

The Role of Sentiment in the Economy of the 1920s

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The Mystery of the Great Depression: New Approaches to Economics

- Graham and Dodd:
Security Analysis (1934)

... to specific qualities.
Rather should we say that the market is a *voting machine*, whereon countless individuals register choices which are the product partly of reason and partly of **emotion.**

- Keynes (1936): “animal spirits” or the role of emotion in cognition, emotions unrelated to fundamentals

- DeLong, Shleifer, Summers, and Waldman (1990), Lee, Shleifer and Thaler (1991): evidence of potential deviations from rational behavior in the pricing of financial assets by examining closed-end fund premia
- White (1990) and Rappaport and White (1993): a significant overvaluation of stocks 1927-9
- Greenspan (1996): “But how do we know when irrational exuberance has unduly escalated asset values, which then become subject to unexpected and prolonged contractions as they have in Japan over the past decade?”

Mohammed El-Erian, Sept 29, 2020:

I am reminded of an insight from Bill Gross, my former colleague at Pimco and the fund management firm's co-founder: To succeed as an investor, one needs expertise on economic and corporate fundamentals, investment maths, and **a fine-tuned gut feeling**. Today, the first two are flashing yellow if not red for many investment opportunities. But it is the third one that matters most at this particular juncture.

Measuring sentiment - Literature

- In both the finance and economics literature, research analysing text using a dictionary approach to search for words with positive and negative emotional content has emerged (for example, Tetlock 2007: “The sentiment theory predicts short-horizon returns will be reversed in the long run, whereas the information theory predicts they will persist indefinitely.”)
- Dominguez and Shapiro (2013) analyse newspaper and media sources to detect narrative shifts that could account for the slowness of the economic recovery.
- Soo (2013) quantifies the positive and negative tone of housing news in local newspaper articles about the US housing market, to isolate the roles of sentiment and fundamentals.
- Other research uses the analysis of news media or other digital sources to derive information about future expectations and behaviour (Ramey and Shapiro, 1999; Romer and Romer, 2010; Dominguez and Shapiro, 2013; Choi and Varian, 2012; Haddow et al 2013)
- Sports outcomes and the economy (Edmans 2007)

Related Literature

- Some highly innovative contributions, employing sentiment indicators derived from text analysis of historical newspaper articles.
- Manela and Moreira (2017) use the title and abstract of front-page news articles from The Wall St Journal from 1896 to 2009 and an algorithm trained on words associated with a modern indicator of stock market volatility (VIX) to reconstruct a News Implied Volatility or 'NVIX' time series back to 1896. They show that NVIX predicts future stock returns and conclude that NVIX captures time varying risk premia.
- Garcia (2013) measures the balance of positive and negative sentiment words in two daily financial news columns of The New York Times over the 20th Century, finding generally small but heightened predictive effects on stock returns during recessions.
- Baker et al. (2016) focus on the macro economy and describe a method to construct an 'Economic Policy Uncertainty' (EPU) index, based on analysing the frequency of the words related to government policy and 'uncertainty' in numerous digitized newspaper articles from several different sources. Using a VAR model, they show that their index of uncertainty has an independent effect on the macro-economy from 1920-84.

Application to the 1920s/30s

- Recent work focused on the period in question have also borne fruit.
- Jalil and Rua (2016) use the historical narrative record from newspapers to determine whether inflation expectations shifted during the second quarter of 1933 as the recovery from the Great Depression took hold. Their results indicate that the shift in inflation expectations played a causal role in stimulating the recovery.
- Mathy and Ziebarth (2017) measure the effect of political uncertainty on economic outcomes using the case of Huey Long's tenure as governor and senator of Louisiana during the Great Depression. Based on primary sources they construct stock volatility indexes and newspaper mentions of terms related to "uncertainty" and the economy. Combined with employment data from the Census of Manufactures they suggest the effects of political uncertainty in Louisiana did not have a marked effect on the economy.

Data and Index construction

- The analysis is based on the ProQuest digital archive of The Wall St. Journal (WSJ). The WSJ ProQuest archives consist of individual articles published between 1889 and 1934, which have been digitized and converted to an XML format that is machine-readable.
- In total we analyse 2.4 million articles to give a rich dataset of words for our algorithm to read. There are an average of 4,167 articles per month in the dataset. This equates to 925 million words over the whole sample or 1.7 million words per month.
- Of the average 1.7 million words per month, there are an average of 14,216 emotion words, or less than 0.85 % that register any emotional content.
- The WSJ had an estimated 7,000 readers in 1902 climbing to 50,000 by the end of the 1920s and can be seen as a good source of information for financial market and business professionals, rather than a general readership (Rosenberg, 1982).

How sentiment is measured

- We use a method based on that of Nyman et al (2018)
- 150 words that are associated with 2 emotion groups (approach and avoidance)
- These differ from the traditional standard lexicons in that they were hand selected based on the psychology literature and are unique, based on Conviction Narrative Theory (Tuckett and Nikolic, 2017). This theory assumes that language use indicates subsequent action/behavior by indicating the mental models (narratives) of economic actors. Actors draw on the information, beliefs, causal models, and rules of thumb situated in their social context to identify opportunities worth acting on, to simulate the future outcome of the actions by means of which they plan to achieve those opportunities, and to feel sufficiently convinced about the anticipated outcomes to act, even though they cannot accurately know what the outcomes will be. Narratives give an easy means for actors to communicate and gain support from others for their selected actions as well as to justify themselves.

Word examples

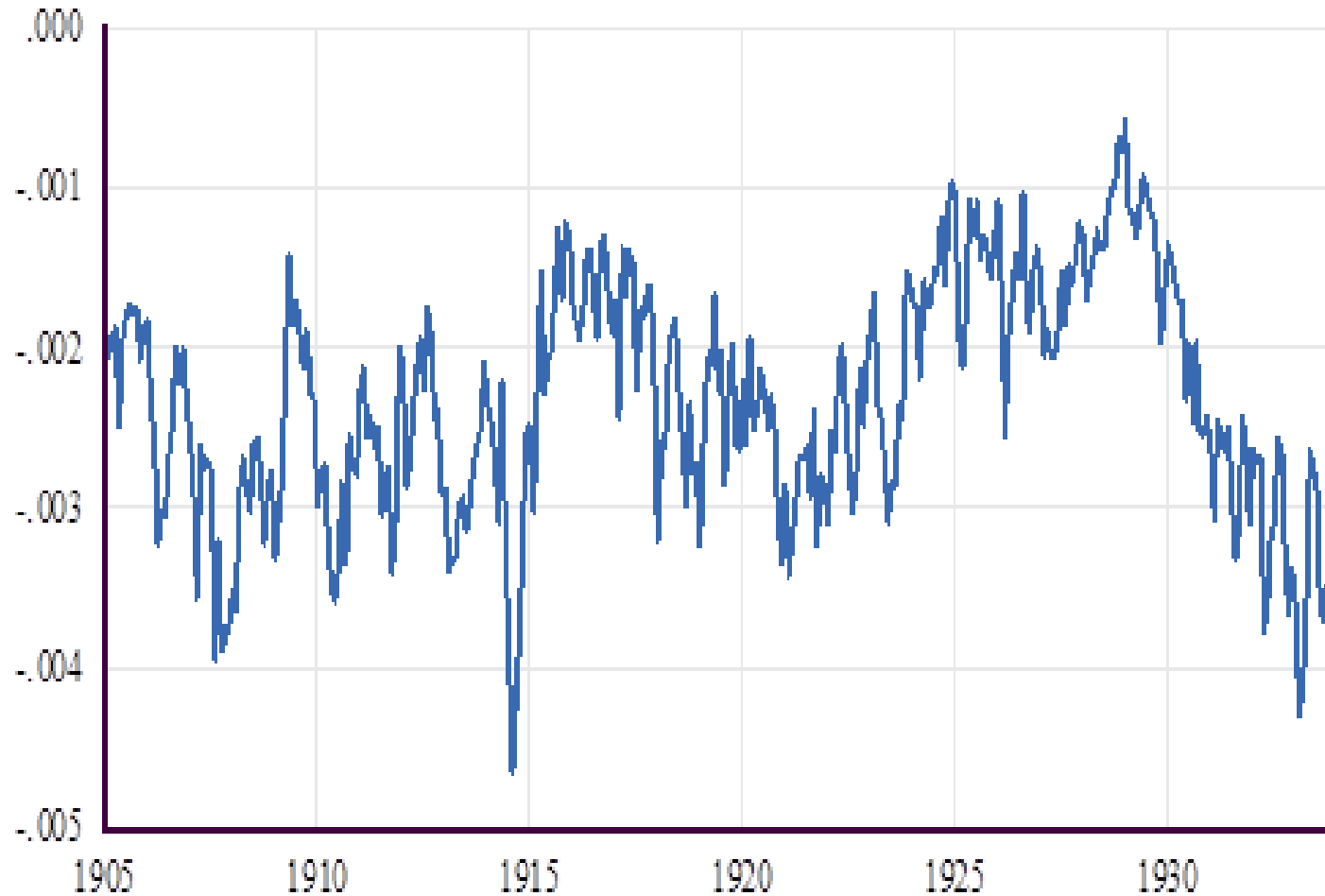
- Excitement/Approach ; ***encouraging, ideal, impress, impressive, incredible, wonderful, animated, confident, fantastic, galvanise.***
- Anxiety/avoidance ; ***terrors, worries, worried, jeopardized, frightened, frightening, hesitant, horrors, peril, phobia, erodes, reject, tense.***

RSS – sentiment index

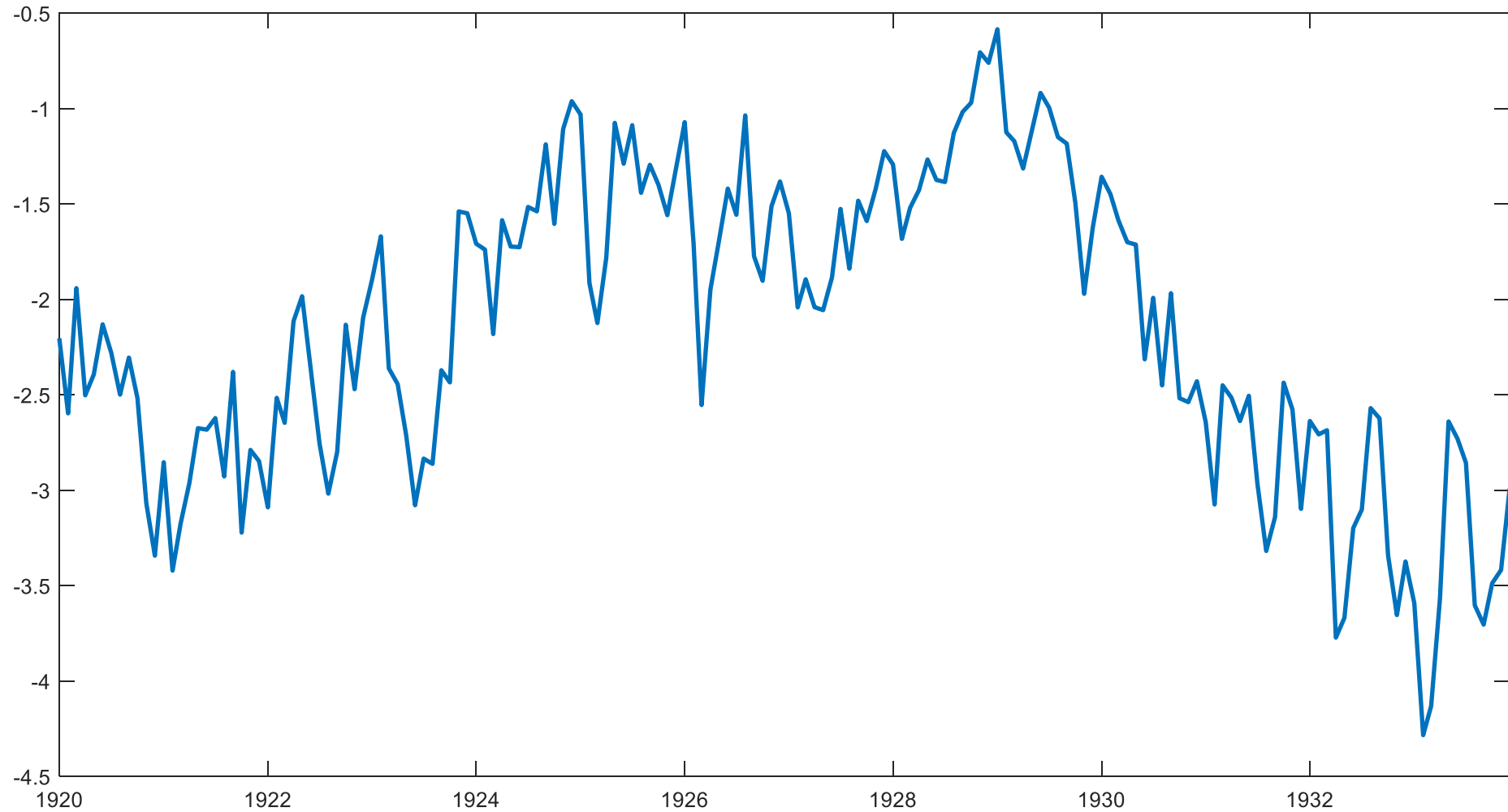
$$RSS[T] = \frac{|Excitement| - |Anxiety|}{Size[T]}$$

