A Broad Monetary Services (Liquidity) Index and its Long-Term Links to Economic Activity*

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*The views expressed are those of the speaker and should not be attributed to the Federal Reserve Bank of Dallas or the Federal Reserve System.

What We Do:

- Extend to 1947-1958, monthly, the series formerly known as the M2-level "St. Louis" Monetary Services Index
- Extend to 1929-1946, annual, the same series
- Expand the extended series to include bond and equity mutual funds held by households

References:

Richard Anderson and Barry Jones (2011). “A Comprehensive Revision of the U.S. Monetary Services (Divisia) Indexes.”Federal Reserve Bank of St. Louis *Review*. September/October.

Richard Anderson, Michael Bordo, and John Duca (2017). “Money and Velocity During Financial Crises: From the Great Depression to the Great Recession.” *Journal of Economic Dynamics and Control*.

Task 1: Extension to Earlier Dates

- Anderson and Jones (2011) produced the most accurate (and detailed) historical MSI series, to date, for the United States at the M1 and M2 levels

- The Anderson and Jones data and algorithms are the core of the current Divisia M2 series published by the Center for Financial Stability

Task 1: Extension to Earlier Dates

Anderson and Jones (2011) con't

- Due to data limitations, series began 1967
- Limitations mostly were w.r.t. rates paid on deposits during the Regulation Q era
- Newly compiled data now permits us to build 1947-1966

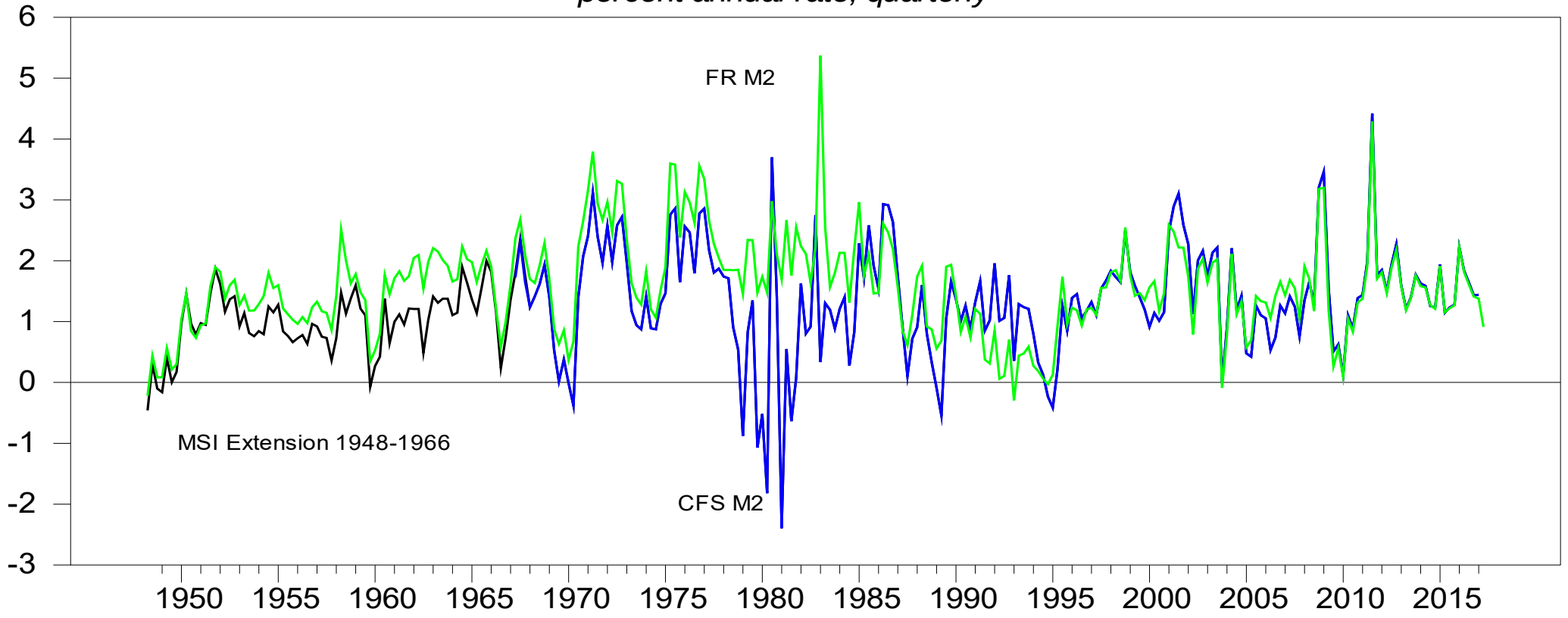
- Benchmark rate
  - Employed two alternative benchmark rates
  - (1) Envelope over included rates + money market rates (incl CP)
  - (2) Envelope + Baa bond yield
  - Plus small liquidity premium

