THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Reis, Ricardo (2022) Losing the inflation anchor. *Brookings Papers on Economic Activity,* https://doi.org/10.1353/eca.2022.0004

https://researchonline.lse.ac.uk/id/eprint/112462/

Version: Published Version

LSE Research Online is the repository for research produced by the London School of Economics and Political Science. For more information, please refer to our Policies page or contact lseresearchonline@lse.ac.uk

Losing the inflation anchor*

Ricardo Reis

LSE

October 2021

Abstract

Inflation has an anchor in people's expectations of what its long-run value will be. If expectations persistently change, then the anchor is adrift; if they differ from the central bank's target, the anchor is lost. This paper uses data on expectations from market prices, from professional surveys, and from the cross-sectional distribution of household surveys to measure shifts in this anchor. Its main application is to the US Great Inflation. The data suggests that the anchor started drifting as early as 1967 and that this could have been spotted well before policymakers did. Using this approach on expectations data from Brazil, Turkey, South Africa, the US in the 1970s, and the US in 2021, confirms their usefulness to measure the inflation anchor in real time.

*Contact: r.a.reis@lse.ac.uk. I am grateful to Alan Blinder, Janice Eberly, Yuriy Gorodnichenko, and Jens Hilscher for comments. Discussions with Joao Ayres, Carlos Viana de Carvalho, Steve Davis, Erik Hurst, and Valerie Ramey stimulated this project at its start. Gustavo Araujo, Viviane Bittencourt, Aloisio Campelo Junior, Pierre Siklos, and Justin Wolfers helped to collect some of the data series. I am grateful to Aleksandra Furmanek, Patrick Leitoff, Samantha Ong, and Annie Wang for their research assistance, and especially to Adrien Couturier, Rui Sousa, and Borui Niklas Zhu. This paper was prepared for the Fall 2021 *Brookings Papers of Economic Activity* conference on September 9, 2021 (first draft, August 2021). It has received funding from the European Union's Horizon 2020 research and innovation programme, INFL, under grant number No. GA: 682288.

1 Introduction

Where is inflation heading? A natural way to answer this question is to measure where people expect inflation to go. Even if each individual is likely surprised by transitory shocks, there is a general principle that on average, across people and time, they will be collectively right. Therefore, expectations data will reveal persistent changes.

When it comes to inflation, economic theory puts a particularly special role on expectations as its driver. The classical dichotomy dictates that in the long run any inflation rate is consistent with the same real outcomes and welfare. Pinning down inflation (in the literature on determinacy) consists almost entirely of pinning down what people expect inflation will persistently be, and how this is influenced by rules, policy regimes, and monetary standards (Castillo-Martinez and Reis, 2019). As for the short run, if expectations of inflation rise, households will buy more goods today, savers will shift away from nominal assets, workers will demand higher wages, and firms will post higher prices, all of which lead inflation to rise. The Phillips curve captures the core idea that if expected inflation rises, then only a deep recession can keep inflation down (Mankiw and Reis, 2018). It is therefore no surprise that central bankers see it as a key part of their job to keep expectations near the target.

Of course, in equilibrium, both inflation and expected inflation are determined together. Also because of this co-determination, in order to gauge future inflation, beyond data on present inflation, a superior source of information ought to be data on expected inflation. To answer the question of where inflation is heading, we are like a person sitting on the beach, seeing a boat float with the sea current, trying to figure out if it is drifting away or staying near shore before it is too late. A screen showing the feed from an underwater camera with even a grainy picture of the boat's anchor would be very valuable. This paper tries to build this grainy picture of the inflation anchor.

In particular, it asks whether data on expectations in the past have helped to detect persistent deviations of inflation from target. Looking back at the US Great Inflation of the 1970s, could we see signs of what was coming in the expectations data? Do these data help advance the debate on what caused it? Were the same data patterns present in two other experiences of drifting inflation, Brazil and Turkey in the past decade? Or would the data generate false positives, missing the stabilization of US inflation in the 1980s, or the stability of inflation in South Africa in the last decade in spite of successive adverse shocks? Finally, what do the expectations data reveal about inflation in 2021, after all the price volatility brought about by the pandemic?

These are difficult questions to answer empirically. They require having, for the same period in time, both an explosion in inflation and available data on inflation expectations. Yet, while inflation scares were common until the mid 1990s, most reliable measures of inflation expectations start only later. Survey measures in most countries were promoted by central banks under inflation targeting, and this policy regime has so far been successful at keeping inflation stable. As for sovereign bonds whose returns are indexed to inflation, or markets in which one can trade inflation swap contracts, they are also recent and grew in counties where inflation was reasonably under control. In short, between 1970 and 1995, many anchors were lost, but there are almost no expectations data; between 1995 and 2020, there are data, but no lost anchors.

This paper starts by focusing on the US experience between 1966 and 1973. In the previous seven years, annual inflation had not been above 2% for a single month. But, between January of 1966 and September of 1973, just before the first oil price shock, inflation averaged 4.3%, rising from 1.9% to 7.4%. It is well appreciated that in the following seven years, from 1974 to 1981, US inflation fluctuated widely and was never below 5%. But the drift in inflation happened before, gradually and steadily from 1966 onwards.

To measure the inflation expectations anchor requires introducing data that have rarely been used. The standard surveys of expectations about CPI inflation in their current form, the Survey of Professional Forecasters and the Michigan survey, start in 1981 and 1978, respectively. Inflation-indexed bonds started only in 1997, and the inflation swap markets was only reasonably liquid starting in 2009. Some research has used the Greenbook forecasts, and the mean of earlier vintages of the Survey of Professional Forecasters or the Livingston Survey to assess expectations in the 1960s and 1970s. But their samples are small, making it hard to estimate any cross-sectional moment beyond central tendency.

This paper brings in some less-used sources of data on inflation expectations. First, between the second quarter of 1966 and the second quarter of 1977, the Michigan survey included a qualitative question about whether inflation was expected to go up, down, or remain unchanged *and* supplemented the up answers with a follow-up question on by how much, with a choice of 5 bins. I use those answers to provide measures of cross-sectional mean, variance and skewness of inflation expectations among households during this key period in the history of US inflation. Second, I use data from the Zurich market on gold forward contracts in USD, one of the few international markets where these were freely traded. Third, I complement these continuous series with more scattered data on expectations by firms and measures of media attention to inflation.

At first sight, it may appear that expectations lagged the drift away of US inflation. The cross-sectional median (or mean) survey expectation for professionals or households only rose sluggishly and with a lag relative to actual inflation during the 7 years. However, between 1968 and 1971, the disagreement captured by the cross-sectional standard deviation and skewness combined with the rising forward prices reveal a clear drift of the inflation anchor. The wage and price controls adopted in 1971 seem to have halted this drift for a little under two years, but after the oil price shock of late 1973, the anchor was clearly lost. Using the approach in Reis (2021) to combine the different expectations data, I estimate a fundamental expected inflation. It shows the anchor drifting by 2.5 percentage points between 1967 and 1971.

The next section of the paper looks at other episodes, across countries and time, to see whether the expectations data provides a reliable measure of the anchor. First, it looks at two cases where inflation drifted away: in Brazil between 2011 and 2016 and in Turkey starting in 2018. In each, looking back today with the benefit of hindsight to what happened to actual inflation and what were the stances of monetary and fiscal policy, the upwards drift of inflation is clear. The paper shows that looking at expectations data at the time would have signaled that this was the case in real time. Second, it looks at a possible false positive, South Africa between 2010 and 2016, which had inflation at the very edge of its target corridor. At the time, it was unclear whether the anchor had been lost, or whether an unlucky succession of supply shocks had temporarily raised prices. Today, hindsight points to it being the latter, and again the real time data on inflation expectations points in the right direction. Third, it looks at a case where inflation drifted down, instead of up, the US experience of the early 1980s. The expectations anchor moved accordingly, and again the data in real time reveals it. Finally, it looks at the data on expected inflation in 2020 and 2021, where the jury is out on whether inflation is going to drift away.

All combined, this paper concludes that, while market and survey data on expectations are noisy and imperfect, they provide valuable signals on where the expected inflation anchor is.[1]

[1]The closest work to this paper is Jalil and Rua (2016) who use news records and scattered business forecasts to infer whether inflation expectations shifted in 1933, triggering the start of the recovery from the Great Depression. See also Binder (2016) for other uses of expectations inflation data in economic history.

2 U.S. inflation 1966-73: Was the anchor adrift?

The top panel of Figure 1 plots inflation in the United States during the 1960s and 1970s according to three commonly-used price indices. Before 1965, inflation was remarkably stable, oscillating in a narrow band between 1% and 2%. The (incomplete and noisy) data on inflation expectations from this time show an anchor that was firm in the seabed. After the Treasury-Fed accord of 1951, monetary policy had been focussed on inflation control, and an independent central bank was able to deliver it. Fast forward a decade, to 1975, and there is little doubt that the expectations anchor was lost, with actual inflation being high and volatile. Low and stable inflation only returned after a painful recession in the early 1980s.

The focus of this section is on the decade between the start of 1965 and the end of 1974. Inflation gradually rose between 1965 and 1967, its pace accelerated between 1967 and 1971, and then slowed down between the middle of 1971 and the end of 1973. While at that time there was a legitimate argument that the anchor was re-settling, as soon as a price shock hit in the form of the rapid rise in oil prices at the end of 1973, it became clear that inflation, whether going up or down, was definitely adrift. There are many discussions of what was behind these movements, which I summarize below, before turning to the focus of this paper: the role that inflation expectations played in policy and academic debates of this time.[2]

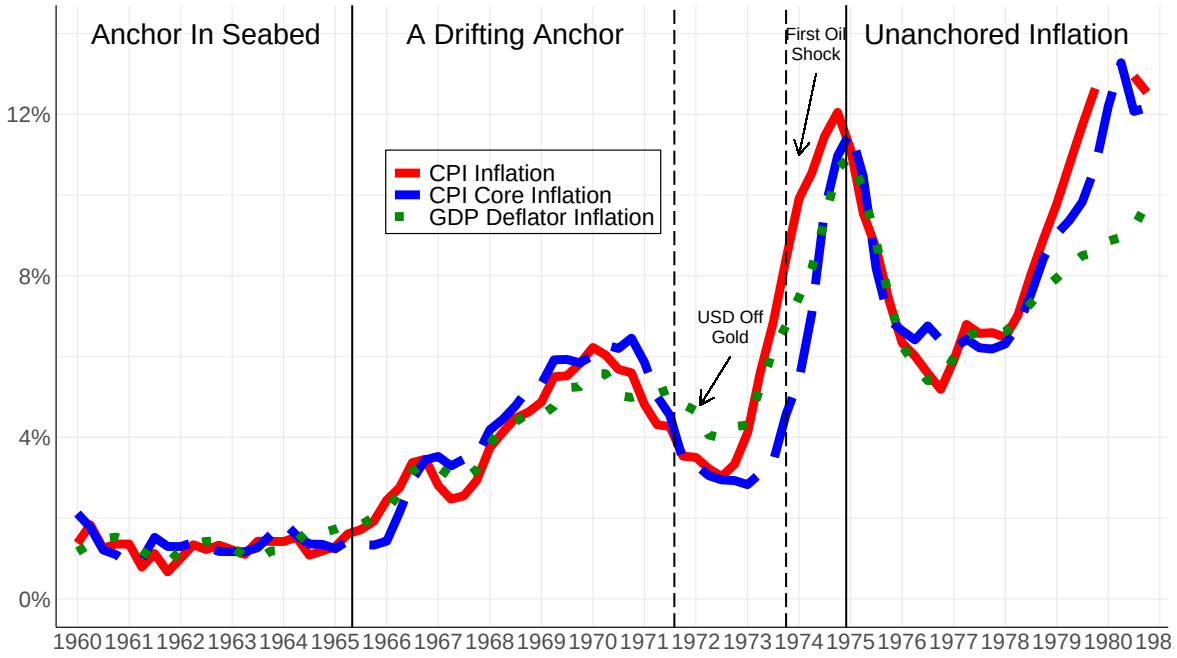
2.1 Inflation 1965-68: All the signs were there

Inflation and monetary policy. Under the William McChesney Martin Jr. chairmanship of the Board of Governors, the Fed settled into a policy regime which he termed "leaning against the wind," and that resulted in short-term interest rates moving countercyclically. After a brief recession, the US economy went through an expansion between 1961 and 1965, with the unemployment rate falling by 4% but inflation only moderately increasing. Things changed in the second half of 1965. Inflation rose above 2%, and the Fed stepped on the brakes, raising the discount rate in December of 1965. It proceeded with other measures to restrict credit in the first half of 1966 that were enhanced in its August 1966 meeting. This policy was a response to both the current state of the economy, as well as to projections of growing military expenditures because of the Vietnam War and grow-

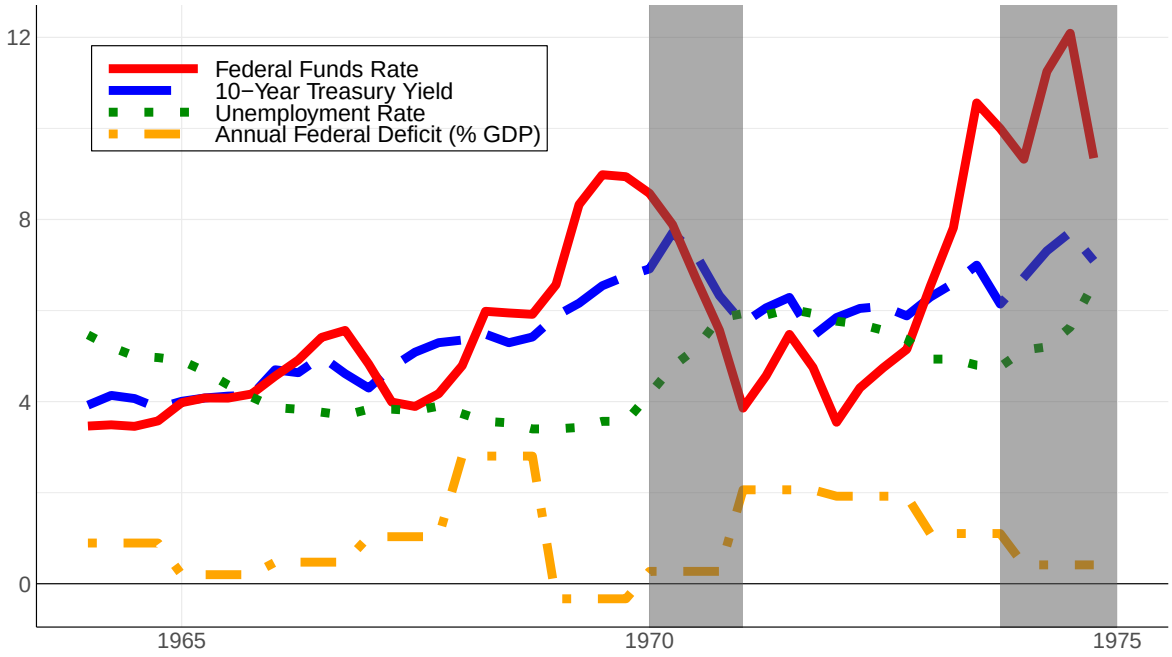
[2] Some excellent discussions are in Blinder (1982), DeLong (1997), Romer and Romer (2002), Meltzer (2010), Hetzel (2020).