- The algorithm uses a “bag of words” method to count the emotion words in news texts
- For the summary statistic of a collection of texts T, we count the frequency of excitement words and anxiety words and then scale these numbers by the total number of words per period.
- To arrive at a single statistic, reflecting the underlying theory of conviction narratives, we subtract the anxiety statistic from the excitement statistic as in . Data are collected at daily frequency but collated at the monthly or quarterly level to ensure a higher signal to noise ratio.

Index of Sentiment for the Wall Street Journal (1905 – 1934)



Index of Sentiment for WSJ: 1920 – 1933



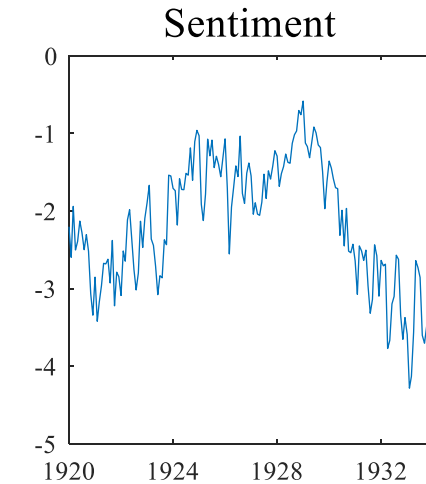
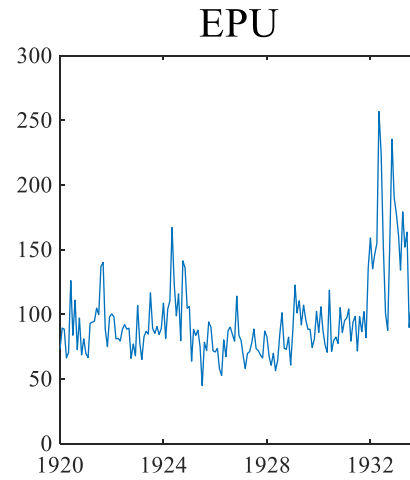
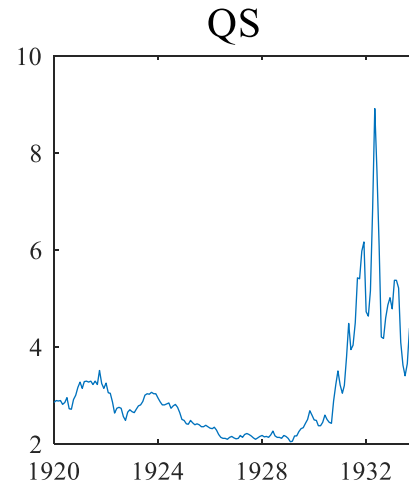
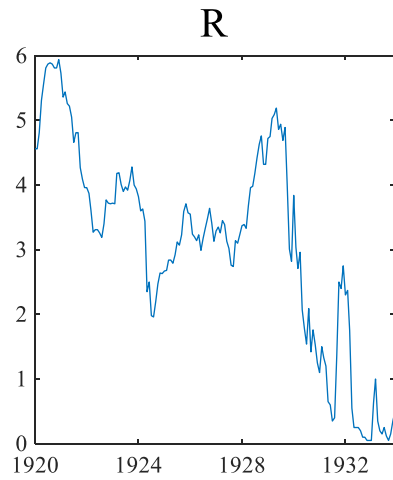
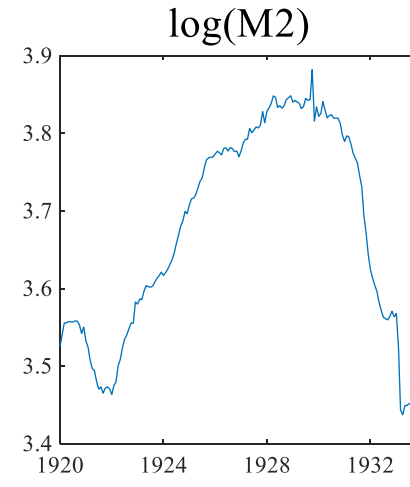
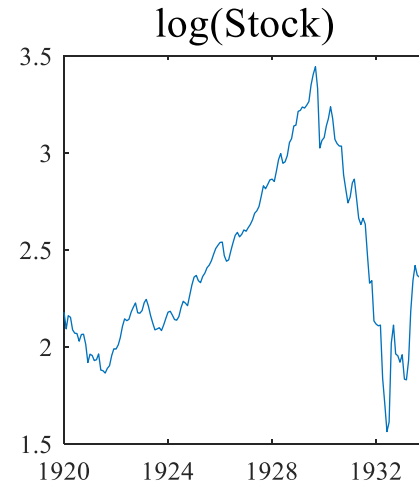
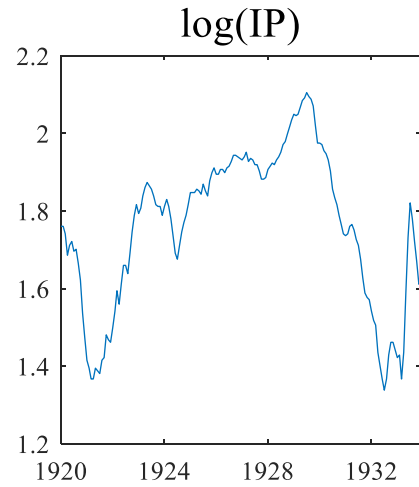
An econometric exploration of the impact of sentiment on the economy in the 1920's and 30's

- In this part of the paper we use the constructed sentiment series in a vector error correction model.
- We identify a shock to sentiment that is orthogonal to a large set of shocks to the economy.
- This “sentiment” shock is the residual after shocks to output, the stock market, the money supply, and other variables are taken into account
- The main econometric question is whether the constructed sentiment series contain information outside of the “usual” explanatory variables

Data Used

- The VEC is built using the following time series:
 - Output (Industrial Production - FRED)
 - The Stock Market (S&P 500 – Shiller, 2017)
 - Money Supply (M2, Friedman and Schwarz, 1971)
 - Price Level (CPI - FRED)
 - Nominal Interest Rate (Cecchetti, 1991)
 - Quality Spread (Baa – Aaa, Bernanke, 1983)
 - Economic Policy Uncertainty (Baker et.al., 2016)
 - Sentiment (authors calculation)

Data Used in Analysis



Data Used

- Monthly frequency
- Sample: Jan -1919 to Dec 1933
- All time series are non-stationary (unit root)
- Evidence of 2 cointegrating (long-run) relationships
 - Sentiment enters both relationships with a statistically significant coefficient.
- Thus, the appropriate econometric model is a vector error correction model (VECM)
 - Information criteria (AIC, BIC) suggests 1 lag in VECM

Econometric Analysis

- In this paper we do the following:
 1. We estimate the VECM for the
 - I. Full Sample (1919-1934)
 - II. 1920's (1919 – June -1929)

 2. Report
 - I. Impulse response functions (orthogonalized)
 - II. Variance Decompositions
 - III. Historical Decompositions
 - I. For whole sample
 - II. For sub-periods

Econometric Analysis (Cont)

- We estimate VECM for the two periods as there is evidence that there is a structural break.
- A Chow test for July 1929 rejects the hypothesis of no-break.
- There are significant changes in the estimation results and the IRF's and decompositions between the two periods
- Note: The sample is too small to get stable results for the VECM using only data after June 1929.
- We report the results for the pre-Crash period in this talk. The results for the full sample are in the paper.

Identification of Shocks

- We identify the “orthogonalized” shocks to the VECM using the Cholesky factorization of the variance-covariance matrix (Sims, 1982)
- The idea is to identify shocks to sentiment that are not due to fundamentals (c.f. Oosterlinck and Landon-Lane, 2007)
- The variables are ordered
 - Output
 - Stock Market
 - Money Supply
 - Nominal Interest Rate
 - Nominal Price Level
 - Quality Spread
 - Economic Policy Uncertainty
 - Sentiment

Identification of Shocks (Cont)

- The first shock is a shock to output
- The second shock is a shock to the stock market that is orthogonal to the output shock.
- The subsequent shocks are orthogonal to earlier shocks
- The last shock is the shock to sentiment. We interpret this shock as the shock to sentiment after controlling for shocks to output, the stock market, money supply, interest rates, prices, the quality spread, and economic policy uncertainty
- We are making it as hard as possible for our sentiment series to have any measureable impact on the variables of the model.