Task 1: Extension to Earlier Dates

- Using a variety of manually collected data from previously unused historical sources, we have extended the quarterly M2-level MSI back to 1947, annual back to 1929
- We feel the quality of the extension is excellent
- To protect our work and intellectual property, we are not disclosing the data and methods until publication.

FR M2, CFS M2, and Historical Extension

percent annual rate, quarterly

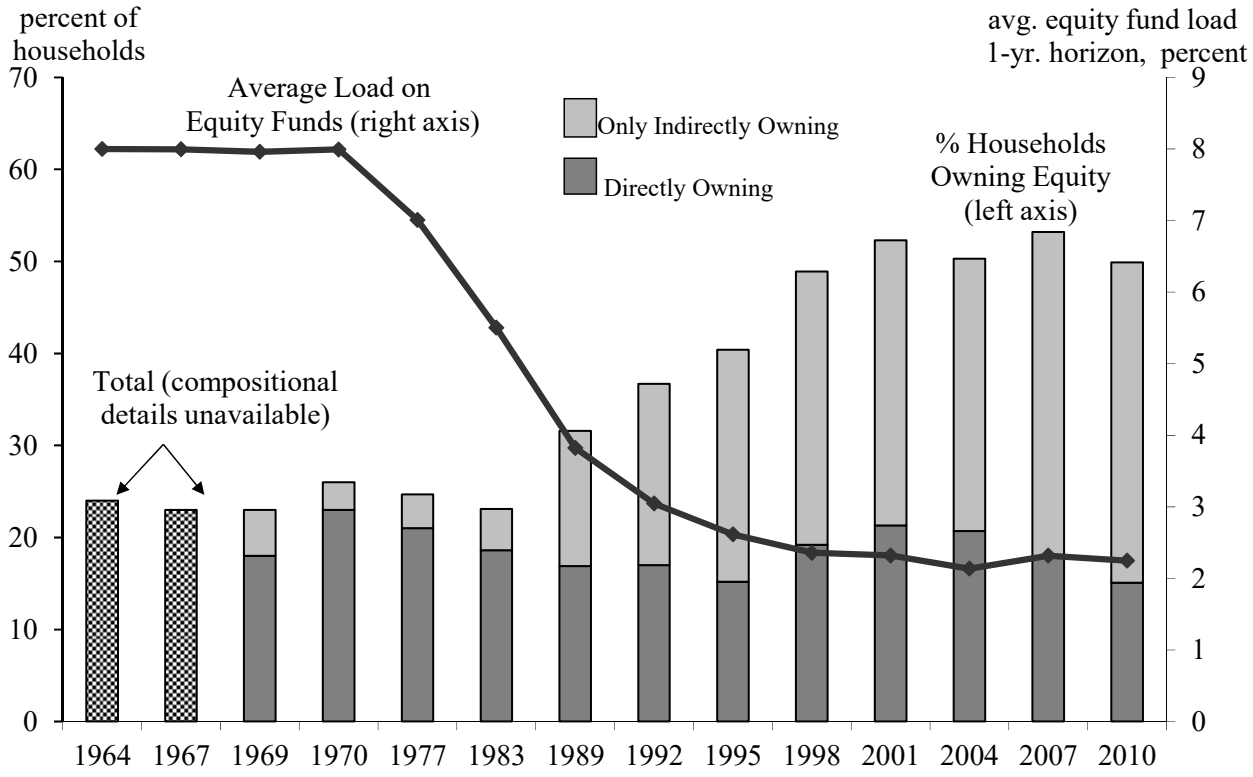


Task 2: Add Bond and Equity Mutual Funds to the MSI

- Anderson, Bordo, and Duca (*JEDC*, 2017) constructed an extended annual M2 series, using current Board of Governors definitions, back to 1929. Essentially, this combined earlier published work by Robert Rasche (1990) with Friedman and Schwartz, *Monetary Statistics of the United States* (1970).
- Follow Friedman and Schwartz in using M2. Also, construct an extended series starting 1929 of M2 plus bond and equity funds.
- For households, bond and equity funds are the most practical way to own non-M2 assets
- Explored the demand/velocity of the M2 aggregate in a VECM/cointegration model.
- Excellent tracking of quantity demanded

