The Economics of Recession: A Survey

March 2023[1]

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1. Introduction

The pace of economic growth in industrial economies tends to change relatively smoothly from quarter to quarter. To be sure, there may be substantial differences in growth rates across several quarters or years, but in the short run we tend to see more continuity. Relatively long economic expansions are the norm, periodically interrupted by shorter periods of sustained economic contraction lasting from a few quarters to, in unusual circumstances, several years. This empirical regularity of alternation between extended periods of expansion and contraction led economic observers already in the nineteenth century to the idea that economic activity goes through recurring cyclical patterns, which came to be known as "trade cycles" or "business cycles." Eventually, economists converged on the use of the term "recession" to refer to the contractionary phase of those cycles.

This introduction to the economics of recession references a series of original articles that represent a substantial core of the professional literature on the topic. No single source can be totally comprehensive in its coverage of the field, but the articles selected here are intended to address some key fundamental questions and to strike a balance between depth and breadth of coverage. Specifically, we consider the following questions.

- What is a recession?
- What causes recessions?
- How do recessions end?
- What are the labor market effects of recessions?
- What other systemic effects do recessions have?
- How can we forecast recessions?
- How can we identify recessions in real time?
- How can we manage the individual risks of a recession?

Subsequent parts of the survey focus on each of the above eight questions in turn, with references to the 60 readings contained in the 2-volume book The Economics of Recession (see note 1). References to those readings are identified in the text as [R#], where # is the reading number, and bibliographic information is provided at the end of the survey.

We begin with a historical overview of the development of the concept of recession. Business cycles and recessions seem to be standard features of industrial economies. Non-seasonal cyclical variation is perhaps not completely unthinkable in agrarian or pre-industrial economies,

[1] The original version of the survey was published in the 2-volume book The Economics of Recession, Edward Elgar Publishing, 2017.

but the concept of the business cycle has been applied almost exclusively to economies that have undergone an industrial transformation. Beyond any conceptual reasons for this focus, it may result from practical factors such as the relative abundance of economic data and economic analysts, making it possible to track cycles systematically using quantitative measures of economic activity.

An early reference to business cycles comes from the observations of a perceptive London banker just before the dawn of the Victorian era. Samuel Jones Loyd (1837), First Baron Overstone, published a monograph entitled "Reflections suggested by a perusal of Mr. J. Horsley Palmer's pamphlet on the causes and consequences of the pressure on the money market."[2] The Mr. Palmer in question was a director of the Bank of England who had published a defense of actions that the Bank had taken with regard to money and credit.

In modern parlance, the Bank at the time was acting both as a central bank – issuing currency – and as a commercial bank – accepting deposits from and extending loans to the private sector. Lord Overstone argued that these two functions should be kept separate because they would be in conflict over the course of a business cycle. In his own words, "The history of what we are in the habit of calling the 'state of trade' is an instructive lesson. We find it subject to various conditions which are periodically returning; it revolves apparently in an established cycle." The specifics of the cycle would be less familiar to readers today. "First we find it in a state of quiescence, – next improvement, – growing confidence, – prosperity, – excitement, – overtrading, – convulsion, – pressure, – stagnation, – distress, – ending again in quiescence." It would take more than a century for the current terminology to evolve, but the basic ingredients of the business cycle were already there.

Toward the end of the century, economist David A. Wells (1890) was using the term "depression" to signify an extended economic contraction in industry, commerce, and other sectors of the economy, something like a modern recession.[3] For example, he used expressions such as "general commercial depression" and "general depression of trade and industry" to describe essentially what we would call a recession today. In one particular case, he applied the term to a serious economic contraction, "a very great depression in the pig-iron industry" in the United States starting in 1873. That episode would soon afterwards become known as "the Great Depression" until another one even greater surpassed it in the 1930s. The 1873 event is now commonly known as "the Long Depression" in the United Kingdom and the United States.[4]

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[2] Samuel Jones Loyd (1837) Reflections Suggested by a Perusal of Mr. J. Horsley Palmer's Pamphlet on the Causes and Consequences of the Pressure on the Money Market, London: Pelham Richardson.

[3] David A. Wells (1890) Recent Economic Changes and their Effect on the Production and Distribution of Wealth and the Well-Being of Society, New York, NY, USA: D. Appleton and Company.

[4] See, for example, A.R. Prest (1948), 'National Income of the United Kingdom 1870-1946', The Economic Journal, 58 (229), March, 31-62.

The direct line to the current approach to recessions starts with the publication by Wesley Clair Mitchell (1913) of a tome entitled "Business Cycles."[5] Mitchell was a university professor and researcher looking for a way to bring the conceptual framework of a business cycle to the data and to develop empirical techniques to date specific business cycles. His underlying premise was that a business cycle occurs when many sectors of the economy are simultaneously either expanding or contracting. He reasoned that if such a pattern actually existed in the data, it would be possible to analyze fluctuations in individual sectors, compare results, and ultimately identify the periods during which changes in activity in many sectors coincided. The analyst would then be able to give specific dates for the various phases of the business cycle.

Mitchell's concept of the business cycle consisted of four phases, not as many as in Lord Overstone's analysis, but certainly more than in the present approach. He labeled the four phases "prosperity, crisis, depression, and revival." Of these, depression is most closely related to the modern concept of recession, as it was in the Wells analysis from 1890. In Chapter III of his book, Mitchell used "the annals of business, 1890-1911" in the United States, as well as in England, France, and Germany, to look for detailed evidence of co-movements in economic activity in each of the countries. The chapter concludes with a summary table that provides a rudimentary business cycle chronology for each country at an annual frequency, classifying periods into the four phases of the cycle that he had earlier laid out. Occasionally, the terms applied to the cyclical phases were qualified as to their intensity, for instance, as in "high tide of prosperity," "deep depression," or "mild depression."

Mitchell (1927) subsequently issued a substantially revised version of the book, this time entitled "Business Cycles: The Problem and Its Setting."[6] A few years earlier in 1920, he had been one of the founders of the National Bureau of Economic Research (NBER) and was instrumental in making business cycle research a major focus for the new institution. The NBER, which itself published the new edition of the book, to this day remains the de facto official arbiter of business cycle dates for the United States.

The empirical content of the 1927 edition was thoroughly revised from the 1913 version. The data sample was extended chronologically to 1925 and geographically to include 13 additional countries in Europe, North America, South America, Asia, and Africa. The conceptual framework remained basically the same, but Mitchell introduced the term "recession" to replace what he had previously identified as the "crisis" phase of the business cycle. He felt that the term "crisis" was imprecise and would have to be qualified each time it was used, and that "recession" was a better complement to the term "revival" at the opposite end of the cycle. In time, this usage would not stick. Mitchell's 1927 term "recession" was more akin to the current concept of business cycle peak than it is to a modern recession.

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[5] Wesley Clair Mitchell (1913) Business Cycles, Berkeley, CA, USA: University of California Press.

[6] Wesley Clair Mitchell (1927) Business Cycles: The Problem and Its Setting Business Cycles: The Problem and Its Setting, New York, NY, USA: National Bureau of Economic Research.

In the 1930s, Mitchell was joined at the NBER by Arthur Burns, one of his graduate students at Columbia University. For more than a decade, the two of them extended and updated the work on business cycles and by 1946 the NBER published their book "Measuring Business Cycles," which was the culmination of their joint efforts in the field.[7] Although their research strategy was largely based on Mitchell's earlier work, the results were presented in a novel way that included the first published statement of the NBER business cycle chronology organized in the form it is reported today.

Instead of trying to identify all four phases of the cycle in their empirical analysis, Burns and Mitchell focused on reporting simply the high and low points of the cycle, which they labeled as "peaks" and "troughs." In addition, they referred to the period between a trough and the next peak as an "expansion," a label still currently in use, and to the period between a peak and the following trough as a "contraction," which corresponds to what we know today as a recession. Following Mitchell's early work, the 1946 book identified business cycles in France, Great Britain, and Germany as well as in the United States.

The finishing touches in the development of the present concept of recession came in a 1958 monograph by NBER researcher Geoffrey Moore entitled "Measuring Recessions."[8] The word "recession" appears in its modern acceptation in the title and also frequently in the text. However, in a historical nod to Burns and Mitchell, recessions are still called "contractions" in all of the tables and throughout most of the text. Terminology notwithstanding, the list of business cycle peaks and troughs given in the first table of the paper, covering the period from December 1854 to July 1957, matches the turning points currently identified by the NBER almost exactly. Only the last two dates in the table were later adjusted. In contrast to the earlier work of Mitchell and Burns, the Moore monograph focused exclusively on business cycles in the United States.

