predictability in FX and bond markets. Our findings suggest that inflation forecast errors impute return predictability to stocks, but less so for bonds and currencies.[5]

Finally, one alternative explanation would be an over-reaction on the nominal cash flow side, induced by extrapolation of nominal cash flows in response to inflation news. Recently, Barberis, Shleifer and Vishny (1998); Fuster, Hebert and Laibson (2011); Hirshleifer and Yu (2013) have studied asset pricing models in which investors extrapolate fundamentals.

A large empirical literature on inflation hedging documents that real stock returns decrease after countries experience higher than average inflation for that country (see, e.g., the work by Lintner (1975), Jaffe and Mandelker (1976), Fama and Schwert (1977), Solnik (1983), Erb, Harvey and Viskanta (1995) and Bekaert and Wang (2010)). In the time series, a country's local inflation rate is a weak predictor of real, local stock returns. We find that past inflation is a strong predictor of real stock returns in the cross-section of countries: Real local stock returns are significantly higher in countries with past inflation that is currently lower than the global average, simply because nominal local stock returns do not respond to news about the future path of inflation at short horizons.

The rest of the paper is organized as follows. Section 2 develops a simple model of sticky nominal discount rates. In section 3, we provide an overview of the data. The remaining sections discuss the main results. We measure the effect of local variation in expected inflation and inflation surprises. In section 4, we use lagged year-over-year CPI inflation as a measure of expected inflation. We explore potential explanations in section 5. We provide direct time series evidence in support of the sticky nominal discount rate hypothesis. Section 6 explores the same relation in currency markets and finds more complete pass-through. Finally, in section 7, we check the robustness of these results by using survey measures of expected inflation, and we

[5] In addition, career concerns give bond managers a strong incentive to spend some bandwidth on monitoring inflation, because inflation forecast errors would differentially effect bond portfolios. Not so for stock portfolios. Our evidence is also consistent with the findings of other researchers who study the effect of macroeconomic announcements on asset prices: Rigobon and Sack (2006) document large, instantaneous effects of monetary policy innovations on yields in bond markets, and smaller, muted effects on valuations in stock markets.

find similar results.

2 Sticky Information Model

We consider a model in which stock investors do not have rational inflation expectations. We use a simple version of the Mankiw and Reis (2002) model of sticky information to analyze the impact on stock prices. In any given period, only a fraction $(1-\lambda)$ of inattentive agents updates their information set each period. When they update, they use rational expectations.

We use \$ to denote variables expressed in nominal terms. We consider the cum-dividend return on a stock, expressed in dollars:

$$R^{\$}_{t+1} = \frac{P^{\$}_{t+1} + D^{\$}_{t+1}}{P^{\$}_t} = \frac{\frac{D^{\$}_{t+1}}{D^{\$}_t}(1 + PD_{t+1})}{PD_t}.$$

We use pd_t to denote the log price-dividend ratio: $pd_t = p_t - d_t = \log\left(\frac{P_t}{D_t}\right)$, where price is measured at the end of the period and the dividend flow is over the corresponding period. Log-linearization of the nominal return equation around the mean log price/dividend ratio delivers the following expression for log dollar returns denoted $r^{\$}$ (see Campbell and Shiller, 1988):

$$r^{\$}_{t+1} = \Delta d^{\$}_{t+1} + \rho p d_{t+1} + k - pd_t,$$

with a linearization coefficient ρ that depends on the mean of the log price/dividend ratio pd: $\rho = \frac{e^{pd}}{e^{pd}+1} < 1$. By iterating forward on the linearized return equation and imposing a no-bubble condition: $\lim_{j\to\infty} \rho^j pd_{t+j} = 0$, we obtain the following expression for the log price/dividend ratio as a function of nominal cash flows and discount rates:

$$pd_t \equiv constant + \left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d^{\$}_{t+j}\right] - \left[\sum_{j=1}^{\infty} \rho^{j-1} r^{\$}_{t+j}.\right] \quad (1)$$

This expression has to hold for all sample paths.

Clearly, when valuing a stock, investors face a two-dimensional forecasting problem. When forecasting cash flows at the firm level, investors directly forecast the firm's cash flows in dollars rather than real terms. On the cash flow side, they do not have to confront the macro inflation forecasting challenge directly. Instead, they forecast firm i's dollar revenue growth.[6] To simplify the analysis, we assume that individual investors specialize in a single stock and compute discount rate and cash flow estimates to value this stock. On the cash flow side, investors forecast nominal stock-specific cash flow growth, but on the discount rate side investors have to confront the inflation forecasting problem directly when setting nominal discount rates.

Given the high variance of firm-specific shocks relative to that of aggregate shocks, it seems natural to assume that information is stickier for the macro inflation forecasting problem investors face when setting discount rates than for the micro revenue forecasting problem: $\lambda_r > \lambda_c$. Consistent with this hypothesis, Coibion and Gorodnichenko (2015) document evidence of information stickiness in inflation expectation surveys that is economically significant.

Rational inattention could potentially rationalize stickiness. In a recent paper, Duffee (2014) computes that news about expected inflation over the life of the bond only account for 10 to 20% of the shocks to Treasury yields, leaving stocks to real rates and term premia to account for the rest. Surely, for stocks, this fraction is an order of magnitude smaller, because stocks are claims to real cash flows. In addition, recomputing the appropriate nominal discount rates when expected inflation changes to reprice the nominal cash flows of stocks is not an easy task. Simply computing the actual duration of stocks is hard. Repricing nominal bonds when expected inflation changes is simple by comparison. As a result, a fraction of stock market investors may rationally decide not to continuously reprice stocks, given a limited capacity to process information, simply because inflation innovations account for a small fraction of total stock return variation, but they account for a much larger fraction of bond return variation. Others have argued that investors may choose to be rationally inattentive in some settings: In a model with information constraints, Kacperczyk, Van Nieuwerburgh and Veldkamp (2013) argue that mutual fund managers rationally re-allocate their attention to idiosyncratic instead

[6] Aggregated across all firms i, these nominal cash flow projections naturally imply an expected future path for aggregate inflation when combined with real cash flow projections. However, most investors do not attack this macro forecasting problem for each firm. Instead, they focus on the micro version, involving only a few firms, because of limited capacity to process information.

of aggregate shocks during expansions.

When we aggregate across all stock market investors, we then end up with discount rates that are sticky. Obviously, this creates arbitrage opportunities for sophisticated investors who are not subject to sticky inflation expectations, but instead use superior and continuously updated inflation forecasts. However, shorting the stock market in a country that has recently experienced high inflation is likely to be a low Sharpe ratio proposition, because stock returns are subject to lots of quantitatively dominant sources of risk other than inflation risk. These investors may choose to deploy scarce capital elsewhere.

Equation 13 has to hold for every sample path. That means it also holds for every individual investor's expectation for his individual stock:

$$pd_t^i = \frac{k^i}{1-\rho} + \mathbb{E}^i_{t-l^c(i)}\left[\sum_{j=1}^{\infty}\rho^{j-1}\Delta d^{i,\$}_{t+j}\right] - \mathbb{E}^i_{t-l^r(i)}\left[\sum_{j=1}^{\infty}\rho^{j-1} r^{i,\$}_{t+j}\right], \tag{2}$$

where $t - l^c(i)$ $(t - l^r(i))$ denotes the last period when i updated her cash flow (discount rate) forecasts. We use the average log price-dividend ratio as an approximation for the market's log price-dividend ratio.[7] By aggregating across individual stocks, we end up with the following expression for the average log of the price-dividend ratio:

$$pd_t = \frac{k}{1-\rho} + \mathbb{F}^c_t\left[\sum_{j=1}^{\infty}\rho^{j-1}\Delta d^{\$}_{t+j}\right] - \mathbb{F}^r_t\left[\sum_{j=1}^{\infty}\rho^{j-1} r^{\$}_{t+j}\right], \tag{4}$$

where $\mathbb{F}^i_t, i =\in \{c, r\}$, denotes the cross-sectional average of the sticky information forecasts. Reis (2006) shows that the cross-sectional average forecast of a variable x_t h periods from now is simply given by:

$$\mathbb{F}^i_t x_{t+h} = (1-\lambda)\sum_{j=0}^{\infty}\lambda_i^j \mathbb{E}_{t-j} x_{t+h}.$$

[7] The market log price-dividend ratio equals the average log price-dividend ratio plus higher-order cross-sectional moments:

$$pd_t^m = pd_t + \sum_{j=2}^{\infty}\kappa_{j,t}[pd_{i,t}], \tag{3}$$

where $\kappa_{j,t}$ denotes the $j-th$ cross-sectional cumulant. We assume that the time-variation in the market price/dividend ratio induced by the variance and higher-order moments is small.

When they update their information set, investors use an AR(1) process for inflation, specified as:

$$\pi_t = (1 - \phi)\theta + \phi\pi_{t-1} + u_t,$$

where $0 < \phi < 1$ denotes the AR(1) coefficient, while θ is the investor's estimate of the unconditional mean of inflation.

To keep the analysis simple, we assume that the real aggregate dividend growth and real stock returns expected by the investors is constant over time: $\mathbb{E}_t[r_{t+1}] = \mu_r$ and $\mathbb{E}_t[\Delta d_{t+1}] = \mu_d$.

We can substitute the AR(1)-forecast of inflation into this expression to obtain the cross-sectional average inflation forecast:

$$\mathbb{F}_t\pi_{t+h} = (1 - \lambda)\sum_{j=0}^{\infty} \lambda^j \phi^{j+h}(\pi_{t-j} - \theta) + \theta$$

The h-period inflation forecast is an infinite moving average of past inflation. This implies the following result for the aggregate log price-dividend ratio.

Proposition 1. *The log dividend price ratio for the market is given by:*

$$dp_t \quad = \quad constant + \sum_{j=0}^{\infty} \frac{(\lambda_r)^j(1 - \lambda_r) - (\lambda_c)^j(1 - \lambda_c)}{1 - \rho\phi}\phi^{j+1}(\pi_{t-j} - \theta).$$

Given differential stickiness of the micro cash flow and macro inflation forecasts, the log-dividend yield is an infinite moving average of past inflation. The moving average weights are governed by the relative degree of information stickiness in discount rates and cash flows. To develop some intuition, we consider a benchmark case in which agents have rational expectations for the micro cash flow forecasting problem, but information is sticky for the macro inflation forecasting problem.

Corollary 1. *When cash flow forecasts are not sticky ($\lambda_c = 0$), the log dividend yield is given* *by*

$$dp_t = constant + \frac{-\phi\lambda_r}{1-\rho\phi}(\pi_t - \theta) + \sum_{j=1}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r)}{1-\rho\phi}\phi^{j+1}(\pi_{t-j} - \theta).$$

As expected, an increase in current inflation above the unconditional mean immediately lowers the dividend yield, or equivalently, lowers the returns expected by a rational investor. A fraction λ_r of agents fail to update inflation expectations. As a result, the nominal discount rate is too low. However, as more agents update in subsequent periods, discount rates start to increase and the dividend yield rises again, which explains the negative effect of lagged inflation on the dividend yield. We use L to denote the lag operator.

Corollary 2. *The log real return can be expressed as:*

$$r_{t+1} = constant + \Delta d_{t+1} + \sum_{j=0}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(1-\rho L^{-1})(\pi_{t-j} - \theta).$$

As a result, the immediate impact of inflation on realized returns is given by:

$$\frac{\partial r_{t+1}}{\partial \pi_{t+1}} = -\rho\frac{(\lambda_c - \lambda_r)}{1-\rho\phi}\phi,$$

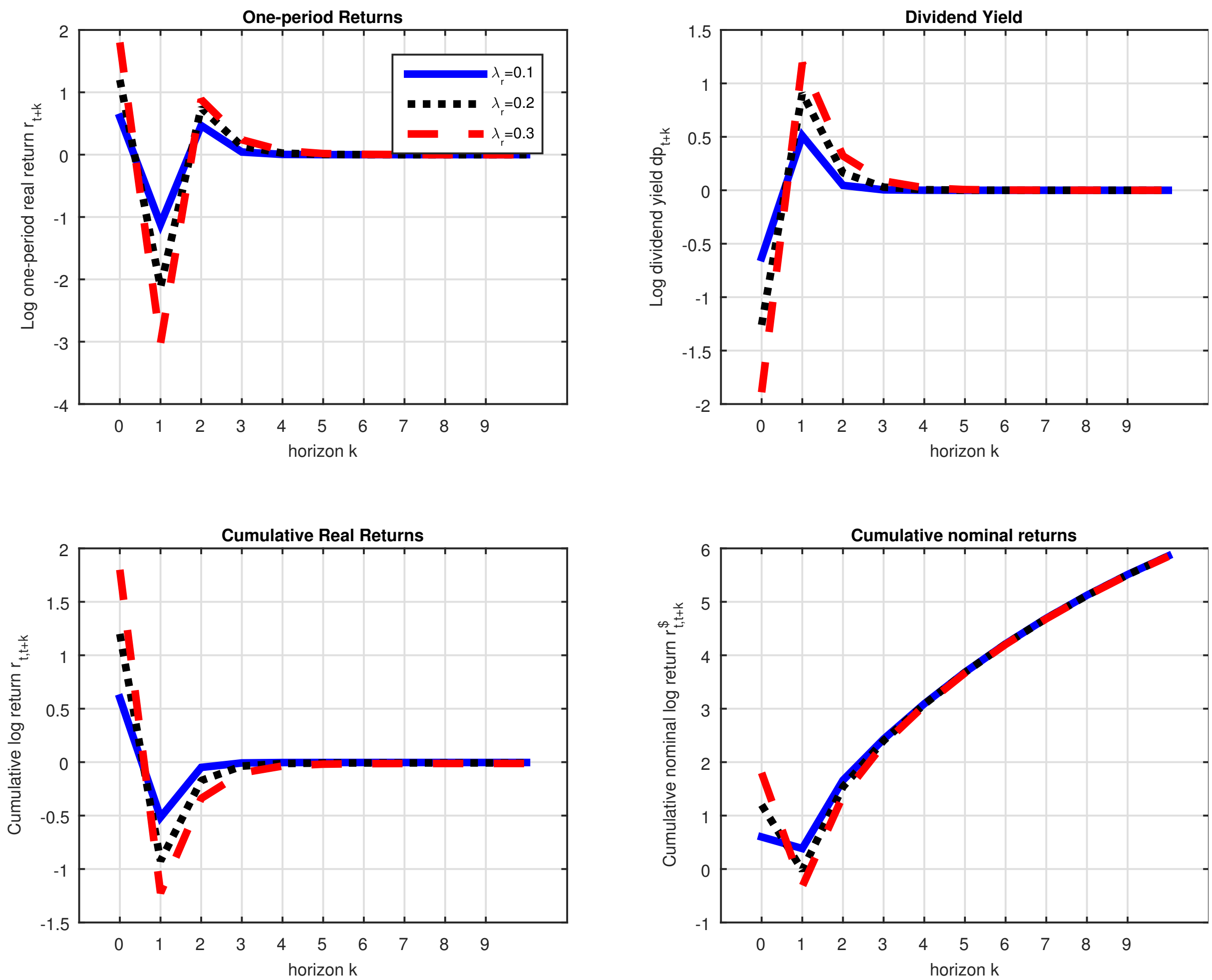
which is positive in case of relative information stickiness in discount rates ($\lambda_r > \lambda_c$). The discount rate does not fully adjust to inflation news, while the cash flow forecast does. In later periods, the discount rate is slowly adjusted upwards, and the impact on real returns is negative. Furthermore, we can trace out the impulse response of the return with respect to past inflation

$$\frac{\partial r_{t+1}}{\partial \pi_{t-j}} = \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(1-\rho L^{-1}), j \geq 0,$$

which can be restated as:

$$\frac{\partial r_{t+1}}{\partial \pi_{t-j}} = \frac{(\lambda_r)^j(1-\lambda_r\rho\phi)(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c\rho\phi)(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}, j \geq 0.$$

Figure 2: Impulse Response to Inflation



Notes: Plot of the impulse response (in pps) of log real returns ($\frac{\partial r_{t+k}}{\partial \pi_t}$), the log dividend yield, cumulative real returns ($\frac{\partial r_{t,t+k}}{\partial \pi_t}$) and cumulative nominal returns with respect to inflation shock of 1 pp at $k = 0$. We use $\rho = 0.95$ and $\phi = 0.90$ for $\lambda_r \in \{0.10, 0.20, 0.30\}$. Finally, we use $\lambda_c = 0$.

To develop a better understanding for the model, we consider a calibrated version of the model at annual frequencies. We use $\rho = 0.95$. The AR(1) coefficient of inflation $\phi = 0.90$ and we explore different values of $\lambda_r \in \{0.10, 0.20, 0.30\}$. To simplify the analysis, we abstract from stickiness on the cash flow projection side: $\lambda_c = 0$.

Figure 2 traces out the impulse response of log returns ($\frac{\partial r_{t+k}}{\partial \pi_t}$), the log dividend yield ($\frac{\partial dp_{t+k}}{\partial \pi_t}$), cumulative real log returns ($\frac{\partial r_{t+k}}{\partial \pi_t}$) and cumulative nominal log returns ($\frac{\partial r^{\$}_{t+k}}{\partial \pi_t}$) with respect to a one percentage point surprise increase in the rate of inflation at $k = 0$. Upon impact, an increase in inflation produces high positive realized real returns (top left panel) and a lower dividend yield (top right panel). Since a fraction of investors failed to update their inflation expectations, the nominal discount rate is set too low, thus pushing up the stock price. This effect is larger when inflation expectations are stickier. At $k = 1$, one period later, an additional fraction $(1-\lambda_r)$ revises their inflation expectations upwards to the rational level, pushing up the discount rate, delivering even larger real negative returns. The cumulative real return at $k = 1$ is always negative. After that prices gradually recover. After 10 years, the dynamics of returns have largely died out. The last plot shows cumulative nominal log returns. Figure 2 plots the same impulse responses starting at $k = 1$. These responses are what we measure in the data. Even when only 10% of investors fail to adjust, the cumulative impact on long horizon returns exceeds the effect we measure in the data (see Section 4).

These dynamics imply that the returns expected by a fully rational agent are lower than normal after an inflation shock. That is apparent from the returns' impulse response starting at $k = 1$. The stickiness of discount rates imputes predictability to real returns. The slope coefficient in a projection of real returns r_{t+1} on inflation π_t, controlling for all other inflation lags, can be recovered from:

$$\frac{\partial r_{t+1}}{\partial \pi_t} = b_r = \frac{(1-\lambda_r\rho\phi)(1-\lambda_r) - (1-\lambda_c\rho\phi)(1-\lambda_c)}{1-\rho\phi}\phi. \tag{5}$$

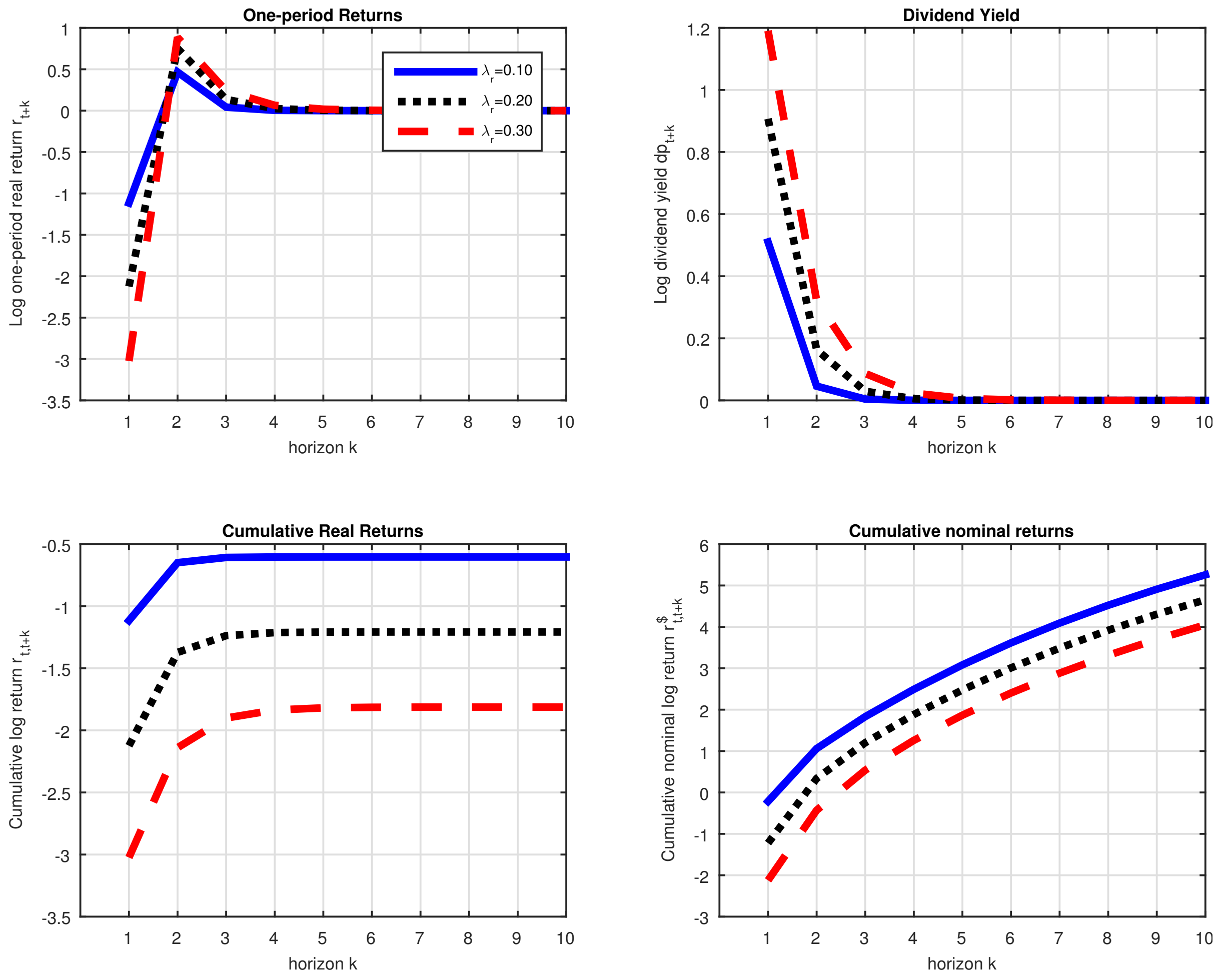
In our benchmark case, the slope coefficient is given by

$$b_r = -\frac{1-(1-\lambda_r\rho\phi)(1-\lambda_r)}{1-\rho\phi}\phi, \tag{6}$$

which is unambiguously negative if $0 < \phi < 1$. Higher inflation predicts lower real returns next period. After that, expected returns recover to normal as investors update:

$$\frac{\partial r_{t+1+j}}{\partial \pi_t} = \frac{(\lambda_r)^j(1-\lambda_r\rho\phi)(1-\lambda_r)}{1-\rho\phi}\phi^{j+1}, j \geq 1,$$

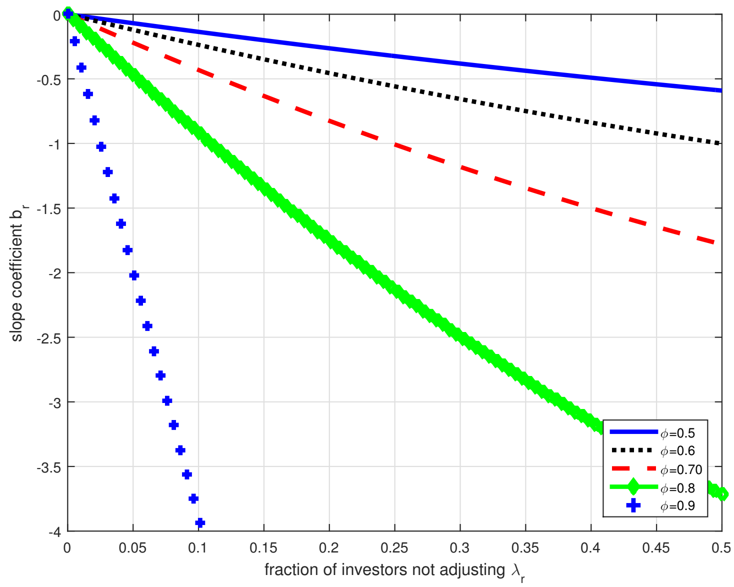
Figure 3: Impulse Response After Inflation



Notes: Plot of the impulse response (in pps) of log real returns ($\frac{\partial r_{t+k}}{\partial \pi_t}$), the log dividend yield, cumulative real returns ($\frac{\partial r_{t,t+k}}{\partial \pi_t}$) and cumulative nominal returns with respect to inflation shock of 1 pp at $k = 0$. We use $\rho = 0.95$ and $\phi = 0.90$ for $\lambda_r \in \{0.10, 0.20, 0.30\}$. Finally, we use $\lambda_c = 0$.

which is positive. Figure 4 provides an overview of the slope coefficient in the return predictability regression in the calibrated model with only discount rate stickiness. The graph plots the slope coefficient against the degree of stickiness, for various AR(1) coefficients. The slope coefficients are always negative. However, if inflation is highly persistent, then we observe strong predictability even if fewer than 10% of investors fail to adjust. However, as persistence declines, much more stickiness needed in order to generate significant return predictability.

Figure 4: RETURN PREDICTABILITY



Notes: Plot of the slope coefficient in a projection of log real returns on lagged inflation ($\frac{\partial r_{t+1}}{\partial \pi_t}$), controlling for all lags of inflation against λ_r, the fraction of investors not adjusting discount rates. We use $\rho = 0.95$ and $\phi \in \{0.50, 0.60, 0.70, 0.80, 0.90\}$. Finally, we use $\lambda_c = 0$.

If local stock investors do not fully incorporate recent declines in the local rate of inflation below its historical mean when setting inflation expectations, and, as a result, they use sticky nominal discount rates that are too high to price nominal cash flows in countries with lower than global inflation, then stocks are actually ‘cheap’ in countries with lower than average inflation. The stock market investors’ nominal discount rate $r^{\$}$ responds sluggishly to news about the path of future of inflation and that raises the dividend yield above its fundamental value when true expected inflation declines: $D/P = r^{\$} - g^{\$}$. When inflation is coming down, investors use a nominal discount rate $r^{\$}$ that is too high and hence underprice the stocks.

3 Inflation and Returns Across Countries

We study a panel of countries to learn about the relation between stock returns and inflation.

3.1 Data

We collect data from Global Financial Data to construct a panel of developed countries and emerging market countries. For each of these countries, we gather returns on a value-weighted stock market index, the Consumer Price Index, the return on a 10-year Government Bond index, as well as the T-bill returns. The sample starts in 1950 and ends in 2012. We supplement the GFD stock return data with MSCI stock index data when possible. The 10-year government bond indices were also constructed by GFD. The Total Return Bond indices are based upon the yields on 10-year Government bonds unless otherwise indicated. Where no 10-year bond was available, the bond closest to a 10-year bond was used. For each country, GFD provides detailed information on the construction of the bond. The separate data appendix provides a list of country codes.

The comprehensive list of countries for which we have stock return data, T-bill data and inflation data is in the separate appendix. We refer to this as the stocks-only panel. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012. The limited panel of all countries for which we have stock, bond as well as T-bill and inflation data starts with only 10 countries in 1950, and ends with 31 countries in 2012. We refer to this as the bonds/stocks panel.

Throughout the paper, we report moments of log returns, simply because that renders the relation between nominal and real returns additive. $\Pi_{t-k\rightarrow t} = \frac{CPI_t}{CPI_{t-k}}$ is the inflation rate over k periods. Lowercase symbols denote logs. $\pi_{t-k\rightarrow t}$ is the log of the inflation rate over k periods. $R^{\$}_{t-k\rightarrow t}$ is the nominal gross return on a risky asset. $r^{\$}_{t-k\rightarrow t}$ is the log of the gross returns in dollars. $Rx_{t-k\rightarrow t} = \frac{R_{t-k\rightarrow t}}{R^f_{t-k\rightarrow t}}$ is the multiplicative excess return on the risky asset. $rx_{t-k\rightarrow t} = \log R_{t-k\rightarrow t} - \log R^f_{t-k\rightarrow t}$ is the log excess return. Finally, $R^{\star}_{t-k\rightarrow t} = \frac{R_{t-k\rightarrow t}}{\Pi_{t-k\rightarrow t}}$ is the real return on the asset in local units of consumption, while $r^{\star}_{t-k\rightarrow t} = \log R_{t-k\rightarrow t} - \log \Pi_{t-k\rightarrow t}$ is the log of the real return in local units of consumption. $R^{£}_{t-k\rightarrow t}$ is the gross return in local currency.

3.2 Country-level Evidence on Inflation and Returns

While most of the literature on inflation hedging and stocks focuses on inflation in its entirety, our paper shifts attention to the country-specific component of inflation. This country-specific component is economically relevant. To establish the country-level facts, Table 1 lists the key moments of log inflation and log returns. The first column is the cross-sectional mean of the time-series average of inflation (returns). The second column reports the cross-sectional standard deviation. For each country, the time series average is computed over the sample that starts when that country enters our panel. We consider investment horizons ranging from 1 month to 12 months. At the one-month horizon, the average annualized rate of inflation in our sample is 4.15 %, while the cross-sectional standard deviation of annualized average inflation is 1.9%. We also report the R^2 in a regression of inflation on average global inflation. Global inflation accounts for 23% (1-month horizon) to 51% (12-month horizon) of the total variation in inflation for the average country in the sample. This confirms that there is a large common component in inflation (see, e.g., Henriksen, Kydland and Šustek (2013)). At annual frequencies, average global inflation accounts for up to half of country-level variation in inflation. We focus on the country-specific half of inflation variation, because we can develop sharper statistical inference about the response of asset markets to the country-specific component in inflation.

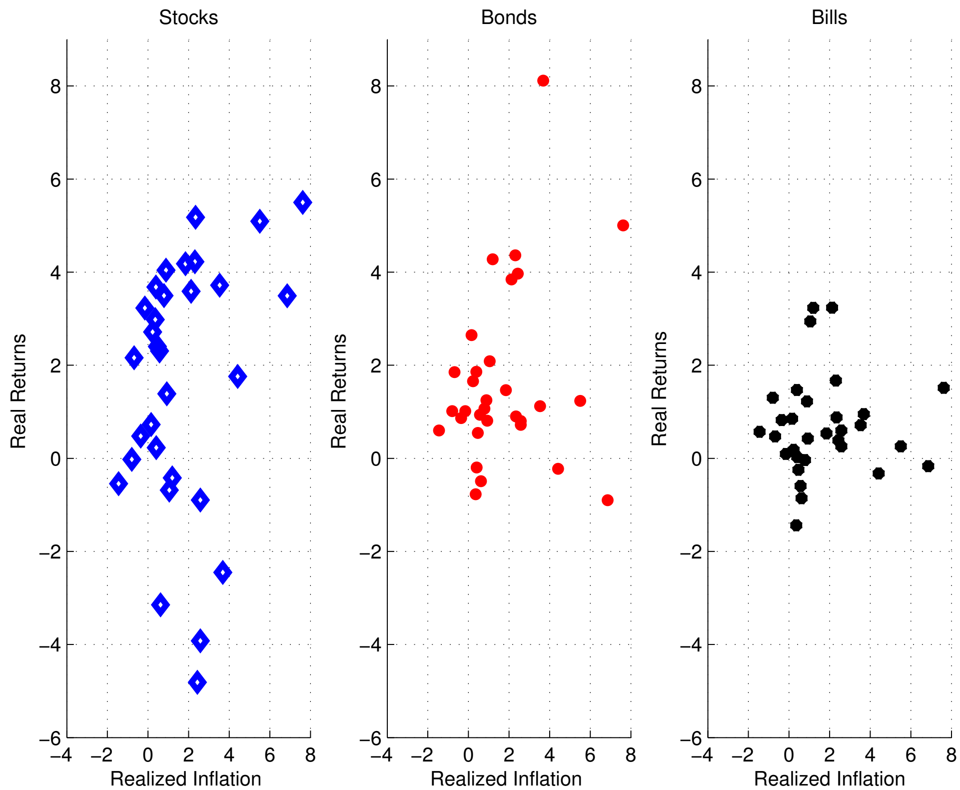
Finally, Table 1 also report real log returns and log excess returns. The average real log return on stocks is 4.75% per annum at the one-month horizon. The average equity premium is only 3.11% per annum at the one-month horizon. This is mostly due to the fact that many countries enter the sample in the last two decades. Importantly, there is no statistically significant relation between average inflation and average real stock returns at country level. Figure 5 plots average log real returns for stocks, bonds and bills (in deviation from the global mean) at the 1-month horizon against average inflation in deviation from the global mean. For each country, the global mean is computed over the sample period that country is part of the panel. Higher than average inflation does not lead to lower than average real stock returns.