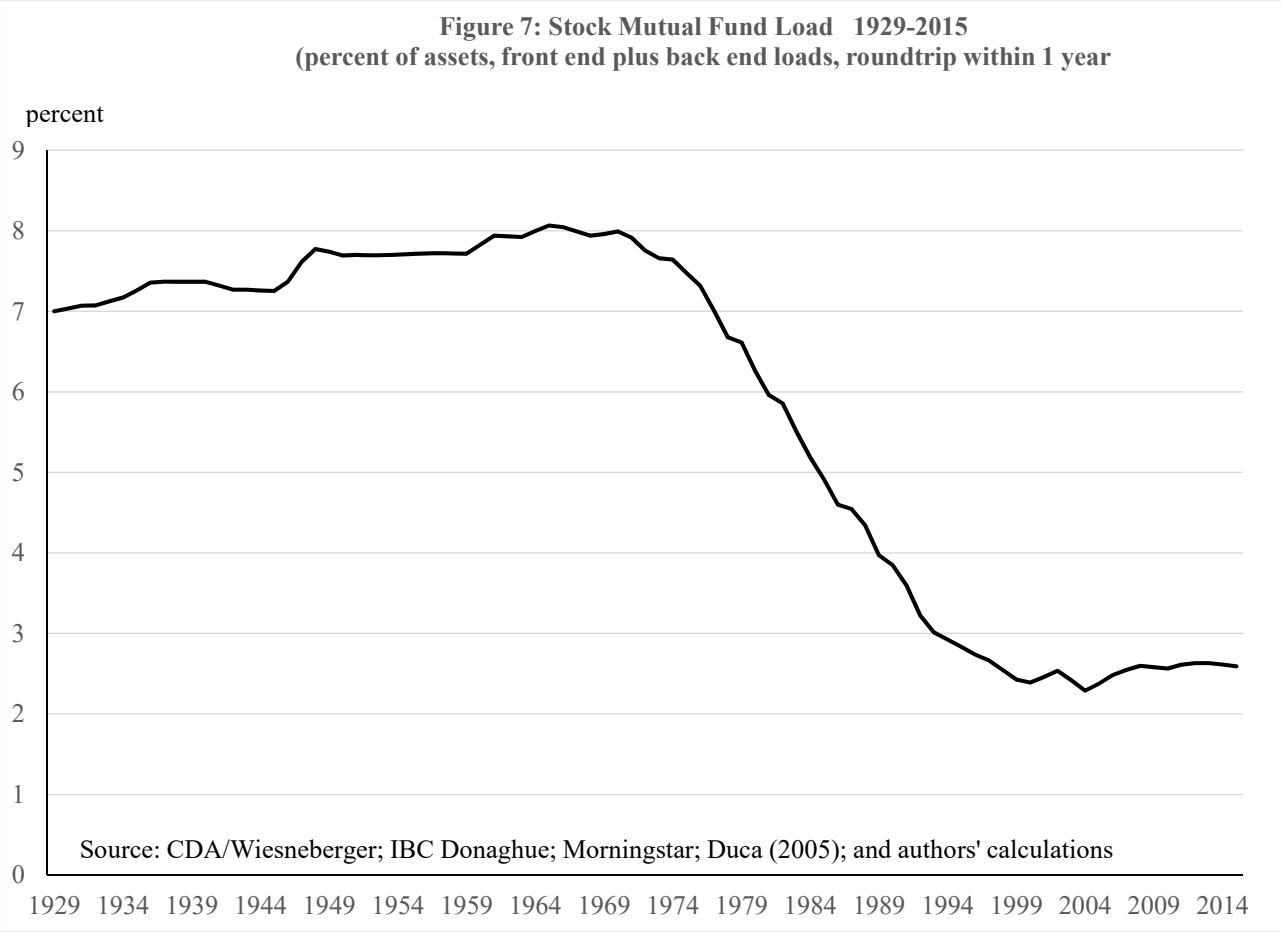
Task 2: Add Bond and Equity Mutual Funds to the MSI

Figure 6: Equity Fund Loads Fall and Stock Ownership Rates Rise



Sources: CDA/Wiesneberger, IBC/Donaghue, Morningstar, Duca (2005), Surveys of Consumer Finances, and authors' calculations.

