

The Myth of Normal: The Bumpy Story of Inflation and Monetary Policy

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There was a time, not too long ago, when central banking was considered to be a rather boring and unexciting occupation. In the era of the “Great Moderation,” mostly seen as the period between the mid-1980s and the beginning of the global financial crisis, inflation was tamed and macroeconomic volatility was contained. Some thought that monetary policy could effectively be placed on auto-pilot. I can confidently say that this time has passed.

Mario Draghi (2013)

I. Introduction

Normalization. No matter your views about when, how, and at what pace various economies will achieve monetary policy normalization, the ideal of normalcy is undeniably comforting. With the Federal Reserve now (data dependently) on the brink of normalization, it seems like a good time to refresh our memories on just what is the normal interplay between inflation dynamics and monetary policy.

A natural starting point is to look at history—surely normal is what was, well, normal. The history of monetary policy running through the gold standard era, Bretton Woods and the more recent triplet of Greats—Inflation, Moderation and Recession—is rich, varied, and, we must admit, peppered with tragic episodes. What does not necessarily stand out, however, is any extended period one would want to take as normal.

One hopeful theme, to which we subscribe, is that policymakers and academics are learning important lessons and that economies are continually moving toward a better normal in monetary policy making and inflation dynamics. Regardless of one's views about the "new normal" for structural issues such as secular stagnation—matters that monetary policy cannot much address—one would hope that basic issues of everyday monetary policy making might return in the near(ish) future to something like life in the decade or so before the crisis.

As Draghi notes in the introductory quotation, that period presents an attractive possible normal in several respects. As that period began, the Great Inflation had been conquered and its lessons had been added to those garnered from the gold standard and Bretton Woods eras. In particular, central bankers had internalized a core focus on price stability. After important innovations in New Zealand in the early 1990s, the flexible inflation targeting framework had evolved rapidly and the core focus had been filled out into a fully operational scheme for policymaking. A new class of models—DSGE models—was added to the suite of models regularly considered by central banks.¹ By 2005, about a decade of experience with this scheme had been associated with unprecedented stability in inflation and real activity. For good reason, King (2003) labeled this the NICE decade—NICE: noninflationary consistently expansionary.

Had we learned the key elements of appropriate monetary policy in normal times? Should we expect to return to such a period?

There seems to be nearly universal agreement that some very important lessons had been learned. Foremost among these is that price stability is a central component of sound monetary policy and that systematic and transparent policy behavior are the best way to promote all goals of policy. These elements are what Bernanke (2003b) describes as the key lessons of the inflation targeting framework; they are now universally accepted and no longer the sole possession of any camp or brand.

We will challenge several other aspects of what we see as the conventional view of normal-times policy and inflation dynamics, a view

that has strongly influenced both academic work and policymaking since the early 1990s. This conventional perspective, which we will call the *nice view*, marries a particular account of *normal business cycle dynamics* to a notion of appropriate monetary policy. In this view, central banks best promote inflation stability by behaving in a simple and systematic manner, responding mainly to the states of inflation and aggregate real activity. Policy behavior is roughly described by some type of Taylor rule. So long as central bank behavior is simple and predictable, normal cyclical dynamics result in inflation showing modest and transitory fluctuations around its target value, with real activity fluctuations that are likewise modest. As we'll explain more fully below, this *nice view* can accommodate a broad range of macro models and perspectives—new Keynesians, old Keynesians, monetarists; those who believe there are few policy-exploitable trade-offs, and those who believe in quite interventionist policy.

The alternative view of the world we present shares much with the *nice view*, but differs in one major respect. Aggregate inflation and real-side dynamics reflect disparate and persistent movements in myriad variables, and the policy implications of these movements are not well captured by two (or any very small number of) conventional summary statistics for headline aggregates. We label this problematic variation in macro variables *disparate confounding dynamics* (DCDs), where *confounding* is meant to suggest that this variation complicates the nature of appropriate monetary policy.

What variables display disparate confounding dynamics? Productivity and output growth of both nations and economic sectors fluctuate persistently relative to one another; closely related, the inflation rates of housing, goods, services, energy, food and medical care differ widely and persistently through time. What are sometimes called the “great ratios,” such as labor’s share of income or consumption as a share of GDP, show substantial fluctuations beyond those attributable to normal cyclical dynamics. The same is true of the debt of various sectors and of term and risk premia in financial markets.

Disparate confounding dynamics are blindingly apparent in the data; if you look at raw data, they are mainly what you see. And none of this is news to policymakers or central bank staffers. That is, we

do not pretend to be heralding the discovery of new objects in the policymaking firmament.

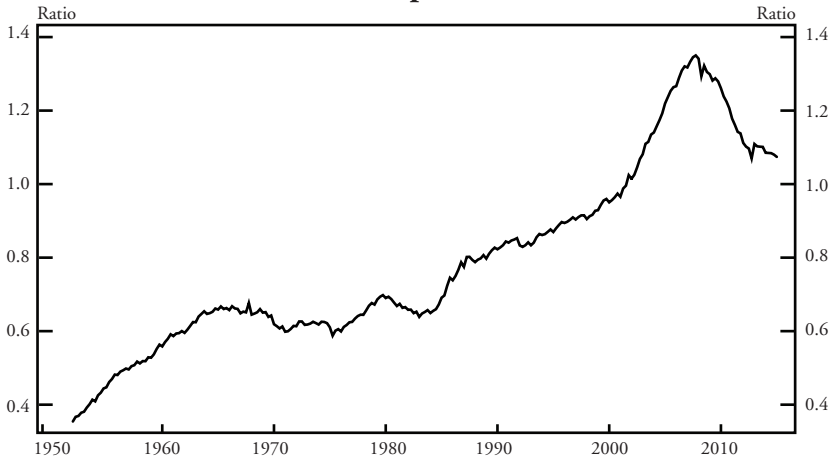
We will, however, argue that a conventional view of normal cyclical dynamics too strongly colors much policy analysis and that DCDs are not integrated sufficiently well into policy. Most academic work on monetary policy in *any* conventional perspective abstracts entirely from confounding elements like those just listed.² Academics among us know the proper defense of leaving out DCDs: models must be idealizations; the art is to strip away superfluous details to focus on the essence. Normal cyclical dynamics, in this view, comprise the heart of the matter.

This paper is an invitation to reconsider just which parts of macro dynamics are—and historically have been—at the heart of good and bad policy making. We'll argue that if we must accept the conventional partitioning of macro dynamics into bins labeled the essence and sideshow, we should probably reverse the labels relative to the placement reflected in standard analysis. Normal cyclical dynamics that are meticulously addressed in standard models are a sideshow, and DCDs, omitted from those models, are the essence. This statement is deliberately provocative: it would obviously be best to integrate the two sources of dynamics in the analytic framework.

After framing the issues more concretely, we start with some summary (nonstructural) evidence suggesting that the conventional view of normal cyclical dynamics has essentially been of no value historically in predicting inflation dynamics. These results build on the work of Faust and Wright (2013). The paper then surveys the history of policymaking and inflation dynamics in an attempt to understand this result. This history points us toward two families of issues.

First come real-time measurement problems. Applying the *nice view* to policy and normal cyclical dynamics requires first filtering out the part of any measured data series that is not the normal business cycle. For example, one attempts to look through food and energy price shocks and must separate trend from cycle in real activity. Any wisdom captured by the *nice view* may be of limited value if the extraneous bits cannot be measured sufficiently well in real time.

Chart 1
Ratio of Credit Market Debt of Households and Nonprofits
to Personal Disposable Income



Sources: Federal Reserve via FRED and authors' calculations.

Second comes a set of issues that arise if business cycle and other dynamics interact in a way that cannot easily be disentangled, either in principle or in real time. For example, the ratio of household debt to income in the United States rose fairly steadily from 1950 through 2007 (Chart 1). This trend is absent in conventional business cycle models. We know of no theories that tell us which movements in this trending variable can safely be ignored and which might importantly contribute to cyclical dynamics.

We argue that generally—and perhaps most especially during the NICE decade—understanding DCDs has been the key to understanding inflation dynamics, and that the variation captured in the *nice view* of normal cyclical dynamics has played a decidedly secondary role.

Few of the ideas in this paper are new—most have been articulated at this symposium in the past. But we came to them while participating in central bank policy making and analyzing communication during the current recovery. We see a significant shift, with central banks focusing on, and communicating about, disparate confounding dynamics such as persistent changes in term premia in financial markets, puzzles over trend versus cycle components in labor force participation and trends in demographics and globalization.

A new and better normal in monetary policy analysis at central banks may already be settling in, and we strongly support this change. When and if economic conditions come to look more like they did in the NICE decade, it would be a serious mistake to return to normal policy analysis as conceived at that time. In the final portion of the paper, we make some suggestions about how to capitalize on recent progress and to lay the groundwork for new and better normal.

II. The Nice View and Normal Cyclical Dynamics

The *nice view* brings a perspective on normal cyclical dynamics together with implications for how monetary policy can best contribute to limiting the costs of business cycles. A central feature of normal cyclical dynamics is that aggregate inflation and real activity tend toward regular fluctuations around some normal values—for inflation, normal is given by the central bank's target; for real variables, normal is defined by some notion of maximum sustainable resource utilization, governed, say, by the growth in potential output. A wide range of sensible policies would deliver broadly similar cyclical dynamics, and the goal is to select the policy that best limits the costs of cycles.

The primary link between inflation and activity, in this view, runs through a systematic, causal connection between slack in aggregate resource utilization and inflation. When demand is higher relative to productive capacity, slack is lower and inflation tends to move up relative to the target. When, say, technical innovation raises capacity relative to demand, slack rises and inflation falls relative to the target. In many formulations, this link is forward looking, so that expected slack affects inflation today.

Monetary policy in the *nice view* can best contribute to economic welfare, first, by not adding uncertainty to the economy. Policy should be transparent and have a systematic relation to underlying conditions. As noted in the Introduction, a strong commitment to transparency and price stability is a hallmark of recent progress in central banking.

How best can the central bank avoid injecting gratuitous noise while limiting the harmful effects of cycles? The holy grail of monetary economics has been to find a simple recipe. Friedman (1960)

argued that something like a constant monetary growth rule might be the best that policy can do. More recently, the focus has turned to the price, instead of the quantity, of liquid assets, and researchers have documented that simple interest rate rules deliver nearly optimal outcomes in conventional models.

Taylor (1993) famously noted that a simple rule that responds to inflation and real activity mimicked the behavior of the Federal Reserve during a period generally recognized as successful for policy. A large body of research documents that across a wide range of models of normal cyclical dynamics, a reaction function in which the central bank adjusts the policy interest rate in a simple (linear) way to some indicator of aggregate inflation and aggregate slack performs well. Indeed, in the models, such rules can deliver an inflation rate and pace of activity that fluctuate as benignly as the blunt tools of monetary policy can achieve. Taylor and Williams' (2010) review documents that the Taylor-type rules give excellent outcomes not only in small abstract models, but also in larger old- and new-fashioned models, including models used by central banks.

One remarkable aspect of the *nice view* of policy is that it tends to be palatable to a wide range of audiences: Keynesians new and old, monetarists modern and traditional, real business cycle advocates, even inflation “nutters.” This basic agreement over policy arises so long as the different parties agree not to dig too deeply into exactly what limiting the costs of “inefficient business cycle variation” means. For example, the policy prescriptions of old Keynesians and new Keynesians are similar, even though unemployment is a focal concern of old Keynesians, while new Keynesians use models that have nothing the old Keynesians would recognize as unemployment. Similarly, so long as it is an empirical regularity that slack predicts inflation, simple policy rules may be palatable to monetarists and inflation “nutters” alike. Advocates of the real business cycle perspective, who argue that misguided central bank policy is itself the primary source of inefficient business cycle variation, can also go along—at least the policy prescriptions are simple and systematic.

The alignment of policy prescriptions under the big tent that we have described as the *nice view* helps us understand Levin and Williams' (2003) remarkable conclusion:

The main finding from our model-based analysis is positive: it is possible to find policy rules that perform very well in a wide range of macro models as long as the policymaker cares about both inflation and output variability. Or, put differently, the members of a policymaking committee that share similar preferences for stabilizing fluctuations in inflation, output, and interest rates, but who have quite different views of the dynamics behavior of the economy, can relatively easily (sic) come to a mutually acceptable compromise over the design of monetary policy (Levin and Williams 2003, p. 969).

The policymaking world in the *nice view* is very nice indeed.

Notice how narrowly the *nice view* circumscribes the policy problem: minimize fluctuations of inflation and output about their normal values. In many circumstances, the problem is even simpler, as the goals of smoothing output and inflation coincide. Thus, Woodford (2004) makes a thorough theory-based case for the view that, in practice, good policy would focus mainly on smoothing inflation. The policy problem is elegant in its simplicity.

Real-world policy frameworks reflect a similar view. The clearest case is the Bank of England, where the governor is charged with writing a letter of explanation to the Chancellor of the Exchequer whenever inflation moves more than 1 percentage point away from the target. Presuming that the Exchequer was not simply looking for a quarterly pen pal, this condition was surely thought to be an exception warranting special attention. The Swedish Riksbank and Bank of England have at times both summarized good policy in the rule of thumb that inflation should usually be expected to return to target within two years.³

In short, the *nice view* seems to involve a strong presumption that central banks can best contribute to both real and nominal stability by focusing on stabilizing inflation.

II.i. The Nice View and Real-world Policymaking

So what are policymakers to make of the array of variables showing disparate secular ups and downs? This is a bit hazy. As noted above,

the models used to draw strong conclusions about the merits of simple policy generally omit these DCDs entirely. The justification for these omissions goes unstated. Perhaps DCDs are assumed to average out in some way so that they can be neglected? Or perhaps they change too slowly to be important for monetary policy? Or perhaps these dynamic factors are cleanly separable from the normal dynamics and simply can be ignored?

To be fair, adherents to the *nice view* as represented in academic research generally realize that the models omit much that may be of some importance. Taylor, for example, emphasized that the policy prescriptions of simple policy rules should not be taken literally and should be used mainly as guides.⁴ Svensson (2003) formulated a forecast-based approach to implementing policy in the *nice view* that provides a natural way to fold otherwise inconvenient aspects of reality into the discussion. These other factors are incorporated insofar as they affect the forecasts of inflation or aggregate activity. Bernanke (2004) and Yellen (2003) expressed a preference for a hybrid forecast-based approach informed by Taylor-type rules.

But how should DCDs affect policy? With what frequency should we expect significant persistent deviations from the simple prescriptions? Given the strong conclusions drawn from models that entirely omit these DCDs, one supposes that they are presumed mainly to be a sideshow and that taking account of them can be left as an exercise for practitioners of central banking. As (Levin and Taylor 2010, p.33) put it, “On occasion, of course, policymakers might find compelling reasons to modify, adjust, or depart from the prescriptions of any simple rule” The policy frameworks of central banks discussed above leave a similar impression.

II.ii. Since the Crisis, Isn't this View Dead?