Table 1: Country-level Evidence on Inflation and Returns

This table reports the cross-sectional mean/standard deviation of country-level time-series averages of inflation and returns. Annualized log k-month returns and inflation. The countries are sorted by year-over-year inflation realized at month $t-1$ ($\pi_{t-13\to t-1}$). The sample is 1950-2012. The data is monthly. This table also reports the R^2 in a regression of inflation on average global inflation. The Bonds/Stocks panel includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S.. The sample starts with only 10 countries in 1950, and ends with 31 countries in 2012.

Horizon		1-month		3-month		12-month	
Moments		X-Mean	X-Std	X-Mean	X-Std	X-Mean	X-Std
		Panel A: log inflation $\pi_{t\to t+k}$					
inflation	Mean	4.15	1.90	4.14	1.88	4.10	1.84
	std	2.04	0.68	2.38	0.80	3.15	1.33
	R^2	0.23	0.12	0.35	0.17	0.51	0.22
		Panel B: nominal log returns in local currency $r^{\pounds}_{t\to t+k}$					
T-bills	Mean	5.79	2.21	5.78	2.20	5.78	2.15
	std	1.07	0.61	1.83	1.02	3.49	1.81
bonds	Mean	8.30	2.93	8.29	2.94	8.13	2.80
	std	7.88	5.41	8.21	4.86	8.81	4.90
stocks	Mean	8.91	3.55	8.98	3.58	8.94	3.68
	std	21.53	5.12	23.31	5.46	25.17	5.92
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$					
T-bills	Mean	1.64	1.10	1.64	1.09	1.68	1.12
	std	2.00	0.66	2.28	0.62	3.02	0.83
bonds	Mean	4.15	2.14	4.14	2.17	4.03	2.11
	std	8.24	5.30	8.72	4.79	9.35	4.80
stocks	Mean	4.75	2.59	4.84	2.57	4.84	2.81
	std	21.68	5.14	23.53	5.49	25.71	5.87
		Panel D: log excess returns in local currency $rx^{\pounds}_{t\to t+k}$					
bonds/T-bills	Mean	2.51	1.77	2.50	1.78	2.35	1.65
	SR	0.36	0.18	0.34	0.18	0.32	0.20
stocks/T-bills	Mean	3.11	2.89	3.19	2.85	3.16	3.04
	SR	0.16	0.15	0.15	0.14	0.14	0.13

Figure 5: Inflation and Real Returns at Country-Level



Notes: For each country in the sample, the figure plots the time-series of average log real returns (annualized) in deviation from the global mean against average log inflation (annualized) in deviation from the global mean at the 1-month horizon. We plot stock returns ('diamonds'), bond returns ('circles'), and returns on T-bills ('stars'). We compute deviations from the global mean that corresponds to the specific time period a country is in the sample.

4 Incomplete Pass-Through of Expected Inflation to Asset Markets

An asset is commonly defined as a perfect inflation hedge if its returns move one-for-one with expected inflation and inflation surprises. This section examines the cross-country relation between the country-specific component of expected inflation and stock, bond and T-bill returns in the cross-section.

4.1 The Cross-Section of Expected Inflation and Returns

In their seminal paper, Fama and Schwert (1977) define an asset to be a perfect inflation hedge if the asset has betas of unity in a multivariate time-series regression of returns on expected and unexpected inflation. Fama and Schwert (1977) conclude that U.S. stocks are ineffective hedges against shocks to overall inflation, in line with the earlier results by Lintner (1975) and Jaffe and Mandelker (1976). These results have been confirmed in international data (see, e.g., Solnik (1983) for early evidence from a short and small sample, and, more recently, Erb et al. (1995) on a longer sample). Bekaert and Wang (2010)) finds similar results in international data, but, the statistical evidence is weak.

To summarize, the consensus view is that the time-series relation between nominal stock returns and inflation innovations is statistically weak and typically negative, at least at short horizons. When forecasting returns with inflation in a time-series regression, one needs an estimate of the average rate of inflation of that country. A negative slope coefficient means that real returns are lower when inflation is higher than average for that country. This country-specific average is hard to estimate, possibly because it varies over time. Instead, we investigate the cross-sectional relation between expected inflation and asset returns by sorting countries into portfolios.[8]

We consider an AR(1) process for inflation in these countries:

$$\pi_t^i = (1-\phi)\theta + \phi\pi_{t-1}^i + u_{t-1}^i, \tag{7}$$

where $-1 < \phi < 1$ is the AR(1) coefficient and θ is the unconditional mean. We use lagged inflation as a measure of expected inflation in the cross-section. If countries share the same $\phi < 1$ and θ parameters, then lagged year-over-year inflation is a perfect measure of short-run inflation expectations. Alternatively, if inflation is a unit root process with $\phi = 1$ and $\theta = 0$, then lagged

[8]This portfolio sorting is equivalent to running cross-sectional non-linear regressions of returns on expected inflation and inflation innovations, one for each time observation, without restrictions on how the coefficients change over time. A negative slope coefficient means that real returns are lower when inflation is higher than the global average at that time, irrespective of that country's average rate of inflation. Non-linear cross-sectional regressions do indeed produce similar results to the portfolio sorts, but only if we allow the coefficients to vary over time. We do not need to estimate the country-specific average inflation rate.

inflation is always the best forecast.[9] We use realized inflation between $t-13$ and $t-1$, denoted $\pi_{t-13\rightarrow t-1}$, as a measure of expected inflation at t. We use year-over-year inflation to eliminate issues of seasonality in the CPI. The 1-month lag ensures that this an implementable investment strategy.[10]

4.1.1 Sorting by Lagged Inflation

We sort countries into quintiles by lagged inflation. We start with the sample of countries for which we have bond and stock returns, as well as inflation. The sample starts out with 10 countries in 1950 (Germany, Italy, the United States, France, Canada, Sweden, Japan, the United Kingdom, Spain and Australia) and it ends with 31 countries in 2012. Australia and New Zealand only report quarterly CPI data. We simply impute the last quarterly CPI level to the next two months in the results reported below, but we also checked the robustness of our results when we exclude these two countries.

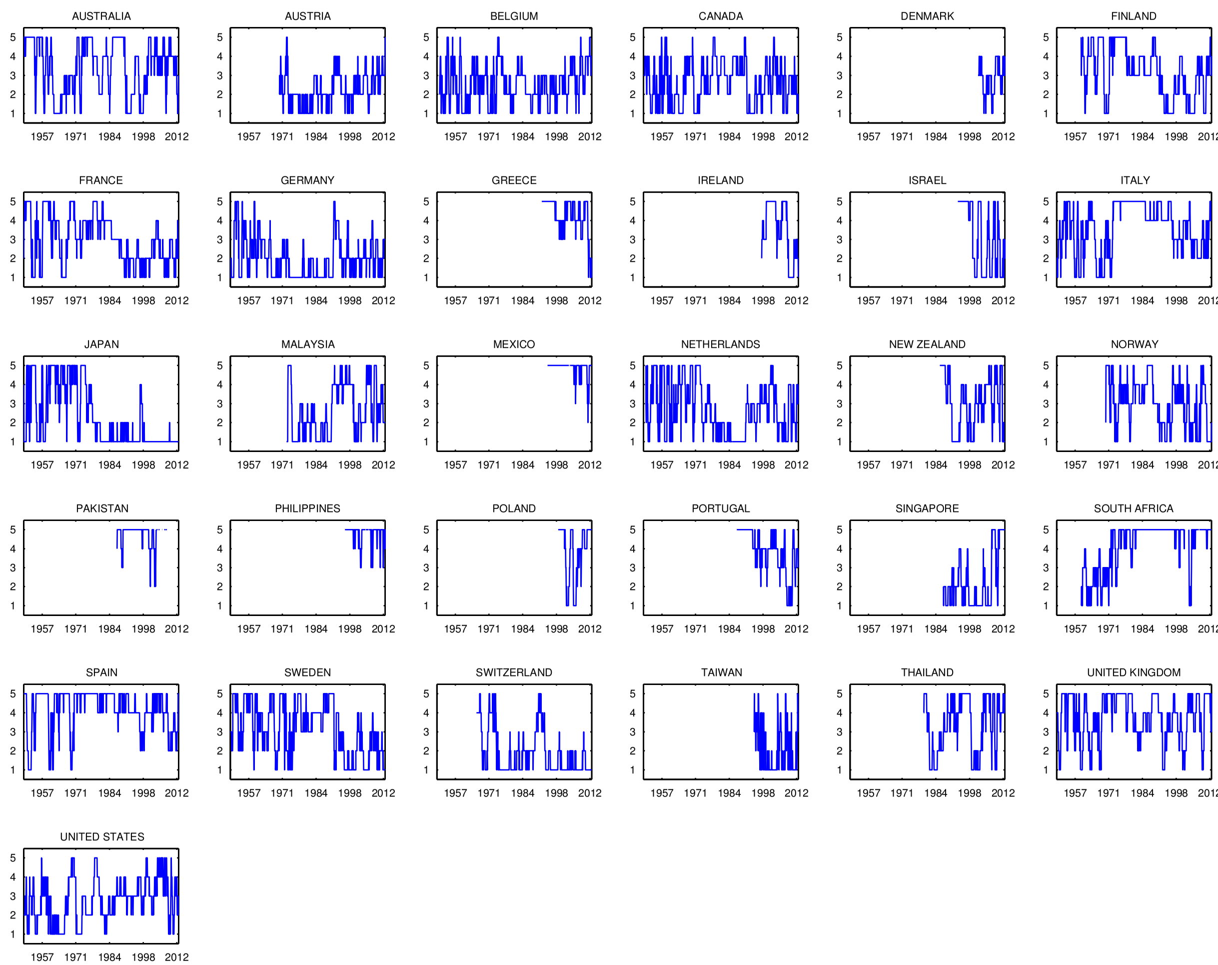
Figure 6 plots the composition of the portfolios re-sorted by year-over-year inflation at the end of each month over time. There is a lot of variation in the composition of the portfolios, but at the country-level, there is quite some persistence. For example, the 1-month rank-autocorrelation for the U.S. is .89, but the one-year rank-autocorrelation is only 0.37. The average one-month autocorrelation for all countries for which we have data over the entire sample is also 0.89. The median portfolio allocation for the U.S. is the middle one.

Table 2 reports results obtained when countries are resorted each month into quintiles based on the lagged annual inflation rate. The standard errors were generated by bootstrapping 10,000 samples from the data. We start with the results at the 1-month horizon. The first panel reports pre-sort annual inflation and subsequently realized inflation over the next month (annualized). During the 12 months preceding the sort, countries in the fifth quintile recorded inflation of 8.91%, while countries in the first quintile recorded a 1.79% rate. The 7.12 % spread in lagged

[9] Atkeson and Ohanian (2001) argue that the current rate of inflation is probably the best out-of-sample forecast for actual inflation. Atkeson and Ohanian (2001) consider a class of Phillips curve-based models to forecast U.S. inflation. They show that the random walk model outperforms this class of models.

[10] However, we do not have vintage data for most of these countries. Data revisions, though much less common for the CPI than for other macro-economic data, may still be an issue in some countries. We do obtain similar results when sorting by alternative measures of inflation expectations.

Figure 6: Composition of Portfolios sorted by Lagged Inflation for Bonds/Stocks Panel



Notes: The panel plots the composition of portfolios of countries sorted by lagged year-over-year inflation ($\pi_{t-13\rightarrow t-1}$) each month at t. The portfolio is on the y-axis. The panel includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 9 countries in 1950, and ends with 30 countries in 2012.

Table 2: Lagged-Inflation-sorted Portfolios

Time-series averages of annualized log k-month returns on portfolios. The countries are sorted by year-over-year inflation realized at month $t-1$ ($\pi_{t-13\rightarrow t-1}$). The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S.. The sample starts with only 10 countries in 1950, and ends with 31 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\rightarrow t+k}$							
sorted	Mean	1.79	2.90	4.03	5.30	8.91	7.12	7.13	7.17
	std	2.07	2.29	2.76	3.20	4.24	3.12	3.12	3.12
realized	Mean	2.54	3.08	4.00	4.71	7.32	4.78	4.66	4.22
	std	1.13	1.11	1.30	1.40	1.68	1.73	2.06	3.33
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$							
T-bills	Mean	4.16	4.75	5.55	6.38	8.26	4.10	4.09	3.99
	s.e.	0.07	0.08	0.11	0.13	0.17	0.15	0.25	0.48
	std	0.56	0.66	0.84	1.00	1.35	1.14	1.95	3.81
bonds	Mean	6.44	6.80	6.46	8.05	9.77	3.33	3.57	3.79
	s.e.	0.48	0.53	0.55	0.52	0.59	0.65	0.67	0.97
	std	3.79	4.18	4.40	4.10	4.64	5.06	5.58	7.07
stocks	Mean	10.87	10.96	11.21	9.50	10.27	-0.60	0.00	1.14
	s.e.	1.66	1.82	1.81	1.83	1.92	1.57	1.80	1.95
	std	13.08	14.46	14.32	14.37	15.18	12.31	13.26	15.10
		Panel C: real log returns in local units of consumption $r^{*}_{t\rightarrow t+k}$							
T-bills	Mean	1.62	1.66	1.55	1.67	0.94	-0.67	-0.56	-0.23
	s.e.	0.14	0.15	0.16	0.17	0.21	0.22	0.22	0.32
	std	1.10	1.10	1.26	1.34	1.59	1.67	1.86	2.60
bonds	Mean	3.90	3.71	2.46	3.34	2.45	-1.44	-1.09	-0.43
	s.e.	0.52	0.56	0.60	0.55	0.61	0.68	0.70	0.97
	std	4.07	4.38	4.73	4.34	4.85	5.33	5.82	7.14
stocks	Mean	8.33	7.88	7.21	4.79	2.95	-5.38	-4.65	-3.08
	s.e.	1.66	1.83	1.82	1.84	1.92	1.58	1.79	1.99
	std	13.11	14.55	14.40	14.47	15.23	12.42	13.31	15.31
		Panel D: log excess returns in local currency $rx^{£}_{t\rightarrow t+k}$							
bonds/T-bills	Mean	2.28	2.05	0.91	1.67	1.51	-0.77	-0.53	-0.19
	s.e.	0.48	0.53	0.55	0.51	0.56	0.63	0.63	0.86
stocks/T-bills	Mean	6.71	6.21	5.65	3.12	2.00	-4.70	-4.09	-2.85
	s.e.	1.66	1.83	1.82	1.83	1.92	1.57	1.80	2.01
stocks/bonds	Mean	4.43	4.17	4.75	1.45	0.49	-3.93	-3.56	-2.65
	s.e.	1.71	1.84	1.86	1.83	1.91	1.59	1.76	1.88

inflation ($\pi_{t-13\to t-1}$) translates into a 4.78 % spread in realized inflation ($\pi_{t\to t+12}$). Hence, lagged inflation is a reliable measure of expected inflation on the part of rational investors. Countries in the last quintile have also experienced inflation that is more than twice as volatile (4.24%) as that in the first quintile (2.07%).

The second panel reports nominal bond and stock returns in local currency ($r^{£}_{t\to t+k}$) on these inflation-sorted portfolios. The returns on T-bills increase by 4.10 % from the first to the last quintile. While nominal bond returns increase by 3.33 % from the first to the last quintile, not enough to keep up with inflation, nominal stock returns actually decrease by 0.60 %.

The third panel reports the implications for real bond and stocks returns ($r^{*}_{t\to t+k}$). Since we report log returns, the real returns are the nominal returns less the rate of inflation. For example, the average nominal stock return in the first quintile is 10.87%, the realized rate of inflation is 2.54%, and the real rate of return is the difference, 8.33%. Real stock returns decrease monotonically from 8.33% per annum to 2.95 % per annum in the last portfolio, while real bond returns decrease from 3.90 % per annum to 2.45 % per annum. Hence, both bonds and stocks are imperfect hedges against expected inflation, but stocks are by far the worse hedges. The spread in real stock returns between quintiles one and five is 5.38 % per annum (s.e. of 1.58 %).

Real T-bill returns are roughly constant across these portfolios. In that sense, sorting by lagged inflation produces very different results from country sorts by nominal interest rates[11] (see, e.g., the work by Verdelhan (2010)), which produce mostly real interest rate variation. Clearly, real interest rate variation is not driving our results.

Finally, the fourth panel in Table 2 reports the excess returns in local currency ($rx^{£}_{t\to t+k}$). These local currency excess returns can also be interpreted as the approximate returns earned by currency-hedged foreign investors. As a result of this imperfect hedging by local stocks against expected inflation, the equity premium on local stocks declines from 6.71 to 2.00 % as we increase expected inflation by switching from the first to the last quintile. The spread between the extreme quintiles is 4.70 % per annum (s.e. of 1.57 %). We also found that the inter-quintile spread in the equity premium of local stocks over local bonds is almost as large:

[11] Appendix F in the separate appendix reports results for sorts of countries by nominal interest rates.

3.93% per annum. There is a marked compression of the returns on equities and other asset classes in the highest inflation quintiles.

4.1.2 Sorting by Lagged Inflation in Deviation from Average Inflation

When countries have different (unconditional) mean rates of inflation (θ in (Equation 7)), but the same persistence, then it might be more informative to use lagged inflation in deviation from the mean as a measure of expected inflation in the cross-section. The results are even stronger when we focus on countries with currently unusually high or low inflation. Table 3 reports the results obtained when we sort by lagged inflation in deviation from that country's 10-year average. The spread in real stock returns at the one-month horizon between the first and the last quintile is 4.99%. In the highest quintile, we now exclusively have countries who currently experience unusually high inflation, rather than countries that on average have experienced high inflation.

We were conservative in using the 1-month lag of year-over-year inflation. If we adopt an even more conservative approach, and we use the year-over-year inflation rate realized at the end of month $t-3$ to sort countries at the end of month t, to allow investors more time to respond, then we obtain a slightly smaller spread in real stock returns between the first and fifth quintile of 4.75%, while the same spread for bonds is only -1.57 % per annum .

High inflation countries do not yield low real returns; only countries with currently abnormally high inflation. When we sort countries by average inflation realized over the past 10 years (our proxy for θ) instead, we do not observe similar patterns. These results are reported in Table A10 in the separate appendix. Nominal stock returns fully compensate for higher inflation in countries which have experienced high inflation on average. In fact, stocks do slightly better in real terms in countries which have on average experienced high inflation over the past decade. The spread in nominal stock returns between the first and the last quintile is 5.34%, compared to a 4.42% difference in realized inflation. Over long periods of time, inflation expectations have no effect on real stock returns. Hence, we can rule out country-fixed effects as an explanation of our results. Not surprisingly, average inflation has no significant effect on real bond returns

Table 3: Lagged-Inflation-Deviation-sorted Portfolios

Time-series averages of annualized log k-month returns on portfolios. The countries are sorted by year-over-year inflation minus 10-year inflation realized at month $t-1$ ($\pi_{t-13\rightarrow t-1} - \pi_{t-121\rightarrow t-1}$). The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S.. The sample starts with only 10 countries in 1950, and ends with 31 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\rightarrow t+k}$							
sorted	Mean	-5.07	-2.01	-0.60	0.39	2.21	7.27	7.27	7.34
	s.e.	0.25	0.12	0.07	0.08	0.10	0.25	0.44	0.86
realized	Mean	4.34	3.84	3.89	4.26	5.77	1.43	1.49	1.15
	s.e.	0.19	0.16	0.16	0.18	0.22	0.25	0.28	0.41
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$							
T-bills	Mean	6.64	5.68	5.37	5.34	6.46	-0.18	-0.16	-0.18
	s.e.	0.13	0.12	0.11	0.11	0.13	0.13	0.22	0.44
	std	1.03	0.90	0.84	0.86	0.99	1.00	1.70	3.30
bonds	Mean	9.37	7.38	7.00	7.08	6.99	-2.38	-2.07	-1.33
	s.e.	0.60	0.56	0.52	0.47	0.52	0.66	0.68	0.95
	std	4.79	4.37	4.08	3.71	4.12	5.25	6.15	6.73
stocks	Mean	12.96	11.46	9.74	9.64	9.40	-3.56	-4.24	-3.21
	s.e.	1.83	1.74	1.78	1.77	1.94	1.65	1.85	2.31
	std	14.42	13.69	13.98	13.99	15.33	12.97	14.43	16.84
		Panel B: real log returns in local units of consumption $r^{*}_{t\rightarrow t+k}$							
T-bills	Mean	2.30	1.84	1.48	1.08	0.69	-1.61	-1.65	-1.33
	s.e.	0.19	0.17	0.16	0.16	0.20	0.24	0.24	0.27
	std	1.34	1.29	1.21	1.24	1.49	1.69	1.74	2.21
bonds	Mean	5.03	3.54	3.11	2.82	1.22	-3.81	-3.56	-2.48
	s.e.	0.63	0.58	0.55	0.51	0.56	0.70	0.72	0.99
	std	4.94	4.59	4.31	4.03	4.45	5.51	6.53	6.84
stocks	Mean	8.62	7.63	5.85	5.38	3.63	-4.99	-5.74	-4.36
	s.e.	1.85	1.75	1.79	1.79	1.95	1.68	1.90	2.33
	std	14.54	13.73	14.03	14.07	15.42	13.19	14.70	16.97
		Panel C: log excess returns in local currency $rx^{£}_{t\rightarrow t+k}$							
bonds/T-bills	Mean	2.73	1.71	1.63	1.74	0.53	-2.20	-1.91	-1.15
	s.e.	0.59	0.55	0.51	0.47	0.51	0.66	0.67	0.89
stocks/T-bills	Mean	6.32	5.79	4.37	4.30	2.94	-3.38	-4.09	-3.03
	s.e.	1.84	1.74	1.78	1.79	1.94	1.65	1.84	2.27
stocks/bonds	Mean	3.59	4.08	2.74	2.56	2.41	-1.18	-2.18	-1.88
	s.e.	1.83	1.79	1.82	1.81	1.94	1.71	1.85	2.39

either. The inter-quintile range in average nominal bond returns is 4.65%.

4.1.3 Robustness

We have established that the pass-through of expected inflation to nominal stock returns is slow and incomplete. The local component of expected inflation is a powerful predictor of real returns on stocks in the cross-section of countries: When a country's expected inflation rate is higher than the global average, subsequent real returns and excess returns are lower for stocks, but not for bonds. The size of the effect on real stock returns is roughly equal to the rate of inflation, in deviation from the global average. This is not true in the time-series dimension: When a country's rate of inflation is higher than average for that country, this has a small, negative but statistically insignificant effect on real returns (see Bekaert and Wang (2010) for a survey of the time-series evidence).[12]

This cross-sectional relation between asset returns and inflation is confirmed when we limit the sample to developed countries. The unbalanced panel includes: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S. These results are reported in Table A12 in the separate appendix.

Real stock returns decline from 8.04 % per annum in the first quintile to 3.71 % in the last quintile, a decline of 4.32 % per annum (s.e. of 1.51 %). For bonds, the corresponding spread is only 0.94 %. This pattern results in a large decline in the equity premium of 3.66 % from the first to the last portfolio. As we increase the holding period, these spreads decrease. The spread in real returns decreases from 4.32 % at the one-month horizon to 4.08 % at the 3-month horizon, and 2.72 % at the 12-month horizon. We also consider a balanced panel of countries (Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom and the United States) that report data at the start of the sample. When we sort these

[12] In their survey paper, Bekaert and Wang (2010), who build a large panel of countries to investigate the usefulness of stocks in hedging inflation risk, report negative slope coefficients on inflation innovations and expected inflation. When Bekaert and Wang (2010) control for industrial production growth in a multivariate regression of stock returns on inflation innovations and output growth, some of these inflation betas of stocks switch signs and become positive.

11 countries into three portfolios, we still record a 2.09% spread in real stock returns between the highest and the lowest portfolio. The spread in realized inflation over this period is only 2.42% per annum. On the other hand, the spread in real bond returns is only 1.20%. Higher local expected inflation implies lower real stock returns.

There is an important sample selection effect in this dataset. Countries which have experienced high and volatile inflation are less likely to issue local currency bonds. Furthermore, if these countries do start issuing these bonds, they will do so after inflation has decreased.[13] When we add the countries who have not issued long-term bonds in local currency, the relation between stock returns and expected inflation increases becomes convex. Appendix D of the separate appendix provides detailed results for the extended stocks-only sample. When we sort countries by lagged inflation, the last quintile includes countries with high and volatile inflation (see Table A14 in the separate appendix). Average, realized inflation in the last quintile is 11.08 % per annum, while the volatility of inflation in the last quintile is 2.40%, which is more than double the volatility of inflation in the first quintile. There is still a 6.61 % spread in the real stock returns between the first and the last quintile, but there is a large increase in nominal stock returns from the fourth to the fifth quintile. For countries in quintile 5, the average lagged inflation rate is 13.77%, compared to only 6.00% in the fourth quintile. Average nominal stock returns increase from 9.67% in quintile four to 14.27% in quintile five, an increase of 4.60 %. By comparison, the difference in realized inflation rates between quintiles four and five is closer to 5.40 %. Hence, there is a robust though incomplete pass-through of inflation to nominal stock returns.[14] When sorting by lagged inflation in deviation from the mean, the results are even stronger: the spread in real stock returns in real stock returns between the first and the fifth quintile is 10.15% at the 1-month horizon. In this case, the last quintile contains countries with

[13] This is borne out by the numbers reported in Table A9 in section Appendix D of the separate appendix. The average rate of inflation in this extended panel is much higher (6.41% per annum), while the cross-sectional standard deviation of average inflation is 5.82%, almost three times higher than in the bond/stocks sample.

[14] In macro-economic regimes characterized by high and volatile inflation, nominal stock returns respond almost one-for-one, even at the 1-month horizon, to variation in expected inflation. In this extended sample, the resulting relation between real stock returns and lagged inflation is convex. It starts out with a very steep slope at low rates of inflation and then flattens at high rates of inflation. This confirms Liew (1995)'s findings who found that the Fisherian relation between inflation and stock returns is restored when inflation is sufficiently high and volatile. Similarly, for currency markets, Bansal and Dahlquist (2000) report that uncovered interest rate parity works better in high inflation environments.

less volatile inflation (see Table A15 in the Separate Appendix): the standard deviation is 3.12% in the last quintile versus 9.96% in the first quintile.

4.2 Pass-Through Dynamics in Stock and Bond Markets

There is a large difference in the dynamics of the bond and stock returns in response to a change in expected inflation: Bond prices respond immediately to inflation news, but stocks respond slowly.

4.2.1 Sorting by Lagged Inflation

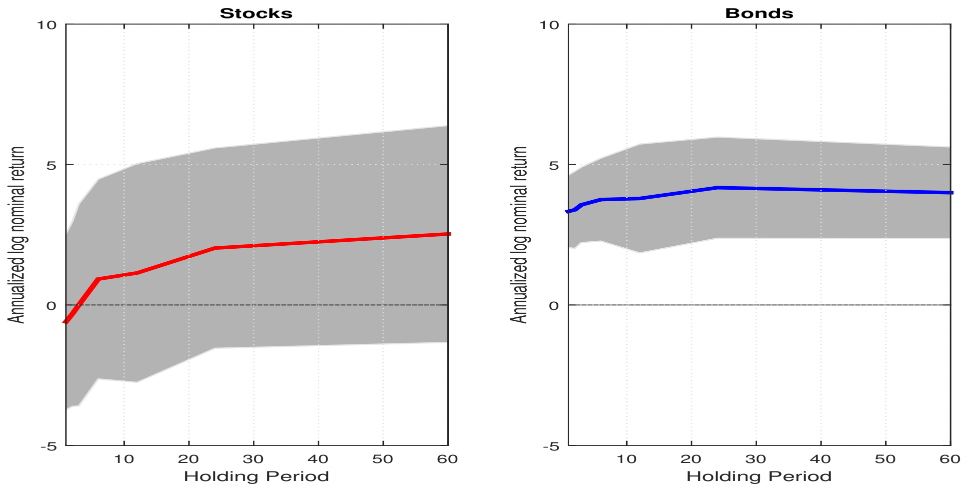
To illustrate these dynamics, Figure 7 plots the nominal (real) returns spreads (the fifth minus the first quintile) against the holding period on the x-axis in the top (bottom) panel. The countries are sorted by lagged inflation. The composition of the portfolios is fixed as we increase the holding period. In the left panels, we plot the the response of stock returns. At the one-month holding period, nominal stock returns do not respond to the difference in expected inflation. At the 12-month holding period, the spread is still only 1.14 % per annum. On the other hand, the spread in nominal bond returns, shown in the right panels, does respond at the one-month horizon; it starts at 3.81 % per annum.

The bottom panel plots real returns. As we increase the holding period, the spread in real stock returns decreases from 5.23 % at the one-month horizon to 3.00% at the 12-month horizon, while the spread in real bond returns decreases from 1.26% to 0.54 % per annum. These effects are transitory. After five years, the gap in real stock returns has closed completely. Recall that countries in the last quintile have experienced more volatile inflation. Clearly, the bond return spread is eliminated much faster than the stock return spread. This is suggestive of sluggish adjustment in the stock market.

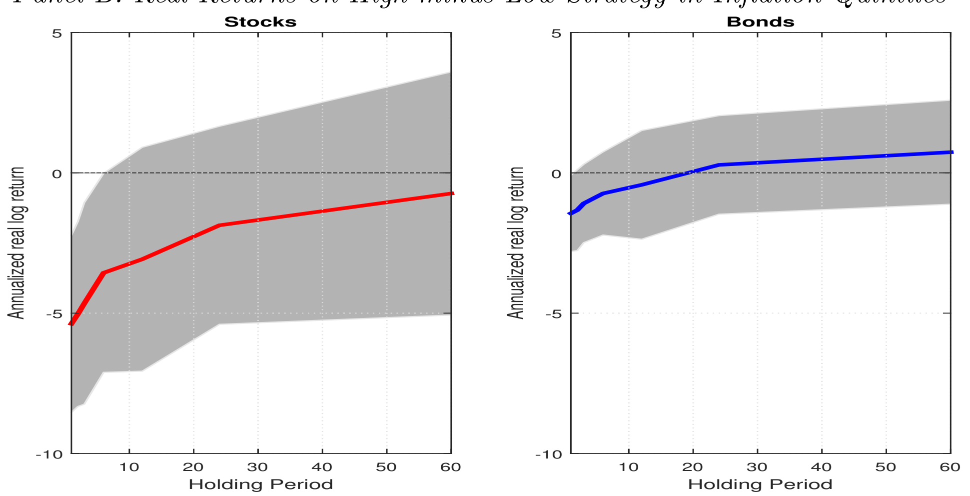
The holding period matters. Boudoukh and Richardson (1993) examine the inflation hedging properties of U.S. stocks over longer holding periods, and they conclude that stocks provide an effective inflation hedge over longer holding periods (e.g., 5 years). Our paper confirms these findings in the cross-section. All of the effects of inflation on real stock returns that we have

Figure 7: Dynamics of Return Spreads on Portfolios sorted by Lagged Inflation

Panel A: Nominal Returns on High-minus-Low Strategy in Inflation Quintiles



Panel B: Real Returns on High-minus-Low Strategy in Inflation Quintiles



Notes: The top (bottom) panel plots the time-series average of log nominal (real) returns (annualized) on quintile 5 minus quintile 1 against the holding period. The left panel is for stocks. The right panel is for bonds. The countries are sorted by lagged year-over-year inflation ($\pi_{t-13\rightarrow t-1}$). The grey areas depict 2 s.e. bands around the point estimates. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K and the U.S. The sample starts with 10 countries in 1950, and ends with 31 countries in 2012.

documented disappear at horizons in excess of 5 years.