Figure 1: The evolution of the US economy

(a) Actual inflation



(b) Other macroeconomic series



ing welfare state spending under President Johnson's Great Society legislation (Meltzer, 2005).

However, the monetary restraint was gone by the end of 1966. At the time, the Fed was accused of causing a credit crunch. The United States was going through turbulent political times, due to social divisions on race and the Vietnam War. Fiscal policy had shifted from being a stabilizer of the business cycle in the Keynesian post-war tradition to instead seeing its role as lowering unemployment as much as possible to raise the tide on all groups in the labor market. Martin thought policy coordination with the administration was important, and the Fed no longer tightened, especially as it subscribed to the view that an unemployment rate above 4% justified loose monetary policy.

Not only did the Fed not tighten further in 1966, in spite of rising inflation (already above 3%), but when unemployment slightly rose in the Spring of 1967, it reversed course with cuts in interest rates to arrest any chance of a recession. The mild slowdown of 1967 gave way to a strong expansion in 1968, and inflation rose to the 4.5% region.

Debates in the literature. Most accounts of the sources of the Great Inflation find its seeds during this period. A first seed was a view of a static Phillips curve such that any inflation was deemed temporary and acceptable in order to keep unemployment low (Romer and Romer, 2002). A second one were the estimates that the economy's acceptable rate of unemployment was 4% in spite of a significant deceleration of productivity (Orphanides, 2003). Third, there was a misperception of the link between monetary policy and inflation that ignored the role of money supply and did not distinguish between nominal and real interest rates (Nelson, 2005). Fourth, despite a permanent and growing external deficit, as well as a large decline in the US stock of gold, the FOMC deferred the defense of the gold peg to the Administration and its active use of capital controls, but the Treasury after 1965 subordinated the commitment to the Bretton Woods system to its goals for fiscal spending and low unemployment (Bordo and Eichengreen, 2013).

Common to all four factors — the Phillips curve, the natural rate of unemployment, the role of monetary policy, and the defense of the gold peg — was Martin's rejection of explicit economic models, and the general lack of a coherent framework (Meltzer, 2005). Martin gave many speeches opposing inflation and emphasizing its costs, and in his meetings with the Johnson Administration he openly disagreed with their sole focus on employment. But, to control inflation, he paid attention to money market data and participants, not economists. Discussions in the FOMC more often focussed on current technical market details, especially with regards to the globalization of financial markets

and banks' response to capital controls, rather than reflecting on the economic fundamentals of inflation.

The role of inflation expectations. This short-run market-centered view created a special role for inflation expectations. Martin placed a strong role on investor psychology in financial markets as driving inflation. Early in his term, testifying to Congress about the slight increase in inflation in the summer of 1959, he stated: "About this time inflationary expectations began to spread. The abrupt upward shift of interest levels in central money markets ... reflected investor demand for an interest premium to cover the risk of a depreciating purchasing power of invested funds.... The experience in the government bond market ... is a vivid example of the influence of inflationary expectations in financial markets. To the extent that such attitudes come to be reflected in decisions on wages, prices, consumption, and investment, they help to bring about their own realization." Later, to explain the clear rise in inflation in 1967-68, FOMC member speeches frequently referenced that "inflationary expectations remained widespread," and in December of 1969 to "the prevailing inflationary psychology." Part of the drift to loose monetary policy during this time can be explained by the subdued values of long-term interest rates. They were used as the measure of both expected inflation and inflation risk premia. Since they were low, Martin inferred that the anchor was firmly in place.

In sum, monetary policy (in relation to inflation expectations):

- saw the inflation expectations anchor as important to keep inflation stable;
- inferred expectations from bond rates and market movements;
- because bond rates remained low, the Fed was growingly surprised by the drift in inflation in 1965-68;
- so it increasingly relied on appeals to unobserved psychology to justify the changes.

2.2 Inflation 1968-71: The anchor comes loose

Inflation and monetary policy. In 1969 and 1970, the economy experienced a mild downturn. GDP fell by less than the fall in federal defense spending. Disposable income actually rose between the peak and the trough of the recession, as the tax surcharge of 1968 expired and the automatic stabilizers in the welfare state kicked in. Monetary aggregates kept rising though, and inflation accelerated to 6%. Martin significantly tightened

monetary policy; December of 1968 is one of the Romer and Romer (1989) dates for a contractionary monetary shock. Yet, this arrived late and did not last long. In February of 1970, Arthur F. Burns became the new chairman of the Board of Governors. The decision at his first FOMC meeting was to ease monetary policy.

Debates in policy and academia. At the time, there was an active debate about the Phillips curve, which Burns was keenly aware of. The economists in the recently-elected Nixon administration accepted the analysis in Friedman (1968), and thought that any reduction in unemployment achieved by increasing inflation was temporary (Meltzer, 2005). But many economists in policy still thought that an overheated economy would result in higher inflation, but not accelerating inflation.[3] On the other side, some academic economists had embraced the view of an expectations-augmented Phillips curve, where the expectations term was proxied by lagged inflation, leading to the so-called accelerationist Phillips curve.[4] By the end of 1971, the latter group had won the debate in light of the continued rise in inflation in spite of the recession.[5]

Even then, an accelerationist Phillips curve implied that reducing inflation even by a few percentage points back to 2% would come with large sacrifices in terms of higher unemployment. Andrew Brimmer, a Board member between 1966 and 1974, affirmed that there was little doubt within the Fed: "Fighting inflation, checking inflation was the second priority". Even in April of 1969, after all the signs of lower productivity and a rising natural rate of unemployment (Orphanides, 2003), Arthur Okun, chair of the CEA, wrote that it was compatible to have a long-term "4 percent rate of unemployment and a 2 percent rate of annual price increase" (Okun, 1970).

The role of inflation expectations. In the Martin Fed throughout 1969, there were mentions that "inflationary expectations remained widespread" and of "expectations of continuing inflation" (Romer and Romer, 1989). The tightening of monetary policy was justified by appealing directly to expectations: "the Committee agreed that, in light of the persistence of inflationary pressures and expectations, the existing degree of monetary restraint should be continued at present" and that "The Committee took note of the signs of some slowing in the economic expansion and of the indications of stringency in financial markets. In view of the persistence of strong inflationary pressures and expectations,

[3] See, for instance page 95 in the Economic Report of the President of 1969.

[4] However, there was an active debate on whether to interpret the lags on inflation as arising because of adaptive expectations or because of institutional rigidities (Gordon, 1980, Tobin, 1980).

[5] See Sargent (1988), Primiceri (2006) for formal models of this change in ideas.

however, the members agreed that a relaxation of the existing degree of monetary restraint would not be appropriate at this time" (1969 Annual Report, pages 121 and 145, respectively). In July of 1969, Martin stated that "inflationary psychology remained the main economic problem ... It would be a mistake ... to take any action that might reinforce inflationary expectations just at the time when some weakening in those expectations might be developing" and in August that "it was important for the System not to get into a position of validating the expectations of numerous skeptics who believed the System would ease its policy as soon as it heard the words 'recession' or 'overkill'" (cited in Weise, 2012).

With respect to inflation expectations, during the period 1968-71:

- they became central in economic discussions as a shifting term in the Phillips curve;
- but their measurement was still inexistent, beyond using past actual inflation to proxy for it;
- policymakers kept appealing to shifts in psychology with no hard data to back it.

2.3 From 1971 to 1974: The anchor adrift

Inflation and monetary policy. In 1972, the economy turned sharply to a strong expansion. Real GDP grew by an astounding 6.9% by the end of the year (but the unemployment rate fell by only 0.8%). Policy was strongly procyclical, as the decline in government purchases of the previous years was halted, and the Fed kept policy loose. From the perspective of inflation though, two milestone events in 1971 drove a fall in CPI inflation during that year, and an acceleration in the next.

The first of these was the end of Bretton Woods, with the suspension of dollar gold convertibility on the 15th of August 1971. The steady increase in inflation in the previous 6 years had caused a large outflow of gold from the United States, and such a large imbalance in balance of payments was no longer sustainable. Without this constraint, inflation was free to rise much more, and the dollar depreciated continuously between 1971 and 1973. Expectations of this depreciation could now drive inflation.[6]

The second key event was the imposition of a wage and price freeze by the Nixon Administration on the 15th of August of 1971 as part of its New Economic Policy (NEP). This

[6]By itself, a flexible exchange rate did not have to cause inflation. Free from the influence of US inflation, West Germany went through a disinflation in 1971, almost a decade before the United States had its own.

brute-force approach to keep CPI inflation down was fully supported by Burns. Nominal wage growth had risen by more than 8% per year in 1970, in spite of the recession and stagnant productivity, and he blamed this on the monopoly power of labor unions and the generosity of welfare programs. An automobile labor strike in 1971 cemented this view, and the annual report of the Federal Reserve was filled with analyses of unit labor costs. Burns dismissed the fast growth in monetary aggregates, and thought that the controls and other guideposts would break the expectations of workers. Hetzel (1998) argues that, even well before this episode, Burns had long regarded wage-price spirals driven by the expectation of inflation as a key driver of high inflation: "One of the main factors in the inflation that we have had since the end of World War II is that many consumers, businessmen, and trade union leaders expected prices to rise and therefore acted in ways that helped to bring about this result" (Burns, 1957, page 71). Government interference in private price and wage setting was to be the way of breaking the spiral.

From then on, between 1972 and 1974, inflation accelerated. Besides the bounce-back from the price controls and the continued effect of the depreciation of the dollar, the most well known direct cause was the rapid increase in oil and food price shocks. Crop failures in 1972, an El Nino event that made Peruvian anchovies disappear, and large sales of US wheat to the Soviet Union led to a surge in world food prices in 1973-74. The OPEC oil embargo after the 1973 Yom Kippur War led to oil prices increasing by a factor of 4 by 1974. By themselves, they can account for more than half of the increase in inflation and its fall in the following years once oil prices stayed high but stopped rising (Blinder and Newton, 1981, Blinder and Rudd, 2013).

Yet, the reversal down of inflation after the oil shocks was far from complete. A possible explanation is that the temporary inflation shock raised inflation expectations becoming inertial. Policymakers at the time thought so, leading to the famous "whip inflation now (win)" public relations campaign in 1974 to try to lower the psychology of inflation expectations, one of the most infamous failures of policy communication that is not backed by actual policy actions.

Theories and expectations. Beyond supply shocks, the literature has offered two other factors that contributed to the acceleration of inflation in these years. Each involves expectations at their center.

The first of these was a confusion between transitory and permanent shocks at the Federal Reserve. At the helm, Burns was confident of his forecasting ability guided by reduced-form empirical analysis of data, shaped by his experience as president of the

National Bureau of Economic Research and its measurement without theory tradition (Hetzel, 1998). In his words, testifying to Congress in 1974, "The current inflation began in the middle 1960s when our government embarked on a highly expansive fiscal policy." In turn, he thought the inflation of 1973 was due to food and oil prices, and the further increase in 1974 was due again to budget deficits (even though those had been small). There was always a temporary shock to explain the persistent drift. Meltzer (2005) describes this period as one when, among the Federal Reserve staff, "... they gave special explanations — a relative price theory of the general price level — in effect claiming that the rise in the price level resulted from one-time, transitory changes that they did not expect to repeat." Likewise, by the end of 1972, an unemployment rate of 5% was seen as close to full employment, higher than the previous 4% but still well below what our estimates today suggest (Reis, 2003). This sluggish adjustment upwards of the natural rate in spite of the higher unemployment and acceleration of inflation of previous years implicitly reveals a view that this was due to temporary shocks to the natural rate of unemployment, coupled with a belief that expected inflation had not changed.

Burns viewed monetary policy as affecting credit conditions and through it the confidence and investment proclivity of businessmen, with money at best reflecting these rather than causing them (Hetzel, 1998). Shifts in expectations were then always tendentially transitory, with a multitude of policies being able to bring them back in line. For instance, testifying to Congress in 1964 about deficit reduction, he stated: "In this new psychological environment, our trade unions may not push quite so hard for a large increase in wage rates, since they would no longer be anticipating a higher inflation rate. And in this new psychological environment, our business people would not agree to large wage increases quite so quickly".

This last quote points to the second factor: the emergence of an inflation bias through expectations. As articulated by Tobin (1980), this was a break with the Keynesian thought of the previous two decades, since it implied that monetary and fiscal policy management would be unable to cure stagflation. Arthur Burns described this in his lecture that reflected on his experience (Burns, 1987): "In earlier times, when a central bank permitted excessive creation of money and credit in times of prosperity, the price level would indeed tend to rise. But the resulting inflation was confined to the expansion phase of the business cycle; it did not persist or gather force beyond that phase. Therefore, people generally took it for granted that the advance of prices would be followed by a decline once a business recession got under way. That is no longer the case. Nowadays, business-

men, farmers, bankers, trade union leaders, factory workers, and housewives generally proceed on the expectation that inflation will continue in the future, whether economic activity is booming or receding."

