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# WORKING PAPER

## IMPROVING THE ACCURACY OF U.S. GOVERNMENT DEBT ESTIMATES

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## **Improving the Accuracy of U.S. Government Debt Estimates**

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*U.S. government estimates suggest that growing public debt threatens the stability of the financial system. However, there is wide variability across estimates of the size and trajectory of federal debt levels and the forecasting track record is poor. This paper analyzes the differences among estimates and argues that modeling innovations are needed to improve public financial policy making and administrative management. The Government Accountability Office should take a lead role in coordinating new investments in economic and financial research across the U.S. government.*

There is broad consensus among American citizens, elected representatives, and federal administrators that the U.S. government is on a fiscally unsustainable path: Our national debt is currently 62 percent of the value of all goods and services produced in the U.S. economy and, absent concerted action, it could reach an amount in excess of 100 percent of gross domestic product (GDP) by 2020, threatening stability and prosperity at home and abroad.<sup>1</sup>

While there are many challenges associated with improving the U.S. government's financial position, experience demonstrates that progress can be achieved with effective budgeting, financial planning, and policy making. However, each of these exercises requires sound estimates of needs, events, and trends: We can't make good decisions about allocating and managing public revenues if we do not have a good understanding of our current situation and how it may change over time.

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<sup>1</sup> In this paper we define national debt as all debt held by the public, which is the amount the government borrows in financial markets by issuing short and long-term debt securities. Governments borrow for investment, to smooth operating cash flow, and to finance consumption that exceeds current revenues. While governments may repay debt by selling assets, it is more common to repay debt with revenues, which increase when the economy grows. Hence it is common to analyze government debt as a percentage of national income, which indicates the extent of leverage on future public revenues. For a more detailed overview of U.S. government debt and deficits, see Polski and Nutter (2010).

## **Who Is Responsible For Debt Estimates and What Are Their Forecasts?**

Every operating unit in the federal government makes estimates and projections of federal spending requirements that are germane to their function; however, there are three offices that are responsible for consolidating these discrete analyses and making whole-of-government, whole-of-economy estimates of revenues and spending: the Office of Management and Budget (OMB), the Congressional Budget Office (CBO), and Government Accountability Office (GAO).

The OMB, which reports to the president and is required by law to support the implementation of the president's policy vision across the executive branch, produces a rolling 10-year estimate of annual deficits and accumulated debt as part of the president's annual budget.

The Congressional Budget Office is legally mandated to provide the Congress with objective, nonpartisan, and timely analyses to aid in economic and budgetary decisions. The CBO makes three debt estimates: the Baseline Estimate (10 years), the Extended Baseline Estimate (25 years), and an Alternate Estimate (25 years).

The GAO is the audit, evaluation, and investigative arm of Congress. Its mission includes examining the use of public funds; evaluating federal programs and policies; and providing analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. Unlike the OMB and the CBO, the GAO is not responsible for developing policy and program assumptions and making budget estimates. However the GAO comments on the budget assumptions made by the OMB and the CBO, and it conducts two simulations based on its own assumptions that include levels of federal debt and deficits that project outcomes over 75 years: the Baseline Extended simulation and the Alternative simulation.

The OMB, CBO, and GAO each estimate that federal debt held by the public will increase over the next 25 years, however there is considerable variability across their forecasts: Measures of FY 2010 federal debt levels range from 61.4 percent to 62.2 percent of gross domestic product (GDP). Long-term estimates vary even more widely, ranging from 79 percent to 237.1 percent of GDP in 2035.

Table 1 shows U.S. government forecasts of debt as a percentage of GDP at December 31, 2010 and every five years thereafter through 2035. The GAO Baseline Estimate is the most

optimistic of the estimates for 2010 whereas the OMB estimate is the most pessimistic. Looking forward, the CBO Extended Baseline estimate is consistently the most optimistic of the estimates; the GAO Alternate is the most pessimistic. And, while the OMB estimate is more pessimistic than the CBO estimate, it tends toward a more optimistic view of debt accumulation.