The crisis showed emphatically that large shocks can drive us far from desired values for quite a long time. It also exposed limitations in the models that support the *nice view*. In the ever-contentious world of academic macroeconomics, some have been eager to proclaim the death of many of the models and associated perspectives.

Sargent (2010) gives an important defense of DSGE models:

The criticism of real business cycle models and their close cousins, the so-called New Keynesian models, is misdirected and reflects a misunderstanding of the purpose for which those models were devised. These models were designed to describe aggregate economic fluctuations during normal times when markets can bring borrowers and lenders together in orderly ways, not during financial crises and market breakdowns.

This argument potentially applies much more broadly than just to the topic of DSGE models. Perhaps, as Sargent suggests, there is a separability between normal and crisis dynamics, and we should accept that *nice view* models were largely “right” in their characterization of normal times. In this view, the financial frictions that researchers are now incorporating into macro models mainly affect dynamics in extreme times, leaving normal-times dynamics approximately as previously modeled.⁵

We suspect that the key elements of the conventional view of normal cyclical dynamics have survived largely intact, with some additional focus on rare, crisis events and with financial channels overlaid. The core of the conventional characterization is that in normal times, policy-relevant business cycle variation is well captured in summary measures of the state of inflation and real activity relative to potential.

III. Normal Cyclical Variation and Disparate Confounding Dynamics in Reality

The *nice view* of normal cyclical dynamics carries with it some implicit assumptions. First, it assumes that we can meaningfully separate the trend and cycle components in real time. Second, it assumes that relevant cyclical components can be captured by the state of two variables—one summarizing inflation and the other real activity. Under these assumptions, the central bank could reliably assess aggregate slack and underlying inflation pressures and could generally ignore other factors in setting policy.

Problems with separating trend from cycle are well known to policymakers, and we will not spend much time on these real-time measurement issues.⁶ In this section, we focus on a point that is less often

emphasized. There are many disparate stochastic trends apparent in the data. Standard economic theories give us no clear basis for concluding that these are irrelevant for policy; indeed, once such movements are admitted to the analysis, conventional reasoning would predict important interactions between fluctuations in these secular movements and inefficient business cycle variation.⁷

In this section, we first describe three example variables showing DCDs that are arguably deeply intertwined with normal cyclical dynamics. Next, we provide some forecast-based evidence suggesting that these factors may entirely obscure any systematic, slack-inflation relation at the core of *nice view* policymaking.

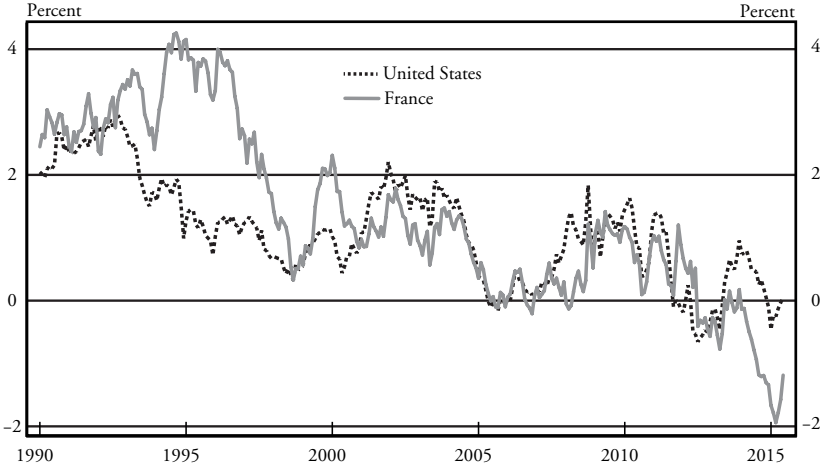
III.i. Reality: A Cornucopia of DCD

Any look at the data reveals that there are many stochastically trending variables showing patterns that are not well summarized by potential output or inflation. The debt-income ratio of households in the United States, mentioned in the introduction, is an example of such a variable (Chart 1). This ratio rose at a persistent but varying pace for much of the period since 1950. While this feature played no important role in standard models used to demonstrate the merits of the *nice view*, we know of no clearly stated case for why this was irrelevant to understanding business cycle dynamics or to determining the appropriate stance of policy.

Term premia—the differences between longer-term rates and the average of expected future short rates—in sovereign debt markets are another example. Although there is general agreement that it is hard to measure these premia with precision, there is also a broad consensus that, however measured, these premia are quite variable at high frequencies, at business cycle frequencies, and at lower frequencies (for example, Wright 2011). Term premia patterns in Chart 2 are typical, exhibiting both cyclical variation and a notable downward trend. Wright (2011) argues that these are robust features of term premia across a number of sovereign debt markets during this time period.

Standard theory does provide guidance to policymakers regarding term premia. As Woodford (2012) reviews, term premia play no essential role in determining appropriate policy in conventional

Chart 2
Term Premia on 10-year Nominal Government Bond Yields
in the United States and France



Source: Hördahl and Tristani (2014).

modern models.⁸ As Rudebusch et al. (2007) argue, however, it is not clear whether this is a feature or a bug of these models. According to Bernanke, for example, quantitative easing works by lowering term premia and, thereby, stimulating real activity (2013, 2012b). While standard theories deny the existence of this channel, those theories generally cannot explain the average size of term premia, the variability of term premia, or the secular downward trend in term premia we have observed around the world.

Relative prices of broad categories of goods and services also show stochastic trends—that is, these categories display persistently different inflation rates. To illustrate this point, we can partition the consumption basket into six broad categories. First, pull out four categories widely known to have special characteristics: food, energy, medical and housing. Next, divide what remains into “other goods” and “other services.” Table 1 summarizes the inflation rates of these categories during the NICE decade. Over this period, headline inflation was 1.95 percent, close to what is now the Fed’s stated objective.⁹ The average inflation rates across the categories varied widely, spanning the range from minus 0.75 percent to nearly 7 percent. Of course, the food and energy categories are known to have inflation rates that are highly variable relative to the others, but the table

Table 1
U.S. Inflation as Measured by Personal Consumption
Expenditures, 1995-2005

Category	Average	Minimum	Maximum	Share
All	1.95	-0.03	4.40	100
Food Goods	2.12	-0.88	4.60	8
Energy Goods	6.90	-57.20	79.80	3
Housing and Utilities	3.11	1.40	7.05	18
Medical	2.81	0.75	4.98	14
Other Services	2.53	0.47	3.98	32
Other Goods	-0.74	-3.46	0.88	25

Notes: Average, minimum and maximum are all for annualized quarterly rates. The six subcategories are nonoverlapping and exhaustive of the total. The column labeled share is the average nominal budget share of each category over this sample.

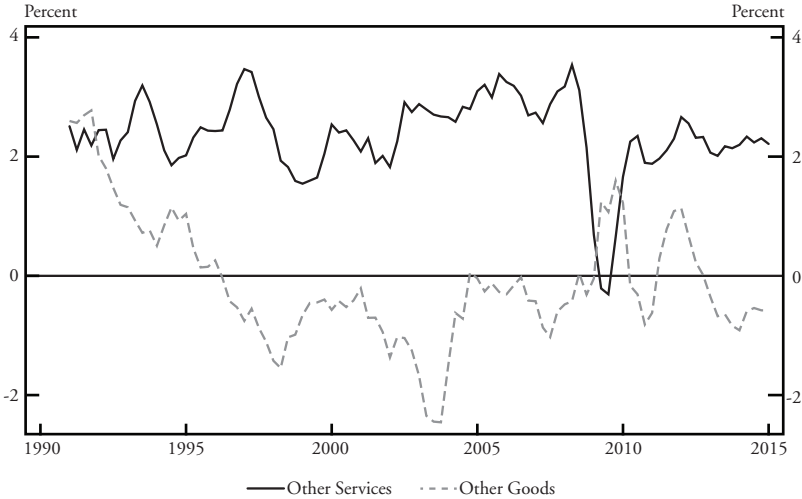
Sources: BEA and authors' calculations.

highlights that there are substantial persistent differences in the inflation rates of the various categories. Medical-care and housing inflation are also special in various ways, with housing-cost inflation in many economies sometimes diverging persistently from general price inflation. Similarly, measured medical-care inflation has run much higher than general price inflation in some periods.

The other goods and other services categories probably come closest to matching the sort of items envisioned in our standard stories of price dynamics. But over the NICE decade, other goods and services had inflation rates that diverged by nearly 4 percentage points, with other services coming in at nearly 3 percent and other goods at about minus 1 percent. Moreover, the inflation rates of other goods and other services show great variation relative to one another at both low and higher frequencies (Chart 3). In the crisis, for example, the inflation rate of other services dropped sharply, as slack-based theory would suggest. In contrast, the rate on other goods rose sharply during the darkest period of the recession. The work of Gilchrist and Zakrajšek (2015) may shed light on this phenomenon.

What guidance does the *nice view* give us about how to treat these disparate dynamics in inflation across broad categories of goods and services? When the headline inflation rate falls because food or oil become cheaper relative to other goods, conventional wisdom says

Chart 3
Annual Inflation as Measured by Personal
Consumption Expenditures Deflators*



*Food, energy, medical and housing components are removed from both Other Goods and Other Services
 Source: Bureau of Economic Analysis and authors' calculations.

that we should “look through,” or ignore, the effect on measured aggregate inflation in assessing appropriate policy. One argument in favor of this view is that the changes in food and/or energy-price inflation tend to be transitory and do not signal changes in “underlying inflation.” How does this logic apply when, say, energy-price inflation differs from other inflation rates for an entire decade, as during the NICE decade? How does this logic regarding food and energy generalize to the case when other goods inflation falls sharply relative to inflation in other categories? Should we look through a sharp drop in medical-care inflation, such as the one experienced recently? When other services inflation is rising but other goods inflation is dropping sharply, how should policy respond? The rationale for looking through disparate food- and energy-price changes suggests that these may be important questions, but we know of no serious treatment of these questions in the *nice view*.

The three items just reviewed—household leverage, term premia and inflation components—are notable because they are not accounted for in the *nice view* but each arguably played a significant role in explaining policy problems during the NICE decade. These

three by no means exhaust the list of prominent DCDs. For example, as we will explore below, labor's share of national income has fallen secularly in many nations since about 1975, a fact also missing from the *nice view* but central to the interplay of wage and price inflation.

III.ii. Some Suggestive Evidence on the Importance of DCD Elements

While it is clear that variables showing DCDs are absent from the *nice view*, we have made no argument so far that these variables have any practical importance for monetary policy. In this section, we begin making the case that the perspective on inflation dynamics embedded in the *nice view* has been largely useless in accounting for real-world inflation dynamics and that DCDs are a likely candidate for explaining the failure.

The argument that DCDs may make macroeconomic aggregates such as inflation and output largely unpredictable is not novel. In 1992, Victor Zarnowitz took up the topic of why standard models had essentially no predictive power in an article titled "Has Macro-Forecasting Failed?" He argued,

Business cycles are persistent and recurrent, but they are by no means predetermined or periodic. They tend to be pervasive but affect different variables and sectors in different ways. Fluctuations and long trends in growth and inflation interact with each other and have stochastic elements. The economy in motion is a complex of dynamic processes, subject not only to a variety of disturbances but also to gradual and discrete changes in structure, institutions and policy regimes. No wonder there are few, if any, constant quantitative rules ... to help the macro-forecaster effectively and consistently over more than a few years or from one business cycle to another. (Zarnowitz 1992, p. 130).

Bottom line? There are multiple and shifting trend and cycle components and these interact. As a result, any normal business cycle component may be neither dominant nor systematic enough to yield much predictive power.

Despite Zarnowitz's 1992 argument, the view that near-term inflation dynamics are predictably linked to slack in a way that forms a reliable basis for policy seems not only to have persisted but to have solidified during the NICE decade that followed his critique. In this section, we summarize a body of evidence suggesting that forecasts based in the *nice view* continued to have no predictive power during the NICE decade.

III.iii. A Forecast-based Approach to Assessing the Nice View

Faust and Wright (2013) conceptualize the forecast path of inflation in terms of a starting point, an ending point, and the particular path in between. Inflation at the starting point—say inflation in the quarter the forecast is made—is not known, but can be viewed as predetermined. This start value is generally called a nowcast. The endpoint of the forecast path is where inflation settles after all of the predictable components—normal and abnormal dynamics—have died out. For a committed inflation targeter, this is presumably the inflation target. For others, this value may not be explicit. Any forecastable dynamics are then reflected in the particular path between the two endpoints of the forecast.

Based on any real-time forecast, we can get some sense of the importance of systematic and predictable elements by building an alternative benchmark forecast as follows. Start with the nowcast from the original forecast and some proxy for the endpoint of that forecast.¹⁰ Then simply connect the two with a smooth path, completely disregarding information on the state of the economy. In particular, Faust and Wright look at forecasts in which 70 percent of the distance is closed each period, regardless of the state of the economy.¹¹

This alternative benchmark is designed to exploit all the wisdom of the original regarding the nowcast (where are we now?) and the long run (where are we ultimately headed?). But the forecast makes no attempt to exploit systematic dynamics in inflation. The forecast commentary would always read, “We forecast that inflation will return smoothly from its current value to its longer-run value.”

Faust and Wright find that the alternative generally performs at least as well as the best practical alternatives. This result holds over

various samples and for various measures of inflation. The point estimate of accuracy of the alternative tends to be very close to, and is often a bit better than, the best alternatives.¹² Faust and Wright (2013) make this result one of the centerpieces of their *Handbook of Economic Forecasting* article on inflation forecasting, documenting it in a variety of ways.

III.iib. Evaluating the Forecasts of Three Policy Institutions

This section presents a sampling of Faust-Wright-style results based on forecasts from three policymaking institutions—the Fed, the Bank of England and the IMF. Given our emphasis on normal times, we focus on the pre-crisis period.¹³ Let us give a brief description of the specific alternative benchmarks.

The Fed's Greenbook (Tealbook) Forecast. As Faust and Wright (2013) discussed more fully, the Fed's Greenbook forecast has been widely studied and is generally thought to be at or near the frontier of forecast accuracy. To construct the alternative benchmark, Faust and Wright start with the Fed's nowcast. Over the period we are studying, the Fed had no explicit inflation target. As a crude proxy for the longer run, Faust and Wright take the forecast of average inflation five to 10 years in the future, which is published twice a year by Blue Chip economic indicators.¹⁴ The path between these endpoints is as described above.

The Bank of England's Monetary Policy Committee (MPC) Forecast. Since 1998, the Bank of England has published a quarterly forecast in its inflation report based on a market path for interest rates. Our alternative benchmark uses the MPC nowcast and the Bank of England's inflation target for the longer run.¹⁵

The IMF's World Economic Outlook Forecast. Each spring and fall, the IMF publishes the WEO, which includes a forecast for member nations. In a review of the WEO, Faust (2013) examines an alternative benchmark based on the WEO forecast. The alternative starts with the WEO nowcast. For the longer-run value, the benchmark uses the six-to-10-year-ahead forecast published by Consensus Forecasts. Of course, the nature of this benchmark makes little sense for nations in the midst of secular disinflation.¹⁶ Consistent with our emphasis on

normal times policy, we select a subset of the matched WEO-Consensus Forecast sample that showed little downward trend in inflation over the sample period. For the work reported here, this leaves a group of 20 national economies.

