CESifo WORKING PAPERS

9425
2021

November 2021

Measuring Inflation Expectations in Interwar Britain

Jason Lennard, Finn Meinecke, Solomos Solomou

CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editor: Clemens Fuest
https://www.cesifo.org/en/wp
An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
· from the RePEc website: www.RePEc.org
· from the CESifo website: https://www.cesifo.org/en/wp

CESifo *Working Paper No. 9425*

Measuring Inflation Expectations in Interwar Britain

Abstract

What caused the recovery from the British Great Depression? A leading explanation - the "expectations channel" - suggests that a shift in expected inflation lowered real interest rates and stimulated consumption and investment. However, few studies have measured, or tested the economic consequences of, inflation expectations. In this paper, we collect high-frequency information from primary and secondary sources to measure expected inflation in the United Kingdom between the wars. A VAR model suggests that inflation expectations were an important source of the early stages of economic recovery in interwar Britain.

JEL-Codes: E300, E600, N140.

Keywords: policy regime change, economic history, Great Depression.

Jason Lennard
Department of Economic History
London School of Economics / UK
J.C.Lennard@lse.ac.uk

Finn Meinecke
Bank of England / UK
finn.meinecke@googlemail.com

Solomou Solomos
Faculty of Economics
University of Cambridge / UK
ss19@cam.ac.uk

The views expressed in this paper are those of the authors, and not necessarily those of the Bank of England or its committees. This research has been generously funded by a Carnevali Grant from the Economic History Society. For excellent research assistance, we are grateful to Nathaniel Butler Blondel. For help and comments, we would like to thank Alex Green, Charles Read, Eddie Gerba, Erik Green, Håkan Lobell, Hendrik Steinbrecher, John Turner, Jonas Ljungberg, Lars Jonung, Martin Ellison, Mats Olsson, Natacha Postel-Vinay, Patrick Wallis, Sara Horrell, Seán Kenny, Sebastian Alvarez, and conference and seminar participants at the Department of Economic History, Lund University; Department of Economic History, London School of Economics; and the Economic History Society Annual Conference.

Expectations [...] and not anything else, constitute the immediate and direct causes or antecedents of industrial fluctuations.

Arthur Pigou, 1927

The importance of economic policy in the recovery from the Great Depression has been widely recognized in much of the historical literature. One aspect of this is the idea that a policy regime change was necessary to end the depression path of the early 1930s. Temin (1989, p. 91) defines a policy regime as "an abstraction from a single decision; it represents the systematic and predicable part of all decisions." A policy regime change implies a shift in expectations and in the circumstances of the Great Depression this meant the substitution of inflationary expectations to end the deflationary vortex of the early 1930s.

Economic theory offers differing insights into modelling expectations. Sargent (1982) used the rational expectations equilibrium framework to show that a policy regime change can be generated instantaneously via a credible and coherent policy commitment. The rational expectations framework relies on agents responding immediately to new information regarding economic policy. The early rational expectations models assumed perfect information on the part of economic agents, together with the assumption of a unique model of the economy and knowledge of its parameters. This is of course unrealistic, and an adaptive learning approach, where agents take time to gather information and learn about parameters over time, is potentially a useful framework. Bray and Savin (1986), Bullard (1991), and Evans and Honkapohja (2001) suggest the learning path of expectations provides an improvement to the early rational expectations models. This is a specific form of bounded rationality and the forecast rule of agents is adjusted over time with the emergence of new data. If adaptive learning is assumed, then expectations may converge to the full "rational expectations" equilibrium eventually but may not jump to such an equilibrium immediately. Distinguishing between these perspectives is important for understanding the 1930s recovery paths as countries left the gold standard at different times.

Temin (1989) argues that in the circumstances of the 1930s, devaluation was often a good signal of a policy regime change. However, this was not always the case. As an example, he argues that Britain did not experience a policy regime change with the devaluation of September 1931, suggesting that the contractionary policy framework had not changed. Temin's evaluation of the UK devaluation is based on the rational expectations framework. Mitchell, Solomou, and Weale (2012) suggest that the high frequency data on UK GDP confirms Temin's key conclusion that we fail to observe a recovery

jump in the economy that correlates with the timing of devaluation. However, this evidence does not rule out a policy regime change that arises over time, a path that is consistent with an adaptive learning process. According to Crafts (2013, 2014, 2018), breaking away from the gold standard, implementing the "cheap money" policy, imposing the General Tariff, and announcing an informal price level target raised inflation expectations, lowering real interest rates and stimulating expenditure. Thus, there is a need to study the sequencing of policy announcements that may have contributed to the formation of a new policy regime in the UK experience. Identifying the sequence of policy announcements that allowed inflationary expectations to change in a learning framework can provide important insights into the recovery profiles of the 1930s.

The international evidence on policy regime change in the recovery profiles of the 1930s is mixed. The evidence for the United States suggests that a regime change in economic policy caused a shift in inflation expectations (Temin and Wigmore, 1990; Eggertsson, 2008; Romer, 2014; Jalil and Rua, 2016; Edwards, 2020). Shibamoto and Shizume (2014) argue that Japan benefited from a policy regime change correlated with devaluation in 1931. The comparative evidence considered by Ellison, Lee, and O'Rourke (2020) shows that most of the countries devaluing in the 1930s saw a shift in inflationary expectations and a fall in real interest rates. There were, however, some significant exceptions, including British India, Denmark, Sweden, and the UK. Ellison et al. (2020) suggest:

> It is striking that all four exceptions left gold right at the start, in September 1931. Eichengreen (1992, pp. 292-3) notes that the early devaluers were reluctant to engage in expansionary open-market operations despite the fact that they had quit gold: sterling area money supplies remained essentially unchanged during 1932. In order to release their golden fetters, it was necessary for policymakers to abandon not only the gold standard's institutions but also the gold standard's ethos.

The existence of time-heterogeneity in the capacity of policymakers to generate policy regime change suggests that a more detailed analysis of the UK experience, as a case study of an early devaluation, will help us understand how policy regime change was generated in the 1930s. This has implications for our understanding of policy regime change more generally for the 1930s.

This paper is related to a growing literature on inflation expectations in interwar Britain. Beyond the seminal contributions of Crafts (2013, 2014, 2018), who most clearly advanced the expectations hypothesis, Chouliarakis and Gwiazdowski (2016) have built a New Keynesian model that lays the theoretical foundations for an expectations channel in the recovery. In an updated version of the

paper, Gwiazdowski and Chouliarakis (2021) construct a monthly news index based on the *Financial Times*, *Guardian*, *Scotsman*, *Telegraph*, and *The Times* and combine this with a narrative from qualitative sources, finding a turning point in May 1933. The contribution of this paper is to develop the evidence further by constructing a quantitative measure of inflation expectations using commodity prices, newspapers, and the term premium.

I. A Concise History of Economic Policy

A short introduction to economic policy in interwar Britain will help us to understand the major policy changes that may or may not have shifted inflation expectations. According to Crafts (2013, 2014, 2018), there were four key changes that led to recovery in the 1930s. First, leaving the gold standard, which occurred on 21 September 1931. Second, implementing the "cheap money" policy, which saw Bank Rate cut in steps from 6 per cent to 2 per cent from 18 February 1932 to 30 June 1932 (Mitchell, 1988, p. 682). Bank Rate was maintained at this effective lower bound until August 1939 (Mitchell, 1988, p. 682). Third, passing the Import Duties Act that levied a 10 per cent tariff on many imported goods, which was effective from 1 March 1932 (Chadha, Lennard, Solomou, and Thomas, forthcoming). Fourth, declaring to restore prices to pre-depression levels. Crafts (2013) suggests that the target of raising prices to the level of 1929 was announced by the Chancellor at the British Empire Economic Conference in Ottawa in July 1932. We have been able to trace an earlier announcement, at the budget on 9 May 1932, and an alternative target, to return wholesale prices to the level of 1928 (Hansard (Commons), 5th ser., CCLXV, 9 May 1932, cols. 1671-4).

International changes in economic policy may also have had an impact on domestic inflation expectations. A chief candidate is the suspension of the gold standard in the United States in March 1933 (Crafts, 2014). These policy changes are summarised in Table 1.

Table 1. *Chronology of Economic Policy Changes in the 1930s*

Policy	Date
United Kingdom	
Gold standard suspended	21 September 1931
Cheap money policy	18 February 1932, 10 March 1932, 17 March 1932, 21 April 1932, 12 May 1932, 30 June 1932
Import Duties Act	1 March 1932
Price-level target	9 May 1932
International	
Gold standard suspended in Germany	July 1931
Gold standard suspended in Canada	October 1931
British Empire Economic Conference	21 July 1932 to 20 August 1932
Gold standard suspended in the United States	March 1933
World Economic Conference	12 June 1933 to 27 July 1933

Notes: This table shows the dates of major changes to economic policy in the early 1930s.

Sources: See text.

II. Data and Methodology

A. *Commodity Prices*

Commodity futures prices are a classic source of inflation expectations in historical contexts (Hamilton, 1987, 1992; Voth, 1999; Perez and Siegler, 2003; Shibamoto and Shizume, 2014). However, although commodity prices are widely used in the literature, they have not been studied in the United Kingdom between the wars. The logic is that the difference between prices of different maturities is equal to the expected price change of the commodity. To understand the intuition, let $S_{i,t}$ be the spot price of commodity i at time t and $F_{i,t}(j)$ be the price of the j-period ahead forward contract, where the price is set at t for delivery in $t+j$. Then:

$$F_{i,t}(j) = E_t S_{i,t+j} \tag{1}$$

where $E_t S_{i,t+j}$ is the expectation at time t of the spot price at $t+j$. Arbitrage suggests that the equality in equation (1) should hold. Suppose that the j-period ahead futures price is above the expectation of the spot price at $t+j$ ($F_{i,t}(j) > E_t S_{i,t+j}$), then market participants can sell the product on the futures market and buy the commodity at the spot price in the future. These sales push down the futures price to the expected spot price (Hamilton, 1987, 1992).

With a measure of expected prices, it is straightforward to calculate expected inflation. First, take logarithms of equation (1), as is conventional in the literature (Hamilton, 1987; Voth, 1999; Perez and Siegler, 2003; Shibamoto and Shizume, 2014). Second, subtract the log spot price from both sides.

$$f_{i,t}(j) - s_{i,t} = E_t s_{i,t+j} - s_{i,t} \tag{2}$$

The equation shows that expected inflation between t and $t+j$ ($E_t s_{i,t+j} - s_{i,t}$) is equal to the difference between the log j-period ahead futures price and the log spot price of commodity i ($f_{i,t}(j) - s_{i,t}$). The beauty of equation (2) is that while the right-hand side is unobservable ($E_t s_{i,t+j} - s_{i,t}$), the left-hand side is observable ($f_{i,t}(j) - s_{i,t}$).

