Predicting the Market Risk Premium

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MGT 295F Empirical Methods

Outline

Expected Risk Premium and Marginal Utility of Consumption

- We normally assume that investors require a high risk premium in bad times, when their consumption is low and their marginal utility of consumption is high
- In bad times, investors are reluctant to bet their precious consumption and have to be compensated well for doing so
- In good times, the marginal utility of consumption and the expected risk premium are low
- **Expected market return should be high in recessions and low in expansions**

High Return in Recessions?

- Our historical definition of recessions is backward-looking: recession is the time of bad surprises (selection bias!)
- NBER definition: recession is the time between the peak and the trough of the business cycle
  - Right after the peak, the life could still be good, but it is already recession, because we are heading down
  - Right after the trough, the life is miserable, but the recovery has begun
- When do you get this "high expected return in recessions"? - During early recovery
  - After the bloodshed of 1929-1932, the market made 57.2% in 1933 and 44.7% in 1935
  - The current crisis was followed by the gain of 31.6% in 2009

Predictive Regressions

- What is the proxy for expected market risk premium?
- Rational expectations: next period excess return should be on average right
- Also, EMH says that if returns are predictable, it must be the expected return (aka risk premium) that is predictable

$$MKT_t - RF_t = \gamma_0 + \gamma_1 \Delta GDP_{t-1}$$

- Low GDP growth means low consumption, hence the expected return in the next period has to be high to make us invest - expect $\gamma_1 < 0$

Inflation and Business Cycle

- Main story: if expected inflation is high, we are probably in expansion, so risk and expected returns are low
- Fama and Schwert (JFE 1977) use Treasury bill rate as a proxy for expected inflation
  - Assume that real risk-free rate is constant. Then the nominal T-bill rate is the constant plus expected inflation
  - What you will get from T-bill at time t is already known at time t-1, so we get inflation directly from the prices of Treasuries
  - Inflation expectations from T-bills use all information available to the market

Treasury Bill Yield: FS-77 Updated

Predictive Regression Updated

$$MKT_t - RF_t = \underset{(0.38)}{1.35} - \underset{(0.065)}{0.16}\ TB_{t-1}$$

- Is the slope statistically significant?
- Expected inflation goes up by 1%, expected market risk premium goes down by 0.16% per month - the sign makes sense
- Expected inflation varies by 3-5% peak to trough - the difference in risk premium between expansions and recessions is from $0.16 \cdot 12 \cdot 3\% \approx 6\%$ per year to $0.16 \cdot 12 \cdot 5\% \approx 10\%$ per year

Investing in the Market in February 2011: EMH Take

- In February 2011, the Treasury bill rate was almost zero
- Substituting the zero in the predictive regression, we estimate the expected market risk premium in March 2011 at 1.35% per month, 16.2% per year
- EMH says this predictability is all about risk
- Hence, in March 2011, the market was expected to be almost three times as risky as usual (6% is the historical average risk premium)
- However, with great risk came great reward of 16% per year return
- In reality, the market portfolio made only 0.29% instead of 1.35% in March 2011

