Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation

Authors:, Olivier Coibion and Yuriy Gorodnichenko.
AEJ: Macroeconomics 7, no. 1 (2015): 197–232

Presented by Kateryna Dashevska

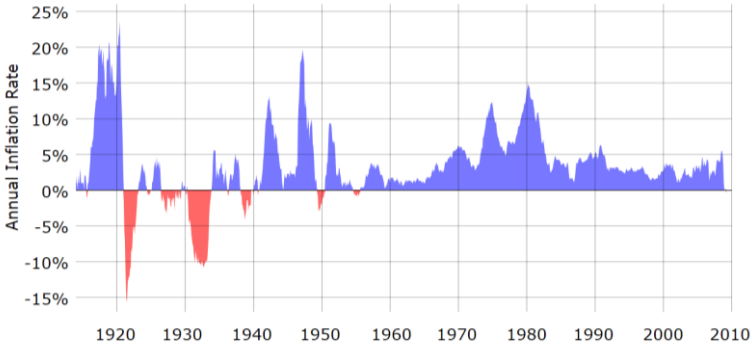
Outline

1. Introduction
2. Background, data and estimation
3. Results
4. Conclusion
5. Discussion

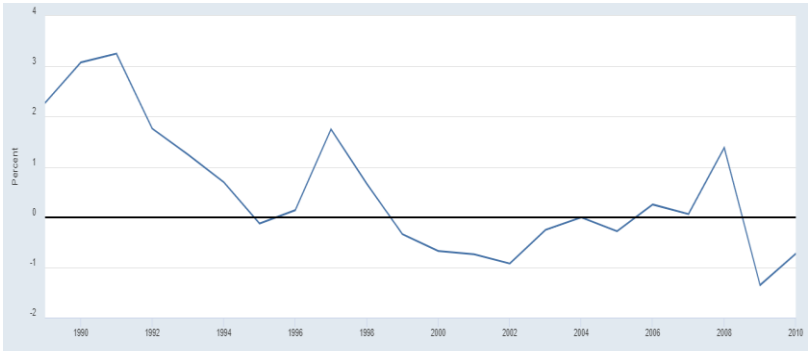
1. Introduction

Motivation

According to the Phillips Curve (PC), advanced economies should have experienced severe disinflation since the Global Financial Crisis (GFC).



Inflation, consumer prices for the U.S.
Source: U.S. Department of Labor / Bureau of Labor Statistics

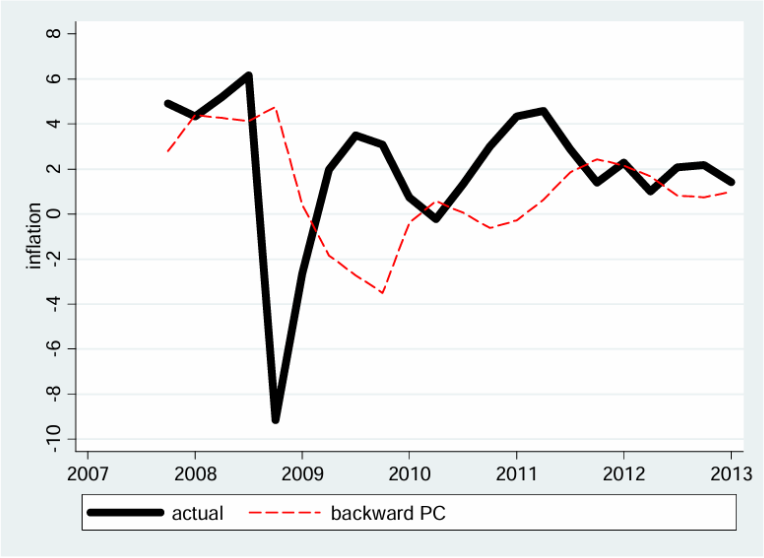


Inflation, consumer prices for Japan
Source: FRED© code: CP

The GFC should have led to deflation in the U.S., but it did not

- The abrupt transitory decline in the 2008Q4 when oil and commodity prices fell dramatically

