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Article

Fiscal stress and inflation

NBER Reporter Online

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National Bureau of Economic Research (NBER), Cambridge, Mass.

Suggested Citation: Leeper, Eric M. (2011) : Fiscal stress and inflation, NBER Reporter Online, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. 2, pp. 12-14

This Version is available at:

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how maintain stability in the Middle East, meeting the world's growing thirst for oil poses a daunting challenge for the next decade.

¹ J. Hamilton, "Understanding Crude Oil Prices," NBER Working Paper No. 14492, November 2008, and Energy Journal 30 (2009, no. 2), pp. 179–206, and "Causes and Consequences of the Oil Shock of 2007–08," NBER Working Paper No. 15002, May 2009, and Brookings Papers on Economic Activity (Spring 2009), pp. 179–206.

² J. Hamilton, "Historical Oil Shocks," NBER Working Paper No. 16790, February 2011.

³ J. Hamilton, "Oil and the Macroeconomy since World War II," Journal of Political Economy (April 1983), pp. 228–48.

⁴ J. Hamilton, "A Neoclassical Model of Unemployment and the Business Cycle," Journal of Political Economy 96 (June 1988), pp. 593–617, and T. Bresnahan and V. Ramey, "Segment Shifts and Capacity Utilization in the U.S. Automobile Industry," NBER Working Paper No. 4105, June 1992, and American Economic Review Papers and Proceedings 83 (1993, no. 2), pp. 213–18.

⁵ P. Edelstein and L. Kilian, "How Sensitive Are Consumer Expenditures to Retail Energy Prices?" Journal of Monetary Economics 56 (2009, no. 6), pp. 766–79.

⁶ V. Ramey and D. Vine, "Oil, Automobiles, and the U.S. Economy: How Much Have Things Really Changed?" NBER Working Paper No. 16067, June 2010, and forthcoming, NBER Macroeconomics Annual.

⁷ J. Hamilton, "Causes and Consequences of the Oil Shock of 2007–08," NBER Working Paper No. 15002, May 2009, and Brookings Papers on Economic Activity (Spring 2009), pp. 179–206.

⁸ J. Hamilton and M. Owyang, "The Propagation of Regional Recessions," NBER Working Paper No. 16657, January 2011, and forthcoming, Review of Economics and Statistics.

⁹ J. Hamilton, "What Is an Oil Shock?," NBER Working Paper No. 7755, June 2000, and Journal of Econometrics 113 (April 2003), pp. 363–398.

¹⁰ J. Hamilton, "Nonlinearities and the Macroeconomic Effects of Oil Prices," NBER Working Paper No. 16186, July 2010, and forthcoming in Macroeconomic Dynamics.

Fiscal Stress and Inflation

Eric M. Leeper *

There is growing concern that inflation worldwide is rising. Among the factors that are cited as potential contributors are expansionary monetary policies in the United States, the United Kingdom, and the Euro Area; rapid economic growth in emerging economies; and increases in value-added taxes and commodity prices. In a sequence of recent papers, I suggest another potential culprit: looming fiscal stress and uncertainty about how policies will adjust to resolve that stress.

Populations in advanced economies are aging and governments have promised substantially more old-age benefits than they have made provisions to finance. The table below summarizes the "unfunded liabilities" problem that countries face. Overall, the

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G-20 countries have made spending promises that exceed financing plans and reach as much as 400 percent of their GDP. When the Congressional Budget Office rolls spending commitments and current revenues into debt accumulation, its debt projections are similar to those shown in the figure below.¹

What happens next is uncertain. Some policies must adjust, and the fact that bondholders continue to value U.S. federal debt implies that investors expect that policies eventually will adjust. The eventual adjustments will be large. My coauthors and I are therefore pursuing a line of research with three key features: 1) policy regime changes can and do occur; 2) the timing and nature of future regimes are uncertain; and 3) a complete picture requires studying fiscal and monetary policies jointly.² Each factor operates strongly through expectations.

To motivate this research, some background on monetary-fiscal interactions is helpful. At a general level, monetary and fiscal policies have two tasks to perform: control inflation and stabilize the value of gov-

ernment debt. There is a beautiful symmetry between the two policies. The conventional assignment—call it *Regime M*—tasks monetary policy with controlling inflation and fiscal policy with stabilizing debt. But an alternative assignment—*Regime F*—has monetary policy maintain the value of debt and fiscal policy control inflation. Regime F characterizes the U.S. policy mix leading up to the 1951 Treasury Accord and, arguably, describes recent policies.³ Many economists regard Regime M as the normal state of affairs and have studied it extensively.