The results for the Greenbook and MPC forecasts are in Table 2. The Greenbook and MPC forecasts over the sample in the NICE decade fit Faust and Wright's pattern. The accuracy of the alternative is somewhat better in two cases and slightly worse in one other.¹⁷

The results for the 20 economies in the WEO sample are summarized in Chart 4, and tell very much the same story. The points near the 45-degree line in Panel A are cases where the alternative and WEO forecasts are similarly accurate; for points on or above this line, the alternative is at least as accurate—10 of the 20 cases. The forecasts of the Fed, MPC and IMF are also considerably more variable than the alternative forecasts (Table 2, column 5; Chart 4, Panel B). The alternative forecasts have a standard deviation that is around 60 percent of the original. To put it in simple terms, the original forecast shows extra wiggles relative to the alternative, but these wiggles provide no meaningful contribution to accuracy.

Those who have read private sector and policy institution inflation forecast summaries know that these reports are filled with details about slack and momentum and special factors informing the shape of the near-term forecast path for inflation.¹⁸ While a great deal of effort goes into crafting the extra wiggles in the path between the now-cast and the longer-run value, that effort yields no benefit in terms of accuracy. Let us emphasize that this result mainly echoes Zarnowitz's main point made more than two decades ago.

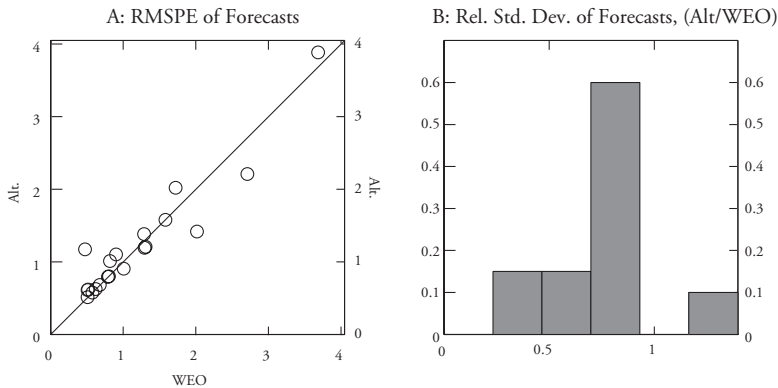
These results probably are more damning of standard forecasts than they first appear. The alternative benchmark in this analysis has two handicaps relative to the original forecast. First, it makes no attempt to exploit normal cycle dynamics. Second, it ignores any special events or technical factors that may have led to predictability in the sample—changes in VAT, droughts that persistently affect food price dynamics, and so forth. If we accept that the forecasters sensibly exploit these special factors, it means that the alternative

Table 2
Comparison of Inflation Forecasts of Policy Institutions
versus Benchmark Alternative

Forecast	Sample	RMSPE		Rel. SD	#
		Orig.	Alt.		
GB, CPI	1995-2005	1.10	0.85	0.45	83
GB, GDP Def.	1995-2005	0.78	0.79	0.62	83
MPC	1998-2005	0.60	0.56	0.57	32

Note: In all cases, inflation is a four-quarter log change and the forecast is for the four quarters starting one quarter after the period in which the forecast is made. GB is Greenbook, GDP Def. is the implicit GDP deflator, MPC is the forecast of the Bank of England’s Monetary Policy Committee, RMSPE is root mean squared prediction error, Orig. signifies the institution’s forecast, Alt. is the benchmark alternative, Rel. SD is the relative standard deviation of the alternative forecast relative to the original, and # is the number of observations available in the stated sample period. Sources: Federal Reserve, Bank of England, Blue Chip Economic Indicators and authors’ calculations.

Chart 4
Comparison of IMF WEO Forecast
to Benchmark Alternative



Notes: In Panel A, each point represents a country in the matched WEO-Consensus forecast database. Panel A shows the RMSPE of the two forecasts; each point represents one country. Panel B is a histogram of the relative standard deviation of the two forecasts; each underlying point is the ratio of the standard deviation of the forecast error of the alternative forecast relative to that of the WEO.

Source: Data and computations are from Faust (2013).

benchmark could be made to look even better relative to the original if we continued to ignore normal cyclical dynamics, but took account of *ad hoc* elements.

Overall, then, this section supports two arguments. First, there are many prominent variables showing DCDs that *a priori* seem deeply intertwined with the monetary policy problem. Second, a long history of evidence on macro forecasting reviewed by Zarnowitz before the start of the NICE decade, and updated here to cover the NICE decade, suggests that these confounding factors may swamp any systematic relation between real-time measures of slack and inflation. This evidence motivates a deeper look into monetary history to explore the role of DCDs versus a simple slack-inflation relation in understanding normal inflation dynamics.

IV. In Search of Normal: A Selective Historical Review of Inflation Dynamics and Monetary Policy

We break history into four periods (1) 1850-1971: the beginning of modern monetary economies to the end of Bretton Woods; (2) 1965-1995: the Great Inflation and subsequent disinflation; (3) 1995-2005: the NICE decade; (4) 2005-present: the crisis and unconventional monetary policy.¹⁹ The precise year boundaries we have chosen are not critical; the periods tend to blend into one another. For example, the Great Inflation commenced in the mid-1960s, but did not spell the end of Bretton Woods until 1971. Similarly, we will date the end of the Great Inflation period around 1995, despite the fact that, depending on the economy in question, one might put the date earlier or later. Finally, it is not clear when we should say that the NICE decade gave way to excesses that (*ex post*) clearly were unsustainable, but we choose 2005.²⁰

IV.i. Inflation Dynamics and Monetary Policy: 1850-1971

From the dawn of modern industrial economies sometime in the 1800s until the Bretton Woods system unraveled, some version of fixed exchange rates underpinned by, or defined in terms of, the gold standard was the dominant monetary arrangement.²¹ In the idealized case, countries operating under the arrangement maintained a fixed price of gold, and cross-border payments imbalances could ultimately be settled in gold. In all its incarnations, the system was

managed (sometimes well, sometimes poorly) so that the link between money and gold was not strict (Bernanke and James 1991; Eichengreen 1992).

We are looking only for gross facts about monetary policy and inflation dynamics in this section, and the primary lesson of this period is that stability of inflation and/or the general price level were, by design, not priorities in this system.

The gold standard is sometimes viewed as akin to a price level target, but this is wrong both conceptually and as a description of how the standard functioned in practice. The general price level is out of the hands of the central bank in this system: with the price of gold fixed, the general price level is left to wander where it might. The price level is governed only by the supply of gold relative to the monetary demands of the economy. Defenders of the “gold as price level target” view might fall back on the argument that changes in relative prices do not constitute inflation, but nothing in the gold standard prevents divergent trends in demand and supply from leading to very persistent (or even permanent) periods of general price inflation or deflation. And, for example, long periods of deflation were familiar features of the gold standard (Bordo and Filardo 2005). It is regularly noted that the price level in England was approximately the same in 1821 and 1914 (Bordo 1981), but inflation over this period was by no means stable, and the equality of the starting and ending price levels was not a design feature of the gold standard; rather, it was an accident of the pace of economic development versus discoveries of gold and advances in mining technology.

Remember that in the *nice view*, general price inflation is stable and, indeed, it seldom deviates for very long by more than 1 percentage point from the inflation objective. By these criteria, the gold standard was a hideous failure. General price stability, however defined, was not a design criterion.

What did the system provide? The gold standard flourished in the late-1800s when industrialization was under way. Growth (and thereby investment) prospects of different nations diverged widely. To a modern economist this divergence suggests that—if the proper

institutions are in place—we should see large capital and trade flows. Broadly speaking, the gold standard through this period was the attempt by thinkers of the day to establish a workable system to facilitate these persistently divergent dynamics. The evolution of the gold system ended with the Bretton Woods system, which proved to be an uncomfortable attempt to marry the fixity of the gold standard with domestic flexibility.²²

A second lesson from this period, then, is that persistently fluctuating differential growth rates of nations are a prominent feature of the world economy. The world monetary system must accommodate this. Three additional points are worth noting given their relevance to today.

First, it is folly to think of monetary arrangements as chosen and then fixed for all time. Perhaps this should have been obvious from the regular suspensions of gold convertibility over the entire gold standard period, but this conclusion surely should have been clear by the end of Bretton Woods in 1971. Nonetheless, it is still common to see these monetary systems modeled as if they were permanently fixed. Further, we hear policymakers make statements that amount to the claim “there is no plan B” as far as monetary arrangements are concerned.²³ A Plan B is always there, even if policymakers don’t want to talk about it. While political systems are, in part, designed to make certain structures difficult to alter, disparate dynamics in the world economy very regularly put severe stresses on such efforts.

Second, as Meltzer (1999) reminded Jackson Hole audiences, and as Bordo and Filardo (2005) document, the deflations that were an inevitable part of life under the gold standard were far from uniformly tragic. Some periods of deflation were quite painful, but others were more normal or even boom times. The relevance of these periods of benign deflation to today is arguable of course; today’s vastly different institutions may imply that different outcomes might be observed.

Third, and more tentatively, it is not clear that any economy faced anything one would call a deflationary trap during this period. Many of the deflations were essentially policy induced, either by adherence

to the gold standard or by desires of nations to return to the gold standard at some former parity. Faust (2015) echoes Meltzer in arguing that there is no unambiguous example of a nation that assiduously attempted to avoid deflation and failed to do so. We return to this point briefly below.

***IV.ii. Normal Inflation Dynamics and Monetary Policy:
1965-1995***

Inflation began to rise in many economies around 1965, and Bretton Woods gave way shortly thereafter. There began a nearly worldwide rise in inflation that did not begin to turn until about 1980.

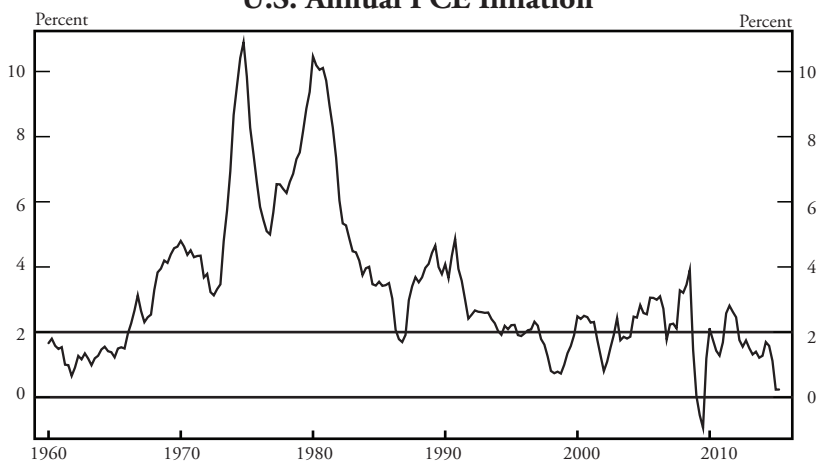
We date the end of the Great Inflation at 1995, but those who are focused on the United States, or on the remarkable drop in output volatility that seemed to occur around 1985, might pick an earlier date. Whether or not the moderation in output volatility was attributable to policy, it occurred well before anyone had a clear picture that the United States or other economies would achieve price stability as it is now conceived. That is, inflation was not clearly fluctuating in a narrow range around 2 percent for almost another decade after the growth moderation, which seemed to occur in the mid-1980s (Chart 5). In much of the rest of the world, the disinflation was clearly not complete before 1995, and, especially outside the most advanced economies, the high inflation period extended at least for several more years (Faust 2013, Rogoff 2004).

Bernanke (2003a) argues,

The primary cause of the Great Inflation, most economists would agree, was overexpansionary monetary and fiscal policies, beginning in the mid-1960s and continuing, in fits and starts, well into the 1970s.

Just why policymakers made these mistakes has been the subject of fascinating discussion at this symposium. For example, Romer and Romer (2002) give a major role to economists and policymakers unlearning and re-learning that there is no long-run employment benefit from higher inflation. In response, Sargent (2002) gives a more prominent role to bad shocks and the need to learn about deeper

Chart 5
U.S. Annual PCE Inflation



Sources: BEA via FRED and authors' computations.

issues, rather than re-learn basic ones. Many others have weighed in on this topic.²⁴

One indisputable lesson from this experience, however, is reflected in a deep and broad conviction among policymakers and academics that price stability—generally interpreted as low and stable inflation—is the central objective of monetary policy.

We have deliberately painted this new view of monetary policy as a near polar opposite of the design criterion under the gold standard. In the gold standard, international considerations dominate and the domestic price level is left to wander where it might. In the new view, the domestic price level is the primary consideration and just what this means for international imbalances plays little role.

Some adherents to the *nice view* may presume that—even in a world of disparate and persistently divergent growth—global stability would be the norm if central banks all ignored each other and simply aimed at domestic price stability. Any such presumption is not based on any actual historical experience of which we are aware.

The 1965-1995 period also provided another lesson pertinent to our theme of disparate confounding dynamics. Two major oil price shocks occurred in the 1970s. The importance of these shocks in the Great Inflation is disputed, but it is unquestionably true that when important relative prices change dramatically, the near-term implications for appropriate policy may be subtle. This period ushered in the notion of core inflation (Gordon 1975), and central banks began to routinely attempt to “look through” the effects of oil and food price shocks.

But looking through is not always so easy. For example, some argue that the oil shocks contributed to a productivity slowdown (Nordhaus 2004) and that subsequent misperceptions of those productivity effects by the Fed contributed to the Great Inflation (Bullard and Eusepi 2003).²⁵ This argument illustrates how confounding dynamics could interact with the proper assessment of the state of slack and contributing to policy mistakes.

The relative price of oil also interacted in dramatic ways with our theme of divergent dynamics in growth and capital flows. The conventional story goes like this:

Petro dollar recycling is a familiar story from the 1970s. When oil prices rose sharply in the fall of 1973, oil exporting countries were faced with a windfall in export receipts. Much of these funds were saved and deposited with banks in industrial countries. The banks, in turn, lent on a large part of these funds to emerging economies, especially in Latin America When the oil boom subsided in the early 1980s, bank flows to emerging markets reversed sharply, triggering the Latin American debt crisis (Wiegand 2008, p. 4).

In turn, it could be argued that the blossoming of the Latin American debt crisis led (for better or worse) to a significant easing of U.S. monetary policy, thereby slowing (for better or worse) the disinflation in the United States.

To put this more generically: stochastic trends in relative prices can greatly complicate monetary policy. In an interconnected, general equilibrium world, these trends may interact in complicated ways

that are not easy to “look through” by simply filtering out some component of key variables as in the focus on core inflation.