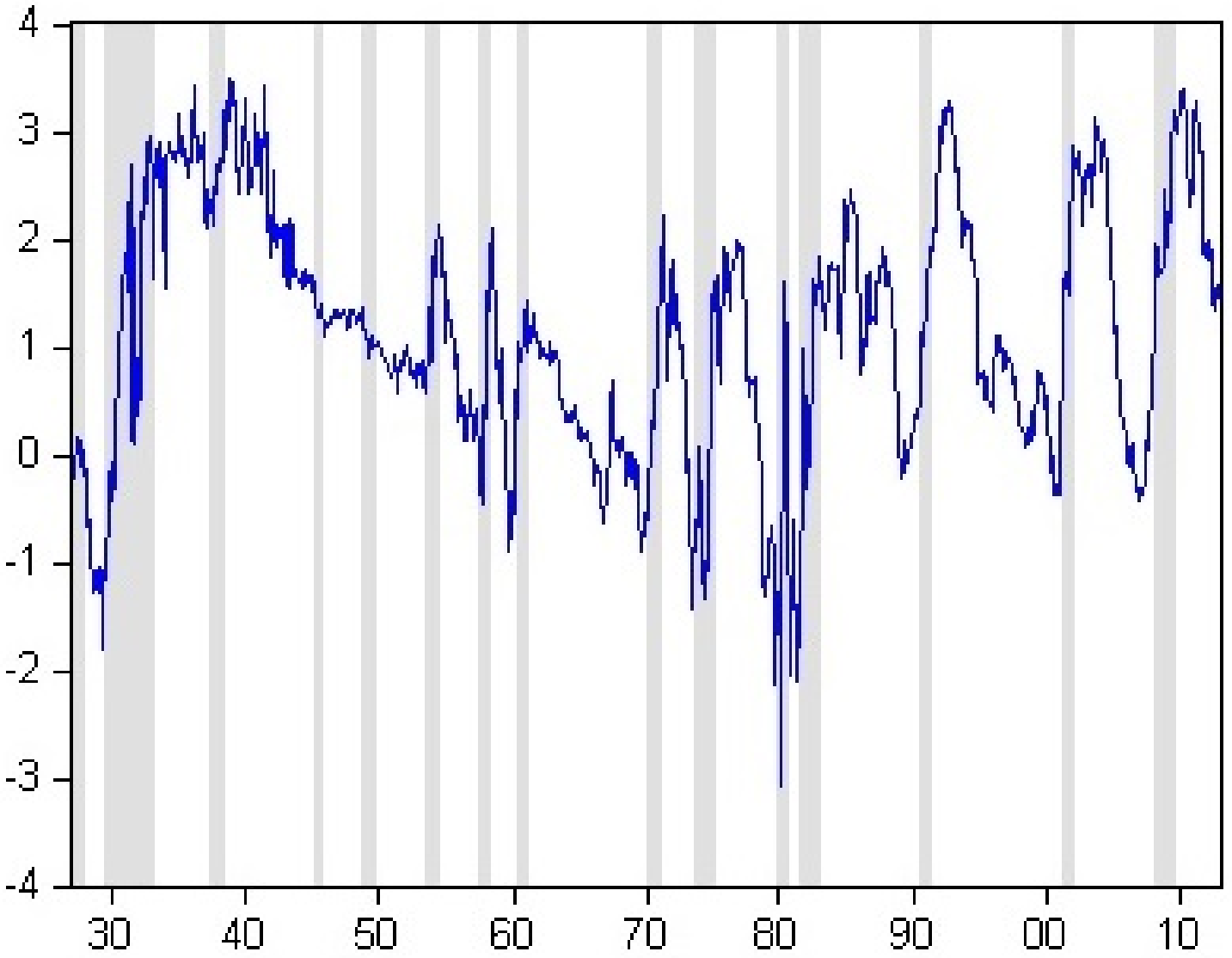
Investing in the Market in February 2011: Behavioral Take

- Behavioral finance says that markets are inefficient and the predictability of returns is one example
- Behavioral people will tell you that the market is the market, and 6% per year,0.5% per month risk premium is fair enough in February 2011, if it was fair enough before
- Then 0.85%=1.35%-0.5% is your "free lunch" you can expect to get in March 2011
- You are expected to get 1.35% in March 2011 whatever you think about EMH, but what you think about EMH will determine how cautious you will be to dig in

Term Spread and Business Cycle

- **Term premium** - long-term Treasury bond yield minus short-term Treasury bill yield (say, 10-year minus 1-year)
- If term premium is high, the market expects interest rates to increase
- If we view Treasury rates as a proxy for inflation, high term premium means inflation will pick up - more true about recessions
- If we think the real risk-free rate is also changing, the risk-free rate has to be low in recessions, because the marginal productivity of capital is low in recessions
- Again, high term premium means the risk-free rate will be higher in the future - more true about recessions