Task 2: Add Bond and Equity Mutual Funds to the MSI



Task 2 (con't)

- In the MSI, including "risky" assets requires an adjustment to user costs.
- Barnett, Liu and Jensen (Macro Dynamics, 1997) explored the risk-adjusted user cost of the services of a monetary asset
- Under risk, the Divisia index becomes an *economic* index number, no longer a *statistical* index number, because it no longer can be calculated only from data – unknown (estimated) parameters necessarily are included
- "Risk" is uncertainty regarding future asset price. Current (beginning of period) price is assumed known.
- Traditional assumption is that future prices of assets that provide monetary services are known with certainty
- When uncertainty regarding the future level of the cost-of-living price index is included, all assets are risky.

Task 2 (con't)

- Extent of risk adjustment depends on degree of risk aversion of investors
- A representative household should be risk neutral ("Owns" the entire economy)
- A risk neutral investor accepts a fair game and accepts a fair game
  - The expected value is his unit price of risk
- A risk averse investor prefers the expected value rather than the fair game and requires a premium to compensate for the loss in satisfaction

Task 2 (con't)

- Under risk neutrality, the adjusted user cost is familiar

$$\pi_{i,t} = \frac{E_t R_t - E_t r_{i,t}}{1 + E_t R_t}$$

- We interpret the expectation operator in a rational expectations sense: The representative investor knows the "true" CDFs of the future prices of the monetary and benchmark assets – i.e., these are statistical expected value operators.
- Other studies have used market surveys and expectations.
- If the CDF of the future price collapses (zero variance), the user cost is the familiar one.

Task 2 (con't)

- Under risk aversion, the most general case is complex.

- But:
  - (1) if the benchmark asset is risk-free (that is, its future price is known with certainty) and
  - (2) either
    - (i) utility is quadratic in consumption or
    - (ii) the bivariate CDF for the future price of asset i and future consumption is Gaussian…

    then the risk-adjusted user cost may be expressed as…

Task 2 (con't)

$$\pi_{i,t} = \frac{E_t R_t^* - \left(E_t r_{i,t}^* - \phi_{i,t} \right)}{1 + E_t R_t^*} \qquad \phi_{i,t} = c_t \left(\frac{-E_t \left[V'' \right]}{E_t \left[V' \right]} \right) Cov \left(r_{i,t}^*, \frac{c_{t+1}}{c_t} \right)$$

where $1 + r_{i,t}^* = \left(\frac{p_t^* (1 + r_{i,t})}{p_{t+1}^*} \right)$ $\qquad 1 + R_t^* = \left(\frac{p_t^* (1 + R_t)}{p_{t+1}^*} \right)$

and $r_{i,t} = \frac{p_{i.t+1} - p_{i,t}}{p_{i,t}}$, $\quad R_t = \frac{P_{t+1} - P_t}{P_t}$ are nominal rates of return

and p^* denotes the price level (or cost of living).