**Table 1: U.S. Government Estimates of Debt as a Percent of GDP 2010–2035<sup>2</sup>**

	2010	2015	2020	2025	2030	2035
OMB (1)	62.2	76.1	76.7	NA	NA	NA
CBO Baseline (2)	62.1	74.9	76.2	NA	NA	NA
CBO Extended Baseline (3)	62.0	65.0	66.0	69.0	74.0	79.0
CBO Alternative (3)	62.0	72.0	87.0	112.0	146.0	185.0
GAO Baseline Extended (4)	61.4	66.5	68.9	78.7	97.5	125.6
GAO Alternative (4)	61.6	84.1	110.5	142.4	184.7	237.1

Sources:

- (1) OMB. Budget of the U.S. Government Fiscal Year 2012. February 14, 2011
- (2) CBO. The Budget and Economic Outlook Fiscal Years 2011-2021. January, 2011
- (3) CBO. The Long Term Budget Outlook Supplemental Material Fig. 1-2. June, 2010
- (4) GAO. [www.gao.gov/special.pubs/longterm/data.html](http://www.gao.gov/special.pubs/longterm/data.html)

### **Why Is There So Much Variability Across U.S. Government Debt Estimates?**

No one has, or can hope to have, complete or perfect knowledge about the future or the impact of the decisions we take today on future revenues and spending: major sources of uncertainty at present include legislative actions, particularly with respect to tax rates and spending; economic growth, which affects incomes, revenues, and prices; military and emergency discretionary spending; and health care spending.

Given inherent uncertainty, the best we can do is to make a broad range of educated assumptions and simulate the future: it is these assumptions and simulations that explain the significant differences among OMB, CBO, and GAO estimates. Detailed explanations of the assumptions underlying these estimates are provided in the agencies’ outlook reports, but

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<sup>2</sup> Note the following for comparison purposes in table 1 and table 2: the CBO Baseline figures were updated in a January 2011 report. CBO does not update their Alternate and Baseline Extended figures until the summer, so those projections in this report are reflective of the 2010 CBO Baseline projections. Similarly, the last GAO update was in Fall 2010, so those numbers are reflective of the CBO’s August 2010 update to the Baseline projections.

generally the differences, which are summarized in table 2, are intentional efforts to identify a wide range of possible revenue and spending outcomes and they reflect the underlying policy missions of the organizations:<sup>3</sup>

- OMB estimates extend over the medium term (5–10 years) and assume that the president’s policy proposals are enacted.
- CBO Baseline and Extended Baseline revenue and spending estimates are intended to be a benchmark for assessing policy impacts over the medium and long-term (over 10 years) rather than a forecast: by statute, the CBO must assume that laws are implemented as currently specified and that funding for entitlement programs is adequate to make all payments.<sup>4</sup> CBO Alternative estimates relax these assumptions.
- GAO simulations are estimates of what might happen to federal deficits and debt levels under varying assumptions over a very long period: GAO’s long-term model was developed in response to a bipartisan request from members of Congress who were concerned about the long-term effects of fiscal policy. Unlike OMB estimates, which assume that the president’s policy preferences are enacted and have their intended effects, or CBO estimates, which assume that existing laws will remain in place and have their intended effects, the GAO is free to challenge OMB and CBO estimates by making alternative assumptions about policies and events.

No matter who estimates debt and deficits, they must make three types of assumptions: 1) assumptions about policy choices, 2) assumptions about the impacts of policy choices, and 3) assumptions about behavior and events. For example, assumptions about tax rates, inflation,

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<sup>3</sup> See OMB, Budget of the U.S. Government Fiscal Year 2012, February 2011; CBO Budget and Economic Outlook Fiscal Years 2011–2021, January 2011 (Baseline estimate); CBO Long Term Budget Outlook Supplemental Material figure 1-2, June 2010 (Extended Baseline and Alternative estimates); GAO, The Federal Government’s Long-Term Fiscal Outlook, Fall 2010 Update. GAO simulation data is based on CBO assumptions for Social Security and Medicare, which are more conservative than those of the Social Security Trustees, available at [www.gao.gov/special.pubs/longterm](http://www.gao.gov/special.pubs/longterm).

<sup>4</sup> Section 257 of the Balanced Budget and Emergency Deficit Control Act of 1985, PL99-177 as amended; U.S. Code 907.

interest rates, discretionary spending, and mandatory spending are tied to past, present, and future policy choices. We can collect facts about past and present policy choices but we cannot provide a fact base for future policy choices.