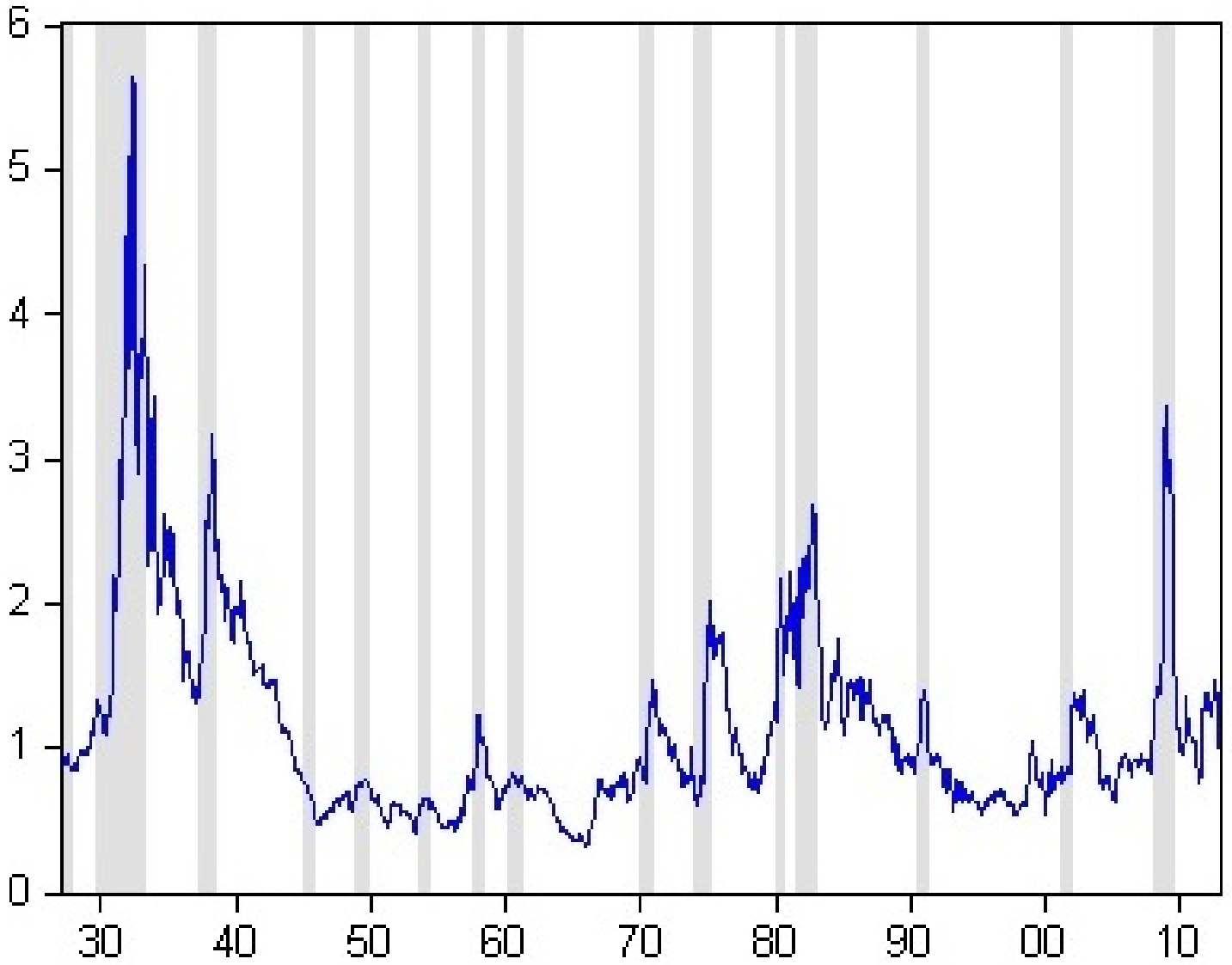
Term Premium: FF-89 Updated



Default Premium and Business Cycle

- **Default premium** - Baa bonds yield minus Aaa bonds yield
  - Moody's Aaa rating - very unlikely to default
  - Moody's Baa rating - moderately likely to default
- Evidently, the risk of default is greater in recessions, so default premium is also greater then
- What should be the sign of the relation between default premium and future market risk premium?