One of the reasons for this change was the political influence over monetary policy. Especially through 1972, the Nixon Administration, and the President personally, strongly pressured the Federal Reserve to not lean against the economic expansion and jeopardize the Fall reelection, and the minutes and transcripts of the Federal Reserve show a concern about the political repercussions of its measures (Weise, 2012). However, they also reflect a view that this would not compromise long-run price stability because the election would be over soon. The inflation bias that yielding to political pressure would have on expectations given recurrent elections was dismissed, and yet it was visible in the data for the two decades that followed (Alesina, 1988). As Gordon (1980) writes: "The overheated expansion of 1972—73 is perhaps the leading postwar example of Nordhaus' (1975) "political business cycle" in action."

In short, while the oil price shocks were significant and unforeseen, the shoot up of inflation in 1971-74 and its lasting effects through the rest of the decade worked in part through their effect on expectations since:

- the gold peg was not replaced by another regime that would keep the expectations anchor steady;
- hope was placed on price and wage controls affecting inflation expectations;
- communication, not backed by actual polices, failed to bring down inflation expectations;
- internal forecasts that all shocks had temporary effects led to a belief that inflation expectations remained anchored, even as there were growing suspicions of an inflation bias in expectations emerging, but no data confirmed either.

2.4 Conclusion: Expectations as add-factors

The decade between 1965 and 1974 was filled with shocks, changes in regime, and contributing causes to the rise in inflation. The literature that has inspected and debated them has fallen into three competing hypothesis: a politics view, that focuses on the pressure from expansionary fiscal policy and the lack of independence by Martin and Burns relative to the Administrations; the ideas hypothesis, that focuses on incorrect views of

the Phillips curve, the value of the natural rate of unemployment, the power of monetary policy, and the role of Bretton Woods; and the supply shocks hypothesis, that focuses on declining productivity, the Nixon price controls and the OPEC oil shock. Across all of them, the political context of the time played an important role, and debates will continue on the relative weight of each view.

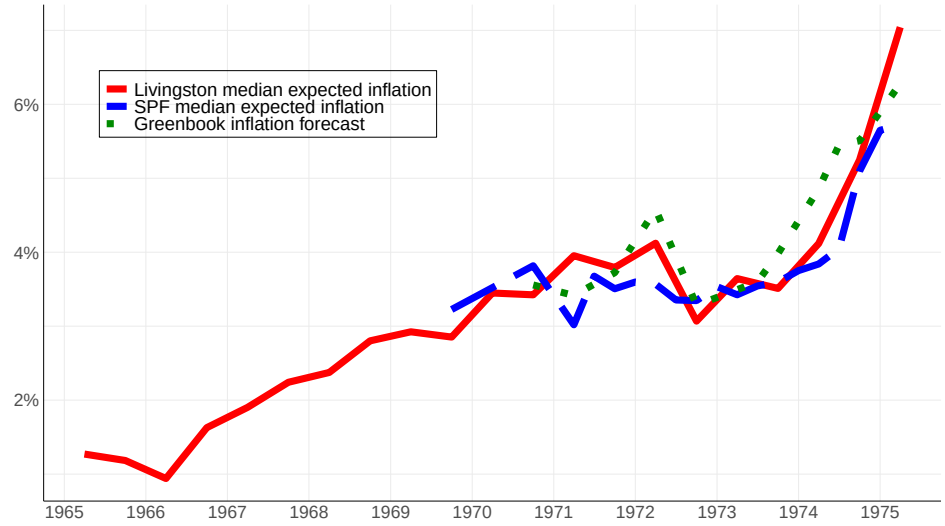
The discussion in this section highlights that expectations play an important role in these discussions. Policymakers used changes in expectations to justify why policies had failed in the past, but would not in the future. Academics appealed to shifts in expectations to explain why economic relationships changed, why the monetary policy regime led to high inflation, or why inflation stayed elevated. Throughout, however, data on expectations was conspicuously missing. Like add-factors in forecasting models, accounts of the Great Inflation use private inflation expectations as unobservables that help explain some of the data.

At times, data on expectations were replaced by appeals to the psychology of markets or businessmen. Other times, they were only indirectly inferred from changes in macroeconomic variables using particular economic theories. With the widespread use of rational expectations from the 1980s onwards, expectations became tightly tied to observed fundamentals, so the obstacles in measuring and observing them were circumvented altogether. None of these options is very useful when trying to assess whether inflation expectations are anchored in the present. Appeals to how people may be feeling are too subjective. Macroeconomic variables can only be used with a long delay to infer what were expectations. And, while expectations are undeniably forward looking, they are also not strictly rational in the rational-expectations sense, leaving us with a wide set of models of where they may be drifting. The next section turns instead to real-time data from surveys and market prices to see whether they can provide timely signals of how solid the anchor is.

3 Data on inflation expectations

This section canvasses sources of data on the inflation expectations anchor during the period when inflation went adrift.

Figure 2: Expected inflation by professionals



3.1 Inflation expectations: Professionals

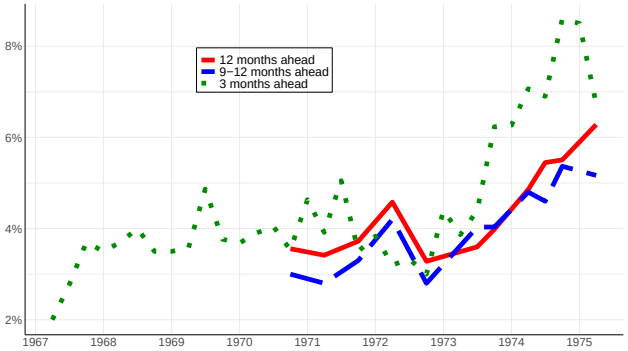
The first source of data was surely looked at by policymakers: the forecasts made by the professionals that work at the Federal Reserve System. These are published in the Greenbook, and are nowadays made public by the FRB Philadelphia. Starting in 1967Q1, the Fed staff produced forecasts for the GDP deflator over the next 3 months. Starting in 1969Q4, there are also forecasts over the next twelve months, and so for annual inflation one-year ahead.

These forecasts are plotted in figure 2 where in the horizontal axis is the date at which the forecast was made (so in quarter t it shows the report made at t for inflation between t and $t+4$). The data is consistent with the narrative analysis of Fed statements in the previous section that it thought that the successive rises in inflation were temporary one-off deviations. The forecasts were significantly below the realizations of inflation, and only adjusted upwards sluggishly. The top panel of figure 3 confirms this view by plotting both the 3 months ahead expectation, the 12 months ahead, and the 9-12 months ahead expectation. Inflation was almost always expected to be higher in the nearer term than in the farther away term.

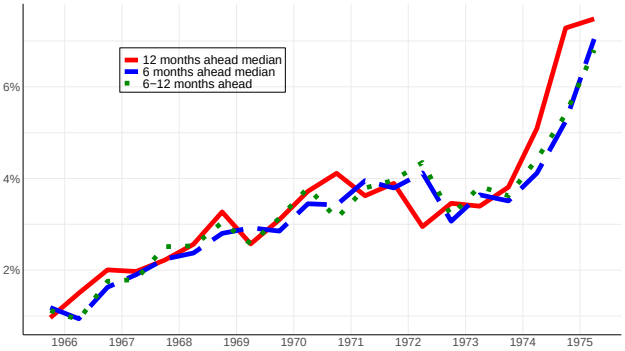
At the same time as the Greenbook forecasts become available, the American Statistical Association and the NBER started surveying a group of professional forecasters working for major banks and large corporations. The typical survey at the time had 10 to 30

Figure 3: Expectations of inflation at different horizons

(a) Greenbook, Fed staff



(b) Livingston, private-sector economists



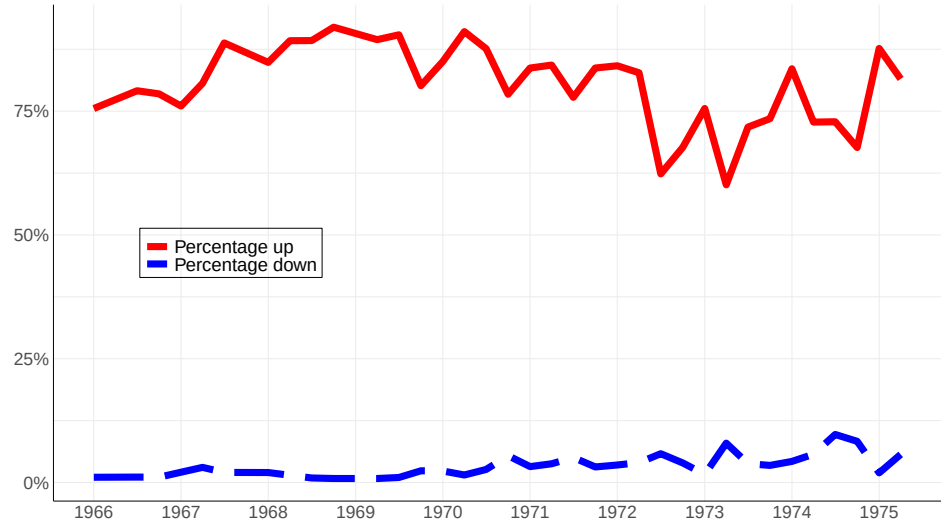
respondents, and took place every quarter. The series in these data for 12-month ahead CPI inflation forecasts is commonly used, but it only starts in 1981Q3. However, the survey started earlier, and from 1968Q4, it included questions on the expected growth of nominal and real GDP; combining the two yields their forecasts for the GDP deflator. A less used but similar survey of professionals was undertaken by journalist Joseph Livingston who asked between 12 and 48 economists in academia, business, and markets, twice per year, starting in 1946, about CPI inflation over the next 6 months and over the next 12 months.

The cross-sectional median in the two surveys of expected inflation over the next 12 months is plotted in figure 2. Because the size of the samples are small, one cannot estimate reliably the cross-sectional distribution beyond a first moment. The median forecast was, similar to the Fed's forecasts, sluggish and slow to keep up with the rapid increase in inflation at the time. There is a telling difference between the two revealed by comparing the two panels of figure 3. The private professionals seemed less convinced that the inflation rise was temporary, as they would raise their expectations at the different horizons in lockstep.

3.2 Inflation expectations: Households

The main survey of household expectations of inflation is the Survey of Consumer Attitudes and Behavior administered by the University of Michigan Survey Research Center (SRC). Since January of 1978, it has surveyed around 500 to 700 households every month, asking them: "By about what percent do you expect prices to go up, on the average, during the next 12 months?" An early version of the quantitative inflation question was tried

Figure 4: Household qualitative expectations of inflation going up/down

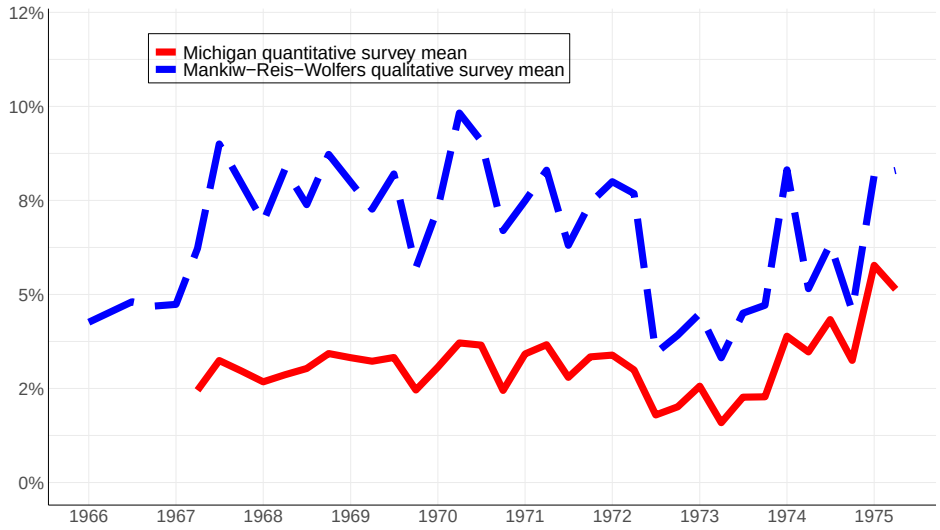


in 1976 and 1977, only every 6 months, still outside our period of interest.

Before 1976, and starting in 1946, the survey existed but it was quarterly and it only asked a qualitative question about inflation. The precise question changed over time, but between 1961Q2 and 1977Q2 it was: "Speaking of prices in general, I mean the prices of the things you buy–do you think they will go up in the next year or go down?" Figure 4 shows the time series of the answers to that question between 1965 and 1974. It is hard to see much of a change. At the same time, with the majority of respondents already anticipating prices to rise from the start, a shift up in how much they think so would not be detected.

Luckily, the SRC asked a supplementary quantitative question after this one between 1966Q2 and 1976Q4. Respondents who expected prices to rise were asked to state in which of a few bins their mean expectation would be. The precise question was: "How large a price increase do you expect? Of course, nobody can know for sure, but would you say that a year from now prices will be about 1% or 2% higher, or 5% higher, or closer to 10% higher than now or what?" While the answers to this question were used in academic articles published in the early 1980s, the data seem to have been forgotten (and it is not easy to access); I found no paper using them that was published in the last twenty years. To convert the bins answers into numerical answers, I use the standard (but

Figure 5: Cross-sectional mean of expected inflation by households



imperfect) procedures in the literature (e.g., Pesaran and Weale, 2006).[7]

Figure 5 shows the resulting cross-sectional mean expected inflation. Also plotted in the figure is a series built by Mankiw, Reis and Wolfers (2004) that used only the answers to up/down and assumed a normal distribution to back out a mean and a standard deviation at every date. As with the first moment from the professional surveys, there is no discernible trend in the central tendency of the household survey until the very end of the decade. As the literature has found for other periods, also during this time, the average household expectations appears very sticky (Coibion and Gorodnichenko, 2012).