The equation may only hold, however, if the following conditions are met: (i) agents are risk neutral (Hamilton, 1992; Voth, 1999; Binder, 2016); (ii) the market is not segmented or underdeveloped (Binder, 2016); and (iii) there are no storage costs (Hamilton, 1992; Voth, 1999). As a futures price may not only reflect the expected future spot price but also the carrying costs involved with storing the goods until maturity, it is common to calculate $j-1$ period expected inflation as the difference between a j-period futures price and the 1-month futures contract (Voth, 1999; Shibamoto and Shizume, 2014):

$$E_t \pi_{i,t+j-1} = f_{i,t}(j) - f_{i,t}(1) \tag{3}$$

However, there are two issues with equation (3) that have not been acknowledged in the literature. First, it is assumed that storage is a cost that is common to both $f_{i,t}(j)$ and $f_{i,t}(1)$. As a result, it is differenced out. But if the storage cost is changing in j, as is probably the case, then equation (3) is not much better than (2). Second, the interpretation as $j-1$ expected inflation is incorrect. In fact, it

represents expected inflation at time t of inflation between $t+1$ and $t+j$, which may be close but is not the precise statistic of interest. These arguments are detailed in Appendix A.

Beyond the question of whether $f_{i,t}(j) - s_{i,t}$ or $f_{i,t}(j) - f_{i,t}(1)$ is an accurate measure of the inflation expectations for a specific commodity, there are additional questions of how this relates to aggregate expected inflation (Hamilton, 1992). The observed commodities may make up a small fraction of the aggregate price index or may be uncorrelated with other prices.

With these caveats in mind, we move on to test the expectations hypothesis with the available data. A valuable source of spot and futures prices is the 'Home Commercial Markets' section of *The Times*. Although this data has been used by economic historians before to test option price efficiency (Chambers and Saleuddin, 2020), it has not been used to study inflation expectations. *The Times* regularly reported copper, cotton, and tin prices, as well as for some other commodities on an irregular basis. In order to construct a high-frequency series, we transcribe the Friday prices on the spot and futures market (1, 3, 6, 11, and 12 months) when available. If prices were not reported for Friday, we use the prices for the previous day. When a buy and sell price was reported, we transcribe both and calculate the arithmetic mean. The sample period is 2 January 1920 to 29 December 1939. Overall, there are almost 15,000 price-week observations.

How important were these commodities in aggregate price indices? The Board of Trade's wholesale price index was a key economic statistic in the interwar period, reflecting the prices paid by retailers to producers (Chadha et al., forthcoming). According to the Board of Trade's description of how the index was constructed (*Board of Trade Journal*, 24 January 1935, p. iv), cotton was allocated the third-highest weight (5 per cent), while copper and tin received less weight (2 per cent and 0.5 per cent respectively).

As the various prices may be affected by idiosyncratic factors such as commodity specific demand and supply shocks and the length of the futures contract, we develop a new model to aggregate the commodity prices into a single series. In order to do so, we estimate equation (4) by OLS:

$$f_{i,t}(j) - s_{i,t} = \alpha_i + \gamma_t + \beta j_{i,t} + e_{i,t} \tag{4}$$

where α_i are commodity fixed effects that allow for differences in the mean expected price change by commodity, j is the length of the futures contract, which should help to account for storage costs, and

$e_{i,t}$ is an idiosyncratic error term.[1] γ_t are time fixed effects that measure the mean expected price change, conditional on the aforementioned controls.

B. *Quantitative News*

An interesting method to measure unoberseved economic statistics is to use text as data, which has been used to study inflation expectations (Binder, 2016; Jalil and Rua, 2016; Daniel and ter Steege, 2020) and uncertainty (Baker, Bloom, and Davis, 2016; Mathy and Ziebarth, 2017; Lennard, 2020; Mathy, 2020) in historical contexts. Applied to expected inflation, this "quantitative news" approach involves counting the number of articles about inflation and deflation in newspapers. The reasoning is that "media coverage reflects and shapes the macroeconomic expectations of the public" (Binder, 2016).

The first step is to select a sample of newspapers. The two key criteria are: (i) that the newspapers, as "shapers" of expectations, are influential and (ii) that the newspapers are balanced in terms of political slant (Gentzkow and Shapiro, 2010; Baker et al., 2016; Lennard, 2020). In the centre (Butler and Freeman, 1968, pp. 278, 287), we study the *Financial Times*, which was the "stockbroker's bible" between the wars (Kynaston, 1988, p. 65) and has been used to measure historical sentiment (Hanna, Turner, and Walker, 2020), and the *Economist*, which has been used to gauge historical expectations (Barsky and De Long, 1991; Crafts and Mills, 2013, 2015). Either side, we have the *Guardian* to the left with a readership of 47,000 in 1930 (Butler and Freeman, 1968, pp. 278, 284) and *The Times* to the right with a readership of 187,000 in 1930 (Butler and Freeman, 1968, pp. 280, 284). These papers have been used to study economic policy uncertainty in interwar Britain (Lennard, 2020).

The second step is to select the term set. Binder (2016) uses (inflation OR reflation) AND (price OR prices) for the inflation set and deflation AND (price OR prices) for the deflation set. Jalil and Rua (2016) use (inflation OR inflationary) and (deflation OR deflationary). While these seem to be reasonable choices, it is not clear what the objective basis is for the inclusion and exclusion of terms. Some important questions are whether the included terms were used to describe historical price changes and whether other excluded terms might have been used.

[1] The inclusion of j will capture storage costs if they are: reflected in the price, time invariant, and linear in j. The last assumption can be relaxed by adding higher-order polynomials to equation (4), such as j^2. However, the results are largely unaffected.

In order to give empirical foundations to our quantitative news estimates, we conduct an audit study (Baker et al., 2016). First, we read a randomly-selected issue from a randomly-selected newspaper. We randomize in two dimensions to capture variation in language *over time* and *across newspapers*. Second, we record whether the article was about inflation or deflation and, if so, what terms were used to describe the price changes. Third, we experiment with different combinations of these candidate terms to minimize the sum of the false negative rate (articles that were about inflation expectations that were excluded) and false positive rate (articles that were not about inflation expectations that were included) in the sample of articles to determine the optimal term set.

A challenge is that the vast majority of news is not about price changes. Thus, if we were to read a large volume of articles, only a few would be about the subject of interest, meaning that more time will be devoted to reading articles about the "Armed Robbers' Haul in Busy City Street", "Newmarket Prospects", and other topics of general interest than articles about inflation or deflation. Across the four publications, 99.6 per cent of articles between 1920 and 1939 made no mention of inflation or deflation. Therefore, we condition on the article containing "inflation OR deflation", which are the only terms common to Binder (2016) and Jalil and Rua (2016). In order to overcome the same challenge in an audit study on uncertainty, Baker et al. (2016) also condition on a set of predetermined terms.

As the volume of terms used in the audit involves a prohibitively large number of potential combinations, we simplify the exercise by stemming, which is a common approach to reduce complexity when using text as data (Gentzkow, Kelly, and Taddy, 2019). This involves replacing words with their root, so that inflated, inflation, and inflationary are replaced by their stem: inflat. By combining the root with the Boolean operator, *, the single term inflat* can be substituted for the other terms with the same stem. In order to identify the roots, we use the Porter stemmer (Porter, 1980).

The audit study suggests that the optimal inflation and deflation term sets are simply inflat* and deflat*, respectively. While adding terms, such as reflat* or price*, tends to lower the false positive rate, this is offset by a rise in the false negative rate.

A possible criticism of the quantitative news approach is the difficulty in separating domestic from international news. Crude conditions that specify the article must contain a geographic term are not sufficient as it is often implied that a report is about domestic affairs unless otherwise stated. For example, just 16.1 per cent of the articles that we identified in our audit study as being about domestic inflation expectations used a geographical term. Of those that did, a wide variety of terms were used,

such as British, domestic, England, English, home, internal, and Great Britain. In any case, it may not be desirable to distinguish by location as this imposes an autarkic model of expectations formation. It may not only be that price news in the United Kingdom shapes the expectations of British agents but also major international price shocks. Reports of inflationary spikes in France, Germany, or the United States may shift agents' inflation expectations in the United Kingdom. The sample period is 1 January 1920 to 31 December 1938, which yields 6,940 daily observations.

C. *The Term Premium*

Another source of information on inflation expectations is the term structure of interest rates. Under the expectations hypothesis, long rates are a forward convolution of future expected short rates (Campbell and Shiller, 1991). As a result, an increase in expectations of future economic activity or inflation results in a rise in expected future short-term rates, which leads to an increase in the term premium (Ellison et al., 2020). Following Ellison et al. (2020), we study the difference between the yields on 10- and 3-year zero coupon government bonds, which have been adjusted for call and conversion provisions (Ellison and Scott, 2020). The sample period is January 1920 to December 1938. As the frequency of the data is monthly, there are 228 observations.

III. Quantitative Evidence

A. *Commodity Prices*

What do commodity prices tell us about inflation expectations in interwar Britain? Figure 1 shows the individual commodity price expectations; Figure 2 plots the aggregated series. In the aftermath of the Great War, there were large deflationary expectations, which preceded the actual fall in prices. Expected deflation returned in the spring of 1930, coinciding with the start of the slump in economic activity (Mitchell et al., 2012). However, expectations were largely positive from the end of August 1930. While expectations responded to some of the policy changes that underpinned the regime change – such as to four of the six cuts in Bank Rate between February and June 1932 and to developments at the Ottawa conference from July 1932 – the gains were relatively modest and transitory.