Macroeconomists often equate Regime F to Sargent and Wallace's (1981) "unpleasant monetarist arithmetic" regime. They infer that it necessarily leads to high inflation rates, and they dismiss it as irrelevant to advanced economies with independent central banks.⁴ But the fiscal theory of the price level is an alternative policy mix that delivers Regime F without necessarily producing the extremely high inflation rates associated with unpleasant arithmetic. This theory plays off the fact that the vast majority of

Country	Ageing-Related Spending
Australia	482
Canada	726
France	276
Germany	280
Italy	169
Japan	158
Korea	683
Spain	652
United Kingdom	335
United States	495
Advanced G-20 Countries	409

Net present value of the impact on fiscal deficits of ageing-related spending as a percent of GDP

Source: International Monetary Fund, “Fiscal Implications of the Global Economic and Financial Crisis,” IMF Staff Position Note SPN/09/13 (2009).

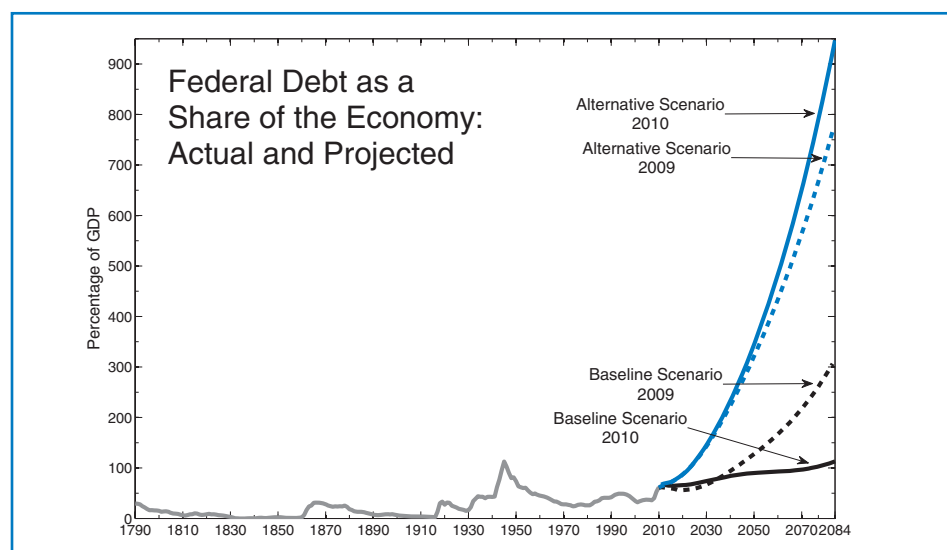
government debt issued by advanced economies is nominal—denominated in domestic currency—so that changes in the price level can change the value of outstanding debt.⁵ If fiscal policy does not consistently raise the present value of primary surpluses whenever debt rises and monetary policy does not consistently combat rising inflation with sharply higher nominal interest rates—that is, does not always obey the Taylor principle—then a fiscal theory equilibrium emerges. Fluctuations in current and expected surpluses feed directly into current or future inflation and monetary policy stabilizes debt by preventing higher inflation from transmitting into still higher nominal interest rates and, therefore, real debt service.

One example demonstrates the economic mechanisms in Regime F: consider a one-time increase in transfers (or a cut in taxes), financed by new nominal debt issuance. With no offsetting increase in current or expected tax obligations, households feel wealthier at the initial price level and try to increase their consumption. Higher demand for goods drives up the price level—reducing the value of debt—and continues to do so until the wealth effect dissipates and households are content with their original consumption plan. News of higher future transfers (or lower future taxes) sets off the identical chain of events, so the current price rises to equate the value of outstanding debt to the lower expected discounted surpluses.⁶

Our research on fiscal stress feeds the Congressional Budget Office’s projections of federal government transfers—Social Security, Medicare, and Medicaid—into a variety of formal models, but treats those transfers as “promised.” These promises are initially honored and paid for with debt sales and distorting taxation. As marginal tax rates rise, though, the private sector grows increasingly disgruntled, increasing the probability that the economy will hit its *fiscal limit*—the point at which political resistance prevents taxes from continuing to rise.