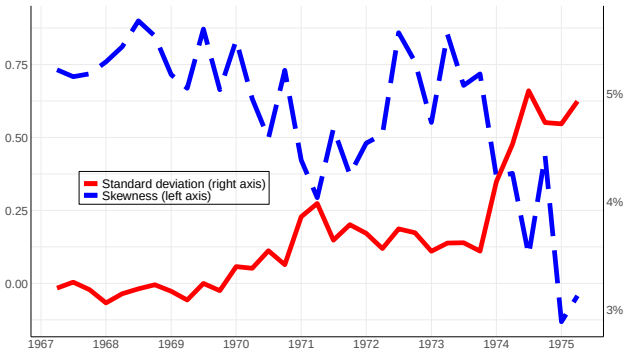
3.3 Disagreement and the cross-sectional distribution of expectations

In light of what we know today from the literature on expectations, it is not so surprising that measures of the first cross-sectional moment of households surveys are seemingly unresponsive to shocks, and only very sluggishly adapt to new regimes (Coibion, Gorodnichenko and Kamdar, 2018). Most people are uninformed, inattentive, or just ignorant about inflation. However, the literature that has focussed on the data since 1980s has also found that the cross-sectional distribution in the expectations contains plenty more information (Mankiw, Reis and Wolfers, 2004, Coibion and Gorodnichenko, 2012). Modern theories of inattention, learning, or mental biases highlight that people differ in how

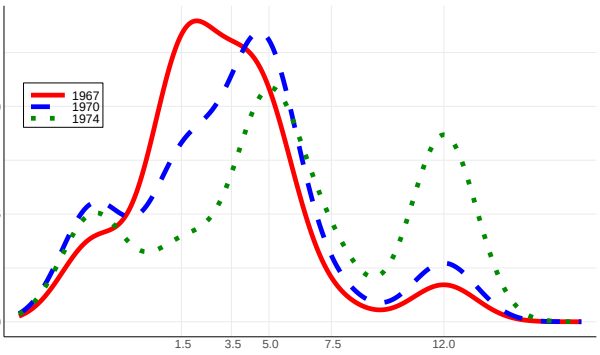
[7]My estimates are not too different from those in Juster et al. (1972) and Juster and Comment (1980).

Figure 6: Disagreement about expected inflation among households

(a) Cross-sectional moments



(b) Three snapshots of the distribution



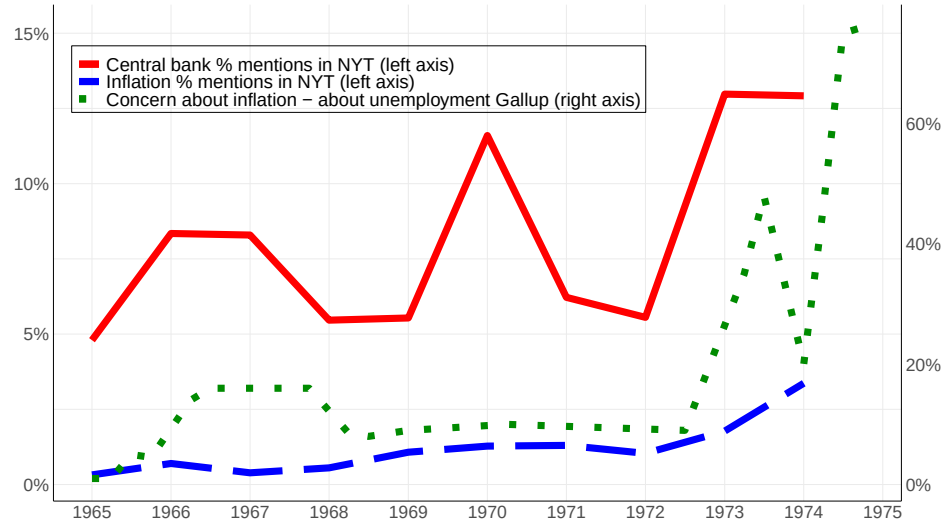
fast they adjust to news in systematic ways (Mankiw and Reis, 2010, Angeletos, Huo and Sastry, 2020). By comparing their expectations, we can infer where they are eventually heading, and thus where the anchor is. The distribution captures the disagreement between people, some better informed than others. It can be quite informative of what the anchor is.

The top panel of figure 6 plots the cross-section standard deviation and skewness of household expectations using the Michigan data. Starting with the forecasts from 1968 about inflation in 1969, the disagreement in the series clearly starts rising for about two years. For the following three years, disagreement is approximately unchanged. But, after the oil shock at the end of 1973, disagreement about expected 1974 inflation jumps up, and stays elevated after that. Skewness, which throughout is positive, also changes around 1968, clearly falling for the first two years. When disagreement settles, skewness starts rising, and when at the end of 1973 disagreement jumps up, skewness jumps down.[8]

Combined, these two series tell the following story, which the bottom panel with the cross-sectional distribution at three points in time confirms. While inflation may have started drifting up in 1965, it is only in the forecasts made around 1967-68 that expectations seem to show some drift in the anchor. The previous section discussed how the 1969-70 downturn marked a turning point in academic thought, with its clear rejection of a static Phillips curve as inflation accelerated. In household expectations, there is also a difference. The mass of agents expecting low inflation thinned out as more households moved to the long right tail of the positively-skewed distribution. This raised dispersion

[8]Estimates of kurtosis or higher-order moments show no appreciable trend. This is also the case in the quantitative Michigan survey answers after 1978: three cross-sectional moments seems to suffice to capture all the relevant time-series variation in the distribution.

Figure 7: Media mentions and public concerns related to inflation



while lowering skewness. Then, between the 1971 and the middle of 1973, the incomes policy seems to have worked in the way Burns hypothesized, by reversing the increase in expected inflation. This is consistent with the robust empirical finding that people form their expectations using a subset of goods, and that large changes in public policy trigger attention to inflation.

Yet, the oil shock, which had only a small and delayed effect on the first cross-sectional moment, had a large impact on the second and third moments in 1974. There was an immediate large movement of mass from the left and middle of the distribution to its right tail. If the wage and price controls had an effect on expected inflation, it was only a temporary one.

3.4 Other, imperfect, proxies for peoples' expectations

Figure 7 plots a proxy for attention to inflation news by households: the number of news references to inflation or to the Federal Reserve, in articles published in the New York Times. Some research suggests that the news can proxy for people updating their expectations more often (Carroll, 2003). The uptick in news stories starts in 1968. Its relative decline in 1972, and the surge upwards after the oil price shock, tracks the patterns of disagreement in the household survey.

The figure also shows the difference between the share of households that report that

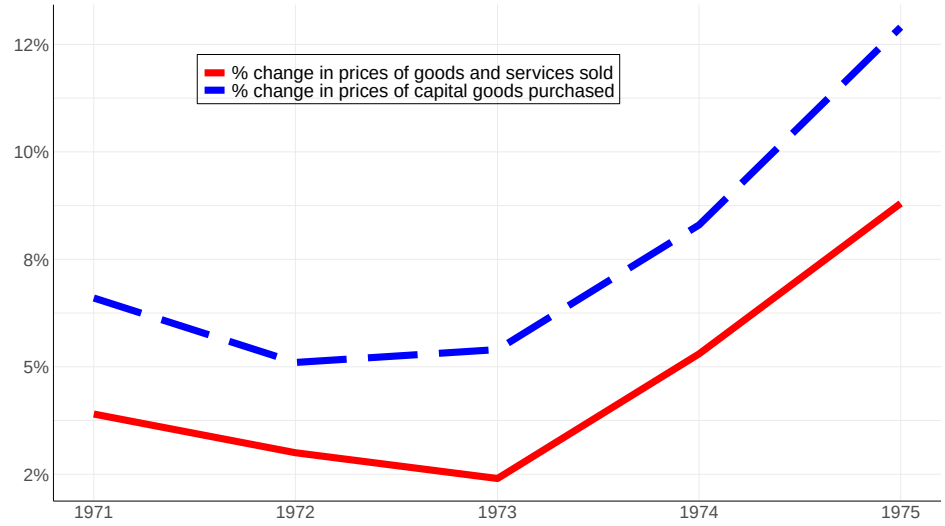
inflation is the nation's biggest problem minus those that mention unemployment as a concern instead in the Gallup poll. The uptick here is higher, and it happens already at the end of 1966, with no decline in 1970-72. The rise after the oil shock is again considerable.

One concern with the survey data used so far is that its horizon was for the most part one year. Yet, economic theory would suggest that it is longer-horizon inflation expectations that provide the anchor for the persistent component of inflation. Moreover, insofar as inflation may be sometimes affected by shocks with a half-life of 2 or 3 years, then 1-year ahead expectations may be more volatile than their 5 or 10-year ahead counterparts giving a misleading impression of an anchor that is not firm. The Michigan survey started asking about long-term inflation expectations after 1990. Focussing on the last ten years, since 2010, the correlation between the standard deviation of the 1-year ahead and the long-term inflation answers is 0.91. The correlation between the skewness measures is lower, 0.4, but mostly because of the considerable month-to-month noise in estimating it, well visible in figure 6. The low-frequency movements that we emphasized are quite similar.

Finally, because firms choose prices, the expectations of their managers may be particularly important as an anchor. Most of them will not employ a professional economist, but at the same time may have a greater financial incentive than households to get their forecasts right. However, research has found that firms do not seem to make more accurate forecasts than households, and too often confuse industry-specific relative price changes for overall inflation (Candia, Coibion and Gorodnichenko, 2021, Andrade et al., 2021).

The only series that I was able to find on firm expectations was asked by the Bureau of Economic Analysis as part of the annual survey of business expenditures on plant and equipment published in the Survey of Current Business from 1970 onwards. Approximately 3200 firms answered the question in year t: "What are your best estimates of average price changes from $t-1$ to t and from t to $t+1$? (Approximations are acceptable.)" The question was asked separately for capital goods purchases, and for the goods and services sold; Figure 8 reports both, as tabulated by de Leeuw and McKelvey (1981). The pattern in the figure roughly confirms the fact that by 1971, expectations were elevated, but over the next two years they seemed to fall, before shooting up in 1974 following the oil price shock.

Figure 8: Firm expectations of inflation



3.5 Inflation expectations: Markets

Most central banks today look at market prices to infer inflation expectations at high frequency. These can be useful because of the strong financial incentive that traders have to get this right. Moreover, the market price reflects the expectation of the marginal trader. Comparing it with that of the average trader, or person, provides a signal of the distribution of inflation expectations. At the same time, market prices are often polluted by noise arising from financial and liquidity frictions.

Market expected inflation is usually measured using either the price of inflation swap contracts, or the difference between yields on inflation-indexed and nominal government bonds. Neither existed in 1965-75. McCulloch (1980) argued that these contracts could not even exist, as they were illegal. In 1933, Congress had approved a "Gold Clause" prohibiting bonds indexed to the price of gold as being against public policy. Under Bretton Woods, court rulings extended this prohibition to any domestic contract indexed to the price level. The clause was only explicitly repealed in 1977, at which point futures contracts for gold started being traded in the United States.

The US Treasury issued foreign currency denominated bonds, in West German marks, Swiss francs, Italian lira, Belgian francs, and Austrian schillings. These "Roosa bonds" were medium-term notes issued between 1962 and 1971 to help relieve the pressure on US gold holdings during its attempt to defend the Bretton Woods system in spite of rising

US inflation. But they were non-marketable, held by foreign governments. Their interest rate does not reflect market expectations.

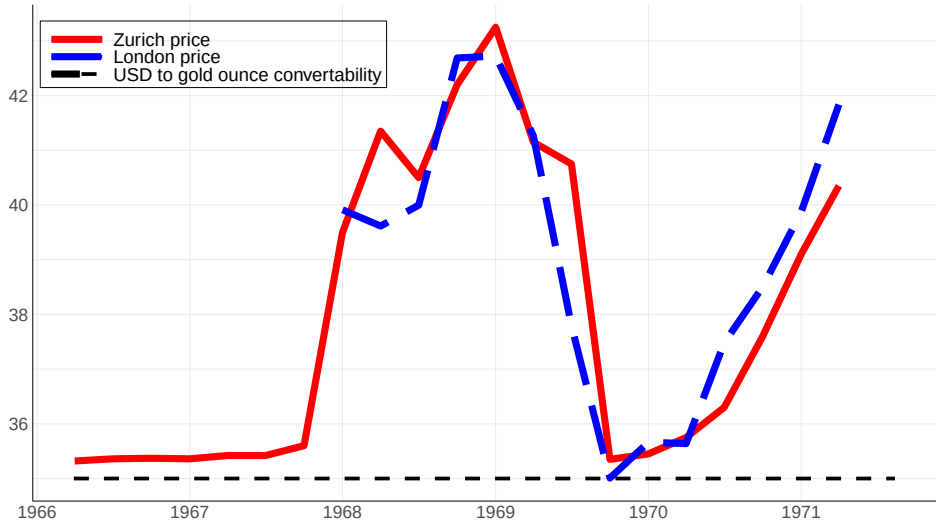
Chairman Martin often referred to long-term bond yields as a measure of market expected inflation. If real interest rates and long-term interest-rate risk were constant, then these would be market forecasts of the persistent component of inflation. However, during this decade, the argument that the natural rate of unemployment and productivity growth changed significantly would imply with equal force that the real rate would have changed as well. Moreover, the literature on the term structure of interest rates almost always finds that risk premia moves around considerably (Ang, Bekaert and Wei, 2007). An alternative used by Friedman and Schwartz (1963) is the equity premium, but again today it is understod that it is more likely to reflect changes in risk premia than in expected inflation (Campbell, Sunderam and Viceira, 2017).

A final dead end is the USD price of gold that was traded freely in the London Mercantile Exchange. The Fed and other foreign central banks formed a "Gold Pool," combining their stocks of gold to intervene in that market to keep the price of an ounce of gold close to its peg of $35. The pool failed in March of 1968, the London market temporarily closed, and even after it re-opened, there were US capital controls and regulations of the London market. Perhaps as a result, there was no trading of organized gold futures in the London market until 1975.

Across the channel, in Zurich, there had been a just-as-active spot gold market since the end of World War II. There were no capital controls in Switzerland, no legal restrictions on writing gold contracts, and no limits to holding, exporting or importing gold. In the immediate post-war, Zurich was the major gold trading centre, only losing to London later, as the market in London opened in 1954. The market boomed in activity during the gold pool in the London market, and there was trading in multiple currencies. American residents and corporations became large investors in the late 1960s. Figure 9 plots the spot USD price of a gold ounce in the London and Zurich markets during these times. They are very close confirming that the Zurich market price signals were arguably as informative as those from the large London market that are commonly used by researchers.