Panel B: CPI Inflation and Predicted Inflation from Phillips Curve



Notes: Panel A shows the scatter plot of inflation surprises ($\pi_t - E_t\pi_t^{BACK}$) vs. unemployment rate. $E_t\pi_t^{BACK}$ is calculated as in equation (2). Blue, empty circles show observations for 1960Q1-2007Q3. Red, filled circles show observations for 2007Q4-2013Q1. Blue, solid line shows predicted inflation surprises as a function of unemployment rate in the linear regression. Inflation surprises for 2008Q4 is outside the range of the figure and is not reported. Panel B plots time series of actual CPI inflation rate (annualized; black thick line) and CPI inflation rate predicted by the Phillips curve (equation (1); red dash line) which is estimated on the 1960Q1-2006Q3 sample.

Is the Phillips curve (Phillips 1958) broken?

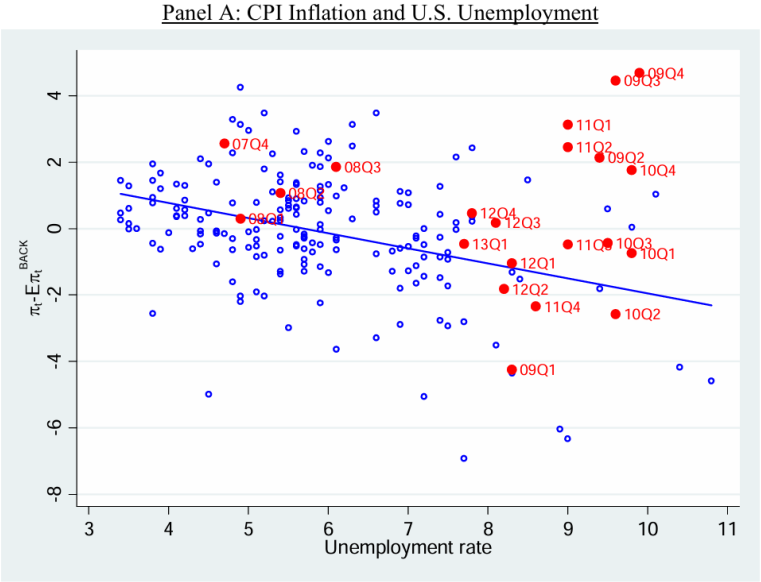
Research Question

- What factors contributed to the missing disinflation during the period following the financial crisis of 2008-2009, and how can these be reconciled with the Phillips curve framework?

2. Background, data & estimation

The 'Missing Disinflation'

- *Blue circles*: data from 1960 to 2007
- *Blue line*: the slope of the average relationship between unemployment & inflation surprises. This relationship is statistically significant
- *Red filled circles*: data from 2009 to 2011
- 2008Q4 data is beyond the range of the figure



- **In 2009–2011, deviations of inflation from expected inflation were systematically higher than one would have expected from historical patterns**

What is already known in the literature?

- Bernanke's (2010) "anchored expectations" hypothesis, which suggests central bank credibility stabilizes inflation by reducing fears of high inflation or deflation, only partially explains the lack of significant disinflation from 2009 to 2011
- Explanations like the long-term unemployed having less impact on wages (Llaudes 2005) or downward wage rigidity (Daly et al. 2012) suggest there should also be missing disinflation in wages, yet this pattern is absent in the data
- Others have pointed to a flattening Phillips curve (IMF 2013), but no structural changes in the economy can account for large changes in the slope of the Phillips curve

The paper's contribution: a novel explanation for the missing disinflation that remains fully within the Phillips curve framework

Methodology

Theoretical model

- **The standard Phillips curve framework**
- **Hypothesis:** If firms' inflation expectations track those of households, then the missing disinflation can be explained by the rise in their inflation expectations between 2009 and 2011

Empirical analysis

- **HH-level and firm-level survey** data (all from September 2013)
- **Regression model**: OLS as well as IV, using as instruments a constant, one lag of unemployment, the dummy variable for post-84 periods, and the interaction of the dummy with the lag of unemployment