In 1978, the NBER opted for a more systematic approach to the identification of U.S. business cycle peaks and troughs with the creation of its Business Cycle Dating Committee (BCDC). This group tracks multiple economic variables as values become available in real time and meets occasionally when circumstances suggest that a cyclical turning point is in the offing or may have occurred in the recent past. The timing of their public announcements strongly suggests that they prefer to identify turning points only when conclusions from the data are ineludible. In this way, they avoid having to revise their assessments later, especially since the data themselves are subject to subsequent revisions. Official public announcements of turning point dates usually take place about a year after the event.

Initially, BCDC members were either NBER research economists or affiliated faculty members. For example, charter members of the committee in 1978 were Robert Hall (Stanford, BCDC chair), William Branson (Princeton), Martin Feldstein (Harvard), Benjamin Friedman (Harvard), Robert Gordon (Northwestern), Geoffrey Moore (NBER), and Victor Zarnowitz

[7] Two chapters from Burns and Mitchell (1946) are referenced here as R3 and R4.
[8] The original journal version of Moore (1958) is referenced here as R5. The article was also reprinted by the National Bureau of Economic Research in New York as "Occasional Paper 61."

(NBER). More recently, the committee has been composed exclusively of affiliated faculty members. As of March 2023, they are Hall (chair), Gordon, James Poterba (MIT), Valerie Ramey (U.C. San Diego), Christina Romer (U.C. Berkeley), David Romer (U.C. Berkeley), James Stock (Harvard), and Mark Watson (Princeton).[9]

Since the 1950s, the NBER has focused its business cycle dating activity exclusively on the United States. However, the NBER methodology may be applied in principle to any country for which sufficient data are available, as Mitchell and Burns showed in their research published between 1913 and 1946. A few public and private organizations have stepped forward to produce recession indicators for countries other than the United States. These indicators are carefully constructed, in some cases using methodology adapted from the NBER, and have become useful tools for economic researchers. It seems fair to say, however, that they are not yet perceived to be as authoritative and quasi-official as those of the NBER are for the United States.

As an example, Geoffrey Moore himself founded the Center for International Business Cycle Research in 1979 at Rutgers University to apply the Mitchell-Burns-Moore methodology to economies other than the United States. The Center moved with Moore to Columbia University in 1983, where it continued to operate until 1996. At that time, Moore and some of his associates left the university to start a private firm, the Economic Cycle Research Institute (ECRI), which continued to operate after Moore's passing in 2000 and currently reports business cycle dates going back to 1948. The data cover 22 countries, including the United States for which turning point dates coincide with the NBER's.

With greater economic and monetary integration in Europe, the London-based Centre for Economic Policy Research started in 2003 to produce a chronology of business cycles for the euro area, that is, for the aggregate economy of European Union member states that have replaced their national currencies with the euro. The chronology dates back to 1970. The CEPR-EABCN dating committee (now also associated with the Euro Area Business Cycle Network) employs a methodology based on the NBER's but adapted for application to a geographical area that includes various national economies The Committee defines a recession as "a significant decline in the level of economic activity, spread across the economy of the euro area, usually visible in two or more consecutive quarters of negative growth in GDP, employment and other measures of aggregate economic activity for the euro area as a whole."[10]

Broader geographical coverage of business cycle turning points is provided by the Organization for Economic Co-operation and Development (OECD), which has a chronology of dates for each of the 34 OECD member countries as well as for 6 non-member countries and for various multi-country aggregates. Most of these chronologies start in 1960. In contrast to the NBER, ECRI, and CEPR, the OECD focuses on a single reference variable for the cycle. The

[9] Membership information contained in https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-members. The site also provides historical information about peaks and troughs as well as transcripts of BCDC announcements.
[10] Obtained from the EABCN website at https://eabcn.org/dc/methodology?_ga=1.214076631.1165591682.147507469.

reference variable was industrial production until April 2012, when it was replaced by real gross domestic product.

The concepts of business cycles and recessions are ubiquitous in economic thinking about macroeconomic fluctuations. It may be possible to think about empirical macroeconomics in their absence, but the revealed preference of economists in academia, business, government, and finance since the nineteenth century has been to rely on some form of the business cycle framework for analysis of macroeconomic data, and in some cases for theoretical macroeconomic modeling. However, we have seen that the definition of recession has not achieved a uniform universal standard and that the term may not mean quite exactly the same to different economic analysts. For that reason, it seems important to take a systematic look at the economic literature on recession and to try to distill from that literature a consensus about the nature and consequences of recessions.

The remainder of this survey considers each of the fundamental questions listed earlier and in the process connects the discussion to each of the 60 individual readings.

2. What is a recession?

It almost seems unnecessary to start with the definition of a term so often bandied about as is "recession." We all talk about the last recession and compare it with previous recessions or with the Great Depression. We all read about recessions in the media, reflexively absorbing the content of the news stories without stopping to think about a formal definition of the term. But is it really clear to everyone what it is that the macroeconomist considers a recession and how economists determine in practice whether a particular economy has entered or exited a recession?

When someone is pressed to define the term, a frequent reply is that a recession occurs when there are two or more consecutive quarters of negative GDP growth. Before 1990, the reference might have been to GNP growth, and a more careful respondent might clarify that it is real rather than nominal growth we care about, but this simple rule of thumb has been a common perception for a very long time. However popular, the two-negative-quarters rule is not the standard by which economists, the press and historians tend to identify recessions in the United States and many other industrial countries. In fact, if we compare periods identified by this rule with periods officially classified as recessions, the difference is quite remarkable.

In the United States, as earlier described, recessions are identified by the NBER. This authority to designate periods as recessions does not derive from law or government decree, but from de facto acceptance as official by economists, government, and media. The NBER, a private nonprofit research organization, came to perform this function in effect because Professor Wesley Clair Mitchell, one of its founders and its first president, had a long-term interest in business cycle research. This quasi-official concept of business cycle evolved throughout much of the twentieth century into the standards we observe today.

The NBER approach to the business cycle has two basic elements. First, the cycle alternates between expansion and contraction of aggregate economic output resulting from concurrent movements in many economic activities. Thus, a recession is the outcome of roughly simultaneous slowdowns in many sectors of the economy with resulting effects that are discernable in overall economic activity. Second, business cycles are recurrent, and the expansion and contraction phases are persistent, though the length of the business cycle and its phases may vary from case to case. In its original formulation, the NBER defined a cycle as lasting from over one year to about twelve years and these guidelines continue to apply in current practice.

Some features of the NBER definition are purposefully left vague. For instance, economic activity may be represented by aggregate output or by the levels of income, employment, expenditures and sales. The lack of specificity forces the economic analyst to track all of these measures, and others as well, to try to identify a cycle. Moreover, it is not enough to look at aggregate measures of activity. The careful analyst will call a recession only when the slowdown is pervasive across the economy, not just in a single sector. Finally, observed cyclical changes in economic activity have to persist over periods longer than one year and in particular must be distinguishable from intra-year seasonal fluctuations.

How does the NBER business cycle chronology compare with the popular two-negative-quarters rule? If we look at the period from 1947 Q2 to 2021 Q2 in the United States, 46 out of a total of 297 quarters were identified as being part of a recession either by the NBER or by the two-negative-quarters rule.[11] Of the 46 quarters, the two methods agree in only 23 cases, one half of the quarters identified. There are 3 cases in which the two-negative-quarters rule called a recession but the NBER did not, whereas there are 20 cases in which the opposite held. The main reason for this difference is that many recessions contain at least one quarter of positive, even if meager, real growth interspersed among the negative growth quarters. Clearly, the two-negative-quarters rule would undercount those cases, but they may be included by the NBER in their search for persistent declines in various sectors of the economy over extended periods.

Two of our readings discuss the NBER definition of a business cycle at a general conceptual level. First, one of the framers of the NBER process, Geoffrey H. Moore, answers the question “What Is a Recession?” [R1] In this article, he provides both some historical context for the NBER method as well as a discussion of some of the practical issues involved in business cycle dating. In the more recent article “What Is a Recession?: A Reprise” [R2], Allan Layton and Anirvan Banerjee give a restatement and defense of the NBER method from a twenty-first century perspective, retaining the emphasis on multiple indicators and arguing against the two-negative-quarters rule.