More important, for the purposes of this paper, is that throughout the 1960s, 6-month and 12-month gold future contracts were traded in Zurich payable in USD. They arose following the London "gold bubble" of 1960. During the Bretton Woods system, the loss of an inflation anchor had to be tied to leaving convertibility with gold. Therefore, the USD prices of future contracts of gold delivery would provide an indicator of expected

Figure 9: Gold prices, spot, per ounce



inflation. Picks (1971 edition) reports representative annual premia in these contracts throughout the 1960s. The implicit expected devaluation of the USD relative to gold can be taken as a proxy for market expected inflation. Between 1966 and 1971, this implicit market expected inflation was: 1.4%, 1.8%, 3%, 4.4%, 3.1%, and 4.1%. That is, again there was a large surge in 1968-69 that persisted until 1971.

3.6 Conclusion

Looking only at the expectations from the Federal Reserve staff and the cross-sectional mean of professional forecasts or households, the inflation expectations anchor seemed to be firm until 1971, with the ever-rising inflation being treated as a sequence of unfortunate temporary deviations. Only after the end of Bretton Woods is there a sustained drift upwards.

This section noted that looking at other, arguably richer, data paints a different picture. Already between 1967 and 1970, the anchor went adrift as revealed by market prices for gold futures, public concerns and media reports and, perhaps more convincingly, by the shift in the cross-sectional distribution of household expectations.

After mid-1970, household expected inflation fell even as professionals and markets were rising, perhaps because of the wage and price controls. This effect was temporary, and by 1973 the inflation expectations anchor was definitely lost.

4 A measure of fundamental expected inflation

In almost every dynamic macroeconomic model, both actual inflation and inflation expectations are endogenous objects that are closely related. Under the extreme assumption of perfect foresight, they coincide, while with full-information rational expectations, the difference between the two is serially uncorrelated and has a mean of zero. Therefore, a traditional approach to measure the expected is to measure the actual inflation. Then, given a goal of foreseeing future inflation movements, since expected inflation is their anchor, economists have focussed on current inflation as a predictor, supplemented with its lags. But the Lucas critique dictates that the relation between expected inflation and lags of inflation can change, and that is is unreliable especially when inflation is about to drift away.

This paper has taken a different approach: it has measured inflation expectations directly, and investigated whether they provide signals about future inflation. It found that it does, but only if one uses the whole cross-sectional distribution of survey expectations from both households and professionals complemented with market-price expectations. It would be useful to combine these into a single estimate of expected inflation. This requires having a model of expectations, yet there is a myriad of them, each with its own virtues and flaws. However, almost all of them share one feature: expectations ultimately converge to the rational expectations fundamental. Whether agents use past data to learn, have incomplete signals, limited attention or heuristic biases, their expectations will differ from rational expectations but gradually converge to them.[9] If an economic fundamental, like a policy regime or a shock, makes the rational expectation change, then in almost all modern models expected inflation will change in the same direction as well. The rational expectation serves as a fundamental for expected inflation.

4.1 A model as a measurement tool

This section uses a parsimonious model following Reis (2021) to combine the different expectations data and estimate this fundamental. The goal is not to test theories or distinguish between models of expectations, but to combine their key ingredients to extract as much signal as possible from the data. The model has three equations for three measures

[9] Most models of expectations eventually converge to the rational expectations equilibrium, much like most business-cycle models eventually converge to the Ramsey-Solow steady state.

of expected inflation:

$$v_t^h = \pi_t^* + c_t^h + \theta_t(e_t^h + \pi_t^e - \pi_t^*) \quad \text{with} \quad c_t^h \sim E(\lambda_t), \;\; e_t^h | \pi_t^e \sim N(0, \sigma_t^2) \tag{1}$$

$$q_t = \frac{\int y_t(\pi_t^e) g_t(F_t^{-1}(\omega_t)) f_t(F_t^{-1}(\omega_t)) d\pi_t^e}{\int g_t(F_t^{-1}(\omega)) f_t(F_t^{-1}(\omega_t)) d\pi_t^e} \quad \text{with:} \quad \omega_t \sim B(\beta) \tag{2}$$

$$E_t^b = \mathbb{E}_t(\pi_t | v_t^{\text{median}}, q_t) \tag{3}$$

The fundamental rational expectation of inflation is π_t^e, while each equation reports how the expectation of households v_t^h, market prices q_t, and professionals E_t^b relates to it.

The first equation implies that the expectations of inflation v^h reported by a household h in a survey follows an exponentially-modified Gaussian (EMG) distribution $F_t(.)$, which is the sum of three parts: The first part is just a prior mean π_t^* for what fundamental expected inflation π_t^e might be. The second is a bias c_t^h drawn from an exponential distribution. It is important to match the fact that survey expected inflation is persistently above actual inflation, perhaps as a long scar from the high inflation of the 1970s and 80s. The third is an individual-specific signal of the fundamental, with noise e_t^h, drawn from a normal distribution. The relevant parameters are: the reaction of expectations to signals θ_t, the informativeness of the signal affecting the dispersion of expectations σ_t^2, and the average bias $1/\lambda_t$. Reis (2021) shows that this model captures the main properties from the large literature on imperfect information, over-reaction, experience learning, and sticky information.

The second equation states that the market price expected inflation q_t is equal to the expected risk-adjusted inflation with risk-adjustment $y_t(\pi_t^e)$. That expectation is formed by traders that start from a prior which is the EMG $F_t(.)$ (traders are people after all), but which is updated following Bayes rule after observing the market price itself, as written out in the second equation. The price is contaminated by a noise ω drawn from a symmetric Beta distribution with parameter β. The density $g_t(.)$ is the endogenous distribution that results from markets having to clear given the noise and fundamental. Reis (2021) shows that this model proxies for many models of imperfect information in financial markets that are in the spirit of Grossman and Stiglitz.

The third equation states that the professionals in the surveys are similar to traders of inflation risk. They use Bayes rule to combine the information that households have with market prices, but what they report in a survey is neither risk-adjusted nor identifies who is the marginal player in the markets. Rather, from the small samples in these surveys we

can only see the objective beliefs of the median trader.

4.2 The information in different data, and the model to filter it

Individually, each different source of expectations data carries useful information. The household expectations are sluggish, less informed and subject to biases, but we have more cross-sectional data with which to estimate the three moments of their cross-sectional distribution and to separate the fundamental from bias and noise. The market price is erratic and polluted by financial noise, but it is fast to react to fundamentals. Surveys of professionals or traders have small samples, so only a first cross-sectional moment can be calculated. But, combined with market prices, they can separate the fundamental from the market noise. While each series has virtues and flaws, it is by combining all of these pieces of data that the model is able to uncover the fundamental expected inflation.

With observations of the first three moments of the cross-sectional distribution of survey inflation expectations, together with a market price for expected inflation, and a first moment from a survey of professionals or traders, one has 5 numbers at each date. With these, and the three equations above, one can back out the reaction, dispersion, and bias coefficients $\theta_t, \sigma_t^2, \lambda_t$, as well as financial market noise ω_t and fundamental expected inflation π_t^e. The model gives a way to filter these five pieces of information and recover the anchor for expectations that underlies all of them.

If the market prices' expected inflation rises, but there is no change in survey expectations, the model will attribute most of it to financial market noise and not change the estimate of fundamental expected inflation. At the other extreme, if the cross-sectional mean of survey expectations of households and professionals both moved in one direction, the model would update its π_t^e in the same direction. In between, and more relevant, if the cross-sectional household survey mean barely moves, but the cross-sectional survey standard deviation and skewness of households moved, together with the market survey and price-implied expectations in a consistent direction, then the model infers that the fundamental has changed. Some people have started updating, and if they have done so in the same direction as traders, then the fundamental must have changed.

To take the model to the 1966-71 annual sample I use the three moments from the Michigan quantitative survey, the median expectation from the subset of professionals in the Livingston survey that work in the finance industry, and the annual expected inflation implied in Zurich gold futures. From 1972 onwards, there is no clear market price to use to implement the model. Note that all inputs are series of expectations; nowhere does

actual inflation enter the calculations.[10]

For the prior inflation π_t^*, I use the previous year's fundamental inflation estimate π_{t-1}^e. This way, the econometrician's prior is to find no change in the fundamenal. Finally, the parameter β measures how noisy financial prices are. Following Reis (2021), I set it equal to 2, which allows for a significant amount of noise in financial markets.

There are three important limitations in using this model with the 1967-73 data. First, the data on market prices comes from the Zurich gold market, but the data on surveyed market participants comes from professional economists in the United States. These are not as close to each other as would be desirable. Second, there are no data with which to calibrate changes in the inflation risk premium, so I assume it is constant (and since the model only identifies changes I set it to zero: $y(\pi^e) = \pi^e$). Third, as discussed in Reis (2021), this is a model of long-horizon expectations. For short-horizon expectations, the different structural models of expectations in the literature are too diverse to be captured in a parsimonious way. Yet, there are no long-horizon expectations data. So, I treat the data on one-year expectations as proxies for longer-horizon expectations.[11]

4.3 The estimates of fundamental expected inflation

Figure 10 plots the estimates of the model. Panel (a) has the fundamental expected inflation. It rose from between 1967 and 1970 by 2.2 percentage points. During this time, actual inflation rose by 2.7 percentage points.[12] The bond yields or the Greenbook forecasts that policymakers looked at during that time would have given a false sense of stability. Instead, the rising market prices combined with the large increase in standard deviation and fall in skewness across households reveal that fundamental expected inflation was changing significantly. The estimates also confirm the temporary respite from this increase in 1971.

To understand what is going on, panel (b) plots the difference between the market

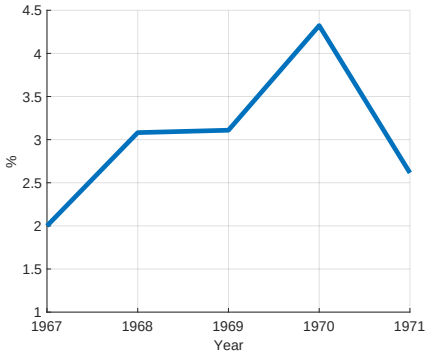
[10]Eusepi et al. (2019) provide an alternative measure of the inflation expectations anchor using actual inflation data.

[11]In the last decade, there are data surveying the traders in financial markets, and asking households about both 1-year and longer-horizon expectations. The correlation coefficient between the quarterly median answer to the FRBNY survey of dealers and the median in the SPF is 0.69; the correlation between the cross-sectional standard deviation and skewness of the answer to long-horizon inflation expectations and 1-year ahead in the Michigan survey are 0.91 and 0.41, respectively.

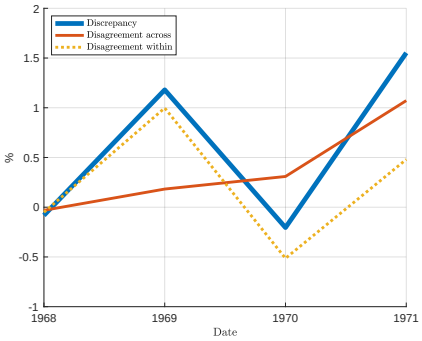
[12]The initial level of expected inflation is not identified. It is pinned down by the choice of prior π^* in the initial period, so the appropriate comparison between actual and expected is their predicted changes. In the figure I set initial expectation in 1967 to 2.0%, even though actual inflation was 3.2%.

Figure 10: Fundamental expected inflation

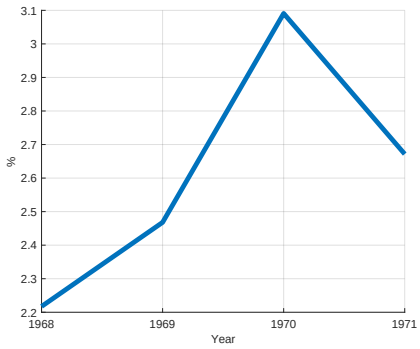
(a) Estimates



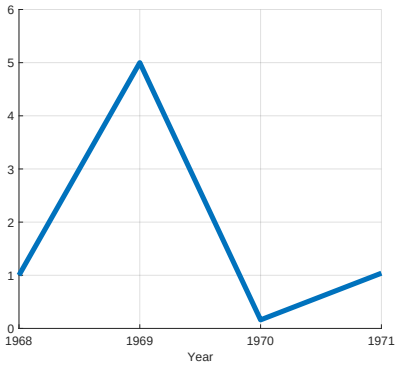
(b) The market-people discrepancy



(c) Standard deviation of signals σ_t



(d) Responsiveness to signals θ_t



expectation and the household expectation, and decomposes it into the difference within traders (marginal versus median) and across people (professionals versus households). At first, market expected inflation rose, while surveys of professionals showed little change. The model interprets this disagreement within as partly due to a financial shock. However, because of the increase in variance and fall in skewness, the model puts a significant weight on this instead being a result of expected inflation rising. Therefore, the estimate of expected inflation is updated upwards. The following year, this suspicion is confirmed, as the median expected inflation rises across surveys converging to the market expectation. In 1970, the rise in survey expectations combined with the movements in disagreement confirm that the fundamental has risen, so the model updates its estimate further up, even though market prices have fallen.

Panels (c) and (d) show the time series of two important model parameters, σ_t, which

measures the dispersion of the idiosyncratic signals, and θ_t,which measures by how much an individual will respond to his/her individual signal. If people were pure Bayesians, then θ_t would be proportional to the inverse of σ_t, but the model allowed this to not be the case following theories of over-confidence, over-reaction, and diagnostic expectations. The estimates strongly supports this. Throughout the period, the estimated standard deviation rises. Agents are confused and disagree on where inflation is heading. But at first they are also more responsive to their individual signals, as if they were paying more attention to the inflation path. Only after they return to their usual responsiveness. Finally, 1971 continues to stand out as a time where there was a reversal in these drifts.

5 Measuring the expected inflation anchor in other episodes

Measures of expected inflation are sufficiently noisy that using them to forecast inflation during tranquil times will likely bring little benefit. The previous two section showed that, when there was a regime change in the US, and inflation persistently drifted, then the expectations data were useful to diagnose this shift. This section investigates whether the same is true in other episodes of regime change, when inflation moved significantly and persistently. Each episode provides a different test of our ability to measure the expected inflation anchor.

