

Inflation & Interest Rates

Fama (AER, 1975): Short-term Interest Rates as Predictors of Inflation

- CPI inflation & Tbill yields, 1953-71

Short-term Interest Rates as Predictors of Inflation

Return on k-period discount bond (interest rate on Tbill maturing in k months) is known at time t-k when you buy the bill

$$B(k,t) = \ln[\$1000/P(t-k)]$$

where $B(k,t)$ is the continuously compounded return (interest rate) from t-k to t

Thus, the only thing uncertain at t-k is how many groceries you can buy with \$1000 when the bill matures at time t

- i.e. the real return

Fama & Schwert (1977): Autocorrelations of Nominal (\$) Returns (Table 1)

Impt Facts:

- quite large and persistent (decay slowly at higher lags) for assets with small standard deviations (bills, bonds, real estate)
- small for assets with large standard deviations (stocks)
- autocorrelations of inflation rate are about .35 for all 12 lags
 - suggests a lot of predictability of inflation (stays high/low for long periods)

Autocorrelations of Real Returns [Deflated by CPI Inflation] (Table 2)

Impt Facts:

- generally small at all lags
 - about .1 at lag 1 for all assets (could be due to poor measurement of CPI changes)
- about .2 at lag 12 for smallest risk assets (bills)
 - could be due to seasonality (real or spurious) in CPI
- If you couldn't see means & standard deviations you wouldn't be able to guess which assets were which

F&S (JFE, 1977): Implications of Autocorrelations

- It looks like the random walk model is reasonable for nominal stock and human capital returns, but not for other assets
- It looks like the random walk model is reasonable for real returns to all classes of assets
- Simple story: people worry about how many groceries they can buy when they invest, not how many pictures of Geo Washington they have

Short-term Interest Rates as Predictors of Inflation

Given the evidence (Table 1) that inflation autocorrelations are high, but autocorrelations of real Tbill returns are low, a simple model is suggested:

$$(1) E[r(t) | \phi(t-k)] = E[r] = \text{constant over time}$$

- about 1% per year
 - $[\cdot 0007 \times 12 \times 100]$; Table 2]

$$(2) E[\rho(t) | \phi(t-k)] = B(k,t) - E[r]$$

- so the expected inflation rate is just the nominal Tbill yield minus the constant expected real return

Short-term Interest Rates as Predictors of Inflation

The simple model for inflation expectations,

$$E[\rho(t) | \phi(t-k)] = B(k,t) - E[r]$$

implies a regression model:

$$\rho(t) = \alpha + \beta B(k,t) + \varepsilon(t)$$

- where the slope $\beta = 1$ and the intercept $\alpha = -E[r]$

Short-term Interest Rates as Predictors of Inflation

Estimates of the regression

$$\rho(t) = \alpha + \beta B(k,t) + \varepsilon(t)$$

show:

- (1) slopes remarkably close to 1
- (2) intercepts imply about 1% per year expected real return
- (3) R^2 about .3 for monthly (.48 and .82 for quarterly & semiannual) implies that a large portion of inflation variation is predictable

- prediction model for inflation is:

$$B(k,t) - .0007k \text{ (for } k\text{-period inflation)}$$

Short-term Interest Rates as Predictors of Inflation: Questions

- (1) Do you think that short-term interest rates have done as well at predicting inflation since 1971? [i.e., have expected real interest rates remained fairly constant at about 1%?]
- (2) Can you think of macroeconomic situations where the interest rate-inflation model could not have worked well? Why?
- (3) If we had another bout of high (expected) inflation, do you think that stocks would do as poorly again? Why, or why not?

Short-term Interest Rates as Predictors of Inflation: 1916-91

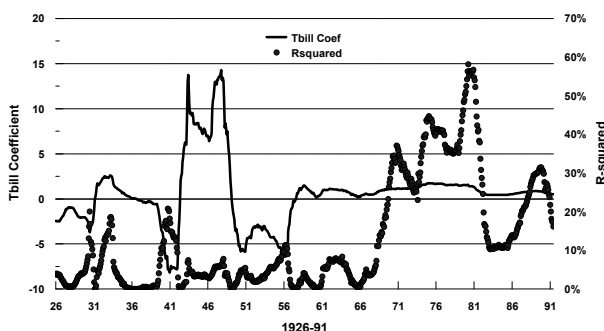
Estimate the regression:

$$\rho(t) = \alpha + \beta B(1,t) + \varepsilon(t), \quad t=1, \dots, T$$

using 10 years' worth of monthly data on inflation $\rho(t)$ and one month Treasury bill yields $B(1,t)$

- then plot the estimates of β and R^2 for month $T+1$
- e.g., use 1916-25 to estimate β and R^2 for January 1926

Short-term Interest Rates as Predictors of Inflation: 1916-91



Short-term Interest Rates as Predictors of Inflation: Summary

1953-71 was a period where expected real interest rates were remarkably constant. Since

$$\begin{aligned} E[r(t)] &= B(1,t) - E[\rho(t)] \\ &= B(1,t) - [\alpha + \beta B(1,t)] \\ &= -\alpha + [1 - \beta] B(1,t) \\ &= -\alpha, \text{ when } \beta = 1. \end{aligned}$$

When β doesn't equal 1, or if past inflation also helps predict $\rho(t)$, then the expected real rate of return varies over time

Short-term Interest Rates as Predictors of Inflation: Summary

The chart on the next slide shows the one month nominal interest rate, $B(1,t)$, the expected inflation rate, $E[p(t)]$, and the expected real return on Tbill, $E[r(t)]$

where the expected inflation rate comes from a regression of current inflation on 12 lags of monthly inflation and the current Tbill yield, using the last 10 years of data

$$E[r(t)] = B(1,t) - E[p(t)]$$

Fama's sample period of 1953-71 was unusual in that $E[r(t)]$ seemed relatively constant