Data Sources

- Professional forecasts from Consensus Economics' survey, and Survey of Professional Forecasters
- Household forecasts from Reserve Bank of New Zealand's Survey of Households and the University of Michigan's Survey of Consumers
- Firm forecasts from Coibion, Gorodnichenko and Kumar (2014) using reported forecasts of 60 firms in New Zealand
- Macroeconomic data from the Federal Reserve Economic Data (FRED)
- Short-term natural rate of unemployment constructed by the Congressional Budget Office (CBO)

Model

$$E_t\pi_{t+1} = \frac{1}{4}(\pi_{t-1} + \pi_{t-2} + \pi_{t-3} + \pi_{t-4})$$

Baseline: Expectations of future inflation are backward-looking and can be approximated by the average of the previous four quarters' inflation rates

$$UE_t^{gap} = UE_t - UE_t^n$$

Unemployment gaps as the quarterly deviation of unemployment from the natural rate

$$\pi_t - E_t\pi_{t+1} = c + \kappa x_t + v_t$$

where x is a measure of economic activity,
v corresponds to cost-push shocks,
c is a constant,
κ is the slope of the Phillips curve,
$E_t\pi_{t+1}$ denotes expectations of inflation

$$\pi_t - E_t\pi_{t+1} = c + \kappa UE_t^{gap} + v_t$$

$$\pi_t - E_t\pi_{t+1} = c + \kappa \times UE_t^{gap} + \gamma \times UE_t^{gap} \times I_{\geq 85,t} + \theta \times I_{\geq 85,t} + error_t$$

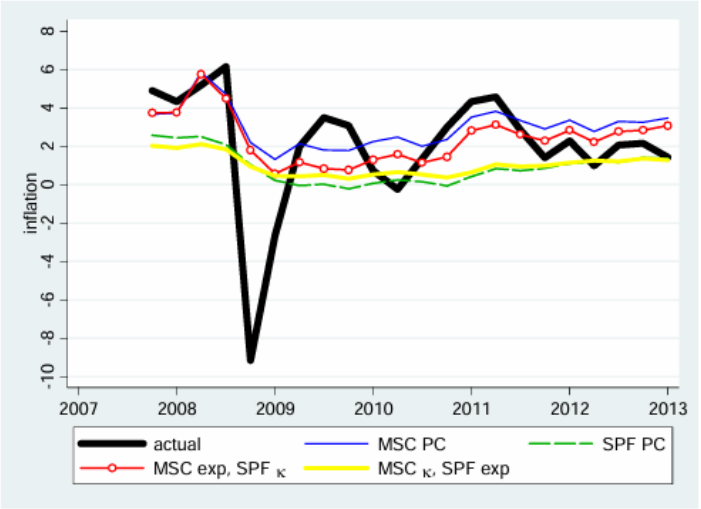
where $I_{\geq 85,t}$ is a dummy variable equal to one for periods from 1985Q1 to 2007Q3 and zero prior to 1985
The interaction of this dummy variable with the unemployment gap (γ) allows us to assess whether the slope of the Phillips curve changed around this period.

3. Results

An expectations-augmented PC – using household inflation expectations – can account for the absence of strong disinflationary pressures since 2009

- Household inflation expectations experienced a sharp increase starting in 2009, rising from a low of 2.5% to around 4% in 2013;
- Other measures of inflation expectations, such as those from financial markets or professional forecasters, have hovered in the neighbourhood of 2% over the same period.

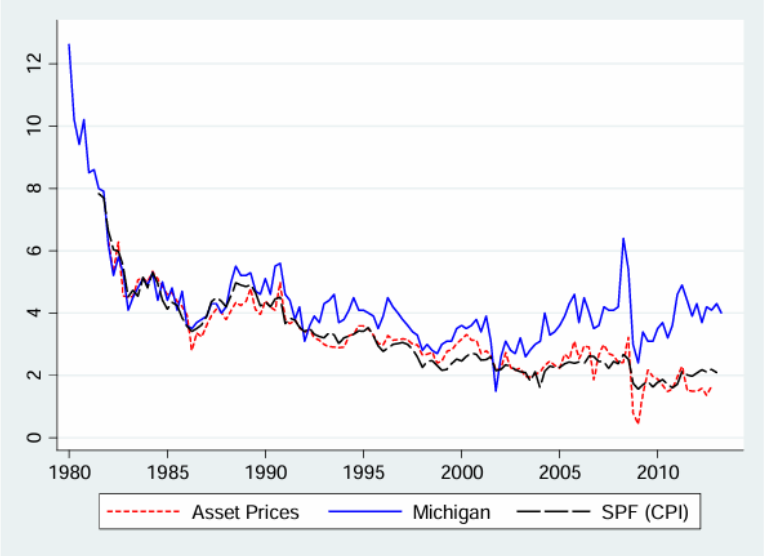
Panel D: Relative Contributions of Slopes and Inflation Expectations