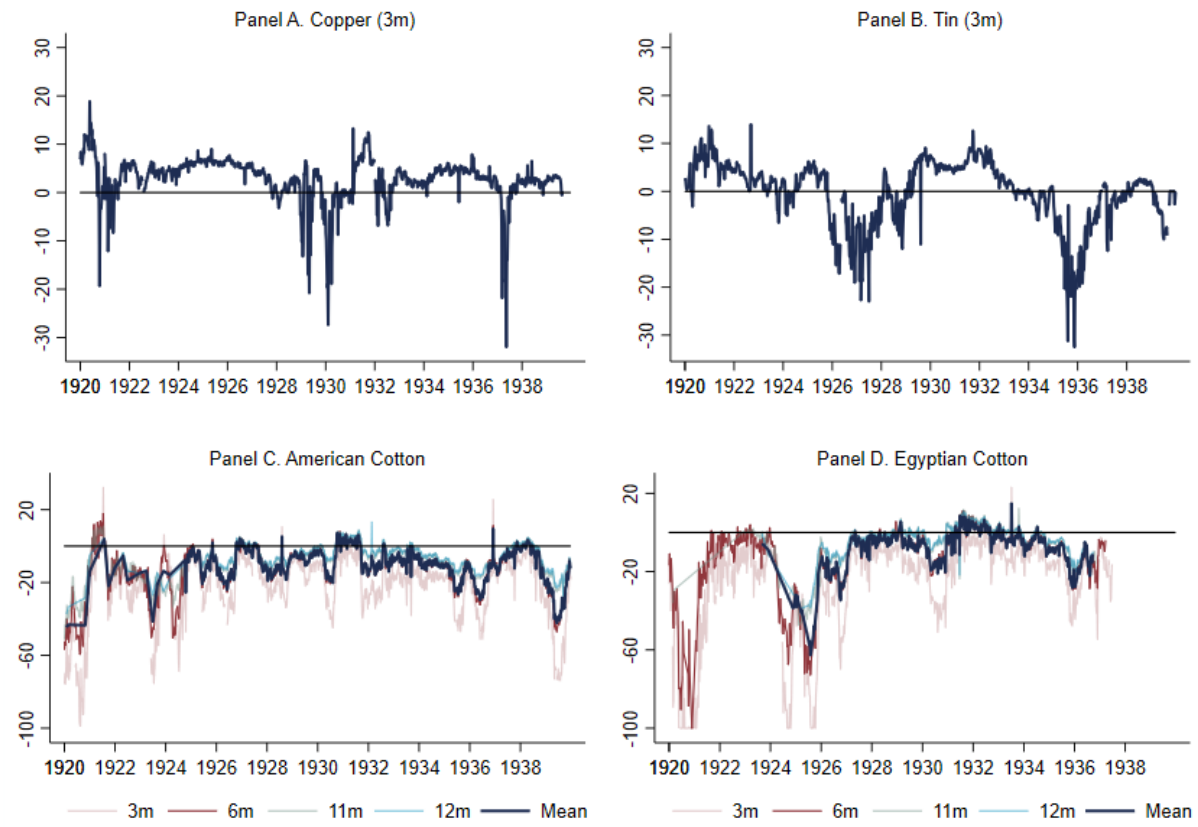

Figure 1. *Forward Premium of Commodity Prices, 1920-39 (%)*

Notes and sources: This figure shows the weekly inflation expectations of copper, tin, and cotton prices based on data reported in the 'Home Commercial Markets' section of *The Times* and equation (2). All series have been annualised by multiplying by $^{12}/_{j}$ and winsorized at $\pm 100\%$.

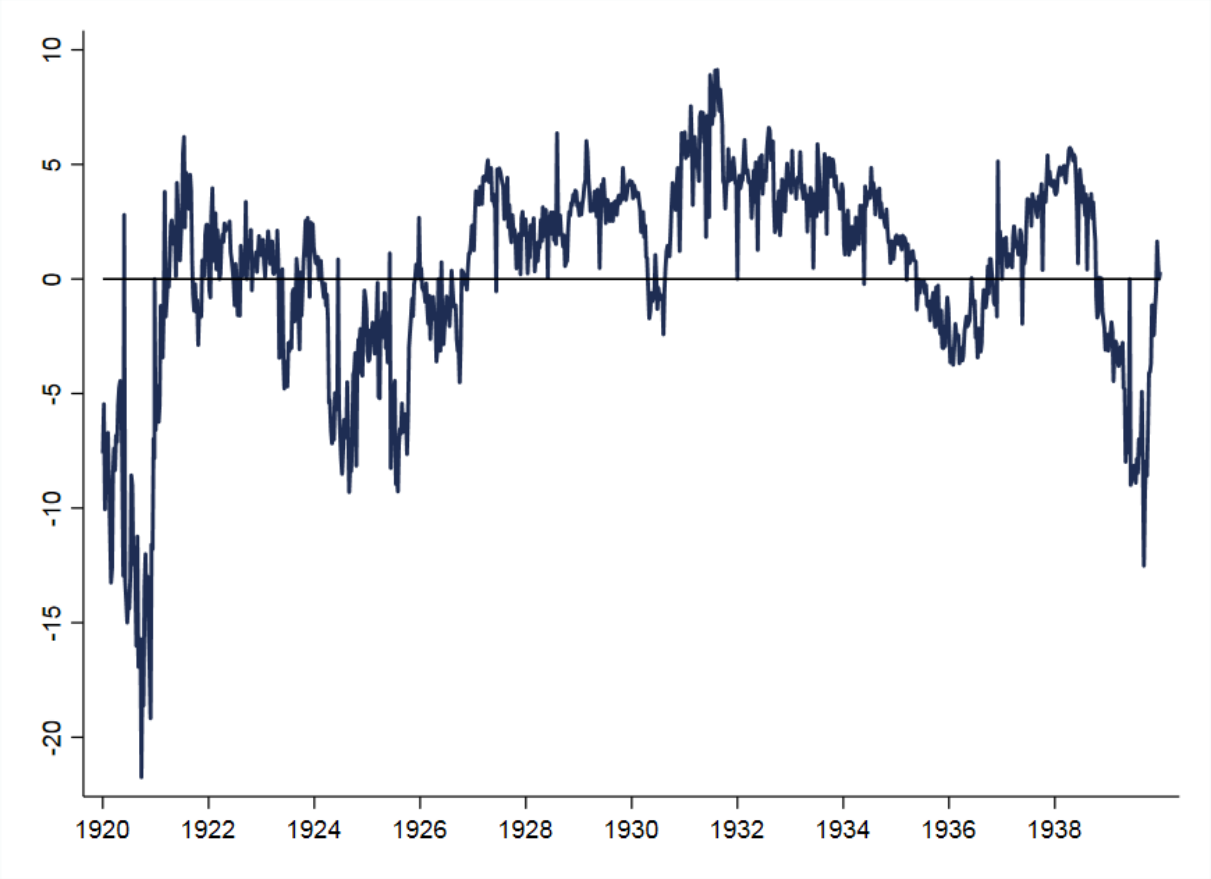

Figure 2. *Inflation Expectations Implied by Commodity Prices, 1920-39 (%)*

Notes and sources: This figure shows the weekly inflation expectations of commodity prices based on data reported in the 'Home Commercial Markets' section of *The Times* and equations (2) and (4).

B. *Quantitative News*

Moving on to quantitative news, Figure 3 shows the series of inflationary and deflationary news coverage. There are three major discontinuities. First, from 21 September 1931, the day that the United Kingdom abandoned the gold standard, there was a spike in reporting on inflation, persisting until the end of October. Second, there is a jump in January 1933 that has no obvious origin. Third, there was a sustained increase from 18 April 1933, when Roosevelt supported legislation to devalue the dollar (Temin and Wigmore, 1990). From this point, inflation coverage remained high throughout 1933, particularly during the World Economic Conference.

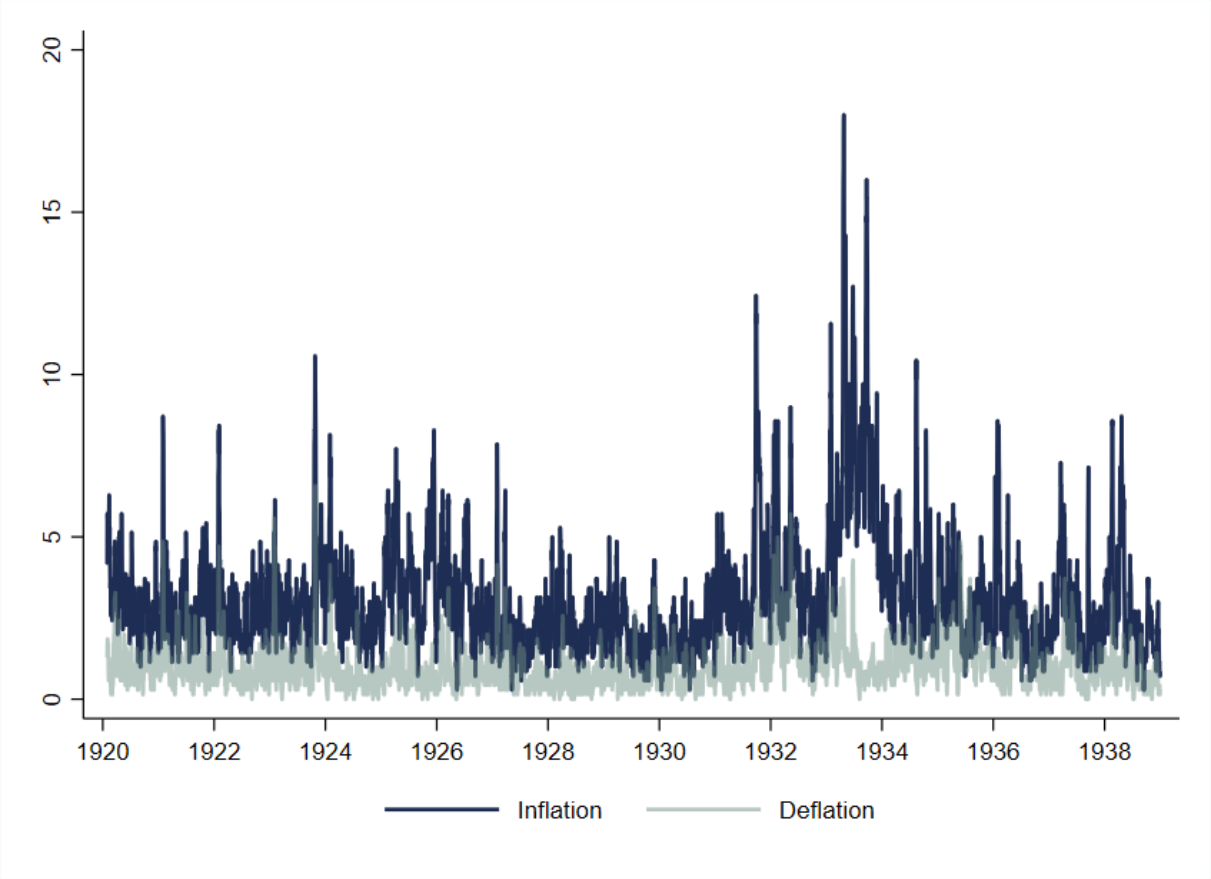

Figure 3. *Inflation Expectations Implied by Newspapers, 1920-38*

Notes and sources: This figure shows the (7-day moving average) daily number of articles about inflation or deflation in a sample of newspapers (*Economist*, *Financial Times*, *Guardian*, and *The Times*) based on the term set: inflat* and deflat*.