However, assumptions about rates of economic growth and unemployment are assumptions about the impacts of policy, economic behavior, and various natural and human events. Economic growth and employment rates arise from very complex systems of behavior that is not well understood and for which there is very little consistent evidence to support alternative assumptions about the relationship between policies, events, and impacts. Until we further develop our knowledge in these areas, we cannot provide a reliable fact base for assumptions about the future impacts of past or present policy choices.<sup>5</sup>

For example, if our policies allow us to collect social insurance such as Social Security at particular ages or under specific circumstances, accurate estimates of claims behavior requires investigating the factors that influence claims decisions: we need to understand why people collect social insurance, when they will claim it, and what factors influence their choice. If life expectancy increases and we are physically able, will we defer claims? If tax, inflation, or interest rates change, will we be more or less likely to claim social security benefits? If most of our social group collects social insurance are we more or less likely to choose to claim it as well? How will a change in the business cycle, a natural disaster, or terrorist attack affect the likelihood that we will collect social insurance?

The best estimates of debt and deficits are based on realistic assumptions about political and economic behavior in complex social systems: what does the forecasting track record suggest about our current grasp of these matters?

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<sup>5</sup> The kinds of empirical investigations that underpin these assumptions include demonstrating the actual (versus theoretical) relationship between tax, inflation, interest, and fiscal policies and growth and unemployment. For a more detailed exploration of the research effort required to better understand the relationship between human choice, policies, and events, see Polski (2008).

**Table 2: Differences Among Assumptions**

<b>Assumptions used to obtain debt estimate (Debt Estimate as a Percent of GDP in 2020)</b>	<b>CBO Extended Baseline (66%)</b>	<b>GAO Extended Baseline (68.9%)</b>	<b>CBO Baseline (76.2%)</b>	<b>OMB (76.7%)</b>	<b>CBO Alternative (87%)</b>	<b>GAO Alternative (110.5%)</b>
Tax Policy	Tax cuts expire	Follows CBO Extended Baseline to 2020; revenue constant at 21.0% of GDP thereafter	Tax cuts extended through 2012	Tax cuts extended through 2012	Tax cuts extended & policy evolves so that revenues are at 19% GDP	Tax cuts extended to 2020 & AMT exemption indexed to inflation; revenues at 18.1% of GDP thereafter
Economic Growth (Change in Real GDP)	2020–2083: average annual rate of 2.2%	GDP is determined by the labor force, capital stock, and total factor productivity. GDP does not respond to changes in fiscal policy	2010: 2.8%; 2011: 2.7%; 2012: 3.1%; 2013-16: 3.4%; 2017-21: 2.4%	2010: 11: 2.7%; 2012: 3.6%; 2013: 4.4%; 2014: 4.3%; 2015: 3.8%; 2016: 3.3%; 2017: 2.9%; 2018: 2.6%; 2019-21: 2.5%	2020–2083: average annual rate of 2.2%	Same as GAO Extended Baseline
Inflation (Change in Consumer Price Index)	2020–2083: average annual rate of 2%	Follows CBO Extended Baseline to 2020; 1.8% in each year thereafter	2010-11: 1.6%; 2012: 1.3%; 2013-16: 1.9%; 2017-21: 2.3%	2010: 1.6%; 2011: 1.3%; 2012: 1.8%; 2013: 1.9%; 2014-15: 2.0%; 2016-21: 2.1%	2020–2083: average annual rate of 2%	Follows CBO Extended Baseline to 2020; 1.8% in each year thereafter
Unemployment Rate	2020–2083: average annual rate of 4.8%	Uses the intermediate unemployment rate projections found in the 2010 Social Security Trustees Report: 2010: 10% 2011: 9.5% 2012: 8.6% 2013: 7.7% 2014: 7.0% 2015: 6.3% 2016: 5.8% 2017: 5.6% 2018-85: 5.5%	2010: 9.6%; 2011: 9.2%; 2012: 8.2%; 2013-16: 5.3%; 2017-21: 5.2%	2010: 9.6%; 2011: 9.3%; 2012: 8.6%; 2013: 7.5%; 2014: 6.6%; 2015: 5.9%; 2016: 5.5%; 2017-21: 5.3%	2020–2083: average annual rate of 4.8%	Same as GAO Extended Baseline