To provide a detailed introduction to the NBER methodology, the readings include a few of the seminal writings of NBER researchers published during the gestational period of the approach. Two excerpts from the classic book by Burns and Mitchell, mentioned earlier, are

[11] The sample for these computations ends one year before the available data at the time of the analysis, in recognition of the lags in the identification of recessions by the NBER.

referenced here. One is the first chapter from the original book, entitled “Working Plans” [R3]. In the very first page of the reading, the authors state the “official” definition of a business cycle, adapted from Mitchell’s earlier 1927 book on the topic but “with modifications suggested by experience in using it.” In 1946, their concept of the cycle still included four phases (expansions, recessions, contractions, and revivals) of which only expansions are still known by the same name. Modern recessions are closest to what Burns and Mitchell call “contractions.” The rest of the reading discusses their general approach to identifying the phases of the business cycle.

In the fourth chapter of the original book, Burns and Mitchell [R4] get down to brass tacks. They illustrate the graphical, tabular, and statistical techniques they used to analyze “specific” cycles in individual industries as well as their approach to putting everything together to come up with dates for the aggregate business cycle. Just as importantly, they provide in Table 16 a set of concrete monthly and quarterly business cycle dates for the United States, France, Great Britain, and Germany covering the period from December 1854 to May 1938, as well as dates going back to 1834 at an annual frequency.

Interestingly, Burns and Mitchell do not report in the table all four phases of the business cycle identified their definition. Instead, they focus on what they call “reference dates,” namely “peaks” and “troughs” of the cycles, which correspond roughly to what they refer in their conceptual discussion as “recessions” and “revivals.” With today’s conventions, we identify a recession as the period from the month or quarter after the peak to the month or quarter of the trough. To Burns and Mitchell, these were “contractions.” They classified the remaining periods – from the month or quarter after a trough to the following peak – as expansions, just as they would be today.

The dates for the United States given by Burns and Mitchell in 1946 are the same in most cases, or at least very close, to those currently in use by the NBER for the period in question. The exact present-day NBER dates were initially fixed by Geoffrey Moore in the article “Measuring Recessions” [R5]. Moore gives a detailed account of how he adjusted a few of the dates from the Burns and Mitchell chronology and how he dated cycles subsequent to the publication of the earlier work. He provides his final results in a table on the second page of the article even before he goes into the detailed analysis. In contrast to the Burns and Mitchell table, only monthly dates are given and only for the United States.

The NBER method has been very successful in practice in that it has assumed quasi-official status worldwide. Still, some economists have tried to construct “objective” procedures for dating recessions that do not rely on the judgment and discretion of a committee. Perhaps this view is another form of the “rules versus discretion” movement in economic policy or perhaps it is simply an attempt to achieve finality and put the process in autopilot mode. In any case, the literature contains various proposals for mechanical ways of dating recessions that do not rely on the judgment of individuals or committees. Recognizing the limitations of the two-negative-quarters rule, proponents have endeavored to come up with more sophisticated algorithms that may better approach the desirable characteristics of the NBER methodology.

To sort out recession quarters from expansion quarters, James Hamilton [R6] proposes "A new approach to the economic analysis of nonstationary time series and the business cycle." The idea is to allow for Markovian switching between the two states of the economy in modeling the stochastic process that is assumed to generate real GNP growth. In a Markovian model, only the current state of the economy and the transition probabilities matter, rather than the full history of the variables, and the unobserved values of the model's parameters may be statistically inferred from real GNP data. Hamilton shows that recession dates derived from his method for the United States are very similar to the NBER dates, even though the latter are not used in the derivation. At a quarterly frequency, some of the turning point dates match exactly, though others are off by as many as three quarters. The Markov switching model is conceptually attractive and produces reasonable results, but it is clearly not a perfect substitute for the NBER.

Michael Boldin [R7] compares the Markov switching approach with four other methods of dating business cycle turning points including the NBER approach, the two-negative-quarters rule of thumb and variations, and peaks and troughs extracted from two business cycle indices that were being produced independently at the time the article was published by the U.S. Department of Commerce and by NBER faculty affiliates James Stock and Mark Watson. Using the NBER dates in effect as a benchmark, Boldin finds that the Markov switching and Stock-Watson approaches performed well historically but that all of the mechanical methods had difficulties in identifying the 1990-91 recession. The article ends with the sobering thought that "It is unlikely that a be-all and end-all technique for dating business cycles can ever be developed."

Harding and Pagan propose a more sophisticated variant of the two-negative-quarters rule in the article "A comparison of two business cycle dating methods" [R8], which draws on ideas from earlier research published by the NBER. The authors pit their non-parametric approach against the Hamilton Markov switching model and find that their method approximates the NBER dates more closely. They also argue that the non-parametric approach is more robust because, in contrast to Markov switching, it does not rely on the validity of an underlying statistical model.

One clear conclusion from research in this area is that finding a mechanical model that matches NBER business cycle dates exactly is an elusive goal, even though various models have come close using U.S. data since the 1950s. Perhaps motivated by that observation and perhaps also because of the wide acceptance of NBER dates, Issler and Vahid [R9] turn the focus of most of this research on its head. Instead of trying to find an index variable whose fluctuations match the NBER dates, they use the NBER dates to build a coincident indicator of the U.S. economy. Their method converts the "yes or no" NBER recession indicator into a quantitative variable whose cyclical fluctuations match the NBER dates as closely as possible.

In the final article of this section, Stock and Watson [R10] return many decades later to one of the basic questions raised in Mitchell's early research on business cycle dating. Is it better to employ a top-down approach in which aggregate economic indicators are first examined and sectoral indicators are used later for corroboration or a bottom-up approach in which sectors are

examined first and the results are later aggregated? Using tools from present-day econometrics, the authors tentatively conclude that Mitchell's bottom-up approach is preferable.

3. What causes recessions?

Regardless of how a recession is precisely defined, its occurrence is clearly an undesirable event for most economic participants. Activity in certain industries can be severely impaired and at the aggregate level we see declining output, employment, and profits as well as rising unemployment rates. So, why do recessions happen? As may be expected, some economists blame the government and its institutions for recessions and others blame the private sector.

Monetary policy has often been featured as the villain of the story. We have seen how already in 1837 Lord Overtone implicated the Bank of England as contributing to the adverse effects of recessions if not to recessions themselves. In the United States, a frequent target has likewise been the nation's central bank, the Federal Reserve System. A caveat to this line of reasoning is that the United States experienced recessions long before the Fed was founded in 1913. Nonetheless, we can conceive of the possibility that monetary policy has always played a role if we accept that a decentralized system of money creation is just as much a form of monetary policy as a central bank with a specific structure and functions defined by law. Empirically, the articles referenced here sidestep this issue by considering U.S. data for the period since World War II, when U.S. monetary policy was firmly in the grasp of the Federal Reserve.

Christina and David Romer [R11] take a novel approach to inference about the stance of monetary policy. Instead of relying exclusively on quantitative data, the authors employ a narrative approach whereby they examine documents released by the Federal Open Market Committee (FOMC), in charge of monetary policy decisions at the Fed, to "look for times when concern about the current level of inflation led the Federal Reserve to attempt to induce a recession (or at least a 'growth recession')." The authors find altogether six times at which the Fed made such decisions during their period of analysis and also find statistical evidence that the Fed's actions were indeed followed by slowdowns in the U.S. economy that were more severe than would be expected absent the Fed's actions. In short, they find both intent and consequences.

A few years later, Bernanke, Gertler, and Watson [R12] consider both monetary policy and oil price movements as causes of recessions. Three major recessions in the United States followed soon after oil price shocks that occurred in the 1970s, suggesting a possible causal connection. Using a structural statistical model, the authors attempt to sort out the direct effects of monetary and oil price shocks on the aggregate economy. Their nuanced conclusion points mainly to monetary policy as a cause of the recessions. Specifically, they find that oil shocks per se had no direct causal effect but that the effects of monetary policy reactions to the oil shocks helped generate the recessions. In the causal chain of the story, oil price increases led to higher inflation, which caused the Fed to tighten, which in turn caused slowdowns in the real economy.