Finally, demographics played a subtle role in this period, as the demographic cohort known as the baby boom probably reached its largest net nominal debt position during this period and benefited handsomely from the Great Inflation’s effect on the value of this debt.²⁶ While few would argue that the boomers consciously conspired to engineer the inflation, the inflation may have been much easier to sustain politically given the benefits that this large cohort received (Eichengreen 1992, Faust 1996). More generally, Bullard et al. (2012) make a political economy argument that when a large segment of the population is young, we may expect to see high inflation, but as it ages, low inflation is the more likely outcome.

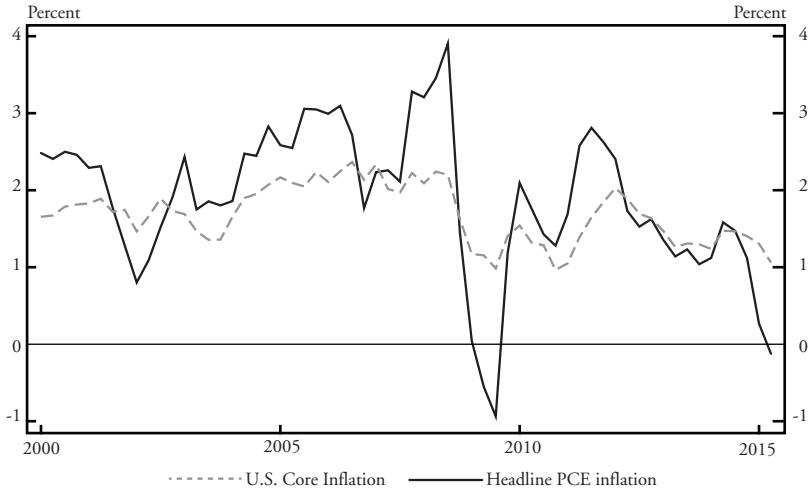
Around 1995, the Great Inflation yielded to the NICE decade. We set this period aside for deeper consideration in Section V, and turn now to the crisis and recovery.

***IV.iii. 2005-20??.* Financial Crisis and the Zero Bound**

Growth slowed in many economies in 2007; the crisis bloomed to full intensity in the fall of 2008; and the critical phase of the crisis was over by mid-2009. The crisis both put a spotlight on and worsened certain sovereign debt issues in the euro area, which remain a source of stress.

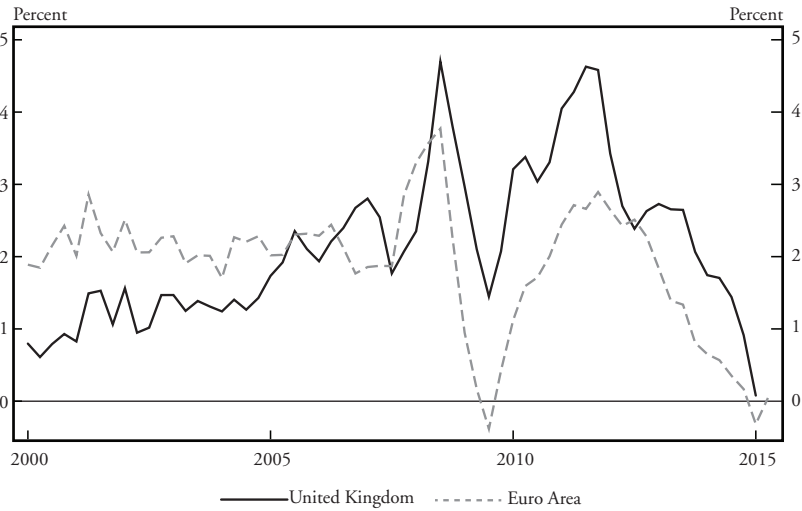
The period of recovery that continues to this day has not involved what anyone would hope is normal policy. If we are keeping score purely in terms of inflation, however, the period from 2008 through 2014 does not look so bad—especially relative to most of history. While there have been, and continue to be, serious concerns about deflation, the United States, United Kingdom and euro area have not experienced more than very brief and mild bouts of actual deflation. For example, core inflation has been quite steady in the United States, and overall inflation seldom fell below zero (Chart 6). Inflation in the United Kingdom has generally been well away from zero, and euro-area inflation has rarely been negative (Chart 7).

Chart 6
U.S. Core* and Headline PCE inflation



*U.S. core inflation excludes food and energy components
Sources: BEA and authors' computations.

Chart 7
U.K. and Euro Area Inflation



Sources: National authorities via FRED and authors' computations.

These inflation outcomes are consistent with the view that no nation or central bank that diligently or single-mindedly attempted to avoid deflation has ever failed. To be clear, we agree with Bernanke (2012a) and others that the Japanese do not provide an example of single-mindedly trying to avoid deflation. Ito and Mishkin (2006) detail the many instances between 1998 and 2003 when the Bank of Japan's rhetoric and actions raised doubts about its commitment to raise inflation (see also Hausman and Wieland 2014 and Ito 2006). We do not presume that nations should single-mindedly avoid deflation; rather, we emphasize that there is a major difference between a deflation trap and simply having priorities other than stopping deflation. It may be that economies can slide from normal times into a deflationary trap, as some theories describe, but as Bernanke (2012a), Faust (2015) and Meltzer (1999) argue, it is not clear that this has ever been observed in practice. The view that single-minded policy authorities can generally avoid persistent deflation may deserve more attention.

Although the disparate confounding dynamics which are our major theme played a starring role in the crisis, we will largely set aside this period. It is too easy to draw a distinction between normal and crisis times and then to follow Sargent's approach, described above, cordoning off confounding dynamics as relevant only in crisis times. To minimize the risk of this, we will mainly skip over the crisis in our quest to understand normal policy and inflation dynamics.

V. Normal Found? A Closer Look at 1995-2005

The period from 1995-2005 was the subject of much attention at the 2005 Jackson Hole Economic Policy Symposium on the Greenspan legacy. A clear consensus emerged: this was an outstanding period for monetary policy. And by the metric of headline aggregates and historical standards, the outcomes were very favorable indeed. Sadly, the ink on the conference volume was barely dry before the world descended into a tragic mess; we suspect that some participants might put a somewhat different spin on things today. And Rajan (2005) put a different spin on things even then.

Reviewers of the period before the crisis now comb through the evidence looking for sins of omission and commission that may have contributed to the subsequent downfall. Our purpose is different, and we will not directly comment one way or the other on the quality of policy over this era. Instead, we seek to make two main points.

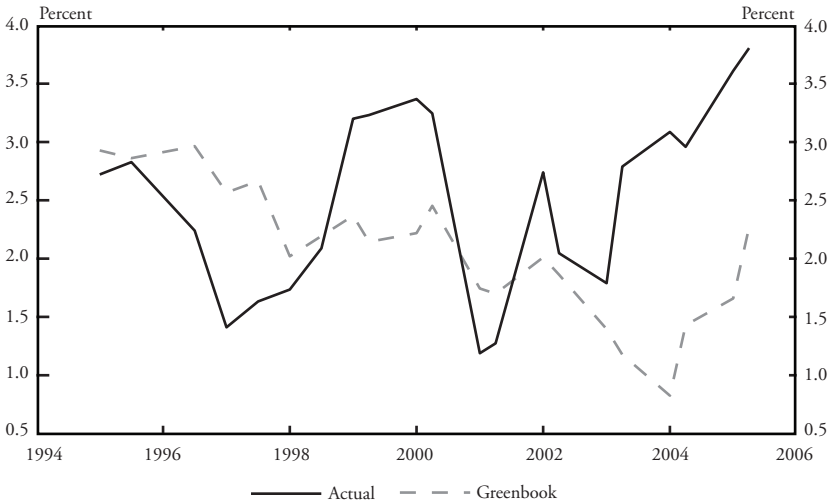
First, whatever the merits of policy between 1995 and 2005, the period is not an example of the *nice view* and of normal cyclical dynamics. The simple world referred to by Draghi in the introductory quotation was more myth than reality.

Second, we will argue that the *nice view* set the tone in many policy discussions. DCDs were identified and much discussed, but lacking an analytical role in the conventional perspective, their policy effects turn out to be ad hoc and unclear. This argument is necessarily highly subjective, and we invite you to form your own opinion.

The primary *ad hoc* deviation from the conventional view arose when then-Chairman Greenspan more or less single-handedly convinced the FOMC in the second half of the 1990s to abandon its view of normal cyclical dynamics in favor of a “new economy” view. The notoriety that this period generated is testament to how rarely such deviations occur.

We focus on the U.S. experience, touching on events elsewhere at the end only to suggest that similar issues arose in other countries. The bounty of DCDs that the short 1995-2005 period offers can be usefully divided into three episodes. From about 1995-98, conventional reasoning pointed to diminishing slack and rising inflation, but Greenspan convinced the FOMC to forbear the rate increases that standard reasoning called for. As this episode ended, the dot-com bubble episode ensued; the bubble eventually burst in 2000. In response to the associated economic contraction, the Fed lowered the federal funds rate to 1 percent and, with slack pointing to worrisome declines in inflation, the third episode began. That episode was dominated by deflation worries, innovative use of forward guidance, and “the conundrum” in long-term interest rates. Each of the episodes is filled with what, up until the crisis, passed

Chart 8
Actual and Greenbook Forecast of CPI Inflation*



*For the year starting one quarter in the future

Note: We plot only the first (January or February) and middle (June or July) forecast and outcome for each year.

Sources: Federal Reserve and authors' calculations.

for high drama in advanced-economy central banking; each has spawned important literature.

Digging a bit deeper into the forecast evidence in section III.iii.b. provides a useful backdrop for the discussion. As already noted, the Fed's inflation forecast (among the best on record) was no more accurate than an alternative benchmark forecast path informed by no data at all beyond the endpoints. Chart 8 shows the Greenbook forecast of CPI inflation for the year beginning one quarter in the future. For clarity, only the first and middle Greenbook forecast for each year are reported. The corresponding actual value of inflation is plotted at the date of the forecast, not the date when it was realized.

The first and third episodes show a very clear pattern of forecast error. Inflation came in consistently lower than predicted in the first, new economy, episode, and inflation came in consistently higher than forecast in the deflation scare episode. Throughout the NICE decade, however, the forecast was persistently far from the outcome. We now attempt to shed some light these results by exploring the role that the *nice view* played in the forecast and policy.

V.i. The Greenspan New Economy Episode

As the early 1990s recession turned to expansion, conventional measures of tightening slack pointed to rising inflation. This view was reflected in the Greenbook forecast, but also in the Consensus Forecasts and the IMF's WEO forecast.²⁷ According to FOMC transcripts and other accounts (Meyer 2006; Blinder and Yellen 2001; and Blinder and Reis 2005), Greenspan sensed an unprecedented period of rapid productivity growth, and more or less single-handedly convinced the FOMC to "forbear" the policy rate increases recommended under the *nice view*.²⁸ That this was a deviation from standard reasoning seems clear. As Blinder and Reis (2005, p. 58) put it:

Was that the optimal policy response? Who really knows. (Though we suspect it was close.) But it certainly wasn't the obvious policy response. In fact, we believe that few central bankers would have had the nerve to stand by calmly as the unemployment rate dipped (and stayed) that low. And we know from firsthand accounts that Greenspan was holding back an FOMC that was eager to raise rates.

Blinder and Reis report evidence, based on the fit of Taylor rules, that the Fed's behavior over this period was most consistent with a Taylor rule in which the natural rate of unemployment was dropping rapidly.

Dornbusch (1999) agrees that this was not policy as envisioned under the *nice view*, but suggests a greater concern with confounding dynamics:

The Fed's experimentation in disregarding Phillips curves and placing great confidence in their better understanding of the New Economy is a key part both in high fundamental values and in the extra bubble part. Surely, too, their willingness to see or suspect increased productivity—in part, quite possibly, in response to high valuation of assets and their effect on investment and innovation and, hence, on the supply side—makes what otherwise would be a bubble possibly more nearly fundamental value (Dornbusch 1999, p. 132).

We will not get into the validity of the claim that Fed policy may have helped fuel the dot-com bubble, but we will highlight Dornbusch's view of confounding dynamics. He speculates that bubble-induced buoyancy in the economy could have supply-side effects that interact with normal cyclical dynamics. In particular, these effects could moderate any signs of excess that might otherwise appear in indicators of slack.

In any case, the Greenspan Fed deviated from the policy that the *nice view* would have prescribed. Some analysts argue that the Fed should not have deviated; others would argue for a different deviation. This period illustrates our view that sorting out DCDs such as persistent shifts in productivity growth are regularly the key to policymaking.

The forbearance episode blended smoothly into the dot-com bubble. For example, the NASDAQ index began a steep ascent in 1999, peaking around March 2000 and then falling through most of 2002 to less than one-third of its peak value.

In the *nice view*, policy responds to the state of inflation and some summary of real activity. Bubbles are not on this short list, and several FOMC members, including Greenspan (2002), stated the conventional wisdom that using monetary policy to battle bubbles was inappropriate.

To be clear, policy can be sensitive to asset prices in the *nice view*, but only insofar as asset prices affect the two key indicators for policy, inflation and real activity. As Bernanke and Gertler (1999) put it at Jackson Hole:

Given a strong commitment to stabilizing expected inflation, it is neither necessary nor desirable for monetary policy to respond to changes in asset prices, except to the extent that they help to forecast inflationary or deflationary pressures (Bernanke and Gertler 1999, p. 115).

Given that the dot-com bust gave rise to a deflation scare, it may be of some interest to see how the confounding dynamics of the bubble affected the FOMC's view of its dual mandate objectives.

At the December 1999 FOMC meeting, Michael Prell presented a macro forecast for both output growth and inflation—the economy was, from a monetary policy standpoint, “performing splendidly.” But Prell commented on rising equity values, warning, “We believe that the economy may be getting seriously overheated and in some ways significantly distorted.”

Consistent with the *nice view*, the FOMC was, he reminded them, monitoring slack as a key indicator of possible problems:

This Committee has, of course, announced its focus on the mounting pressures in the labor market as the most likely potential source of deteriorating inflation performance and thus cyclical instability (FOMC 1999).

Regarding diminishing slack, evidence was mixed, but “the official data actually show decelerating wages.”

At the risk of boiling things down too far, one might summarize this discussion as saying that the stock market is worrisome, but we do not see any problem in slack. Under the *nice view*, unless an asset bubble leads unambiguously to tightness in resource utilization, it remains largely a curiosity from the standpoint of policy. As Dornbusch argued, the bubble may tend to mask any such effect.

To get further into the nitty-gritty, the FOMC baseline focuses on modal outcomes. The popping of a bubble in any given forecast window will, almost by definition, never be the modal scenario, so any implications of bubbles for dual mandate objectives are discussed in alternative scenarios. In March 2000, about at the peak of the bubble, the modal Greenbook outlook remained splendid. Productivity growth had again been marked up and was used to explain an absolute decline in unit labor costs. However, Prell made clear,

I still find the valuations of many so-called tech companies—and the rationales analysts give for them—rather wacky. The fact is, though, that at yesterday’s close the Wilshire 5000 was up fully 4 percent from the 13,500 level prevailing a week ago, when we locked into our Greenbook assumption of a flat stock market through the projection period. (FOMC (2000).