The Phillips curve and the missing disinflation with household inflation expectations (1)

- Household inflation expectations experienced unusual increases relative to professional forecasts of inflation and inflation forecasts from asset markets during each run-up in oil prices – from 2003 to 2008, and again from 2009 to 2012.

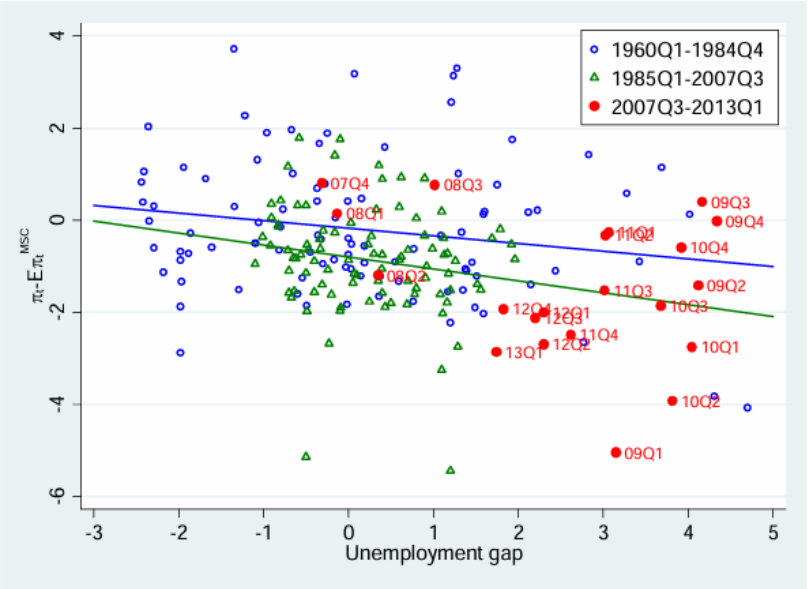
Panel A: Inflation Expectations for Different Economic Agents



The Phillips curve and the missing disinflation with household inflation expectations (2)

- The Phillips curve is stable over time, and the rise in household expectations since 2009 can fully account for the missing disinflation.

Panel B: Phillips Curve with Household Inflation Expectations



Notes: Panel B shows the scatter plot of inflation (CPI) surprises vs. unemployment gap as well as fitted linear regressions for two sub-periods.

Why focus on the expectations of households aiming to capture the inflation expectations of firms? (1)

1. There is no quantitative measure of firm inflation expectations available in the US.

Why focus on the expectations of households aiming to capture the inflation expectations of firms? (2)

2. The study presents new empirical evidence from estimated Phillips curves in the pre-Great Recession period that household forecasts are likely to be a better proxy for firm forecasts than either professional or backward-looking forecasts.

TABLE 2. WHICH EXPECTATIONS BEST PROXY FOR FIRMS' EXPECTATIONS?