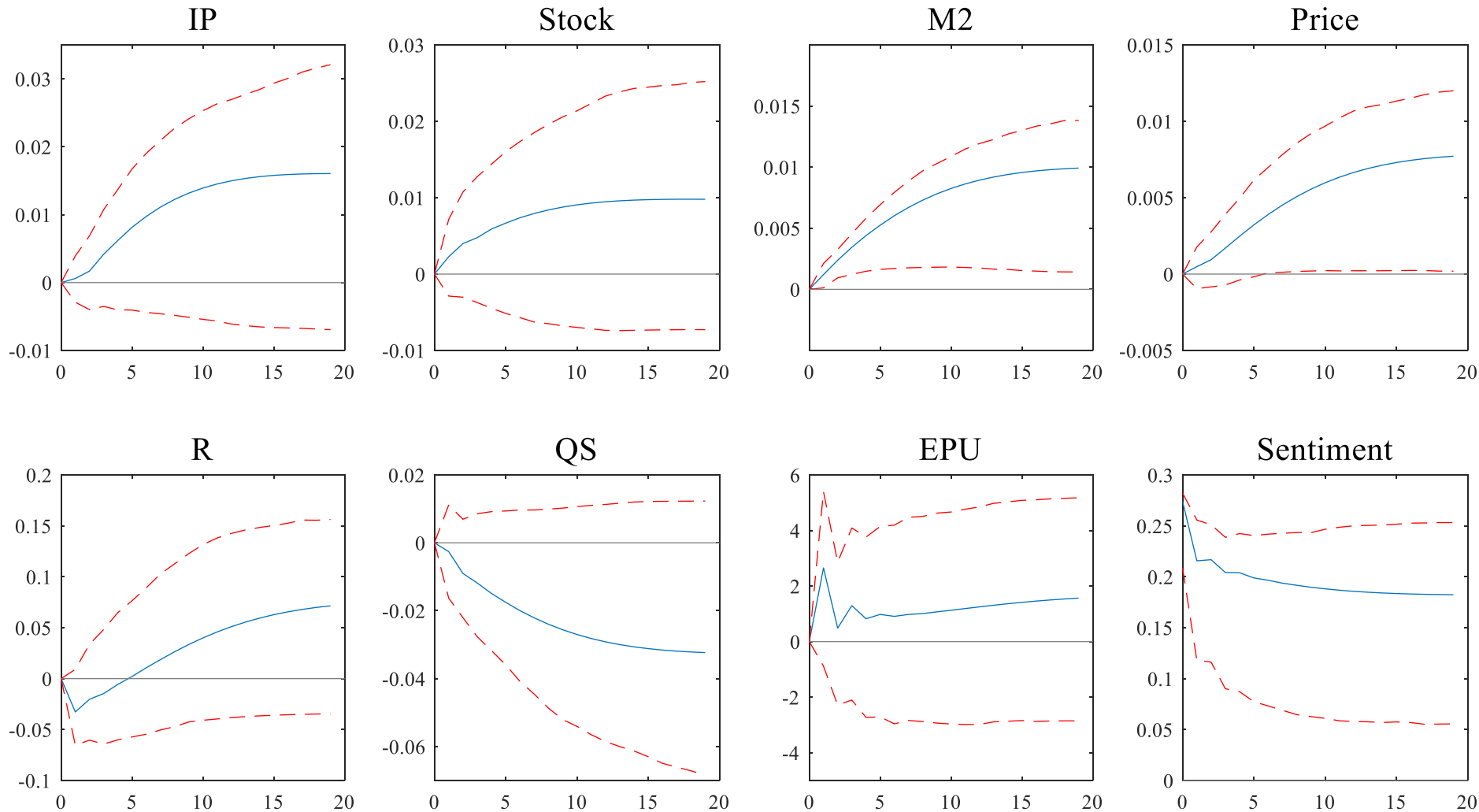
Our Interpretation of the Results

- The full sample is dominated by the post June 1929 period
- When the economy is crashing there is less room for agent's beliefs to be different from “fundamentals”.
- In such periods, sentiment should line up with fundamentals.
 - i.e. everyone knows the state of the economy – it is bad!
- Our identification biases the “explanation” towards shocks higher up the ordering when multiple shocks occur at the same time.
- We next drop the post June 1929 data and re-estimate our model.

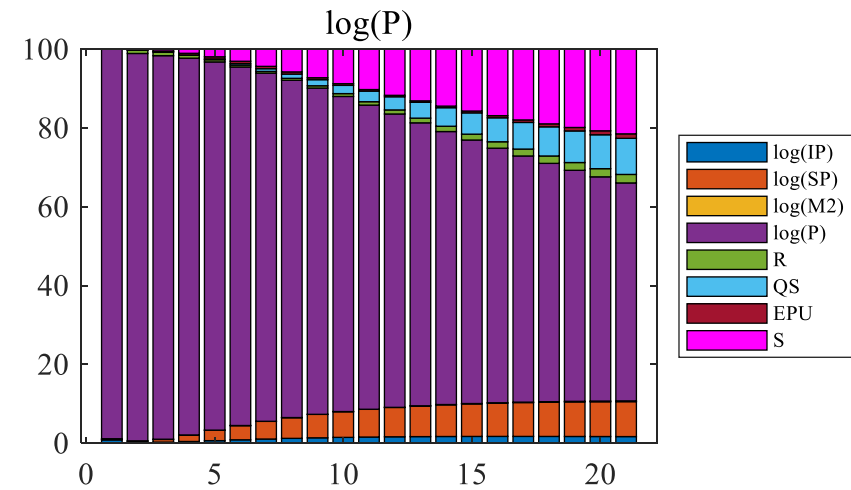
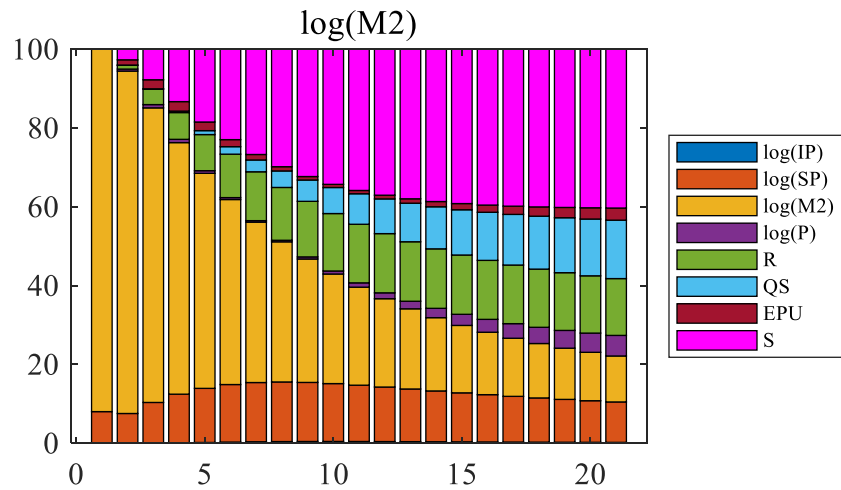
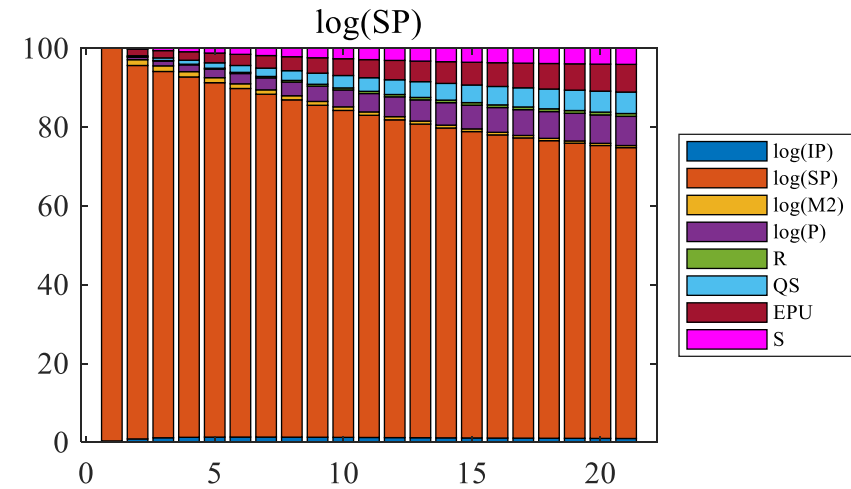
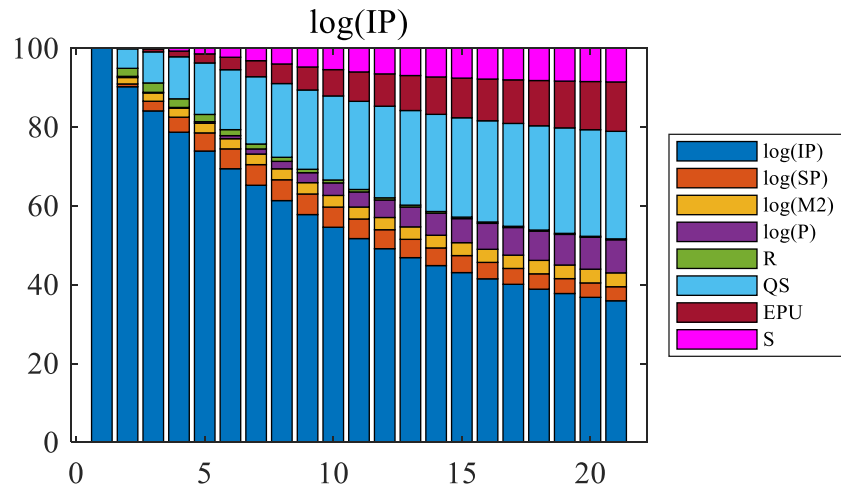
Results for Pre-Crash Sample

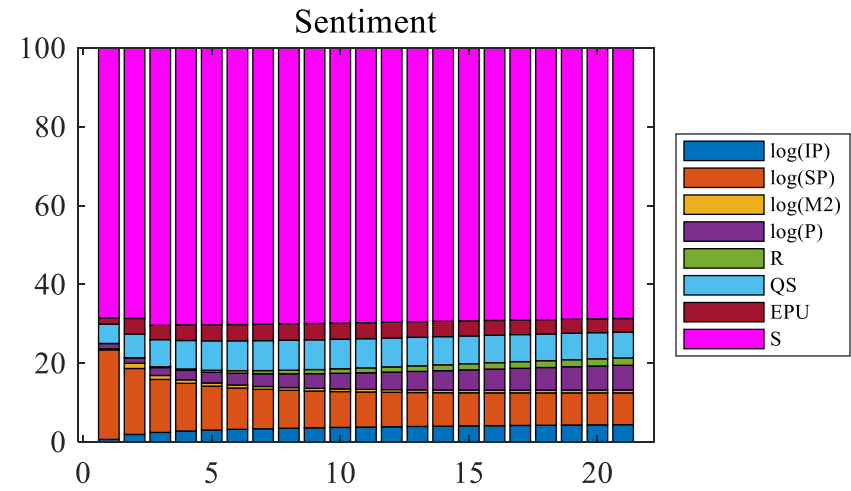
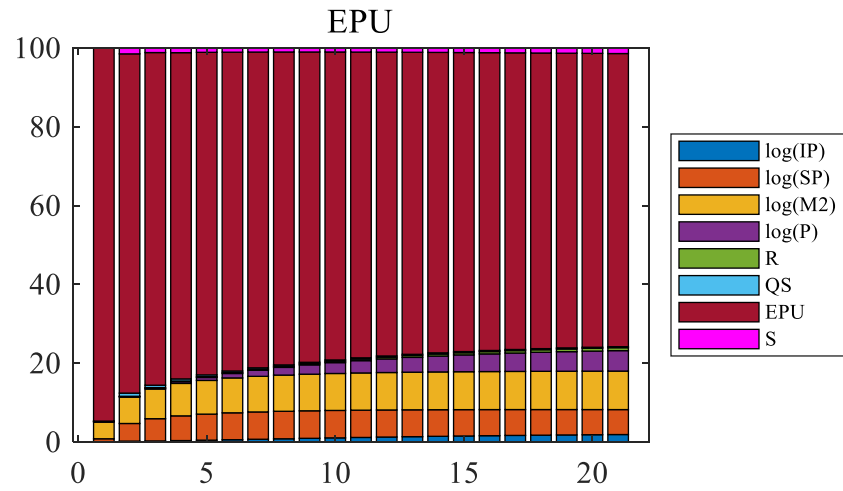
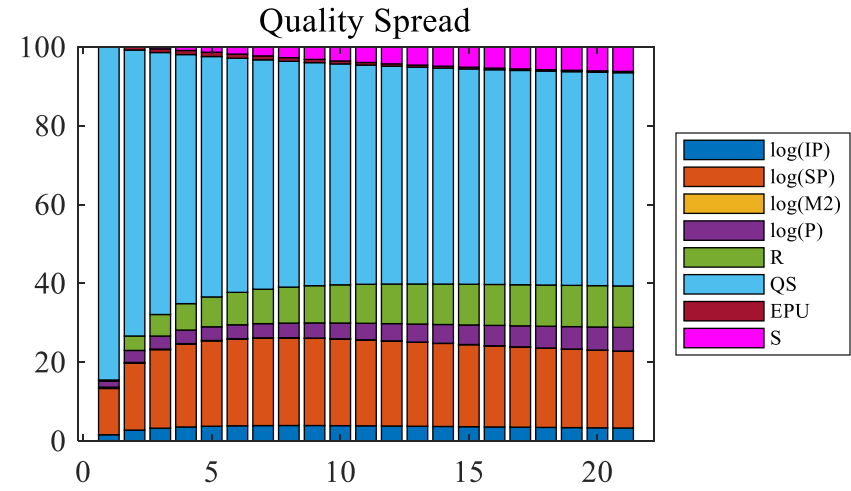
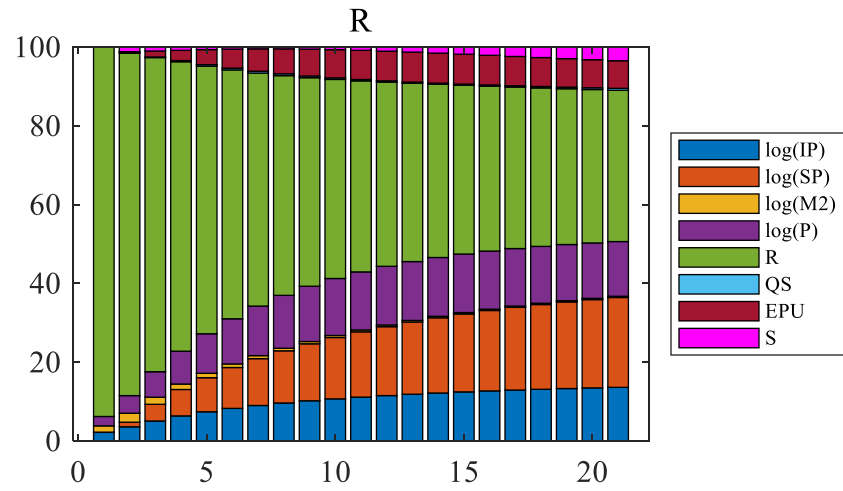
- We estimate the VECM using data from June 1919 to June 1929.
- We find that sentiment does have a role to play in explaining output and the stock market.
- We also break our sample into smaller sub-periods to investigate the impact of sentiment on some interesting periods.