Interest Rates (Ten-Year Treasury Note Rate)	2020–2083: average annual rate of 3.0% (about equal to the average rate observed over the past 50 years)	Follows CBO Extended Baseline to 2020; 5.1% in each year thereafter	2010: 3.2% 2011: 3.4% 2012: 3.8% 2013-16: 4.7% 2017-21: 5.4%	2010: 3.2% 2011: 3.0% 2012: 3.6% 2013: 4.2% 2014: 4.6% 2015: 5.0% 2016: 5.2% 2017-21: 5.3%	2020–2083: average annual rate of 3.0% (about equal to the average rate observed over the past 50 years)	Same as GAO Extended Baseline
Discretionary Spending	As projected in Baseline through 2020; 2020 level as share of GDP thereafter	Follows CBO Extended Baseline to 2020 then grows with GDP at constant rate of 7.0% of GDP	Spending rises with inflation		As projected in Baseline through 2013; 2010 level as share of GDP thereafter	Grows with GDP at constant rate of 8.6% of GDP
Mandatory Spending	Cuts in Medicare Physician fees occur as scheduled; Medicare & Medicaid increases 7% per year 2011–2020; x% per year 2020–2035.	Follows CBO Baseline Extended to 2020 then holds other spending constant as a share of GDP (2.3%). Social Security spending after 2020 based on 2010 Social Security Trustees; Medicare spending after 2020 increases 1.0% faster than GDP per capita; Medicaid spending after 2020 based on 2010 Medicare Trustees' intermediate projections	Cuts in Medicare Physician fees occur as scheduled; Medicare & Medicaid increases 7% per year 2011–2020.		Medicare payments for physicians increase; policies enacted to restrain growth in health care end in 2020; other spending falls below historical levels	Social Security spending same as GAO Baseline Extended; Medicare spending physician payments grow with inflation; Medicaid spending reflects growth consistent with CMS Actuary's alternative scenario
Other Differences	Assumption that real earnings will grow at an average annual rate of 1.4% from 2020 to 2083				Assumption that real earnings will grow at an average annual rate of 1.4% from 2020 to 2083	



<i>Sources:</i>	<a href="http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/budget.pdf">http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/budget.pdf</a> <a href="http://www.cbo.gov/ftpdocs/120xx/doc12039/01-26_FY2011Outlook.pdf">http://www.cbo.gov/ftpdocs/120xx/doc12039/01-26_FY2011Outlook.pdf</a> <a href="http://www.cbo.gov/ftpdocs/115xx/doc11579/06-30-LTBO.pdf">http://www.cbo.gov/ftpdocs/115xx/doc11579/06-30-LTBO.pdf</a> <a href="http://www.gao.gov/new.items/d11201sp.pdf">http://www.gao.gov/new.items/d11201sp.pdf</a> <a href="http://www.ssa.gov/OACT/TR/2010/tr10.pdf">http://www.ssa.gov/OACT/TR/2010/tr10.pdf</a>
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**How Realistic Are Our Assumptions About Future Debt?**

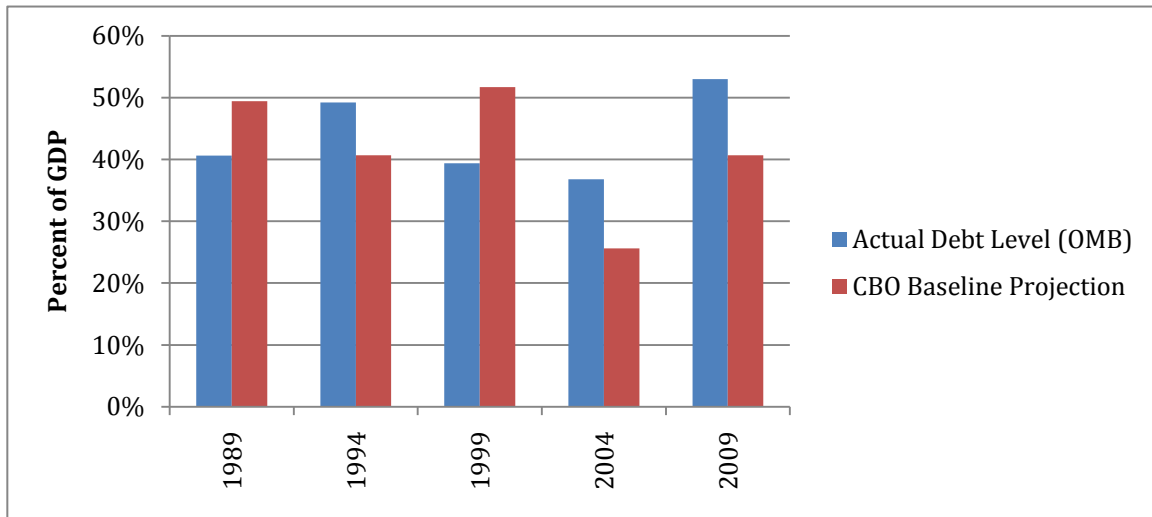
The CBO baseline estimate is a reference point for OMB, GAO, and private forecasts as well as a great deal of political and economic decision making. So let’s take a very simplified look at how well this estimate has predicted debt over time.<sup>6</sup>