	Pre-Great Recession, 1981Q1-2007Q3				Full sample, 1981Q1-2013Q1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Unemployment rate								
$E_t\pi^{MSC}_{t+1,t+4}$	1.442***	1.089***	1.128***	0.803***	1.480***	1.036***	0.935***	0.627***
	(0.218)	(0.210)	(0.214)	(0.179)	(0.182)	(0.190)	(0.140)	(0.152)
$E_t\pi^{SPF}_{t+1,t+4}$	0.018	0.289*	-0.128	0.197	0.077	0.361**	0.0650	0.373
	(0.200)	(0.171)	(0.214)	(0.179)	(0.136)	(0.158)	(0.140)	(0.152)
UE_t	-0.250**	-0.235**	-0.077	-0.095	-0.267***	-0.208***	-0.190***	-0.151***
	(0.106)	(0.096)	(0.100)	(0.086)	(0.076)	(0.058)	(0.064)	(0.053)
$\log\left(\frac{OilP_t}{OilP_{t-1}}\right)\times 400$		0.009***		0.010***		0.014***		0.015***
		(0.003)		(0.002)		(0.004)		(0.004)
Observations	105	105	105	105	127	127	127	127
R^2	0.537	0.612	0.262	0.394	0.466	0.627	0.205	0.461
Panel B: Unemployment gap								
$E_t\pi^{MSC}_{t+1,t+4}$	1.475***	1.117***	1.088***	0.782***	1.469***	1.026***	0.976***	0.662***
	(0.220)	(0.219)	(0.192)	(0.167)	(0.184)	(0.190)	(0.143)	(0.150)
$E_t\pi^{SPF}_{t+1,t+4}$	-0.079	0.201	-0.0880	0.218	0.024	0.321**	0.0240	0.338
	(0.187)	(0.166)	(0.192)	(0.167)	(0.129)	(0.152)	(0.143)	(0.150)
$UE_t - UE^n_t$	-0.262**	-0.249**	-0.160	-0.168*	-0.304***	-0.243***	-0.267***	-0.214***
	(0.109)	(0.099)	(0.104)	(0.089)	(0.088)	(0.065)	(0.082)	(0.061)
$\log\left(\frac{OilP_t}{OilP_{t-1}}\right)\times 400$		0.009***		0.010***		0.014***		0.015***
		(0.002)		(0.002)		(0.004)		(0.004)
Observations	105	105	105	105	127	127	127	127
R^2	0.537	0.612	0.270	0.402	0.465	0.628	0.217	0.470

Notes: Dependent variable is the annualized rate of inflation (quarter on quarter). $E_t\pi^{MSC}_{t+1,t+4}$ and $E_t\pi^{SPF}_{t+1,t+4}$ are one-year-ahead inflation forecasts from the Michigan Survvery of Consumers (MSC) and the Survey of Professional Forecasters (SPF). $OilP$ is the price of oil (Crude Oil Prices: West Texas Intermediate (WTI); FRED: OILPRICE). UE_t is the rate of unemployment. UE^n_t is the natural rate of unemployment from the Congress Budget Office (CBO). Constant is included but not reported. Specifications in columns (3), (4), (7) and (8) impose that the coefficients on $E_t\pi^{MSC}_{t+1,t+4}$ and $E_t\pi^{SPF}_{t+1,t+4}$ sum up to one. Newey-West standard errors are in parentheses. ***,**,* indicate significance at 1%, 5%, 10% respectively.

Similarly, the authors document that household inflation forecasts outperform backward-looking forecasts.

Why focus on the expectations of households aiming to capture the inflation expectations of firms? (3)

3. The authors present preliminary results from an ongoing survey of firms' inflation expectations in New Zealand and show that their properties resemble those of households more than professional forecasts – with relatively high levels of forecasted inflation and very high dispersion of forecasts across firms.