The possible implications of a fall in stock prices were covered in two alternative scenarios in Greenbook, neither of which involved significant disruption (Federal Reserve Board 2000). Some commentators accuse central banks of being unaware of worrisome developments. We think awareness is seldom the issue. But if one starts the discussion by giving primacy to the *nice view* of normal cyclical dynamics, it may be difficult for other issues to gain traction.

In the aftermath of the bubble and recession, the federal funds rate was lowered to 1 percent. Inflation was low and, with standard estimates suggesting that there was significant slack, inflation under the *nice view* was projected to fall further. This was worrisome given the very low starting point.

Throughout 2002 and 2003, real-side outcomes tended to meet or exceed the Greenbook forecast, but surprisingly strong productivity growth was a key part of the good news. More rapid productivity growth meant that the economy could expand more quickly without taking up the slack. With the period of slack lasting longer, the inflation forecast was progressively marked down as the real side was marked up.

The June 2002 Greenbook forecast summary states,

Given the slack in labor and product markets that has opened up over the past year, we anticipate that wage and core price increases will be somewhat smaller in 2002 and 2003 than in 2001 Core PCE inflation is anticipated to slow to 1.4 percent in both 2002 and 2003, compared with 1.6 percent in 2001 (Federal Reserve Board 2002, pp. I-12–I-13).

In the January 2003 summary:

All told, we have upped our projection of GDP growth about 1/4 percentage point, to 3-1/2 percent, this year and about 1/2 percentage point, to 4-3/4 percent, for 2004. (Federal Reserve Board 2003a, pp. I-1, I-2)

Despite the faster growth of real activity over the forecast period as a whole, we are now projecting a larger gap in resource utilization than we projected in the December

Greenbook, reflecting upward revisions to our potential output This path for the unemployment rate and our assumed increase in structural productivity are projected to be sufficient to keep inflation trending down. In particular, we are forecasting that core PCE inflation will decline from a bit above 1-1/2 percent in 2002 to around 1-1/4 percent in 2003 and 2004, a projection that is down slightly from our previous one. (Federal Reserve Board 2003a, pp. I-1, I-2).

From the June 2003 Greenbook summary:

After increasing at a 1-1/2 percent annual rate in the first half of the year, real GDP is expected to grow at a 4-1/4 percent annual rate in the second half, about 1/3 percentage point more than in the April Greenbook These positive influences have led us to raise our 2004 real GDP projection to 5-1/4 percent. Although such a rapid pace of economic growth would be a far cry from recent experience, it reflects our view that the powerful sources of macroeconomic stimulus will lead to a more durable step-up in the pace of final demand and that business spending and hiring will gain momentum by the turn of the year. But the rapid expansion we are projecting for next year also reflects importantly our above-consensus forecast for the growth of potential output

Slack in resource utilization is expected to put further downward pressure on price inflation over the next year and a half. Following this year's deceleration of about 1/2 percentage point, core PCE inflation edges down a bit further next year, to just under 1 percent. (Federal Reserve Board, 2003b, pp. I-1, I-2).

At the June 2003 FOMC meeting, the staff "put the probability of deflation at about 15 percent for this year, just short of 40 percent for 2004, and about 40 percent for 2005" (FOMC 2003, p. 75).

In light of the concern with deflation, in his July 2003 Humphrey-Hawkins testimony, Greenspan ventured into the world of forward guidance, uttering the immortal words "considerable period:"

In the judgment of the Committee, policy accommodation aimed at raising the growth of output, boosting the utilization of resources, and warding off unwelcome disinflation can be maintained for a considerable period without ultimately stoking inflationary pressures (Greenspan 2005).

The policy tightening that began in June 2004 was presaged in the May FOMC statement with the further forward guidance, “At this juncture, with inflation low and resource use slack, the Committee believes that policy accommodation can be removed at a pace that is likely to be measured ...” (FOMC 2004a).

The FOMC then commenced two years in which the federal funds rate rose reliably by 25 basis points each FOMC meeting. The federal funds rate went from 1 percent to 5 1/4 percent over this period. Over the same period, yields on long-term Treasury securities were essentially unchanged. It is now generally agreed that there was a substantial fall in the term premium over this period (Backus and Wright 2007).

At the December 2004 FOMC meeting, then-Vice Chairman Kohn raised this issue,

I also find the recent behavior of bond yields hard to understand. While this Committee has become increasingly confident of the vigor of the expansion over recent months, long-term yields have actually declined, and most of this decrease is accounted for by the decreases in real rates (FOMC 2004b).

Kohn (2005) noted the possible policy implications of term premia falling:

For example, the decline in term premiums in the Treasury market of late may have contributed to keeping long-term interest rates relatively low and, consequently, may have supported the housing sector and consumer spending more generally.

This unusual (dare we say “confounding”?) dynamic was labelled “the conundrum” in Greenspan’s June 2005 monetary policy testimony. Calling this a conundrum was another way to say it does not fit in the *nice view* of normal cyclical dynamics.

V.ii. A Rich Interplay of Confounding Elements

Let us return briefly to the elements of disparate confounding dynamics presented in Section III and discuss the roles they played in the deflation scare period. Early in the 2000s, Federal Reserve policymakers were closely monitoring the rising household indebtedness (Chart 1). As Greenspan (2004) commented:

(Many analysts) have been disturbed particularly by the rising ratio of household debt to income and the precipitous decline in the household saving rate. The analysts point out, correctly, that the ratio of household debt to disposable income has risen especially steeply over the past five years and, at 1.2, is at a record high.

He continues,

To be sure, some households are stretched to their limits. The persistently elevated bankruptcy rate remains a concern, as it indicates pockets of distress in the household sector. But the vast majority appear able to calibrate their borrowing and spending to minimize financial difficulties. Thus, short of a significant fall in overall household income or in home prices, debt servicing is unlikely to become destabilizing.

Of course, relative house prices, too, were showing an unprecedented surge.

Term premia, trending down for many years, fell sharply starting around 2004 giving rise to the conundrum (Chart 2). Under the *nice view*, the central bank sets its short-term policy rate systematically based on output and inflation, presuming (we suppose) that longer-term rates will behave in some normal way. Term premium dynamics play no essential role, as Rudebusch et al. (2007) noted in discussing the conundrum period and as Woodford (2012) emphasized more generally. Turner (2013) characterizes the role of long-term interest rates—as distinct from the path of expected future short rates—as “benign neglect.” He argues that information in long rates can lead

to fresh interpretations of several episodes between 1990 and the financial crisis.

Many commentators, including New York Fed President Dudley, have subsequently commented that the Fed was, in fact, tightening financial conditions less than intended and, perhaps, should have done more.²⁹ Whether the Fed's gradualism helped to fuel a housing bubble remains hotly debated.

As noted above, the Fed cited a modest deceleration in actual inflation as consistent with its forecast of falling inflation. Chart 3 shows that part of the softness in inflation during the 2002-04 period is attributable to the fact that the inflation rate in "other goods" fell from around zero to below minus 2 percent. The inflation rate in "other services" actually rose modestly over the same period giving a different view of inflation pressures.

A variety of work reported here at Jackson Hole suggests that increasing competition from China and elsewhere in the emerging world may have played a prominent role in the large drop in goods inflation (Rogoff 2004).

Of course, in a general equilibrium world, all of the above factors interact. Falling goods inflation was associated with a large rise in cheap goods from abroad, which, in turn, was associated with a large U.S. trade deficit. The flip side of the trade deficit was a capital account surplus. The capital inflows, according to Bernanke (2005), may have contributed to the falling term premia and promoted household borrowing that, in turn, supported the housing bubble.³⁰ Against this backdrop, the Fed was forecasting increasing slack and possible deflation.

In the end, the slack-based inflation predictions over this period did not materialize. The fact that things do not turn out according to the modal forecast in any one episode is not strong evidence of anything. This is why we documented the more general properties of standard slack-based inflation forecasts above. The examples merely flesh out the roles that slack and the *nice view* of normal cyclical dynamics played in the formation of forecasts.

Our message once again is that a conventional view of normal cyclical dynamics and of the supposed reliable relation between slack and inflation played a central role in policy deliberations over the period. To return to a claim in the Introduction, we argue that if you had to put the labels “sideshow” and “heart of the matter” on normal cyclical dynamics or DCDs, normal cyclical dynamics were the sideshow and DCDs deserved to be the main focus.

The experience of the United States was not unique over this period. For example, in assessing the first decade of Bank of England independence, a report to the Treasury commented favorably on the headline outcomes but noted all the main features we have emphasized,

We cannot guarantee that the next ten years will be so “nice.” Many of the benefits of globalisation have already worked through, and the adverse impact on commodity prices of the development of China and India is now being felt. And the effective labour force is unlikely to grow as rapidly as it has done over the past decade or so. Moreover, some aspects of the global economy look unsustainable, particularly the pattern of global current account imbalances and the low level of real interest rates and risk premia. So the macroeconomic context is likely to be somewhat less benign (Bank of England 2007, p. 21).

Viii. Bottom Line on the NICE Decade

So far we have attempted to make an objective case that potentially policy-relevant DCDs are ubiquitous in the policy world, and a highly subjective case that policy would be improved if these played a more central role in policy deliberations.

The nice headline outcomes for a brief time during the NICE decade resulted in part, we believe, from a favorable confluence of disparate confounding dynamics. Any policymakers focused mainly on domestic slack and aggregate inflation, as the *nice view* recommends, would have been blissfully unaware of most of the story. But, in our experience, central bankers are never blissful and rarely unaware. These confounding elements were the subject of extensive and thoughtful discussion.

We have tried to make a case for our subjective view that DCDs, which were extensively discussed, played a minor role relative to the conventional views of slack and inflation when it came to the actual policy decisions. Lacking a natural home in the dominant paradigm, these concerns largely remained on lists of conundra, alternative scenarios, risk factors and future research topics.

This claim is merely an assertion based on our experiences in central banking and our reading of documents associated with policy deliberations. The mapping from policy discussions and conceptual frameworks to real-world policy decisions is necessarily quite opaque, and we can do little more than provide illustrative examples of our view and commend the topic for your consideration.

In the remainder of the paper, we explore the possible implications of the perspective that we are recommending.

VI. Doing Better in the Coming Normal

Most conventional applied academic work on policy accepts that there are complexities in reality that are not modeled, but essentially leaves as an exercise for real policymakers how to determine when those complexities warrant deviating from the baseline, simple policy prescriptions. Under the presumption that academic research should focus on the hard parts, leaving the easy parts for policymakers to sort out, we think that macroeconomists have gotten it backward by focusing on simple solutions to the cases where economic dynamics are simple and regular.

There are much more interesting questions. Why are these disparate confounding dynamics so prominent? How can a formal policymaking framework take them into account? There are great opportunities for productive basic research on questions like these, and in Section VII we will illustrate some examples of work that is making progress on such questions. But, to borrow a phrase from Sims' (1980) "Macroeconomics and Reality," "a long road remains" to be traveled before DCDs are integrated in our standard analytic framework.

In the meantime, policy must be made, and in this section we explore how DCDs can more systematically be integrated into regular

policy discussions—even before research provides a comprehensive analytic framework.

VI.i. Policy Analysis: Is the New Normal Emerging Already?

History offers us an episode that illustrates what normal policy analysis might look like in the perspective we advocate: the current recovery. To be clear, the tools that policymakers are using to implement policy do not, we hope, constitute a new normal. And, as throughout the paper, we are not taking a stand on whether the particular policies that have recently been followed are optimal in any sense. But the framework for policy analysis is very much in the spirit that we are suggesting.

The paper started with Draghi's summary of the *nice view* of policy and the NICE decade. Of the more recent period, he argues:

[T]here is little doubt that our simpler understanding of monetary policy in the past will not readily return. Policymakers are operating in a more complex and heterogeneous environment. Structural breaks and model uncertainty imply that the regularities of the past can no longer be relied upon. This in turn means that judgement plays a greater role in decision-making (Draghi 2014).

Our only nitpick with this statement echoes Zarnowitz: at least as far as inflation dynamics are concerned, the reliability of those regularities in the past is more myth than reality.

Yellen (2014a, pp. 3, 4) recently argued,

The assessment of labor market slack is rarely simple and has been especially challenging recently. Estimates of slack necessitate difficult judgments about the magnitudes of the cyclical and structural influences affecting labor market variables, including labor force participation, the extent of part-time employment for economic reasons, and labor market flows, such as the pace of hires and quits. A considerable body of research suggests that the behavior of these and other labor market variables has changed since the Great Recession. Along with cyclical influences, significant structural factors have affected the

labor market, including the aging of the workforce and other demographic trends, possible changes in the underlying degree of dynamism in the labor market, and the phenomenon of “polarization”—that is, the reduction in the relative number of middle-skill jobs.

As the speech makes clear, these elements not only are being discussed, they are clearly affecting policy choices regarding issues such as the timing and pace of normalization. This is very much in the spirit that we advocate.

Perhaps the clearest example of change is in the treatment of term premia in policymaking. After his stint at the Fed, Blinder (1997, p. 16) expressed concern about “everyone—and here I mean analysts, market participants and central bankers alike” simply reading expectations off of the term structure of interest rates, despite the fact that this is “wrong” in a world of large and variable term premia.

In the wake of the crisis, Bernanke (2013) made a clear case that term premia are large, volatile and manipulable by policy and that taking account of them is an essential element of policymaking. Since the crisis, the often confusing dynamics of term premia have become a regular feature of policy discussions, with policymakers incorporating views on substantial changes in premia in their interpretation of interest rate movements. For example,

[A]lthough market-based measures of inflation compensation have declined appreciably since last summer and bear close watching, I suspect that these declines are primarily driven by changes in risk premiums and market factors that I expect to prove transitory (Yellen 2015).

These quotes are merely indicative of a much richer picture of macroeconomic dynamics we see reflected in policymaking over the last several years.

VI.ii. Barbarians

The line of reasoning that policymakers must use judgment and take a stand on things that basic research has not yet incorporated into a well-established analytic framework rightly brings fears of

“seat-of-the-pants” policymaking and, for the more excitable, of barbarians at the central bank gates. Once again, the best solution to this very real risk is for researchers to integrate the disparate confounding dynamics that dominate the practice of central banking into standard models.

Until that happens, policymakers must take a stand (either explicitly or implicitly) on what DCDs mean for policy. While history and a large body of research convincingly demonstrate the virtues of constrained discretion, no work shows that the constraints on discretion should include ignoring economic dynamics that dominate the data.

Let us emphasize that the literature on the virtues of simple policy rules discussed above is based on models that abstract almost entirely from DCDs. That literature mainly demonstrates that in models in which dynamics are simple, policy can be as well. There has been no clear historical episode of any appreciable duration in which simple Taylor-type-rule behavior resulted in benign outcomes.³¹

In our view, until we have more complete analytical models, the best way to avoid the dangers of “seat-of-the-pants” policymaking is to create a robust framework for integrating these elements systematically into policy deliberations. First steps involve explicitly listing key factors and taking an explicit stand on how they are affecting policy.

