Impact of Interest Rate Changes on Equity Prices: A Review

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Monetarist Foundations of Early Studies

- Theoretical chain of monetary policy transmission articulated by Brunner (1961), Friedman (1961), Friedman and Meiselman (1963), Friedman and Schwartz (1963)

Monetary Portfolio Model

- Assumption: Public seeks to maintain desired balance sheet
- Effect of increase in money supply and decrease interest rates via monetary policy:
  - Public response: reducing money holdings and purchase low-risk fixed income
  - Bond price increase/rate decrease spurs equity and real asset purchases

Graphical Analysis

First performed by Sprinkel (1964) and Palmer (1970) with updated data by Sprinkel (1971)

- Appears to show money supply growth leads stock price growth
  - Implies a profitable trading rule contradicting weak form efficient market hypothesis (EMH) summarized by Fama (1970)
- Major Flaw:
  - Hindsight bias – favorable buy/sell points selected arbitrarily and retrospectively
    - Literally executed trading rule matched buy and hold performance (Rozeff 1974)

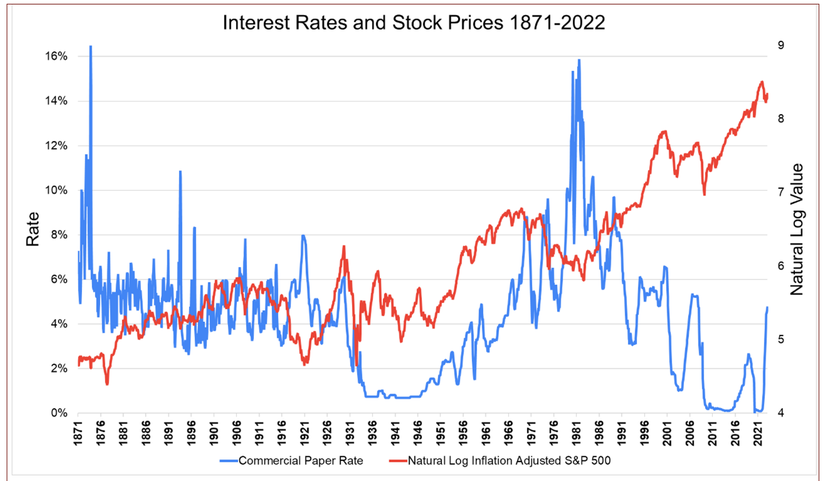
First Regression Analysis

Money supply changes leading stock price changes:

- Palmer (1970) introduced a simple regression analysis
  - Finds a correlation coefficient of 0.44 but does not identify regression variables or methodology
  - Likely autocorrelation from using stock price six month moving avg
- Keran (1971) - complex regression model to predict stock prices
  - Independent Variables: real money, real GNP, "expected inflation", "expected corporate earnings"-> produced by sub-equation
  - Produced R^2 .98 and money supply leading stock prices by 2 qtrs.
  - Major Flaws: (noted by Miller 1972)
    - Low D-W statistic signals misspecification
    - Lag mined with a high-order polynomial fits only sample period
    - Stock and earnings levels (not changes) -> common trend
- Homa and Jaffee (1971) reproduced a simpler equation of Keran (1971)
  - Major Flaws: The same as Keran (1971)
- Hamburger and Kochin (1972)
  - Finds money supply leads stock prices by two quarters
  - Major Flaw: Almon lag use necessarily induces leading result

General Issue: Timing of data

- Money supply data is released with a publication lag
  - Initial estimates are also subsequently revised which are entered in archives
- Studies ignoring this lag produce ex-post rules that are not useful ex-ante and therefore does not disprove the EMH
  - Issue does not theoretically preclude stock prices lagging underlying money supply changes or interest rates



Data Sources: Commercial Paper Rates (FRED: M13002US35620M156NNBR, H0RIFSPPCD07NB, RIFSPPFAAD90NB)
S&P 500: Robert Shiller Dataset http://www.econ.yale.edu/~shiller/data.htm

Subsequent Regression Analysis

Money supply changes lagging stock price changes:

- Cooper (1974)
  - Theoretical reconciliation of the EMH and Monetary Portfolio model
  - Finds a relationship between stock returns and money supply growth
    - Money supply growth lags stock returns by up to one month
- Rozeff (1974)
  - Critique of prior regression analysis
  - Findings consistent with the EMH – money supply changes do not lead stock returns
    - Greatest coefficient is a lag of 2 months – the stock market appears to predict future changes in money supply
- Rogalski and Vinso (1977)
  - Granger causality tests supports a bi-directional theory of causality
    - Causality from stock prices to money supply followed by reverse

Event Study Methodology

Literature Review by Selin (2001)

Examining equity price reactions to periodic monetary policy decisions produces split results between money supply (M1) and interest rates (DR, FF). M1 is problematic because it can also represent money demand.

Table 2. The effect on equity prices of monetary policy announcements.