An article by Sims and Zha [R13] again poses the question “Does monetary policy generate recessions?” Like the previous reference, this article employs an identified statistical model and comes to a nuanced conclusion. It assumes that monetary policy may either react to ongoing economic conditions or may introduce unexpected shocks, which may reflect a change in approach or simply random decisions unrelated to past or current economic data. The principal conclusion of the article is that most variation in monetary policy is of the reactive type rather than the unpredictable. If there is bilateral causation between policy and the economy, it may be difficult to disentangle cause from effect, but that does not necessarily negate the effectiveness of policy to affect real economic activity.

Drawing on extensive experience as economic advisor at the Federal Reserve Bank of Richmond, Marvin Goodfriend [R14] recounts “How the world achieved consensus on monetary policy.” Goodfriend is not shy about assigning responsibility to the Fed for generating recessions, for example, in “The Volcker Fed brought the inflation rate down to 4 percent by 1984, although it precipitated recessions in 1980 and 1981–82 to do so.” More generally, he examines how concerns about inflation and the Fed’s reactions have led to economic downturns of varying severity. However, he proposes that the greater macroeconomic stability of the post-Volcker era has made it possible for the Fed to engineer mild recessions to stave off inflation and in some cases to avoid recession altogether. It would be intriguing to extend the analysis to the recession that followed shortly after the article was published.

Adrian and Estrella [R15] take a data-driven approach to the question of whether Fed tightening causes recessions. Looking at changes in the federal funds rate as an indicator of Fed monetary policy, they infer the end dates of 13 monetary policy tightening cycles during the period from 1955 to 2005, each following a large sustained increase in the federal funds rate. They then show that 9 of those episodes were followed within 18 months by an NBER-dated recession and that 10 (including the 9) were followed by an increase in the unemployment rate. What distinguishes the remaining three episodes? They were the only ones in which the Treasury 10-year rate was above the 3-month rate, as it is most of the time, when the Fed stopped tightening. We return to this result later when we discuss forecasting recessions.

All in all, the evidence seems clear that monetary policy has the potential to cause recessions and that it has been a significant contributing factor in the United States since the 1950s. One important reason may be a short-run policy tradeoff between inflation control and real economic growth. In fact, several of the foregoing articles suggest that the Fed may have intentionally triggered recessions in order to rein in inflation.

How about fiscal policy? Here too there may be a tradeoff between fiscal responsibility and macroeconomic stimulus, which was the focus of considerable debate during the recession of 2008-09. Allsopp and Vines [R16] consider the proper role of fiscal policy when monetary policy follows a consensus approach that strives for medium-term price stability and short-term real stabilization, not unlike the approach that Goodfriend describes. The article argues that fiscal policy, contrary to what the consensus view may suggest, should not be relegated to a passive role in those circumstances but may be employed in the service of economic stabilization and long-run interest rate determination. The article provides an example of how fiscal policy could

help trigger a recession in a country within the European Monetary Union if the constraints of the Stability and Growth Pact were binding on national fiscal policy.

The real business cycle (RBC) theory of macroeconomic fluctuations dispenses with the need to blame government policies for the occurrence of recessions. In this view, aggregate fluctuations are driven by real shocks, that is, by unexpected changes in the structure of the real economy such as technological innovations. These shocks are then transmitted through the economy over time as a result of dynamic interactions across the various sectors. According to the RBC approach, the economy could undergo something that looks like the observed business cycle even if monetary and fiscal policy had no real effects.

Hansen and Prescott [R17] apply RBC theory to U.S. data to investigate the possibility that technology shocks caused the 1990-91 recession. In contrast to econometric analysis such as that of [R12] and [R13], which is based on statistical estimates of empirical models, RBC proponents typically start with a theoretical model containing parameters whose values are calibrated based on related empirical analysis. The goal is to simulate the calibrated model and produce numerical time-series data whose properties mimic selected characteristics of the actual observed data as closely as possible. In [R17], the authors develop a three-sector model of the U.S. economy and use it to simulate real GNP from 1984 to 1993. A time-series plot of the results follows a pattern very similar to actual real GNP over the period, including a recession at around the same time as in the actual data.

Caggiano, Castelnuovo, and Groshenny [R18] examine the recessionary effects of a different type of shock. In this case, the shock is to the level of uncertainty present in the economy at a macroeconomic level, which may be modeled empirically in alternative ways using financial market data. The results of this article suggest that an uncertainty shock has measurable properties similar to those of a negative demand shock, which could lead to a recession. Moreover, the response of the unemployment rate to uncertainty is found to be larger in recessions than in economic expansions.

Most of the literature on the causes of recessions is based on data for a single country, implicitly assuming that domestic factors are sufficient to explain domestic recessions. Christiansen [R19] takes a broader geographical view of recessions by introducing the concept of “severe simultaneous recessions,” defined as recessions that occur simultaneously in at least half of the six developed countries included in the empirical sample of the article. Conceptually, we could surmise that these multi-country recessions occur as a result of common driving factors or of contagion across countries. The article finds that these types of recessions tend to be more serious than those that are limited to one country. The main focus of this article is on prediction, which is discussed later, but it addresses an international dimension of recessions that is lacking from most of the research in the field.

4. How do recessions end?

If monetary policy is the focus of many theories about how recessions begin, fiscal policy tends to be the main focus as to how they end. Yet, monetary policy is not completely discounted as a means of ending a recession. John Taylor [R20] argues that "… when the economy starts into recession, sharp and rapid interest-rate declines are appropriate." In fact, the celebrated Taylor Rule, unveiled in this article, is in part a mechanism for monetary easing when output falls below potential, and Taylor argues directly that following this technique can "help mitigate recessions."

However, the use of fiscal policy to escape recessions is a much more prevalent argument, particularly since Keynes published his "General Theory" in 1936. During the 2008-09 recession and its aftermath, no economist has been a more vocal proponent of fiscal stimulus than Paul Krugman. In an article [R21] published even before the recession, we find him arguing for a return to an old-fashioned Keynesian approach to fiscal policy. In particular, he suggests that fiscal stimulus is a useful tool when policymakers are facing prolonged economic slumps. He uses the example of Japan to illustrate his point, but the period of sluggish growth that outlasted the subsequent recession in the United States affords further opportunities to consider this policy prescription.

Auerbach and Gorodnichenko [R22] address the question of whether fiscal policy is more or less effective in recessions than in expansions. They employ a statistical methodology based on Markov switching and find that fiscal policy is not only helpful in extricating an economy from recession, but that fiscal multipliers for some types of government spending – the aggregate effect on the economy per dollar spent – are in fact higher during recessions. For example, the multiplier for military spending is estimated to be the largest. These results suggest that fiscal policy is especially effective in attempts by policymakers to end a recession.

5. Labor market effects of recession

When economists look at a single variable to represent the effects of recession, they frequently turn to real output, as in the two-negative-quarters rule and the OECD individual country indicators. However, the adverse effects of a recession on the labor market are significant and also clearly related to the level and growth of real output. In fact, we have seen that the level of employment figures prominently in the list of variables tracked by the NBER and the CEPR. From a labor market perspective, the key problems during recessions are involuntary unemployment and loss of labor income.

Classical economic theory with flexible prices and wages has traditionally found it difficult to model involuntary unemployment in general and in particular during recessions. In contrast, the standard textbook approach to involuntary unemployment assumes that wages and prices are sticky, which results in recessionary unemployment if wages do not adjust sufficiently during recessions for the labor market to clear. Roberts [R23] bridges this gap by proposing a

model that shows that inefficient "recessionary unemployment" is possible in theory even with wage and price flexibility.

A common thread in much of the empirical literature on recessionary unemployment is an attempt to quantify the costs of the inefficiency it generates within the business cycle. Clark, Leslie, and Symons [R24] calculate the labor markets costs of recession by estimating the amount of income that a representative household would be willing to give up to avoid recessionary unemployment. Robert E. Lucas (1987) had performed a similar exercise with a somewhat different measure of cost and had concluded that the amount of income forgone was negligible.[12] In contrast, Clark et al. find that the amount a household is willing to give up is economically significant, with the implication that recessions produce of a large social cost through labor unemployment. The authors trace the difference between their results and those of Lucas to the respective definitions of loss from uncertainty. Lucas estimates the income that households would give up to eliminate cyclical fluctuations, whereas Clark et al. estimate a combination of the fall in expected consumption attributable to unemployment risk and a risk premium associated with household risk aversion.