C. *The Term Premium*

Figure 4 plots the difference between the adjusted yields on 10- and 3-year zero coupon government bonds from Ellison and Scott (2020). While there are some interesting swings in the 1920s, it is the early 1930s that are most striking. The yield curve was inverted – short-rates were above long-rates – intermittently from February 1929 and persistently between June 1931 and December 1932. However, from January 1933, there was a sharp increase so that the term premium was positive and large. The yield curve remained upward sloping thereafter. This analysis suggests that there was a reversal in expectations from deflationary to inflationary at the start of 1933.

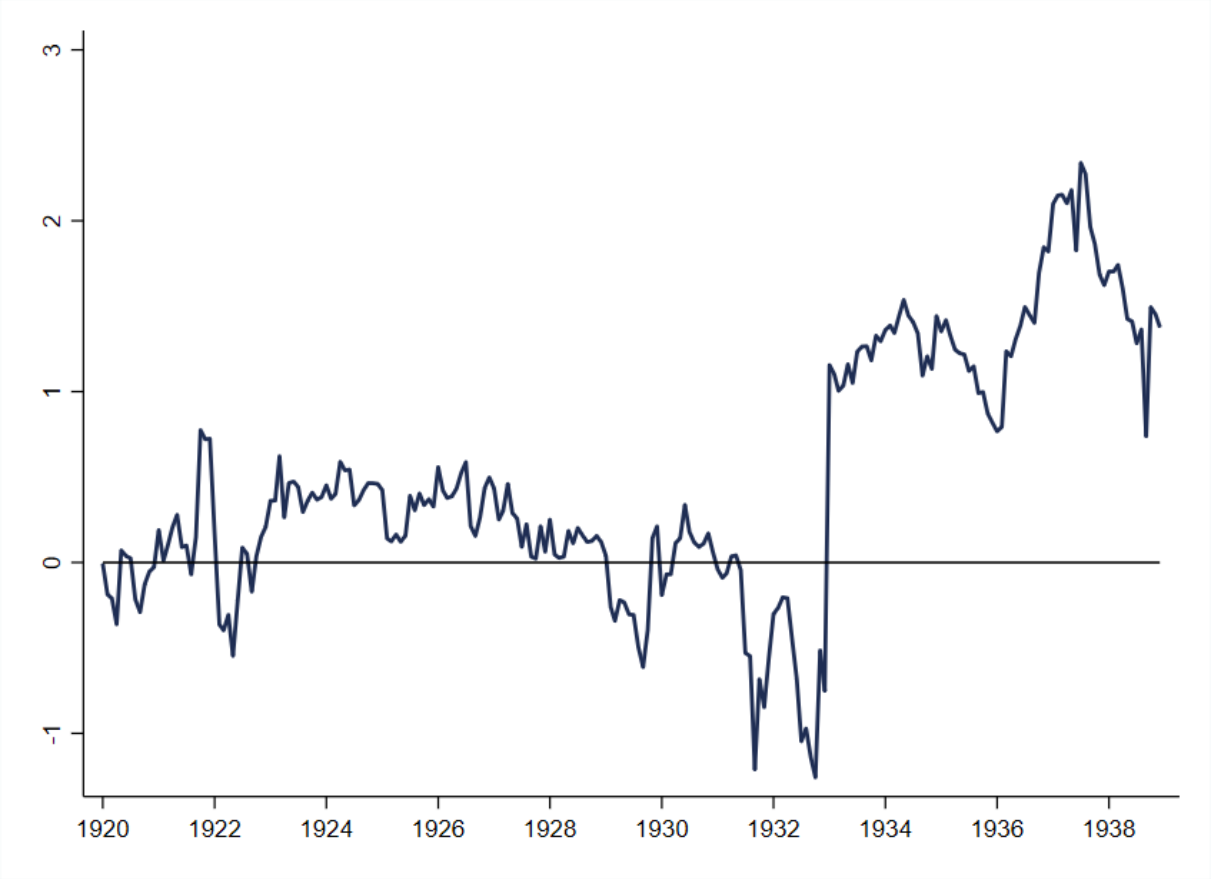

Figure 4. *Inflation Expectations Implied by the Term Premium, 1920-38 (Percentage Points)*

Notes and sources: This figure shows the monthly difference between the adjusted yields on 10- and 3-year zero coupon government bonds from Ellison and Scott (2020).

D. *Comparing Measures of Inflation Expectations*

An interesting question is how much of the variation in each estimate of inflation expectations is common and how much is idiosyncratic. Table 2 reports a correlation matrix for the series based on commodity prices, quantitative news, and the term premium.[2] The results suggest that although there are strong signals within the series, there is also a good deal of noise, which is likely to be a consequence of the various limitations of each of the series. The series with the highest average correlation is quantitative news; the series with the lowest is based on commodity prices, suggesting that the relatively small coverage of commodities results in a large idiosyncratic component in this measure of aggregate inflation expectations.

[2] Henceforth, the measure of quantitative news is based on the number of inflationary articles. The results are insensitive to whether quantitative news is based on inflationary articles or the difference between inflationary and deflationary articles.

As the idiosyncratic variation will not only cloud our discussion but it may also lead to attenuation bias in any subsequent econometric models, we summarise the common variation in the various estimates using principal components analysis, based on the standardised series and the covariance matrix. Essentially, this yields a weighted average of the standardised series. The weights, reported in Table 3, place the least emphasis on commodity prices and most on quantitative news. As the principal components are not in meaningful units, we re-express them in retail price inflation space by adjusting the mean of the estimates to match the mean of retail price inflation (Capie and Collins, 1983; Kapetanios, Maule, and Young, 2016). This normalization will not, however, affect the econometric results.[3] This principal components measure of inflation expectations is presented in Figure 5.

Table 2. *Comparing Measures of Inflation Expectations*

	Commodity Prices	Quantitative News	Term Premium
Commodity Prices	1		
Quantitative News	0.16**	1	
Term Premium	0.04	0.31***	1

Notes: This table shows the correlation matrix for various series of inflation expectations. The sample period is January 1920 to December 1938. *, **, and *** indicate statistical significance at 10, 5, and 1 per cent level, respectively.

Sources: See figures 2, 3, and 4.

Table 3. *Principal Components Analysis*

	Weights
Commodity Prices	0.37
Quantitative News	0.69
Term Premium	0.62

Notes: This table shows the weights estimated by principal components analysis and the covariance matrix. The sample period is January 1920 to December 1938.

Sources: See figures 2, 3, and 4.

[3] Binder (2016) proposes an alternative approach to scaling that involves: (i) regressing leads of actual inflation on proxies of inflation expectations and (ii) using the predicted values as the scaled measure of inflation expectations. However, this approach is only unbiased under rational expectations, whereas we are agnostic on the theoretical nature of expectations.

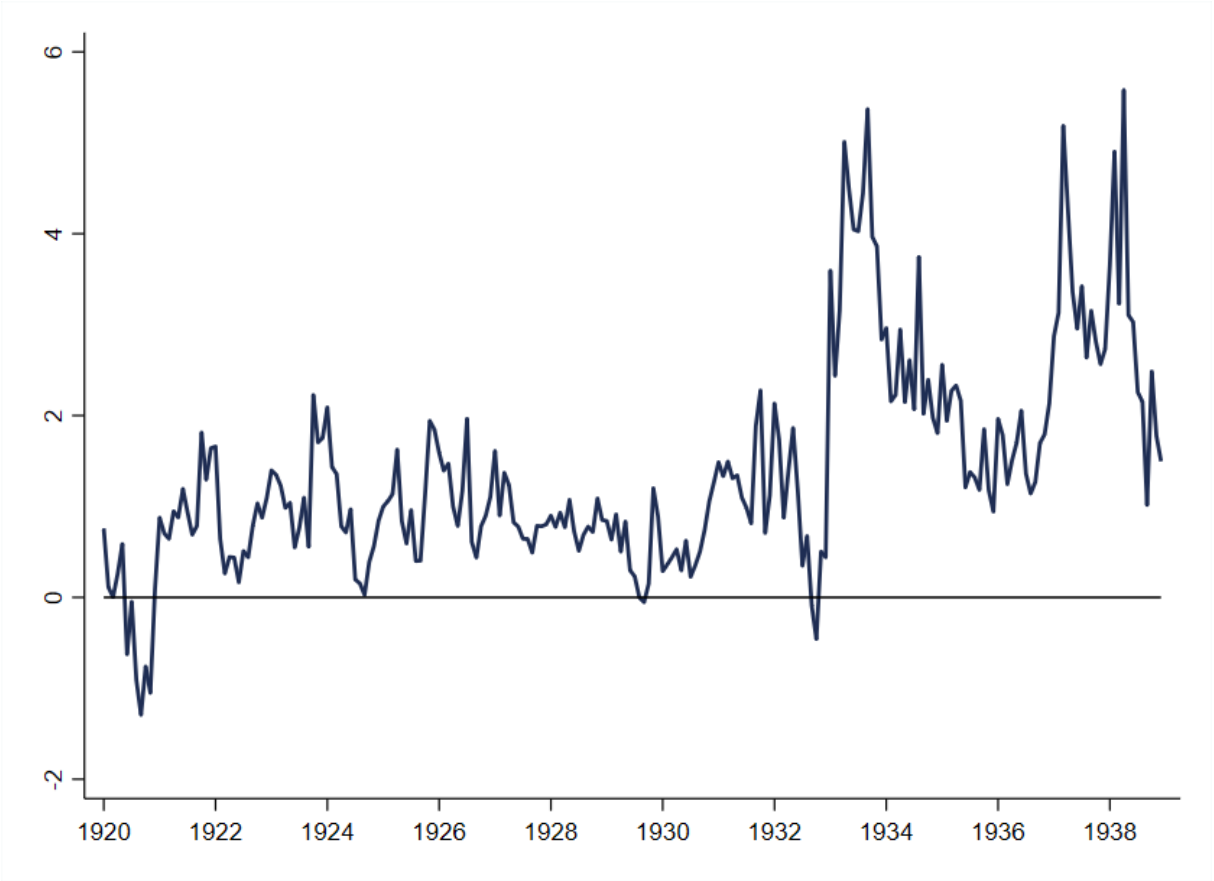

Figure 5. *Aggregate Measure of Inflation Expectations, 1920-38 (%)*

Notes and sources: This figure shows monthly inflation expectations estimated by principal components analysis and the covariance matrix. The sample period is January 1920 to December 1938. *Sources:* See figures 2, 3, and 4.