Figure 1 compares actual debt levels with the five-year CBO baseline estimate for a sample of years from 1989 through 2009. In this very small sample, the CBO baseline estimate is off average by about 11 percent and beginning in 1994 the extent of the variance increased from about 9 percent to 12 percent. In some cases, the CBO underestimates actual debt levels and in other cases it overestimates. For example, in 1984 the CBO estimated that in 1989 debt as a percentage of GDP would be 49.4 percent. Once 1989 ended and all adjustments had been made, it was determined that debt was actually 40.6 percent of GDP, an overestimate of 8.8 percent. In 1989, the CBO estimated that debt in 1994 would be 40.7 percent of GDP however the actual level at the end of the fiscal year was 49.2 percent, an underestimate of 8.5 percent.

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<sup>6</sup> We note that this is a very cursory analysis, which we use to provide a more accessible demonstration of the issue. A complete analysis would look at the annual record from the inception of the CBO to the present, which is beyond the scope of this paper. For an example of this type of analysis, see CBO (2007), which we discuss in subsequent paragraphs.

**Figure 1: Actual Debt Compared to CBO Baseline Estimate**



What are we to make of errors in debt estimates? One way to think about these estimates is that each number represents a point estimate with a range of possible outcomes around the estimate. Figure 2, which was calculated by the CBO based on an analysis of its track record in forecasting, illustrates this idea.<sup>7</sup> The shaded area in the figure represents the 90 percent confidence range or the range within which the actual value for each year has a 90 percent chance of falling.<sup>8</sup> The figure shows the estimated likelihood of alternative projections of the level of outstanding debt under current policies in March 2007. The baseline projections that CBO reported in their outlook for fiscal years 2008–2017 fell in the middle of the darkest area of this figure, which means that under the assumption of no change in tax and spending policies, there was a 10 percent chance that the actual level of debt would fall in the darkest area of the figure and a 90 percent chance that it would fall within the whole shaded area.

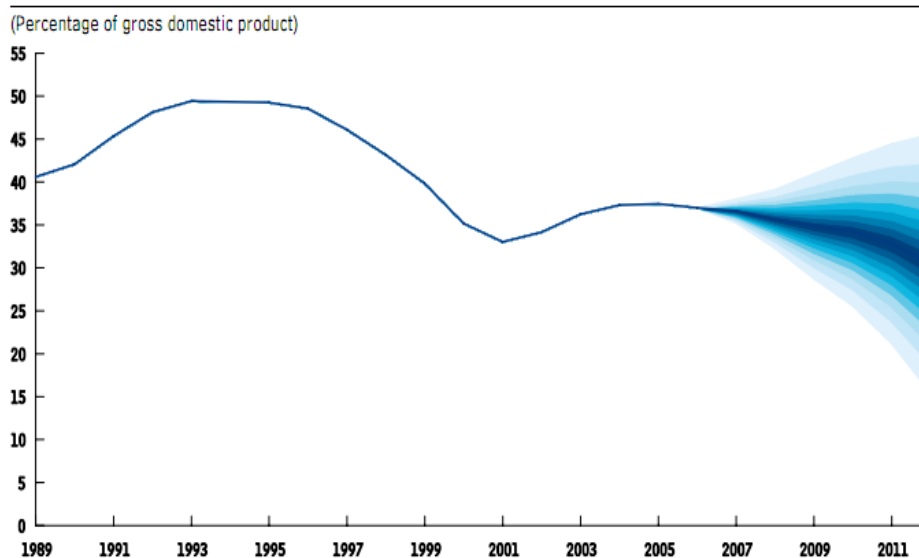
These simple and more complex analyses of the CBO debt forecasting record suggest that there are significant flaws in our assumptions about the financial impacts of political and economic behavior in our country. So let's take a deeper dive into the estimation process.

<sup>7</sup> CBO. 2007. "The Uncertainty of Budget Projections: A Discussion of Data and Methods." March.

<sup>8</sup> CBO estimates this range on the basis of the uncertainty in its historical record of budget projections, which include a total of 25 baselines from 1981–2006. The estimates of uncertainty presume that in the future, budget outcomes will deviate from CBO's projections as they have in the past, with about the same probability distribution of large and small differences. See CBO (2007).