Macroeconomic models that assume sticky wages often invoke theoretical motivations such as union negotiations, implicit labor contracts, and efficiency wages. Bewley [R25] takes an empirical approach to the search for an explanation of sticky wages. In this reading, he summarizes the results of an extensive survey of "more than 330 business people, labor leaders, counselors of unemployed workers, labor market intermediaries (headhunters), labor lawyers, and management consultants" to try to ascertain why wages are sticky. The full results are presented in a book (Bewley 2002) with the suggestive title "Why Wages Don't Fall during a Recession."[13] The main conclusion of this research effort is that rigidity comes from management, not from workers, in an attempt to preserve morale. Managers in the survey found it preferable to fire workers during a recession rather than cut their wages and leave them disgruntled with the possibility of affecting the morale of others as well.

The next two selections involve the use of longitudinal surveys to trace the long-term effects of recessions. Kahn [R26] examines "The long-term labor market consequences of graduating from college in a bad economy." Data are obtained from a longitudinal survey of youth in the United States that includes tracking of the experience of white males who graduated from college between 1979 and 1989. The results are far from encouraging, suggesting that students graduating in a "worse economy" tend to earn less when they enter the labor market and tend to settle into lower-level occupations.

Davis and Wachter [R27] examine U.S. Social Security longitudinal records from 1974 to 2008 for evidence of cumulative earnings losses resulting from job displacement. Their principal finding is that earnings losses from job displacement during recessions in the sample period, as represented by episodes in which the national unemployment rate was above 8 percent, are twice

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[12] Robert E. Lucas (1987) Models of Business Cycles, Oxford: Basil Blackwell.
[13] Truman F. Bewley (2002) Why Wages Don't Fall during a Recession, Cambridge, MA, USA: Harvard University Press.

as large as losses from mass layoff events when the unemployment rate is below 6 percent. In their estimates, involuntary unemployment always brings a significant cost to wage earners, but the effects are clearly more troubling if they occur during a period of high unemployment such as a recession.

6. Other systemic effects of recession

Beyond the headline figures on real growth and unemployment, the effects of recessions can be pervasive throughout the whole economy. In this section, we take a look at research on systemic effects more broadly and consider possible impacts on industrial organization, financial investments, social relations, and public health. Perhaps surprisingly, not all the effects are detrimental, though some are difficult to pin down.

Schumpeter (1942) proposed that recessions can have positive effects on industries by accelerating the process of elimination of weaker firms, for which he coined the term "creative destruction."[14] Ouyang [R28] looks at two sides of this issue by allowing in his analysis for both a Schumpeterian "cleansing effect" as well as a "scarring effect" left by the destruction of potentially superior firms during their infancy. Calibrating the parameters of a theoretical model, the article concludes that the scarring effect dominates and that it reduces average productivity during recessions. At the very least, this analysis points to the limitations of relying exclusively on Schumpeter's hypothesis to assess the costs of recession in the industrial sector.

An aspect of the impact of recessions where formal research seems to be limited is the effect on financial investments. The bulk of the literature that deals with the relationship between financial asset prices and recessions has focused on the leading indicator properties of financial variables, which is discussed in the next section. That focus makes sense when we recognize that rational market participants need to look ahead when setting prices on financial instruments whose payments are scheduled to take place at various future horizons.

The forward-looking nature of financial asset prices may also explain why it is difficult to identify consistent effects of recessions on these prices. For a simple illustration, consider the value of a single future dividend payment on an equity stake in an industrial firm. We can think of the present value of that payment as the product of the expected cash payment and a discount factor. During a recession, the expected value of the future cash payment may decline. However, the discount factor may have an offsetting higher value since interest rates are likely to fall in a recession. Moreover, the discount factor is also conceptually a function of a risk premium that may increase in the recession, in this case causing the discount factor to fall. The net result of these three effects leaves us with no a priori sense about the direction of the asset price movement in a recession. If we add to the mix the fact that expected cash flow, interest rates, and

[14] Joseph A. Schumpeter (1942) Capitalism, Socialism, and Democracy, New York, NY, USA: Harper and Brothers.

risk premiums each follows its own cyclical timing with phases that may not coincide, the asset price is even less likely to follow a consistent pattern through the recession.

Some articles in the literature have tackled a limited aspect of the effect of recessions on financial asset prices. For instance, Estrella [R29] examines the cyclical pattern of optimal bank capital over the business cycle. In particular, the model looks at the effects of recessions on bank capital when capital is managed optimally and external capital is available to counteract asset losses. Using aggregate data for U.S. banks from 1984 to 2001, the article shows that banks raise more external capital during recessions, but that the new external capital is not enough to offset concurrent losses on bank assets. The net effect is a loss in the value of bank equity during the recession.

Beber and Brandt [R30] investigate an indirect effect of recessions on bond prices. It is clear that prices of U.S. Treasury bonds may be affected by relevant news regardless of the stage of the business cycle. The strategy of this article is to look at expansions and recessions separately and to assess the effects of various types of macroeconomic announcements on bond returns in the two phases of the business cycle. From our perspective, the main result is that during recessions, good news about inflation seems to have the greatest impact on bond returns among the types of news tested.

The next few readings consider a variety of social costs or benefits that may be associated with recessions. These effects do not impact income or employment directly but they affect society as a whole in ways that have the potential to change the level of aggregate welfare. For instance, theory suggests that price collusion by firms reduces the welfare of consumers vis-a-vis the case of perfect competition. Bagwell and Staiger [R31] construct a Markovian model of the business cycle in the style of Hamilton [R6] and investigate how incentives to collude change in the two phases. Their principal finding is that when market demand growth rates are positively correlated over time, the intensity of collusion is weakly procyclical in the sense that collusive prices are higher in expansions and lower in recessions. In this case, we can think of recessions as producing a mild social benefit.

Barlevy [R32] takes issue with the Schumpeterian “cleansing effect” of recessions, as did Clark et al. [R24], but in this case the focus is on the quality of jobs. Through a phenomenon the article calls the “sullying effect” of recessions, the slow pace of creation of more productive jobs makes workers who hold the less productive jobs more likely to remain in place during a recession. They may still search for a better job, but it takes longer to find one in recession than in expansion. The end result does not necessarily lead to lower employment or loss of income directly, but it results in a greater proportion of lower quality, low productivity jobs.

Household formation is an important determinant of housing demand in industrial societies. As offspring become more independent from their parents, there is a tendency for them to move on their own, with a resulting increase in housing demand. Lee and Painter [R33] construct a variety of alternative models to examine the connection between recessions and household formation. Based on calibration of the models using U.S. data, they find consistently across the models that recessions reduce the pace of household formation. The extent of the

reduction is economically significant, with declines in household formation ranging from 1 to 9 percent, depending on the age of young adults during the recessionary period.

Searing [R34] looks into the effects of recession on the more elusive social issue of interpersonal trust. Using data for Latin America from the World Values Survey, an international survey coordinated at the University of Michigan, Searing connects a quantitative measure of interpersonal trust to a set of control variables also available in the survey. Statistical regressions of the measure of trust on variables representing the stage and duration of the business cycle, as well as other control variables, suggest that interpersonal trust increases as recessions grow longer, resulting in a benefit rather than a cost. The regression variables control for confidence in the central government and church attendance, both of which are associated with higher levels of trust.

A common perception in the late twentieth century was that individuals who grew up during the Great Depression tended to be cautious about personal finances and spending. Giuliano and Spilimbergo [R35] elaborate on this theme by investigating whether growing up in a recession has lasting effects on the economic and political views of individuals. Using 1972-2010 data from the U.S. General Social Survey, supplemented by the World Values Survey and a longitudinal survey of 1972 high school graduates, they indeed find statistical evidence that the effect of recessions on beliefs is long-lasting. In particular, they find that "individuals who experienced a recession when young believe that success in life depends more on luck than effort, support more government redistribution, and tend to vote for left-wing parties."

Disruptions caused by recessions can motivate some firms to enact practices intended to improve social well-being. Graddy-Reed and Feldman [R36] examine the responses of for-profit and non-profit enterprises in North Carolina to the 2008-09 recession in terms of social innovation. The latter is measured by alternative "scales of social investment" that quantify increases in the activity of the firms in various types of social practices falling into three general categories: environmental (11 practices), community (13 practices), and employee (13 practices). Results indicate that the "more socially innovative organizations," which have a history of activity in the social practices, tended to introduce further social innovation in all three categories in response to the 2008-09 recession.