Promised transfers continue to grow relentlessly, so further policy adjustments must occur. We posit that people ascribe some probability to Regime M—where monetary policy targets inflation and entitlements reform stabilizes debt—and some probability to Regime F—where promised transfers are delivered and monetary policy stabilizes debt. Uncertainty plays a crucial role in agents’ decisions, as probability distributions describe both the fiscal limit and future regimes. We compute rational expectations equilibria, which require that policies be sustainable in the long run.⁷

Several robust implications for inflation emerge from this research. First, if people believe that Regime F could occur in the future, then the central bank loses control of actual and expected inflation. A higher likelihood of Regime F, even if the regime is temporary, produces a larger increase in inflation. Second, effects on inflation from fiscal stress can be small and gradual or large and sudden, depending on agents’ beliefs about possible future policy regimes. Small and gradual effects can be difficult to glean from early warning signals of inflation, such as long-term interest rates, particularly because the effects arise through expectations of distant policy adjustments. Third, because larger accumulations of debt produce larger run-ups in inflation, postponing eventual



Actual and projected U.S. federal government debt as a share of GDP
Source: Congressional Budget Office, The Long-Term Budget Outlook, Washington, D.C. (2009 and 2010).

fiscal adjustments raises inflation risks. Finally, even when long-run expectations are anchored on Regime M—where monetary policy can control inflation perfectly—the central bank’s loss of inflation control can be dramatic along the transition path.

This research demonstrates that inflation can arise for *fiscal* reasons that are beyond the control of independent central banks. It also suggests that efforts by central banks to offset fiscally-induced inflation through more aggressive monetary policy cannot succeed if fiscal policies and their expectations are inconsistent with the central bank’s inflation goals.

¹ *The CBO posits a constant inflation rate over the projection period, implying that inflation achieves some target level throughout.*

² H. Chung, T. Davig, and E.M. Leeper, “Monetary and Fiscal Policy Switching,” NBER Working Paper No. 10362, March 2004, and *Journal of Money, Credit and Banking* 39(4), 2007, pp. 809–42; T. Davig and E.M. Leeper, “Fluctuating Macro Policies and the Fiscal Theory,” NBER Working Paper No. 11212, March 2005, and in NBER Macroeconomics Annual, vol. 21, D. Acemoglu, K. Rogoff, and M. Woodford, eds., Cambridge: MIT Press, 2006, pp. 247–98; T. Davig and E.M. Leeper, “Monetary-Fiscal Policy Interactions and Fiscal Stimulus,” NBER Working Paper No. 15133, July 2009, and *European*

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³ For a derivation of these two policy regimes, see E.M. Leeper, “Equilibria Under ‘Active’ and ‘Passive’ Monetary and Fiscal Policies,” *Journal of Monetary Economics* 27(1),

1991, pp. 129–47. Pre-Accord policies are discussed in M. Woodford, “Fiscal Requirements for Price Stability,” NBER Working Paper No. 8072, January 2001, and *Journal of Money, Credit and Banking* 33(3), 2001, pp. 669–728. Recent policies are examined by J.H. Cochrane, “Understanding Policy in the Great Recession: Some Unpleasant Fiscal Arithmetic,” NBER Working Paper No. 16087, June 2010, and *European Economic Review* 55(1), 2011, pp. 2–30.

⁴ T.J. Sargent and N. Wallace, “Some Unpleasant Monetarist Arithmetic,” *Federal Reserve Bank of Minneapolis Quarterly Review* 5 (Fall), 1981, pp. 1–17.

⁵ Sargent and Wallace rule out the fiscal theory a priori by using perfectly indexed debt.

⁶ Sticky prices and long-term bonds alter the inflation dynamics, but not the underlying economic logic.

⁷ This work takes sovereign debt default off the table, which is reasonable for the United States, but suspect for other countries. Some recent work connects fiscal limits to the probability of default: H. Bi, “Sovereign Risk Premia, Fiscal Limits and Fiscal Policy,” CAEPR Working Paper No. 007-2010, Indiana University, May 2010; H. Bi and E.M. Leeper, “Sovereign Debt Risk Premia and Fiscal Policy in Sweden,” NBER Working Paper No. 15810, March 2010; H. Bi, E.M. Leeper, and C. Leith, “Stabilization versus Sustainability: Macroeconomic Policy Tradeoffs,” manuscript, Indiana University, November 2010.

Evaluating the Impact of Social Security

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Although pressing issues, from immigration to national security, can capture the

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attention of policymakers from year to year, the problems associated with the fiscal consequences of an aging population are always looming in the background. The eventual impact of Social Security and Medicare on the long-run budget in the United States is likely to be substantial. But, the problems facing other OECD countries are

perhaps even more severe. Birth rates elsewhere are lower, meaning that fewer workers will be paying for the benefits of retirees. Moreover, the share of retirement benefits provided through the state is higher in many other OECD countries than in the United States.¹

In light of these pressures, many coun-