Impulse Response Function of a Shock to Sentiment



Variance Decompositions: Pre-Crash Sample





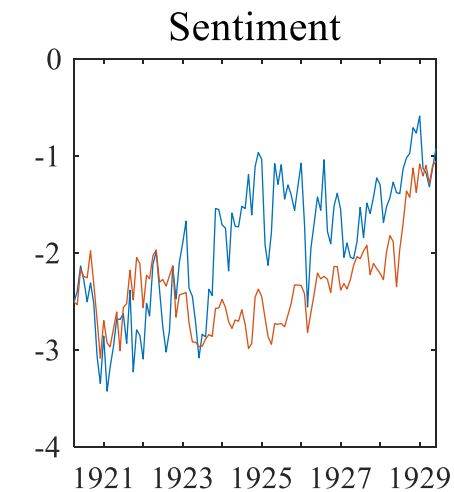
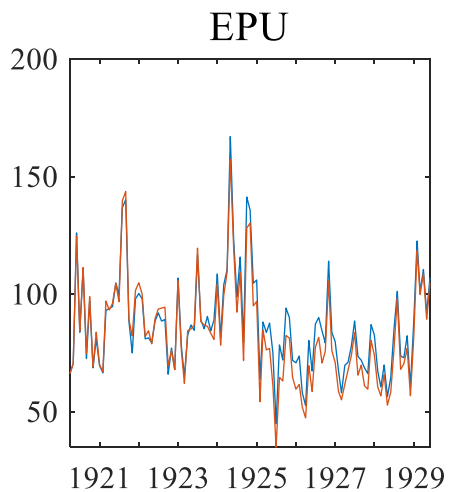
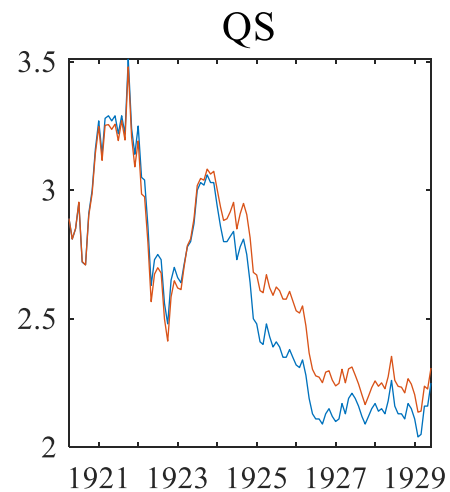
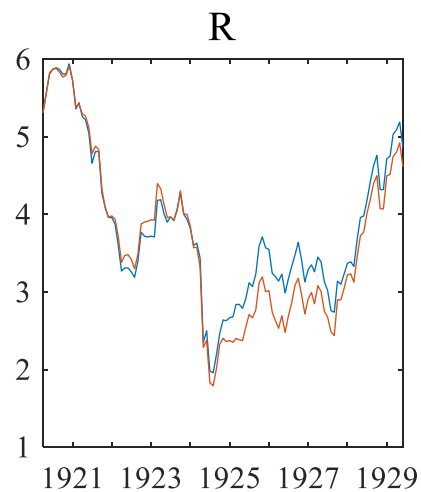
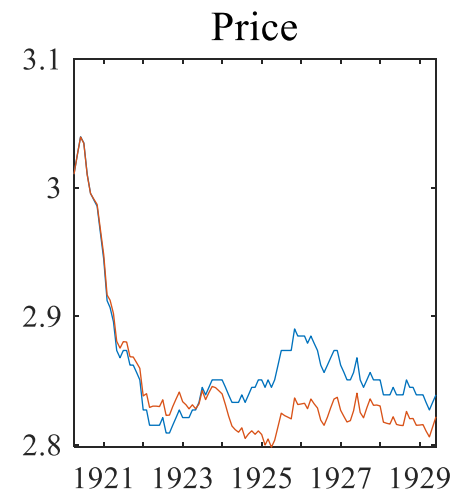
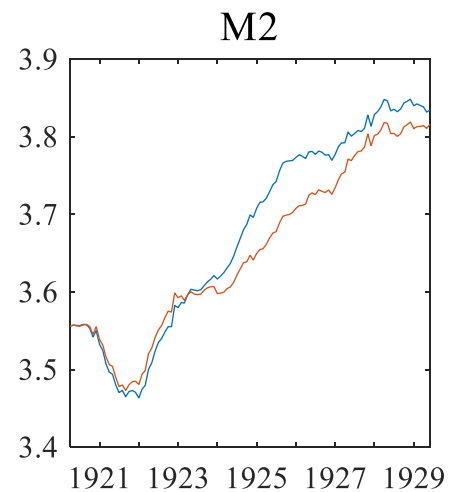
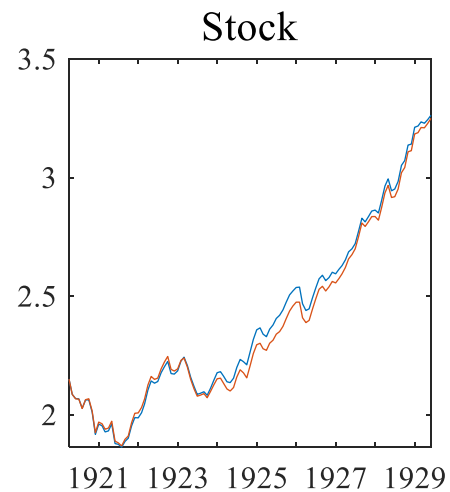
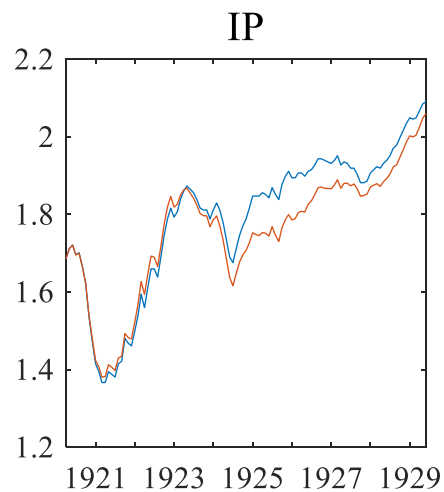
Variance Decompositions (Cont)

- The identified Sentiment Shock explains
 - about 8% of the 1-step ahead forecast error for output after 20 periods (months)
 - about 4% of the 1-step ahead forecast error for the stock market after 20 periods (months)
 - about 40% for money supply
 - about 20% for the price level

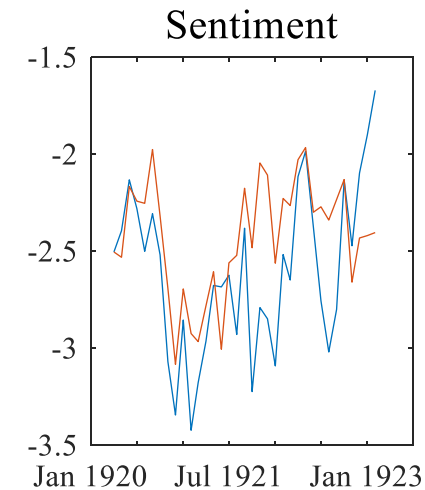
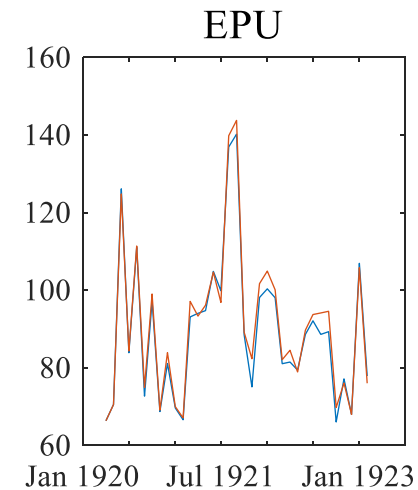
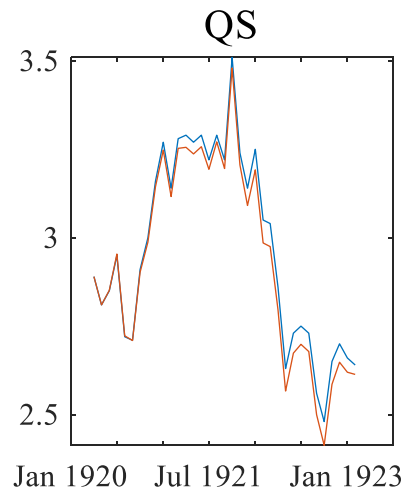
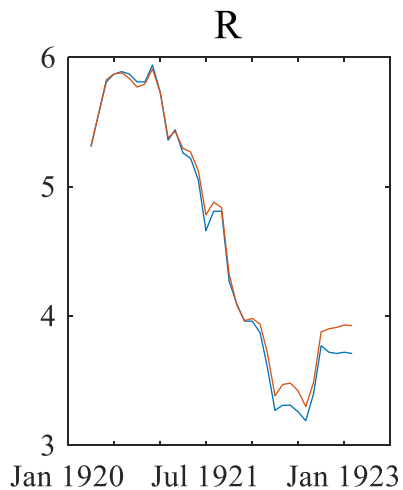
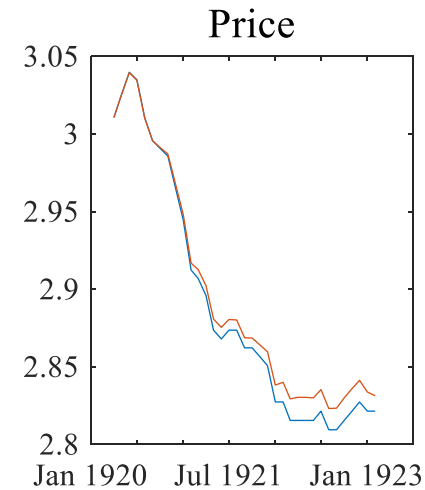
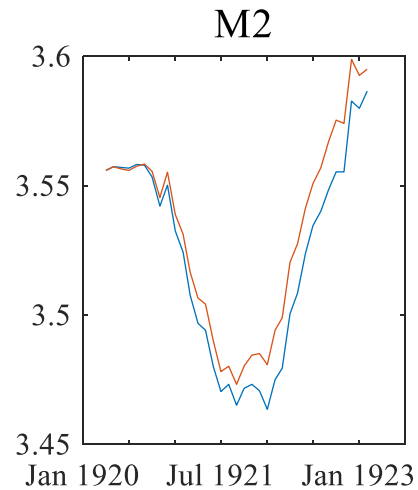
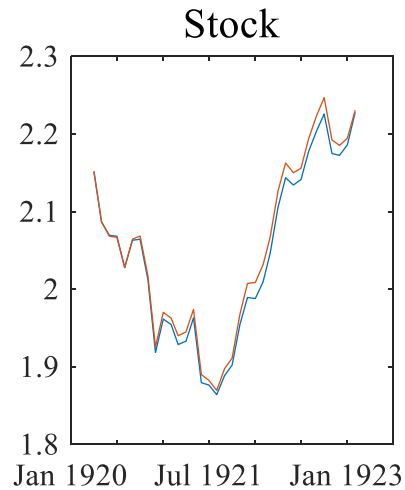
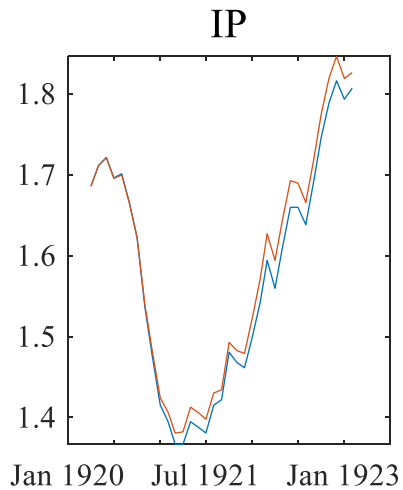
Historical Decompositions