The Fed has taken some important initial steps in this regard. For example, under Bernanke’s leadership, the Fed adopted a statement of longer-run goals and strategy, for the first time stating an explicit longer run price stability objective and explaining,

[T]he maximum level of employment is largely determined by nonmonetary factors that affect the structure and dynamics of the labor market. These factors may change over time and may not be directly measurable. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee’s policy decisions must be informed by assessments of the maximum level of employment, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments (FOMC 2015).

This is a start. But just a start. Despite the Fed's efforts, there has been a regular refrain from astute policy observers that the Fed has been "moving the goal posts" as it explains its evolving assessments of the state of the labor market.³² To an audience steeped in the *nice view*, in which policy can be based on two relatively well-measured sufficient statistics, the new approach does look like moving the goal posts. And without a clearer framework for applying the new approach, central bank policy could devolve into regular goal-post moving.

We commend central banks for recently integrating DCD elements into policy analysis, but we also strongly advocate that they formulate and communicate a more explicit framework for how key elements are likely to affect policy.

While our main topic is the coming normal, readers may naturally wonder what our analysis might imply, say, for the timing and pace of liftoff in the United States. Any serious treatment of this topic would require another paper, but for clarity let us say the following. One key factor will surely be the degree of confidence policymakers have that inflation will be returning to target. We can sketch two variations on statements that might support liftoff sooner rather than later. First, "we can be confident based on our slack measures that inflation will soon be rising." Second, "we are confident that slack is diminishing and that, at some point, as slack diminishes, this will provide upward pressure on inflation. We believe we are nearing that point." Evidence reviewed above suggests that statements like the first are not warranted; statements like the second probably deserve serious consideration.

VII. The Longer-Run: Research and DCD Issues that May Be Prominent in the Future

From a modeling perspective, the issues we are emphasizing regarding disparate secular or persistent dynamics have been core issues since the beginning of the field of applied macro modeling. Like many modern modelers, for example, Klein sought to model the economy on a balanced growth path with the balance reflected in "great ratios." Klein and Kosobud (1961) report their efforts empirically to assess these ratios in a theory-consistent manner. They

explore the savings rate, labor's share of income, labor force participation, and then they ask about the role of the real interest rate in determining whether income growth is balanced between workers and capitalists.

A quick summary from a more modern perspective is this: measurement is difficult, the ratios seem to have secular dynamics and those secular dynamics are difficult to disentangle from cyclical variation.

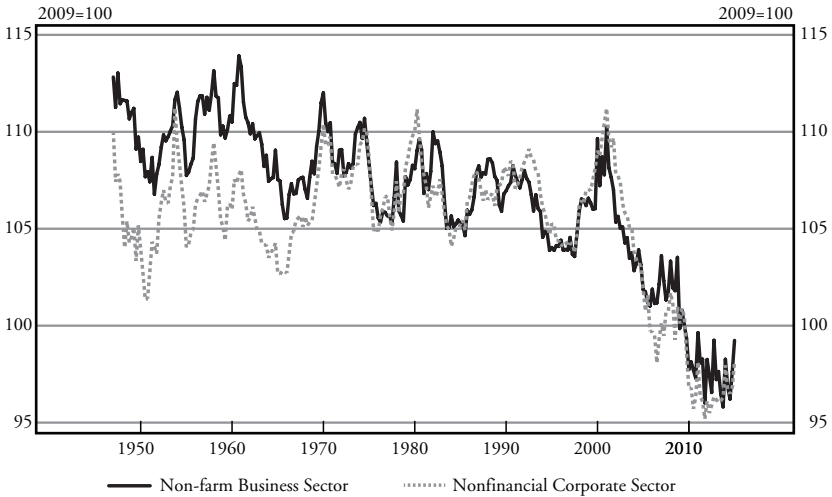
There are two ways of dealing with inconvenient stochastic trends in variables. First, ignore them entirely—for example, assume that the great ratios are fixed. Central banks seldom take this approach, but it is common in academic research. Second, assume that the movement in these variables is sufficiently slow-moving as to be irrelevant for near-term policy analysis. Often this amounts to reasoning based on observed changes and then assuming that the slow-moving component does not change much at policy-relevant horizons. This is common in policymaking.³³ It is this sort of reasoning that might support 50 years of ignoring a secular increase in household leverage without considering how much debt is too much.

Academic and policy researchers have, however, begun to move beyond the *nice view* models to integrate disparate confounding dynamics into otherwise conventional monetary policy models. This section considers three prominent examples of DCDs whose importance to policymakers is likely to grow in coming decades. We explore how these phenomena could affect the appropriate stance of monetary policy.

VII.i. Labor's Share of Income

In Klein and Kosobud's work from 50 years ago, labor's share of income displayed important cyclical variation, but did not contain persistent, secular change. Recent evidence suggests that labor share now shows secular, stochastic variation. By several measures, labor's compensation as a share of total income has declined considerably in the United States (Chart 9). Feestra et al. (2015) document that declining labor share of income is a widespread phenomenon among advanced economies. Among the world's eight largest economies, seven have

Chart 9
Measures of Labor's Share of Income in the United States



experienced declining labor shares since 1975.³⁴ The cyclical component in this ratio remains prominent, as the chart makes clear.

From a societal perspective, the secular change in this share is related to important debates over the income and wealth distribution in our economies, a topic many monetary policymakers have noted with concern in recent years, citing reasons that center on what Carney (2014) calls “delivering a basic social contract comprised of relative equality of outcomes; equality of opportunity; and fairness across generations.”³⁵

The consensus among policymakers, with which we agree, is that monetary policy can do little to affect secular variation in labor’s share and that focusing on stability in growth and inflation at least provides favorable background conditions against which society can grapple with these important issues.

But trends and cycles can interact in subtle ways—once again, it is difficult to “look through” the secular variation to see the cyclical part. Suppose, for example, that underlying secular forces have now turned and are tending to promote a return of labor’s share to something closer to prior levels. In accounting terms, the most obvious way for this to happen is for nominal wages to grow faster than the

sum of inflation and productivity growth. In the *nice view*, there is no secular movement in labor share, and this wage behavior signals diminishing slack, overheating, and rising inflation. By that view, tighter monetary policy should nip this in the bud.

In the real world that we might soon face, policymakers may have to take a position on whether the rising wages are a natural part of a secular—and to many, a desirable—re-balancing in labor's share or instead are a sign of cyclical overheating. A sharp monetary policy response to what happens to be beneficial secular dynamics could have the undesired consequence of slowing the economy, raising unemployment, and delaying the secular rebound in labor's share.³⁶ In short, a central bank intending to lean against inflationary winds could inadvertently end up resisting secular forces toward income equality.

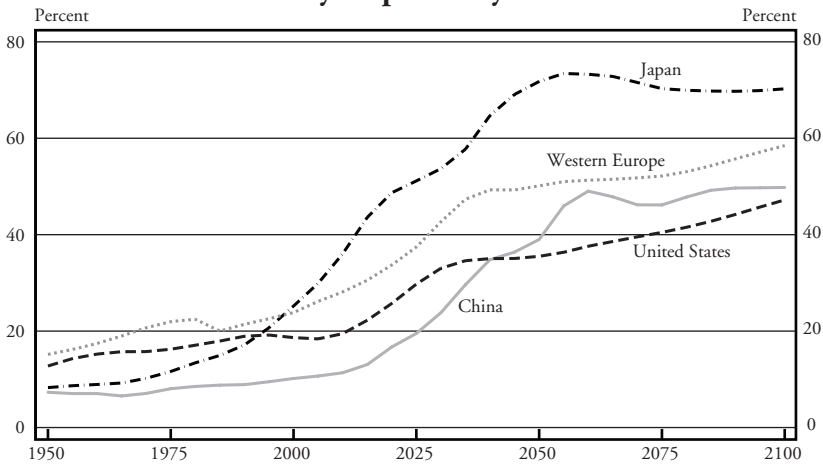
VII.ii. Demographics

Demographics probably provide the canonical case of slow-moving variables that may be immensely important to understanding longer-run dynamics and welfare, but have few clear shorter-run implications. As Bean (2004, p. 449) put it: "... the glacial nature of demographic changes appears to suggest that the implications for monetary policy should be modest."

Demographic developments and projections have been thoroughly discussed at this symposium.³⁷ As those works document, the major economies are generally aging, but at disparate rates. Japan is now the world's oldest advanced economy, with Germany close behind (Chart 10). The U.S. population is older than China's, but that ranking is projected to reverse in 25 years, as China's population ages rapidly in coming years. While we agree with Bean, we still see ample ways for these trends to interact with monetary policy in ways that, if ignored, could have important implications.

Demographics require that we abandon representative-agent thinking and confront intergenerational distribution issues—inherently political issues that present challenges to independent central banks charged with aggregate objectives. As noted above, distributional issues may have played a role in the Great Inflation. Distributional

Chart 10
Elderly Dependency Ratio



Note: The ratio is the population older than 64 as a percentage of the working age population ages 15-64.
Source: United Nations.

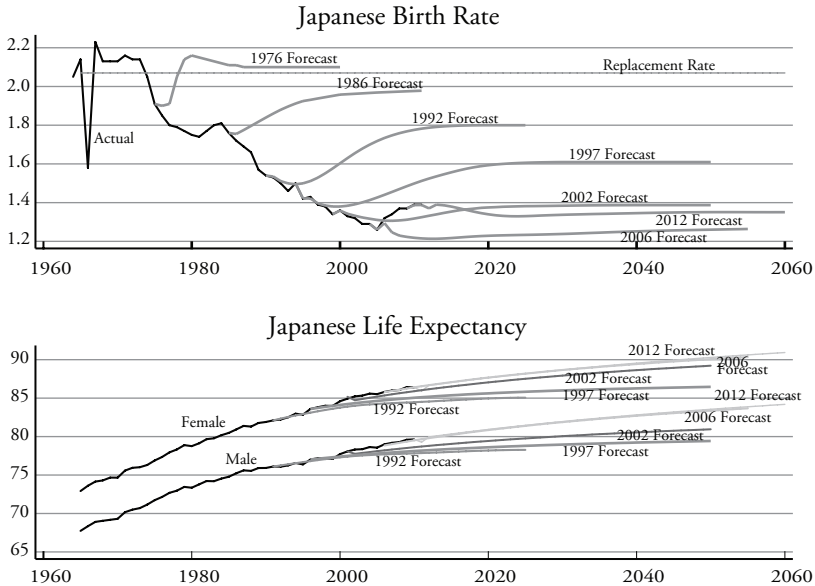
issues have clearly loomed large in the recent period as analysts have debated whether low interest rates and LSAPs have hurt an older generation of savers in order to promote a return to work of younger generations facing historically high rates of unemployment.

There is no doubt that monetary policy is much simpler and less politically sensitive in a balanced-growth world where these distributional issues do not exist or do not evolve much over time. But in the real world, population dynamics may present substantial challenges to policymakers.

There are two distinct aspects to demographic changes. The first might be called “pure demographics,” which entails the direct impacts of aging populations, increases in longevity, changes in fertility rates, immigration and shifts in relative sizes of generations. A second issue, which in many cases is deeply intertwined with the pure demographics, is the fiscal stresses that may be created when a large generation reaches retirement age and begins to collect old-age benefits.³⁸ We will return to fiscal stress in section VII.iiiib.

Even the glacial change in pure demographics may not be perfectly predictable. When Medicare was passed in 1965, American newborns were expected to live about 70 years; now that number

Chart 11
Revisions to Forecasts of Japanese Fertility Rates
and Life Expectancy



Sources: Ministry of Health, Labour and Welfare; National Institute of Population and Social Security Research, adapted from Nishimura (2012).

is 80. Sixty-five-year-olds at that time were expected to live another 14 years; today that number is 20 years. Chart 11 illustrates surprise changes in expectations of Japanese fertility rates and life expectancy by comparing government projections to actual outcomes. About every five years, when new forecasts come out, there have been substantial revisions to important demographic variables. Fertility rates have been consistently lower than expected, while life expectancy has surprisingly risen more than expected. This amounts to a sequence of shocks that have raised expected old-age dependency ratios.

At the quarterly frequency on which central banks typically focus, these changes are surely not of great importance. But, like slowly rising household leverage, persistent demographic change and news about demographics may fundamentally alter the functioning of the economy, feeding directly into consumption-saving decisions, portfolio composition and labor-retirement choices.

Japan has been at the vanguard of research and policy discussions about the macroeconomic implications of demographic shifts. Former governor of the Bank of Japan Shirakawa (2012) presents a case for how monetary policy interacts with an aging population. He lists a number of considerations to argue that, on net, it is possible that Japan's aging may create a "looming menace" that threatens to produce prolonged deflation.

Cross-country evidence on macroeconomic impacts of demographics consistently finds that aging populations, whether measured as increases in life expectancy, decreases in fertility rates, or increases in old-age dependency ratios, are associated with lower per-capita growth rates and lower real interest rates.³⁹ Results for inflation are more mixed (Aksoy et al. 2015, Juselius and Takáts (2015) and Yoon et al. 2014). This data summary, however, leaves open the question of what channels may be operative.

A growing body of theory papers that bring life-cycle consumers into monetary models helps with those interpretations. This literature combines demographic dynamics with sluggish price adjustment to deliver simple life-cycle versions of the *nice* models.⁴⁰

Work along this line has provided some provocative insights:

- Marginal propensities to consume can vary dramatically across age cohorts. As big (or small) generations move through their life cycles, aggregate consumption functions will drift.
- Consumption bundles also vary across stages of the life cycle, with older consumers spending more of their income on services (like health care) and less on durables (like housing). Slowly moving and persistent shifts in relative demands for goods and services inject trends into relative prices. An unusually large age cohort like the baby boom can create very large shifts in relative prices.
- As a population ages, labor force and labor supply decline to reduce the marginal product of capital and reduce investment opportunities.
- An aging population may reduce the economy's aggregate saving and willingness to absorb government debt, a point that Hoshi and Ito (2014) emphasize confounds demographics with sovereign risk.

- Macroeconomic shocks—including monetary policy actions—affect age cohorts asymmetrically. Young households’ decisions are more interest-sensitive than are those of old households. In addition to producing redistributive effects, this asymmetry alters the transmission mechanism of monetary policy in time-varying ways.⁴¹
- Periodic revisions to official forecasts of fertility and longevity, like those in Chart 11, can have powerful effects on public pension systems, whose actuarial evaluations use those projections. Projection updates force discrete shifts in expected paths of fiscal expenditures or taxes, which alter households’ expected disposable income.
- Through various channels, an aging population may lead to a negative trend in long-term real interest rates and in the long-run neutral real interest rate. If monetary policymakers do not take account of this fact and thereby perceive too high a neutral rate, policy will be chronically tighter than intended until their perception changes, as Carvalho and Ferrero (2014) illustrate.
- It is an empirical regularity that older people have a higher propensity to vote, and so an aging population can be expected to alter political economy dynamics.⁴²

These results are best viewed as basic research, but research into a topic that is likely to take on growing importance in coming years. We offer two examples that are more concrete and relevant at present.