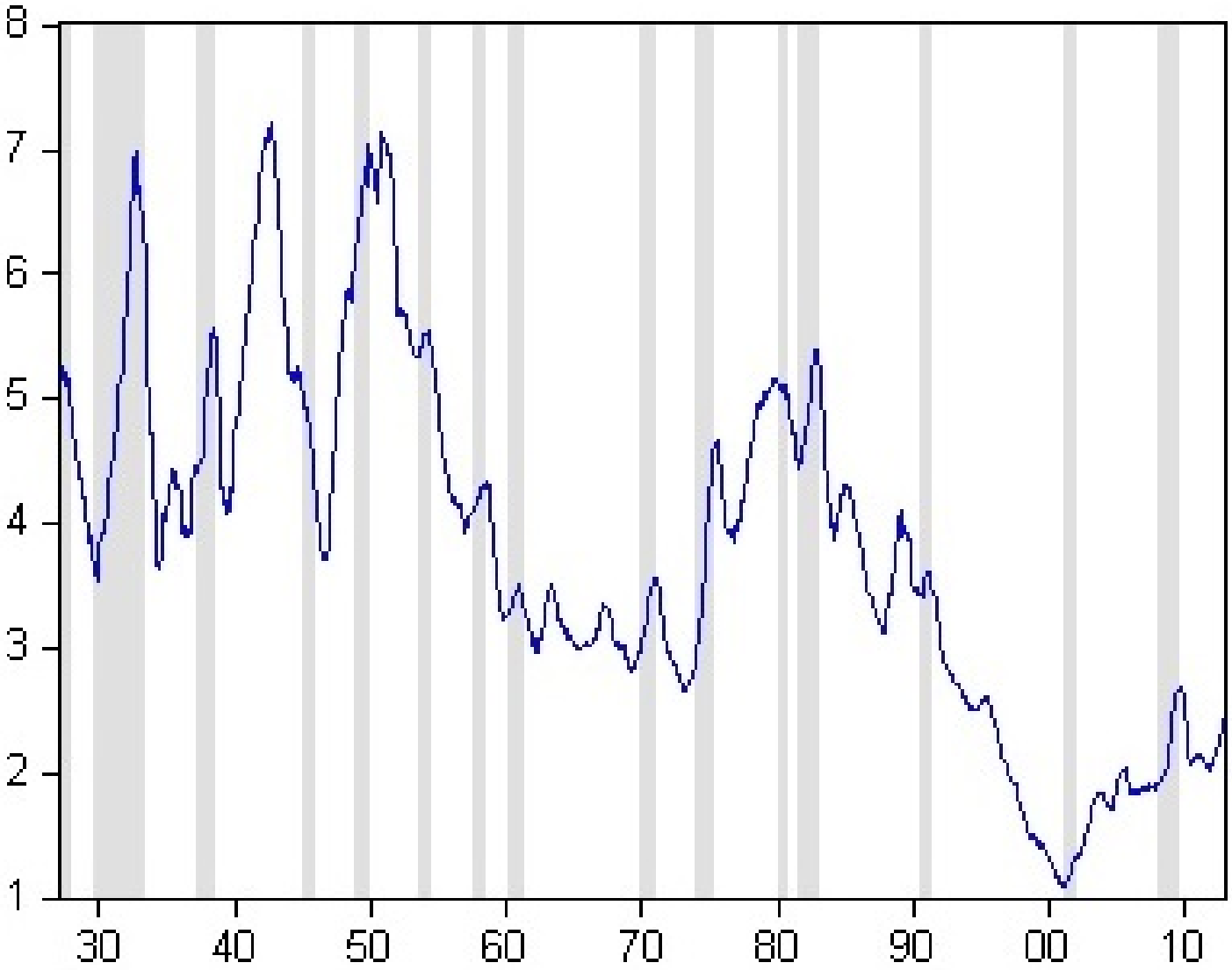
Default Premium: FF-89 Updated



Dividend Yield and Business Cycle

- **Dividend yield** - sum of dividends paid by all firms in the market (usually within the past twelve months) divided by lagged price
- In recessions, prices are beaten down, but dividends are not (dividends are "sticky")
- Hence, dividend yield should be high in recessions
- What should be the sign of the relation between dividend yield and future market risk premium?