The next four readings address the effect of recessions on various health-related issues. Ruhm [R37] goes to the heart of the matter by asking "Are Recessions Good for Your Health?" The simple, perhaps surprising answer is that yes, they seem to be. Using a longitudinal survey from 1972 to 1991 as well as behavioral microdata from 1987 to 1995 for the United States, the article concludes that total mortality, as well as fatalities from 8 of 10 causes examined, tend to fall during recessions. Moreover, the effects are greater for causes and age groups for which behavioral reasons are most plausible, such as motor vehicle fatalities and young adults. One caveat to these results is that long economic expansions, though not shorter ones, are also associated with decreased mortality rates. A second caveat is that Ruhm (2015) finds in follow-

up work that the pattern in recessions is reversed for some causes, including cancer, though it remains the same for cardiovascular disease and transport accidents.[15]

Boone and van Ours [R38] consider a stylized fact that workplace safety seems to improve during recessions and find conflicting evidence by peering below the surface. Their analysis, using data for 16 OECD member countries, suggests that the rate of workplace accidents does not decrease during recessions, but that it is rather the rate at which these accidents are reported that declines. They surmise that reporting an accident has a negative effect on the reputation of a worker and increases the probability that the worker will be fired, in both cases reducing the incentive to report. The effect is particularly strong during recessions, when job security is more vulnerable.

NcInerney and Mellor [R39] return to the question of whether recessions affect mortality rates, but this time focusing the senior population, aged 65 and above. Their main source of information is the U.S. Medicare Beneficiary Survey for the period from 1994 to 2008. In contrast to the earlier literature (Cf., [R37]), they find that mortality increases during recessions among the senior population. In addition, seniors tend to report worse mental health during recessions and there is no tendency to engage in healthier behaviors.

Do declines in disposable income during recessions deter individuals from engaging in costly unhealthy behavior? Using longitudinal data for Canada from 1994 to 2009, Latif [R40] finds that quite the contrary applies to alcohol consumption and smoking during recessions. Results show that a higher unemployment rate has a significant positive impact on alcohol consumption as well as on the likelihood of becoming a binge drinker. Cigarette consumption among daily smokers increases as well, though in this case the higher unemployment rate does not increase the likelihood of becoming a smoker.

On balance, is there a silver lining to recessions from these other systemic effects? Many of them are negative, reinforcing declines in output and employment. The encouraging exceptions are collusive pricing ([R31]), interpersonal trust ([R34]), social innovation ([R36]), and overall public health ([R37]). Even in these cases, however, we have seen that there are caveats to consider.

7. Forecasting recessions

Predicting real economic activity is very difficult in general, and predicting the timing of business cycle turning points and recessions is more difficult still. Judgmental forecasts based on data analysis and econometric forecasts from empirical models – large and small – have been used for a long time but with only limited success.[16]

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[15] Christopher J. Ruhm (2015) 'Recessions, Healthy No More?', Journal of Health Economics, 42, 17-28.

[16] Some of the readings cited in this section, in particular [R56], provide comparative evidence of the record of professional forecasters.

Various lines of research since the late 1980s have focused on the use of financial asset prices to forecast real activity. Financial assets involve future payments and their prices are in principle set by forward-looking market participants who take expected future economic conditions into account. Thus, financial asset prices may be viewed as containing implicit forecasts that may be retrieved with the right procedures. Research tends to confirm this interpretation, though accuracy is not always guaranteed. As economist Paul Samuelson quipped in 1966, the stock market "predicted nine out of the last five recessions!"

Stock and Watson [R41] offer a new method to improve on previous recession forecasts by applying state-of-the-art econometric techniques. The main purpose of their research, sponsored and published by the NBER, was to construct indexes of coincident and leading indicators for the U.S. economy. The underlying premise is that there is a single index of economic activity that can be used to date the business cycle, but instead of assuming that the index is a specific observable variable like GDP, industrial production, or employment, they treat the index as unobservable and infer its value from multiple macroeconomic time series using a dynamic factor model. The result is a single coincident monthly index for the United States constructed from data for industrial production, personal income, sales, and employee hours.

The Stock-Watson leading index is defined as the optimal forecast of the growth rate of the coincident index over a 6-month horizon. The leading index is computed from seven variables with statistically-determined relative weights: three real-economy variables (housing permits, unfilled orders, and part-time work) and four financial market variables (the dollar exchange rate, the 10-year Treasury yield, the spread between 6-month commercial paper and Treasury bill rates, and the spread between the 10-year and 1-year Treasury yields). To forecast recessions, the article first applies a nonparametric rule to the single coincident index to construct a recession indicator that approximates NBER recession dates. The recession index is in the form of a probability of recession six months ahead, derived from the statistical estimates by numerical integration, conditioning on the observed values of the coincident and leading indicators.

The recession forecasting model performs reasonably well within sample. However, as the authors indicate, "Overfitting the data (and the consequent poor out-of-sample performance) is a risk in any empirical exercise, and the danger is particularly clear here." The article discusses some pseudo out-of-sample simulation experiments, but a true real-time test of the model came very soon afterwards with the 1990-91 recession. The results of the model for this recession were less than satisfactory, which led to a thorough reformulation of the leading indicator index in a follow-up article, which eliminated most of the financial variables from the index.[17] The coincident and leading indexes were eventually retired in December 2003, but the basic principle

[17] James H. Stock and Mark W. Watson (1993) 'A Procedure for Predicting Recessions with Leading Indicators: Econometric Issues and Recent Experience', in James H. Stock and Mark W. Watson (eds.) Business Cycles, Indicators and Forecasting, Chicago, IL, USA: University of Chicago Press.

of forecasting recessions with leading indicators in a formal statistical model remained influential in the subsequent literature.

In the late 1980s, a single bond market variable received much attention from economists as a leading indicator of recessions. The variable is computed from yields on U.S. Treasury securities and is known variously as the slope of the yield curve or the term spread. It is calculated simply by taking the difference between a long-term Treasury yield (on a bond with maturity between 10 and 30 years) and a short-term Treasury yield (typically on a 3-month bill). The term spread is easy to obtain quickly in real time at any data frequency, from intra-day to quarterly or beyond, and evidence that it can be used to forecast recessions accurately started soon to accumulate.

Estrella and Hardouvelis [R42] use the term spread (10-year minus 3-month yields) to forecast various measures of real economic activity including real GNP, its components, and NBER-dated recessions. Stock and Watson include a similar spread (10-year minus 1-year yields) in [R41] as one of many variables used jointly to forecast recessions. In contrast, this article uses the term spread as a single predictive variable in a formal forecasting model structured as a probit equation. Results are strong and robust across the various measures of real activity, except for government spending. The authors suggest that the term spread is a good predictor of real growth at predictive horizons between 1 and 7 quarters.

With regard to recessions, the analysis finds statistically significant results with a 4-quarter predictive horizon, for which the power to forecast real growth is also strong. The longer predictive horizon, as compared with [R41], seems to make better use of the information contained in the term spread, and the parsimony of using a single variable addresses the warning from Stock and Watson about the dangers of overfitting. The recession model has proved to be very durable, as some of the subsequent readings show.

Friedman and Kuttner [R43] propose a different financial spread variable as a leading indicator of recessions, namely the difference between 6-month commercial paper and 6-month Treasury bill rates. Like the term spread, the paper-bill spread is one of the seven components of the original Stock-Watson leading index, but this article investigates its properties as a single predictor of real economic growth. The analysis finds that the variable is strongly related to subsequent real growth in single- and multiple-equation models. There is no explicit recession prediction model, but the article compares the average value of the spread over the full monthly data sample from 1959 to 1990, which is 0.57 percent, with its value in months 1 to 6 prior to recessions during the period, which is 0.88 percent. This result suggests that higher-than-normal values of the paper-bill spread may be used to predict recessions over a 6-month horizon. Consistency over time has been an issue for this leading indicator. For example, it did not rise in anticipation of the 1990-91 and 2001 recessions, although it gave a very clear signal before the 2008-09 recession.

The Estrella-Hardouvelis recession forecasting model from [R42] is applied by Estrella and Mishkin [R44] to four European countries and again to the United States. The model uses the term spread for each country to forecast recessions with a 4-quarter horizon, defining the

spread as closely as possible to the variable that proved to be successful in the United States. Empirical estimates cover a shorter sample from 1973 to 1994 in order to have consistent data for all countries, but the term spread was statistically significant for all the European countries (France, Germany, Italy, and the United Kingdom) as well as for the United States. For the United Kingdom and the United States, quasi-official indexes of leading indicators were also available and their predictive performance was compared with that of the term spread. The spread was shown to contain independent information in both cases, as did the U.K. leading index, but the U.S. leading index did not.