E. *Structural Breaks*

In order to give an objective foundation to our subjective narrative of the major turning points in inflation expectations, we test for structural breaks. To do so, we estimate Bai and Perron (1998) tests for multiple unknown break points for each series of inflation expectations between January 1920 and December 1938, allowing for a maximum of 5 structural breaks in each series.[4]

The results are reported in Table 4. Focusing on the early 1930s and the aggregate principal components measure of inflation expectations suggests that an identifiable shift occurs in January 1933, remaining persistently high throughout the year, before returning to more normal levels in 1934.

[4] Since the Bai-Perron tests can be sensitive to sample period we also estimate structural breaks over the period January 1928 – December 1936. The results are robust to these sample changes.

Table 4. *Structural Breaks in Inflation Expectations*

	Frequency	Break Dates			
		1	2	3	4
Commodity Prices	Weekly	27/10/1922	15/10/1926	10/10/1930	9/11/1934
Quantitative News	Daily	1/10/1923	8/8/1926	2/9/1931	2/9/1934
Term Premium	Monthly	12/1922	2/1929	1/1933	3/1936
Aggregate Measure	Monthly	1/1933			

Notes: This table shows the dates of structural breaks in various series of inflation expectations based on Bai and Perron (1998) tests. The sample period is January 1920 to December 1938.

Sources: See figures 2, 3, and 4.

F. *Inflation Expectations and the Macroeconomy*

The new measures suggest that there was a discontinuity in inflation expectations. Did this shift in expectations spur the recovery?

In theory, the dynamic IS equation of the New Keynesian model implies that an increase in inflation expectations increases output relative to its natural level by reducing the real interest rate (Galí, 2018). Figure 6 charts the ex-ante real interest rate, based on the Fisher equation, where inflation expectations are (approximately) equal to the nominal interest rate minus expected inflation. The nominal interest rates are Bank Rate, the prime bank bill rate, the yield on treasury bills, and the yield on consols (Capie and Webber, 2010). The first three are short-term interest rates, the fourth is long-term. The series of inflation expectations is the scaled composite measure.

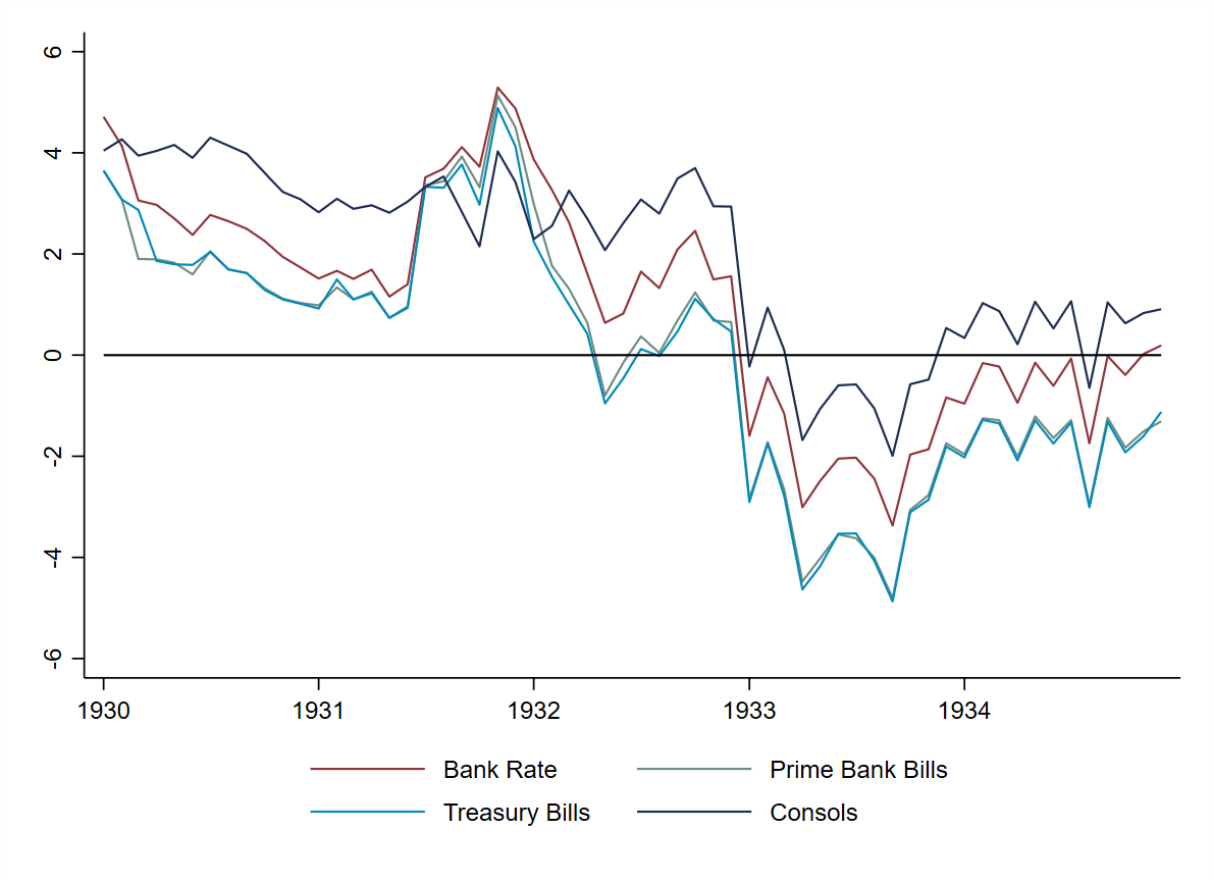

Figure 6. *Ex-ante Real Interest Rates, 1930-4 (%)*

Notes and sources: This figure shows monthly real interest rates based on data reported in Capie and Webber (2010), the scaled aggregate measure of inflation expectations, and the Fisher equation.

The Figure shows that real interest rates were rather high after leaving the gold standard as Bank Rate was held at 6 per cent. However, from December 1931, real rates began to come down. Between January 1933 and October 1934, ex-ante real interest rates on short-term instruments, such as Bank Rate, prime bank bills and Treasury bills, were negative.

While the Fisher equation implies that inflation expectations and the ex-ante real interest rate move one-for-one, the dynamic IS equation suggests that the relationship between inflation expectations and the output gap is governed by the elasticity of intertemporal substitution. A low elasticity implies that the output gap will respond sluggishly to changes in expected inflation. Therefore, how economic activity responds to changes in expectations is an empirical question.

In order to answer this question, we estimate a model developed by Leduc, Sill, and Stark (2007) for the modern US economy that incorporates inflation expectations into a vector autoregression (VAR). The model includes a measure of inflation expectations, retail price inflation, (log) real GDP at factor

cost, and the yield on treasury bills. The variables, sources, and descriptions are summarised in Table 5. In terms of lags, we include 1 of each endogenous variable, based on the minimisation of Schwarz's Bayesian Information Criterion. To account for seasonality, we include monthly dummies as exogenous variables. Following Leduc et al. (2007), we use a recursive identification scheme, ordering expectations first so that expectations affect, but are not affected by, the other variables contemporaneously. The logic is that when agents form expectations at time t, they do not know the outturn of the other variables for t. To maximise the plausibility of this assumption, we use high-frequency data.

Table 5. *Data Sources*

Variable	Source	Description
Inflation expectations	See text	Per cent
Retail price inflation	Capie and Collins (1983, p. 38)	Calculated as the 12 month change in the retail price index. Per cent
Real GDP at factor cost	Mitchell et al. (2012)	Seasonally adjusted at source. £ millions. 1938 prices
Treasury bill yield	Capie and Webber (2010)	Month end. Per cent

Notes: This table details the data used in the baseline VAR model.

The results are presented in Figure 7. Panel A shows that in response to a 1 percentage point increase in inflation expectations, retail price inflation rises by up to 0.91 percentage points ($t = 2.79$) after seven months. Thereafter, inflation declines and is not statistically different from zero after 12 months. The positive response of inflation to changes in inflation expectations is consistent with the New Keynesian Phillips Curve.