Dividend Yield: FF-89 Updated



Predicting the Market Risk Premium

$$MKT_t - RF_t = \underset{(0.62)}{0.19} + \underset{(0.65)}{1.83}\, DEF_{t-1} + \underset{(0.25)}{0.69}\, DIV_{t-1} - \underset{(0.13)}{0.61}\, TB_{t-1} - \underset{(0.23)}{0.43}\, TERM_{t-1}$$

- Higher DEF and DIV mean higher expected market risk premium - makes sense
- Lower TB means higher expected market risk premium - makes sense
- The TERM slope is backwards
- All coefficients are economically significant

Predicting Returns for Individual Stocks

- The regressions above can be used to determine company's cost of capital (if EMH is true) and as a market-timing tool (if EMH is false)
- One can also re-run these regressions at the individual stock level
- Under EMH, the predictive regressions indicate which way the risk of the LHS variable goes in recessions

Predicting Returns for Individual Stocks: Example

- Suppose that for stock X we run regression

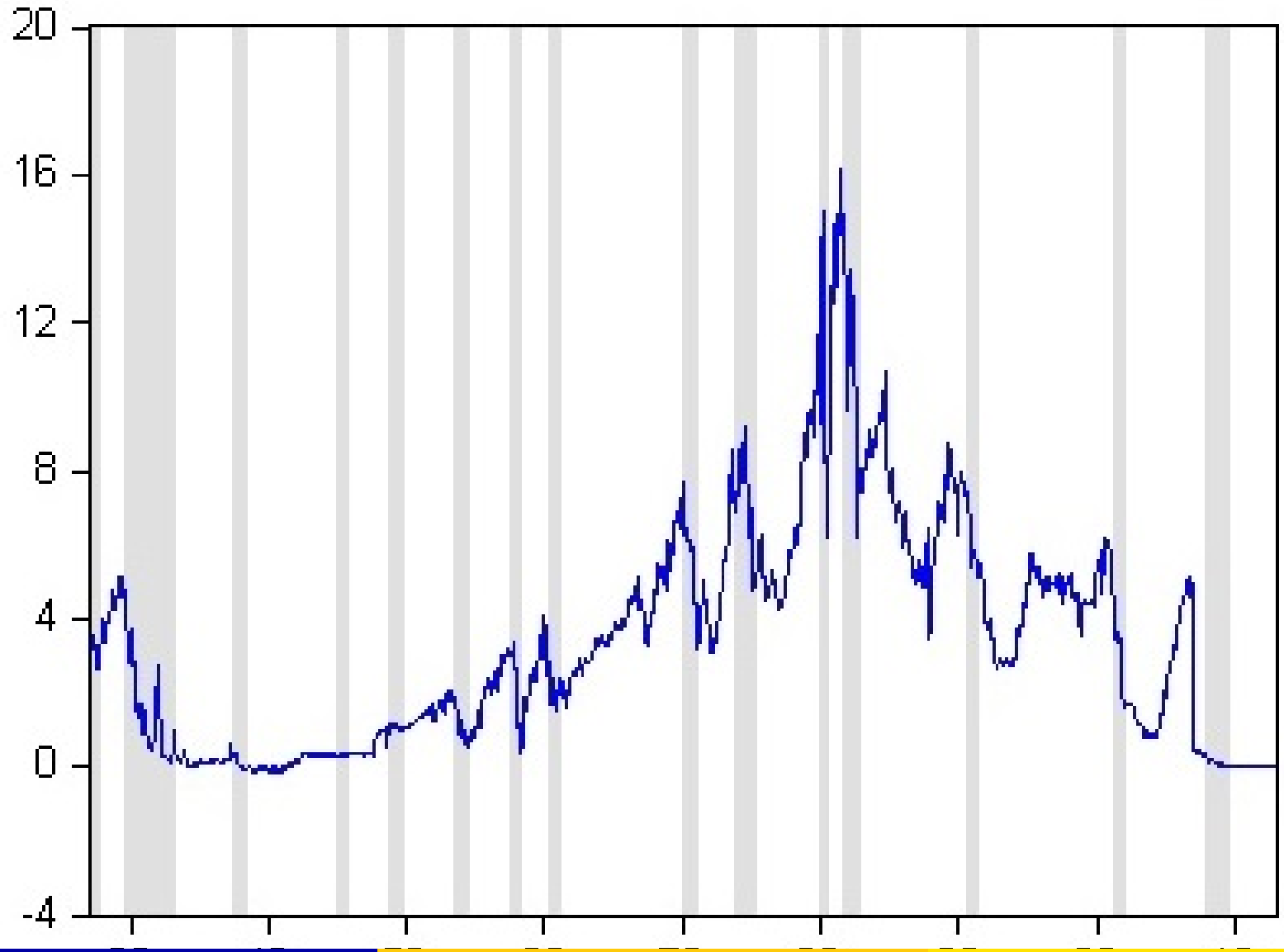
$$Ret_t - RF_t = \gamma_0 + \gamma_1 \cdot DEF_{t-1}$$