- We construct counterfactual series with the sentiment shock removed.
- We do this for the whole sample and for various sub-samples
- Note that the counterfactual series incorporates the accumulated impact of excluding the sentiment shock
 - For the sub-periods we calculate the impact of removing the sentiment shock starting from the start of the sub-period

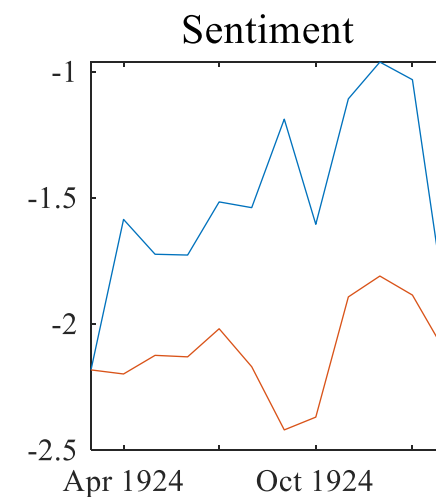
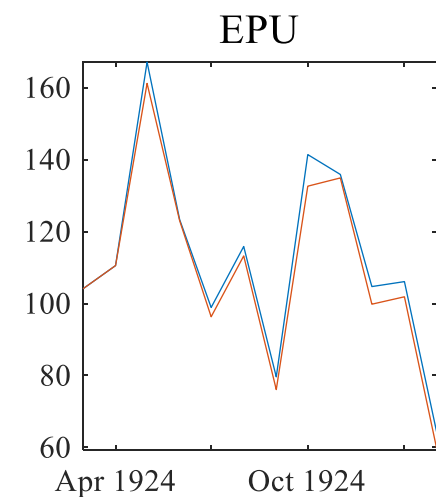
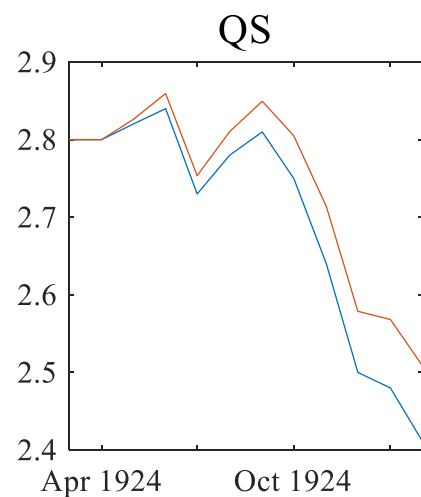
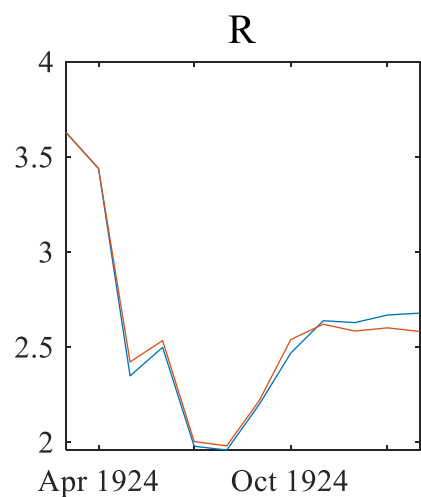
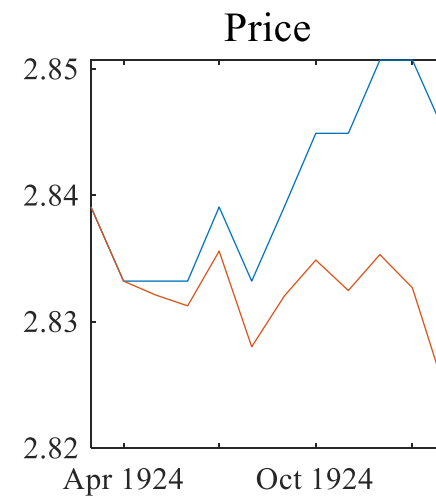
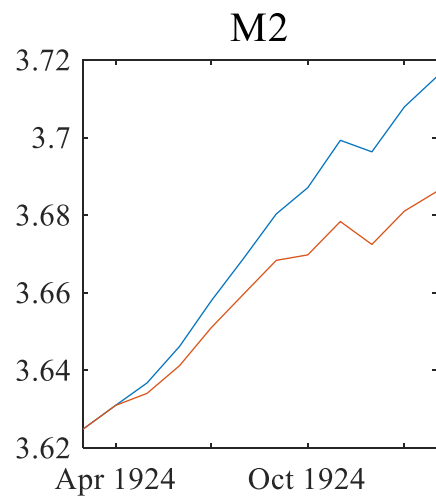
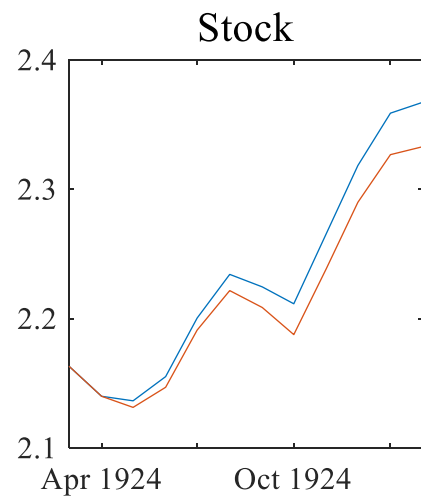
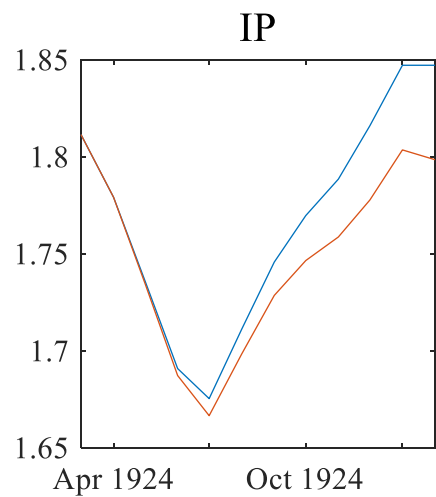
Historical Decomposition: 1920-1929



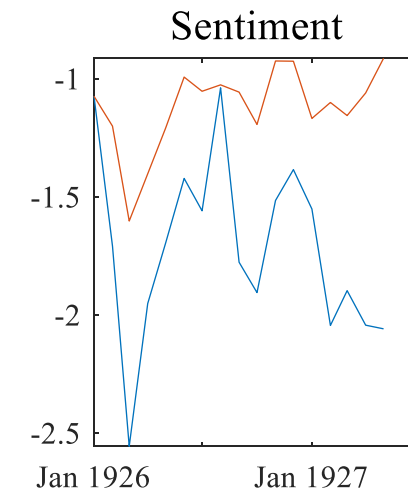
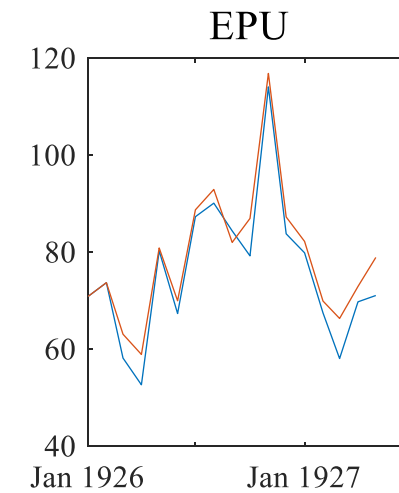
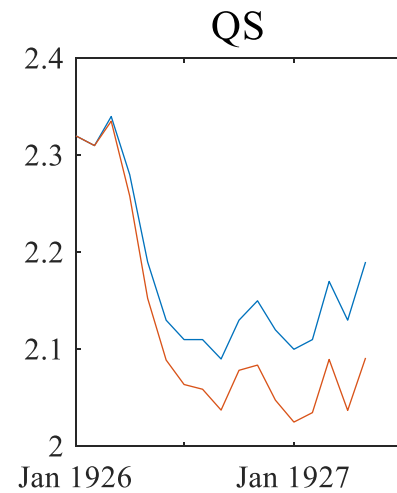
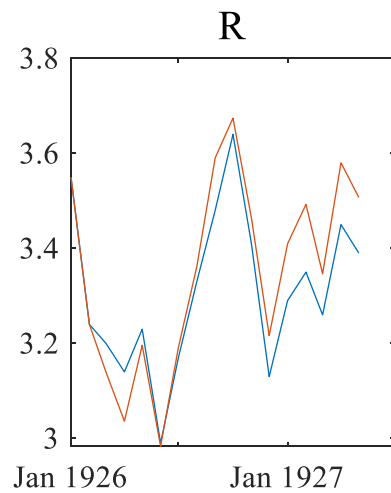
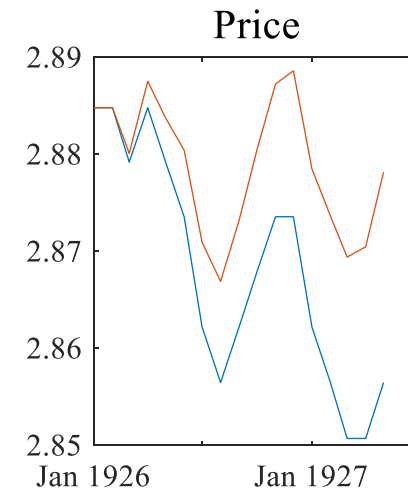
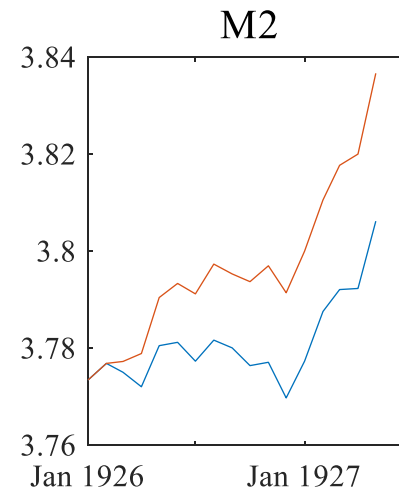
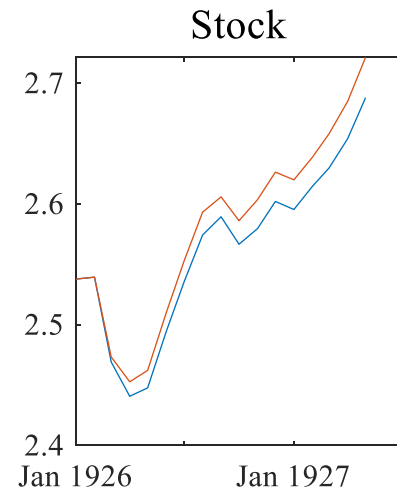
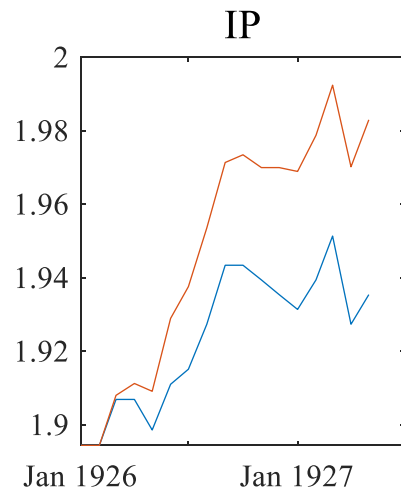
Historical Decomposition: 1920-1922