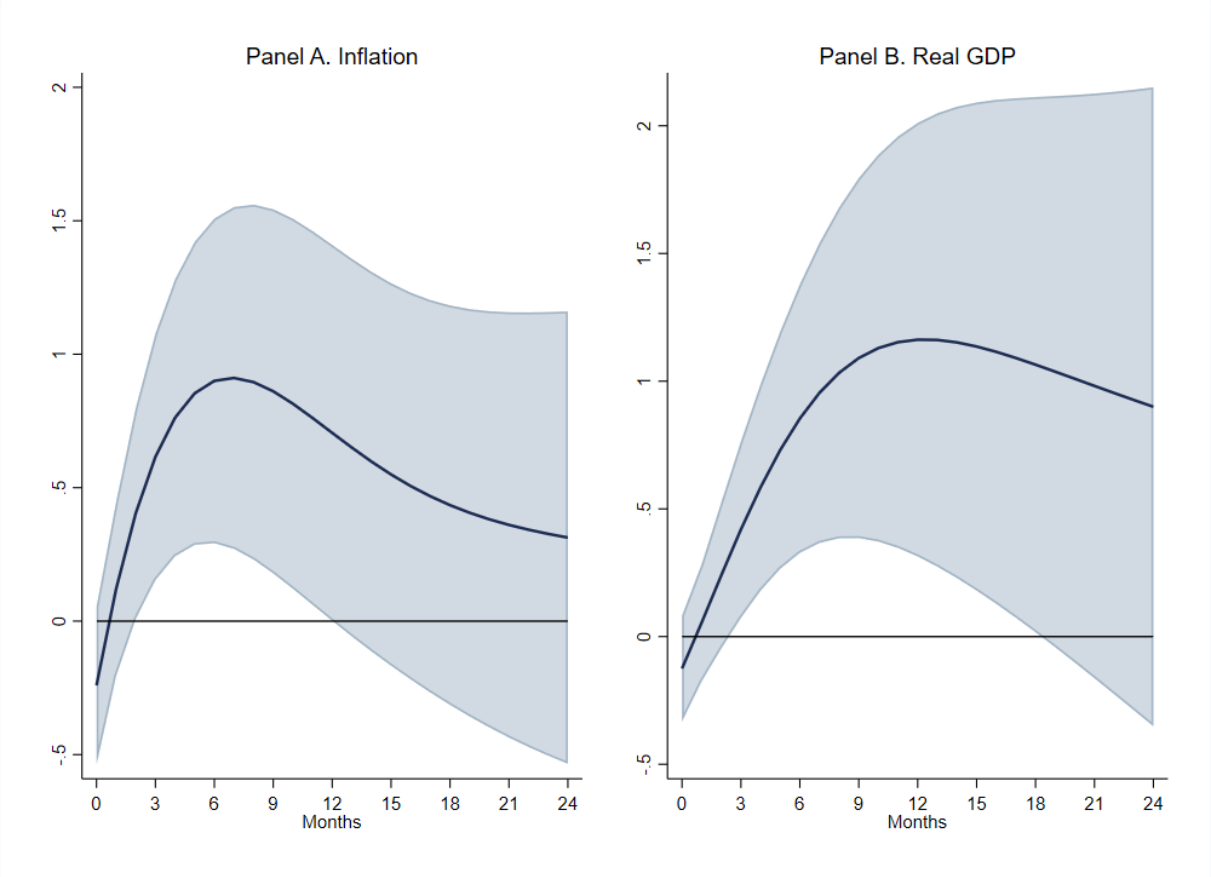

Figure 7. *The Response of Inflation and Real GDP to Inflation Expectations (%)*

Notes and sources: This figure shows the response of inflation and real GDP to a 1 percentage point change in inflation expectations based on a VAR model and data listed in Table 5. The sample period is January 1930 to December 1934. The shaded area spans the 95 per cent confidence interval.

Panel B shows that following a 1 percentage point increase in inflation expectations, real GDP rises by a maximum of 1.16 per cent ($t = 2.68$) after twelve months. The effect subsides thereafter and is not distinguishable from zero after 18 months. That inflation expectations are positively associated with economic activity is consistent with the dynamic IS equation.

In terms of robustness, these finding are not sensitive to including 3 lags (in line with the minimisation of the Akaike Information Criterion), reversing the ordering so that inflation expectations are affected by, but do not affect, the other variables contemporaneously, using alternative measures of output – real GDP at market prices (Mitchell et al., 2012) and an economic activity index (Albers, 2018) – and including various measures of fiscal policy – log government expenditure, revenue and debt (Lennard, 2020).

The results suggest a robust link between inflation expectations and economic activity. An interesting extension would be to investigate the transmission mechanism. According to the New Keynesian model, the first step in the chain is higher inflation expectations feeding into lower ex-ante real interest rates. Figure 6 is good evidence in support of this channel. The intermediate step is lower real rates stimulating consumption and investment. Unfortunately, high-frequency information on the components of GDP are not available for the interwar period, preventing us from exploring whether it was consumption or investment that was most sensitive to changes in ex-ante real interest rates. The final step is simply an accounting exercise, where higher consumption and investment raise GDP one for one.

A valid concern is the endogenous formation of expectations. Do expectations affect economic outcomes or do economic outcomes affect expectations? In the narrow sense of Granger causality, it seems that expectations affect, but are not affected by, economic outcomes. As Table 6 shows, inflation expectations Granger-cause inflation ($p < 0.01$) and real GDP ($p < 0.01$). However, inflation ($p = 0.39$) and real GDP ($p = 0.72$) do not Granger-cause inflation expectations. Combined with the robustness of the results to alternative orderings, this should help to alleviate concerns about endogeneity.

Table 6. *Granger Causality*

	p-values in parentheses
Do inflation expectations Granger-cause inflation?	Yes (0.00)
Does inflation Granger-cause inflation expectations?	No (0.39)
Do inflation expectations Granger-cause real GDP?	Yes (0.00)
Does real GDP Granger-cause inflation expectations?	No (0.72)

Notes and sources: This table shows the p-values for the null hypothesis that all coefficients are equal to zero. The sample period is January 1930 to December 1934.

What accounted for the recovery from the Great Depression in the United Kingdom? This question can be answered with a historical decomposition based on the estimated VAR model. Figure 8 plots the contribution of each variable in the model to real GDP growth. The model suggests that deflationary expectations were a persistent drag on growth until November 1931 and a regular impediment thereafter. It was not until April 1933 that inflationary expectations were a sustained stimulus to economic activity. From that point until the pre-recession peak was surpassed in January 1934, real GDP increased by 5.6 per cent, of which inflation expectations accounted for 69 per cent. Measured from the trough of the depression in September 1932 to January 1934, real GDP increased by 8.9 per

cent, of which inflation expectations accounted for 36 per cent. These results imply an active expectations channel in ending the slump of the early 1930s. Although the impact of expectations on recovery can be identified in parts of 1932, what stands out is the volatility of the effect in this early phase – a result that is consistent with the idea that the early devaluation in the UK was unable to generate a one-off persistent shift in expectations. Only in 1933 do we observe a significant expectations effect that plays a central role in giving momentum to the early stages of UK economic recovery.

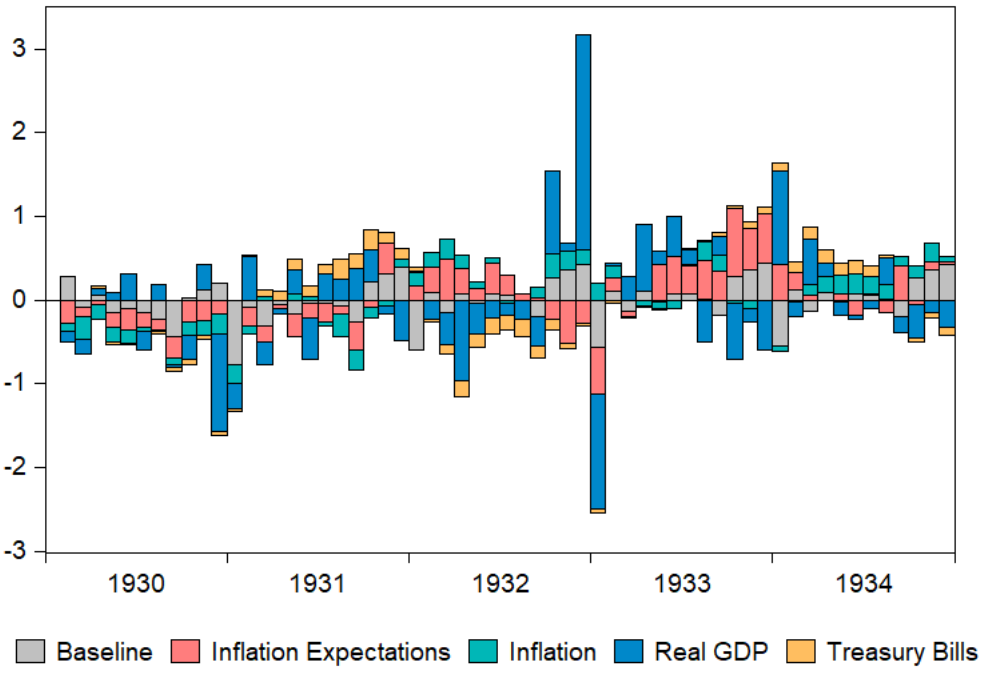

Figure 8. *A Historical Decomposition of Real GDP Growth (%)*

Notes and sources: This figure shows a historical decomposition of real GDP based on a VAR model. The sample period is March 1930 to December 1934.

IV. Qualitative Evidence

We now turn from quantitative evidence to qualitative. Given the challenge of reconstructing an unobserved economic statistic such as inflation expectations, narrative evidence is a readily available and valuable complement. The most useful sources have been contemporary newspapers and parliamentary debates and reports. We have ordered this section chronologically, so that we can trace how expectations evolved over time.

The account begins in the midst of depression with the appointment of a committee by the Chancellor of the Exchequer, which included Lord Macmillan (as Chairman) and John Maynard Keynes, to recommend how to stimulate trade, commerce, and employment. As far as we have been able to tell, the Committee on Finance & Industry Report (P. P., 1931, pp. 116-7) or the "Macmillan Report," published on 13 July 1931, was the first quasi-official declaration to raise prices: "A large rise towards the price level of 1928 is greatly to be desired […] We recommend that this objective be accepted as the guiding aim of the monetary policy of this country. The acceptance of such an objective will represent in itself a great and notable change."

Yet this recommendation did not become policy for some time. Following the suspension of the gold standard on 21 September 1931, the Board of Trade agreed with the Grocers' Federation of the United Kingdom to "cooperate with the Government in every possible way to keep prices at the present level" (*The Times*, 23 September 1931, p. 6) and with the Liverpool Provision Trade Association to "cooperate as fully as possible with the Government in the present situation regarding the maintenance of prices and the prevention of undue inflation of prices" (*The Times*, 23 September 1931, p. 6). Thus, the government was publicly colluding with industry not to push prices up but to keep them down.

The fear of inflation was maintained into 1932. The *Daily Telegraph* (10 February 1932, p. 5) wrote that "the currency is sound, the possibility of inflation no longer exists, internal prices are either stable or falling. The whole economic edifice is being adjusted to new conditions and long before the other great countries are over their impending difficulties we shall have put our house in order." *The Times* (11 April 1932, p. 19) reported that "even now we witness in the House of Commons and elsewhere repeated statements that it is a matter for congratulation that our internal prices are not rising."

At the budget of 1932, however, the Chancellor embraced the recommendations of the Macmillan Report (Hansard (Commons), 5th ser., CCLXV, 9 May 1932, col. 1671):

> The Government do desire to see a rise in wholesale prices in this country and, although not to the same extent, a rise in retail prices, because it is clear that, if industries in this country, by a rise in wholesale prices, can once more make profits, then we are getting back to the condition which we all desire to see when confidence will be restored, when business will be ready to take advantage of cheap and abundant money, and when we may expect to see our businesses expand and employment once more increase.