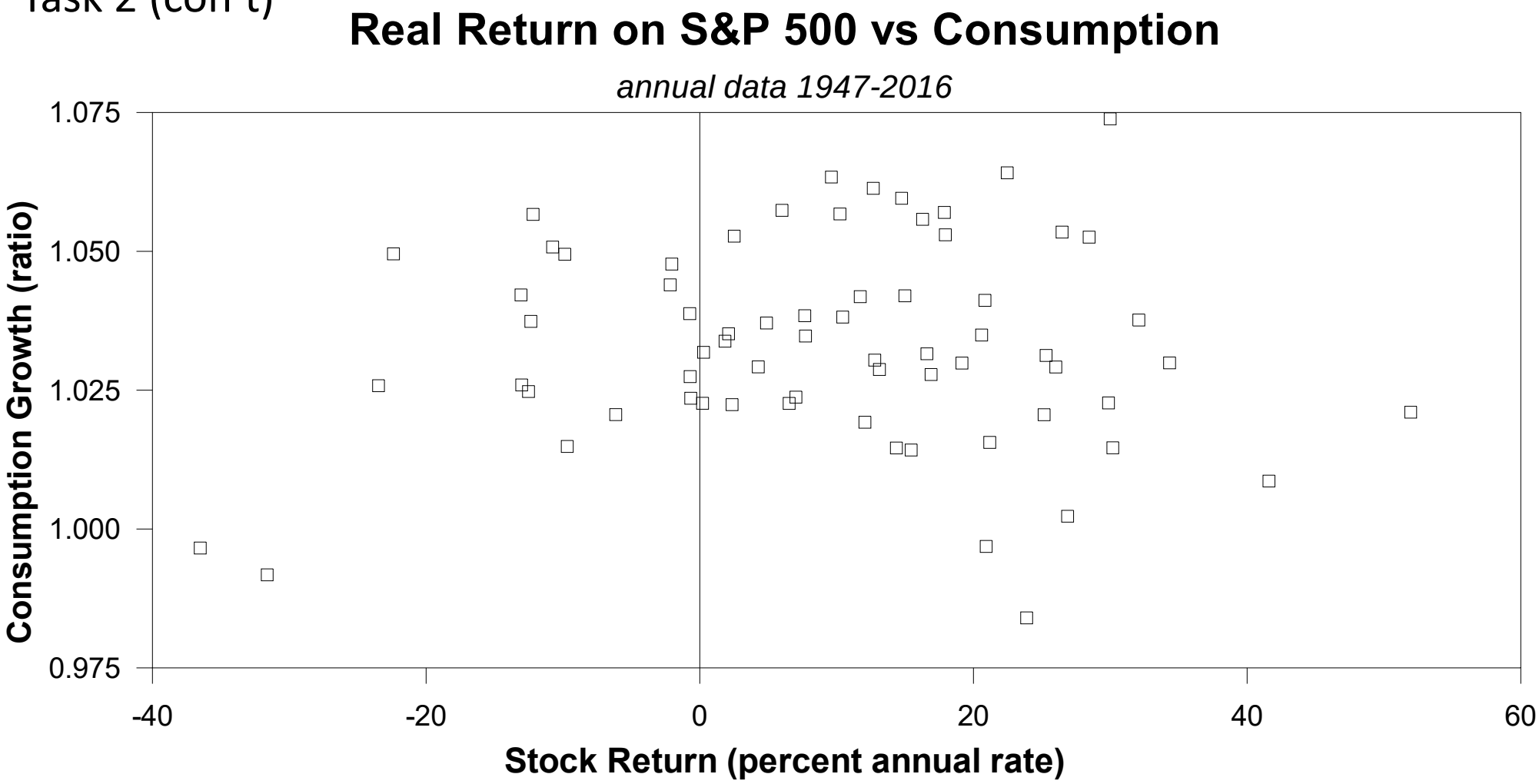
Task 2 (con't)

- The empirical questions:

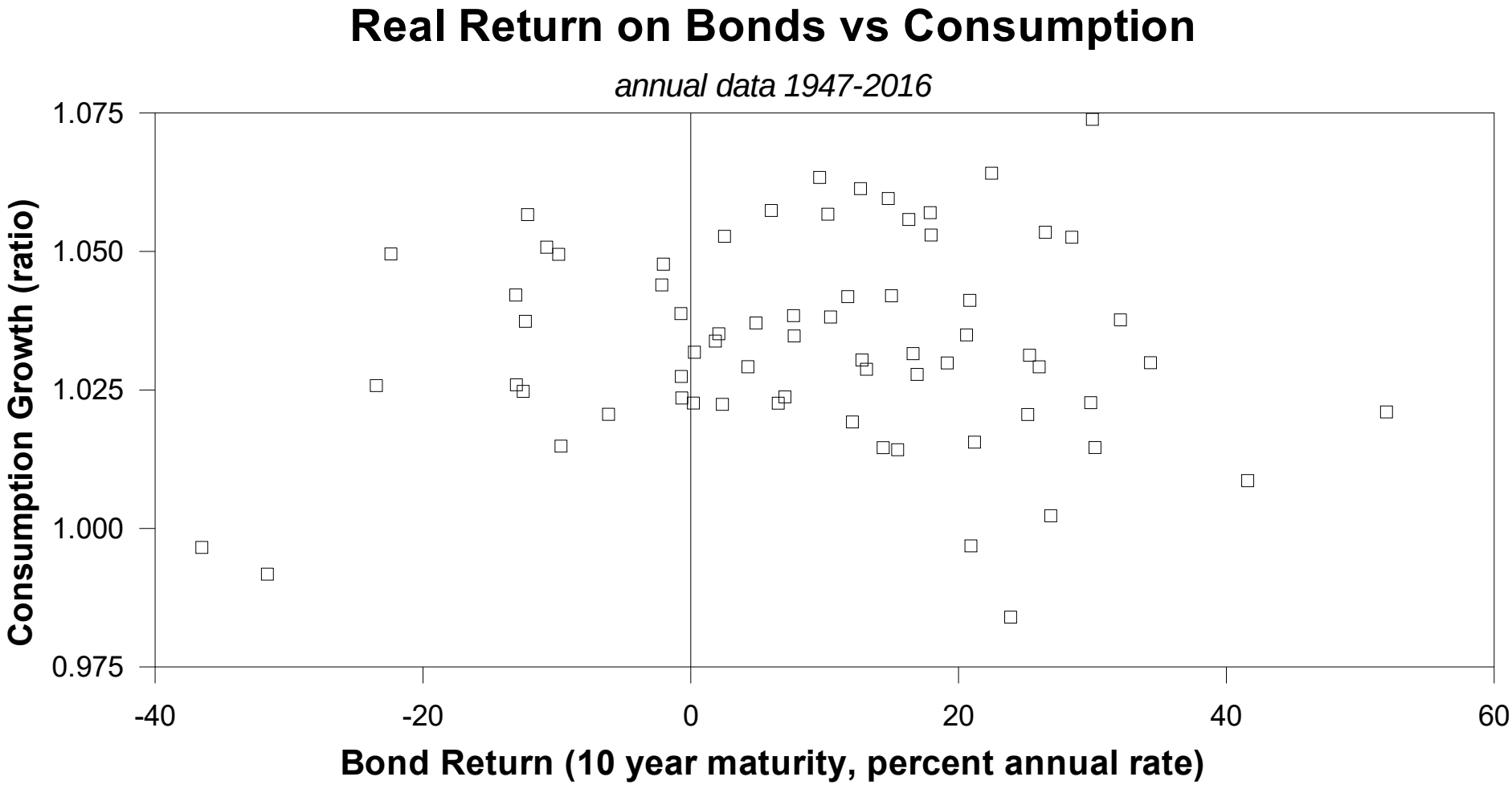
  (1) Does the correction for risk aversion matter?
  - Should it even be included?
  - Why would a representative consumer be risk averse?
  - Simple test: Correlation of returns on risky assets with growth rate of personal consumption expenditures

  (2) How to measure the statistical expected values for the risk neutral case?
  - Assume that perfectly anticipated prices fluctuate randomly and hence returns are martingales or random walks.

Task 2 (con't)


Real Return on S&P 500 vs Consumption
annual data 1947-2016
Consumption Growth (ratio)
1.075
1.050
1.025
1.000
0.975
-40
-20
0
20
40
60
Stock Return (percent annual rate)

Task 2 (con't)


Real Return on Bonds vs Consumption
annual data 1947-2016
Consumption Growth (ratio)
1.075
1.050
1.025
1.000
0.975
-40
-20
0
20
40
60
Bond Return (10 year maturity, percent annual rate)

Task 2 (con't)

Next Installment:

- Explore appropriate level of disaggregation for mutual funds
  - Funds are not perfect substitutes
    - e.g., large cap, small cap, foreign equity funds
    - e.g., corporate bond funds, Treasury bond funds

- Create an acceptable statistical model for the expected rates of return on bond and equity mutual funds

- Build Divisia M2 containing bond and equity mutual funds
  - Bond and equity funds are the margin at which households substitute away from M2-type assets

Thank you