- Suppose that we find that $\gamma_1 < 0$
- Which way does the risk of stock X go in recessions?
- Would you rather have the risk of your portfolio increase or decrease during recessions?

Persistent Variables

- Most macroeconomic variables used to predict returns are *persistent* - once they start increasing, they will keep climbing up for a while and will be slow to come back to the average value
- Just eyeball the graph - if the variable frequently forms trends, it is persistent
- Correlation with the variable's own lag (autocorrelation) is a good measure of persistence
- High autocorrelation means high persistence: $Corr(TB_t, TB_{t-1}) = 0.95$

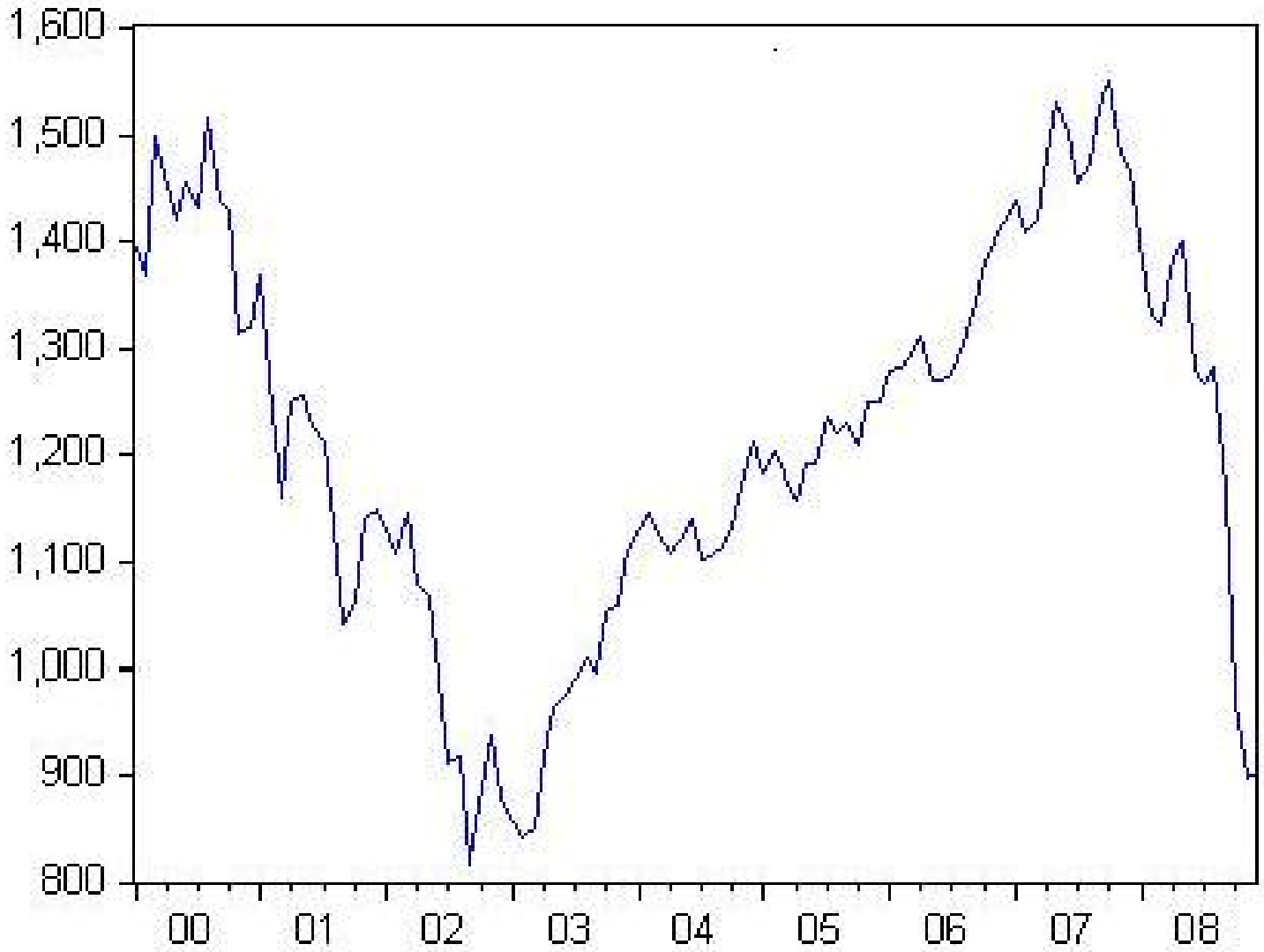
TB Yield: Persistent Variable



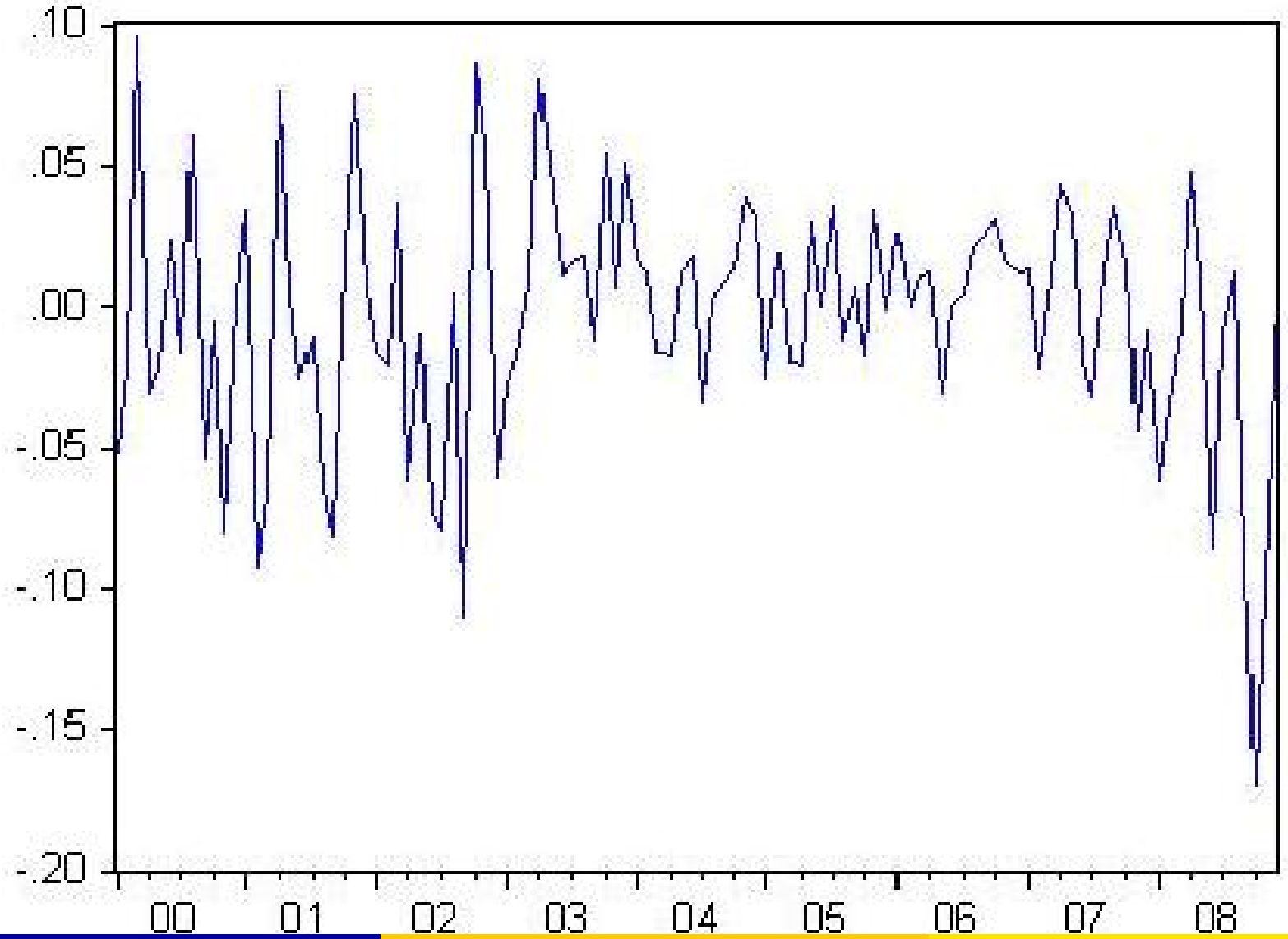
Random Walk and White Noise

- Stock prices are the most persistent of all: they are called *random walk* and have the autocorrelation of 1
- Once they climb up, they stay there and never revert back to the mean
- Which implies that stock returns are *white noise*: they just jump around the average