While this was Chamberlain's clearest commitment to return "towards the price level of 1928" (Hansard (Commons), 5th ser., CCLXV, 9 May 1932, col. 1674), it was not unambiguous. By aiming for a rise in wholesale prices (producer prices) greater than the rise in retail prices (consumer prices), the government was managing expectations to engineer a shift in *relative* prices, which is a challenging and nuanced message to communicate.

The commitment to raising prices was cemented at the British Empire Economic Conference of 1932, which ran from 21 July to 20 August. The objective of "raising prices and stimulating trade" was discussed from the opening of the conference (*The Times*, 22 July 1932, p. 14). It was reported that "a rise throughout the world in the general levels of wholesale prices is in the highest degree desirable. The evil of falling prices must be attacked by the Government and individual action in all its causes which are political, economic, financial or monetary" (*Financial Times*, 13 August 1932, p. 5). The target was to increase prices "to a height more in keeping with the level of costs, including the burden of debts and other fixed and semi-fixed charges" (*Financial Times*, 13 August 1932, p. 5).

The need to end deflation and depression was reiterated over the coming years, which suggests that economic policy was struggling to turn the tide, at least to the extent that Roosevelt would later achieve in his first 100 days (Eggertsson, 2008). For example, *The Times* (4 November 1932, p. 15) suggested that, "the recession in business has gone farther than ever before. Positive measures of assistance may now be needed, in addition to the removal of obstacles, to secure recovery from a depression of unprecedented depth. The outstanding positive measure which claims our attention is reflation." The *Guardian* (7 February 1933, p. 9) wrote that "it is evident that all the other troubles are either caused or aggravated by the disastrous fall of the price level". Chamberlain stated to the House of Commons in February 1933 that "we have got to raise wholesale prices" (Hansard (Commons), 5th ser., CCLXXIV, 16 Feb. 1933, col. 1227).

While domestic economic policy was targeted at reflation, it was perceived that there were some international obstacles in the way. One fear was that if British prices rose in isolation, then exports would suffer further: "If all we do is to raise our own internal prices, then we will lose still more of the little export trade we have so far managed to keep […] Unless reflation can be carried through upon an international scale it must be more limited" (*Financial Times,* 3 April 1933, p. 7). The task of international coordination was on the agenda of the World Economic Conference in the summer of 1933. Although the conference ended in impasse, there were commitments to "price boosting" from a number of countries, including Australia, United Kingdom, and the United States (*The Economist*, 24 June 1933, p. 1341).

By the spring of 1934, it was clear that recovery was well underway. Announcing the budget, Chamberlain reported (Hansard (Commons), 5th ser., CCLXXXVIII, 17 Apr. 1934, col. 906):

> In 1932 many dark clouds still hung round the horizon. In 1933, although the outlook was distinctly brighter, there was no settled feeling that we were about to enjoy a spell of fine weather. To-day the atmosphere is distinctly brighter. The events of the last 12 months have shown gratifying evidence that the efforts of His Majesty's Government are bearing fruit. There is a small but distinct rise in wholesale prices […] The volume of our industrial production has very much gone up and equilibrium has practically been restored in the balance of payments. If you look to what I might call the telltale statistics, the unemployment figures and statistics of such things as retail trade, consumption of electricity, transport, iron and steel production and house building, in every case you see a definite revival of activity […] If I might borrow an illustration from the titles of two well-known works of fiction, I would say that we have now finished the story of "Bleak House" and that we are sitting down this afternoon to enjoy the first chapter of "Great Expectations."

The Economist (23 June 1934, pp. 1360-1) summarised the recovery in Britain and beyond:

> The experience of the last two years shows conclusively that recovery in the emancipated countries has been only partially a recovery of exports, and far more a general internal recovery. Great Britain, the United States, Scandinavia and South Africa are obvious examples […] But the fundamental fact remains that the emancipated countries have succeeded in raising their price levels toward adjustment with their cost levels, while the gold countries have not. This is perhaps the major fact of the economic history of the last two years […] In almost every case money has been cheapened, credit expanded, conversions undertaken, foreign exchange control relaxed, and anxiety about the trade balance and the Budget generally relieved. But these are exactly the measures most calculated to raise prices and reduce costs and so promote revival; for revival has come through lower interest charges as well as higher prices in the emancipated countries.

How did inflation, actual and expected, stimulate recovery? The media coverage discussed a number of mechanisms. *The Times* (29 November 1932, p. 15) elaborated on a textbook channel, that inflation or reflation is “proof to producers that they will not produce in vain and to consumers that they had better buy quickly while prices are low,” which might stimulate aggregate demand and aggregate

supply. Sir Arthur Salter, in a radio broadcast, echoed Irving Fisher's (1933) theory of debt deflation (*The Times*, 10 January 1933, p. 6):

> If a "world policy of controlled reflation" could be achieved, whether by this or an alternative method, every problem with which they were faced would be lightened. Enterprise would be as much stimulated, as it had been depressed by deflation; the burden of debts would be lightened: the dangers of wholesale bankruptcy - and default which were threatening the whole credit system would be lightened.

J. A. Hobson, writing for the *Guardian* (7 February 1933, p. 9), thought that raising prices would have wide-ranging benefits:

> If prices could be put upon a fairly stable basis of the pre-depression period idle plant and labour could everywhere be employed with profit to employers, surplus savings would everywhere flow into new productive enterprises, credit (alike long and short) would be put to secure and profitable uses both for domestic and international trade, every burden of fixed interest indebtedness would be lightened, and confidence would be established in all business and financial quarters.

While the narrative evidence suggests that recovery was achieved some time between the World Economic Conference in the summer of 1933 and the budget in spring 1934, it does not necessarily imply a causal role to inflation expectations, which may have been affected by, but did not affect, the return to growth. This issue of endogeneity was pointed out by Lionel Robbins: "when the conditions of profitability and confidence were restored, some measure of price recovery was almost inevitable" (*Guardian*, 19 November 1933, p. 25).

V. Conclusions

The case study of the UK allows for a better understanding of how policy regime change was generated in the 1930s. A shift in inflationary expectations allows us to identify the time-profile of policy regime change. Clearly, the countries exiting the gold standard early, such as the UK, found it difficult to break from the existing policy framework of the gold standard. Although the devaluation created the possibility of greater policy freedoms, these were not initially used. In fact, the opposite seems to have been the case as in the summer of 1931 the balanced budget was used to confirm that price stability was a key objective of the government. However, by mid-1932 the government was beginning to

accept that some temporary inflation could be stabilising. By pursuing the informal price level target of 1928, this was seen as a one-off stabilising inflation that could contribute to economic recovery. The evidence considered suggests that the time-profile for generating inflationary expectations change is consistent with some form of learning running from 1932 and into 1933. By January 1933 inflationary expectations in the UK were clearly moving in an upward direction, contributing to negative ex-ante real interest rates and making a significant positive contribution to the early stages of UK economic recovery.

Given the time-profile of the shifting expectations, this allowed both national and international forces to play a role. The fact that UK inflation expectations shift by January 1933 and remain persistent throughout the year suggests that as more countries were breaking from the gold standard, international learning spillovers were present. There is now clear evidence that late devaluers were able to benefit from a more rapid shift in inflationary expectations than was the case for the early devaluers. The different experiences of early and late devaluers suggests that the late devaluers were able to benefit from observing the policy experiments emerging from 1931-2 in a global learning process. The reciprocal of this is that the early devaluers may have also seen a positive effect from Roosevelt's policy framework in 1933. This two-way relationship arising from global learning is important to understanding how the uncoordinated national policy responses of the 1930s impacted on inflation expectations and economic recovery.

Comparing our results to the existing literature, we observe some similarities and differences that are noteworthy. Crafts (2013, 2014, 2018) suggested that the sequence of policies in 1931 to 1932 were able to shift inflationary expectations in the UK. The qualitative evidence we have considered confirms that the start of this process is clear in 1932 but the quantitative evidence suggests that the most significant inflationary expectations changes took place in January 1933. The long time horizon in shifting inflationary expectations suggests that a mixture of national and global spillovers are likely to have determined UK inflationary expectations. The fact that the UK expectations change happens before the Roosevelt policy regime change suggests that the time spent in 1932 to generate a one-off shift in inflation expectations was bearing fruit. However, the persistence of this effect into 1933 suggests that as the network of countries exiting the old policy regime of the gold exchange standard widened, this is likely to have impacted favourably on UK inflation expectations. The evidence we have presented is also consistent with results presented in Ellison et al. (2020). As reported earlier they find that the early devaluers did not witness a shift in inflationary expectations. Our evidence is consistent with this for the UK case but clearly the UK was able to shift inflationary expectations over time. Ellison et al. (2020) report two measures of inflation expectations, the term structure of interest rates (which

displays a jump in inflation expectations in early 1933) and a model-based measure (which suggests a jump in inflation expectations in late 1933). Our results complement the Ellison et al. (2020) result by showing that a broad set of expectation measures agree with the term structure evidence and find that the expectation effect is clear from January 1933. However, our measure of inflation expectations differs from the model-based evidence of Ellison et al. (2020), which suggests a structural break in inflation expectations in October 1933.

REFERENCES

Albers, T. N. H., 'The Prelude and Global Impact of the Great Depression: Evidence from a New Macroeconomic Dataset', *Explorations in Economic History*, 70 (2018), pp. 150–63.

Bai, J. and Perron, P., 'Estimating and Testing Linear Models with Multiple Structural Changes', *Econometrica*, 66 (1998), pp. 47–78.

Baker, S. R., Bloom, N., and Davis, S. J., 'Measuring Economic Policy Uncertainty', *Quarterly Journal of Economics*, 131 (2016), pp. 1593–636.

Barsky, R. B. and De Long, J. B., 'Forecasting Pre-World War I Inflation: The Fisher Effect and the Gold Standard', *Quarterly Journal of Economics*, 106 (1991), pp. 815–36.

Binder, C. C., 'Estimation of Historical Inflation Expectations', *Explorations in Economic History*, 61 (2016), pp. 1–31.

Board of Trade, *Board of Trade Journal* (London, 1935).

Bray, M. M. and Savin, N. E., 'Rational Expectations Equilibria, Learning, and Model Specification', *Econometrica*, 54 (1986), pp. 1129–60.

Bullard, J. B., 'Learning, Rational Expectations and Policy: A Summary of Recent Research', *Federal Reserve Bank of St. Louis Review*, 73 (1991), pp. 50–60.