Searching through the history of inflation over the last 15 years, there were only a handful of countries that had both good survey and market-price expectations of inflation, as well as inflation above their central banks' targets for a few years. Three episodes stood out. Brazil between 2011 and 2016 provides the clearest counterpart to the US inflation of the 1970s. Turkey since 2018 has also had a drifting inflation, but because it is more recent, the jury is still out in terms of how persistent this will be. Looking at the expectations data today in 2021 gives an example of how to try to measure the anchor in almost real time. Finally, South Africa between 2010 and 2016 provides a placebo, or a possible example of whether the expectations data can deliver false positives. While inflation was high during those years, this turned out to be temporary, and the rate of price changes was back on target afterwards.

After these three cases in other countries, this section returns to US history to look at what the expectations data showed in the early 1980s, when inflation came down sharply. Finally, it concludes with a real time look at expectation data after the 2020 pandemic.

5.1 Brazil, 2011-16

Introduction. After two decades of struggling against high, and sometimes hyper, inflation, Brazil managed to reform its monetary regime in 1994 and to bring inflation down (Ayres et al., 2019). In 1999, the Banco Central do Brasil (BCB) adopted an inflation targeting regime with a target for the CPI and wide upper and lower bounds that are periodically updated. Between 2002 and 2003 the regime came under a trial by fire, as the combination of a domestic drought, contagion from the financial crisis in Argentina, and a contested presidential election cycle led to a sharp increase in sovereign spreads, a depreciation of the currency, and inflation spiking to 17% in 2003, well outside the target range. Aggressively tight monetary policy followed, and inflation came down sharply back to target.

Actual inflation. In August of 2010, the inflation rate (year-on-year changes in the IPCA index) was 4.5%, exactly its target. The BCB had just gone through a tightening cycle, but inflation was modestly rising, perhaps due to large public deficits and increases in oil and commodity prices. A new president came into power in January 1st, 2011 and in the August policy meeting, according to press accounts, the BCB unexpectedly and significantly eased policy. The main policy interest rate (Selic) was reduced from 12.5% to 7.25% continuously over the next 14 months, this in spite of GDP in 2010 having risen by a remarkable 7.5%, and inflation in July of 2011 having been 6.9%, above the upper bound of the target of 6.5%.

Panel (a) of Figure 11 shows the evolution of Brazilian inflation. Between 2011 and the end of 2015, inflation was always close to the upper bound, peaking in June of 2015 at 11.4%. Public deficits were large and growing, and the government resorted to hidden fiscal expansions by persuading the main oil producer to sell domestically below market prices, and having the State-owned development bank (BNDES) and mortgage lender (Caixa) run persistently large losses that amounted to a quasi-fiscal deficit. Monetary policy was timid in its response to inflation rising, only starting to gradually raise the interest rate after May of 2013. This led to concerns about fiscal dominance of inflation and lack of independence of the BCB, especially as the central bank reports and policy minutes are persistently optimistic about inflation, fiscal consolidation, and the public credit subsidies. Moreover, the government kept the administered prices of gasoline and diesel very low between 2011 and 2014, and cut energy tariffs and sales taxes for some commodities, all directly lowering measured consumer prices. This created a large gap

between prices that were set in markets, and those that were set by the government, and contributed to rising public deficits (Bonomo, 2018).

After the re-election of president Dilma Roussaef in 2014, administered prices were adjusted back in line, which immediately led to a very large jump of overall inflation by more than 3 percentage points. Accumulating the change in the price level between August of 2010 and August of 2016, the annualized rate of inflation was 7.3%, well above the 6.5% target. After a controversial impeachment process, Roussaef left office at the end of August of 2016. The new government replaced the members of the monetary policy committee, monetary and fiscal policy were tightened, and by March of 2017 inflation was back at the 4.5% target. Some good luck followed in the form of strong agricultural production lowering food prices, and inflation was always below 3% between mid 2017 and mid 2018.

Expected inflation. Panel (b) in figure 11 shows series for inflation expectations in Brazil during this time. The professional forecasters series corresponds to the median answer in the Focus survey ran by the BCB. It is an unusual survey because it includes as many as 140 respondents drawn from financial market participants, and it provides incentives by giving out a prize every year to the most accurate forecaster, which is then widely reported in the financial media. The household expectations correspond to the survey of consumer sentiment that includes approximately 2000 consumers and asks a precise numerical question about inflation over the next 12 months. The series corresponds to the mean over the sample that excludes the top and bottom quartile of answers, and is reported monthly by FGV-IBRE. Finally, the market price expected inflation refers to the breakeven rate—the difference between the rates in inflation-indexed and nominal bonds—over the next year, corrected for seasonal factors and indexation lags.[13]

Both the survey of professionals and the market prices track actual inflation quite well. This is perhaps not too surprising, given the strong incentives to do so. Insofar as inflation was being kept artificially low through the administrative prices though, this is less informative about the anchor. The first moment of the household survey instead starts clearly drifting up from the start of 2013 onwards. It strongly suggests that the anchor was drifting away.

Panel (c) shows the second and third cross-sectional moments from the household

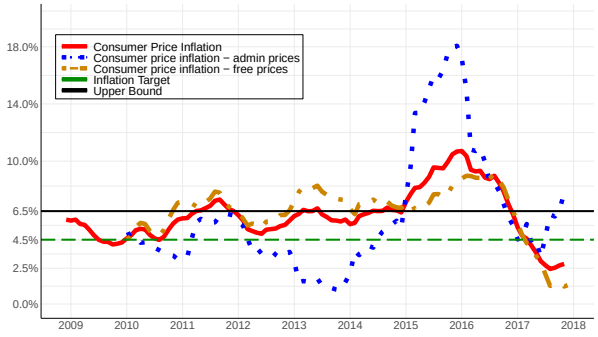
[13]For more on the Focus survey, see Alves, Areosa and Carvalho (2020), on the FGV-IBRE series see Gaglianone, Issler and Matos (2017), and on the breakeven series see Val and Araujo (2019).

survey.[14] This shows a clear increase in both series since the middle of 2011. The starting positive skew in the Brazilian household expectations is much lower than its counterpart in the United States. This is consistent with a smaller inflation bias and higher rate of information updates by Brazilian citizens given the country's history.[15] But during this period, the loss of the anchor appears, as more households move to the right of the distribution. This both raises the variance and increases the positive skew.

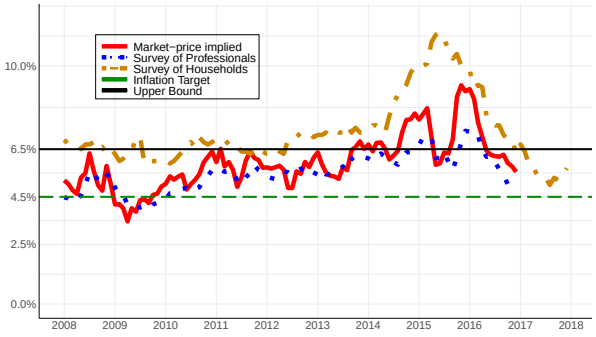
Panel (d) confirms this by plotting the distributions at the start of the year in 2011, the middle of 2014 and the start of the year in 2016. The increase in variance and skewness clearly arises from a subset of households breaking off to the right of the median. They expected higher and higher inflation as months went by.

Figure 11: Brazil's drifting expected inflation anchor: 2011-16

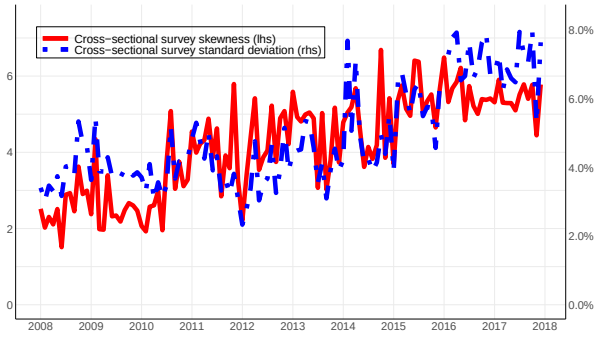
(a) Actual inflation and its target



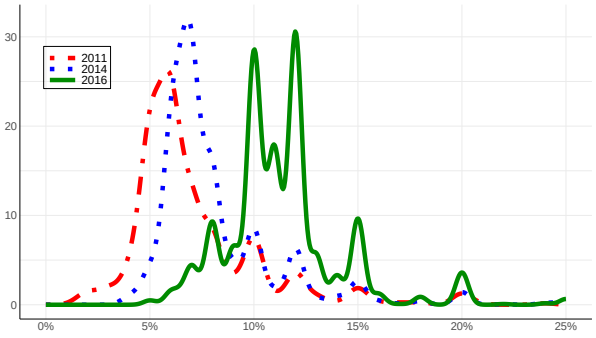
(b) Markets and survey first-order moments



(c) Cross-sectional disagreement of households



(d) Cross-sectional distribution of households



[14] I calculate this by using the micro-data directly, and excluding only the top and bottom 1% of answers to deal with outliers. Results cutting the top and bottom 5% are very similar. Also, the mean calculated this way is not too different from the one calculated with the official procedure of excluding the bottom and top 25% (which would be too aggressive to calculate higher-order moments).

[15] Fitting the EMG distribution from section 4, the λ parameter is much higher for Brazil than for the US.

Lessons. The Brazilian experience in 2011-16 adds to the lessons from the US experience of 1967-74. A similar combination of timid monetary policy, fiscal dominance, and persistent belief that inflation is only temporarily high were the harbingers of rising inflation. Moreover, the government's direct interference on the CPI via administrative prices lowered professional and market-price expectations, but only appeared to have delayed the movements in household expectations. Like in the US, such policies seemed to be effective only temporarily.

As in the US, measures of disagreement in the cross-sectional survey provide a good image of the loss of the inflation anchor, but one should not expect them to be captured by a naive time-series correlation between standard deviation and skewness. In Brazil they moved together, while in the US, initially skewness and variance moved in opposite directions. The reason is revealed by the cross-sectional distribution plots. The initial drift of the anchor in the US came with a thinning out of the left tail of the distribution: those that expected very low inflation joined the median. Instead, in Brazil, the median moved to the right and the right tail thickened. A naive correlation of these two measures of disagreement will not be particularly informative.

5.2 Turkey: 2018-...

Introduction. Turkey had a brush with very high inflation during the 1990s associated with political instability and the monetary financing of deficits. After an IMF program and a law giving independence to the Central Bank of the Republic of Turkey (CBRT) in 2001, a sharp disinflation program lowered it from 49% to 8% in 4 years with little output costs. In 2006, an inflation targeting regime was adopted, with a target around 5% although with some annual changes. Actual inflation was always above target, but steadily so, averaging 8% between 2006 and 2017.

Actual inflation. In the three years between the start of 2018 and the end of 2020, inflation shot up to an average of 15%, three times the inflation target (Kara, 2021). The precipitating event behind the rise in inflation seems to have been the re-election of Recep Erdogan in June of 2018. This was a period of political instability, following a failed coup in July of 2016, a constitutional referendum in April of 2017, and the premature election that should have taken place only in November of 2019. As the president consolidated his power, but the economy was faltering, he started commenting on inflation and interfering with the CBRT's independence. In May of 2018, in a campaign speech in London he

expressed desire to take greater control of the economy, and defended lower interest rates in order to control inflation. In June, he announced he would investigate Moody's after a downgrade of the country's debt, and the lira depreciated strongly against the USD. In September, Erdogan repeated his theory that lower interest rates are desirable and that inflation was not a monetary phenomenom, sharply criticizing the CBRT.

On the fiscal side, defense spending increased significantly since 2015 associated with the wars in Syria and Iraq. The early elections of 2018 came with several new spending measures in 2017-18: 750,000 contract workers in the public sector became permanent employees, a minimum wage subsidy estimated to cost 0.2% of GDP was extended together with a monthly subsidy for new hires, and a bonus was offered to all pensioners at two religious holidays costing 0.7% of GDP (IMF, 2018, OECD, 2018). As for monetary policy, right after the election in July of 2018, the CBRT surprisingly did not raise interest rates, as had been widely expected since inflation was at a 14-year high. However, in September, it sharply increased them from 17.75% to 24%, right after the criticisms from Erdogan.

Expected inflation. Panel (a) of Figure 12 also shows monthly inflation expectations from t to one year ahead. The market-price series is a measure of breakeven inflation rates made available by the CBRT. Throughout, they have been very significantly underpredicting inflation.

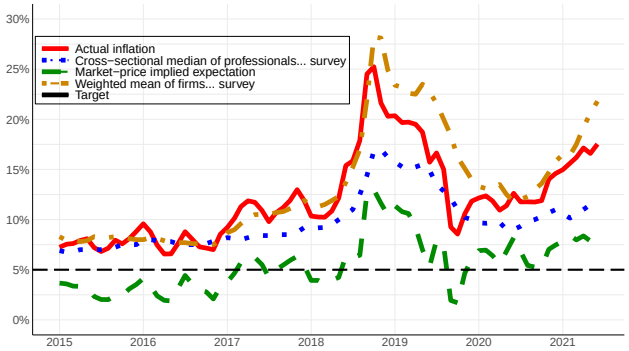
The second series is the median from a monthly survey of professionals that is dominated by financial-market participants who are asked to put their expected inflation in bins. This is also collected by the CBRT, starting in 2001, and has 60-70 respondents. The figure also shows the median response from the Business Tendency Survey, also conducted by the CBRT since 1987 and that every month surveys approximately 500 firms on business confidence, including a question about PPI inflation.

All three measures of expected inflation move closely together. All of them missed the 2018 burst in inflation back in 2017; all of them expected some of that inflation to revert back; and all of them expected some of it to persist into the future

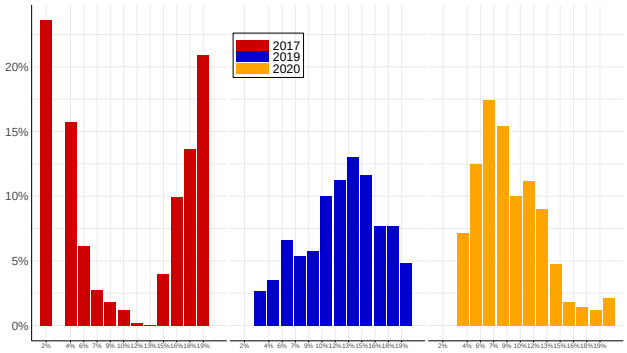
The micro data from the survey of firms is not available. An imperfect proxy is the survey of professionals. This is imperfect for three reasons. First, because these are professionals, and at least for the US, their expectations tends to be closer to a normal and less informative beyond the cross-sectional mean. Second, because the number of respondents is not large enough to accurately calculate a third-order cross-sectional moment. And third, because the survey's top bin is 20% or more, which given the rise in inflation will truncate the right tail.