In Estrella and Mishkin [R45], the term spread is pitted against a large number of competing leading indicators, including interest rates and spreads, monetary aggregates, leading indicator indexes, and individual components of the leading indexes. The strategy is to apply the Estrella-Hardouvelis recession prediction model to each individual variable and to combinations of variables, and compare the results in both in-sample and pseudo out-of-sample experiments. Estimates use quarterly U.S. data from the first quarter of 1959 to the first quarter of 1995 and results are evaluated primarily on the basis of the Estrella (1998) pseudo R-squared, which is related monotonically to the joint test statistic for significance of the explanatory variables in each model and takes on values interpretable as in the scaling of the ordinary R-squared.[18] Predictive horizons from 1 to 8 quarters ahead are examined.

Within sample, a few of the variables are significant for forecast horizons up to four quarters or slightly more, including the term spread, the monetary base, stock prices, and the Stock-Watson leading index. The paper-bill spread is significant, but only one quarter ahead. The term spread has the strongest results overall, with an R-squared of 30 percent at 4 quarters as compared with 17 percent for the monetary base and 10 percent for the Stock-Watson index over the same horizon. When each of the other variables is included with the term spread in the model, they are generally not significant, with the exception of the stock market at horizons of up to 3 quarters. Out-of-sample results are fairly stark. One quarter ahead, the above variables all perform well, except for the paper-bill spread. The Stock-Watson index leads the group at this horizon with an R-squared of 32 percent. At 2 or more quarters ahead, the term spread dominates. Out-of-sample performance at 4 quarters is about the same as in-sample and the only other variable that helps forecast out of sample is the stock index, but only up to 3 quarters ahead.

Bernard and Gerlach [R46] explore the international dimension further. First, they estimate the Estrella-Hardouvelis model for a larger sample of 8 countries,[19] and they consider the effects of adding the term spread from a different country to the domestic spread in the model. Predictive horizons from 0 to 8 quarters are evaluated and the data sample timeline extends from 1972 to 1993. Results show that the domestic term spread is significant at the 5 percent level in many cases, particularly from 2 to 4 quarters ahead. The only exception is the

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[18] Arturo Estrella (1998) 'A New Measure of Fit for Equations With Dichotomous Dependent Variables', Journal of Business and Economic Statistics, **16** (2), April, 198-205.

[19] Belgium, Canada, France, Germany, Japan, the Netherlands, United Kingdom, and United States.

Netherlands, for which the best performance is registered at the 2-quarter horizon and is significant only at the 10 percent level.

The results of adding either the U.S. or the German term spread to the domestic spread in the equations for the other countries are interesting and suggestive for further research. The U.S. spread is strongly significant for the United Kingdom and mildly significant for Canada, but not for the other countries. The German spread, on the other hand, is strongly significant for Canada, Japan, and the United States. This pattern might be related to the openness of economies or to relationships in international trade and finance, but further work must be done to try to investigate those connections. In the case of the German spread in the model for Japan, the authors hypothesize that simultaneity of recessions may be at play rather than a causal connection.

The wealth of significant results from the yield curve recession models suggests an important role for the term spread in expectations formation for business and government. However, how stable and robust are the results over time and across policy regimes? Estrella, Rodrigues, and Schich [R47] examine the stability of the recession prediction models in Germany and the United States using comparable monthly data for the respective countries from 1967 to 1998. In particular, they test econometrically for unknown breakpoints in the models as well as for breakpoints at particular critical times such as the appointment of Chairman Volcker at the Federal Reserve in 1979. The analysis fails to uncover any evidence of breaks in the recession prediction models for either country at any time during the period. For models that predict industrial production growth rather than recessions, the unknown breakpoint tests uncover mild evidence (at the 10 percent level) of a break in the U.S. model as of September 1983.

Empirical research on forecasting recessions using the term spread marched full speed ahead for more than a decade without waiting for economic theory to catch up. Harvey (1988) had explored a theoretical model in which the real term spread and the real short-term rate (both adjusted for expected inflation) may be used jointly to forecast real consumption growth.[20] This result, while suggestive, differs from the empirical models in three important ways. First, the model forecasts consumption growth rather than recessions, which are defined with reference to the whole economy. Second, the model uses the real term spread as predictor rather than the observable nominal term spread, as in most of the empirical literature. The two would be interchangeable only if expected inflation were constant, which seems unlikely. Third, the Harvey model also requires inclusion of the real short-term rate as a joint predictor rather than just the term spread as in the empirical models.[21]

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[20] Campbell R. Harvey (1988) 'The Real Term Structure and Consumption Growth', Journal of Financial Economics, **22**, 305-33.

[21] Technically, empirical estimates in Harvey (1988) reject the proposed theoretical model. Specifically, the coefficients of the two predictive variables are shown to be the same in theory, but in the estimates they consistently have opposite signs. The article does not report the significance level of these rejections.

Estrella [R48] constructs a theoretical model whose implications closely parallel the empirical predictive relationship between the term spread and recessions. In the model, the nominal term spread is the optimal predictor of the gap between actual and potential real aggregate output. If output starts at potential, a negative value of the spread is equivalent to a forecast of output falling below potential the following year, in other words of a recession. The model suggests that the predictive connection between the term spread and real economic activity is driven both by optimal expectations and by a monetary policy rule similar to the Taylor rule of [R20]. Changes in the parameters of the monetary policy rule may alter the precise values of the parameters of the predictive model, but the relationship between a negative spread and an expected recession is robust to these changes. This feature of the model is consistent with the empirical results of the [R47] reading.

Duarte, Venetis, and Paya [R49] return to the application of the probit term spread recession model to European economies, but with a couple of twists. First, they consider recessions for the euro area in the aggregate. Recessions are dated by a nonparametric method, a variant of the two-negative-quarters rule, which is applied to aggregate growth for the euro area for the period from 1970 to 2000. Interest rates are quarterly averages of 10-year and 3-month rates for each country, combined using purchasing-power-parity weights. The second twist in this article is that the model may contain one of two types of structural breaks. Empirical results show that the model performs well with or without the structural breaks, but that the versions of the model that allow for breaks perform best in pseudo out-of-sample experiments.

The term spread recession model is conceptually very simple, but its application in practice from start to finish contains many technical details that may affect the results. For instance, how is the dependent variable of the model – the recession index – defined? The NBER does not provide the recession variable directly and some definitional decisions are required to produce it. Also, how is the short-term rate computed? Ideally, the short-term rate should be computationally compatible with the long-term bond rate, but bill rates are typically expressed on a different basis from bonds and must be adjusted. A frequent pitfall for the financial media is that they issue reports about yield curve inversions (short-term rate above the long-term rate) using the 2-year rate as the short-term benchmark. The research that points to yield curve inversion as a benchmark is based on the 3-month short-term rate, and indiscriminate substitution of the 2-year rate tends to lead to earlier and longer-lasting inversions, resulting in a biased signal. To clarify the decisions made in earlier research to and facilitate replication, Estrella and Trubin [R50] go carefully over the methodological details of the term spread recession model and its components.

Several researchers have retained the basic form of the recession prediction equation, but have explored the inclusion of different variables that may have predictive power for recessions. Christiansen, Eriksen, and Møller [R51], for example, consider survey measures of consumer and business sentiment. Using monthly U.S. data from 1978 to 2011, they estimate alternative probit equations containing the sentiment variables by themselves, together, and jointly with other predictors such as the term spread, short-term interest rates, the stock market, and factors drawn from a large number of macroeconomic variables. The results suggest that the sentiment

variables contain useful forecasting value even when alternative predictive variables are included in the equation.

Bluedorn, Decressin, and Terrones [R52] examine the predictive power of falling asset prices using the basic form of the recession prediction model. In this case, the model is estimated in a logit rather than a probit equation, but this difference in functional specification is unlikely to produce very different results in general. The three main asset price variables used as predictors in the models are stock price growth, housing price growth, and stock price volatility. Using quarterly data for the G-7 group of industrial countries from 1970 to 2011, the article finds support for all three predictors, even when the term spread and oil price growth are included in the equations. The article also draws a distinction between predicting the start of a recession and predicting its continuation, and provides evidence that the asset price variables are most helpful in predicting the start.