4.2.2 Sorting by Lagged Inflation in Deviation from the Mean

However, when we sort by lagged inflation in deviation from the 10-year average, the impact on real stock return differences initially increases and is much more persistent. Figure 8 plots the nominal (real) returns spreads (the fifth minus the first quintile) against the holding period on the x-axis in the top (bottom) panel. The composition of the portfolios is fixed as we increase the holding period. At the 60-month horizon, the spread in real stock returns is still 4.01%, while the spread in real bond returns is only 1.13%. Most of the catch-up after the first year seems to take place in countries with high inflation over the past 10 years, but not in countries that have transitioned to high inflation recently. These findings are consistent with the sticky nominal discount rate model in which stock investors overweight historical inflation but underweight recent inflation.

As a result, the real stock stock response at one month is -81 bps (6.23 divided by 7.35) per 100 bps of inflation-deviation difference between the quintiles. At the 12-month (60 month) horizon, the response is 59 (51) basis points.

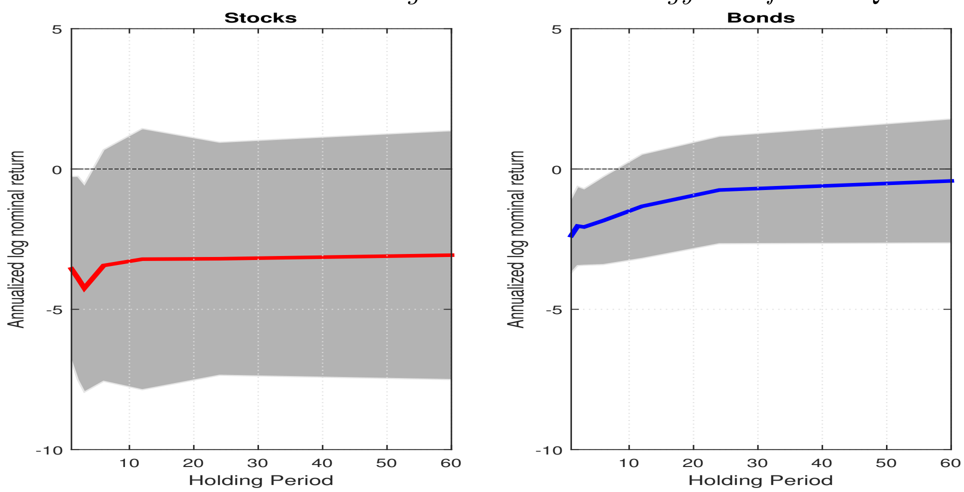
4.3 Stability of the Cross-sectional Relation between Expected Inflation and Returns

The relation between inflation and returns varies over time. In the left panel, Figure 9 plots the cumulative log return on a long position in stocks and a short position in bills. The dashed line plots the first quintile (low inflation) and the full one plots the last quintile (high inflation). The equity premium is consistently higher in low inflation portfolios than in high inflation portfolios. The right panel shows the equivalent cumulative returns for long positions in equity and short positions in bonds. In the highest inflation quintile, investors with this long-short position have lost money over the past six decades.

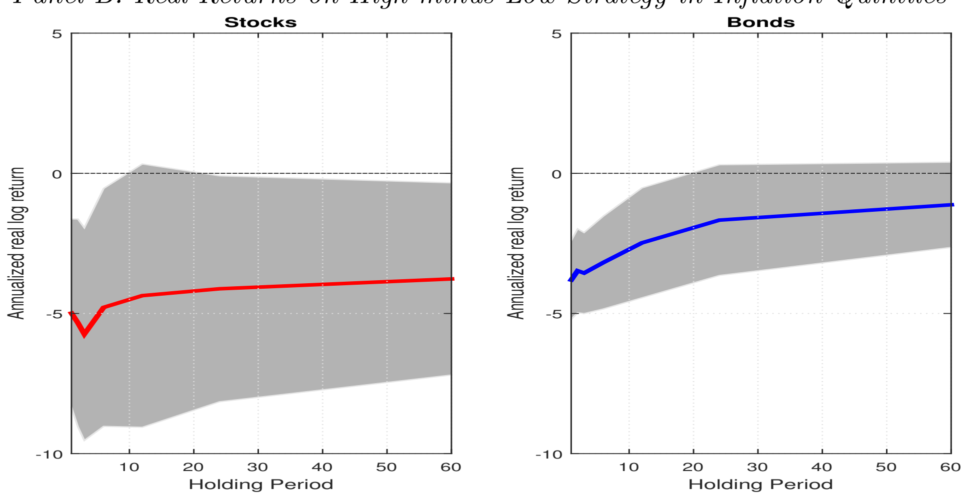
The spread in real stock returns between the extreme quintiles in the stock/bonds sample (the stock-only sample) varies from -11.00% (-12.80%) in the 50s to -10.92% (-11.57%) in the 60s, -2.85% (-9.86%) in the 70s, -1.18% (-2.33%) in the 80s, -9.62% (-4.29%) in the 90s, and 1.53% (-.41%) in the 00s. Hence, the last decade is the only exception. Stocks of countries with low

Figure 8: Dynamics of Return Spreads on Portfolios sorted by Lagged Inflation in Deviation from the Average

Panel A: Nominal Returns on High-minus-Low Strategy in Inflation Quintiles



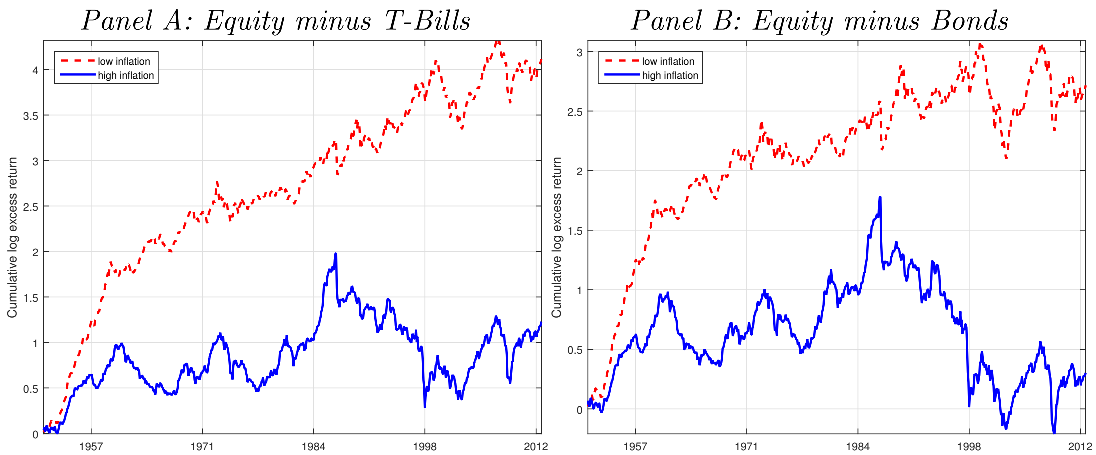
Panel B: Real Returns on High-minus-Low Strategy in Inflation Quintiles



Notes: The top (bottom) panel plots the time-series average of log nominal (real) returns (annualized) on quintile 5 minus quintile 1 against the holding period. The left panel is for stocks. The right panel is for bonds. The countries are sorted by lagged year-over-year inflation ($\pi_{t-13\rightarrow t-1}$). The grey areas depict 2 s.e. bands around the point estimates. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K and the U.S. The sample starts with 10 countries in 1950, and ends with 31 countries in 2012.

realized inflation consistently deliver higher average log excess returns over the entire sample, even though the differences narrow considerably in the 70s and 80s. By contrast, we only see

Figure 9: Cumulative Stock Returns on Inflation-Sorted Portfolios



Notes: The figure plots cumulative log returns on a long position in stocks and a short position in bills in the left panel (bonds in right panel) for the first and the last quintile of the inflation-sorted countries. The countries are sorted by year-over-year inflation realized at month $t-1$ ($\pi_{t-13\rightarrow t-1}$). The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S.. The sample starts with only 10 countries in 1950, and ends with 31 countries in 2012.

real bond return differences in the first three decades.[15] The same numbers for the portfolios sorted by lagged inflation in deviations from the 10-year average are: -13.53% (-13.83%) in the 50s, -12.05% (-12.13%) in the 60s, -4.56% (-10.30%) in the 70s, 2.77% (-12.13%) in the 80s, 1.78% (-2.92%) in the 90s, and -4.50% (-4.91%) in the 00s.

This cross-sectional relation between expected inflation and real returns break down in the late 90s, exactly when stocks around the world switched from positive to negative bond betas. When global bond markets signal that higher expected inflation goes hand-in-hand with lower discount rates (see Appendix B of the separate appendix), the cross-sectional spread in real stock returns between the highest and lowest inflation quintile shrinks. This is exactly when the risk-based explanation would imply that bets against inflation would be most profitable, because the negative covariance signals that high expected inflation states of the world are perceived to be good for the average investor (e.g., when output growth is dominated by demand shocks).

[15]Detailed results in Table A11 in the on-line appendix.

Around the same time, there was also a noticeable decrease in the persistence of inflation around the world. This decline in persistence may partly be due to changes in the monetary policy framework which have taken place in most developed countries starting in 1990s (Wright (2011)). In the last decade, the autocorrelation of inflation actually turned negative for the average country in our sample (see Appendix C of the separate appendix).[16] When inflation is not persistent, sticky nominal discount rates have a much smaller impact on valuations (see section 2). Hence, the time variation in the high/low inflation spread seems broadly consistent with the sticky discount rate hypothesis.

In the next section, we explicitly demonstrate that the time variation in the spreads is consistent with the sticky discount rate model: higher current inflation spreads and lower historical inflation predict larger future real return spreads in the data.

4.4 Time-Variation in Pass-Through

This section provides direct time series evidence that stock market investors overweight historical long-run inflation in setting nominal discount rates in stock markets, consistent with the sticky nominal discount rate hypothesis in section 2. We find that real stock returns are lower in high inflation countries, but this difference decreases as long-run inflation increases in the high inflation countries. This is not true of bond returns.

We use average inflation over the past 10 years as our measure of θ. To document the incomplete pass-through of inflation to nominal returns, we run forecasting regressions of future log return spreads between portfolio 5 and portfolio 1– for nominal returns, inflation, real returns

[16] It follows that lagged inflation may no longer be a good measure of expected inflation over this sample. In section 7, we use survey measures of one-year expected inflation instead of lagged inflation, and we find that even in the last 15 years real stocks returns are significantly lower in countries with higher than average expected inflation, but real bond returns are not.

Table 4: Stock Return Predictability: Developed Countries

Regression of future stock returns on lagged and long-run inflation. Regressions specified in Equation 8, Equation 9, Equation 10, and Equation 11. Portfolios of countries sorted by lagged year-over-year inflation at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. Sample: 1950-2012. Monthly data. All returns are annualized. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. We report Hansen and Hodrick (1980) with 12k lags and Newey and West (1987) t-stats (with Bartlett kernel).

Horizon k		*nominal log returns* $r^{\$}_{t\to t+k}$					*inflation* $\pi_{t\to t+k}$					*real log returns* $r_{t\to t+k}$					*log excess returns* $rx_{t\to t+k}$				
		Equation 8					*Equation 9*					*Equation 10*					*Equation 11*				
in years		β	*ols*	*nw*	*hh*	R^2	β	*ols*	*nw*	*hh*	R^2	β	*ols*	*nw*	*hh*	R^2	β	*ols*	*nw*	*hh*	R^2
Panel A: $\boldsymbol{X}_t$: *long-run inflation*																					
1	constant	-1.76	-2.95	-1.61	-1.59	0.05	2.55	19.25	7.86	5.27	0.11	-4.31	-7.08	-3.87	-3.29	0.02	-3.17	-5.29	-2.93	-2.50	0.01
	long-run	0.79	6.47	3.13	2.95	0.05	0.26	9.63	3.63	2.50	0.11	0.53	4.27	2.27	2.02	0.02	0.27	2.18	1.10	0.90	0.00
2	constant	-2.11	-4.65	-2.18	-1.62	0.18	2.20	17.63	6.20	3.62	0.11	-4.31	-9.13	-3.79	-2.52	0.12	-3.26	-7.12	-2.85	-1.94	0.06
	long-run	1.21	12.82	5.77	4.06	0.18	0.25	9.68	2.87	1.67	0.11	0.95	9.76	3.89	2.73	0.11	0.66	6.99	2.57	1.68	0.06
3	constant	-1.84	-4.85	-2.42	-1.56	0.23	1.89	16.29	5.61	3.13	0.15	-3.73	-9.58	-4.15	-2.51	0.14	-2.80	-7.49	-3.07	-1.97	0.08
	long-run	1.17	14.82	7.13	5.08	0.23	0.28	11.35	3.17	1.63	0.15	0.90	11.02	4.82	4.43	0.14	0.63	8.03	3.19	2.61	0.08
4	constant	-1.53	-4.28	-2.32	-1.45	0.22	1.64	14.79	5.17	2.81	0.19	-3.17	-8.89	-4.61	-2.64	0.13	-2.32	-6.81	-3.37	-1.98	0.06
	long-run	1.06	14.01	6.79	3.75	0.22	0.30	12.75	3.47	1.63	0.19	0.76	10.10	5.65	4.87	0.12	0.51	7.02	3.66	3.15	0.06
5	constant	-1.16	-3.42	-1.73	-1.40	0.24	1.46	13.37	4.36	2.58	0.20	-2.63	-7.75	-3.85	-2.97	0.14	-1.80	-5.51	-2.66	-1.91	0.07
	long-run	1.10	14.93	7.36	4.08	0.24	0.31	13.06	3.26	1.53	0.20	0.79	10.77	6.42	5.26	0.14	0.53	7.43	4.24	3.07	0.07
Panel B: $\boldsymbol{X}_t$: *long-run and current inflation*																					
1	constant	-1.83	-1.80	-0.95	-0.68	0.05	-0.33	-1.84	-0.80	-0.53	0.41	-1.50	-1.46	-0.75	-0.54	0.04	-1.60	-1.58	-0.82	-0.58	0.01
	long-run	0.79	6.42	3.12	3.19	0.05	0.21	9.66	4.23	3.61	0.41	0.58	4.65	2.29	2.27	0.04	0.29	2.38	1.19	1.07	0.01
	lagged	0.01	0.08	0.03	0.02		0.50	19.57	5.98	3.93		-0.49	-3.40	-1.39	-1.01		-0.27	-1.92	-0.81	-0.59	
2	constant	-0.51	-0.68	-0.38	-0.25	0.19	-0.52	-3.09	-1.23	-0.69	0.43	0.01	0.01	0.01	0.00	0.17	0.03	0.04	0.02	0.01	0.10
	long-run	1.23	13.11	6.39	4.53	0.19	0.20	9.59	4.80	3.91	0.43	1.03	10.85	5.86	4.16	0.17	0.72	7.73	3.61	2.41	0.10
	lagged	-0.28	-2.63	-1.20	-0.72		0.47	20.17	5.62	2.93		-0.75	-7.02	-3.04	-1.92		-0.57	-5.44	-2.35	-1.54	
3	constant	-1.49	-2.36	-1.23	-0.70	0.23	-0.49	-3.07	-1.16	-0.61	0.43	-1.00	-1.58	-0.83	-0.50	0.18	-0.73	-1.19	-0.62	-0.37	0.10
	long-run	1.18	14.78	7.45	5.55	0.23	0.22	11.17	5.32	3.85	0.43	0.96	11.87	7.09	5.22	0.18	0.67	8.63	4.44	3.54	0.10
	lagged	-0.06	-0.70	-0.33	-0.18		0.41	18.83	5.18	2.46		-0.47	-5.38	-2.57	-1.72		-0.36	-4.22	-1.89	-1.30	
4	constant	-2.34	-4.00	-1.78	-1.07	0.22	-0.43	-2.79	-1.08	-0.56	0.42	-1.91	-3.29	-1.61	-1.05	0.13	-1.46	-2.62	-1.25	-0.76	0.07
	long-run	1.04	13.61	7.25	4.93	0.22	0.25	12.34	5.56	3.78	0.42	0.79	10.45	6.84	4.56	0.13	0.53	7.25	4.55	3.64	0.07
	lagged	0.14	1.75	0.74	0.46		0.36	17.00	5.01	2.28		-0.22	-2.72	-1.36	-1.21		-0.15	-1.95	-0.91	-0.66	
5	constant	-2.09	-3.79	-1.71	-1.19	0.25	-0.41	-2.67	-1.01	-0.57	0.40	-1.68	-3.06	-1.53	-1.19	0.15	-1.16	-2.18	-1.06	-0.69	0.08
	long-run	1.07	14.38	8.03	5.68	0.25	0.25	12.21	5.58	3.25	0.40	0.82	11.02	7.66	5.25	0.15	0.55	7.60	5.13	3.56	0.07
	lagged	0.16	2.13	1.03	0.65		0.33	15.44	4.55	2.21		-0.17	-2.18	-1.32	-1.35		-0.11	-1.53	-0.87	-0.62	

and excess returns, all in logs– on predictor variables $\boldsymbol{X}_t$:

$$r^{5,\pounds}_{t\to t+k} - r^{1,\pounds}_{t\to t+k} = \beta^{\pounds}_0 + \boldsymbol{\beta}^{\pounds,\prime}\boldsymbol{X}_t, \tag{8}$$

$$\pi^{5}_{t\to t+k} - \pi^{1}_{t\to t+k} = \beta^{\pi}_0 + \boldsymbol{\beta}^{\pi,\prime}\boldsymbol{X}_t, \tag{9}$$

$$r^{5}_{t\to t+k} - r^{1}_{t\to t+k} = \beta_0 + \boldsymbol{\beta}^{\prime}\boldsymbol{X}_t, \tag{10}$$

$$rx^{5}_{t\to t+k} - rx^{1}_{t\to t+k} = \beta^{rx}_0 + \boldsymbol{\beta}^{rx,\prime}\boldsymbol{X}_t. \tag{11}$$

In Table 4, the vector of predictors $\boldsymbol{X}_t$ includes inflation over the past 10 years ($\pi^5_{t-10\to t} - \pi^1_{t-10\to t}$) and inflation over the past year ($\pi^5_{t-1\to t} - \pi^1_{t-1\to t}$). We refer to the first variable as long-run inflation, the second variable as lagged inflation. Note that the coefficients in Equation 10 equal the coefficients in Equation 8 minus the coefficients in Equation 9. The excess returns in Equation 11 are not clean measures of risk premia because the short leg involves interest rate risk. To correct for the autocorrelation induced by overlapping windows and heteroskedasticity, we report Hansen and Hodrick (1980) with $12k$ lags and Newey and West (1987) t-stats (with Bartlett kernel).

The results for stocks are reported in Table 4. Panel A of Table 4 reports the results obtained using only long-run inflation as a predictor. The first five columns report results for Equation 8. A 100 basis point increase in long-run inflation accrued over the past 10-years increases nominal stock returns by 79 bps at the one-year horizon to 110 basis points per annum at the 5-year horizon. These slope coefficients are estimated precisely, even after adjustments for autocorrelation in the errors induced by the overlap in returns and heteroskedasticity. The pass-through of long-run inflation (over long horizons) to nominal stock returns is more than 100 percent, even at the 5-year horizon.

Next, we consider inflation. The next five columns report the same forecasting regression results for Equation 9, with log inflation on the left hand side of the regression. A 100 basis point increase in inflation over the past 10-years increases log inflation by only 26 bps at the one-year horizon to 31 basis points per annum at the 5-year horizon. Hence, nominal stock returns seem to respond too strongly to the historical rate of inflation.

The next five columns report real returns (Equation 10). Since we work with log real returns, the estimated coefficients equal those in the second panel minus those in the first panel. A 100 basis point increase in inflation over the past 10-years increases log inflation by 53 bps at the one-year horizon to 79 basis points per annum at the 5-year horizon. These coefficients are significantly different from zero. At the 2-year horizon, the effect is 95 basis points. The last five report the results for forecasting excess returns in Equation 11.

Panel B in Table 4 reports the forecasting results that we obtained when controlling for lagged inflation. The results are essentially unchanged, because the slope coefficients in the regression of nominal returns on current inflation (i.e. inflation in the year preceding t) are very small, or even negative. In Equation 8, the pass-through of past inflation (over long horizons) to nominal stock returns is more than 100 percent, even when controlling for current inflation. On the other hand, in forecasting actual inflation in Equation 9, current inflation is assigned a large weight that always exceeds the weight on past inflation (at all horizons). As we would expect in the case of AR processes, the weight assigned to lagged inflation decreases as we increase the forecasting horizon from 0.50 to 0.33.

At the one-year horizon, the coefficient on long-run inflation (lagged inflation) in the real returns regression (Equation 10) is 0.58 (-0.49). The coefficients on long-run inflation are close to 90 bps at $k = 2$ and $k = 3$. The negative loadings on current inflation in a regression of real returns simply reflect the small or non-existent pass-though of current inflation to nominal returns. As before, these slope coefficients are simply the difference between the coefficients in the nominal and the inflation forecasting panel. As a result, a 100 basis bps increase in the historical inflation difference translates into a 55 bps increase in the expected log excess return on stocks in the fifth relative to the first quintile.[17]

There is no evidence of sticky discount rates in bond markets. Table 5 reports the evidence for bond returns. We run the same regressions with the returns on bond portfolios on the left hand side. In Equation 8, the coefficients on long-run inflation are only about half the size of those estimated for nominal stock returns: they vary between 58 and 49 basis points, depending

[17] We report similar evidence for the larger sample of countries in the separate appendix in Table A25.

on the horizon. As a result, real bond returns are much less sensitive to the long-run component of inflation, while excess returns on bonds at all horizons are completely unresponsive to the long run component of inflation. Using the Hansen and Hodrick (1980) standard errors, we cannot reject the null that long-run inflation has no effect on real bond returns or excess returns on bonds.

Finally, Table 6 shows the same results when controlling for the current yield spread, a forward-looking measure of expected inflation. Panel A reports the results for stock returns. Long-run inflation still has a large, significant effect on real stocks returns. The coefficients on Panel B reports results for bond returns. Now, we cannot reject the null that long-run inflation has no effect on bond excess returns at any horizon. In this case, the long-run component of inflation no longer has any significant bearing on nominal bond returns, but still has a large and statistically significant impact on nominal and real stocks returns, as well as excess returns.

Our empirical results are consistent with the notion that local stock market investors' long-run discount rates respond more slowly to local news about expected inflation than bond market investors' discount rates. As a result, subsequent realized returns are higher than they expect.

Table 5: Bond Return Predictability: Developed Countries

Regression of future bond returns on lagged and long-run inflation. Regressions specified in Equation 8, Equation 9, Equation 10, and Equation 11. Portfolios of countries sorted by lagged year-over-year inflation at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. Sample: 1950-2012. Monthly data. All returns are annualized. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. We report Hansen and Hodrick (1980) with $12k$ lags and Newey and West (1987) t-stats (with Bartlett kernel).

Horizon k		*nominal log returns* $r^{\$}_{t\to t+k}$					*inflation* $\pi_{t\to t+k}$					*real log returns* $r_{t\to t+k}$					*log excess returns* $rx_{t\to t+k}$				
		Equation 8					*Equation 9*					*Equation 10*					*Equation 11*				
in years		β				R^2	β				R^2	β				R^2	β				R^2
			ols	*nw*	*hh*			*ols*	*nw*	*hh*			*ols*	*nw*	*hh*			*ols*	*nw*	*hh*	
1	constant	1.53	3.39	1.86	1.53	0.10	-0.33	-1.84	-0.80	-0.53	0.41	1.86	3.91	2.20	1.88	0.10	1.76	4.31	2.38	2.25	0.04
	long-run	0.49	8.92	3.47	2.44	0.09	0.21	9.66	4.23	3.61	0.41	0.27	4.74	1.86	1.36	0.10	-0.01	-0.24	-0.13	-0.10	0.04
	lagged	-0.04	-0.68	-0.33	-0.25		0.50	19.57	5.98	3.93		-0.54	-8.13	-3.50	-2.60		-0.33	-5.70	-3.00	-2.42	
2	constant	1.72	5.12	2.64	1.85	0.21	-0.52	-3.09	-1.23	-0.69	0.43	2.24	6.33	3.62	2.67	0.21	2.26	7.94	4.52	3.37	0.12
	long-run	0.58	13.99	4.64	2.41	0.21	0.20	9.59	4.80	3.91	0.43	0.38	8.72	3.31	1.80	0.20	0.07	2.07	1.09	0.65	0.12
	lagged	-0.10	-2.19	-0.99	-0.85		0.47	20.17	5.62	2.93		-0.57	-11.65	-4.84	-3.10		-0.40	-9.96	-5.09	-3.32	
3	constant	0.78	2.72	1.27	0.83	0.25	-0.49	-3.07	-1.16	-0.61	0.43	1.27	4.13	2.20	1.28	0.14	1.54	6.62	3.46	1.87	0.06
	long-run	0.55	14.94	4.25	1.99	0.25	0.22	11.17	5.32	3.85	0.43	0.32	8.24	2.61	1.34	0.13	0.04	1.26	0.53	0.29	0.06
	lagged	0.08	1.99	0.79	1.21		0.41	18.83	5.18	2.46		-0.33	-7.82	-2.94	-1.67		-0.22	-6.78	-2.96	-1.61	
4	constant	0.11	0.40	0.17	0.10	0.28	-0.43	-2.79	-1.08	-0.56	0.42	0.53	1.89	0.90	0.47	0.08	0.99	4.60	2.05	0.93	0.02
	long-run	0.51	14.68	3.89	1.86	0.28	0.25	12.34	5.56	3.78	0.42	0.26	7.14	2.16	1.14	0.08	0.00	0.00	0.00	0.00	0.01
	lagged	0.19	5.26	1.86	2.03		0.36	17.00	5.01	2.28		-0.17	-4.23	-1.49	-0.79		-0.10	-3.31	-1.33	-0.62	
5	constant	-0.01	-0.04	-0.02	-0.01	0.33	-0.41	-2.67	-1.01	-0.57	0.40	0.40	1.55	0.73	0.39	0.10	0.92	4.63	2.03	0.92	0.02
	long-run	0.55	16.44	4.09	2.05	0.33	0.25	12.21	5.58	3.25	0.40	0.29	8.42	2.59	1.38	0.10	0.02	0.87	0.33	0.19	0.01
	lagged	0.18	5.29	1.79	2.07		0.33	15.44	4.55	2.21		-0.15	-4.11	-1.40	-0.74		-0.09	-3.43	-1.30	-0.61	

Table 6: Stock and Bond Return Predictability

Regression of future stock and bond returns on yields and long-run inflation. Regressions specified in Equation 8, Equation 10, and Equation 11. Portfolios of countries sorted by lagged year-over-year inflation at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. Sample: 1950-2012. Monthly data. All returns are annualized. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. We report Hansen and Hodrick (1980) with $12k$ lags and Newey and West (1987) t-stats (with Bartlett kernel).

Horizon k		*nominal log returns* $r^{£}_{t\to t+k}$					*real log returns* $r_{t\to t+k}$					*log excess returns* $rx_{t\to t+k}$				
		Equation 8					*Equation 10*					*Equation 11*				
in years		β	*ols*	*nw*	*hh*	R^2	β	*ols*	*nw*	*hh*	R^2	β	*ols*	*nw*	*hh*	R^2
Panel A: Stock Returns																
1	constant	-2.05	-3.03	-1.60	-1.29	0.05	-3.58	-5.23	-2.72	-2.14	0.02	-2.24	-3.30	-1.75	-1.40	0.01
	yield	0.44	1.94	0.92	0.65	0.05	-0.28	-1.22	-0.59	-0.42	0.02	-0.50	-2.22	-1.06	-0.74	0.01
	long-run	0.58	3.63	2.05	1.86		0.57	3.53	2.16	2.02		0.46	2.87	1.68	1.51	
2	constant	-2.43	-5.01	-2.21	-1.57	0.16	-3.77	-7.53	-3.24	-2.19	0.09	-2.45	-5.03	-2.22	-1.61	0.06
	yield	0.44	2.72	1.21	0.80	0.16	-0.24	-1.40	-0.62	-0.43	0.09	-0.49	-2.97	-1.29	-0.88	0.06
	long-run	0.92	7.82	3.17	2.21		0.92	7.62	2.93	2.15		0.80	6.81	2.78	1.91	
3	constant	-2.59	-6.66	-2.81	-1.73	0.23	-3.74	-9.33	-3.74	-2.20	0.11	-2.52	-6.44	-2.69	-1.74	0.06
	yield	0.71	5.47	2.23	1.54	0.23	0.14	1.01	0.41	0.30	0.10	-0.15	-1.17	-0.47	-0.35	0.06
	long-run	0.73	7.63	3.05	3.02		0.67	6.78	2.42	2.37		0.60	6.18	2.42	2.25	
4	constant	-2.37	-6.84	-2.97	-1.67	0.24	-3.37	-9.57	-3.92	-2.18	0.10	-2.22	-6.42	-2.73	-1.57	0.04
	yield	0.91	7.92	3.28	2.16	0.24	0.41	3.53	1.46	1.11	0.09	0.12	1.03	0.42	0.31	0.04
	long-run	0.48	5.51	2.61	4.12		0.37	4.20	1.72	2.23		0.32	3.64	1.62	2.17	
5	constant	-1.91	-6.07	-2.54	-1.91	0.28	-2.81	-8.78	-3.42	-2.47	0.12	-1.75	-5.58	-2.27	-1.63	0.05
	yield	0.85	8.22	3.51	1.97	0.28	0.41	3.82	1.62	0.96	0.11	0.14	1.39	0.58	0.35	0.05
	long-run	0.52	6.24	3.05	4.28		0.39	4.62	1.82	1.71		0.32	3.88	1.72	1.92	
Panel B: Bond Returns																
1	constant	-0.39	-1.55	-0.98	-0.87	0.29	-1.93	-6.48	-3.78	-3.04	0.04	-0.58	-2.25	-1.34	-1.13	0.01
	yield	1.19	14.25	6.29	5.16	0.29	0.48	4.89	2.26	1.77	0.04	0.26	3.00	1.46	1.25	0.01
	long-run	0.00	-0.02	-0.01	-0.01		-0.01	-0.12	-0.09	-0.07		-0.12	-1.95	-1.63	-1.42	
2	constant	-0.26	-1.62	-0.76	-0.50	0.52	-1.60	-7.21	-3.48	-2.00	0.10	-0.28	-1.55	-0.76	-0.51	0.03
	yield	1.21	22.55	11.68	8.14	0.52	0.53	7.12	3.55	2.39	0.10	0.28	4.69	2.44	1.75	0.03
	long-run	0.01	0.31	0.14	0.11		0.02	0.32	0.14	0.13		-0.10	-2.39	-1.16	-0.91	
3	constant	0.01	0.11	0.05	0.03	0.68	-1.14	-6.53	-3.06	-1.70	0.16	0.08	0.63	0.31	0.20	0.07
	yield	1.19	32.43	16.50	14.92	0.68	0.61	10.50	5.15	3.20	0.15	0.32	7.21	3.72	2.93	0.07
	long-run	-0.04	-1.51	-0.79	-0.84		-0.10	-2.37	-1.01	-0.86		-0.18	-5.34	-2.71	-2.15	
4	constant	0.02	0.24	0.12	0.06	0.74	-0.98	-6.55	-3.54	-1.76	0.23	0.17	1.39	0.73	0.37	0.12
	yield	1.17	37.52	21.09	24.32	0.74	0.67	13.61	6.66	3.62	0.22	0.38	9.66	5.29	3.56	0.12
	long-run	-0.06	-2.53	-2.89	-2.60		-0.17	-4.46	-2.57	-1.25		-0.22	-7.45	-5.37	-2.72	
5	constant	-0.06	-0.73	-0.40		0.79	-0.97	-7.24	-3.97	-1.94	0.27	0.09	0.87	0.47	0.23	0.15
	yield	1.10	40.91	25.78		0.79	0.65	14.67	6.93	3.81	0.27	0.39	11.06	6.15	3.99	0.15
	long-run	-0.02	-0.82	-0.92			-0.14	-4.08	-1.92	-0.84		-0.21	-7.59	-4.47	-2.16	

5 What Drives the Incomplete Pass-through? Alternative Explanations

We have established that nominal stock returns seem sluggish in responding to changes in local inflation. There are two distinct ways to interpret these results. First, investors do not have rational inflation expectations. Second, investors have rational inflation expectations and fully understand this relation between inflation and returns. This section reviews all potential explanations.