- White noise means zero autocorrelation: $Corr(MKT_t, MKT_{t-1}) = -0.006$
- Random walk means that autocorrelation starts high and declines like a geometric series as the lag increases, $Corr(S\&P_t, S\&P_{t-1}) = 0.997$, $Corr(S\&P_t, S\&P_{t-2}) = 0.994$, $Corr(S\&P_t, S\&P_{t-12}) = 0.943$

S&P Index: Random Walk



S&P Return: White Noise



Spurious Regression

- When you regress two random walks on each other, the t-stat and R-squared go through the roof, because residuals are random walk too
- This is *spurious regression*: even for two unrelated random walks, the t-statistic will be huge
- Example: regress S&P500 level on GDP - the slope will be significant, but it will mean nothing
- Or probably it will mean something - if the residuals are not like random walk

Almost Spurious Regression

- What if you regress white noise on random walk?
- Residuals will be random walk, and you are in trouble again
- Regress S&P500 return on GDP - the slope will be significant, but it will mean nothing
- **Advice #1:** never put random walks (levels of anything with prices) on the right-hand side in predictive regressions, use changes instead
- Same applies, but to a smaller extent, if the right-hand side variable is very persistent (like the Treasury bill rate)
- **Advice #1a:** take the results from predictive regressions with a grain of salt

Overlapping Horizons

- Macro variables reflect the long-run state of the economy
- Why then we use them to predict returns one month ahead?
- Let's predict returns one year ahead... but we only have 45-80 years
- Why don't we predict returns 12 months ahead each month?

Overlapping Horizons

- In October 1991, predict returns from November 1991 to October 1992
- In November 1991, predict returns from December 1991 to November 1992
- But then, in consecutive months we are predicting almost the same thing - the returns become very persistent
- **Advice #2:** do not believe the strong predictability from the regressions with overlapping horizons, especially if it is not accompanied by predictability at the monthly horizon