Other research maintains the focus on the term spread as a predictor, but employs different econometric methods. Chauvet and Potter [R53] use Bayesian estimation methods that provide greater modelling flexibility. In particular, they allow the innovation variance to change over the business cycle and include an autoregressive component. Using monthly U.S. data from 1955 to 2000, they conclude that the model has a better in-sample fit than the basic probit model. They also use the 2001 recession as a case study for the implications of the alternative models estimated in the article. In this case, the models without an autoregressive component have the better performance.

Kauppi and Saikkonen [R54] work with dynamic binary response models, which are similar to probit and logit but allow for greater flexibility to introduce lags of the dependent and independent variables. Various dynamic models as well as the basic probit model are estimated with quarterly U.S. data from the fourth quarter 1955 to the fourth quarter 2005. In the empirical results, the more flexible dynamic specifications outperform the standard probit model in-sample. To guard against the possibility of overfitting, the article executes pseudo out-of-sample experiments that also give the edge to the dynamic models.

Österholm [R55] departs from the earlier literature with respect to both the econometric method and the predictive variables selected. The model tested is a Bayesian VAR, which combines the features of vector autoregression with the ability of Bayesian models to evaluate probabilities of events involving the variables of the model. The variables included in the VAR are real GDP growth, inflation, a short-term rate, consumer sentiment, business sentiment, oil price changes, and a measure of tightening of bank lending. This model is estimated using quarterly U.S. data from 1982 to 2008. The main conclusion is that the model performs poorly with regard to forecasting the 2008-09 recession, which leads to a suggestion to stay with the models that predict recessions well, such as the basic term spread model.

As noted earlier, professional forecasters do not exactly have an illustrious record of predicting recessions. Rudebusch and Williams [R56] present historical evidence of that record obtained from the U.S. Survey of Professional Forecasters and compare the performance of the survey with the simple term spread model from 1968 to 2007. The article points to an enduring

puzzle that may be formulated in the form of a question: if the term spread performs so well historically and professional forecasters presumably use all available information, why does the term spread consistently outperform the survey? Perhaps another survey is needed to answer this question.

8. Identifying recessions in real time

The term "real time" has to be loosely interpreted when applied to the identification of recessions. For one, it takes a lot of time and effort to collect aggregate output data. For example, U.S. GDP, which is probably available as promptly as any in the world, is reported by the government in dribs and drabs, first as advance estimates, then as revised estimates. Eventually, the final figures are released, but even then there is a possibility of further revisions, perhaps years down the line. A true direct real-time measure of U.S. recessions is thus all but impossible. The best that economists have been able to accomplish so far is to produce estimates of current economic growth from available data for past periods, relying as much as possible on data with shorter reporting lags.

Chauvet and Piger [R57] construct real time recession estimates using two alternative models that extend, respectively, the nonparametric approach of Harding and Pagan [R8] and the Markov switching approach of Hamilton [R6]. The models are used to simulate real-time identification of NBER turning point dates associated with the four recessions that started in 1980, 1981, 1990, and 2001. Results show that the Markov switching model has an edge as far as conforming more closely to the NBER dates, with estimates generally within one month of the corresponding NBER turning point. Both models are quicker than the NBER to identify cyclical troughs (ends of recessions), in one case beating the NBER announcement by more than one year. Still, identification of troughs comes at best about 6 months after the trough itself. For NBER peaks (starts of recessions), which may be more important to forecast, the results are not as impressive. Lead times over the NBER announcements, if any, are relatively small and identification of peaks lags the NBER announcement more often than not.

Hamilton [R58] examines a greater variety of model specifications that may be used to identify business cycle turning point dates in real time. Comparing the models' timing with the NBER as in the previous reference, he expresses cautious preference for a Markov switching model based on GDP alone, which nevertheless "could clearly be improved upon" according to the author. Qualitatively, results for this model are generally similar to those of the previous reference. The GDP-based model identifies troughs earlier than the NBER in 3 of 5 cases, in one case by one year. For peaks, the model's identification predates the NBER announcement in only 2 of 5 cases. In the cases in which the model comes in first, however, it estimates the date of the peak to be 3 quarters earlier than the NBER date. In light of the disappointing results of these articles, Hamilton's call for further research in this area seems very sensible.

9. Managing the individual risks of recession

Several earlier references attribute to central banks the power to create recessions, and they further claim that central banks have deliberately created recessions in order to keep inflation under control. If that view is correct, recessions are most likely an inescapable recurring feature of modern economic life. Confronted with that reality, rational households and businesses would be expected to take precautions in anticipation of possible recessions and to have in store optimal plans of action to be executed once a recession is underway. The articles in this section examine the optimizing behavior of firms before and during recessions.

In the model of Ang and Smedema [R59], firms have an optimal time-varying amount of desired financial flexibility, which fluctuates cyclically as a function of the probability of a recession 12 months ahead, among other factors. A higher probability of recession increases the desire of the firm to hold cash or other liquid assets in anticipation of losses in case of recession. If changes in financial flexibility are costly, the firm makes a partial adjustment each period to the desired level of financial flexibility. Using U.S. data from 1980 to 2008, the authors obtain econometric estimates of various alternative specifications of the model, which they use to inquire whether U.S. firms act optimally as in the model. Aggregate results suggest that firm behavior is suboptimal in that they tend to ignore forecasts of upcoming recessions. However, when the sample is disaggregated into cash-constrained and unconstrained firms, results for the latter are consistent with optimization, while cash-constrained firms are unable to optimize, which clouds the aggregate results.

Caballero and Hammour [R60] model the response of firms once a recession is underway and its consequences for an industry in the aggregate. The model incorporates the Schumpeterian view of creative destruction, but here there is also a response along another margin with different implications. Units that are technologically outdated are scrapped, as in Schumpeter's approach, producing what the authors term the "cleansing effect" of recessions. However, there is also a "creation margin" in which firms respond to a reduction in demand by cutting back on the creation of new units endowed with up-to-date technology if the process of creation is costly. This second effect may insulate some of the outdated units that would otherwise be eliminated, since firms may be unable to replace them on a cost-effective basis.

Using a calibrated version of the model, the article explores implications for job creation and job destruction and compares the quantitative results with actual U.S. data from 1972 to 1983. The model matches job destruction more closely than job creation, but the relative smoothness of job creation over the business cycle matches a stylized fact about the data. Variation along the creation margin is attenuated by costs, as in the theoretical model, partly insulating the outdated units and reducing the cleansing effect of recessions.

10. Concluding remarks

The concept of recession, if not the terminology and its exact definition, may be traced well back into the nineteenth century. However, it was not until early in the twentieth century

that the pace of research activity in this area started to intensify, largely through the efforts of Wesley Clair Mitchell and his collaborators. Researchers at the NBER have continued to follow in their footsteps since then, providing continuity as well as investigating new methods that could improve our knowledge of recessions. Another intensification of the pace of research came in the late 1980s, initially with a focus on forecasting but later expanding into many specialized subtopics. As we now survey the 8 questions posed in this introduction, we may not always have definitive answers, but research achievements have led to a higher level of understanding, cut through some of the earlier misperceptions, and produced results of genuine practical value.

Nevertheless, the work is far from done, even with regard to some of the basics. Can the definition of recession be made more transparent while retaining the fundamental guiding principles of the NBER approach and avoiding hopelessly simplistic methods? Can economists worldwide achieve consensus on methods of business cycle dating so that uniformly-defined dates can be set for each industrial economy? Many of the articles in the collection show that some empirical relationships have been robust across recessions while others have not. Can economic theory explain these differences?

In the end, should economic researchers pay more attention to the economics of recession? Recessions in the United States account for under 15 percent of the time elapsed since the 1950s, but that does not imply that economists should only be interested in recessions less than 15 percent of the time. Better understanding of recessions could reduce that proportion even more, or could perhaps lead to the conclusion that recessions are necessary for Schumpeterian or for monetary policy reasons.

In terms of modeling and conceptual understanding, we could try to distinguish more effectively between the common features of all recessions and the particular characteristics of each. Recessions do not repeat themselves but, as Mark Twain might have said, they sometimes almost rhyme. Many of the present readings find statistical regularities associated with all recessions. Others examine particular recessions, including the “Great Recession” of 2008-09, on which more work is still underway. In this connection, a topic of great potential interest is the role of financial markets and institutions in recessions. Some of our readings have considered aspects of this issue, but it seems to be an area of research where much more can be done.

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