5.1 Sticky Information Models and Under-reaction of Nominal Discount Rates

The slow pass-through of inflation to subsequent returns that we have documented in the data is consistent with the predictions of sticky information models. The present-value relation also holds under the true measure:

$$pd_t = constant + \mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1}\Delta d_{t+j}\right] - \mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}.\right] \tag{12}$$

In this model, real discount rates (under the true measure) $\mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}\right]$ decline in response to an increase inflation, simply because nominal discount rates fail to adjust. Recent evidence from inflation surveys supports this channel. As we explained, the model also predicts a positive contemporaneous effect, which appears counterfactual.

If inflation follows a random walk, then the change in inflation is a good measure of inflation surprises. We use the change in inflation $\pi_{t\to t+k} - \pi_{t-k\to t}$ between month t and $t+k$ to rank countries into portfolios at t, where k denotes the investment horizon. We report average log returns realized between month t and $t+k$ on portfolios of stocks, bonds and bills. These are not returns on an an implementable investment strategy. The investment horizon varies from 1 month to 12 months, but all the numbers in the tables are annualized. We hold the portfolios constant for k periods. For each of these portfolios, we compute the returns $r_{t\to t+k}$ over the next k periods. Since we do not have monthly inflation data for Australia and New Zealand, we exclude these countries.

Real bond returns in the last quintile are 9.00 % per annum lower (s.e. of 0.69%) than those in the first quintile, but real stock returns in the last quintile are 7.46% percent per annum (s.e. of 1.60%) lower than those in the first quintile. At the 1-month horizon, stocks perform only slightly better than bonds in hedging against surprise inflation. At the 3-month horizon, the results look very similar. The difference in real bond returns between portfolio 5 and portfolio 1 is -7.72%, compared to -5.71% for stocks. Again, stocks only provide a small incremental hedge against inflation innovations. Detailed results are in the separate appendix in Appendix E.

However, if future real cash flow growth is predicted by the level of inflation ($\mathbb{E}_t[\Delta d_{t+1}] = \psi \pi_t$), then the contemporaneous effect of inflation on the dividend yield would be mitigated if $\psi < 0$. This cash flow effect does not alter any of the real return predictability results.

More importantly, the sticky discount rate model presents a time aggregation challenge for asset pricing econometricians: The model without the cash flow channel predicts instantaneous positive returns, but negative returns immediately after the revelation of inflation news. After a burst of inflation, the real discount rate drops on day 0, but then immediately starts to increase (on day 1) as agents adjust their inflation expectations. If we had calibrated the sticky information model to daily data, the one-day response would be large and positive, but immediately followed by negative returns the next day, and all days after that, until the effects had dissipated. Hence, it is entirely possible that we fail to detect this effect because it is immediately followed by a negative response in the sticky information model.

5.2 Extrapolation and Over-reaction of Nominal Cash Flows

Sticky information models generate an under-reaction of discount rates. An alternative explanation could be the overreaction of nominal cash flow forecasts at the firm level to inflation news. This would imply that real cash flow forecasts $\mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j}\right]$ increase in response to inflation in Equation 12. Appendix B develops a simple model with nominal cash flow extrapolation that delivers similar implications for return predictability. Recently, Barberis et al. (1998); Fuster et al. (2011); Hirshleifer and Yu (2013) all study behavioral asset pricing models in which investors extrapolate fundamentals. We cannot definitively rule out this explanation of our findings.

5.3 Rational Expectations Models and Risk-based Explanations

The hypothesis in rational expectations models is that risk premia are lower in countries with higher inflation than the global average, thus lowering real discount rates $\mathbb{E}_t\left[\sum_{j=1}^{\infty}\rho^{j-1}r_{t+j}\right]$ in Equation 12 decline in response to an increase inflation. Two ingredients are needed. First, the stock market investors' real discount rate

$$cov\left(\mathbb{E}_t\left[\sum_{j=1}^{\infty}\rho^{j-1}\Delta r_{t+j}\right], \pi_t^e\right) < 0$$

covaries negatively with (expected) inflation π^e and increases the dividend yield when expected inflation declines, producing a negative inflation risk premium: nominal assets provide a fundamental hedge. Investors want to pay for exposure to expected inflation.

Second, rational expectation models face the same challenge as sticky information models in accounting for the contemporaneous impact. In this class of rational expectations models, there is no time aggregation issue.[18] As a result, the discount rate effect has to be more than offset by a decrease in current and future expected cash flow growth –the cash flow channel– to be consistent with the response of stocks to inflation surprises

$$cov\left(\Delta\pi_{t+1}, (\mathbb{E}_{t+1}-\mathbb{E}_t)\left[\sum_{j=1}^{\infty}\rho^{j-1}\Delta d_{t+j}\right]\right) < 0$$

In a flexible, reduced-form model, Lettau and Wachter (2007) build this second ingredient, the cash flow channel (negative correlation between current dividend growth and inflation innovations), into a reduced form model engineered to match the yield curves as well other moments

[18] Recall that in sticky discount rate models, the instantaneous positive effect on stock valuations of an inflation surprise is immediately offset by subsequent decreases in the valuation, as agents update inflation expectations. That is not the case when investors have rational inflation expectations.

of bond and stock returns. A model with the cash flow channel, but not the discount rate channel, matches the negative relation between real stock returns and lagged inflation as well as the negative relation between inflation innovations and real stock returns. This model also delivers an upward sloping nominal yield curve and a positive stock-bond correlation. However, a model with both cannot deliver an upward sloping yield curve. Moreover, it is hard to explain why adverse macroeconomic news about current or future cash flow growth would lower the risk premium in an equilibrium model.[19]

There is a large, related literature on this topic. Fama (1981) originally proposed a proxy explanation of the negative correlation between expected inflation and stock returns in the U.S. time series. Fama conjectures that there is a negative relation between the future growth of real activity and the level of expected inflation, as well as a positive correlation between the future growth and expected real stock returns, thus giving rise to a negative correlation between inflation expectations and expected real returns. Geske and Roll (1983) developed a reverse causation version of this argument. More recently, Piazzesi and Schneider (2006) show that a negative correlation between expected inflation and future real consumption growth, a feature of the U.S. post-war data, delivers upward sloping nominal yield curves in a standard representative agent dynamic equilibrium model. Bansal and Shaliastovich (2013) extend a version of this model to match moments of bond, stock and currency returns by introducing uncertainty about inflation as an additional state variable. Nakamura, Steinsson, Barro and Ursua (2013) find evidence of inflation spikes during consumption disasters.

5.4 Other Explanations

First, in an incomplete markets model, demand for stocks as a hedging device against inflation may drive down the real stock returns that investors demand in equilibrium. In this class of models, inflation volatility determine the demand for stocks as hedges. In the cross-section,

[19] A central tenet of modern asset pricing is that the price of risk is counter-cyclical (Campbell and Cochrane (1999)). There is plenty of empirical evidence to support this notion (see, e.g., Lettau and Ludvigson (2002) and Lustig and Verdelhan (2012)). In this class of models, expected returns on stocks invariably increase in bad times, when marginal utility growth is high. That delivers a negative covariance between realized stock returns and the pricing kernel, the key to a positive equity premium.

we find no evidence of a relation between inflation volatility, measured over 60-month rolling windows, and real stock returns.[20]

Second, lower than expected inflation increases corporate leverage because corporations tend to issue nominal bonds. The credit risk associated with deflation is priced in U.S. corporate bond markets (Kang and Pflueger (2014)). The increase in leverage would lead to higher expected returns on equity in the portfolios of countries with low lagged inflation in deviation from the average. However, it is doubtful that this mechanism is quantitatively important for the value-weighted stock market. In addition, from the perspective of the real debt burden, unanticipated inflation is good news for stocks (Gomes, Jermann and Schmid (2014)), contrary to what we find in the data.

Third, money illusion cannot account for our findings. In their classic paper, Modigliani and Cohn (1979) conjectured that stock market investors may use nominal discount rates to price real cash flows. Looking at the U.S. experience, Asness (2000) documents a striking correlation between nominal bond yields and the stock market's earning yields, suggesting that U.S. investors discount real cash flows at a lower rate when nominal interest rates are low. The 'Fed model' implies that stocks are expensive in low-inflation environments.[21] We find the opposite relation in a large panel of countries.

[20]In a related strand of the literature, Alvarez, Atkeson and Kehoe (2002, 2009) develop a Baumol-Tobin model with endogenously segmented markets. Investors incur a fixed costs when participating in asset markets. An increase in expected inflation increases the benefit of participation in asset markets and hence lowers risk premia. If inflation is sufficiently high, the neutrality of inflation is restored, in line with our findings for high inflation countries. However, this Baumol-Tobin mechanism cannot explain the asymmetric effect of inflation on equity and bond risk premia.

[21]Several authors have found additional evidence in support of the money illusion hypothesis. Campbell and Vuolteenaho (2004) find that the level of inflation explains a large share of mispricing of the U.S. stock market, consistent with the Modigliani-Cohn hypothesis. In the cross-section of U.S. stocks, Cohen, Polk and Vuolteenaho (2005) also find evidence that stock market investors are subject to money illusion, while Brunnermeier and Julliard (2008) report similar evidence from U.S. housing markets. Using survey data for earnings forecasts and expected inflation, Sharpe (2002) attributes the negative correlation between equity valuations and expected inflation to an increase in the required real return on stocks and a decrease in expected earnings growth that coincide with a rise in expected inflation. In recent work, Bekaert and Engstrom (2010) attribute this U.S. correlation to heightened uncertainty during times of higher expected inflation in the U.S.

6 Faster Pass-through of Expected Inflation In Currency Markets

Traditional portfolio advice includes partial or complete hedging of currency risk in bond and stock portfolios. Recently, Campbell, Medeiros and Viceira (2010) showed that the optimal hedging strategy for an equity portfolio depends on the characteristics of the currency, because the correlations of exchange rate changes with local equity markets vary from one currency to the next. However, currency exposure may help to hedge against inflation risk. Investors in countries which experience an increase in expected inflation realize a capital gain on their long position in foreign currencies, because the foreign currency appreciates against their domestic currency.

To investigate this alternative inflation hedging mechanism, we construct equal-weighted baskets of foreign stocks (excluding the domestic stock index) for all of the countries, and we report the local currency returns realized by the local investors in different inflation quintiles in panel A of Table 7. The portfolio composition is identical to that in Table 2.

The returns to a local investor consists of the foreign currency stock returns plus the percentage rate of appreciation of the foreign currency ($-\Delta s$). For example, the average nominal local currency stock return earned by local investors in the last quintile is 12.61%, the sum of a 7.69% currency appreciation and a 4.92% stock return in foreign currency. In this case, local investors benefit from some additional local inflation hedging from the foreign currency exposure. At the one-month horizon, the currencies in the fifth portfolio depreciate against all other currencies by 2.16% compared to the first portfolio. At the 12-month horizon, they depreciate by 2.84% per annum. As a result, the nominal stock return in local currency in the fifth quintile is 2.46 % higher than the returns on the first quintile. That spread accounts for about half of the inflation spread between the first and the last quintile. Hence, the appreciation of the basket of foreign currencies relative to the high inflation currencies helps the local investors hedge. The real stock returns on the last portfolio are only 2.25% lower than those on the first portfolio. That should be compared to the 5.29% spread that we documented for the real stock returns on local stocks in Table 2

Finally, we also examined the performance of foreign stocks when we sort portfolios by inflation in deviation from the 10-year average in Panel B of Table 7. These numbers can be directly compared to the results in Table 3. The 5.91% (5.43%) spread in real stock returns is reduced to 1.76% (1.49%) at the 1-month horizon (at the 12-month horizon).

Mean-variance investors have been traditionally advised to hedge currency exposure in foreign bond and stock portfolios (see, e.g., Glen and Jorion (1993)), but our findings strengthen the case for international diversification in foreign stocks (and bonds) without currency hedging, because the currency risk exposure hedges the local inflation risk.

7 Alternative Measures of Expected Inflation and Pass-Through

In this section, we check the robustness of our findings by using two alternative measures of expected inflation. In doing so, we want to guard against the concern that the decreased persistence of inflation has rendered lagged inflation less effective as a measure of expected inflation over the last 15 years.

7.1 The Cross-section of Nominal Interest Rates and Returns

First, we use the nominal interest rate as a proxy for expected inflation, but we control for real interest rate variation. We find that real stock returns are much lower in countries with higher nominal interest rates. These results are reported in detail in Appendix F in the separate appendix.

Portfolio sorts by nominal interest rates generate substantial variation in ex post real interest rates. To control for real interest rate variation, we first sort all of the countries in the extended panel into 3 portfolios based on nominal T-bill rates at t (i_t). Next, we again sort all countries independently into 2 portfolios based on real interest rates ($i_t - \pi_{t-12\rightarrow t}$). In Table A21 in the separate appendix, we report the results for the six portfolios that are the intersection of these 3 nominal interest-rate-sorted portfolios and 2 real interest-rate-sorted portfolios.

As local expected inflation increases, real stock returns decline. For the countries with

Table 7: Foreign Stocks

Time-series averages of annualized log k-month returns on portfolios. In Panel A, the countries are sorted by lagged year-over-year inflation ($\pi_{t-13\to t-1}$) at time t. In Panel B, The countries are sorted by year-over-year inflation minus 10-year inflation realized at month $t-1$ ($\pi_{t-13\to t-1} - \pi_{t-121\to t-1}$). The portfolios are re-sorted each month. For each country, we invest in a basket of foreign stocks, excluding the local stock. The sample is 1950-2012. The data is monthly. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 9 countries in 1950, and ends with 30 countries in 2012.

		Panel A: Lagged Inflation							
Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$							
sorted	Mean	1.77	2.84	3.90	5.18	8.82	7.05	7.05	7.09
realized	Mean	2.51	2.96	3.90	4.63	7.22	4.71	4.57	4.12
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
foreign currency $-\Delta s$	Mean	5.52	4.82	4.54	5.75	7.69	2.16	2.46	2.84
	s.e.	0.61	0.39	0.39	0.43	0.48	0.88	0.81	0.85
	std	4.78	3.10	3.10	3.44	3.77	6.96	6.50	6.36
foreign stocks	Mean	10.15	9.48	9.30	10.57	12.61	2.46	2.74	3.03
	s.e.	1.70	1.63	1.61	1.58	1.51	0.89	0.82	0.88
	std	13.37	12.89	12.69	12.54	12.06	7.02	6.58	6.61
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
foreign currency $-\Delta s$	Mean	3.01	1.86	0.64	1.12	0.46	-2.55	-2.11	-1.28
	s.e.	0.61	0.39	0.39	0.42	0.46	0.88	0.81	0.86
	std	4.78	3.26	3.30	3.54	3.94	7.09	6.54	6.08
foreign stocks	Mean	7.64	6.52	5.39	5.94	5.38	-2.25	-1.83	-1.10
	s.e.	1.70	1.64	1.62	1.60	1.52	0.91	0.83	0.82
	std	13.37	12.99	12.82	12.63	12.11	7.14	6.62	6.28
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
foreign stocks/local T-bills	Mean	6.03	4.81	3.93	4.33	4.43	-1.61	-1.31	-0.89
	s.e.	1.71	1.64	1.62	1.59	1.51	0.89	0.83	0.88
		Panel B: Lagged-Inflation-Deviation							
		Panel A: log inflation $\pi_{t\to t+k}$							
sorted (dev.)	Mean	-5.08	-2.03	-0.64	0.32	2.16	7.24	7.24	7.29
	std	6.77	3.30	2.10	2.14	2.67	6.55	6.55	6.57
realized	Mean	4.28	3.89	3.88	4.26	5.70	1.41	1.43	1.09
	std	1.35	1.22	1.26	1.39	1.72	1.91	2.19	3.36
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
foreign currency $-\Delta s$	Mean	6.38	6.09	6.21	4.53	6.03	-0.35	-0.68	-0.34
	s.e.	0.48	0.43	0.54	0.41	0.47	0.74	0.75	0.83
	std	3.73	3.43	4.28	3.18	3.64	5.73	5.90	6.40
foreign stocks	Mean	10.98	10.75	11.02	9.31	10.95	-0.03	-0.35	-0.09
	s.e.	1.60	1.61	1.70	1.63	1.56	0.74	0.77	0.86
	std	12.56	12.61	13.36	12.74	12.24	5.77	5.96	6.54
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
foreign currency $-\Delta s$	Mean	2.25	2.26	2.35	0.23	0.18	-2.08	-2.42	-1.75
	s.e.	0.47	0.42	0.53	0.40	0.45	0.73	0.75	0.77
	std	3.83	3.57	4.43	3.27	3.85	5.95	5.90	5.85
foreign stocks	Mean	6.85	6.92	7.16	5.01	5.09	-1.76	-2.09	-1.49
	s.e.	1.61	1.62	1.72	1.64	1.57	0.78	0.78	0.74
	std	12.64	12.67	13.47	12.80	12.33	5.96	5.93	5.91
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
foreign stocks/local T-bills	Mean	4.53	5.12	5.68	4.00	4.35	-0.18	-0.51	-0.19
	s.e.	1.60	1.61	1.70	1.64	1.56	0.74	0.76	0.79

currently low real interest rates, the real stocks returns decline by 6.64% from the lowest to the highest nominal interest rate portfolio, as we increase nominal T-bill returns from 3.26% to 13.86%. Realized inflation increases from 3.95% to 15.16%. Hence, the residual nominal interest rate variation seems to be measuring mostly variation in local expected inflation. For the countries with currently high real interest rates, real stock returns decline by 2.36% from the highest to the lowest interest rate portfolio, as nominal interest rates increase from 4.04% to 11.68%. Similarly, the equity premium over T-bills declines by 6.03% per annum and by 5.97% per annum respectively. Hence, we again confirm that higher expected inflation translates into significantly lower subsequent real stock returns, as well as lower excess returns.

7.2 The Cross-Section of Survey-Based Inflation Expectations and Returns

As a second alternative, we use the one-year expected inflation from the Consensus Economics Inflation Surveys. This 1-year blended inflation forecast is a weighted average of this year and next year's inflation forecast. The weight is the fraction of the year that has elapsed at the time when the forecast is calculated.

We sort the countries into quintiles in month t based on the one-year expected inflation from the Consensus Economics inflation surveys at t. The portfolios are resorted at the end of each month. The unbalanced sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 18 countries in 1990, and ends with 30 countries in 2012.

In Table 8, we report annualized log returns on these portfolios. On average, the one-year inflation expectations from the survey are accurate forecasts of realized inflation. The spread in expected inflation between the lowest and the highest quintile is 3.78 % per annum, quite close to the 3.65 % per annum spread in realized inflation.

At the 1-month horizon, nominal bond returns increase 5.36 % from the first to the last quintile, while nominal stock returns only increase by 1.38 %. As a result, real stock returns decline by 2.18 % from the first to the last quintile, while real bill returns increase by 1.15 % and real bond returns increase by 1.80 % per annum from the first to the last quintile.

Nominal stock returns fail to keep up with realized inflation over this short-sample. This is not the case for bond returns. As a result, there is a compression of the average returns on equities and other classes, as expected inflation increases. The equity premium over bills is close to zero in the highest quintiles, while the equity premium over bonds is negative. However, given the short sample length, these differences in returns are not statistically significant.

Table 8: EXPECTED-INFLATION-SORTED PORTFOLIOS

Time-series averages of annualized log k-month returns. The countries are sorted at t by one-year ahead expected inflation (from Consensus Economics) measured at month t. The portfolios are re-sorted each month. The sample is 1990-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 18 countries in 1990, and ends with 30 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$							
sorted	Mean	1.33	1.97	2.39	3.00	5.11	3.78	3.79	3.83
realized	Mean	1.00	1.81	2.24	2.68	4.56	3.56	3.30	3.21
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	2.80	3.45	3.93	4.92	7.50	4.71	4.69	4.64
	s.e.	0.10	0.11	0.12	0.13	0.25	0.18	0.31	0.60
	std	0.59	0.56	0.63	0.68	1.17	0.81	1.37	2.64
bonds	Mean	6.23	6.76	7.70	8.70	11.60	5.36	5.81	6.12
	s.e.	1.27	1.06	1.04	1.32	1.34	1.64	1.55	1.91
	std	5.72	4.75	4.73	5.97	6.08	7.30	8.71	7.58
stocks	Mean	7.44	8.26	7.86	7.01	8.82	1.38	1.82	2.94
	s.e.	3.50	3.71	3.64	3.45	4.02	2.75	2.73	2.66
	std	15.67	16.75	16.21	15.62	18.04	12.38	12.76	12.34
		Panel C: real log returns in local units consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	1.80	1.64	1.69	2.24	2.94	1.15	1.39	1.43
	s.e.	0.20	0.20	0.20	0.24	0.30	0.26	0.27	0.37
	std	0.93	0.92	0.95	1.11	1.36	1.17	1.26	1.68
bonds	Mean	5.24	4.95	5.46	6.02	7.04	1.80	2.51	2.91
	s.e.	1.31	1.10	1.06	1.39	1.38	1.66	1.58	1.88
	std	5.87	4.95	4.81	6.26	6.27	7.39	8.72	7.78
stocks	Mean	6.44	6.45	5.62	4.33	4.26	-2.18	-1.48	-0.27
	s.e.	3.50	3.71	3.67	3.47	4.02	2.77	2.77	2.86
	std	15.66	16.73	16.34	15.70	18.03	12.44	12.91	12.97
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
bonds/T-bills	Mean	3.44	3.32	3.77	3.78	4.09	0.66	1.12	1.47
	s.e.	1.26	1.05	1.04	1.31	1.31	1.64	1.56	1.81
stocks/T-bills	Mean	4.64	4.81	3.93	2.09	1.32	-3.33	-2.87	-1.71
	s.e.	3.50	3.72	3.65	3.45	4.03	2.78	2.81	3.01
stocks/bonds	Mean	1.21	1.49	0.16	-1.69	-2.78	-3.98	-4.00	-3.18
	s.e.	3.67	3.90	3.90	3.72	3.99	2.91	2.75	2.93

8 Conclusion

This paper examines whether local stocks hedge local investors against increases in the cost of the local consumption basket. At each point in time, we consider only the effect of local inflation shocks in deviation from the global average which allows for sharper inference. We conclude that the nominal discount rates uses by local stock market investors are slow to respond to news about the future path of local inflation. There is no comparable evidence of stickiness in the response of the nominal discount rates applied to local bonds and baskets of foreign stocks. The effects of this stickiness on real stock returns are large and economically significant, and quite persistent.

While we cannot rule out a risk-based explanation of our findings, we found little evidence in the data to support this view. Instead, we view our findings as consistent with small departures from rational inflation expectations on the part of stock investors when they set long-run nominal discount rates. When inflation is highly persistent, these small mistakes impute substantial predictability to real returns, because stocks are long duration assets. More applied theory work is needed in this area to ascertain whether the heterogeneity in stickiness of stock and bond investors' discount rates can be quantitatively attributed fully to either rational inattention, to learning about the inflation data generating process or some other mechanism.

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A Proofs

Proof of Proposition 1:

Proof. In the case of information stickiness, the discount rate component is given by:

$$\mathbb{F}_t^r\left[\sum_{k=1}^{\infty}\rho^{k-1}r_{t+k}^{\$}\right]=\sum_{k=1}^{\infty}\rho^{k-1}(1-\lambda_r)\sum_{j=0}^{\infty}(\lambda_r)^j\phi^{j+k}(\pi_{t-j}-\theta),$$

which can be simplified as

$$\mathbb{F}_t^r\left[\sum_{k=1}^{\infty}\rho^{k-1}r_{t+k}^{\$}\right] = \frac{\mu_r}{1-\rho}+\sum_{j=0}^{\infty}(\lambda_r)^j(1-\lambda_r)(\pi_{t-j}-\theta)\sum_{k=1}^{\infty}\rho^{k-1}\phi^{j+k},$$

$$= \frac{\mu_r}{1-\rho}+\sum_{j=0}^{\infty}(\lambda_r)^j(1-\lambda_r)\frac{\phi^{j+1}}{1-\rho\phi}(\pi_{t-j}-\theta).$$

In the case of information stickiness, the aggregate cash flow component is given by:

$$\mathbb{F}_t^c\left[\sum_{k=1}^{\infty}\rho^{k-1}\Delta d_{t+k}^{\$}\right] = \frac{\mu_d}{1-\rho}+\sum_{j=0}^{\infty}(\lambda_c)^j(1-\lambda_c)(\pi_{t-j}-\theta)\sum_{k=1}^{\infty}\rho^{k-1}\phi^{j+k}$$

$$= \frac{\mu_d}{1-\rho}+\sum_{j=0}^{\infty}(\lambda_c)^j(1-\lambda_c)\frac{\phi^{j+1}}{1-\rho\phi}(\pi_{t-j}-\theta),$$

where we have used that firm-level real dividend growth is i.i.d. over time. We end up with the following expression for the log dividend price ratio:

$$dp_t = \frac{-k}{1-\rho}+\frac{\mu_r-\mu_d}{1-\rho}+\sum_{j=0}^{\infty}\frac{(\lambda_r)^j(1-\lambda_r)-(\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(\pi_{t-j}-\theta),$$

$$= \frac{-k}{1-\rho}+\frac{\mu_r-\mu_d}{1-\rho}+\frac{\phi(\lambda_c-\lambda_r)}{1-\rho\phi}(\pi_t-\theta)+\sum_{j=1}^{\infty}\frac{(\lambda_r)^j(1-\lambda_r)-(\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(\pi_{t-j}-\theta).$$

□

Proof of Corollary 2:

Proof. Next, we turn to real log returns. Log-linearization of the real return equation around the mean log price/dividend ratio delivers the following expression for log real returns denoted

r (see Campbell and Shiller, 1988):

$$\begin{aligned}
r_{t+1} &= \Delta d_{t+1} + \rho p d_{t+1} + k - p d_t, \\
&= \Delta d_{t+1} - \rho \frac{\phi(\lambda_c - \lambda_r)}{1-\rho\phi}(\pi_{t+1} - \theta) + \frac{\phi(\lambda_c - \lambda_r)}{1-\rho\phi}(\pi_t - \theta) \\
&- \rho \sum_{j=1}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(\pi_{t+1-j} - \theta) \\
&+ \sum_{j=1}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(\pi_{t-j} - \theta).
\end{aligned}$$

Or, equivalently, the log real return can be expressed as:

$$\begin{aligned}
r_{t+1} &= \Delta d_{t+1} + \rho p d_{t+1} + k - p d_t, \\
&= \Delta d_{t+1} + \sum_{j=0}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(L-\rho)(\pi_{t+1-j} - \theta) \\
&= \Delta d_{t+1} + \sum_{j=0}^{\infty} \frac{(\lambda_r)^j(1-\lambda_r) - (\lambda_c)^j(1-\lambda_c)}{1-\rho\phi}\phi^{j+1}(1-\rho L^{-1})(\pi_{t-j} - \theta).
\end{aligned}$$

□

B Model of Cash Flow Extrapolation

We use \$ to denote variables expressed in nominal terms. We consider the cum-dividend return on a stock, expressed in dollars:

$$R^{\$}_{t+1} = \frac{P^{\$}_{t+1} + D^{\$}_{t+1}}{P^{\$}_t} = \frac{\frac{D^{\$}_{t+1}}{D^{\$}_t}(1 + PD_{t+1})}{PD_t}.$$

We use pd_t to denote the log price-dividend ratio: $pd_t = p_t - d_t = \log\left(\frac{P_t}{D_t}\right)$, where price is measured at the end of the period and the dividend flow is over the corresponding period. Log-linearization of the nominal return equation around the mean log price/dividend ratio delivers the following expression for log dollar returns denoted $r^{\$}$ (see Campbell and Shiller, 1988):

$$r^{\$}_{t+1} = \Delta d^{\$}_{t+1} + \rho pd_{t+1} + k - pd_t,$$

with a linearization coefficient ρ that depends on the mean of the log price/dividend ratio pd: $\rho = \frac{e^{pd}}{e^{pd}+1} < 1$. By iterating forward on the linearized return equation and imposing a no-bubble condition: $\lim_{j\to\infty} \rho^j pd_{t+j} = 0$, we obtain the following expression for the log price/dividend ratio as a function of nominal cash flows and discount rates:

$$pd_t \equiv constant + \left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d^{\$}_{t+j}\right] - \left[\sum_{j=1}^{\infty} \rho^{j-1} r^{\$}_{t+j}.\right] \quad (13)$$

This expression has to hold for all sample paths.

We consider a model in which stock investors do not have rational expectations. The stock investor prices stocks by discounting nominal cash flows. By taking expectations under the investor-specific measure, we end up with an expression for the log of the price-dividend ratio:

$$pd_t = constant + \mathbb{E}^{inv}_t \left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d^{\$}_{t+j}\right] - \mathbb{E}^{inv}_t \left[\sum_{j=1}^{\infty} \rho^{j-1} r^{\$}_{t+j}\right] \quad (14)$$

When setting the nominal discount rates (i.e. computing $\mathbb{E}^{inv}_t \left[\sum_{j=1}^{\infty} \rho^{j-1} r^{\$}_{t+j}\right]$), the marginal stock investor uses an AR(1) process for inflation, specified as:

$$\pi_t^r = (1 - \phi^r)\theta^r + \phi^r \pi_{t-1}^r + u_t^r,$$

where $-1 < \phi^r < 1$ denotes the AR(1) coefficient, while θ^r is the investor's estimate of the unconditional mean of inflation. When projecting nominal cash flow growth rates (i.e., computing $\mathbb{E}_t^{inv}\left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j}^{\$}\right]$) the marginal stock investor also uses an AR(1) process, albeit with different parameters :

$$\pi_t^c = (1 - \phi^c)\theta^c + \phi^c \pi_{t-1}^c{}^r + u_t^c,$$

where $-1 < \phi^c < 1$ denotes the AR(1) coefficient, while θ^c is the investor's estimate of the unconditional mean of inflation.