First, world demographics play a role in Bernanke’s (2005) “savings glut” hypothesis, put forward as a partial explanation for the interest rate conundrum in the early 2000s. While the demographic dynamics are glacial, the changes discussed by Bernanke interact in rich ways with relative growth, trade patterns and institutions, long-run world real interest rates and the state of the business cycle to present policymakers with a difficult interpretational challenge.

The second example concerns labor force participation and is directly confronting policymakers at present. As the baby boom moves toward retirement, experts have long expected a trend decline in

labor force participation in the United States and elsewhere. But the magnitude and timing of that decline are empirical matters. Standard reasoning suggests that secular and cyclical forces should interact, as the particular choice of retirement date may be affected by near-term wage prospects. A worker who loses her job at a point near a target retirement date may prefer to retire and forego a costly job search. Initial job entry may similarly be affected by cyclical conditions.

In the face of the recent severe recession, labor force participation in the United States declined from 66.4 percent in January 2007 to 62.6 percent in June 2015. There seems to be no question that demographic movements alone could account for much of this decline (Aaronson et al. 2014), but there is considerable uncertainty regarding whether some of this drop might be reversed in a robustly growing economy. This issue, in turn, raises direct questions about when the recovery in the labor market will be effectively complete and policy should be normalized.⁴³ Erceg and Levin (2013) illustrate a path to incorporating such issues into otherwise standard business cycle models.

To emphasize the generic themes of this paper, the issue here is how secular demographic changes may interact with the normal business cycle to make a standard slack measure like the unemployment rate an insufficient—and possibly misleading—guide to policy.

In a balanced growth world with fixed great ratios and static age distributions, central banks are not confronted with these issues, which has the helpful side benefit that monetary policymakers are not drawn into a politically sensitive area. We believe that it is inevitable that central banks will be drawn further into these issues in coming years. We commend central banks that have already taken the lead on researching these issues, and urge continuing those efforts.

VII.iii. Fiscal Policy

One stochastically trending variable that no one ignores is the ratio of sovereign debt to income. Actually, this statement only applies to practical policy discussions, for many models of normal cyclical dynamics do not include or ascribe any importance to the sovereign debt-income ratio. By conventional views, monetary policy affects

the real economy so long as prices and wages do not fully adjust to economic disturbances. Once adjustments are complete, monetary policy is neutral. Unlike monetary policy, fiscal policy does not rely primarily on nominal rigidities to affect the economy: government spending and tax rates impinge on private decisions directly and, when those policy actions affect asset accumulation, their impacts can be long lasting. The IMF (2015), for example, emphasizes the role that fiscal policy plays in promoting and sustaining long-term economic growth.

Many econometric models that central banks developed during the *nice* period follow the usual monetary new Keynesian approach of Christiano et al. (2005) or Smets and Wouters (2003, 2007) and simply omit government's fiscal position.⁴⁴ Assuming some version of Ricardian equivalence is required for this to be strictly true. If we were not being sticklers, we might imagine that this approach could be approximately appropriate in a world where the fiscal position is stable and, loosely speaking, does not matter much.

In a world where government debt-GDP ratios follow dramatic trends that can shift rapidly, though, this *nice view* assumption that the magnitude of debt ratios is approximately irrelevant is not tenable. Ricardian equivalence sweeps under the carpet the potentially long-lasting dynamics that changes in distorting taxes and financing of government debt may induce. Most policymakers, in our experience, reject Ricardian equivalence out of hand—with its powerful implication about the irrelevance of government debt; there are many reasons why the assumption might not hold even approximately.⁴⁵

Once we dispense with Ricardian irrelevance, government debt becomes an important state variable whose slow evolution may induce movements in almost any macroeconomic aggregate and affect the dynamics of those aggregates. The frequencies at which fiscal policy actions affect macro variables depend on details of fiscal modelling, including role of government spending—as a substitute for or complement to private consumption or as infrastructure investment—types of distorting taxes, maturity structure of government debt and fiscal rules.⁴⁶ Dynamic impacts of fiscal policy also depend in important ways on maintained assumptions about monetary policy behavior. In

addition, advanced economies and, before long, some newly emerging economies are headed for prolonged periods of increasing fiscal stress prompted by the demographic issues already discussed. Aging populations have been promised old-age benefits that to a large degree are being financed on a pay-as-you-go basis. For several decades economists have been warning of the “coming generational storm.”⁴⁷

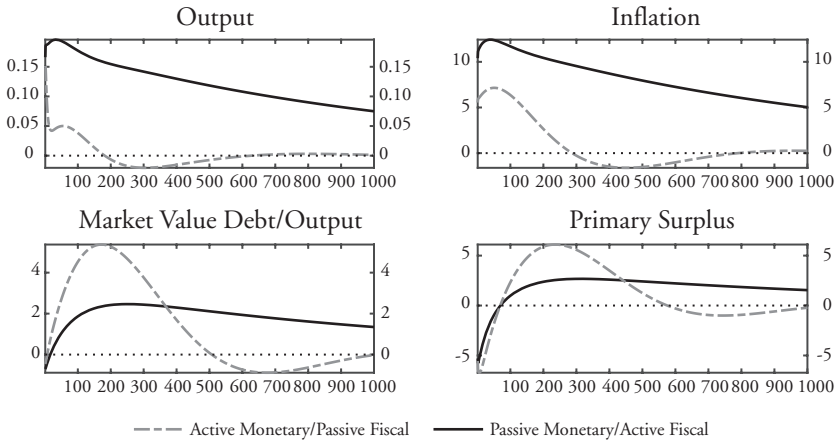
In this section we review three generic features of fiscal policy that greatly complicate empirical interpretations. We start with ways in which routine fiscal disturbances are likely to be misapprehended by models of the *nice view*. Then we turn to two examples relevant to advanced economies today: the potentially subtle consequences of fiscal stress that arise from population aging and an analytical approach to fiscal limits and sovereign-risk spreads.

VII.iiia. Fiscal Dynamics

Chart 12 illustrates one estimate of how long fiscal dynamics can persist in a conventional model that includes fiscal details. The thought experiment debt-finances a temporary but persistent increase in government purchases of 1 percent of spending under two monetary-fiscal combinations: active monetary/passive fiscal policy or monetary dominance (dashed lines) and passive monetary/active fiscal policy or fiscal dominance (solid lines). The chart illustrates two generic features of fiscal effects: first, government debt dynamics are central to output and inflation outcomes—across both policy mixes, outcomes reflect the paths that government debt takes; second, those dynamics can be very slow-moving—the chart plots paths over 250 years.

Fiscal dynamics stem from two sources. Over shorter horizons, the role that government spending serves combines with the real and nominal rigidities that DSGE models embed to exert strong influences. In the chart, model estimates make spending a complement to consumption and some rigidities are fairly high.⁴⁸ These features alone do not produce the longer-run dynamics. Those come from a second source: how the expansion in government debt is financed—the precise mix of tax revenues, spending reversals and inflation that eventually retire debt back to its pre-expansion level. Like all

Chart 12
Paths of Macro Variables after a Transitory 1 Percent
Expansion in Government Spending under Alternative
Monetary-fiscal Mixes



Notes: Estimated from 1955:Q1-2014:Q2. In percentage deviations from steady state, except inflation, which is in basis points. Time unit is quarters.
 Source: Leeper et al. (2015).

deleveraging, historically, U.S. federal debt has been paid off only gradually.⁴⁹ Like the “headwinds” associated with private deleveraging, the impacts of public deleveraging depend on both the speed of the deleveraging and the methods employed.

The fiscal dynamics that Chart 12 depicts are absent from standard models developed to understand the NICE decade. In those models, government debt and lump-sum taxes take on lives of their own, with no implications for macro variables. Their effects then will be perceived as conundrums or be misattributed in some way. These issues are likely to loom largest when accurate interpretations are most important, such as during large fiscal expansions of the variety implemented in the aftermath of the financial crisis.

VII.iiib. Fiscal Stress

Studies repeatedly conclude that fiscal policies in most advanced economies are on “unsustainable trajectories.” Unsustainable policies bring to mind Stein’s (1989, p. 1) law: “If something cannot go on forever, it will stop.” Remarkably, policy reports about fiscal sustainability tend to turn the law on its head by asking, “If past policies,

including ones that everyone knows cannot last, were to continue indefinitely, what explosive path would government debt follow?”⁵⁰ Pointing out that something has to change serves a purpose in political discourse. But for a policymaker who is trying to interpret incoming data, it is more useful to explore the range of possible changes and their economic consequences.

These sustainability reports treat fiscal policy with the same lack of seriousness that the NICE-decade monetary models do. In those models, government debt can grow forever as a share of GDP without implications for the real economy or inflation, as long as it doesn't grow too fast.⁵¹

This is not all about predicting fiscal crises. For example, we might be confident that most advanced economies will reform their fiscal policies well before signs of crisis emerge. But people are not completely myopic, and their beliefs about the nature and the timing of those reforms affect their economic decisions today. Those decisions must be leaving tracks in data that can inform monetary policy choices.

Recent experiences in Europe remind us of how messy one sort of resolution to fiscal stress—sovereign default—can be. But it's naïve to believe that fiscal stress is having negligible effects until it explodes in our faces. Policy change occurs when the status quo is no longer tenable—the economy hits its fiscal limit, the point at which—for economic or political reasons—tax revenue can no longer rise to finance the promised payments.

Unresolved fiscal stress means that no one knows how policy will change at the fiscal limit. And because the fiscal limit itself and the economy's path to that limit are driven by future economic and political shocks, no one knows when—or if—the limit will be breached. This uncertainty leads economic agents to bet on how things will play out. Will taxes rise to finance promised benefits? Will some promised benefits be renegeged upon? Will inflation rise and bond prices fall to devalue the debt the government issues to finance benefits? Will some combination of the three occur?

Sensible people, with little else on which to base beliefs, may put some weight on each scenario and base their decisions on what they expect inflation, interest rates, tax rates and government transfers will be as a result. These decisions affect the equilibrium that we observe today, but because no crisis has occurred, the impacts may be subtle.

Davig et al. (2010, 2011) and Richter (2015) simulate what the equilibrium might look like in the decades before the economy hits its fiscal limit. Their notion of a fiscal limit is driven by the prevailing resistance in the United States to taxes: once the income tax rate reaches an upper bound, no further rate increases are politically viable.⁵² In the period before taxes reach their limit, government transfers are fully honored and financed by a mix of higher taxes and higher government debt. Nothing dramatic happens. Higher taxes reduce both work effort and investment, so output, consumption and real interest rates fall. Inflation rises glacially: 10-year-ahead average inflation gradually rises by 40 to 60 basis points over a 20-year simulation period.

The simulation hangs together with only a modest increase in expected and realized inflation because the distribution of future inflation begins to look rather alarming. The distribution of future inflation develops a fat upper tail, with the upper 0.005 percentile containing inflation rates as high as 50 percent annually. The slow upward creep in inflation and the severe skewing of inflation's distribution occur despite a monetary policy that slavishly obeys the Taylor principle to fight inflation in the run-up to the fiscal limit.

These are not forecasts of economic outcomes from unresolved fiscal stress. They are merely possible scenarios based on purely illustrative assumptions about future policy rules and their probabilities. But the work shows one realistic way in which fiscal policy can subtly and very gradually affect the probability distribution of inflation and the economic environment that monetary policy confronts.

VII.iiic. Fiscal Limits

A deeper concept of fiscal limits aims to model a country's ability and willingness to honor its sovereign debt obligations.⁵³ "Ability and willingness" are pretty broad, encompassing both economic and

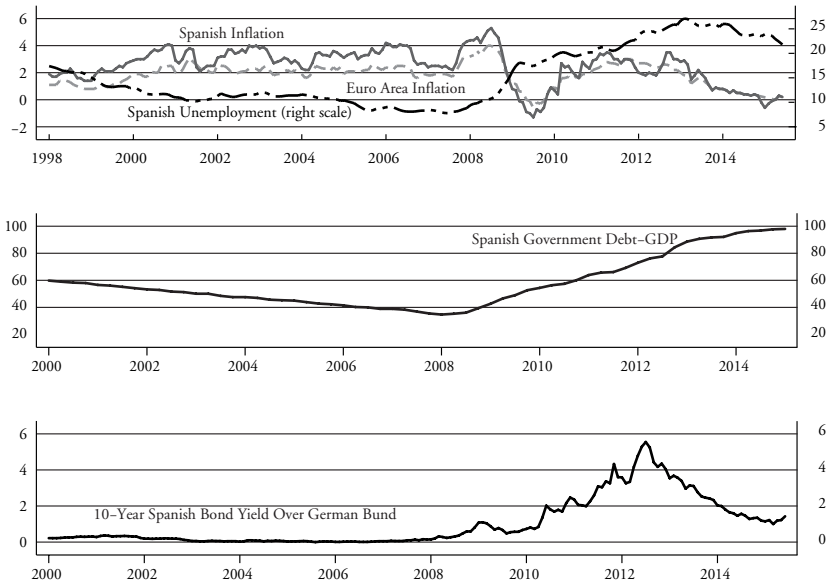
non-economic considerations. Ability depends on the discounted future stream of “maximum” primary surpluses, which determine how much debt can be supported. Any factors that influence maximum revenues and minimum expenditures feed into the stream of maximum surpluses. Examples include expected productivity growth, prospective policies—structural, tax or expenditure reforms—demographic trends, and political economy developments. Because these factors are intrinsically uncertain and forward-looking, the analysis produces a probability distribution of future maximum surpluses that hinges critically on country-specific features.

Bi (2012) uses a DSGE model to map the current state of the economy into the current fiscal limit distribution. For example, given a level of government debt today, a good productivity shock whose effects are expected to linger will raise the expected path of maximum surpluses to shift the fiscal limit out and increase the distance between current debt and the limit. The farther debt is from its limit, the less risky it is and the smaller are risk premia.⁵⁴

Fiscal limits force us to think beyond a country’s current debt-GDP ratio to consider the many factors that impinge on the country’s future ability and willingness to repay its debts. It’s easy to cite Ireland, Greece or Portugal and list the reasons that their sovereign bonds were deemed to be risky during the 2010-12 period. Spain presents a subtler challenge. From the start of monetary union Spanish government debt shrank to reach a nadir in 2008 of about 30 percent of GDP—10 percentage points below Germany’s. Based on this single statistic, Spain seemed poised to enter the global financial crisis far from its fiscal limit. With the recession, in Spain—and everywhere else—government debt began to rise, but it remained below the German level through 2009 and stayed well below the euro area as a whole.