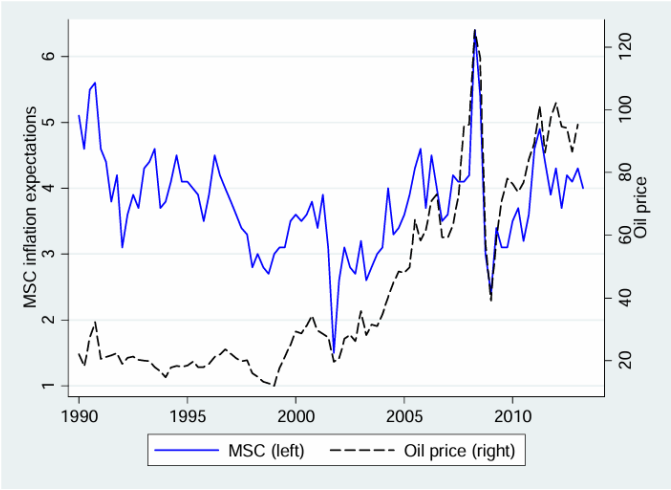
TABLE 3: PROPERTIES OF INFLATION FORECASTS OF DIFFERENT AGENTS

	New Zealand (Sept. 2013)			United States (Feb. 2013)		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Annual CPI Inflation	0.7			2.0		
Central Bank Forecast of Year Ahead Inflation	1.7			1.5		
Professionals' Forecasts of Year Ahead CPI Inflation	1.9	1.9	0.2	1.9	1.8	0.3
Households' Forecasts of Year Ahead Inflation						
All participants	5.3	N.A.	5.4	4.4	3.0	4.4
Truncated	3.1	3.0	1.7	3.8	3.0	3.0
Firms' Forecasts of Year Ahead Inflation						
All participants	8.8	5.0	7.8			
Truncated	5.3	4.5	3.3			
Non-Financial Firms' Forecasts of Year Ahead Inflation						
All participants	6.1	5.0	4.0			
Truncated	5.7	5.0	3.3			

Notes: Central Bank Forecast for U.S. is for PCE price index, mid-range of central tendencies of 1.5 for 2013 and 1.75 for 2014, yielding 10/12*1.5+2/12*1.75=1.54. Annual CPI inflation for New Zealand is for June 2013. All other dates are as reported in Table. Professional forecasts are taken from Consensus Economics' survey. Household forecasts are from Reserve Bank of New Zealand's Survey of Households and the University of Michigan's Survey of Consumers. Firm forecasts are from ongoing work in Coibion, Gorodnichenko and Kumar (2014) using reported forecasts of 60 firms in New Zealand.

The salience of oil prices

- More than half of the historical differences in inflation forecasts between households and professionals can be accounted for by the level of oil prices.



Notes: Oil Price is the Spot Oil Price for West Texas Intermediate (FRED© name: OILPRICE). MSC inflation expectations is the mean one-year-ahead inflation expectations in the Michigan Survey of Consumers (MSC).

- With gasoline prices being among the most visible prices to consumers, households pay particular attention to them when formulating their expectations of other prices. Individuals who spend more money on gasoline adjust their inflation forecasts more in response to oil-price changes than do individuals who spend less money on gasoline.

4. Conclusion

Key takeaways

- The available evidence is consistent with the use of household inflation forecasts as a proxy for firm forecasts of inflation in the Phillips curve.
- It is quantitatively successful in explaining the missing disinflation.
- The study presents new econometric and survey evidence consistent with firms' inflation expectations being similar to those of households.
- The difference in household inflation expectations and those of professional forecasters since 2009 can readily be accounted for by the evolution of oil prices during this period.

Implications of the explanations

- The lack of pronounced disinflation or deflation after the Great Recession likely resulted from unique factors, such as China's rapid recovery boosting global demand for commodities, with rising oil prices potentially preventing deflation and serving as a "lucky break" for inflationary expectations.
- Contrary to Bernanke's 'anchored expectations' hypothesis, the authors find that household expectations remain unanchored and highly responsive to commodity price changes. If expectations had been fully anchored, more severe disinflationary dynamics might have resulted, suggesting that while anchored expectations are generally desirable, the post-2009 experience highlights potential risks in certain economic contexts.

5. Discussion

External validity

- The inattention to inflation dynamics varies significantly depending on the economic environment. Households and firms in high-inflation countries tend to be more informed about inflation compared to those in low-inflation settings. This indicates that inflation expectations are not universally formed in the same way, but rather depend on the specific circumstances agents face.
- The role of salient prices of frequently purchased goods in shaping inflation expectations further emphasizes the need for context-specific modelling.

Limitations

- The lack of direct quantitative data on firms' expectations in the U.S., which the authors acknowledge
- It is sensitive to whether the expectations data used come from the SPF or from the Michigan Survey of Consumers as Coibion and Gorodnichenko (2015) emphasize, and is also sensitive to the exact timing of the variables

THANK YOU !


100
THIS NOTE IS LEGAL TENDER
FOR ALL DEBTS, PUBLIC AND PRIVATE
LB 25170250 D
SERIES
2009
A
100