To keep the analysis simple, we assume that the real aggregate dividend growth and real stock returns expected by the investors is constant over time: $\mathbb{E}_t^{inv}[r_{t+1}] = \mu_r$ and $\mathbb{E}_t^{inv}[\Delta d_{t+1}] = \mu_d$. As a result, expected nominal returns are given by: $\mathbb{E}_t^{inv}[r_{t+j}^{\$}] = \mu_r + \theta^r + \phi^j(\pi_t - \theta^r)$. We can back out a similar expression for expected nominal dividend growth. Plugging these back into Equation 14 produces:

$$pd_t = constant + \frac{\theta^c((1-\phi^c)(1-\rho\phi^r)) - \theta^r((1-\phi^r)(1-\rho\phi^c))}{(1-\rho)(1-\rho\phi^c)(1-\rho\phi^r)} + \frac{(\phi^c - \phi^r)}{(1-\rho\phi^c)(1-\rho\phi^r)}\pi_t. \quad (15)$$

Real Return Predictability under Actual Measure Now we turn to the real version of this equation under the actual measure. If we assume that real dividend growth is not predictable under the actual measure ($\mathbb{E}_t[\Delta d_{t+1}] = \mu_d$), then the price/dividend ratio increases in response to inflation. We return to **??**), but we now take expectations under the actual measure in terms of real cash flows and returns:

$$pd_t = constant + \mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1}\Delta d_{t+j}\right] - \mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}\right] = constant - \mathbb{E}_t\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}\right]. \quad (16)$$

The log dividend yield equals the present discounted value of expected real returns:

$$dp_t = constant + \mathbb{E}_t\left[\sum_{j=1}^{\infty}\rho^{j-1}r_{t+j}\right] = constant + \frac{(\phi^r - \phi^c)}{(1-\rho\phi^c)(1-\rho\phi^r)}\pi_t,$$

where the last equality follows from Equation 15. Under the actual measure, the log real stock returns thus inherit the AR(1) dynamics of inflation.

The slope coefficient in a projection of real returns on inflation ($r_{t+1} = a_r + b_r\pi_t + \epsilon_{t+1}$) can be recovered from:

$$\frac{b_r}{1-\rho\phi} = \frac{(\phi^r - \phi^c)}{(1-\rho\phi^c)(1-\rho\phi^r)},$$

which implies that:

$$b_r = \frac{(\phi^r - \phi^c)(1-\rho\phi)}{(1-\rho\phi^c)(1-\rho\phi^r)}, \tag{17}$$

where ϕ equals the actual AR coefficient of π_t.

Contemporaneous Response to Inflation The contemporaneous response of nominal returns to inflation innovations is given by:

$$r_{t+1}^{\$} = \Delta d_{t+1}^{\$} + \rho\frac{(\phi^c - \phi^r)}{(1-\rho\phi^c)(1-\rho\phi^r)}\pi_{t+1} + k - \frac{(\phi^c - \phi^r)}{(1-\rho\phi^r)(1-\rho\phi^c)}\pi_t,$$

If real dividend growth does not respond to inflation innovations, the slope coefficient in a contemp. regression of the nominal returns $r_{t+1}^{\$}$ on π_{t+1}

$$\rho\frac{(\phi^c - \phi^r)}{(1-\rho\phi^c)(1-\rho\phi^r)}$$

The cash flow extrapolation hypothesis implies that $\phi = \phi^r < \phi^c$: The stock investor's cash flow process implies less mean reversion in inflation than the discount rate process. To keep the analysis tractable, we assume that the marginal stock investor implicitly relies on the actual data generating process for inflation when projecting nominal discount rates: $(\phi^r, \theta^r) = (\phi, \theta)$. However, when computing nominal discount rates for nominal cash flows, the marginal stock investor uses $\phi < \phi^c$. The slope coefficient in Equation 17 simplifies to:

$$b_\pi = \frac{(\phi - \phi^c)}{(1 - \rho\phi^c)}. \tag{18}$$

Higher current (long-run) inflation means lower (higher) subsequent real stock returns, simply because investors extrapolate nominal cash-flow growth rates. The regression coefficients for excess returns are identical provided that bond investors use the right inflation process.

Online Appendix for "Are Stocks Real Assets?"
—Not For Publication—

This Appendix contains additional results, s and s that were left out of the final draft. This is organized as follows.

1. Appendix A provides more detail on the data.
2. Appendix B documents the changing time-series correlation between bond returns and stock returns.
3. Appendix C documents the changes in the moments of inflation.
4. Appendix D shows the results for the Stocks-Only sample.
5. Appendix E shows the results for the sorts by inflation surprises.
6. Appendix F shows the results for the sorts by nominal interest rates.
7. Appendix G contains all of the additional Figures and Tables.

A Data Appendix

The stock return data are the Total Return Indices - Stocks from Global Finance Data, listed in Table A1. We supplement this data with the MSCI country-level stock return data in Table A2 for those countries that do not have GFD indices. The bond return data are the Total Return Indices - Bonds (10-year Government Bond Return Index) from Global Financial Data, listed in Table A3. The T-bill return data are the Total Return Indices - Bills from Global Financial Data, listed in Table A4. The price level data are the Consumer Price Indices from Global Financial Data, listed in Table A5. We supplement this data with the MSCI CPI data in Table A6 for those countries that do not have GFD CPI indices. The GFD CPI data contained numerous data errors that were corrected manually. The industrial output data are the Industrial Production Index data from Global Financial data in Table A8, supplemented with Industrial Output Volume data in Table A8.

Finally, we also have Consensus one-year Inflation Forecasts for Argentina, Australia, Germany, Belgium, Brazil, Bulgaria, Colombia, China, Chile, Canada, Czech Republic, Denmark, Spain, Finland, France, Greece, Hong Kong, Honduras, Indonesia, India, Ireland, Israel, Italy, Japan, Korea, Mexico, Malaysia, Netherlands, Norway, New Zealand, Austria, Peru, Philippines, Panama, Poland, Portugal, Romania, Russia, South Africa, Sweden, Singapore, Switzerland, Slovak Republic, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, United States, and Venezuela.

Stocks-Only Panel The comprehensive list of countries for which we have stock return data, T-bill data and inflation data consists of Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. We refer to this as the stocks-only panel. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Bonds/Stocks Panel The smaller list of all countries for which we have stock, bond as well as T-bill and inflation data includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with only 9 countries in 1950, and ends with 30 countries in 2012. We refer to this as the bond sample. There is an important sample selection effect. Countries which have experiences high and volatile inflation are less likely to issue local currency bonds. This accounts for the gap in the results we report for the bonds/stocks panel.

Developed Countries The subset of developed countries in this sample includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S.

Output data Finally, the list of countries for which we have output as well inflation, stocks and T-bill data consist of only 20 countries Austria, Belgium, Canada, China Hong Kong, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S. The industrial output data was gathered from International Financial Statistics.

B Time-Series Correlation between Inflation, Bond and Stock Returns

The time series relation between stocks and inflation seems to change dramatically over time. figure A11 plots an overview of the inflation betas of stocks, computed by running time-series regressions of nominal log stock returns in local currency ($r_{t\to t+1}^{£,stocks}$) on the one-month log lagged rate of inflation ($\pi_{t-1\to t}$) on 5-year rolling windows. We plot the U.S. beta as well as the cross-sectional average for all countries, at each point time. On average, these inflation betas are negative for the U.S. and the rest of the world, but they vary dramatically over time. As a result, the time series evidence on the relation between stock returns and expected inflation is statistically weak.

Recently, Campbell et al. (2013a) have shown that the covariance between stock returns and U.S Treasury returns, a proxy for the covariance of stock returns and inflation expectations, has changed in the late 90s.[22] We document this same dramatic change for the other countries in the developed sample. The bond betas in figure A10 were computed by running time-series regressions of nominal log stock returns in local currency ($r_{t\to t+1}^{£,stocks}$) on the one-month log rate of return on 10-year bonds ($r_{t\to t+1}^{£,bonds}$) on 5-year rolling windows.Starting in the late 90s, higher inflation expectations were correlated with lower discount rates in stock markets (or higher expected cash-flow growth rates).

[22]When the variation in output growth is predominantly due to supply shocks, high inflation states are bad state of the world for the typical investor. In this supply shock regime, we would expect to see a positive covariance between bond returns and stock returns. On the other hand, when the variation is mostly due to demand shocks, the covariance turns negative.

Table A1: GFD Equity Data

Ticker	Name	Series Type	Currency
TRCHLSTM	Santiago SE Return Index	Total Return Indices - Stocks	Chile Peso
TRCHNSTM	China Stock Return Index	Total Return Indices - Stocks	China Renminbi Yuan
TRCOLSTM	Colombia Stock Return Index	Total Return Indices - Stocks	Colombia Peso
TRIDNSTM	Indonesia Stock Return Index	Total Return Indices - Stocks	Indonesia Rupiah
TRINDSTM	India Stocks Total Return Index	Total Return Indices - Stocks	India Rupee
TRISRSTM	Tel Aviv SE Return Index	Total Return Indices - Stocks	Israel New Sheqalim
TRKORSTM	Korea Stocks Total Return Index	Total Return Indices - Stocks	South Korean Won
TRLKASTM	Sri Lanka Stock Return Index	Total Return Indices - Stocks	Sri Lanka Rupee
TRMARSTM	Morocco Stock Return Index	Total Return Indices - Stocks	Morocco Dirham
TRMYSSTM	Kuala Lumpur SE Return Index	Total Return Indices - Stocks	Malaysia Dollar
TRNLDSTM	Netherlands Total Return Stock Index	Total Return Indices - Stocks	Netherlands Guilder (Euro from 01/01/1999)
TRPAKSTM	Pakistan Stock Return Index	Total Return Indices - Stocks	Pakistan Rupee
TRPERSTM	Peru Stock Return Index	Total Return Indices - Stocks	Peru New Sol
TRPHLSTM	Philippines Return Stock Index	Total Return Indices - Stocks	Philippines Peso
TRRBILED	Turkey ISE-100 Total Return Index	Total Return Indices - Stocks	Turkey New Lira
TRSBF250D	France CAC All-Tradable Total Return Index	Total Return Indices - Stocks	France Franc (Euro from 01/01/1999)
TRSGPSTM	Singapore SE Return Index	Total Return Indices - Stocks	Singapore Dollar
TRTHASTM	Bangkok SE Return Index	Total Return Indices - Stocks	Thailand Baht
TRZAFSTM	Johannesburg SE Return Index	Total Return Indices - Stocks	South Africa Rand
_AORDAD	Australia ASX Accumulation Index-All Ordinaries	Total Return Indices - Stocks	Australia Dollar
_ATXTRD	Vienna SE ATX Total Return Index	Total Return Indices - Stocks	Austria Schilling (Euro from 01/01/1999)
_AXJOAD	Australia S&P/ASX 200 Accumulation Index	Total Return Indices - Stocks	Australia Dollar
_BCIPRD	Italy BCI Global Return Index (w/GFD extension)	Total Return Indices - Stocks	Italy Lira (Euro from 01/01/1999)
_BCNPR30	Barcelona SE-30 Return Index (w/GFD extension)	Total Return Indices - Stocks	Spain Peseta (Euro from 01/01/1999)
_BCSHD	Brussels All-Share Return Index (GFD extension)	Total Return Indices - Stocks	Belgium Franc (Euro from 01/01/1999)
_BUXD	Budapest Stock Exchange Index (BUX)	Total Return Indices - Stocks	Hungary Forint
_BVLGD	Lisbon BVL General Return Index	Total Return Indices - Stocks	Portugal Escudo (Euro from 01/01/1999)
_BVSPD	Brazil Bolsa de Valores de Sao Paulo (Bovespa)	Total Return Indices - Stocks	Brazil Real
_CDAXD	Germany CDAX Total Return Index (w/GFD extension)	Total Return Indices - Stocks	Germany Deutschemark (Euro from 01/01/1999)
_HSIDVD	Hang Seng Composite Return Index	Total Return Indices - Stocks	Hong Kong Dollar
_IBX50D	Sao Paulo IBrX-50 Return Index	Total Return Indices - Stocks	Brazil Real
_IETRD	Ireland ISEQ-20 Return Index	Total Return Indices - Stocks	Ireland Pound
_IGNTD	Ireland ISEQ General Return Index	Total Return Indices - Stocks	Ireland Pound
_IRTD	Mexico SE Return Index	Total Return Indices - Stocks	Mexico Peso
_LUXXRD	Luxembourg SE Total Return Index	Total Return Indices - Stocks	Luxembourg Franc (Euro from 01/01/1999)
_NZGID	New Zealand SE Gross All-Share Index	Total Return Indices - Stocks	New Zealand Dollar
_OBXD	Oslo SE OBX-25 Total Return Index	Total Return Indices - Stocks	Norway Krone
_OMXCBGI	OMX Copenhagen Benchmark Gross Index	Total Return Indices - Stocks	Denmark Krone
_OMXCGID	OMX Copenhagen All-Share Gross Index	Total Return Indices - Stocks	Denmark Krone
_OMXHGID	OMX Helsinki All-Share Gross Index	Total Return Indices - Stocks	Finland Markka (Euro from 01/01/1999)
_OMXIGID	OMX Iceland All-Share Gross Index	Total Return Indices - Stocks	Iceland Krona
_OMXRGID	OMX Riga SE Total Return Index	Total Return Indices - Stocks	Latvia Lat
_OMXSBGI	OMX Stockholm Benchmark Gross Index (GFD extension	Total Return Indices - Stocks	Sweden Krona
_OMXTGID	OMX Talinn SE Total Return Index	Total Return Indices - Stocks	Estonia Kroon (Euro from 01/01/2011)
_OMXVGID	OMX Vilnius VILSE Total Return Index	Total Return Indices - Stocks	Lithuania Litas
_RDXTRUD	Russian Depository Total Return Index	Total Return Indices - Stocks	United States Dollar
_RETMD	ASE Total Return General Index	Total Return Indices - Stocks	Greece Drachma (Euro from 01/01/2001)
_SEMTRID	Mauritius Semdex Total Return Index Rupees	Total Return Indices - Stocks	Mauritius Rupee
_SPXTRD	S&P 500 Total Return Index (w/GFD extension)	Total Return Indices - Stocks	United States Dollar
_SSHID	Swiss Performance Index	Total Return Indices - Stocks	Switzerland Franc
_TFTASD	UK FTSE All-Share Return Index (w/GFD extension)	Total Return Indices - Stocks	United Kingdom Pound
_TOPXDVD	Japan Topix Total Return Index	Total Return Indices - Stocks	Japan Yen
_TRGSPTSE	Canada S&P/TSX-300 Total Return Index	Total Return Indices - Stocks	Canada Dollar
_TSE50TD	Taiwan FTSE/TSE-50 Return Index	Total Return Indices - Stocks	Taiwan New Dollar
_WIGD	Warsaw SE General Index (WIG)	Total Return Indices - Stocks	Poland New Zloty

Table A2: Datastream Equity data

Ticker	Name	Country
MSARGTL	MSCI ARGENTINA	ARGENTINA
MSAUSTL	MSCI AUSTRALIA	AUSTRALIA
MSASTRL	MSCI AUSTRIA	AUSTRIA
MSBELGL	MSCI BELGIUM	BELGIUM
MSBRAZL	MSCI BRAZIL	BRAZIL
MSCNDAL	MSCI CANADA	CANADA
MSCHILL	MSCI CHILE	CHILE
MSCOLML	MSCI COLOMBIA	COLOMBIA
MSCZCHL	MSCI CZECH REPUBLIC	CZECH REPUBLIC
MSDNMKL	MSCI DENMARK	DENMARK
MSEGYTL	MSCI EGYPT	EGYPT
MSFINDL	MSCI FINLAND	FINLAND
MSFRNCL	MSCI FRANCE	FRANCE
MSGERML	MSCI GERMANY	GERMANY
MSGDEEL	MSCI GREECE	GREECE
MSHGKGL	MSCI HONG KONG	HONG KONG
MSHUNGL	MSCI HUNGARY	HUNGARY
MSINDIL	MSCI INDIA	INDIA
MSINDFL	MSCI INDONESIA	INDONESIA
MSEIREL	MSCI IRELAND	IRELAND
MSISRDL	MSCI ISRAEL 'DEAD' DOMESTIC	ISRAEL
MSITALL	MSCI ITALY	ITALY
MSJPANL	MSCI JAPAN	JAPAN
MSJORDL	MSCI JORDAN	JORDAN
MSKOREL	MSCI KOREA	SOUTH KOREA
MSMALFL	MSCI MALAYSIA	MALAYSIA
MSMEXFL	MSCI MEXICO	MEXICO
MSMORCL	MSCI MOROCCO	MOROCCO
MSNETHL	MSCI NETHERLANDS	NETHERLANDS
MSNZEAL	MSCI NEW ZEALAND	NEW ZEALAND
MSNWAYL	MSCI NORWAY	NORWAY
MSPAKIL	MSCI PAKISTAN	PAKISTAN
MSPERUL	MSCI PERU	PERU
MSPHLFL	MSCI PHILIPPINES	PHILIPPINES
MSPLNDL	MSCI POLAND	POLAND
MSPORDL	MSCI PORTUGAL	PORTUGAL
MSRUSSL	MSCI RUSSIA	RUSSIAN FEDERATION
MSSINGL	MSCI SINGAPORE	SINGAPORE
MSSARFL	MSCI SOUTH AFRICA	SOUTH AFRICA
MSSPANL	MSCI SPAIN	SPAIN
MSSRILL	MSCI SRI LANKA	SRI LANKA
MSSWDNL	MSCI SWEDEN	SWEDEN
MSSWITL	MSCI SWITZERLAND	SWITZERLAND
MSTAIWL	MSCI TAIWAN	TAIWAN
MSTHAFL	MSCI THAILAND	THAILAND
MSTURKL	MSCI TURKEY	TURKEY
MSUTDKL	MSCI UK	UNITED KINGDOM
MSUSAML	MSCI USA	UNITED STATES
MSVENFL	MSCI VENEZUELA 'DEAD'	VENEZUELA
MSEMUIL	MSCI EMU	INTERNATIONAL
MSUAEIL	MSCI UAE	UNITED ARAB EMIRATES
MSKUWAL	MSCI KUWAIT	KUWAIT
MSSARAL	MSCI SAUDI ARABIA 'DEAD'	SAUDI ARABIA

Table A3: GFD Bond Data

Ticker	Name	Series Type	Currency
TRAUSGVM	Australia 10-year Government Bond Return Index	Total Return Indices - Bonds	Australia Dollar
TRAUTGVM	Austria 10-year Total Return Government Bond Index	Total Return Indices - Bonds	Austria Schilling (Euro from 01/01/1999)
TRBELGVM	Belgium 10-year Total Return Government Bond Index	Total Return Indices - Bonds	Belgium Franc (Euro from 01/01/1999)
TRCANGVM	Canada 10-year Total Return Government Bond Index	Total Return Indices - Bonds	Canada Dollar
TRDEUGVM	Germany 10-year Government Bond Return Index	Total Return Indices - Bonds	Germany Deutschemark (Euro from 01/01/1999)
TRDNKGVM	Denmark 10-year Total Return Government Bond Index	Total Return Indices - Bonds	Denmark Krone
TRESPGVD	Spain 10-year Government Bond Total Return Index	Total Return Indices - Bonds	Spain Peseta (Euro from 01/01/1999)
TREUROGM	Europe Euro-17 10-year Government Bond Return Index	Total Return Indices - Bonds	Europe Euro
TRFINGVM	Finland 10-year Government Bond Total Return Index	Total Return Indices - Bonds	Finland Markka (Euro from 01/01/1999)
TRFRAGVM	France 10-year Total Return Government Bond Index	Total Return Indices - Bonds	France Franc (Euro from 01/01/1999)
TRGBRGCM	United Kingdom Consol Government Bond TR Index	Total Return Indices - Bonds	United Kingdom Pound
TRGBRGVM	United Kingdom 10-year Government Bond Total Return Index	Total Return Indices - Bonds	United Kingdom Pound
TRGRCGVM	Greece 10-year Bond Total Return Index	Total Return Indices - Bonds	Greece Drachma (Euro from 01/01/2001)
TRHKGGVM	Hong Kong 10-year Government Bond Return Index	Total Return Indices - Bonds	Hong Kong Dollar
TRINDGVD	India 10-year Government Bond Total Return Index	Total Return Indices - Bonds	India Rupee
TRIRLGVM	Ireland 10-year Government Bonds Return Index	Total Return Indices - Bonds	Ireland Pound
TRISRGVM	Tel Aviv SE Gilon & Shahar Govt Bond Return Index	Total Return Indices - Bonds	Israel New Sheqalim
TRITAGVM	Italy 10-year Total Return Government Bond Index	Total Return Indices - Bonds	Italy Lira (Euro from 01/01/1999)
TRJPNGVM	Japan 10-year Government Bond Return Index	Total Return Indices - Bonds	Japan Yen
TRKORGVM	South Korea 10-year Government Bond Return Index	Total Return Indices - Bonds	South Korean Won
TRMEXGVM	Mexico 10-year Government Bonds Total Return Index	Total Return Indices - Bonds	Mexico Peso
TRMYSGVM	Malaysia 10-year Government Bond Return Index	Total Return Indices - Bonds	Malaysia Dollar
TRNLDGVM	Netherlands 10-year Government Bond Return Index	Total Return Indices - Bonds	Netherlands Guilder (Euro from 01/01/1999)
TRNZLGVD	New Zealand 10-year Government Bond Return Index	Total Return Indices - Bonds	New Zealand Dollar
TRPAKGVM	Pakistan Government Bond Total Return Index	Total Return Indices - Bonds	Pakistan Rupee
TRPHLGVM	Philippines 10-year Government Bond Return Index	Total Return Indices - Bonds	Philippines Peso
TRPOLGVM	Poland 10-year Government Bond Return Index	Total Return Indices - Bonds	Poland New Zloty
TRPRTGVM	Portugal 10-year Government Bond Return Index	Total Return Indices - Bonds	Portugal Escudo (Euro from 01/01/1999)
TRSGPGVM	Singapore 10-year Government Bond Total Return Index	Total Return Indices - Bonds	Singapore Dollar
TRTHAGVM	Thailand 10-year Government Bond Return Index	Total Return Indices - Bonds	Thailand Baht
TRTWNGVM	Taiwan 10-year Government Bond Return Index	Total Return Indices - Bonds	Taiwan New Dollar
TRUSACOM	USA Total Return AAA Corporate Bond Index	Total Return Indices - Bonds	United States Dollar
TRUSG10M	USA 10-year Government Bond Total Return Index	Total Return Indices - Bonds	United States Dollar
TRZAFGVM	South Africa SARB Government Bond Return Index	Total Return Indices - Bonds	South Africa Rand
_BRIXD	Oslo SE BRIX Government Bond Return Index	Total Return Indices - Bonds	Norway Krone
_DJCBTD	Dow Jones Corporate Bond Return Index	Total Return Indices - Bonds	United States Dollar
_DJTIPSD	Dow Jones Long-term TIPS Index	Total Return Indices - Bonds	United States Dollar
_RXTBD	Sweden Govt Bond Return Index (w/GFD extension)	Total Return Indices - Bonds	Sweden Krona
_SDGTD	Switzerland TR Government Bond Index	Total Return Indices - Bonds	Switzerland Franc

Table A4: GFD T-bill Data

Ticker	Name	Series Type	Currency
TRAUSBIM	Australia Total Return Bills Index	Total Return Indices - Bills	Australia Dollar
TRAUTBIM	Austria Euribor/T-bill Return Index	Total Return Indices - Bills	Austria Schilling (Euro from 01/01/1999)
TRBELBIM	Belgium Total Return Bills Index	Total Return Indices - Bills	Belgium Franc (Euro from 01/01/1999)
TRCANBIM	Canada Total Return Bills Index	Total Return Indices - Bills	Canada Dollar
TRCHEBIM	Switzerland Total Return Bills Index	Total Return Indices - Bills	Switzerland Franc
TRDEUBIM	Germany Total Return Bills Index	Total Return Indices - Bills	Germany Deutschemark (Euro from 01/01/1999)
TRDNKBIM	Denmark CIBOR/T-bills Total Return Index	Total Return Indices - Bills	Denmark Krone
TRESPBIM	Spain Treasury Bills Total Return Index	Total Return Indices - Bills	Spain Peseta (Euro from 01/01/1999)
TREUROBM	Europe Euro-17 Bills Return Index	Total Return Indices - Bills	Europe Euro
TRFINBIM	Finland Bill Return Index	Total Return Indices - Bills	Finland Markka (Euro from 01/01/1999)
TRFRABIM	France Total Return Bills Index	Total Return Indices - Bills	France Franc (Euro from 01/01/1999)
TRGBRBIM	United Kingdom Total Return Bills Index	Total Return Indices - Bills	United Kingdom Pound
TRGRCBIM	Greece Treasury Bills Total Return Index	Total Return Indices - Bills	Greece Drachma (Euro from 01/01/2001)
TRHKGBIM	Hong Kong Bills Total Return	Total Return Indices - Bills	Hong Kong Dollar
TRINDBID	India Bills Total Return Index	Total Return Indices - Bills	India Rupee
TRIRLBIM	Ireland Bills Total Return	Total Return Indices - Bills	Ireland Pound
TRISRBIM	Israel Makam Bill Index	Total Return Indices - Bills	Israel New Sheqalim
TRITABIM	Italy Total Return Bills Index	Total Return Indices - Bills	Italy Lira (Euro from 01/01/1999)
TRJPNBIM	Japan Total Return Bills Index	Total Return Indices - Bills	Japan Yen
TRKORBIM	South Korea Government Bills Total Return Index	Total Return Indices - Bills	South Korean Won
TRMYSBIM	Malaysia Bills Total Return Index	Total Return Indices - Bills	Malaysia Dollar
TRNLDBIM	Netherlands Bills Total Return Index	Total Return Indices - Bills	Netherlands Guilder (Euro from 01/01/1999)
TRNZLBID	New Zealand Bills Total Return	Total Return Indices - Bills	New Zealand Dollar
TRPAKBIM	Pakistan Bills Total Return Index	Total Return Indices - Bills	Pakistan Rupee
TRPHLBIM	Philippine Treasury Bill Return Index	Total Return Indices - Bills	Philippines Peso
TRPOLBIM	Poland Treasury Bill Total Return Index	Total Return Indices - Bills	Poland New Zloty
TRPRTBIM	Portugal Bills Total Return	Total Return Indices - Bills	Portugal Escudo (Euro from 01/01/1999)
TRSGPBIM	Singapore Bills Return Index	Total Return Indices - Bills	Singapore Dollar
TRTHABIM	Thailand Bills Return Index	Total Return Indices - Bills	Thailand Baht
TRTURBIM	Istanbul SE 90-day Bills Performance Index	Total Return Indices - Bills	Turkey New Lira
TRTWNBIM	Taiwan Treasury Bills Total Return Index	Total Return Indices - Bills	Taiwan New Dollar
TRUSABIM	USA Total Return T-Bill Index	Total Return Indices - Bills	United States Dollar
TRVENBIM	Venezuela Cash Total Return Index	Total Return Indices - Bills	Venezuela Bolivar Fuerte
TRZAFBID	South Africa 3-month Bills Total Return Index	Total Return Indices - Bills	South Africa Rand
_MXFR1D	Mexico Bills Total Return Index	Total Return Indices - Bills	Mexico Peso
_RXVXD	Sweden Bills Return Index (w/GFD extension)	Total Return Indices - Bills	Sweden Krona
_ST1XD	Norway Bills Total Return (w/GFD extension)	Total Return Indices - Bills	Norway Krone

Table A5: GFD CPI Data

Ticker	Name	Series Type	Currency
CPARGM	Argentina Consumer Price Index	Consumer Price Indices	Argentina New Peso
CPAUSM	Australia Consumer Price Index	Consumer Price Indices	Australia Dollar
CPAUTM	Austria Consumer Price Index	Consumer Price Indices	Austria Schilling (Euro from 01/01/1999)
CPBELM	Belgium Consumer Price Index	Consumer Price Indices	Belgium Franc (Euro from 01/01/1999)
CPBRAM	Brazil Consumer Price Index	Consumer Price Indices	Brazil Real
CPCANM	Canada Consumer Price Index	Consumer Price Indices	Canada Dollar
CPCHINAM	China Consumer Prices	Consumer Price Indices	China Renminbi Yuan
CPCHLM	Chile Consumer Price Index	Consumer Price Indices	Chile Peso
CPCOLM	Colombia Consumer Price Index	Consumer Price Indices	Colombia Peso
CPCYPM	Cyprus Consumer Price Index	Consumer Price Indices	Cyprus Pound (Euro from 01/01/2008)
CPCZEM	Czech Republic Consumer Price Index	Consumer Price Indices	Czech Republic Koruna
CPDEUM	Germany Consumer Price Index	Consumer Price Indices	Germany Deutschemark (Euro from 01/01/1999)
CPDNKM	Denmark Consumer Price Index	Consumer Price Indices	Denmark Krone
CPEGYM	Egypt Consumer Price Index	Consumer Price Indices	Egypt Pound
CPESPM	Spain Consumer Price Index	Consumer Price Indices	Spain Peseta (Euro from 01/01/1999)
CPFINM	Finland Consumer Price Index	Consumer Price Indices	Finland Markka (Euro from 01/01/1999)
CPFRAM	France Consumer Price Index	Consumer Price Indices	France Franc (Euro from 01/01/1999)
CPGRCM	Greece Consumer Price Index	Consumer Price Indices	Greece Drachma (Euro from 01/01/2001)
CPHKGM	Hong Kong Consumer Price Index	Consumer Price Indices	Hong Kong Dollar
CPHUNM	Hungary Consumer Price Index	Consumer Price Indices	Hungary Forint
CPIDNM	Indonesia Consumer Price Index	Consumer Price Indices	Indonesia Rupiah
CPINDM	India Consumer Price Index - Industrial Workers	Consumer Price Indices	India Rupee
CPIRLM	Ireland Consumer Price Index	Consumer Price Indices	Ireland Pound
CPIRNM	Iran Consumer Price Index	Consumer Price Indices	Iran Rial
CPISRM	Israel Consumer Price Index	Consumer Price Indices	Israel New Sheqalim
CPITAM	Italy Consumer Price Index	Consumer Price Indices	Italy Lira (Euro from 01/01/1999)
CPJORM	Jordan Consumer Price Index	Consumer Price Indices	Jordan Dinar
CPJPNM	Japan Consumer Price Index	Consumer Price Indices	Japan Yen
CPKENM	Kenya Consumer Price Index	Consumer Price Indices	Kenya Shilling
CPKORM	South Korea Consumer Price Index	Consumer Price Indices	South Korean Won
CPLKAM	Sri Lanka Consumer Price Index	Consumer Price Indices	Sri Lanka Rupee
CPMARM	Morocco Consumer Price Index	Consumer Price Indices	Morocco Dirham
CPMEXM	Mexico Consumer Price Index	Consumer Price Indices	Mexico Peso
CPMUSM	Mauritius Consumer Price Index	Consumer Price Indices	Mauritius Rupee
CPMYSM	Malaysia Consumer Price Index	Consumer Price Indices	Malaysia Dollar
CPNGAM	Nigeria Consumer Price Index	Consumer Price Indices	Nigeria Naira
CPNLDM	Netherlands Consumer Price Index	Consumer Price Indices	Netherlands Guilder (Euro from 01/01/1999)
CPNORM	Norway Consumer Price Index	Consumer Price Indices	Norway Krone
CPNZLM	New Zealand Consumer Price Index	Consumer Price Indices	New Zealand Dollar
CPPAKM	Pakistan Consumer Price Index	Consumer Price Indices	Pakistan Rupee
CPPERM	Peru Consumer Price Index	Consumer Price Indices	Peru New Sol
CPPHLM	Philippines Consumer Price Index	Consumer Price Indices	Philippines Peso
CPPOLM	Poland Consumer Price Index	Consumer Price Indices	Poland New Zloty
CPPRTM	Portugal Consumer Price Index	Consumer Price Indices	Portugal Escudo (Euro from 01/01/1999)
CPSGPM	Singapore Consumer Price Index	Consumer Price Indices	Singapore Dollar
CPSWEM	Sweden Consumer Price Index	Consumer Price Indices	Sweden Krona
CPZAFM	South Africa Consumer Price Index	Consumer Price Indices	South Africa Rand
CPCHEM	Switzerland Consumer Price Index	Consumer Price Indices	Switzerland Franc
CPCHNM	China Consumer Price Index	Consumer Price Indices	China Renminbi Yuan
CPCRIM	Costa Rica Consumer Price Index	Consumer Price Indices	Costa Rica Colon
CPDEUIM	Germany Hyperinflation Consumer Prices Index	Consumer Price Indices	Germany Deutschemark (Euro from 01/01/1999)
CPGBRM	United Kingdom Retail Price Index	Consumer Price Indices	United Kingdom Pound
CPTHAM	Thailand Consumer Price Index	Consumer Price Indices	Thailand Baht
CPTURM	Turkey Consumer Price Index	Consumer Price Indices	Turkey New Lira
CPTWNM	Taiwan Consumer Price Index	Consumer Price Indices	Taiwan New Dollar
CPUSAM	United States BLS Consumer Price Index NSA	Consumer Price Indices	United States Dollar