Why, if Spanish debt was in safe territory, did its 10-year bond yields begin to rise in 2011? Chart 13 suggests that more than bond-market vigilantism was in play. During the decade of good fiscal housekeeping, Spanish inflation was chronically above European Union-wide inflation, at times by more than a percentage point.⁵⁵ Thoughtful observers would note that in a monetary union, Spain’s persistently higher-than-union-wide inflation rates could damage the

Chart 13
Spanish Harmonized Index of Consumer Prices, All Items



Notes: Growth rate over same month of the previous year, not seasonally adjusted; Spanish harmonized unemployment rates, in percent, ILO definition, total, not seasonally adjusted; Spanish central government debt as percentage of GDP, Maastricht definition. Spread is difference between Spanish and German long-term interest rates for convergence purposes, 10-year yields.

Sources: Eurostat and European Central Bank.

country's competitiveness and future growth prospects. With weak future economic growth comes lower tax revenues and higher social safety-net expenditures that reduce the expected flow of Spanish primary surpluses. This, in turn, shifts the country's fiscal limit inward toward prevailing and growing debt levels.

Whether from lack of competitiveness or some other source, Spain did experience a second dip in economic growth from 2011 through the middle of 2013. Unemployment continued the upward march that it began during the recession, rising well above 20 percent before peaking at 27 percent in February 2013. These developments raised concerns about Spain's ability to finance a government debt that rose from 69 to 92 percent of GDP between 2011 and 2013. Movement of debt toward Spain's fiscal limit coincided with an inward shift in the country's limit distribution, a combination that Bi's (2012) fiscal limit analysis predicts would raise risk premia.

Fiscal limits tell us that debt-GDP ratios are an incomplete—and potentially misleading—summary of a country's fiscal health. What matters is the distance between current debt and the fiscal limit distribution. The position and shape of that distribution, in turn, depend on the great many factors that determine the discounted value of future primary surpluses. As the Spanish and U.S. fiscal stress examples illustrate, interactions between cyclical outcomes (inflation and unemployment) and longer-run developments (fiscal financing and sustainability) run in both directions to compound the confounding dynamics.

This dynamic concept of a fiscal limit offers a fresh perspective on one aspect of the return to normal. Policymakers are well aware that if normal entails raising interest rates toward their historic averages, large outstanding government debt stocks will generate much higher debt service.⁵⁶ But higher real interest rates reduce the present value of primary surpluses. In the absence of higher revenues or lower outlays, the fiscal limit distribution will shift in, narrowing its distance from current outstanding debt. In countries that are already staring at their limits, government bond yields may rise for reasons unrelated to the expected path of short rates.

We wrap up the discussion of fiscal policy with another example of policy-relevant disparate confounding dynamics. Kocherlakota (2015) recently gave a speech that links three issues: (i) the secular decline in the neutral long-run real interest rate, as measured by 10-year, 10-year-forward yields on Treasury Inflation Protected Securities; (ii) the consequences of this declining long rate for the likelihood that policy will hit the lower bound for the nominal policy interest rate, and (iii) the role of the level of public debt for the level of the neutral long rate. He points out that if government debt serves a role in completing financial markets—by providing collateral or liquidity—then there can be surprising benefits from issuing more debt when monetary policy is at the zero lower bound. An expansion in government debt raises the neutral real interest rate, which pulls up the nominal policy interest rate. Kocherlakota's example ties together demographic change—a possible source of the declining neutral real

rate—with globalization of financial markets, monetary policy, and fiscal policy to address a pressing policy issue.

VIII. Concluding Remarks

This paper offers no simple or straightforward way to deal with the issues we present. Our only robust advice at this point is that we should stop looking for simple and straightforward solutions to the challenges that monetary policy poses.

What, then, will the new normal be? Regarding the big structural questions—secular stagnation and the like—we have nothing to offer.

From the standpoint of policy analysis, however, we think there is a clearer picture. We will not *return* to the policy as mythologized during the NICE decade—the myth in which normal cyclical dynamics are would tend inherently to be benign if only monetary policy were to behave in some simple way. We cannot *return* to that world because it never existed.

Our reading of history is that understanding disparate confounding dynamics has always been the key to good policymaking, and that failure to understand those dynamics has played a key role in major policy mistakes. Normal cyclical dynamics as captured in the *nice view*, in contrast, have played a distinctly minor role in policy's successes and failures.

The new normal in policy analysis will, we hope, look more like what we have seen in policy analysis during the current recovery. This places great demands on policymakers, both in the formulation and communication of policy. As episodes such as the taper tantrum illustrate, this road will likely be bumpy. Central banks have made a good start and we believe that, with the continued focus of academics, staff economists and policymakers, this road can be smoothed.

Authors' note: Jon Faust thanks many people at the Fed for valuable lessons, including Ben Bernanke, Bill English, Thomas Laubach, Trevor Reeve, Michelle Smith, David Wilcox and Janet Yellen, and also thanks Bob Barbera and Jonathan Wright for useful comments. Eric M. Leeper thanks Jim Nason, Bruce Preston, Ellis Tallman, Anders Vredin and Todd Walker for helpful discussions. We thank Maggie Jacobson for research assistance and the Bank for International Settlements for providing its estimates of risk premia.

Endnotes

¹Smets and Wouters (2003, 2007) probably marked the breakthrough of these models into practical policy relevance.

²Some might object, claiming that recent efforts to incorporate financial frictions into policy models provide an exception to this statement. We argue that these efforts, at best, very partially address the points we are making.

³While recognizing that how long inflation takes to return to target is state-dependent, the Riksbank's description of the principles of monetary policy states, "The Riksbank's ambition has generally been to adjust the repo rate and the repo rate path so that inflation is expected to be fairly close to the target in two years' time" (Sveriges Riksbank 2010).

⁴For example, Taylor (1993) points to historical instances when the Fed consciously deviated from the simple rule to react to information contained in oil prices or bond-market developments.

⁵Del Negro et al. (2015) is an example of work that may capture financial crisis dynamics by adding financial frictions, while having few implications for normal-times policy or dynamics.

⁶For a recent look at how this problem manifests itself around recessions, see Martin et al. (2014).

⁷That is, complete separation would emerge as a special and, we suspect, implausible case.

⁸The role of policy in the economy in many standard models can be entirely summarized by the path of expected future short rates.

⁹Throughout the paper, we have computed inflation as the annualized change in the natural logarithm of the underlying price index.

¹⁰Practical real-time forecasts are often reported only for a short horizon and the endpoint is thereby implicit, leading to a need for a proxy.

¹¹Specifically, the one-period ahead forecast at time t is,

$$y_{t+1}^f = \text{norm}_t + \rho(\text{norm}_t - \text{now}_t) \quad (1)$$

where *now* is the nowcast and *norm* is current normal. Longer-horizon forecasts are given by,

$$y_{t+h}^f = \text{norm}_t + \rho(\text{norm}_t - y_{t+h-1}^f) \quad (2)$$

Taking the case of $\rho = 0.3$, these equations imply that 70 percent ($1 - \rho = 0.7$) of any remaining gap between the variable and its normal value is expected to dissipate each period.

¹²It is not essential to our point in this paper, but the best practical forecasts seem to be the subjective forecasts of central banks and private sector forecasters, with mechanical statistical models coming in well behind.

¹³Many forecasting results are much different for the period of the crisis, and in particular, we would not expect our assumption that inflation will return smoothly to its normal value to be appropriate around the time of a crisis.

¹⁴Nason and Smith (2015) explore more careful modeling of the longer run.

¹⁵The preferred inflation index and target changed in our sample period. The work reported here simply makes the switch in the first quarter of 2003.

¹⁶Because in six to 10 years we expect to be in a very different place from where we are today.

¹⁷Faust and Wright find that over various sample periods and horizons, the root mean square prediction error (RMSPE) of the alternative benchmark is very close to that of the Greenbook forecast. For CPI inflation, the RMSPE of the alternative is generally smaller; for the GDP deflator, Greenbook's RMSPE is generally a bit lower.

¹⁸For those unfamiliar with forecast commentaries, any of the Greenbook citations illustrate this point.

¹⁹The Federal Reserve has provided an annotated timeline of many of these events in association with the 100th anniversary celebrations, available at www.federalreservehistory.org/Events.

²⁰For two summaries of the historical time series properties of U.S. inflation, see Cogley and Sargent (2015) and Nason (2006).

²¹See, for example, Bernanke and James (1991), Eichengreen (1992) and Kindleberger (1973). Especially through the first part of the period, bimetallism played a role, and it was always waiting in the wings.

²²Eichengreen (2004).

²³Sometimes the statement is literal. On April 4, 2013, ECB President Mario Draghi responded to a question about the possibility of a country's exit from the eurozone with the statement: "[T]hey keep on asking questions like: 'If the euro breaks down, and if a country leaves the euro.' It's not like a sliding door. It's a very important thing. It's a project in the European Union. That's why you have a very hard time asking people like me 'what would happen if.' No Plan B."

²⁴For other perspectives on policymaker learning and on the role of fiscal policy, see Bianchi and Ilut (2014), Davig and Leeper (2006), Eusepi and Preston (2013) and Primiceri (2006).

²⁵This raises the more general topic of learning, which can often contribute to confounding dynamics. Eusepi and Preston (2015) survey the implications of imperfect knowledge. Eusepi et al. (2015) consider learning in the context of low frequency drift. Heterogeneous beliefs provide a related channel of dynamics explored, e.g., in Kasa et al. (2014) and Rondina and Walker (2014a, b).

²⁶This is most true where fixed interest rate mortgages predominated, as in the United States.

²⁷It is important to note that the Greenbook forecast is a staff forecast, and in this period reflected conventional wisdom rather than Greenspan's view.

²⁸As Blinder and Yellen note, the new economy miracle was not really in the macro data until a major revision in 1998.

²⁹Dudley is quoted as saying, "... this was probably a period where the Fed should have done a bit more because we probably should have been tightening financial conditions over that period" (Fleming 2015). Barbera (2009) also makes this case.

³⁰Barbera (2006) raised this argument at the time.

³¹Advocates of such rules can rightly point out that this may be because the approach has not yet been given a real chance. But the fact remains that any claims that NICE-decade outcomes would result are not based in historical experience.

³²Google "federal reserve" "moving the goal posts" for a sampling of such analyses.

³³For example, Summers (1996, p. 39) makes this argument about secular change in term premia; see also the discussion of demographics.

³⁴Karabarbounis and Neiman (2014) report that, in increasing order of size of decline, the seven are: United States, Japan, Canada, France, Italy, Germany and China. Great Britain is the only large economy in which labor share has risen (slightly).

³⁵Bernanke (2007), Carney (2014), Haldane (2015), Mersch (2014) and Yellen (2014b). Not everyone agrees there is an immediate empirical link between labor share and income or wealth distribution (Gordon and Dew-Becker 2008; Jacobson and Occhino 2012).

³⁶As Goodhart and Erfurth (2014) note, there are other possible confounding dynamics here. Setting aside the secular change, from a purely cyclical perspective, tight policy may raise labor's share: recessions hurt profits, but if firms retain labor, recessions hurt wages less, so labor's share rises. Labor gets a bigger piece of a shrinking pie.

³⁷Lee (2014) is an excellent exposition of demographic trends from last year's symposium; Bloom and Canning (2004) and Bryant (2004) are more detailed analyses from a decade earlier. Bryant is packed with analytical insights about the economic implications of demographic change, with special emphasis on international dimensions.

³⁸The two need not be linked. For example, Norway has pure demographic shifts occurring, but it also has a massive sovereign wealth fund and no fiscal stress.

³⁹Aksoy et al. (2015) and Yoon et al. (2014), for example.

⁴⁰The economies in these models are subject to changes in birth rates, retirement age and life expectancy, so they can be used to mimic observed demographic changes. See, for example, Gertler (1999), including Carvalho and Ferrero (2014), Kara and von Thadden (2015), Katagiri (2012), Katagiri et al. (2015) and Fujiwara and Teranishi (2008).

⁴¹Imam (2013) finds evidence that demographic changes account for some of the decline in monetary policy effectiveness that Boivin et al. (2010) document.

⁴²Katagiri et al. (2015) develop a life-cycle model whose political economy equilibrium implies that, when monetary policy is at the zero lower bound, the impacts of aging depend on its underlying source: unexpected declines in birth rates raise inflation, while surprise increases in longevity reduce inflation.

⁴³The fall in labor force participation might be reversed at least for a time until the continued evolution of the secular component swamps any cyclical aspects.

⁴⁴For example, the ECB's areawide model (Christoffel et al. 2008) or Sveriges Riksbank's RAMSES II (Adolfson et al. (2013). Exceptions include Brayton et al. (2014), Freedman et al. (2010) and Harrison et al. (2005), which model how (potentially distorting) fiscal instruments adjust to stabilize debt.

⁴⁵Without providing an exhaustive list, practical reasons that Ricardian equivalence can break down include: presence of distorting taxation, private decision makers with different planning horizons than governments, incomplete financial markets, short-term government debt that serves as collateral and liquidity in financial transactions and uncertainty about how policies will adjust in the future to stabilize debt.

⁴⁶By "fiscal rules" we mean how the evolution of taxes and spending are formally modeled.

⁴⁷That phrase comes from Kotlikoff and Burn's (2004) book, but the warnings well predate it; see Auerbach and Kotlikoff (1987, ch. 11), Auerbach et al. (1994, 1995), Congressional Budget Office (2002) and O'Neill (1996).

⁴⁸Bouakez and Rebei (2007), Leeper et al. (2010b), Traum and Yang (2015) and Zubairy (2014) estimate models under various assumptions about the roles that government spending plays.

⁴⁹Other studies that emphasize the role of fiscal financing include Chung and Leeper (2007), Drautzburg and Uhlig (2013), Hall and Sargent (2011), Leeper et al. (2010a), and Uhlig (2010).

⁵⁰Examples abound, but Cecchetti et al. (2010), Congressional Budget Office (2002), and Ghosh et al. (2012) are representative. The Netherlands Bureau for Economic Policy Analysis (CPB) is an exception to these long-run fiscal analyses (Bos and Teulings 2012).

⁵¹The growth rate must be less than the rate at which real debt service accumulates. A small piece of fiscal reality—a limit to the amount of tax revenue the government can extract—eliminates equilibria with exploding debt.

⁵²In their study of Japanese government debt sustainability, Hoshi and Ito (2013) define the fiscal limit as the point at which government debt outstanding exceeds total private sector financial assets.

⁵³Bi (2012) develops this idea of a fiscal limit and applies it to the European debt crisis.

⁵⁴The Slovakian Council for Budget Responsibility uses Bi's approach to compute Slovakia's fiscal limit distribution to help guide the government's fiscal decisions (see Múčka 2015).

⁵⁵Faust (2013) points out that both the IMF's *World Economic Outlook* and the *Consensus Forecasts* underpredicted Spanish inflation from 2000-08 by an average of 80 basis points.

⁵⁶The Congressional Budget Office (2015) assumes three-month treasuries will rise from 0.1 to 3.4 percent from 2015 to 2025, while 10-year bond yields will increase from 2.6 to 4.6 percent. Despite a relatively flat path for government debt, interest rate hikes will increase net interest payments from 6.6 to 15.4 percent of federal outlays.

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