Figure 12: Turkey's drifting expected inflation anchor: 2018-...

(a) Actual inflation, markets and survey first-order moments



(b) Cross-sectional survey distribution



Subject to all these caveats, already by the end of 2017, the standard deviation almost quadrupled, while the skewness went from being negative at -1% to positive at 0.25%. Panel (b) of Figure 12 shows the distributions in December of 2017, January of 2019 and June of 2021. In 2017, the uncertainty is evident, with a bimodal distribution and more than half of the respondents expecting inflation to exceed 17%. The events of 2018 removed some of the disagreement by consolidating a view that inflation would be well above the target. By 2021, more mass has moved rightwards, and the inflation anchor seems definitely lost.

Lessons. The Turkish experience of a lost anchor leads to two additional lessons. First, even close to real time, and when inflation is bouncing up and down, like it did in Turkey in 2018 and 2019, the expectations data can paint a clear picture of a lost inflation anchor. Second, in countries where arguably the anchor was not firm in the seabed to start with, the shifts in the cross-sectional distribution can be large and fast. The loss of the inflation anchor can come fast and need not be gradually building up like it did in the US in the late 1960s.

5.3 South Africa: 2010-2016

Introduction. The South African Reserve Bank (SARB) adopted inflation targeting in 2000, with a target range of CPI inflation between 3% an 6% and no stated midpoint. The first few years of the new regime were rocky, with oscillations in the exchange rate and reversals of policy, but after 2005, transparency increased, so that after one decade of inflation targeting, outcomes were on average solidly within the range. The global

financial crisis of 2008-10 brought a recession, affecting the country mainly through its international trade linkages to Europe.

Actual inflation. Between 2010 and 2016, the SARB had to face an unusual, difficult sequence of supply shocks. Inflation averaged only slightly less than the 6% upper bound of its target as a result, as shown in the top panel of Figure 13. First, the rise in global oil and commodity prices in 2010-12 pushed inflation towards the upper bound of the range. At the same time, the recession in Europe due to its sovereign debt crisis implied that the South African economy was slow to recover. The SARB kept interest rates steady so as to not prevent that recovery.

Second, as inflation was falling in the first half of 2012, with the economy recovering and oil prices stabilizing, inflation was hit by a different shock throughout 2013 and 2014. The producer of electricity ran perennial deficits and needed large investments to solve the persistent outages. The increase in costs led the regulators to approve a large increase in prices, well above the inflation targeting range. Headline inflation continued to exceed core inflation, but monetary policy held steady for a while until finally raising the repo interest rate in 2014, for the first time in 6 years. By 2015 these effects were over and inflation fell sharply to the middle of the target range, leading the SARB to loosen monetary policy.

A third shock arrived soon though. In 2016, an El Nino storm led to a large decline in soil productivity together with a drought, which raised food prices that are a large component of the consumption baskets. Again headline inflation moved to the upper range of the target, even as core inflation was well within it, and again the SARB held monetary policy steady. Finally, by 2017, no more shocks arrived, and since then inflation has stayed near the midpoint of the range.[16]

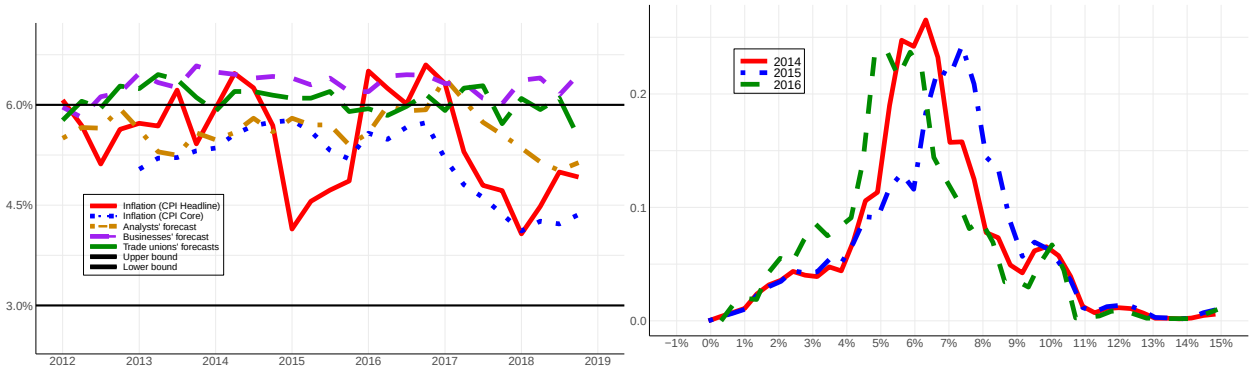
Expected inflation The top panel of figure 13 shows the median expected inflation from three separate samples: financial market analysts, non-financial firms, and trade unions. The survey is conducted by the Bureau of Economic Research for the SARB on a South African panel quarterly since 2000 (for Economic Research, 2021). All three behaved similarly during this period, persistently forecasting inflation to be around 6%. On the one hand, these forecasts by professionals proved to be reasonably accurate ex post and they are remarkably stable in light of the volatility in actual inflation. On the other hand, they

[16]For a description of the SARB's reaction to the successive shocks, see Kabundi, Schaling and Some (2015) or Mminele (2019).

Figure 13: South Africa's unlucky run: 2010-16

(a) Actual inflation, markets and survey first-order moments

(b) Cross-sectional survey distributions



missed the fall in inflation in 2015 and were slow to catch up to the lower inflation from 2017 onwards.

The bottom panel instead reproduces the cross-sectional distribution among households at three successive months of October between 2014 and 2016, calculated by Du Plessis, Reid and Siklos (2021). These come from a remarkable survey of between 2000 and 2500 individuals in urban and rural environments at a quarterly frequency, conducted by AC Nielsen under contract with the SARB and the BER. As inflation moves up and down, the distributions shift right and left. However, note that disagreement, measured by either second or third moments, does not change much.

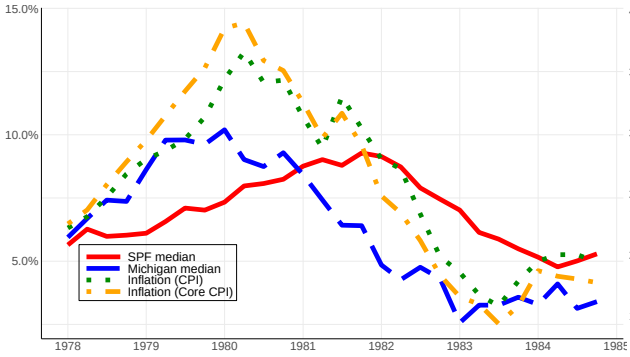
Lessons. The survey data throughout the 2011-16 period seemed consistent with a stable anchor. Shocks hit the economy, the central bank justifiably kept monetary policy steady letting inflation rise, and both outcomes and expectations reflected this with higher expected inflation. Yet, there was no permanent rise of either actual or expected inflation, unlike we saw in the US, Brazil, or Turkey. Disagreement did not increase during this period. Contrary to the US in the 1970s, inflation did not drift up as the expected inflation anchor remained steady. In the South Africa case, the price controls worked in the opposite direction of what they did in the US and Brazil, yet their effects were qualitatively similar: significant but temporary.

5.4 The United States in the 1980s: dropping the anchor

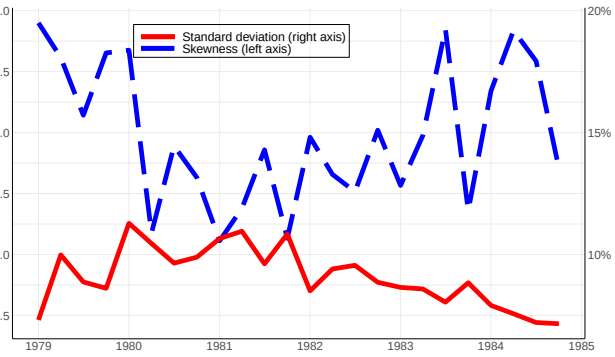
Between 1979 and 1983, under chair Paul Volcker, the Fed adopted highly restrictive monetary policy and inflation fell significantly. If the main episode studied in this paper is the

Figure 14: Dropping the anchor: the US 1980s

(a) Actual and survey first-order moments



(b) Survey disagreement



loss of an inflation anchor, this episode is the dropping a new anchor, which persists in place until today. It adds a reversal situation and again tries to measure the anchor.

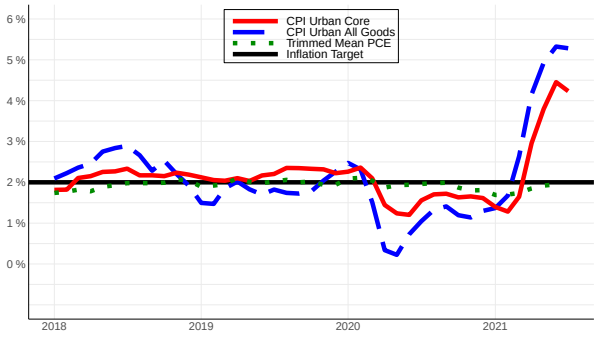
Figure 14 shows that the survey of households, which now corresponds to the standard Michigan quantitative series, was quick to catch on. The decline was swift, keeping up with inflation. Professional forecasters were slower (or perhaps more skeptical). Digging deeper into the household cross-sectional distribution, the figure shows that as some households started expecting lower inflation, this increased the standard deviation, while it lowered the positive skew. As the remaining households gradually caught up, the median fell, the standard deviation started declining after reaching a peak, and the skew started rising. Altogether, this behavior is consistent with the model described in section 4, where people that are inattentive, overconfident, and use sticky information in updating their biases would react in this gradual way to a change in policy regime. As in section 3, it shows that looking at the distribution of expectations, from first to third moment, can provide some signals of where the expected inflation anchor is and where it is going.

5.5 United States 2020-21: Where is it heading?

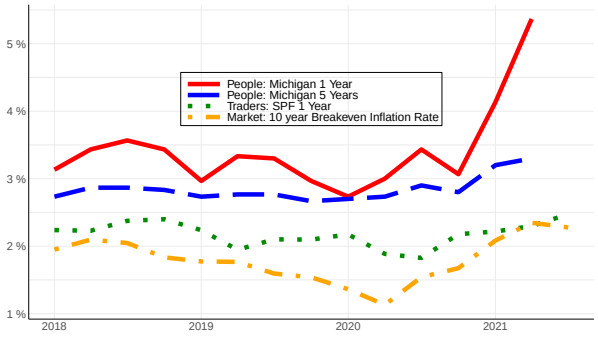
The final application of the ideas in this paper is more tentative. The pandemic recession of 2020 and the swift recovery in 2020-21 interrupted three decades where the expected inflation anchor was steadily at 2% and actual inflation had only small transitory movements near its anchor. As panel (a) in Figure 15 shows, inflation fell sharply with the lockdown in the first half of the year, and rebounded very strongly in the first half of 2021 reaching levels that had not been seen for decades. Many ask today the question that this

Figure 15: The expected inflation anchor through the pandemic

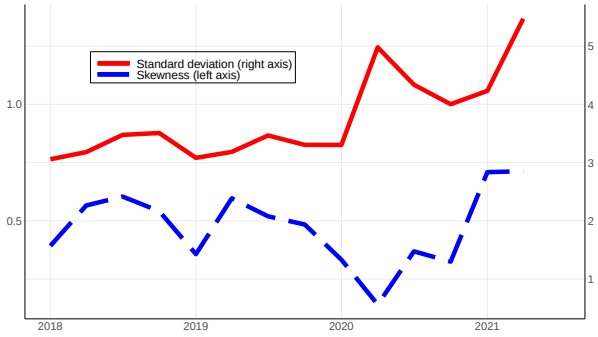
(a) Actual inflation



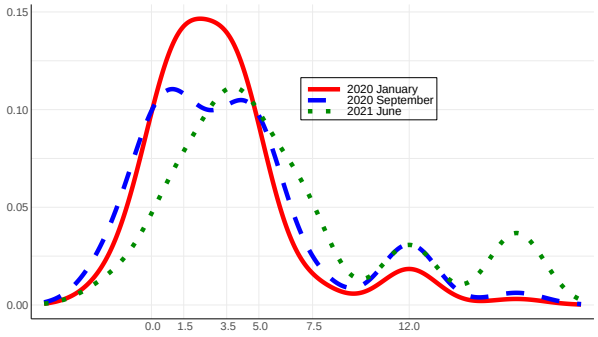
(b) Markets and survey first-order moments



(c) Cross-sectional disagreement of households



(d) Cross-sectional distribution of households



paper asked at the start: Where is inflation heading?

The economic disruptions associated with the pandemic have many peculiar features that make this a hard question. Still, we can look at the expectations data to see if the same patterns are present as in the other episodes of a lost anchor. Panel (b) in Figure 15 shows that professional forecasters have raised their expectation only slightly. If they were the single measure of the anchor, one would confidently conclude that inflation will soon quickly revert back to this anchor. Market-price expected inflation instead has increased significantly in 2021, albeit only after having fallen significantly in 2019 and 2020. These sharp movements in market expectations might shake that confidence, but they could be dismissed as another illustration of the market noise ω in the model.

The household survey is more worrying. Both the long-horizon expectations and the one-year ahead have jumped up in just 6 months faster than almost ever before in the post-1980s sample. Given its usual sluggish slow adjustments, this unusual quick jump is hard to interpret. Candia, Coibion and Gorodnichenko (2021) report a very high discrep-

ancy between the expectations of households and professionals across different surveys and for other countries as well.