Table A6: DATASTREAM CPI DATA

Ticker	Name	Country
AGCONPRCF	AG CPI NADJ	ARGENTINA
AUCONPRCF	AU CPI NADJ	AUSTRALIA
OECONPRCF	OE CPI EXCL. SEASONAL ITEMS NADJ	AUSTRIA
BSCONPRCF	BS CPI NADJ	BANGLADESH
BGCONPRCF	BG CPI - GENERAL INDEX NADJ	BELGIUM
BRCPINATF	BR NATIONAL CPI OR INPC NADJ	BRAZIL
CNCONPRCF	CN CPI NADJ	CANADA
CLCONPRCF	CL CPI NADJ	CHILE
CHCONPRCF	CH CPI (CPPY=100) NADJ	CHINA
CBCONPRCF	CB CPI: NATIONAL NADJ	COLOMBIA
DKCONPRCF	DK CPI NADJ	DENMARK
EYCONPRCF	EY CPI NADJ	EGYPT
EOCONPRCF	EO CPI (1997=100) NADJ	ESTONIA
FNCONPRCF	FN CPI NADJ	FINLAND
FRCONPRCF	FR CPI (NEW METHODOLOGY FROM JANUARY 1998) NADJ	FRANCE
BDCONPRCF	BD CPI (PAN BD FROM 1991) NADJ	GERMANY
GRCONPRCF	GR CPI NADJ	GREECE
HKCONPRCF	HK CPI COMPOSITE NADJ	HONG KONG
HNCONPRCF	HN CPI (1990=100) NADJ	HUNGARY
ICCONPRCF	IC CPI NADJ	ICELAND
INCONPRCF	IN CPI: INDUSTRIAL LABOURERS (DS CALCULATED) NADJ	INDIA
IDCONPRCF	ID CPI (SEE IDCP..02F) NADJ	INDONESIA
IRCONPRCF	IR CPI (SEE IRCONPR6F FOR 2006M12=100) NADJ	IRELAND
ISCONPRCF	IS CPI NADJ	ISRAEL
ITCONPRCF	IT CPI INCLUDING TOBACCO (NIC) NADJ	ITALY
JPCONPRCF	JP CPI: NATIONAL MEASURE NADJ	JAPAN
KOCONPRCF	KO CPI NADJ	KOREA
MXCONPRCF	MX CPI NADJ	MEXICO
NLCONPRCF	NL CPI NADJ	NETHERLANDS
NZCONPRCF	NZ CPI (METHO-BREAK FROM Q3 2006) NADJ	NEW ZEALAND
NWCONPRCF	NW CPI NADJ	NORWAY
PTCONPRCF	PT CPI - NATIONAL NADJ	PORTUGAL
SPCONPRCF	SP CPI NADJ	SINGAPORE
SACONPRCF	SA CPI NADJ	SOUTH AFRICA
ESCONPRCF	ES CPI NADJ	SPAIN
SDCONPRCF	SD CPI NADJ	SWEDEN
SWCONPRCF	SW CPI NADJ	SWITZERLAND
TWCONPRCF	TW CPI NADJ	TAIWAN
THCONPRCF	TH CPI NADJ	THAILAND
UKRPALL.F	UK RPI NADJ	UNITED KINGDOM
USCONPRCF	US CPI - ALL URBAN SAMPLE: ALL ITEMS NADJ	UNITED STATES

Table A7: GFD Industrial Output

Ticker	Name	Series Type	Country
NDAUTM	Austria Industrial Production Index	Production and Output	Austria
NDBELM	Belgium Industrial Production Index	Production and Output	Belgium
NDBRAM	Brazil Industrial Production Index SA	Production and Output	Brazil
NDCANM	Canada Industrial Production Index	Production and Output	Canada
NDDEUM	Germany Industrial Production Index	Production and Output	Germany
NDDNKM	Denmark Industrial Production Index SA	Production and Output	Denmark
NDESPM	Spain Industrial Production Index	Production and Output	Spain
NDFINM	Finland Industrial Production Index	Production and Output	Finland
NDFRAM	France Industrial Production Index	Production and Output	France
NDGBRM	United Kingdom Industrial Production Index	Production and Output	United Kingdom
NDGRCM	Greece Industrial Production Index	Production and Output	Greece
NDINDM	India Industrial Production Index NSA	Production and Output	India
NDIRLM	Ireland Industrial Production Index	Production and Output	Ireland
NDITAM	Italy Industrial Production Index SA	Production and Output	Italy
NDJPNM	Japan Industrial Production Index	Production and Output	Japan
NDKORM	Korea Industrial Production Index	Production and Output	Korea, Republic Of
NDMEXM	Mexico Industrial Production Index SA	Production and Output	Mexico
NDNLDM	Netherlands Industrial Production Index	Production and Output	Netherlands
NDNORM	Norway Industrial Production Index	Production and Output	Norway
NDPRTM	Portugal Industrial Production Index	Production and Output	Portugal
NDSWEM	Sweden Industrial Production Index	Production and Output	Sweden

Table A8: GFD Industrial Output

Ticker	Name	Series Type	Country
NDWARGM	Argentina Industrial Production Volume SA	Production and Output	Argentina
NDWAUSM	Australia Industrial Production Volume SA	Production and Output	Australia
NDWAUTM	Austria Industrial Production Volume SA	Production and Output	Austria
NDWBELM	Belgium Industrial Production Volume SA	Production and Output	Belgium
NDWBRAM	Brazil Industrial Production Volume SA	Production and Output	Brazil
NDWCANM	Canada Industrial Production Volume SA	Production and Output	Canada
NDWCHEM	Switzerland Industrial Production Volume SA	Production and Output	Switzerland
NDWCHLM	Chile Industrial Production Volume SA	Production and Output	Chile
NDWCHNM	China Industrial Production Volume SA	Production and Output	China
NDWCOLM	Colombia Industrial Production Volume SA	Production and Output	Colombia
NDWDEUM	Germany Industrial Production Volume SA	Production and Output	Germany
NDWDNKM	Denmark Industrial Production Volume SA	Production and Output	Denmark
NDWECUM	Ecuador Industrial Production Volume SA	Production and Output	Ecuador
NDWESPM	Spain Industrial Production Volume SA	Production and Output	Spain
NDWFINM	Finland Industrial Production Volume SA	Production and Output	Finland
NDWFRAM	France Industrial Production Volume SA	Production and Output	France
NDWGBRM	United Kingdom Industrial Production Volume SA	Production and Output	United Kingdom
NDWGRCM	Greece Industrial Production Volume SA	Production and Output	Greece
NDWHKGM	Hong Kong SAR China Industrial Production Volume SA	Production and Output	Hong Kong
NDWHUNM	Hungary Industrial Production Volume SA	Production and Output	Hungary
NDWIDNM	Indonesia Industrial Production Volume SA	Production and Output	Indonesia
NDWINDM	India Industrial Production Volume SA	Production and Output	India
NDWIRLM	Ireland Industrial Production Volume SA	Production and Output	Ireland
NDWISRM	Israel Industrial Production Volume SA	Production and Output	Israel
NDWITAM	Italy Industrial Production Volume SA	Production and Output	Italy
NDWKORM	Korea, Rep. Industrial Production Volume SA	Production and Output	Korea, Republic Of
NDWMEXM	Mexico Industrial Production Volume SA	Production and Output	Mexico
NDWMYSM	Malaysia Industrial Production Volume SA	Production and Output	Malaysia
NDWNLDM	Netherlands Industrial Production Volume SA	Production and Output	Netherlands
NDWNORM	Norway Industrial Production Volume SA	Production and Output	Norway
NDWNZLM	New Zealand Industrial Production Volume SA	Production and Output	New Zealand
NDWPAKM	Pakistan Industrial Production Volume SA	Production and Output	Pakistan
NDWPERM	Peru Industrial Production Volume SA	Production and Output	Peru
NDWPHLM	Philippines Industrial Production Volume SA	Production and Output	Philippines
NDWPOLM	Poland Industrial Production Volume SA	Production and Output	Poland
NDWPRTM	Portugal Industrial Production Volume SA	Production and Output	Portugal
NDWRUSM	Russian Federation Industrial Production Volume SA	Production and Output	Russian Federation
NDWSGPM	Singapore Industrial Production Volume SA	Production and Output	Singapore
NDWSWEM	Sweden Industrial Production Volume SA	Production and Output	Sweden
NDWTHAM	Thailand Industrial Production Volume SA	Production and Output	Thailand
NDWTURM	Turkey Industrial Production Volume SA	Production and Output	Turkey
NDWTWNM	Taiwan, China Industrial Production Volume SA	Production and Output	Taiwan
NDWUSAM	United States Industrial Production Volume SA	Production and Output	United States
NDWZAFM	South Africa Industrial Production Volume SA	Production and Output	South Africa
USINDPROM	United States Industrial Production Index (Index 2002=100, SA)	Production and Output	United States

C Overview: The Post-War History of Global Inflation

After WWII, the volatility of U.S. inflation started to increase in the 1970s, peaked in the 1980s and then decreased dramatically to about 1% per annum in the 90s. The bottom panel shows the one-month autocorrelation of year-over-year inflation. There was a noticeable increase in the persistence of inflation starting in the 1960s, peaking in the 1980's and tapering off in the 1990s. Recently, in the last decade, the autocorrelation actually turned negative.

figure A12 plots an overview of the decade-by-decade mean, standard deviation and autocorrelation of year-over-year inflation in the U.S. Average inflation started to increase in the 70s, and gradually came down again in the 80s and 90s. The U.S. experience is very much like that of the rest of the developed world. This is not surprising: there is a strong common factor structure in global inflation (see Rogoff (2003)). Since the 1970's, there has been a gradual decrease in average inflation. Moreover, inflation volatility has been decreasing from 5% in the 60s to 1% over the last decade, while the autocorrelation of inflation has decreased has decreased considerably in the 00s.

D Stocks-Only Sample

There is an important sample selection effect in this dataset. Countries which have experienced high and volatile inflation are less likely to issue local currency bonds. Furthermore, if these countries do start issuing these bonds, they will do so after inflation has decreased. This is borne out by the numbers reported in the bottom panel of Table A9. The average rate of inflation in this extended panel is much higher (641 bps per annum). For the average country in this panel, global inflation accounts for at most 40% of the variation in inflation. In this panel, the cross-sectional standard deviation of average inflation is 5.82%, almost three times higher than in the bond/stocks sample. Below, we quantify this selection effect by reporting results for the comprehensive stocks-only panel of countries.

D.1 Incomplete Pass-Through of Expected Inflation to Asset Returns

By focusing on countries that have a market for local currency government bonds with longer maturities, we implicitly eliminate countries that have experienced very high inflation in their recent history. We address this concern by studying a larger panel of countries for which we have stock return, inflation and interest rate data. Figure A13 describes the portfolio composition for each of the countries in this extended sample.

When we add the countries without long-term bonds in local currency, the convexity of the relation between stock returns and expected inflation increases. The detailed results are reported in Table A14. The last quintile includes countries with high and volatile inflation. Average, realized inflation in the last quintile is 11.08 % per annum. The volatility of inflation in the last quintile is 2.40%, which is more than double the volatility of inflation in the first quintile. In this case, there is a large increase in nominal stock returns from the fourth to the fifth quintile. For countries in quintile 5, the average lagged inflation rate is 13.86%, compared to only 6.02% in the fourth quintile. Average nominal stock returns increase from 9.67 in quintile four to 14.27% in quintile five, an increase of 460 basis points. The difference in realized inflation rates between quintiles four and five is closer to 540 basis points. Hence, there is a robust though incomplete pass-through of inflation to nominal stock returns. These results are confirmed when we look at deviations of inflation from the 10-year average instead (see Table A15). In macro-economic regimes characterized by high and volatile inflation, nominal stock returns respond almost one-for-one, even at the 1-month horizon, to variation in expected inflation. The resulting relation between real stock returns and inflation is highly convex. It starts out with a very steep slope at low rates of inflation and then flattens at high rates of inflation. This confirms Liew (1995)'s findings; he established that the Fisherian relation between inflation and stock returns is restored when inflation is sufficiently high and volatile. Similarly, Bansal and Dahlquist (2000) report that uncovered interest rate parity works better in high inflation environments.

D.1.1 Stability of the Cross-sectional Relation between Expected Inflation and Returns

In this extended sample, the time-variation is similar to what we found before. The difference between the extreme quintiles in real stock returns in this extended sample varies over time in much the same way, although the variation is larger. In the 50s, 60s and 70s, the real stock return spreads are -12.80%, -12.13% and -11.15% respectively, but they're only -3.03% in the 80s and -3.16% in the 90s. Finally, in 00s, the spread is only -0.41%.

The effect of relative inflation on real stock returns was largest in the 50s, 60s, and 70s and smallest in the 80s, 90s and 00s.The detailed results are shown in Table A16. Part of this change in the relation towards the end of the 90s may be due to the decreased persistence in inflation, which would render lagged inflation less useful as a measure of expected inflation. We address this in section section 7 by using survey measures instead.

D.2 Incomplete Pass-Through of Inflation Surprises to Asset Returns

There is more evidence of stocks adjusting to inflation innovations in this extended sample. Table A17 in the separate appendix reports the results that we obtained on the stock sample, which includes countries for which we do not have long-term nominal bond data. The fifth quintile now includes countries which have experienced inflation rates of 11.34% per annum over the past five decades. For countries in quintile 5, at the one-month horizon, nominal stock returns are 291 bps higher than for those countries in portfolio 4, while the realized rate of inflation is 675 bps higher in portfolio 5 than in portfolio 4. It is not a perfect hedge, but it is better. Nevertheless, the annualized spread in real returns between the first and the last quintile is 9.30% with a s.e. of 2.01. At the 3-month horizon, the spread is still 793 bps per annum. In the case of countries which have experienced sustained high inflation, nominal stock returns do respond to inflation innovations, even at short horizons. Overall, it is clear that higher than expected, country-specific inflation leads to lower real stocks returns. When the country-specific inflation innovation is large enough, nominal stock returns do immediately respond to inflation innovations, but real stock returns still decline.

E Incomplete Pass-through of Inflation Surprises to Asset Returns

We also want to gauge the contemporaneous pass-through of country-specific inflation surprises to asset returns. An asset is only defined as a perfect inflation hedge if it also hedges against inflation surprises. In addition, this evidence will help us discriminate between a risk-based explanation of our findings and other candidate explanations.

If inflation follows a random walk, then the change in inflation is a good measure of inflation surprises. We use the change in inflation $\pi_{t\to t+k} - \pi_{t-k\to t}$ between month t and $t+k$ to rank countries into portfolios at t, where k denotes the investment horizon. We report average log returns realized between month t and $t+k$ on portfolios of stocks, bonds and bills.

These are not returns on an an implementable investment strategy. The investment horizon varies from 1 month to 12 months, but all the numbers in the tables are annualized. We hold the portfolios constant for k periods. For each of these portfolios, we compute the returns $r_{t\to t+k}$ over the next k periods. Since we do not have monthly inflation data for Australia and New Zealand, we exclude these countries.

E.1 The Cross-section of Inflation Surprises and Returns

Table A26 reports the results. At the one-month horizon, we are simply using the one-month change in monthly inflation ($\Delta\pi_{t\to t+1} = \pi_{t\to t+1} - \pi_{t-1\to t}$) to rank countries into portfolios at the end of month t. These are reported in the first line. The annualized ($12\times$) change in the one-month rate of inflation varies from -8.8% to 9%. In the second line, we report that on an annual basis, realized inflation increases from 0.39 percent in the first quintile to 9.57 percent in the fifth quintile.

Next, we check how different asset classes perform in response to these large one-month inflation innovations. The nominal returns are reported in the second panel. Obviously, nominal bonds and T-bills cannot hedge against inflation surprises, because these securities are claims to nominal cash flows. As a result, nominal bond returns do not respond to inflation innovations in the cross-section.[23] However, stocks are claims to real cash flows. Our results suggest that nominal stock returns do not immediately adjust to country-specific inflation news, except in the last quintile. In fact, nominal stock returns decline from 10.32% in the first quintile to 9.72% in the fourth quintile, and then increase to 12.03%. Nominal stock returns do increase by 3.27 % from portfolio 3 to portfolio 5 , but this increase is much smaller than the 4.47% increase in realized inflation.

The third panel reports real returns on bills, stocks and bonds. Real bond returns in the last quintile are 9.00 % per annum lower (s.e. of 0.69%) than those in the first quintile, but real stock returns in the last quintile are

[23] Nominal bond returns vary between 8.05% in the first quintile and 8.22% in the last quintile.

7.46% percent per annum (s.e. of 1.60%) lower than those in the first quintile. At the 1-month horizon, stocks perform only slightly better than bonds in hedging against surprise inflation. At the 3-month horizon, the results look very similar. The difference in real bond returns between portfolio 5 and portfolio 1 is -7.72%, compared to -5.71% for stocks. Again, stocks only provide a small incremental hedge against inflation innovations.[24]

Because nominal stock returns are insensitive to inflation surprises, there is no real difference between the sensitivity of real stock and bond returns to surprise inflation at the 1-month horizon, except in the last portfolio, for which the gap between stocks and bonds increases.

When we exclude emerging market countries, there is no evidence whatsoever that stocks provide a better hedge against inflation surprises than bonds, even when we focus on the highest inflation portfolios. Nominal stock returns are roughly constant across all portfolios. The limited evidence in favor of inflation hedging against inflation innovations was driven exclusively by emerging market countries in the highest quintile that have experienced very high rates of inflation.

E.2 The Cross-Section of Survey-Based Inflation Surprises and Returns

Finally, for each investment horizon k, we used realized (annualized) inflation $\pi_{t\rightarrow t+k}$ minus one-year ahead expected inflation measured at month t as a measure of the inflation surprise, and we sorted countries into quintiles based on this measure. We dropped Australia and New Zealand from the sample, because we do not have monthly inflation data for these countries.

The results are reported in Table A18. The annualized rate of inflation varies from -4% in the first quintile to 8% per annum in the last quintile. As before, there is no evidence that nominal stock returns provide more protection against inflation surprises than bonds at the 1-month horizon. The spread in real bond returns between the lowest and the highest quintile is -13.58%, while the spread in real stock returns is -13.86%. At the 12-month horizon, stocks even do considerably worse than bonds, as evidenced by the results reported in the lower panel.

F Country-specific Interest Rate Variation

As a robustness check, we look at the effect of nominal interest rate variation.-term nominal interest rates are a good measure of short-run inflation expectations, but when we sort by nominal interest rates, we will also pick up up some real interest rate variation.

F.1 Bonds/Stocks Panel

When we sort countries into quintiles by their nominal interest rates, the T-bill rates increase by 684 bps. from the first quintile to the fifth quintile. Table A19 provides detailed results. Interestingly, nominal bond returns do increase with short-term nominal interest rates, but nominal stock returns do not. Nominal bond returns increase from 6.13% to 10.04% in the last portfolio, while nominal stock returns are flat. As a result, the real stock returns, reported in the third panel, are 456 bps (s.e. of 160 bps) lower for the highest interest rate quintile than for the lowest interest rate quintile. This difference is significant at the 5% significance level. The relation between expected inflation and real stock returns is non-linear. Real stock returns are 6.56% in the first portfolio, but increase to 7.92% in the fourth portfolio, only to decrease almost 500 bps. to 2.00% in the last portfolio. Not surprisingly, the ex post realized real interest rate is 325 basis points higher in the last than in the first portfolio. So, high real interest rates rather then higher expected inflation may be responsible for part of these results.

At the 3-month horizon, nominal stock returns in the fifth portfolio are 101 bps (s.e. of 168) higher than in the first portfolio; 187 bps (s.e. of 162 bps) at the 12-month horizon. As a result, these real return differences shrink at longer horizons. At the 3-month horizon, the spread in real returns decreases to 256 bps (s.e. of 174), and it is only 159 (s.e. of 175) at the 12-month horizon.

F.2 Stocks-Only Panel

These results do not simply carry over to the stock sample. There is much less inertia in the stock markets of these high-inflation countries in the stock sample. Table A20 in the lists these results. For example, there is now a 779 bps difference (s.e. of 232) between the nominal stock returns of portfolio 4 and portfolio 5 countries. The difference between portfolio 5 and portfolio 1 stock returns is 557 bps (s.e. of 209). Hence, there is a large

[24] Table A13 in the separate appendix demonstrates that these results are quite stable over time.

immediate response of nominal stock returns, even at the 1-month horizon, and this response of nominal stock returns increases as we increase the holding period to 3 and 12 months. As a result, the real stock returns in portfolio 5 are actually only 174 bps lower than the real stock returns in portfolio 1. However, there is still quite a bit of compression in the highest interest rate quintile. The excess returns are 589 bps lower in the last than in the first quintile, but that could partly reflect the 415 bps difference in ex post realized real interest rates.

Double-Sorts These portfolio sorts by nominal interest rates generate substantial variation in ex post real interest rates. To control for real interest rate variation, we first sort all of the countries in the extended panel into 3 portfolios based on nominal T-bill rates at t (i_t). Next, we again sort all countries independently into 2 portfolios based on real interest rates ($i_t - \pi_{t-12\to t}$). In Table A21, we report the results for the six portfolios that are the intersection of these 3 nominal interest-rate-sorted portfolios and 2 real interest-rate-sorted portfolios.

We focus on the 1-month horizon. As local expected inflation increases, real stock returns decline. For the countries with currently low real interest rates, the real stocks returns decline by 664 bps from portfolio 1 to 3, as we increase nominal T-bill returns from 3.26% to 13.86%. Realized inflation increases from 3.95% to 15.16%. Hence, the residual nominal interest rate variation seems to be measuring mostly variation in local expected inflation. For the countries with currently high real interest rates, real stock returns 236 bps from portfolio 4 to 6, as nominal interest rates increase from 4.04% to 11.68%. Similarly, the equity premium over T-bills declines by 603 bps per annum from portfolio 1 to 3, and by 597 bps per annum from portfolio 4 to 6. Hence, we confirm that higher expected inflation translates into significantly lower subsequent real stock returns, as well as lower excess returns.

G Additional s and s

Table A9: Country-level Evidence on Inflation and Returns in Stocks-Only Panel

This table reports the cross-sectional mean/standard deviation of country-level time-series averages of inflation and returns. Annualized log k-month returns and inflation. The countries are sorted by year-over-year inflation realized at month $t-1$ ($\pi_{t-13\rightarrow t-1}$). The sample is 1950-2012. The data is monthly. This table also reports the R^2 in a regression of inflation on average global inflation. The Stocks Only panel includes Australia, Austria, Belgium, Brazil, Canada, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Horizon		1-month		3-month		12-month	
Moments		X-Mean	X-Std	X-Mean	X-Std	X-Mean	X-Std
		Panel A: log inflation $\pi_{t\rightarrow t+k}$					
inflation	Mean	6.41	5.82	6.67	6.64	6.65	6.54
	std	2.79	1.97	3.54	2.66	4.98	4.31
	R^2	0.19	0.10	0.27	0.14	0.40	0.20
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$					
T-bills	Mean	8.39	6.65	8.96	7.60	9.08	7.88
	std	1.51	1.46	2.81	3.00	5.17	5.54
stocks	Mean	11.49	7.24	11.88	7.82	12.14	9.85
	std	26.48	10.60	28.96	11.92	32.01	15.41
		Panel C: real log returns in local units of consumption $r^{*}_{t\rightarrow t+k}$					
T-bills	Mean	1.98	2.44	2.29	2.59	2.44	3.10
	std	2.72	1.88	3.28	2.18	4.38	3.32
stocks	Mean	5.08	4.71	5.20	4.38	5.49	6.09
	std	26.70	10.99	29.17	12.04	32.32	14.94
		Panel D: log excess returns in local currency $rx^{£}_{t\rightarrow t+k}$					
stocks/T-bills	Mean	3.10	4.62	2.91	4.78	3.05	6.09
	SR	0.15	0.16	0.14	0.15	0.13	0.18

Table A10: Average Inflation-sorted Portfolios for Bonds/Stocks Panel

Time-series averages of annualized log k-month returns on portfolios. The countries are sorted by 10-year inflation realized at month $t-1$. The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$							
sorted	Mean	2.62	3.46	4.38	5.45	10.04	7.42	7.34	7.12
	s.e.	0.05	0.06	0.08	0.08	0.22	0.20	0.35	0.64
	std	1.39	1.70	2.09	2.31	5.67	5.35	5.24	4.87
realized	Mean	2.63	3.41	4.08	4.78	7.05	4.42	4.48	4.36
	s.e.	0.14	0.15	0.18	0.20	0.20	0.21	0.24	0.39
	std	1.06	1.16	1.42	1.48	1.56	1.58	1.92	2.95
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	3.83	4.97	5.59	6.29	8.40	4.57	4.55	4.51
	s.e.	0.06	0.10	0.11	0.12	0.16	0.14	0.25	0.49
	std	0.49	0.75	0.89	0.99	1.27	1.13	1.95	3.76
bonds	Mean	5.42	6.55	7.20	7.78	10.07	4.65	4.64	4.41
	s.e.	0.42	0.50	0.52	0.60	0.59	0.65	0.68	0.86
	std	3.37	3.98	4.09	4.65	4.69	5.13	5.43	5.97
stocks	Mean	7.83	10.11	11.17	9.73	13.18	5.34	5.16	5.05
	s.e.	1.74	1.91	1.74	1.88	1.86	1.55	1.58	1.76
	std	13.60	15.02	13.74	14.71	14.68	12.20	12.03	13.58
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	1.21	1.56	1.51	1.51	1.35	0.14	0.07	0.15
	s.e.	0.13	0.15	0.17	0.20	0.19	0.20	0.23	0.36
	std	1.00	1.12	1.36	1.47	1.49	1.53	1.81	2.77
bonds	Mean	2.79	3.15	3.13	3.00	3.02	0.23	0.16	0.05
	s.e.	0.45	0.54	0.56	0.64	0.62	0.68	0.71	0.86
	std	3.60	4.23	4.40	4.94	4.85	5.31	5.66	6.16
stocks	Mean	5.21	6.70	7.09	4.95	6.12	0.92	0.68	0.69
	s.e.	1.75	1.92	1.76	1.87	1.87	1.56	1.61	1.84
	std	13.66	15.10	13.90	14.72	14.74	12.31	12.26	14.08
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
bonds/T-bills	Mean	1.58	1.58	1.61	1.49	1.67	0.09	0.09	-0.10
	s.e.	0.42	0.51	0.51	0.59	0.57	0.64	0.66	0.74
	S.R.	0.47	0.39	0.40	0.32	0.37	0.02	0.02	-0.02
	s.e.	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
stocks/T-bills	Mean	4.00	5.14	5.58	3.44	4.78	0.78	0.61	0.54
	s.e.	1.75	1.92	1.74	1.88	1.87	1.56	1.61	1.87
	S.R.	0.29	0.34	0.41	0.23	0.32	0.06	0.05	0.04
	s.e.	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.13
stocks/bonds	Mean	2.42	3.55	3.97	1.96	3.11	0.69	0.52	0.64
	s.e.	1.80	1.94	1.78	1.88	1.84	1.61	1.68	1.83

Table A11: Inflation-sorted Portfolios for Bonds/Stocks Panel: Decade-by-Decade

Time-series average of annualized log 1-month, 3-month and 12-month spread in real log returns (in local units of consumption). Returns on Portfolio 5 minus Portfolio 1. The countries are sorted by year-over-year inflation realized at month $t-1$ ($\pi_{t-13\to t-1}$) into 5 portfolios at t. The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with only 10 countries in 1950, and ends with 30 countries in 2012.

Decade		1-month	3-month	12-month
			log inflation $\pi_{t\to t+k}$	
1950	sorted	6.52	6.52	6.52
	realized	2.16	1.78	0.92
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	-2.42	-2.02	-1.25
	bonds	-3.44	-2.96	-2.69
	stocks	-11.37	-10.32	-6.71
			log inflation $\pi_{t\to t+k}$	
1960	sorted	5.32	5.32	5.32
	realized	2.88	2.93	2.43
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	-1.23	-1.32	-1.06
	bonds	-2.86	-3.10	0.37
	stocks	-11.67	-9.84	-3.82
			log inflation $\pi_{t\to t+k}$	
1970	sorted	9.18	9.18	9.18
	realized	6.85	6.66	6.51
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	-2.81	-2.61	-2.46
	bonds	-4.86	-4.38	-5.43
	stocks	-2.22	-1.98	-2.46
			log inflation $\pi_{t\to t+k}$	
1980	sorted	8.93	8.93	8.93
	realized	7.37	7.36	6.71
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	0.25	0.19	0.53
	bonds	2.65	1.94	1.64
	stocks	-3.02	-4.73	-3.82
			log inflation $\pi_{t\to t+k}$	
1990	sorted	8.66	8.66	8.66
	realized	6.81	6.60	6.01
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	2.24	2.39	2.67
	bonds	0.78	1.26	1.09
	stocks	-6.50	-7.37	-6.62
			log inflation $\pi_{t\to t+k}$	
2000	sorted	4.22	4.22	4.26
	realized	2.50	2.28	2.19
			log returns $r^{\star}_{t\to t+k}$	
	T-bills	-0.14	0.06	0.20
	bonds	1.63	2.46	2.34
	stocks	1.33	2.03	1.25

Table A12: Inflation-sorted Portfolios for Panel of Developed Countries

Annualized log k-month returns. The countries are sorted by lagged year-over-year inflation realized at month $t-1$. Portfolios are re-sorted each month. The sample is 1950-2012. The unbalanced panel includes: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S.