Historical Decomposition: 1924-1925



Historical Decomposition: 1926-1927

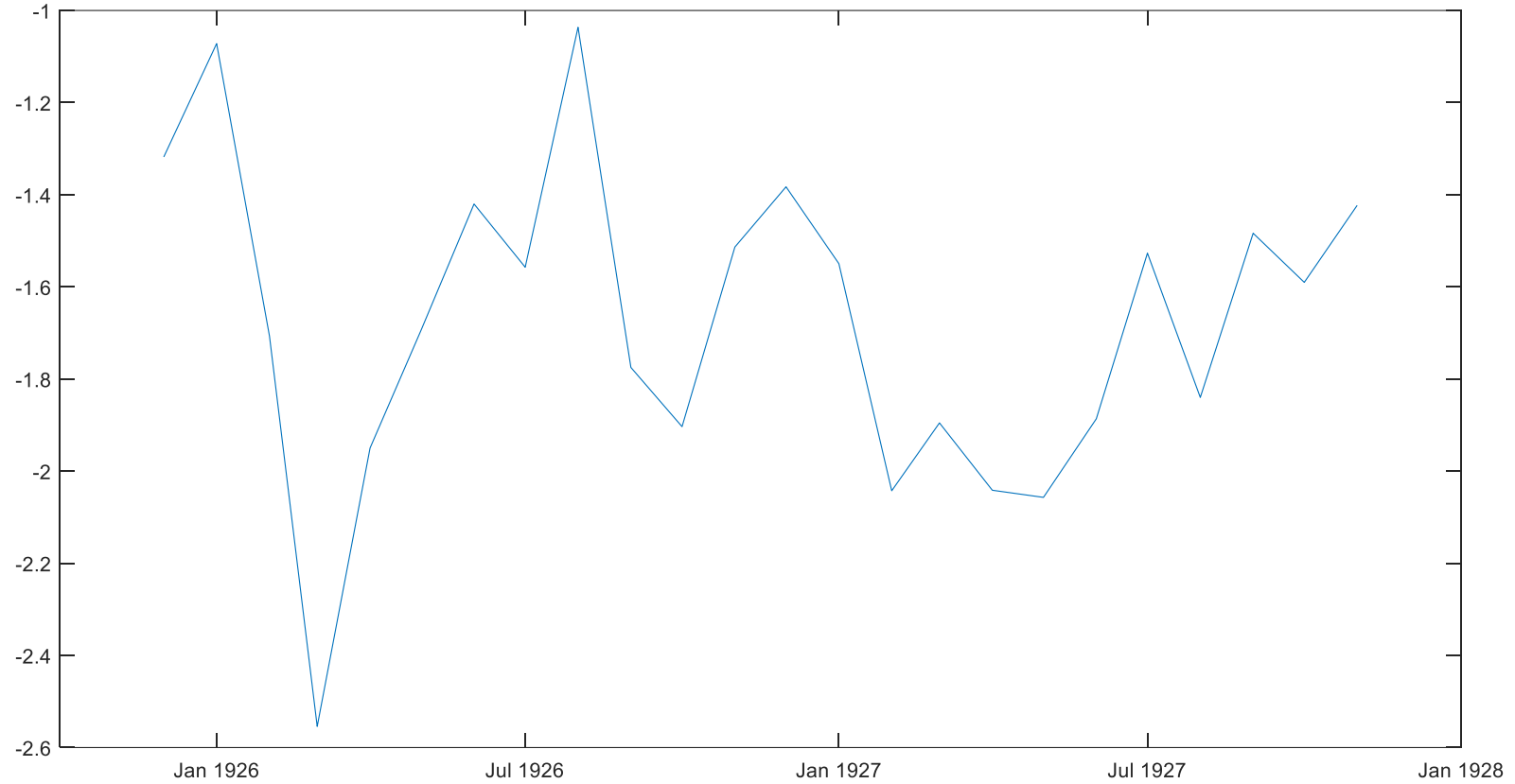


Summary of Results for 1920's

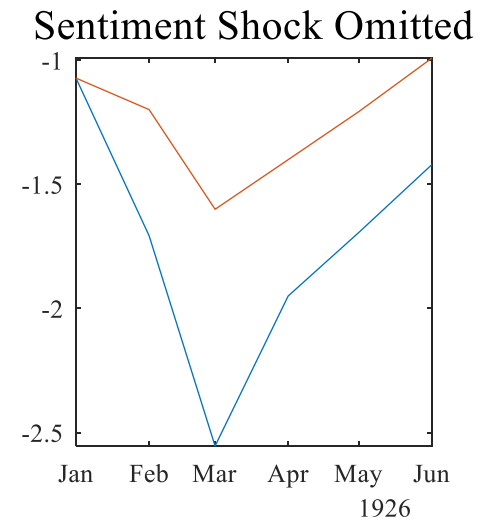
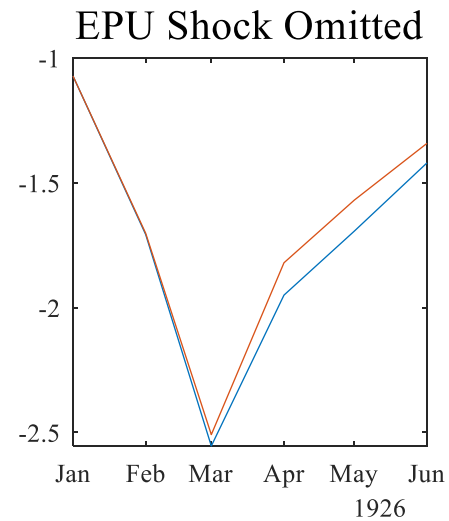
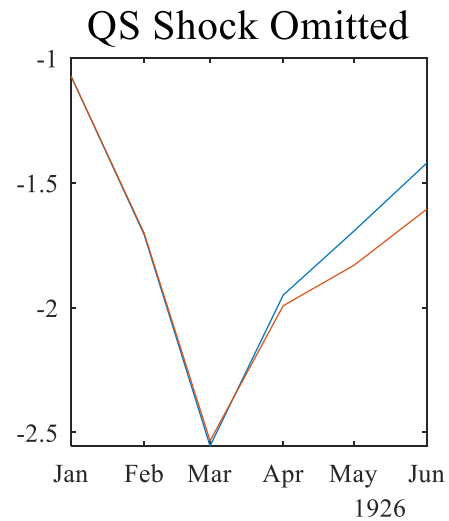
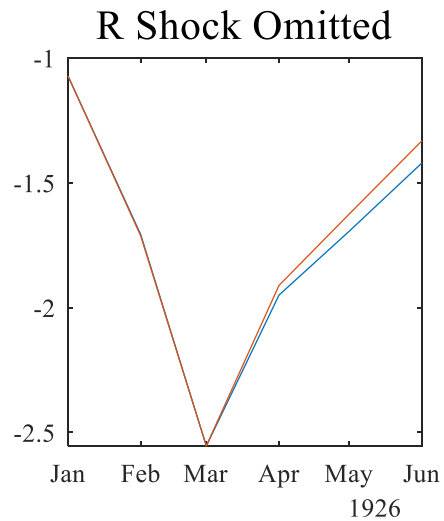
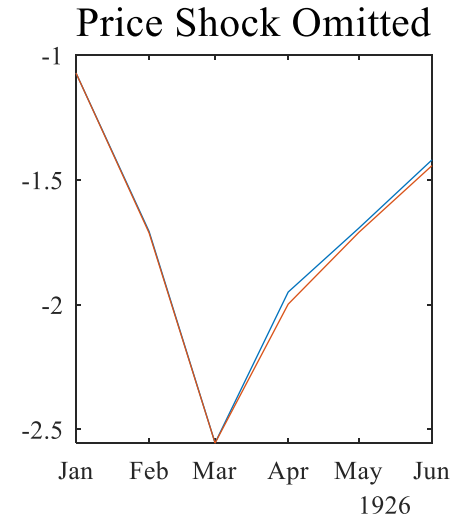
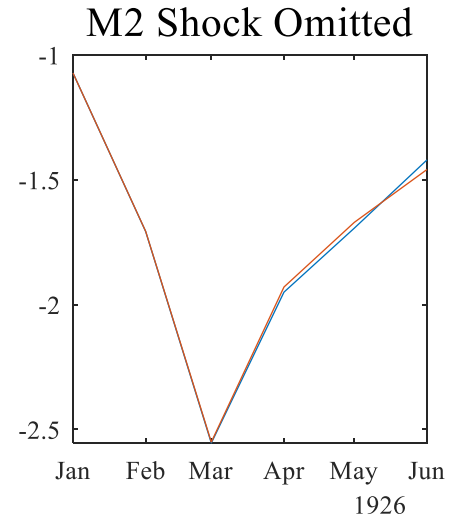
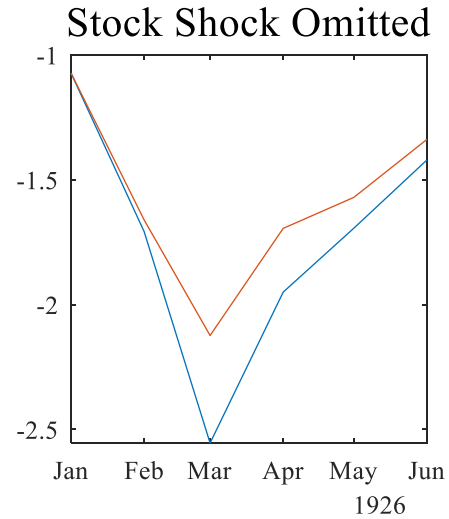
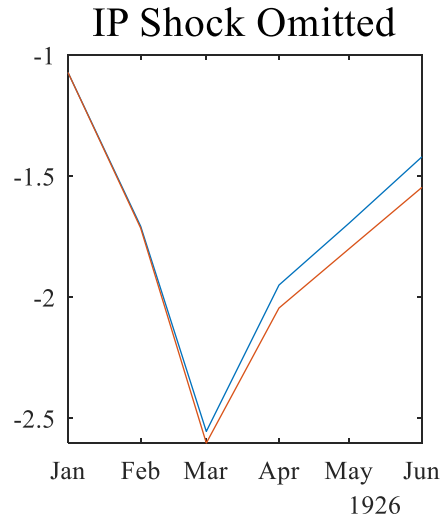
- Sentiment does play a role during the 1920s
- After the 1921 recession, sentiment does not rebound immediately. The continued negative sentiment extended recession by about a month.
- Sentiment played a role in 1924.
 - Higher than what fundamentals implied
 - Had a positive impact on economy
- A big drop in sentiment in early 1926
 - Had a negative impact on economy