Study	Instrument	Stock index	Period	Effect of easier monetary policy: Actual	Expected	Unexpected
Waud (1970)	DR	SP	1952–67	pos		
Berkman (1978)	M1	SPCA	1975–77	neg		neg
Lynge (1981)	M1, M2	DJIA	1976–79	neg		
Pearce & Roley (1983)	M1	DJIA	77–79/79–80/80–81			neg/neg/neg
Cornell (1983)	M1	SP	78–79/79–81		none	neg/neg
Smirlock & Yawitz (1985)	DR	NYSE–VW	75–79/79–82	none/pos		
Pearce & Roley (1985)	M1	SP	77–79/79–82			neg/neg
	DR			pos/pos		
Hafer (1986)	M1	SP, S&P 400, and three sector indices	77–79/79–82/82–84		none	neg/neg/neg
	DR			neg/pos/neg		
Hardouvelis (1987)	M1	SP, NYFi, AM, and Value Line	79–82/82–84			neg/neg
	DR			pos/none		
Jensen & Johnson (1993)	DR	CRSP, Financial index	62–79/79–82/82–90	pos/pos/pos		
Thorbecke & Alami (1994)	FF target	DJIA, DJCA, SPCA	1974–86	pos		
Jensen & Johnson (1995)	DR	CRSP, Financial index	62–79/79–91	pos/pos		
Tarhan (1995)	OMO	CRSP	1979–84			none
Thorbecke (1997)	FF target	DJIA, DJCA	1974–94	pos		

DR is the discount rate, FF is the fed funds rate, and OMO is open market operations.

SP = S&P 500, SPCA is the S&P Composite Average, NYFi is the NYSE Financial index, and AM is the AMEX Major Market index.

Replicating Smithers (2009) - Appendix 3

Attributed to James Mitchell

- Claims:
  - Interest rate changes have significant impact on stock price movements for following 3 – 15 months
  - Effect disappears after 18 months – no long term (5+ years) effect
    - Disproving the Fed Model equilibrium long term relationship between prices (p), earnings (e), and interest rates (r)
      - Fed Model defined as: $p_t - e_t = \lambda r_t$ where λ is unity
- Methodology:
  - Vector Autoregressive (VAR) model to estimate coefficients for each variable to calculate an estimate of λ over several lags (2, 6, and 12 months)
  - Testing both nominal and real variables
- Replication Issues
  - Interest Rate – defined as 3-month commercial paper rate from NBER and the Fed
    - Available data series found are discontiguous – 3 different series of data over the stated period
      - 1871- 1970 data series is itself a compilation of multiple series for commercial paper terms of 60-90 days
    - Data after 1970 offer separate series for financial and non-financial commercial paper – unclear which selected by Mitchell
  - VAR Model Structure
    - Log first differences for variables
    - However, formulas for each coefficient also include the intercept term multiplied by a combination of non-first difference prior values of prices minus earnings minus λ times interest rate
      - The formula for rate is missing a λ term
    - Unclear how to estimate λ given its existence only within the formulas of other variables
    - $$\Delta p_t = \alpha_0 + \sum_{i=1}^{P} \alpha_{1i}\Delta p_{t-i} + \sum_{i=1}^{P} \alpha_{2i}\Delta e_{t-i} + \sum_{i=1}^{P} \alpha_{3i}\Delta r_{t-i} + \alpha_4(p_{t-1} - e_{t-1} - \lambda r_{t-1}) + e_{1t}$$
      $$\Delta e_t = \beta_0 + \sum_{i=1}^{P} \beta_{1i}\Delta p_{t-i} + \sum_{i=1}^{P} \beta_{2i}\Delta e_{t-i} + \sum_{i=1}^{P} \beta_{3i}\Delta r_{t-i} + \beta_4(p_{t-1} - e_{t-1} - \lambda r_{t-1}) + e_{2t}$$
      $$\Delta r_t = \chi_0 + \sum_{i=1}^{P} \chi_{1i}\Delta p_{t-i} + \sum_{i=1}^{P} \chi_{2i}\Delta e_{t-i} + \sum_{i=1}^{P} \chi_{3i}\Delta r_{t-i} + \chi_4(p_{t-1} - e_{t-1} - \chi r_{t-1}) + e_{3t}$$
- Unable to produce similar results

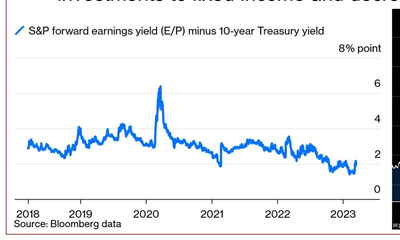
Contemporary Importance – Rate Hiking Cycle

Monetary Policy Makers

- Financial conditions - higher valuations support capital raising and real investment
- Wealth Effect – may alter economic demand by consumers with investments

Investors

- Equity Risk Premium theory suggests rate increases should shift investments to fixed income and decrease equity valuations



Source: Bloomberg data