Horizon		1-month							3-month	12-month
Portfolio		Low	2	3	4	High	High-Low		High-Low	High-Low
sorted	Mean	1.85	2.84	3.90	4.98	7.66	5.81	5.81	5.85	
	s.e.	0.08	0.09	0.11	0.13	0.17	0.12	0.20	0.40	
	std	2.12	2.33	2.80	3.37	4.55	3.12	3.12	3.12	
realized	Mean	2.41	3.07	3.96	4.56	6.27	3.87	3.67	3.36	
	s.e.	0.15	0.16	0.18	0.20	0.22	0.21	0.24	0.35	
	std	1.16	1.16	1.42	1.52	1.72	1.68	1.96	3.02	
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$								
T-bills	Mean	4.10	4.87	5.62	6.14	7.35	3.25	3.24	3.11	
	s.e.	0.08	0.09	0.12	0.13	0.16	0.12	0.20	0.39	
	std	0.59	0.71	0.90	1.02	1.25	0.94	1.62	3.16	
bonds	Mean	5.94	6.98	6.85	7.42	8.71	2.77	2.84	2.87	
	s.e.	0.53	0.64	0.66	0.57	0.64	0.68	0.63	0.71	
	std	4.12	4.98	5.21	4.47	5.01	5.30	5.60	6.01	
stocks	Mean	10.52	9.30	11.63	9.83	9.69	-0.83	-0.29	0.98	
	s.e.	1.68	1.85	1.86	1.92	1.87	1.44	1.55	1.66	
	std	13.21	14.46	14.54	14.93	14.56	11.42	11.60	12.84	
		Panel C: real log returns in local units of consumption $r^{\star}_{t\rightarrow t+k}$								
T-bills	Mean	1.70	1.79	1.66	1.58	1.08	-0.62	-0.43	-0.26	
	s.e.	0.15	0.16	0.18	0.18	0.21	0.21	0.21	0.28	
	std	1.14	1.16	1.39	1.43	1.61	1.64	1.78	2.38	
bonds	Mean	3.53	3.91	2.89	2.86	2.44	-1.10	-0.83	-0.49	
	s.e.	0.57	0.66	0.70	0.62	0.67	0.71	0.68	0.70	
	std	4.38	5.12	5.51	4.82	5.26	5.59	5.91	6.38	
stocks	Mean	8.11	6.22	7.68	5.27	3.42	-4.69	-3.96	-2.38	
	s.e.	1.69	1.86	1.88	1.93	1.87	1.45	1.56	1.68	
	std	13.28	14.55	14.70	15.03	14.58	11.53	11.65	12.92	
		Panel D: log excess returns in local currency $rx^{£}_{t\rightarrow t+k}$								
bonds/T-bills	Mean	1.84	2.11	1.23	1.27	1.36	-0.48	-0.40	-0.24	
	s.e.	0.53	0.64	0.66	0.57	0.62	0.67	0.62	0.58	
	S.R.	0.45	0.42	0.24	0.29	0.28	-0.09	-0.07	-0.04	
	s.e.	0.13	0.12	0.13	0.13	0.15	0.12	0.13	0.13	
stocks/T-bills	Mean	6.42	4.43	6.02	3.69	2.34	-4.08	-3.53	-2.12	
	s.e.	1.68	1.85	1.87	1.92	1.87	1.44	1.55	1.66	
	S.R.	0.49	0.31	0.41	0.25	0.16	-0.36	-0.31	-0.17	
	s.e.	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	
stocks/bonds	Mean	4.58	2.32	4.79	2.41	0.98	-3.60	-3.13	-1.89	
	s.e.	1.71	1.87	1.90	1.97	1.93	1.47	1.50	1.69	

Table A13: Inflation-Innovation-sorted Portfolios for Bonds/Stocks Panel: Decade-by-Decade

Annualized log 1-month returns. The countries are sorted by $\pi_{t\to t+1} - \pi_{t-k\to t}$ between month t and $t+1$ to rank countries into portfolios at t. Portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Horizon		1-month					
Portfolio		Low	2	3	4	High	High-Low
		log inflation $\pi_{t\to t+1}$					
1950	sorted	-10.93	-4.30	-0.92	2.32	10.55	21.49
	realized	-3.12	-0.08	1.84	2.94	7.96	11.08
	T-bills	7.25	3.48	1.66	0.53	-4.07	-11.32
	bonds	6.63	4.79	3.58	0.42	-3.90	-10.53
	stocks	18.62	17.29	15.76	13.45	9.40	-9.22
		log inflation $\pi_{t\to t+1}$					
1960	sorted	-8.80	-3.17	-0.70	1.96	8.56	17.36
	realized	-0.14	1.88	2.38	4.65	8.67	8.80
		real log returns in local units of consumption $r^{\$}_{t\to t+k}$					
	T-bills	5.05	2.91	2.43	0.16	-3.86	-8.91
	bonds	5.41	3.56	1.76	0.02	-3.35	-8.76
	stocks	7.71	1.04	6.47	1.68	0.05	-7.66
		log inflation $\pi_{t\to t+1}$					
1970	sorted	-9.21	-3.64	-0.47	2.36	9.62	18.83
	realized	4.92	6.63	7.60	9.09	14.68	9.76
		real log returns in local units of consumption $r^{\$}_{t\to t+k}$					
	T-bills	2.40	0.87	-0.53	-1.91	-7.40	-9.80
	bonds	3.79	-0.85	-2.30	-2.18	-8.07	-11.86
	stocks	2.92	7.13	-0.70	-4.05	-3.66	-6.58
		log inflation $\pi_{t\to t+1}$					
1980	sorted	-7.66	-3.09	-0.55	1.68	7.26	14.91
	realized	2.20	3.53	4.32	5.80	9.72	7.52
		real log returns in local units of consumption $r^{\$}_{t\to t+k}$					
	T-bills	7.52	5.52	5.05	3.47	-0.21	-7.73
	bonds	9.84	6.79	3.87	7.48	2.78	-7.06
	stocks	14.22	7.69	13.22	7.21	6.19	-8.04
		log inflation $\pi_{t\to t+1}$					
1990	sorted	-8.11	-2.59	-0.13	2.21	8.32	16.43
	realized	0.87	1.67	3.07	4.47	8.72	7.85
		real log returns in local units of consumption $r^{\$}_{t\to t+k}$					
	T-bills	7.55	5.33	4.25	2.50	-0.80	-8.35
	bonds	12.41	10.41	8.17	3.13	2.59	-9.82
	stocks	10.67	7.59	8.47	10.05	5.79	-4.88
		log inflation $\pi_{t\to t+1}$					
2000	sorted	-8.67	-2.91	-0.06	3.07	9.92	18.60
	realized	-2.12	0.87	2.14	3.77	7.88	10.00
		real log returns in local units of consumption $r^{\$}_{t\to t+k}$					
	T-bills	5.24	1.98	0.62	-0.88	-4.70	-9.95
	bonds	7.79	4.95	4.13	3.03	1.22	-6.57
	stocks	6.66	2.36	4.02	0.77	-1.69	-8.35

Table A14: Lagged-Inflation-sorted Portfolios for Stocks-Only Panel

Time-series averages of annualized log k-month returns on portfolios. The countries are sorted by lagged year-over-year inflation ($\pi_{t-13\rightarrow t-1}$) at time t. The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012. The unbalanced panel includes Australia, Austria, Belgium, Brazil, Canada, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\rightarrow t+1}$							
sorted	Mean	1.70	2.97	4.28	6.00	13.77	12.07	13.24	13.06
	s.e.	0.08	0.08	0.10	0.12	0.28	0.27	0.63	1.10
	std	2.04	2.25	2.77	3.30	7.66	7.31	10.22	10.65
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$							
realized	Mean	2.57	3.11	4.14	5.43	11.13	8.56	8.73	7.71
	s.e.	0.15	0.16	0.17	0.18	0.32	0.33	0.49	0.85
	std	1.16	1.16	1.30	1.39	2.48	2.58	3.89	6.84
T-bills	Mean	4.32	4.88	5.83	7.34	12.04	7.72	8.19	7.76
	s.e.	0.07	0.08	0.10	0.14	0.29	0.28	0.53	1.00
	std	0.55	0.65	0.80	1.10	2.29	2.19	4.21	7.92
stocks	Mean	12.38	10.69	10.74	9.66	14.34	1.96	3.19	4.99
	s.e.	1.74	1.84	1.80	1.94	2.23	1.95	2.15	2.69
	std	13.68	14.51	14.30	15.19	17.57	15.22	16.17	19.69
		Panel C: real log returns in local units of consumption $r^{*}_{t\rightarrow t+k}$							
T-bills	Mean	1.76	1.77	1.68	1.91	0.91	-0.84	-0.54	0.06
	s.e.	0.15	0.16	0.16	0.18	0.26	0.26	0.29	0.35
	std	1.13	1.15	1.26	1.46	2.02	2.06	2.39	3.00
stocks	Mean	9.81	7.58	6.60	4.24	3.21	-6.61	-5.54	-2.71
	s.e.	1.74	1.85	1.82	1.95	2.24	1.94	2.12	2.60
	std	13.70	14.59	14.44	15.26	17.64	15.19	15.93	18.46
		Panel D: log excess returns in dollars $rx^{\$}_{t\rightarrow t+1}$							
stocks/T-bills	Mean	8.06	5.81	4.91	2.33	2.30	-5.76	-5.00	-2.77
	s.e.	1.74	1.85	1.81	1.95	2.21	1.90	2.07	2.52
	S.R.	0.59	0.40	0.34	0.15	0.13	-0.39	-0.32	-0.15
	s.e.	0.15	0.14	0.13	0.13	0.13	0.13	0.14	0.13

Table A15: Lagged-Inflation-Deviation-sorted Portfolios for Stocks-Only Panel

Time-series averages of annualized log k-month returns on portfolios. The countries are sorted by lagged year-over-year inflation ($\pi_{t-13\to t-1} - \pi_{t-121\to t-1}$) minus 10-year inflation at time t. The portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012. The unbalanced panel includes Australia, Austria, Belgium, Brazil, Canada, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+1}$							
sorted	Mean	-8.98	-2.63	-0.71	0.38	3.15	12.13	12.09	11.73
	s.e.	0.36	0.16	0.09	0.08	0.11	0.35	0.61	1.28
	std	9.96	4.44	2.34	2.29	3.12	9.53	9.46	9.06
realized	Mean	5.92	4.30	4.17	4.52	8.37	2.45	2.41	1.92
	s.e.	0.21	0.18	0.17	0.18	0.28	0.30	0.40	0.67
	std	1.55	1.41	1.32	1.38	2.19	2.26	3.09	5.49
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	8.75	6.36	5.63	5.69	8.88	0.14	0.19	0.27
	s.e.	0.19	0.12	0.11	0.12	0.23	0.19	0.35	0.68
	std	1.48	0.91	0.85	0.90	1.83	1.50	2.63	5.16
stocks	Mean	17.49	12.56	9.76	10.29	9.79	-7.70	-7.11	-5.35
	s.e.	2.04	1.79	1.86	1.83	2.12	1.90	1.97	2.30
	std	15.98	13.92	14.36	14.15	16.42	14.95	15.06	16.81
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	2.83	2.06	1.46	1.17	0.51	-2.32	-2.22	-1.66
	s.e.	0.20	0.18	0.16	0.16	0.23	0.27	0.29	0.34
	std	1.48	1.43	1.25	1.24	1.80	1.97	2.18	2.68
stocks	Mean	11.57	8.26	5.58	5.77	1.42	-10.15	-9.52	-7.28
	s.e.	2.06	1.80	1.87	1.84	2.14	1.93	2.02	2.25
	std	16.11	13.98	14.47	14.22	16.53	15.17	15.31	16.96
		Panel D: log excess returns in dollars $rx^{\$}_{t\to t+1}$							
stocks/T-bills	Mean	8.74	6.20	4.12	4.60	0.91	-7.83	-7.30	-5.62
	s.e.	2.04	1.80	1.86	1.84	2.12	1.89	1.96	2.22
	S.R.	0.55	0.44	0.29	0.32	0.06	-0.53	-0.49	-0.34
	s.e.	0.14	0.14	0.13	0.14	0.13	0.13	0.12	0.12

Table A16: Inflation-sorted Portfolios for Stocks-Only Panel: Decade-by-Decade

Annualized log 1-month returns. Portfolios of countries sorted by lagged year-over-year inflation realized at month $t-1$. Portfolios are re-sorted each month. Sample: 1950-2012. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

		1-month	3-month	12-month
			log inflation $\pi_{t\rightarrow t+1}$	
1950	**sorted**	6.46	6.46	6.46
	realized	1.84	1.57	0.55
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	-1.93	-1.64	-0.70
	stocks	-12.80	-11.60	-7.94
			log inflation $\pi_{t\rightarrow t+1}$	
1960	**sorted**	5.36	5.36	5.36
	realized	2.99	2.97	2.53
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	-1.31	-1.31	-1.13
	stocks	-12.13	-9.93	-4.74
			log inflation $\pi_{t\rightarrow t+1}$	
1970	**sorted**	10.92	10.92	10.92
	realized	8.12	7.83	7.12
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	-3.93	-3.61	-2.98
	stocks	-11.15	-10.24	-10.49
			log inflation $\pi_{t\rightarrow t+1}$	
1980	**sorted**	15.97	17.29	17.29
	realized	12.80	12.79	12.34
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	-0.75	-0.39	-0.17
	stocks	-3.03	-1.49	2.56
			log inflation $\pi_{t\rightarrow t+1}$	
1990	**sorted**	24.08	31.07	31.37
	realized	17.21	19.98	18.61
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	2.56	2.75	3.22
	stocks	-3.16	-2.32	-1.84
			log inflation $\pi_{t\rightarrow t+1}$	
2000	**sorted**	10.27	10.16	9.89
	realized	7.93	7.65	6.71
			log returns $r^{\star}_{t\rightarrow t+1}$	
	T-bills	0.99	1.17	1.67
	stocks	-0.41	-0.20	2.42

Table A17: Inflation-innovation-sorted Portfolios: Stocks-Only Panel

Annualized log k-month returns. The countries are sorted by $\pi_{t\to t+k} - \pi_{t-k\to t}$ between month t and $t+k$ to rank countries into portfolios at t. Portfolios are re-sorted each month and held for 1 month. Standard errors are generated by bootstrapping the sample 10,000 times. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$							
sorted	Mean	-11.46	-3.62	-0.57	2.35	11.34	22.80	16.89	9.19
realized	Mean	0.84	2.87	3.92	5.63	12.38	11.54	8.18	3.54
		Panel B: nominal log returns in local currency $r^{\pounds}_{t\to t+k}$							
T-bills	Mean	8.50	6.62	6.39	6.52	8.14	-0.35	-0.83	-0.95
	s.e.	0.23	0.14	0.13	0.14	0.20	0.21	0.41	0.65
	std	1.80	1.11	1.00	1.06	1.57	1.68	3.06	5.36
stocks	Mean	12.21	10.57	10.44	11.53	14.46	2.25	0.25	-0.79
	s.e.	1.95	1.86	1.90	1.87	2.07	1.81	1.89	2.15
	std	15.63	14.62	14.99	14.71	16.38	14.31	15.13	17.34
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	7.66	3.75	2.47	0.89	-4.24	-11.90	-9.01	-4.49
	s.e.	0.82	0.14	0.14	0.14	0.23	0.85	0.89	0.96
	std	6.51	1.11	1.10	1.06	1.80	6.71	7.02	7.41
stocks	Mean	11.37	7.70	6.52	5.90	2.08	-9.30	-7.93	-4.33
	s.e.	2.10	1.86	1.91	1.88	2.08	2.01	2.11	2.32
	std	16.83	14.68	15.07	14.80	16.49	15.85	16.67	18.52
		Panel D: log excess returns in local currency $rx^{\pounds}_{t\to t+k}$							
stocks/T-bills	Mean	3.72	3.95	4.05	5.01	6.32	2.60	1.08	0.16
	s.e.	1.94	1.87	1.91	1.87	2.07	1.81	1.88	2.17
	SR	0.24	0.27	0.27	0.34	0.39	0.18	0.07	0.01
	s.e.	0.13	0.13	0.14	0.13	0.13	0.13	0.13	0.13

Table A18: Inflation-Innovation-sorted Portfolios

Time-series averages of annualized log k-month returns. The countries are sorted at t by realized (annualized) inflation $\pi_{t\to t+k}$ minus one-year ahead expected inflation (from Consensus Economics) measured at month t. The portfolios are re-sorted each month. The sample is 1990-2012. The data is monthly. The sample includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, Norway, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 18 countries in 1990, and ends with 30 countries in 2012.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$							
realized	Mean	-4.10	0.10	1.88	3.65	8.48	12.58	8.20	4.59
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	4.04	3.92	4.03	4.51	5.69	1.64	2.36	3.67
	s.e.	0.14	0.13	0.13	0.16	0.20	0.15	0.30	0.74
	std	0.71	0.69	0.67	0.78	0.94	0.67	1.23	2.87
bonds	Mean	9.74	7.80	8.23	7.51	8.74	-1.00	-0.69	2.00
	s.e.	1.39	1.17	1.02	1.29	1.22	1.56	1.20	1.25
	std	6.19	5.30	4.56	5.76	5.53	6.93	6.65	4.94
stocks	Mean	9.02	8.40	6.15	8.25	7.74	-1.28	-1.18	-0.43
	s.e.	4.02	3.78	3.49	3.74	3.86	2.73	2.15	2.88
	std	18.00	16.74	15.76	17.04	17.29	12.27	11.70	12.56
		Panel C: real log returns in local units consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	8.14	3.81	2.15	0.86	-2.79	-10.93	-5.84	-0.92
	s.e.	0.38	0.17	0.17	0.18	0.25	0.39	0.37	0.59
	std	1.69	0.82	0.80	0.87	1.16	1.75	2.06	2.31
bonds	Mean	13.83	7.70	6.36	3.86	0.26	-13.58	-8.89	-2.59
	s.e.	1.46	1.20	1.05	1.32	1.26	1.64	1.22	1.24
	std	6.47	5.45	4.66	5.89	5.67	7.25	6.95	4.82
stocks	Mean	13.11	8.30	4.27	4.60	-0.74	-13.86	-9.38	-5.02
	s.e.	4.04	3.78	3.49	3.74	3.87	2.76	2.13	2.97
	std	18.04	16.74	15.75	17.03	17.35	12.43	11.93	12.75
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
bonds/T-bills	Mean	5.70	3.88	4.20	3.00	3.05	-2.65	-3.05	-1.67
	s.e.	1.36	1.17	1.02	1.28	1.21	1.55	1.19	1.10
	SR	0.94	0.73	0.93	0.53	0.56	-0.38	-0.46	-0.35
	s.e.	0.26	0.27	0.22	0.27	0.22	0.23	0.21	0.25
stocks/T-bills	Mean	4.97	4.49	2.12	3.74	2.05	-2.92	-3.54	-4.10
	s.e.	4.02	3.79	3.49	3.75	3.87	2.73	2.16	3.23
	SR	0.28	0.27	0.13	0.22	0.12	-0.24	-0.30	-0.30
	s.e.	0.23	0.23	0.22	0.23	0.23	0.22	0.21	0.21
stocks/bonds	Mean	-0.72	0.61	-2.09	0.74	-1.00	-0.28	-0.49	-2.43
	s.e.	3.97	4.00	3.70	4.01	3.88	2.82	2.25	3.18

Table A19: Interest-rate-sorted Portfolios for Bonds/Stocks Panel

Annualized log one-month returns. Portfolios of countries sorted by one-month T-bill returns at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. The sample is 1950-2012. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with only 9 countries in 1950, and ends with 30 countries in 2012.

Horizon		1-month							3-month	12-month
Portfolio		1	2	3	4	5	5-1		5-1	5-1
		Panel A: log inflation $\pi_{t\to t+k}$								
sorted	Mean	3.17	3.65	4.37	5.04	7.14	3.97	3.96	4.02	
	s.e.	0.10	0.11	0.12	0.13	0.15	0.14	0.23	0.49	
	std	2.63	2.79	3.12	3.28	4.13	3.72	3.73	3.72	
realized	Mean	3.06	3.55	4.08	4.66	6.66	3.60	3.57	3.50	
	s.e.	0.19	0.15	0.18	0.19	0.20	0.24	0.29	0.41	
	std	1.41	1.21	1.30	1.47	1.57	1.81	2.11	3.17	
		Panel B: nominal log returns in local currency $r^{\pounds}_{t\to t+1}$								
T-bills	Mean	2.72	4.32	5.33	6.62	9.66	6.94	6.77	6.33	
	s.e.	0.06	0.09	0.11	0.12	0.16	0.13	0.22	0.43	
	std	0.46	0.67	0.85	0.97	1.26	0.99	1.71	3.23	
bonds	Mean	6.33	6.14	6.83	8.31	9.87	3.54	4.77	5.75	
	s.e.	0.47	0.60	0.53	0.56	0.54	0.61	0.70	0.82	
	std	3.63	4.80	4.15	4.43	4.27	4.86	5.50	8.30	
stocks	Mean	10.03	11.15	10.62	12.67	9.10	-0.93	0.59	1.21	
	s.e.	1.77	1.85	1.77	1.81	1.94	1.58	1.76	1.58	
	std	13.97	14.41	13.89	14.19	15.22	12.47	13.15	12.99	
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$								
T-bills	Mean	-0.35	0.77	1.25	1.96	2.99	3.34	3.20	2.83	
	s.e.	0.19	0.15	0.18	0.18	0.18	0.22	0.23	0.30	
	std	1.41	1.17	1.29	1.42	1.39	1.64	1.66	2.27	
bonds	Mean	3.27	2.59	2.75	3.65	3.21	-0.06	1.20	2.25	
	s.e.	0.51	0.64	0.56	0.60	0.57	0.64	0.73	0.85	
	std	3.95	5.07	4.37	4.72	4.52	5.06	5.68	8.23	
stocks	Mean	6.96	7.60	6.54	8.02	2.43	-4.53	-2.98	-2.29	
	s.e.	1.78	1.86	1.77	1.83	1.95	1.62	1.81	1.72	
	std	14.05	14.49	13.96	14.29	15.28	12.71	13.49	13.60	
		Panel D: log excess returns in local currency $rx^{\pounds}_{t\to t+1}$								
bonds/T-bills	Mean	3.61	1.82	1.50	1.69	0.22	-3.40	-1.99	-0.58	
	s.e.	0.46	0.59	0.51	0.55	0.53	0.61	0.68	0.74	
	S.R.	0.99	0.38	0.37	0.39	0.05	-0.70	-0.37	-0.07	
	s.e.	0.12	0.13	0.13	0.14	0.13	0.12	0.12	0.13	
stocks/T-bills	Mean	7.31	6.82	5.29	6.05	-0.56	-7.87	-6.18	-5.12	
	s.e.	1.77	1.85	1.77	1.82	1.95	1.59	1.77	1.67	
	S.R.	0.52	0.47	0.38	0.43	-0.04	-0.63	-0.47	-0.38	
	s.e.	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.15	
stocks/bonds	Mean	3.70	5.01	3.79	4.36	-0.78	-4.47	-4.19	-4.54	
	s.e.	1.84	1.86	1.79	1.85	1.95	1.65	1.80	1.66	

Table A20: Interest-rate-sorted Portfolios for Stocks-Only Panel

Annualized log k-month returns. The countries are sorted by the T-bill rate. Portfolios are re-sorted each month. The sample is 1950-2012. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012. We report the global CAPM alpha for a hedged investor who invests in an equal-weighted portfolio of all hedged foreign stocks, and for an unedited investor who invests in the value-weighted global stock index.

Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel I.A: log inflation $\pi_{t\to t+k}$							
sorted	Mean	3.24	3.62	4.54	6.15	13.21	9.97	9.91	9.91
realized	Mean	3.02	3.56	4.38	5.54	10.32	7.31	7.16	6.86
		Panel I.B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	2.83	4.39	5.68	7.58	14.29	11.46	11.11	10.41
	s.e.	0.06	0.08	0.11	0.13	0.36	0.34	0.54	1.00
	std	0.47	0.66	0.86	1.02	2.76	2.62	4.36	8.13
stocks	Mean	9.17	11.47	11.55	10.98	14.74	5.57	6.78	7.45
	s.e.	1.89	1.93	1.68	1.75	2.21	1.90	2.21	2.54
	std	14.91	15.20	13.26	13.89	17.48	14.83	16.55	19.65
		Panel I.C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	-0.18	0.83	1.30	2.03	3.97	4.15	3.95	3.54
	s.e.	0.19	0.17	0.18	0.17	0.61	0.63	0.64	0.79
	std	1.42	1.30	1.32	1.34	4.80	4.91	5.18	6.01
stocks	Mean	6.15	7.90	7.17	5.44	4.41	-1.74	-0.38	0.59
	s.e.	1.90	1.93	1.70	1.77	2.27	1.99	2.26	2.51
	std	15.01	15.26	13.35	14.04	17.98	15.43	16.97	19.07
		Panel I.D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
stocks/T-bills	Mean	6.34	7.08	5.87	3.40	0.45	-5.89	-4.32	-2.95
	s.e.	1.89	1.93	1.69	1.77	2.19	1.88	2.15	2.36
	SR	0.42	0.47	0.44	0.24	0.03	-0.40	-0.27	-0.17
	s.e.	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13
	alpha	1.76	2.45	1.80	-0.89	-4.88	-6.64	-5.48	-4.65
		1.71	2.29	1.96	-0.92	-4.06	-3.56	-4.70	-7.26
	beta	0.99	1.00	0.88	0.93	1.16	0.16	0.25	0.36

Table A21: Interest-rate-sorted Portfolios for Stocks-Only Panel

Time-series average of annualized log k-month returns on portfolios. The countries are sorted independently by nominal T-bill rates into 3 portfolios and by real rates at month t into 2 portfolios. We show results for the 6 portfolios that are the intersection of these. The portfolios are re-sorted each month. The sample is 1950-2012. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

Horizon		1-month						3-month						12-month					
Portfolio		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	nom rates	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
	real rates	Low	Low	Low	High	High	High	Low	Low	Low	High	High	High	Low	Low	Low	High	High	High
		Panel A: log inflation $\pi_{t\rightarrow t+k}$																	
sorted	Mean	4.06	6.69	18.78	1.81	3.31	6.71	4.05	6.65	18.76	1.82	3.32	6.72	4.07	6.67	18.67	1.84	3.34	6.74
realized	Mean	3.95	6.20	15.16	1.58	3.10	5.62	3.64	5.79	12.90	2.15	3.33	6.59	3.54	5.57	11.59	2.57	3.65	6.97
		Panel B: nominal log returns in local currency $r^{£}_{t\rightarrow t+k}$																	
T-bills	Mean	3.26	5.86	13.86	4.04	6.06	11.68	3.35	5.91	13.88	4.05	6.05	11.46	3.55	6.08	13.82	4.11	6.01	10.95
	s.e.	0.06	0.11	0.39	0.09	0.11	0.25	0.11	0.20	0.64	0.15	0.19	0.38	0.23	0.42	1.12	0.31	0.38	0.77
	std	0.50	0.89	2.96	0.64	0.86	1.92	0.88	1.56	5.03	1.11	1.50	3.16	1.80	3.22	9.80	2.19	2.97	5.80
stocks	Mean	10.06	12.92	14.63	10.70	12.01	12.37	9.32	12.24	15.93	11.08	11.42	13.57	9.28	10.36	16.82	9.54	11.10	14.65
	s.e.	1.86	2.03	2.92	2.35	1.73	2.09	2.18	2.44	3.43	2.78	1.99	2.34	2.41	2.97	3.84	2.83	2.53	2.65
	std	14.50	16.01	22.15	17.18	13.35	16.48	16.45	18.92	26.24	20.24	15.24	18.84	17.03	21.07	29.70	20.25	18.05	21.17
		Panel C: real log returns in local units of consumption $r^{*}_{t\rightarrow t+k}$																	
T-bills	Mean	-0.69	-0.33	-1.30	2.46	2.96	6.06	-0.29	0.12	0.98	1.90	2.71	4.87	0.01	0.50	2.23	1.54	2.37	3.98
	s.e.	0.18	0.21	0.35	0.22	0.14	0.73	0.22	0.26	1.22	0.21	0.19	0.27	0.29	0.40	1.43	0.35	0.30	0.41
	std	1.34	1.58	2.64	1.53	1.08	5.75	1.63	1.98	10.53	1.50	1.65	3.39	2.33	3.06	9.66	2.74	2.46	4.37
stocks	Mean	6.11	6.73	-0.53	9.11	8.91	6.75	5.68	6.45	3.04	8.93	8.08	6.98	5.74	4.79	5.23	6.97	7.45	7.68
	s.e.	1.88	2.04	2.90	2.36	1.74	2.20	2.21	2.47	3.59	2.77	2.02	2.37	2.49	3.00	3.57	2.97	2.59	2.75
	std	14.60	16.08	22.06	17.24	13.47	17.43	16.69	19.04	27.14	20.19	15.49	19.11	17.85	21.67	28.00	20.49	18.54	21.53
		Panel D: log excess returns in local currency $rx^{£}_{t\rightarrow t+k}$																	
stocks/T-bills	Mean	6.81	7.06	0.78	6.66	5.95	0.69	5.97	6.33	2.05	7.03	5.37	2.11	5.73	4.29	3.00	5.43	5.09	3.70
	s.e.	1.86	2.02	2.88	2.36	1.74	2.08	2.19	2.44	3.38	2.79	2.03	2.34	2.44	2.98	3.83	2.89	2.60	2.66
	SR	0.47	0.44	0.04	0.39	0.44	0.04	0.36	0.34	0.08	0.35	0.35	0.11	0.33	0.20	0.10	0.26	0.27	0.18
	s.e.	0.14	0.13	0.13	0.14	0.14	0.13	0.14	0.14	0.13	0.13	0.14	0.13	0.15	0.15	0.13	0.15	0.14	0.14

Table A22: Interest-rate-sorted Portfolios for Panel of Developed Countries

Annualized log one-month returns. The countries are sorted by one-month T-bill returns at month t. The portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. The sample is 1950-2012. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S.