A Closer Examination of 1926

Sentiment in 1926



Historical Decomposition for the Sentiment Series



Sentiment in 1926

- There are two shocks that appear to explain the large drop in sentiment in March 1926
 1. A stock market shock
 2. The sentiment shock (biggest impact)
- Note: It could be that something happened that impacted sentiment and the stock market at the same time. Our identification would interpret this as a stock market shock.

Early 1926 – Trouble in Europe

- During 1926, the articles that help push down the sentiment index are heavy in references to Belgium, France and Germany.
- March 16,17
 - Problems with Belgian Debt
 - Belgian government withdrew support of Franc due to problems negotiating stabilization loan
- March 19
 - Problems in Geneva regarding US participation in League of Nations' Justice Court
 - Issues with American investing in German real estate
- March 24
 - Headline of “SWITZERLAND SLOW IN TRADE RECOVERY, Crisis in Germany, France's Troubles and English-Tariff Have Hampered Industrial Progress”

BELGIAN FRANCS FALL A HALF CENT

Withdrawal of Government Support Follows Selling on Reports of Diffi- culties in Negotiating Loans

Belgian government withdrew its support of the Belgian franc market Monday, with result that rate broke to \$.6401, off \$.0052½ from Saturday's close, after about six months of complete stability. Rate opened at the equivalent of \$.0450 in London and declined steadily. When early cables to New York quoted \$.0426, local holders threw their supplies on the market with result that quotation was offered down to \$.0404 before bids appeared. From that level there was a rally to above \$.0420 on covering purchases by shorts and purchasing by traders who considered the decline too severe.

Immediate cause of the collapse was thought to be difficulties encountered by Belgium in negotiating the \$150,000,000 of stabilization loan planned to be floated in connection with the nation's financial reorganization which began last year with arrangements to fund war debts to England and United States.

SWITZERLAND SLOW IN TRADE RECOVERY

Crisis in Germany, France's Troubles and English Tariff Have Ham- pered Industrial Progress

From THE WALL STREET JOURNAL, Paris Office

PARIS—Switzerland failed to make the industrial progress she had hoped for in 1925. The crisis in Germany, the political and financial troubles in France, England's further steps along the road to protection and the eternal question of the exchanges are responsible. The general index of gains or losses may be seen in the foreign trade figures as follows (in millions of Swiss francs):

	Imports	Exports	Excess of imports
1925.....	2,634	2,039	595
1924.....	2,504	2,070	434
1923.....	2,243	1,760	483
1913.....	1,920	1,576	544

Discussion of Results

- dramatic negative turns in sentiment: early 1921, later in 1922, summer of 1922
- 1924 a year of positive sentiment shock
- 1926 two negative large shocks (March and October)

- tempting to explain in terms of European events (German reparations in early 1920s, German stabilization and the Dawes Plan in 1924, uncertainty about Belgium and France in 1926)
- US economy not an open economy
- suggests a psychological channel of “contagion” (people are interested in the state of the world, even if they can’t see a direct impact)

- in 1924 sentiment appears to be boosting the economy with higher growth rates of output and money supply, and higher prices, but after 1926 sentiment appears to be slowing the economy
- results do not corroborate the idea of an economy-wide monotonic increase in optimism leading to a peak in 1929 (irrational exuberance), nor that the depression economy of 1929-34 was driven by pessimism
- we could be identifying a dimension of the news which is 'fundamentals-based' but not yet reflected in the price of financial assets

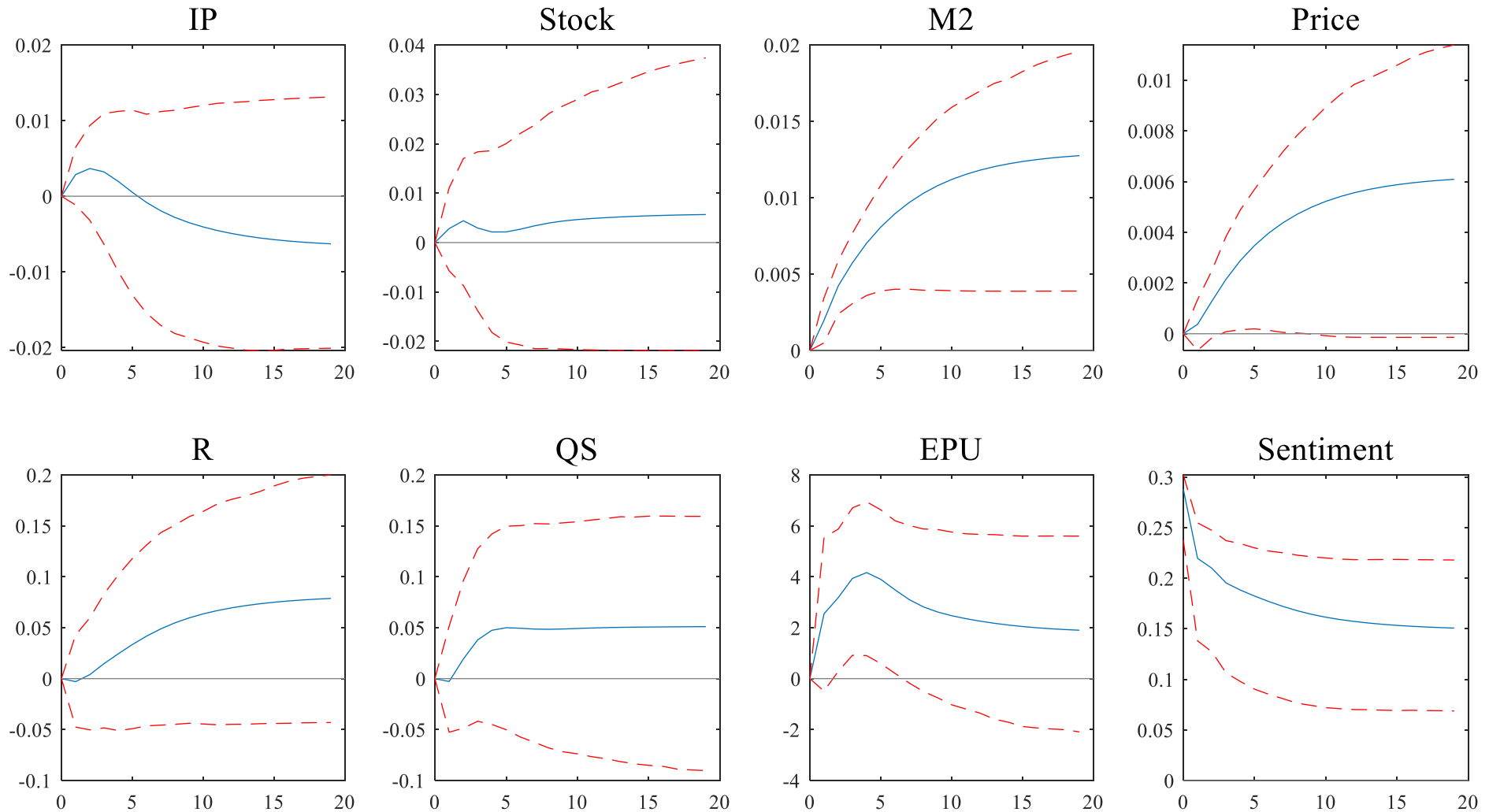
- sentiment played a statistically significant and economically large role during the 1920s in both accelerating and dampening the path of the economy, and with a highly variable intensity.
- effects of sentiment on industrial production, M2 and the S&P500 are large, having an impact of up to 5 % for industrial production, 3% for M2 and 3% for the S&P500, for specific time-periods.