Again, looking at higher order moments and, more generally, at the whole distribution provides some guidance. Between the start of 2020 and the second half of the year, mass moved away from the peak of the bell-shaped distribution and towards the right tail. That is, some households started believing that inflation might be very high. As a result, both the standard deviation and the skewness increased rapidly. In the first half of 2021, instead it is the left tail that has been hollowed out. Few US households believe today that inflation will be below target in the near future, and just as many expect that an inflation disaster could happen. As Knotek et al. (2020) document, households have been particularly attentive and responsive to news about inflation during this time period.

Perhaps, like in the early 1980s, households are ahead of the curve in detecting a change in regime. Or, perhaps through the overconfidence discussed in the model, a few price changes in key goods have had an over-influence on overall inflation expectations, much like the wage and price controls in the US 1970s, the administered prices in Brazil 2010s, and the food prices and electricity prices in South Africa in 2012. If so, then those past experiences suggest that the rise in expectations will be transitory and brief. One lesson from the 1967-73 experience is that policymakers should keep a close eye on measures of the expected inflation anchor, and not give in to the temptation to dismiss them as temporary noise or as vague psychological factors.

6 Conclusion

Every respectable central banker talks endlessly about credibility, steering expectations, and how well anchored inflation is. Yet, the experience of the US Great Inflation illustrates that expectations are sometimes treated as mystical objects that the policymaker infers from his/her wisdom and personal experiences. Economists as well often refer to inflation expectations as an add-on factor to complement their model of fundamentals for why inflation rose or fell. Theorists assume that expectations are strictly rational, and so need not be measured, while empiricists despair at how first-order moments for surveys have persistent bias and move so sluggishly.

This paper argued that we can measure inflation expectations in multiple ways. Looking deeper at households surveys, we can examine their distributions, and especially the disagreement in them as measured by second and third order moments. Combining sur-

veys of professionals with market prices provides valuable information to separate noise from signal. The wisdom of the crowd gives hints of what lies ahead. A parsimonious model can be used as a measurement tool to combine these hints into estimates.

During the US Great Inflation, the expectations data shows a drifting anchor already between 1967 and 1970, well before the end of Bretton Woods or the oil price shocks. This paper adds a new element to the *bad measurement* class of explanations of the Great Inflation: the bad measurement of inflation expectations. Not only did policymakers had incorrect estimates of productivity growth, the natural rate of unemployment, or the natural rate of interest, but they also failed to accurately measure expectations of inflation. These mistakes reinforced each other in leading them to miss the drift of the expected inflation and hence not preventing its loss. To the *bad theories* explanations, it adds the observation that policymakers had no theory of expectations, appealing instead to vague animal spirits that led them to over-rely on transitory explanations for persistently rising inflation, and to believing that wage and price controls sufficed. Finally, to the *bad luck* stories, it adds a new channel to the role of oil price shocks. The rise in the salient price of gas made usually-sluggish inflation expectations jump quickly, and by a lot.

Confirming the usefulness of using inflation expectations data, the paper showed that: (i) they also detected the loss of the inflation anchor in Brazil in 2011-16; (ii) even if Turkey has not had a very firm anchor, and events are still too recent to be sure, the expectations data points to a significant change in 2018, (iii) the expectations data do not give a false positive in South Africa 2010-16, instead showing a steady expectations anchor in spite of several adverse shocks to actual inflation, and (iv) they also move consistently when an anchor is being dropped on the seabed as in the US 1979-84. Finally, looking at current events, the data suggests that the anchor may have drifted in 2021, but it is still early enough that good policy or good luck in the near future can keep it in place.

Looking forward, there is much work to do in order to provide better measurements of the expected inflation anchor. The 1960s provide a warning that, even if a central bank cares about inflation expectations, trying to steer them with communications without a clear model or measurement of these expectations is a fruitless task. Ultimately, inflation expectations are not an exogenous force, but a mirror of the monetary and fiscal policy regimes being followed. Those policies are the fundamentals that anchor the expectations anchor itself.

References

Alesina, Alberto. 1988. "Macroeconomics and Politics." In *NBER Macroeconomics Annual 1988, Volume 3*. 13–62. National Bureau of Economic Research, Inc.

Alves, Sergio, Waldyr Areosa, and Carlos Carvalho. 2020. "Beating the "pros" ith a semi-structural model of their own inflation forecasts." PUC-Rio manuscript.

Andrade, Philippe, Olivier Coibion, Erwan Gautier, and Yuriy Gorodnichenko. 2021. "No firm is an island? How industry conditions shape firms' expectations." *Journal of Monetary Economics*.

Ang, Andrew, Geert Bekaert, and Min Wei. 2007. "Do macro variables, asset markets, or surveys forecast inflation better?" *Journal of Monetary Economics*, 54(4): 1163–1212.

Angeletos, George-Marios, Zhen Huo, and Karthik Sastry. 2020. "Imperfect Macroeconomic Expectations: Evidence and Theory." In *NBER Macroeconomics Annual 2020*. Vol. 35. NBER.

Ayres, Joao, Marcio Garcia, Diogo A Guillén, and Patrick J Kehoe. 2019. "The Monetary and Fiscal History of Brazil, 1960-2016." National Bureau of Economic Research Working Paper 25421.

Binder, Carola Conces. 2016. "Estimation of historical inflation expectations." *Explorations in Economic History*, 61: 1–31.

Blinder, Alan S. 1982. "The Anatomy of Double-Digit Inflation in the 1970s." *Inflation: Causes and Effects*, , ed. Robert E. Hall, 261–282. University of Chicago Press.

Blinder, Alan S., and Jeremy B. Rudd. 2013. "The Supply-Shock Explanation of the Great Stagflation Revisited." *The Great Inflation: The Rebirth of Modern Central Banking*, , ed. Michael D. Bordo and Athanasios Orphanides, 119–175. University of Chicago Press.

Blinder, Alan S., and William J. Newton. 1981. "The 1971-1974 controls program and the price level : An econometric post-mortem." *Journal of Monetary Economics*, 8(1): 1–23.

Bonomo, Marco. 2018. "The Brazilian Economy in 2018: Diagnosis of a Crisis." Lemann Lecture, University of Illinois Urbana Champaign.

Bordo, Michael, and Barry Eichengreen. 2013. "Bretton Woods and the Great Inflation." *The Great Inflation: The Rebirth of Modern Central Banking*, 449–489. University of Chicago Press.

Burns, Arthur F. 1957. *Prosperity Without Inflation.* New York:Fordham University Press.

Burns, Arthur F. 1987. "The Anguish of Central Banking." In *Money and the Economy: Central Bankers' Views*. *Palgrave Macmillan Books*, , ed. Pierluigi Ciocca, Chapter 7, 147–166. Palgrave Macmillan.

Campbell, John Y., Adi Sunderam, and Luis M. Viceira. 2017. "Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds." *Critical Finance Review*, 6(2): 263–301.

Candia, Bernardo, Olivier Coibion, and Yuriy Gorodnichenko. 2021. "The Inflation Expectations of U.S. Firms: Evidence from a new survey." National Bureau of Economic Research Working Paper 28836.

Carroll, Christopher D. 2003. "Macroeconomic Expectations of Households and Professional Forecasters." *Quarterly Journal of Economics*, 118(1): 269–298.

Castillo-Martinez, Laura, and Ricardo Reis. 2019. "How do central banks control inflation? A guide to the perplexed." LSE manuscript.

Coibion, Olivier, and Yuriy Gorodnichenko. 2012. "What Can Survey Forecasts Tell Us about Information Rigidities?" *Journal of Political Economy*, 120(1): 116–159.

Coibion, Olivier, Yuriy Gorodnichenko, and Rupal Kamdar. 2018. "The Formation of Expectations, Inflation, and the Phillips Curve." *Journal of Economic Literature*, 56(4): 1447–1491.

de Leeuw, Frank, and Michael J. McKelvey. 1981. "Price Expectations of Business Firms." *Brookings Papers on Economic Activity*, 1981(1): 299–314.

DeLong, J. Bradford. 1997. "America's Peacetime Inflation: The 1970s." *Reducing Inflation: Motivation and Strategy*, 247–280. University of Chicago Press.

Du Plessis, Stan, Monique Reid, and Pierre Siklos. 2021. "What Drives Household Inflation Expectations in South Africa? Demographics and Anchoring Under Inflation Targeting." *Economic Systems*, 45.

Eusepi, Stefano, Emanuel Moench, Bruce Preston, and Carlos Viana de Carvalho. 2019. "Anchored Inflation Expectations." C.E.P.R. Discussion Papers CEPR Discussion Papers 13900.

for Economic Research, Bureau. 2021. "The BER's inflation expectations survey: know your data." *BER Research Note 3*.

Friedman, Milton. 1968. "The Role of Monetary Policy." *The American Economic Review*, 58(1): 1–17.

Friedman, Milton, and Anna J. Schwartz. 1963. *A Monetary History of the United States, 1867–1960.* Princwton University Perss.

Gaglianone, Wagner Piazza, João Victor Issler, and Silvia Maria Matos. 2017. "Applying a microfounded-forecasting approach to predict Brazilian inflation." *Empirical Economics*, 53(1): 137–163.

Gordon, Robert J. 1980. "Postwar Macroeconomics: The Evolution of Events and Ideas." *The American Economy in Transition*, , ed. Martin Feldstein, 101–182. University of Chicago Press.

Hetzel, Robert L. 1998. "Arthur Burns and inflation." *Economic Quarterly*, , (Win): 21–44.

Hetzel, Robert L. 2020. "Handbook of the History of Money and Currency." , ed. Yago K. Battilossi S., Cassis Y., Chapter The Evolution of US Monetary Policy. Springer, Singapure.

IMF. 2018. "Staff Report for the 2018 article IV consultation." *IMF Country Report No. 18/110*.

Jalil, Andrew J., and Gisela Rua. 2016. "Inflation expectations and recovery in spring 1933." *Explorations in Economic History*, 62: 26–50.

Juster, F. Thomas, Paul Wachtel, Saul Hymans, and James Duesenberry. 1972. "Inflation and the Consumer." *Brookings Papers on Economic Activity*, 1972(1): 71–121.

Juster, Thomas, and Robert Comment. 1980. "A note on the Measurement of Price Expectations." SRC Michigan manuscript.

Kabundi, Alain, Eric Schaling, and Modeste Some. 2015. "Monetary policy and heterogeneous inflation expectations in South Africa." *Economic Modelling*, 45: 109–117.

Kara, Hakan. 2021. "Turkey's Ceaseless Battle with Price Stability." LSE lecture delivered on February of 2021.

Knotek, Edward S., Raphael Schoenle, Alexander Dietrich, Keith Kuester, Gernot Müller, Kristian Myrseth, and Michael Weber. 2020. "Consumers and Covid-19: A Real-Time Survey." *Federal Reserve Bank of Cleveland Economic Commentary 2020-08*.

Mankiw, N. Gregory, and Ricardo Reis. 2010. "Imperfect Information and Aggregate Supply." In *Handbook of Monetary Economics*. Vol. 3A, , ed. Benjamin Friedman and Michael Woodford, Chapter 5, 183–230. Elsevier: North Holland.

Mankiw, N. Gregory, and Ricardo Reis. 2018. "Friedman's Presidential Address in the Evolution of Macroeconomic Thought." *Journal of Economic Perspectives*, 32(1): 81–96.

Mankiw, N. Gregory, Ricardo Reis, and Justin Wolfers. 2004. "Disagreement about Inflation Expectations." , ed. Mark Gertler and Kenneth Rogoff Vol. 18, 209–248. NBER Macroeconomics Annual 2003.

McCulloch, J Huston. 1980. "The Ban on Indexed Bonds, 1933-77." *American Economic Review*, 70(5): 1018–1021.

Meltzer, Allan H. 2005. "Origins of the Great Inflation." *Review*, 87(Mar): 145–176.

Meltzer, Allan H. 2010. *A History of the Federal Reserve, Volume 2, Book 1, 1951-1969.* Univesity of Chicago Press.

Mminele, Daniel. 2019. "Understanding the core drivers of inflation in South Africa." Keynote address at SP Dow jones Indices South African seminar.

Nelson, Edward. 2005. "The Great Inflation of the Seventies: What Really Happened?" *The B.E. Journal of Macroeconomics*, 5(1): 1–50.

OECD. 2018. *OECD Economic Surveys: Turkey 2018.* Paris:OECD Publishing.

Okun, Arthur. 1970. *The Political Economy of Prosperity.* Washington, DC:Brookings Institution Press.

Orphanides, Athanasios. 2003. "The quest for prosperity without inflation." *Journal of Monetary Economics*, 50(3): 633–663.

Pesaran, M. Hashem, and Martin Weale. 2006. "Survey Expectations." In *Handbook of Economic Forecasting*. Vol. 1, , ed. G. Elliott, C.W.J. Granger and A. Timmermann, Chapter 14, 715–776. Elsevier: North Holland.

Picks. 1971 edition. *Pick's Currency Yearbook.* Pick Publishing Co.

Primiceri, Giorgio E. 2006. "Why Inflation Rose and Fell: Policy-Makers' Beliefs and U. S. Postwar Stabilization Policy*." *The Quarterly Journal of Economics*, 121(3): 867–901.

Reis, Ricardo. 2003. "Where is the Natural Rate? Rational Policy Mistakes and Persistent Deviations of Inflation from Target." *Advances in Macroeconomics*, 3(1): 1–40.

Reis, Ricardo. 2021. "The People versus the Markets: A Parsimonious Model of Inflation Expectations." *CEPR discussion paper 15624*.

Romer, Christina D., and David H. Romer. 1989. "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz." *NBER Macroeconomics Annual*, 4: 121–170.

Romer, Christina D., and David Romer. 2002. "The evolution of economic understanding and postwar stabilization policy." *Proceedings - Economic Policy Symposium - Jackson Hole*, 11–78.

Sargent, Thomas J. 1988. *The Conquest of American Inflation.* New Jersey:Princeton University Press.

Tobin, James. 1980. "Stabilization Policy Ten Years After." *Brookings Papers on Economic Activity*, 11(1, Tenth Anniversary Issue): 19–90.

Val, Flávio, and Gustavo Araujo. 2019. "Breakeven Inflation Rate Estimation: an alternative approach considering indexation lag and seasonality." Central Bank of Brazil, Research Department Working Papers Series 493.

Weise, Charles L. 2012. "Political Pressures on Monetary Policy during the US Great Inflation." *American Economic Journal: Macroeconomics*, 4(2): 33–64.