Butler, D. and Freeman, J., *British Political Facts, 1900–67* (London, 1968).

Campbell, J. Y. and Shiller, R. J., 'Yield Spreads and Interest Rate Movements: A Bird's Eye View', *Review of Economic Studies*, 58 (1991), pp. 495–514.

Capie, F. and Collins, M., *The Inter-war British Economy: A Statistical Abstract* (Manchester, 1983).

Capie, F. and Webber, A., *A Monetary History of the United Kingdom, 1870–1982* (London, 2010)

Chadha, J. S., Lennard, J., Solomou, S., and Thomas, R., 'Exchange Rates, Tariffs and Prices in 1930s' Britain', in P. Clavin, G. Corsetti, M. Obstfeld, and A. Tooze, eds., *Keynes's* Economic Consequences of the Peace *after 100 Years: Polemics and Policy* (Cambridge, forthcoming).

Chambers, D. and Saleuddin, R., 'Commodity Option Pricing Efficiency Before Black, Scholes, and Merton', *Economic History Review*, 73 (2020), pp. 540–64.

Chouliarakis, G. and Gwiazdowski, T., 'Regime Change and Recovery in 1930s Britain', Mimeo (2016).

Committee on Finance & Industry Report (P. P., 1931).

Crafts, N., 'Returning to Growth: Policy Lessons from History', *Fiscal Studies*, 34 (2013), pp. 255–82.

Crafts, N., 'What Does the 1930s' Experience Tell Us about the Future of the Eurozone?', *Journal of Common Market Studies*, 52 (2014), pp. 713–27.

Crafts, N., *Forging Ahead, Falling Behind and Fighting Back: British Economic Growth from the Industrial Revolution to the Financial Crisis* (Cambridge, 2018).

Crafts, N. and Mills, T. C., 'Rearmament to the Rescue? New Estimates of the Impact of "Keynesian" Policies in 1930s' Britain', *Journal of Economic History*, 73 (2013), pp. 1077–104.

Crafts, N. and Mills, T. C., 'Self-defeating Austerity? Evidence from 1930s' Britain', *European Review of Economic History*, 19 (2015), pp. 109–27.

Daniel, V. and ter Steege, L., 'Inflation Expectations and the Recovery from the Great Depression in Germany', *Explorations in Economic History*, 75 (2020).

Edwards, S., 'Change of Monetary Regime, Contracts, and Prices: Lessons from the Great Depression, 1932–1935', *Journal of International Money and Finance*, 108 (2020).

Eggertsson, G. B., 'Great Expectations and the End of the Depression', *American Economic Review*, 98 (2008), pp. 1476–516.

Eichengreen, B., *Golden Fetters: The Gold Standard and the Great Depression, 1919–1939* (New York, 1992).

Ellison, M., Lee, S. S., and O'Rourke, K. H., 'The Ends of 30 Big Depressions', NBER Working Paper No. 27586 (2020).

Ellison, M. and Scott, A., 'Managing the UK National Debt 1694–2018', *American Economic Journal: Macroeconomics*, 12 (2020), pp. 227–57.

Evans, G. W. and Honkapohja, S., *Learning and Expectations in Macroeconomics* (Princeton, New Jersey, 2001).

Fisher, I., 'The Debt-deflation Theory of Great Depressions', *Econometrica*, 1 (1933), pp. 337–57.

Galí, J., 'The State of New Keynesian Economics: A Partial Assessment', *Journal of Economic Perspectives*, 32 (2018), pp. 87–112.

Gentzkow, M., Kelly, B., and Taddy, M., 'Text as Data', *Journal of Economic Literature*, 57 (2019), pp. 535-74.

Gentzkow, M. and Shapiro, J. M., 'What Drives Media Slant? Evidence from U.S. Daily Newspapers', *Econometrica*, 78 (2010), pp. 35–71.

Gwiazdowski, T. and Chouliarakis, G., 'Regime Change and Recovery in 1930s Britain', Leeds University Business School Working Paper (2021).

Hamilton, J. D., 'Monetary Factors in the Great Depression', *Journal of Monetary Economics*, 19 (1987), pp. 145–69.

Hamilton, J. D., 'Was the Deflation During the Great Depression Anticipated? Evidence from the Commodity Futures Market', *American Economic Review*, 82 (1992), pp. 157–78.

Hanna, A. J., Turner, J. D., and Walker, C. B., 'News Media and Investor Sentiment during Bull and Bear Markets', *European Journal of Finance*, 26 (2020), pp. 1377–95.

Jalil, A. J. and Rua, G., 'Inflation Expectations and Recovery in Spring 1933', *Explorations in Economic History*, 62 (2016), pp. 25–50.

Kapetanios, G., Maule, B., and Young, G., 'A New Summary Measure of Inflation Expectations', *Economics Letters*, 149 (2016), pp. 83–5.

Kynaston, D., *The Financial Times: A Centenary History* (London, 1988).

Leduc, S., Sill, K., and Stark, T., 'Self-fulfilling Expectations and the Inflation of the 1970s: Evidence from the Livingston Survey', *Journal of Monetary Economics*, 54 (2007), pp. 433–59.

Lennard, J., 'Uncertainty and the Great Slump', *Economic History Review*, 73 (2020), pp. 844–67.

Mathy, G. P., 'How Much Did Uncertainty Shocks Matter in the Great Depression?', *Cliometrica*, 14 (2020), pp. 283–323.

Mathy, G. P. and Ziebarth, N. L., 'How Much does Political Uncertainty Matter? The Case of Louisiana under Huey Long', *Journal of Economic History*, 77 (2017), pp. 90–126.

Mitchell, B. R., *British Historical Statistics* (Cambridge, 1988).

Mitchell, J., Solomou, S., and Weale, M., 'Monthly GDP Estimates for Inter-war Britain', *Explorations in Economic History*, 49 (2012), pp. 543–56.

Perez, S. J. and Siegler, M. V., 'Inflationary Expectations and the Fisher Effect Prior to World War I', *Journal of Money, Credit and Banking*, 35 (2003), pp. 947–65.

Pigou, A. C., *Industrial Fluctuations* (London, 1927).

Porter, M. F., 'An Algorithm for Suffix Stripping', *Program*, 14 (1980), pp. 130–7.

Romer, C. D., 'It Takes a Regime Shift: Recent Developments in Japanese Monetary Policy through the Lens of the Great Depression', in J. A. Parker and M. Woodford, eds., *NBER Macroeconomics Annual 2013* (Chicago, 2014), pp. 383–400.

Sargent, T., 'The Ends of Four Big Inflations', in R. E. Hall, ed., *Inflation: Causes and Effects* (Chicago, 1982), pp. 41–98.

Shibamoto, M. and Shizume, M., 'Exchange Rate Adjustment, Monetary Policy and Fiscal Stimulus in Japan's Escape from the Great Depression', *Explorations in Economic History*, 53 (2014), pp. 1–18.

Temin, P., *Lessons from the Great Depression: The Lionel Robbins Lectures for 1989* (Cambridge, Massachusetts, 1989).

Temin, P. and Wigmore, B. A., 'The End of One Big Deflation', *Explorations in Economic History*, 27 (1990), pp. 483–502.

Voth, H-J., 'Inflationary Expectations and Uncertainty during the Great Depression in Germany', Mimeo (1999).

Appendix A. Measuring Inflation Expectations Using Commodity Prices

This appendix expands on two issues associated with subtracting the 1-period ahead futures contract from the j-period contract as a method to difference out unobserved storage and transaction costs.

I. Interpretation

This practice alters the horizon over which expectations are measured. Returning to the former setup where the log j-period ahead futures price is equal to the log expected spot price at $t + j$:

$$f_{i,t}(j) = E_t s_{i,t+j} \tag{1}$$

The 1-month ahead contract is therefore:

$$f_{i,t}(1) = E_t s_{i,t+1} \tag{2}$$

Subtracting (2) from (1):

$$f_{i,t}(j) - f_{i,t}(1) = E_t s_{i,t+j} - E_t s_{i,t+1} \tag{3}$$

This approach measures expectations between $t + 1$ and $t + j$ not between t and $t + j - 1$. Only in the special case that expected inflation from t to $t + 1$ is the same as from $t + j - 1$ to $t + j$ are the two equivalent.

II. Storage and Transaction Costs

A. *Homogenous Costs*

Moving on to the case of a homogenous cost that does not depend on the maturity (j) of the futures contract. Adding this constant cost (κ) to equation (1) and (2):

$$f_{i,t}(j) = E_t s_{i,t+j} + \kappa_{i,t} \tag{4}$$

$$f_{i,t}(1) = E_t s_{i,t+1} + \kappa_{i,t} \tag{5}$$

Subtracting (5) from (4):

$$f_{i,t}(j) - f_{i,t}(1) = \left(E_t s_{i,t+j} + \kappa_{i,t}\right) - \left(E_t s_{i,t+1} + \kappa_{i,t}\right) \tag{6}$$

$$f_{i,t}(j) - f_{i,t}(1) = E_t s_{i,t+j} - E_t s_{i,t+1} \tag{7}$$

As the homogenous cost cancels, the difference in the j- and 1- period ahead futures prices is equal to the j- and 1- period ahead inflation expectations. A plausible example of such a cost is a transaction cost.

B. *Heterogeneous Costs*

Proceeding to the case of a heterogeneous cost that does depend on the maturity (j) of the futures contract. Adding this cost ($\kappa(j)$) to equation (4) and (5):

$$f_{i,t}(j) = E_t s_{i,t+j} + \kappa_{i,t}(j) \tag{8}$$

$$f_{i,t}(1) = E_t s_{i,t+1} + \kappa_{i,t}(1) \tag{9}$$

Subtracting (9) from (8):

$$f_{i,t}(j) - f_{i,t}(1) = \left(E_t s_{i,t+j} + \kappa_{i,t}(j)\right) - \left(E_t s_{i,t+1} + \kappa_{i,t}(1)\right) \tag{10}$$

$$f_{i,t}(j) - f_{i,t}(1) = \left(E_t s_{i,t+j} - E_t s_{i,t+1}\right) + \left(\kappa_{i,t}(j) - \kappa_{i,t}(1)\right) \tag{11}$$

As the heterogeneous costs do not cancel, the difference in the j- and 1- period ahead futures prices is equal to the j- and 1- period ahead inflation expectations plus the difference in the j- and 1- period costs. A plausible example of such a cost is a storage cost.