Horizon		1-month							3-month	12-month
Portfolio		Low	2	3	4	High	High-Low		High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+1}$								
sorted	Mean	3.09	3.61	4.19	4.83	6.15	3.06	3.07	3.12	
	s.e.	0.10	0.11	0.11	0.13	0.16	0.13	0.22	0.46	
	std	2.55	2.92	3.01	3.40	4.35	3.53	3.53	3.52	
realized	Mean	2.92	3.37	4.08	4.45	5.76	2.84	2.90	2.83	
	s.e.	0.20	0.17	0.18	0.19	0.21	0.24	0.28	0.39	
	std	1.48	1.33	1.38	1.45	1.59	1.80	2.10	3.07	
		Panel B: nominal log returns in local currency $r^{\$}_{t\to t+1}$								
T-bills	Mean	2.92	4.43	5.33	6.25	8.47	5.55	5.43	5.08	
	s.e.	0.07	0.09	0.11	0.13	0.16	0.11	0.18	0.34	
	std	0.53	0.70	0.88	1.01	1.22	0.82	1.40	2.63	
bonds	Mean	6.27	6.53	6.91	7.00	9.02	2.75	3.98	4.89	
	s.e.	0.57	0.63	0.69	0.63	0.52	0.64	0.62	0.69	
	std	4.52	4.95	5.46	5.01	4.13	5.09	5.26	5.61	
stocks	Mean	8.98	10.80	10.89	10.36	9.62	0.64	1.58	2.54	
	s.e.	1.67	1.86	1.96	1.82	1.88	1.52	1.64	1.63	
	std	13.09	14.60	15.27	14.26	14.63	11.87	12.52	12.60	
		Panel C: real log returns in local currency $r_{t\to t+1}$								
T-bills	Mean	0.00	1.07	1.25	1.80	2.71	2.72	2.54	2.25	
	s.e.	0.20	0.16	0.18	0.18	0.18	0.23	0.23	0.28	
	std	1.49	1.28	1.33	1.41	1.39	1.66	1.73	2.21	
bonds	Mean	3.35	3.16	2.83	2.55	3.26	-0.09	1.09	2.06	
	s.e.	0.61	0.66	0.72	0.68	0.56	0.67	0.66	0.72	
	std	4.79	5.19	5.67	5.35	4.41	5.27	5.49	5.89	
stocks	Mean	6.06	7.43	6.81	5.91	3.86	-2.20	-1.31	-0.29	
	s.e.	1.68	1.87	1.96	1.84	1.89	1.54	1.69	1.69	
	std	13.19	14.66	15.32	14.44	14.68	12.02	12.77	12.97	
		Panel D: log excess returns in local currency $r^{\$}_{t\to t+1}$								
bonds/T-bills	Mean	3.36	2.09	1.59	0.75	0.55	-2.81	-1.45	-0.20	
	s.e.	0.57	0.63	0.68	0.63	0.52	0.64	0.60	0.56	
	S.R.	0.74	0.42	0.30	0.15	0.13	-0.56	-0.28	-0.04	
	s.e.	0.12	0.15	0.13	0.13	0.13	0.12	0.13	0.13	
stocks/T-bills	Mean	6.07	6.36	5.56	4.11	1.15	-4.92	-3.85	-2.54	
	s.e.	1.67	1.86	1.95	1.83	1.89	1.52	1.64	1.64	
	S.R.	0.46	0.44	0.36	0.29	0.08	-0.41	-0.31	-0.20	
	s.e.	0.14	0.13	0.14	0.13	0.13	0.13	0.13	0.13	
stocks/bonds	Mean	2.71	4.27	3.98	3.36	0.60	-2.11	-2.40	-2.35	
	s.e.	1.74	1.88	1.95	1.89	1.92	1.55	1.62	1.66	

Table A23: Inflation-innovation-sorted Portfolios for Panel of Developed Countries

Annualized log one-month returns. Portfolios of countries sorted by one-month T-bill returns at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. Sample: 1950-2012. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Horizon		1-month						3-month						12-month					
Portfolio		Low	2	3	4	High	High-Low	Low	2	3	4	High	High-Low	Low	2	3	4	High	High-Low
		Panel A: log inflation $\pi_{t\to t+1}$																	
innovations	Mean	-8.14	-3.19	-0.57	2.03	8.12	16.26	-5.51	-2.30	-0.32	1.53	5.34	10.84	-2.38	-1.08	-0.21	0.59	2.24	4.62
realized	Mean	0.25	2.19	3.18	4.78	8.65	8.40	1.42	2.77	3.60	4.57	7.23	5.79	3.48	3.49	3.68	4.04	5.71	2.23
		Panel B: nominal log returns in local currency $r^{\$}_{t\to t+k}$																	
T-bills	Mean	5.78	5.52	5.39	5.55	5.65	-0.13	5.80	5.48	5.48	5.49	5.65	-0.16	6.08	5.46	5.44	5.28	5.77	-0.31
	s.e.	[0.12]	[0.12]	[0.12]	[0.12]	[0.12]	[0.08]	[0.21]	[0.21]	[0.20]	[0.20]	[0.22]	[0.15]	[0.41]	[0.40]	[0.40]	[0.39]	[0.43]	[0.24]
bonds	Mean	7.32	6.63	7.08	7.37	7.04	-0.28	8.05	7.15	6.53	6.96	7.15	-0.72	8.58	7.66	7.16	6.58	6.07	-2.51
	s.e.	[0.68]	[0.67]	[0.54]	[0.66]	[0.60]	[0.75]	[0.79]	[0.69]	[0.85]	[0.67]	[0.61]	[0.69]	[1.17]	[1.03]	[0.81]	[0.70]	[0.72]	[0.95]
	std	5.40	5.25	4.27	5.14	4.77	5.92	6.56	5.27	5.90	4.93	5.10	6.04	8.42	8.65	6.18	5.92	5.70	6.64
stocks	Mean	10.57	8.15	10.29	10.84	10.66	0.09	10.53	9.66	9.35	10.31	10.31	-0.11	10.29	10.78	9.53	9.46	10.02	-0.27
	s.e.	[1.90]	[1.85]	[1.87]	[1.87]	[1.82]	[1.53]	[2.03]	[2.22]	[2.15]	[2.17]	[2.22]	[1.56]	[2.51]	[2.29]	[2.70]	[2.63]	[2.57]	[1.68]
	std	15.07	14.67	14.76	14.71	14.40	12.07	16.53	16.74	16.48	16.28	16.84	12.67	20.04	18.21	18.66	19.25	18.75	14.26
		Panel C: real log returns in local units of consumption $r^{\$}_{t\to t+k}$																	
T-bills	Mean	5.53	3.33	2.21	0.77	-2.99	-8.53	4.38	2.71	1.88	0.92	-1.59	-5.95	2.60	1.96	1.76	1.24	0.06	-2.54
	s.e.	[0.21]	[0.13]	[0.13]	[0.15]	[0.22]	[0.26]	[0.21]	[0.19]	[0.20]	[0.20]	[0.25]	[0.24]	[0.29]	[0.31]	[0.34]	[0.31]	[0.40]	[0.32]
bonds	Mean	7.07	4.44	3.89	2.59	-1.61	-8.68	6.63	4.38	2.93	2.39	-0.09	-6.51	5.11	4.17	3.48	2.53	0.36	-4.74
	s.e.	[0.72]	[0.69]	[0.57]	[0.69]	[0.65]	[0.80]	[0.84]	[0.74]	[0.87]	[0.74]	[0.71]	[0.72]	[1.18]	[1.08]	[0.88]	[0.80]	[0.95]	[1.04]
	std	5.66	5.44	4.50	5.37	5.17	6.31	7.10	5.56	6.15	5.39	5.76	6.42	8.54	9.10	6.72	6.84	7.24	7.01
stocks	Mean	10.32	5.96	7.10	6.05	2.01	-8.31	9.11	6.90	5.75	5.74	3.08	-5.90	6.81	7.29	5.85	5.42	4.30	-2.50
	s.e.	[1.91]	[1.86]	[1.88]	[1.89]	[1.83]	[1.55]	[2.05]	[2.24]	[2.18]	[2.18]	[2.21]	[1.52]	[2.52]	[2.35]	[2.76]	[2.72]	[2.69]	[1.64]
	std	15.15	14.74	14.82	14.78	14.42	12.16	16.69	16.84	16.63	16.47	16.98	12.66	20.31	18.64	19.22	20.05	19.77	14.51
		Panel D: log excess returns in local currency $r^{£}_{t\to t+k}$																	
bonds/bills	Mean	1.54	1.10	1.68	1.83	1.38	-0.15	2.26	1.67	1.05	1.47	1.50	-0.56	2.51	2.21	1.72	1.30	0.30	-2.19
	s.e.	[0.67]	[0.67]	[0.55]	[0.66]	[0.60]	[0.75]	[0.78]	[0.68]	[0.84]	[0.67]	[0.60]	[0.68]	[1.10]	[1.05]	[0.78]	[0.73]	[0.70]	[0.96]
	Mean	0.29	0.21	0.39	0.36	0.29	-0.03	0.34	0.32	0.18	0.30	0.30	-0.09	0.33	0.25	0.28	0.21	0.05	-0.35
	s.e.	[0.14]	[0.12]	[0.13]	[0.15]	[0.13]	[0.13]	[0.14]	[0.13]	[0.12]	[0.13]	[0.12]	[0.13]	[0.15]	[0.11]	[0.13]	[0.13]	[0.13]	[0.16]
stocks/T-bills	Mean	4.78	2.62	4.89	5.29	5.00	0.22	4.73	4.19	3.87	4.82	4.67	0.05	4.21	5.33	4.09	4.18	4.24	0.05
	s.e.	[1.90]	[1.86]	[1.87]	[1.88]	[1.83]	[1.53]	[2.05]	[2.23]	[2.17]	[2.17]	[2.22]	[1.55]	[2.48]	[2.30]	[2.72]	[2.68]	[2.62]	[1.69]
	Mean	0.32	0.18	0.33	0.36	0.35	0.02	0.28	0.25	0.23	0.29	0.28	0.00	0.21	0.29	0.22	0.21	0.22	0.00
	s.e.	[0.13]	[0.13]	[0.13]	[0.14]	[0.13]	[0.13]	[0.14]	[0.14]	[0.14]	[0.14]	[0.14]	[0.13]	[0.15]	[0.16]	[0.15]	[0.14]	[0.14]	[0.14]
stocks/bonds	Mean	3.25	1.52	3.21	3.46	3.62	0.37	2.48	2.52	2.82	3.35	3.16	0.61	1.71	3.12	2.37	2.89	3.95	2.24
	s.e.	[1.92]	[1.88]	[1.86]	[1.96]	[1.85]	[1.55]	[2.11]	[2.29]	[2.19]	[2.24]	[2.28]	[1.56]	[2.50]	[2.44]	[2.67]	[2.63]	[2.52]	[1.80]

Table A24: Lagged-Inflation-sorted Portfolios and Output Risk for Stocks-Only Panel

Time-series averages of annualized log k-month returns. Portfolios of countries sorted by year-over-year inflation realized at month $t-1$. Portfolios are re-sorted each month. The sample is 1950-2012. The data is monthly. The unbalanced sample includes Austria, Belgium, Canada, China Hong Kong, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S. The sample starts with 10 countries in 1950 and ends with 20 countries in 2012. We report the moments of subsequent industrial output growth realized after portfolio formation at t.

Horizon		1-month						3-month						12-month					
Portfolio		Low	2	3	4	High	High-Low	Low	2	3	4	High	High-Low	Low	2	3	4	High	High-Low
		Panel A: log inflation $\pi_{t\to t+k}$																	
pre-sort	Mean	1.97	2.92	3.89	5.38	13.47	11.50	1.98	2.93	3.90	5.44	15.42	13.44	2.02	2.96	3.93	5.47	15.47	13.45
	s.e.	0.08	0.08	0.09	0.11	0.37	0.36	0.13	0.14	0.16	0.19	0.91	0.91	0.25	0.27	0.30	0.38	1.49	1.48
	std	2.06	2.16	2.44	2.98	9.91	9.78	2.04	2.15	2.44	2.98	14.65	14.70	2.02	2.16	2.44	2.97	14.63	14.69
realized	Mean	2.73	2.96	3.82	4.92	10.84	8.38	2.73	3.12	3.83	5.10	11.30	8.86	3.03	3.32	3.80	5.12	10.94	8.23
	s.e.	0.16	0.17	0.18	0.20	0.37	0.40	0.19	0.20	0.21	0.30	0.56	0.59	0.33	0.29	0.32	0.48	0.98	1.03
	std	1.19	1.30	1.39	1.54	2.89	3.00	1.44	1.54	1.70	2.17	4.54	4.69	2.72	2.28	2.44	3.59	7.99	8.52
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$																	
T-bills	Mean	4.51	4.95	5.49	6.84	12.76	8.51	4.51	4.94	5.47	6.92	13.66	9.45	4.57	4.97	5.47	6.92	13.52	9.23
	s.e.	0.07	0.09	0.10	0.13	0.37	0.37	0.13	0.15	0.17	0.24	0.72	0.72	0.31	0.29	0.32	0.45	1.35	1.36
	std	0.57	0.66	0.74	1.03	2.92	2.83	1.00	1.14	1.27	1.80	5.81	5.71	2.06	2.23	2.44	3.44	10.98	10.86
stocks	Mean	10.82	9.29	9.92	8.26	14.79	4.06	9.97	9.93	10.19	8.41	15.45	5.50	9.35	9.59	8.90	9.19	17.01	7.62
	s.e.	1.88	2.01	2.06	2.07	2.52	2.23	2.17	2.34	2.35	2.52	2.98	2.46	2.37	2.66	2.53	2.79	3.90	3.12
	std	14.16	15.27	15.68	15.65	19.50	17.10	15.81	17.22	17.52	18.06	22.06	18.17	17.63	18.70	17.68	20.95	27.03	23.11
		Panel C: real log returns in local units consumption $r^{*}_{t\to t+k}$																	
T-bills	Mean	1.78	1.99	1.67	1.92	1.92	0.13	1.78	1.82	1.64	1.82	2.36	0.59	1.55	1.65	1.67	1.80	2.57	1.00
	s.e.	0.15	0.17	0.18	0.21	0.30	0.32	0.19	0.21	0.22	0.27	0.38	0.37	0.33	0.33	0.30	0.43	0.60	0.57
	std	1.17	1.31	1.38	1.57	2.34	2.37	1.40	1.59	1.66	2.11	3.07	2.92	2.55	2.34	2.41	3.36	4.72	4.29
stocks	Mean	8.10	6.34	6.11	3.34	3.95	-4.31	7.24	6.81	6.36	3.31	4.16	-3.36	6.32	6.27	5.10	4.07	6.07	-0.61
	s.e.	1.90	2.02	2.08	2.07	2.52	2.22	2.19	2.36	2.37	2.58	2.97	2.40	2.47	2.72	2.61	2.93	3.79	2.85
	std	14.26	15.31	15.82	15.68	19.53	17.04	15.91	17.41	17.68	18.34	22.05	17.96	18.12	19.33	18.20	22.00	26.49	21.85
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$																	
stocks/T-bills	Mean	6.31	4.34	4.44	1.42	2.03	-4.44	5.47	4.98	4.72	1.49	1.80	-3.95	4.77	4.62	3.43	2.28	3.50	-1.60
	s.e.	1.88	2.02	2.07	2.07	2.48	2.18	2.18	2.35	2.36	2.56	2.93	2.37	2.39	2.71	2.58	2.84	3.63	2.73
	SR	0.45	0.28	0.28	0.09	0.11	-0.27	0.34	0.29	0.27	0.08	0.08	-0.22	0.27	0.24	0.19	0.11	0.14	-0.07
	s.e.	0.14	0.14	0.14	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.13	0.13	0.15	0.15	0.15	0.15	0.13	0.13
		Panel E: output growth $\Delta y_{t\to t+k}$																	
output	Mean	5.39	1.42	3.18	4.61	4.66	-0.98	3.49	3.62	2.62	4.60	3.66	0.03	4.01	3.42	3.30	3.33	3.99	-0.15
	Std	25.06	26.28	29.45	36.81	32.30	7.24	18.55	18.81	21.04	25.18	23.69	5.14	6.44	5.76	5.34	5.39	5.27	1.17

Table A25: Return Predictability: All Countries

Regression of future returns on current yields and long-run inflation: $y_{t\to t+k} = \beta_0 + \beta' \boldsymbol{X}_t$. $y_{t\to t+k}$ is the log return in local currency $(r^{5,£}_{t\to t+k} - r^{1,£}_{t\to t+k})$, real log returns $(r^5_{t\to t+k} - r^1_{t\to t+k})$ and log excess return spreads $(rx^5_{t\to t+k} - rx^1_{t\to t+k})$ on last year's inflation $(\pi^5_{t-1\to t} - \pi^1_{t-1\to t})$ and long-run inflation $(\pi^5_{t-10\to t} - \pi^1_{t-10\to t})$. Portfolios of countries sorted by one-month T-bill returns at month t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. Sample: 1950-2012. Monthly data. All returns are annualized. The subset of developed countries includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. We report Hansen and Hodrick (1980) and Newey and West (1987) t-stats. The Hansen-Hodrick t-stats are computed with $12k$ lags. We use the Bartlett optimal number of lags to compute the Newey-West t-stats.

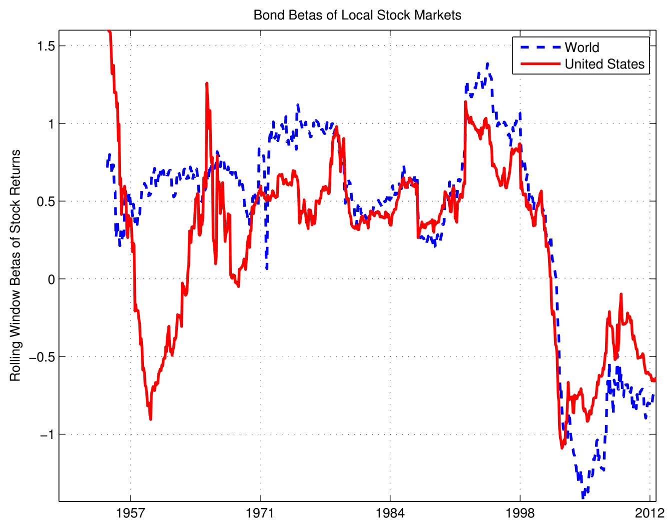
Horizon k		*nominal log returns* $r^{\$}_{t\to t+k}$					*inflation* $\pi_{t\to t+k}$					*real log returns* $r_{t\to t+k}$					*log excess returns* $rx_{t\to t+k}$				
in years		β				R^2	β				R^2	β				R^2	β				R^2
			ols	*nw*	*hh*			*ols*	*nw*	*hh*			*ols*	*nw*	*hh*			*ols*	*nw*	*hh*	
1	constant	0.45	0.33	0.18	0.13	0.04	-0.85	-3.85	-1.75	-1.32	0.48	1.30	0.93	0.48	0.37	0.04	1.75	1.23	0.64	0.48	0.02
	long-run	0.68	5.27	2.57	2.19	0.03	0.26	12.66	5.77	4.91	0.48	0.42	3.24	1.60	1.33	0.04	0.13	0.98	0.49	0.38	0.02
	current	-0.33	-1.89	-0.86	-0.67		0.54	19.49	7.12	5.20		-0.87	-4.95	-2.19	-1.70		-0.73	-4.05	-1.82	-1.38	
2	constant	3.56	3.66	2.08	1.39	0.13	-0.88	-4.36	-1.92	-1.43	0.49	4.44	4.51	2.40	1.57	0.15	5.21	5.12	2.79	1.85	0.11
	long-run	0.92	9.77	4.60	2.98	0.13	0.26	13.05	6.28	4.43	0.49	0.67	6.96	3.38	2.18	0.15	0.36	3.61	1.60	0.96	0.11
	current	-0.78	-6.43	-3.07	-2.11		0.50	19.68	6.57	4.40		-1.28	-10.41	-4.54	-3.20		-1.19	-9.36	-4.11	-2.96	
3	constant	3.19	3.99	2.13	1.13	0.15	-0.72	-3.69	-1.62	-1.23	0.49	3.90	4.88	2.43	1.31	0.17	5.00	6.01	3.11	1.77	0.14
	long-run	0.84	10.56	5.52	3.35	0.15	0.28	14.53	6.79	4.29	0.49	0.56	7.04	3.79	2.29	0.17	0.28	3.41	1.64	0.93	0.13
	current	-0.69	-6.92	-3.50	-2.07		0.43	17.84	6.02	4.11		-1.12	-11.24	-5.12	-3.37		-1.10	-10.61	-4.79	-3.25	
4	constant	2.53	3.54	1.77	0.90	0.13	-0.59	-3.11	-1.40	-1.19	0.48	3.12	4.44	2.19	1.14	0.14	4.30	5.88	2.99	1.58	0.12
	long-run	0.72	9.74	5.93	3.76	0.13	0.30	15.32	7.06	4.14	0.48	0.42	5.78	3.72	2.41	0.13	0.16	2.14	1.24	0.71	0.12
	current	-0.50	-5.63	-3.12	-1.65		0.37	15.77	5.66	4.19		-0.87	-9.98	-5.55	-3.25		-0.89	-9.74	-5.33	-3.02	
5	constant	2.34	3.78	1.77	1.10	0.16	-0.49	-2.59	-1.17	-1.24	0.45	2.83	4.64	2.16	1.46	0.14	3.99	6.33	3.01	1.88	0.12
	long-run	0.76	11.43	7.40	6.29	0.16	0.31	15.03	6.51	3.59	0.45	0.45	6.93	4.72	4.44	0.14	0.19	2.86	1.77	1.23	0.12
	current	-0.43	-5.51	-3.01	-1.64		0.33	13.86	4.93	4.84		-0.75	-9.89	-5.41	-3.73		-0.78	-9.86	-5.35	-3.16	

Table A26: Inflation-innovation-sorted Portfolios for Bonds/Stocks Panel

Time-series averages of annualized log k-month returns. The countries are sorted by $\pi_{t\to t+k} - \pi_{t-k\to t}$ between month t and $t+k$ to rank countries into portfolios at t. Portfolios are re-sorted each month. Standard errors are generated by bootstrapping the sample 10,000 times. The sample is 1950-2012. The data is monthly. The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K. and the U.S. The sample starts with 9 countries in 1950, and ends with 30 countries in 2012.

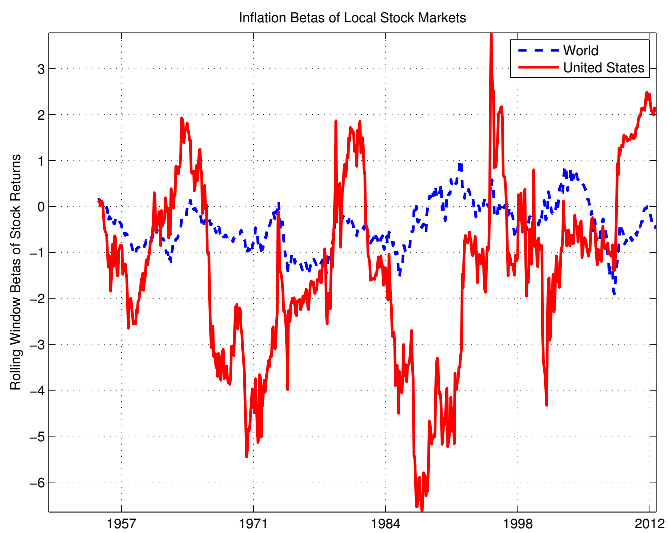
Horizon		1-month						3-month	12-month
Portfolio		Low	2	3	4	High	High-Low	High-Low	High-Low
		Panel A: log inflation $\pi_{t\to t+1}$							
sorted	Mean	-9.03	-3.41	-0.62	2.05	8.72	17.75	11.73	5.28
	s.e.	0.20	0.11	0.09	0.10	0.18	0.25	0.22	0.25
	std	1.46	0.83	0.71	0.79	1.36	1.72	1.66	2.07
realized	Mean	0.35	2.38	3.44	4.87	9.35	9.00	5.99	2.04
	s.e.	0.22	0.14	0.13	0.14	0.20	0.26	0.26	0.39
	std	1.69	1.09	1.02	1.05	1.52	1.89	2.03	2.88
		Panel B: nominal log returns in local currency $r^{£}_{t\to t+k}$							
T-bills	Mean	6.23	5.75	5.72	5.67	6.06	-0.17	-0.30	-0.74
	s.e.	0.12	0.11	0.11	0.11	0.11	0.09	0.17	0.34
	std	0.94	0.87	0.87	0.85	0.87	0.74	1.21	2.42
bonds	Mean	7.99	7.23	7.02	7.12	8.13	0.15	-1.54	-3.81
	s.e.	0.54	0.52	0.56	0.61	0.53	0.62	0.60	0.86
	std	4.29	4.11	4.36	4.82	4.21	4.91	5.30	5.82
stocks	Mean	10.45	9.74	11.15	9.55	11.60	1.15	0.21	-1.56
	s.e.	1.92	1.87	1.84	1.83	1.78	1.55	1.53	1.60
	std	15.22	14.73	14.58	14.34	14.08	12.21	12.21	13.76
		Panel C: real log returns in local units of consumption $r^{*}_{t\to t+k}$							
T-bills	Mean	5.88	3.37	2.28	0.80	-3.29	-9.16	-6.29	-2.79
	s.e.	0.21	0.13	0.13	0.14	0.20	0.25	0.23	0.29
	std	1.55	1.05	1.00	1.06	1.47	1.81	1.93	2.38
bonds	Mean	7.63	4.85	3.58	2.24	-1.22	-8.85	-7.53	-5.86
	s.e.	0.59	0.55	0.59	0.64	0.57	0.67	0.63	0.89
	std	4.60	4.32	4.58	5.01	4.50	5.26	5.65	6.03
stocks	Mean	10.09	7.35	7.70	4.67	2.25	-7.84	-5.78	-3.60
	s.e.	1.94	1.87	1.85	1.83	1.79	1.57	1.53	1.55
	std	15.29	14.75	14.65	14.40	14.17	12.34	12.35	14.18
		Panel D: log excess returns in local currency $rx^{£}_{t\to t+k}$							
bonds/T-bills	Mean	1.76	1.48	1.30	1.44	2.07	0.32	-1.23	-3.07
	s.e.	0.53	0.52	0.56	0.60	0.53	0.62	0.59	0.83
	S.R.	0.42	0.37	0.30	0.30	0.50	0.06	-0.24	-0.57
	s.e.	0.13	0.13	0.12	0.14	0.12	0.13	0.13	0.15
stocks/T-bills	Mean	4.22	3.99	5.43	3.88	5.54	1.32	0.51	-0.82
	s.e.	1.93	1.87	1.85	1.83	1.78	1.56	1.53	1.56
	S.R.	0.28	0.27	0.37	0.27	0.39	0.11	0.04	-0.06
	s.e.	0.13	0.13	0.13	0.13	0.14	0.13	0.13	0.14
stocks/bonds	Mean	2.46	2.50	4.13	2.43	3.47	1.01	1.75	2.26
	s.e.	1.95	1.90	1.87	1.85	1.80	1.59	1.54	1.68

Figure A10: Bond Betas



Notes: 5-year rolling window betas of the local stock market return w.r.t. the local lagged monthly rate of inflation (lagged by one month). Sample: 1950-2012. The unbalanced sample includes Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

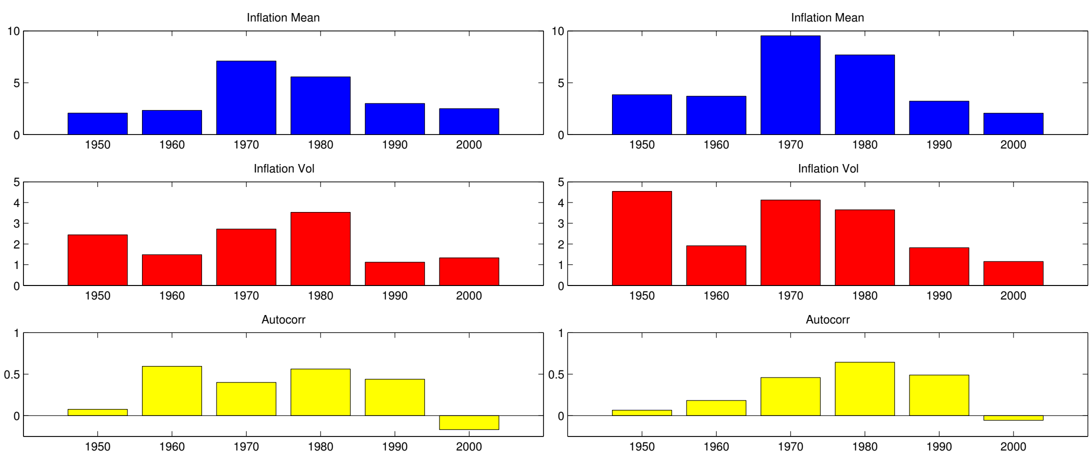
Figure A11: Inflation Betas



Notes: 5-year rolling window betas of the local stock market return w.r.t. the local lagged monthly rate of inflation (lagged by one month), computed by running time-series regressions of nominal log stock returns in local currency $rx^{\pounds}_{t\rightarrow t+1}$ on the one-month log lagged rate of inflation $\pi_{t-1\rightarrow t}$ on 5-year rolling windows. Sample: 1950-2012. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Kingdom, the United States and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.

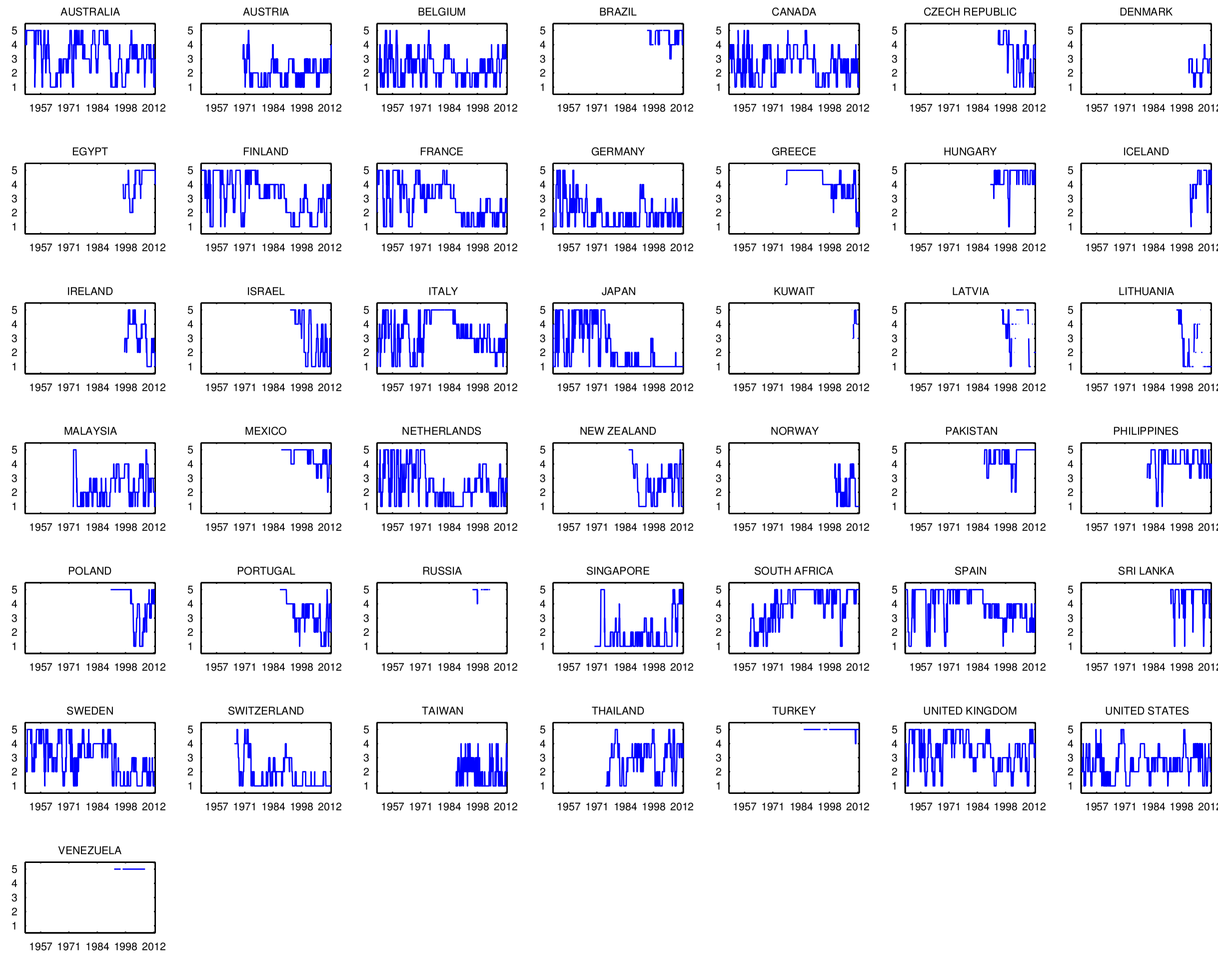
Figure A12: Inflation

Panel A: U.S. *Panel B: Developed Countries*



Notes: Decade-by-decade overview of inflation. Monthly data. The top panel plots average year-over-year inflation. The middle panel plots the standard deviation of year-over-year inflation. The bottom panel plots the one-month autocorrelation of year-over-year-inflation.

Figure A13: Composition of Portfolios sorted by Inflation for Stocks-Only Panel



Notes: The panel plots the composition of portfolios of countries sorted into quintiles by lagged year-over-year inflation ($\pi_{t-13\rightarrow t-1}$) each month at time t. The portfolio is on the y-axis. The unbalanced sample includes Australia, Austria, Belgium, Brazil, Canada, China Hong Kong, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Malaysia, Mexico, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, the U.K., the U.S. and Venezuela. The sample starts with 10 countries in 1950 and ends with 46 countries in 2012.