- THANK YOU

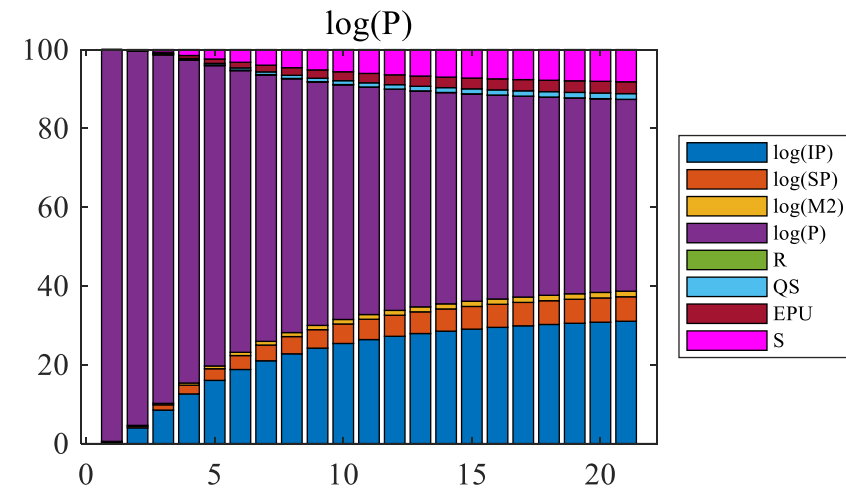
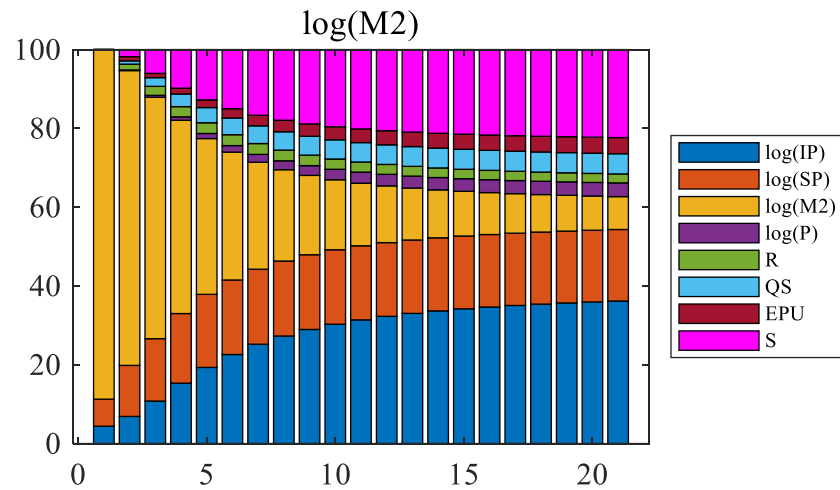
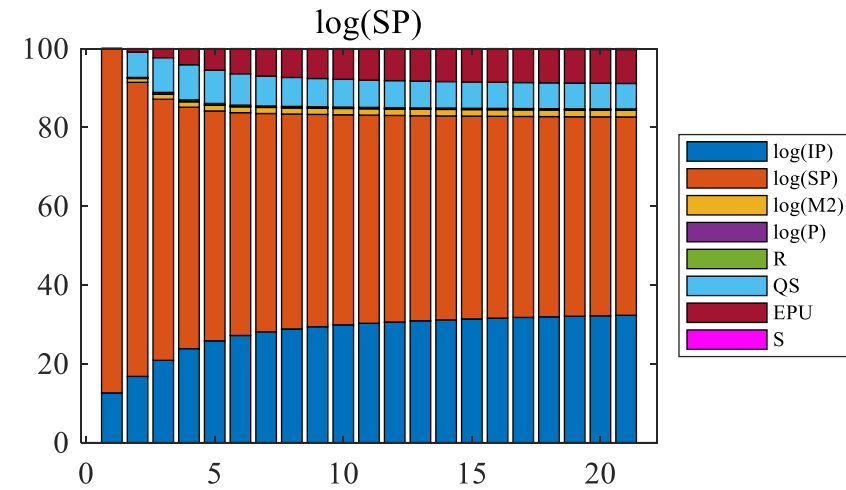
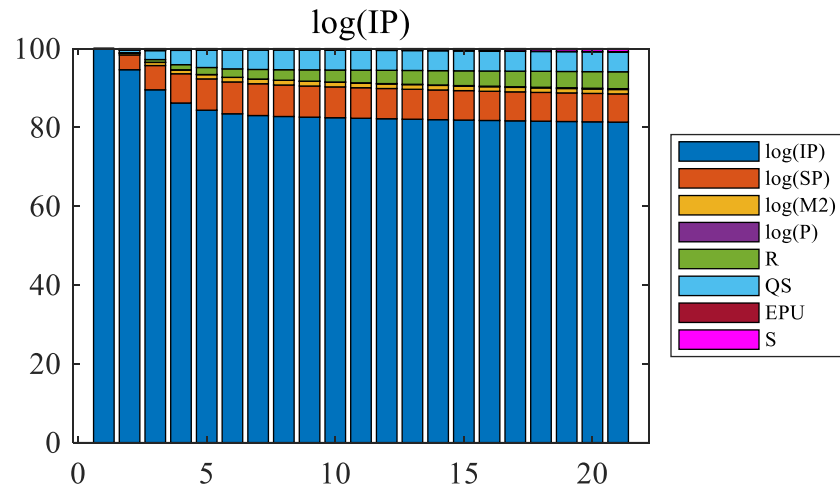
Results for Full Sample

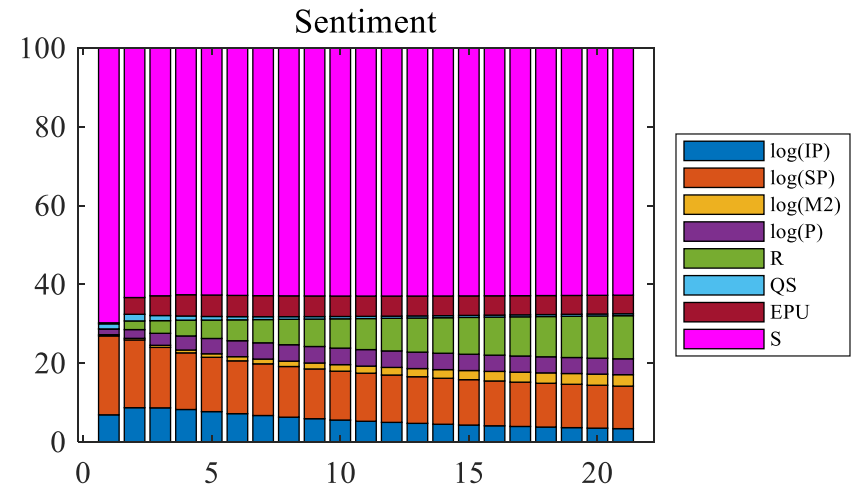
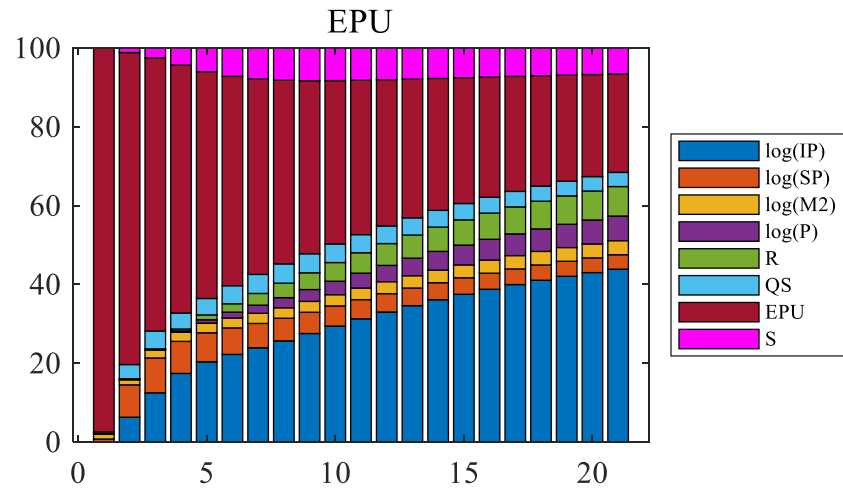
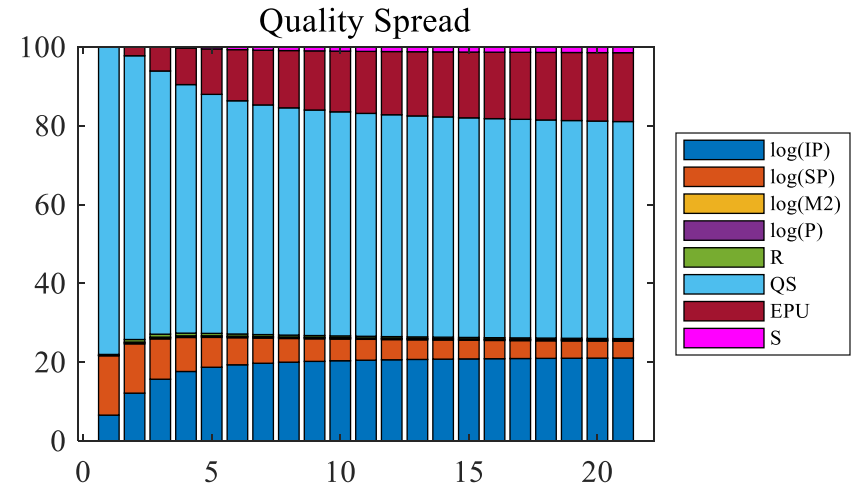
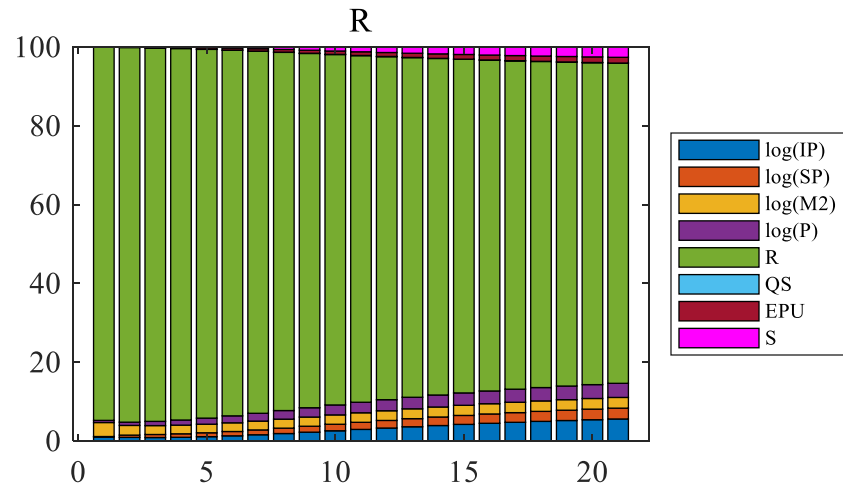
- We estimated our VECM with 2 cointegrating relationships and 1 lag for the full sample (June-1919 to Dec -1934)
- We constructed
 - Impulse response functions
 - Variance decompositions
 - Historical decompositions
- The sentiment shock
 - Had little impact on output and the stock market
 - Did have sizeable impact on money supply and prices.

Impulse Response Function of a Shock to Sentiment

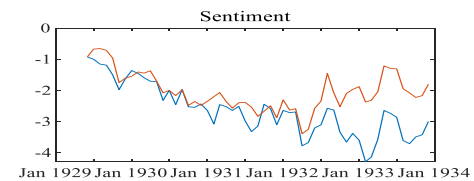
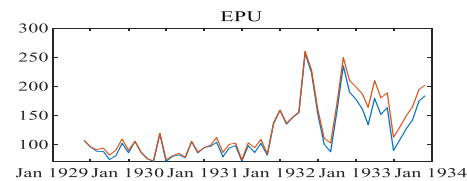
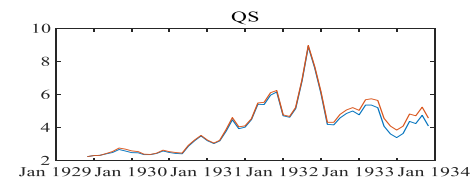
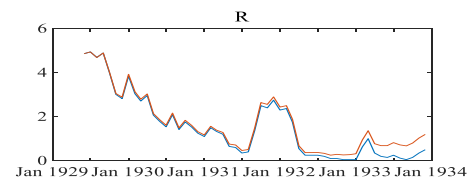
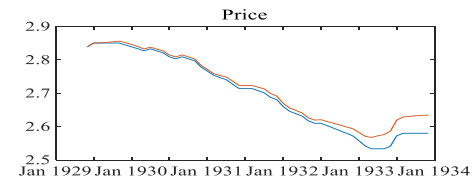
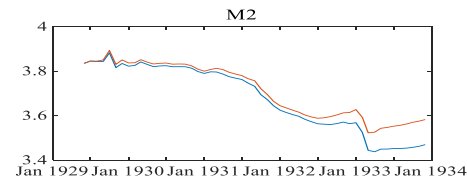
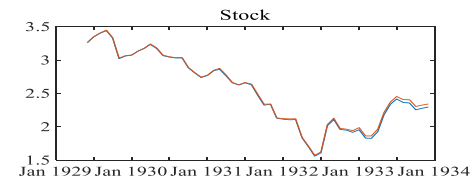
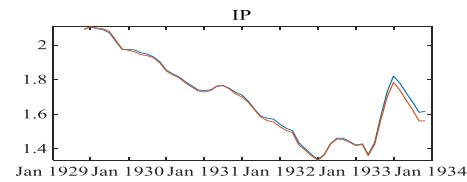


Variance Decompositions: Full Sample





Historical Decomposition (Post June 1929, Sentiment Shock Omitted)



Historical Decomposition

- Red line is the counterfactual series with the sentiment shock omitted.
- Very little discrepancy between actual and counterfactual output and stock market series post June 1929.
- There is an impact of sentiment on money supply and prices.
- Actual sentiment continues to decline after output and stock market turns, dragging down money supply and prices.
- It takes a while for sentiment to catch on to the turn around in the economy