Journal of Monetary Economics 82 (2016) 85–106

Contents lists available at ScienceDirect

Journal of Monetary Economics

journal homepage: www.elsevier.com/locate/jme

Indeterminacy and learning: An analysis of monetary policy in the Great Inflation

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ARTICLE INFO

Article history:
Received 27 August 2014
Received in revised form
13 July 2016
Accepted 14 July 2016
Available online 30 July 2016

JEL classification:
C11
C32
E52

Keywords:
Federal reserve
Great moderation
Bayesian estimation
Least squares learning

ABSTRACT

The Great Inflation of the 1970s can be understood as the result of equilibrium indeterminacy in which loose monetary policy engendered excess volatility in macroeconomic aggregates and prices. The Federal Reserve inadvertently pursued policies that were not anti-inflationary enough because it did not fully understand the economic environment it was operating in. Specifically, it had imperfect knowledge about the structure of the economy and was subject to data misperceptions. The combination of learning about the economy and the use of mis-measured data resulted in policies, which the Federal Reserve believed to be optimal, but when implemented led to equilibrium indeterminacy.

1. Introduction

There are three narratives about the Great Inflation and the Great Moderation in the academic literature. At opposite ends of the spectrum are the good/bad luck and good/bad policy stories. The 1970s were a time of economic upheaval with strong and persistent exogenous shocks that occurred with high frequency. It was simply bad luck to being a central banker at that time since despite best intentions the incidence of shocks proved too difficult to handle. In the 1980s, however, the reduced incidence and persistence of shocks rang in the Great Moderation. This view is exemplified by Sims and Zha (2006). An almost orthogonal narrative argues that the Federal Reserve conducted bad policy in the 1970s in that it was not aggressive enough in fighting inflation. It is only through a high-interest rate policy, commonly labelled the Volcker disinflation, that the Great Inflation was reigned in. This view of policy having been bad is associated with Clarida et al. (2000) and Lubik and Schorfheide (2004) who argue that policy that is not sufficiently anti-inflationary leads to equilibrium indeterminacy in the economy and excess fluctuations in output and inflation. A third narrative, typically associated with Orphanides (2001), rests on the idea that the Federal Reserve did not perceive the economic scenario of the 1970s correctly. Data misperceptions led it to implement policies that delivered bad outcomes and that only abated in the 1980s with a better understanding of the state of the economy.

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http://dx.doi.org/10.1016/j.jmoneco.2016.07.006
0304-3932/

Our paper attempts to integrate the bad policy narrative with the data misperception narrative. More specifically, the paper provides an explanation why the Federal Reserve engaged at first in monetary policy that led to bad outcomes (the Great Inflation), but subsequently pursued a policy that resulted in good outcomes (the Great Moderation). What appears in the data as good and bad outcomes is the result of an optimal policy problem under imperfect information. This framework sits at the intersection between the view espoused by Clarida et al. (2000) and Lubik and Schorfheide (2004) on the one hand and the optimal policy analysis under central bank learning of Primiceri (2006) and Sargent et al. (2006) on the other hand. Relative to the latter, we use a forward-looking private-sector model, which allows us to think seriously about the issue of equilibrium indeterminacy as a cause of the Great Inflation. Relative to the former, we provide an explanation of why the switch from indeterminacy to determinacy, from the Great Inflation to the Great Moderation, occurs at a certain point in time.

The key element that is added to these frameworks is that the Federal Reserve operates in a real-time data environment, where initial data releases are subject to measurement error. The main finding is that shifts in the type of equilibrium are driven by changing perceptions of inflation and output dynamics in the economy, which translates into shifts in optimal monetary policy coefficients. The fact that the central bank misperceives the true state of the economy can lead to policy and equilibrium outcomes that would not be implemented if the true final data are known. This framework not only rationalizes the presence of indeterminate equilibria during the 1970s, but also the switch to a determinate equilibrium in the Volcker disinflation. In this model it is precisely the specific pattern of mis-measured data that is important in explaining post-war U.S. economic history. When there are no data misperceptions, so that the central bank observes the true data contemporaneously, the indeterminacy period extends well into the 1990s.

The model assumes a central bank that does not know the true data-generating process and that observes all data with error. It gathers information by estimating a backward-looking model, and then updates its beliefs about the state of the world and the underlying economic model using least-squares learning. The central bank then chooses monetary policy in a linear-quadratic optimal policy problem. Every period, the optimal rule is communicated to the private sector, which is represented by a standard New Keynesian framework. Private agents assume that the policy rule is time-invariant and form rational expectations conditional on that rule. The source of indeterminacy that arises from this rational expectations system is the same as in Bullard and Mitra (2002), Woodford (2003), and Lubik and Schorfheide (2004), namely a violation of the Taylor principle, which is tied to the value of the policy coefficients in an interest-rate rule. The model is estimated on real-time and final data using Bayesian methods.

The paper thus provides a rationale for why the central bank may choose policy coefficients that inadvertently induce indeterminate outcomes. Given the learning mechanism, the estimated coefficients of the central bank's model, and therefore the optimal policy coefficients, change period by period. The values that these coefficients attain depend on the degree of misperception of the data due to measurement issues. The equilibrium that arises each period is either unique or indeterminate given the policy rule in place. It is the endogenous shifts of the policy coefficients for fixed private sector parameters that move the economy across the threshold between the determinate and indeterminate regions of the parameter space. 'Bad policy', that is, indeterminacy, arises not because of intent but because of incomplete knowledge of the economy on part of the central bank.

We identify two especially prominent turning points. The largest change in policy, based on our estimated policy coefficients, occurred at the end of 1974, at the height of stagflation in the wake of the abandonment of price controls earlier that year. We find that the Federal Reserve under Burns pursued an aggressively anti-inflationary policy that resulted in a determinate equilibrium in the middle of the Great Inflation decade. The Federal Reserve reversed course, when it was confronted with a situation where a decline in growth in 1975 implied a lessening of inflationary pressures. It consequently shifted to a more accommodative stance that led to an indeterminate equilibrium. This set in motion a shift towards an increasingly less accommodative policy stance that culminated in what has come to be known as the Volcker disinflation. A central result of our framework is that the policy change under Volcker is not an abrupt move to an aggressive policy regime, but rather the culmination of a gradual process that started under Burns.

Traditionally, DSGE models for the analysis of monetary policy have been estimated using final data. It is only very recently that the importance of real-time data for understanding monetary policy decisions is being considered in this literature.[1] Collard and Dellas (2010) demonstrate in an, albeit calibrated,[2] New Keynesian DSGE model that monetary misperceptions, interpreted as the difference between real-time and revised data, are an important driver of observed economic fluctuations through a monetary policy transmission channel. Neri and Ropele (2011) substantiate these insights by estimating a similar model for Euro area real-time data using Bayesian Methods. They find that data misperceptions lead to estimated interest-rate smoothing coefficients that are higher than in the standard model. This finding parallels our results since an increasingly more inertial policy rule was one of the drivers of the switch from indeterminacy to determinacy in the early 1980s.

[1] This is notwithstanding earlier contributions, such as Orphanides and Williams (2005), which use reduced-form models and non-system based empirical methods to understand the implications of data misperceptions.

[2] Collard et al. (2009) estimate this model using Bayesian methods and find strong support for the data mismeasurement specification in terms of overall fit. However, they do not use real-time data in their estimation. Consequently, measurement error takes on the role of a residual that is not disciplined by the relevant data concept in the empirical model.