## Figure 2: Uncertainties of CBO's Projections of the Level of Outstanding Debt

Source: CBO. 2007. "The Uncertainty of Budget Projections: A Discussion of Data and Methods." Figure 6. March.



### What Are the Estimation Challenges?

Projections of debt and deficits are extremely sensitive to economic as well as policy change. Economic growth rates are one of the most important measures of human social behavior: They provide an indicator of our efforts to develop ourselves, transact with others, accumulate things with material value, conceptualize the future, defer short-term gratification for long-term gains, make commitments, and so on. And economic growth arises from a very complex social system. So one way to measure how well we understand political and economic behavior in complex social systems and our capacity to make realistic assumptions about future levels is to analyze our ability to forecast future economic growth.

Economic forecasting problems are well documented in comparisons of the results of OMB's, CBO's, and private sector economic forecasts of growth rates for real output from 1976–2009. Each year, the CBO analyzes the forecasting record, comparing government forecasts with the private sector *Blue Chip* consensus.<sup>9</sup> While all the forecasts are generally quite similar and forecasting errors are insignificant for most years prior to 1996, since 1996 public and private forecasts have generated statistically significant errors for 6 of the past 13 years:

<sup>9</sup> CBO's Economic Forecasting Record: 2010 Update, July, tables 3 and 12. The *Blue Chip* consensus is an average of more than 50 private sector business economists' forecasts that is published periodically as the *Blue Chip Economic Indicators* by Randell E. Moore for Aspen Publishers.

1997, 1998, 1999, 2000, 2002, and 2009. For the years 1997–2000, which many analysts have associated with a bubble in technology stocks, all of the forecasts underestimated growth. For the years 2002 and 2009, which are associated with recession (both periods), a housing bubble (2009), systemic crisis (2009), and significant structural change in the global economy, the forecasts overestimated growth. It is worth noting that the forecasts show similar magnitudes of error in years associated with price shocks and recessions in the period 1976–1996.

In sum, the data on economic forecasting provides further evidence that suggests our existing analytic techniques are inadequate for the task of understanding behavior in a system as complex as the U.S. political economy, particularly for those periods that have the greatest impact on debt accumulation such as changes in the business cycle, natural disasters and other types of shocks, and structural change. If we wish to better manage our financial affairs, we need to invest in both more research on political and economic behavior in complex social systems and better forecasting tools.

### **A Better Way Forward**

Estimating fiscal outcomes and managing government finances in a complex political and economic system is an extraordinary technical challenge. Major sources of uncertainty over the next 25 years include legislative actions, particularly those related to tax and spending rates; the impact of structural change in the global economy on domestic economic growth, which affects incomes, revenues, and prices; military and emergency spending; and mandatory spending on veterans benefits, government retirement benefits, social security, and health care costs.

Standard macroeconomic techniques, which assume either that the future will closely resemble the past or that simulations of a simplified world characterized by mathematically tractable behavior can inform real policy and economic choices, cannot handle the disruptive events, strategic behavior, or adaptive change that characterize real political economies. New techniques are needed to better understand the macro-level effects of micro-level behaviors.<sup>10</sup> The U.S. is uniquely positioned to take a leading role in developing the next generation of estimation tools and techniques in economics and

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<sup>10</sup> For an overview of the flaws in existing modeling techniques and the challenges and opportunities associated with contemporary economic and financial estimation, see Buchanan (2009) and Farmer and Duncan (2009).

policy analysis but as the largest consumers of estimation analytics, it is up to Congress and the executive branch to invest in innovation and demand that their advisors experiment with new approaches.

One way to overcome the weaknesses in conventional economic forecasting techniques is to take advantage of recent advances in the computational sciences and build agent-based models that can better represent U.S. government fiscal management challenges.

An agent-based model is a computer-based simulation of decision makers with particular preferences operating in a virtual (but empirically verifiable) world governed by specific rules of the game. Behavior in agent-based models evolves as the agents in the model act and react to changing opportunities and events in the virtual situation. Instead of assuming that the economy will mechanically move toward the predetermined and unrealistic outcomes of general equilibrium models, the state of the world in an agent-based model evolves as the agents in the model adapt and change their strategies to achieve their aims.

Agent-based simulations can handle a wider range of nonlinear behavior than conventional general equilibrium models. A computer program keeps track of agent interactions and evolving states of play and analysts can use this data to simulate political and economic change under different policy and event scenarios and systematically explore the consequences.

As the audit arm of the federal government, the GAO is best positioned to improve the analytical foundation for policy making and financial management. Congress and the executive branch should give high priority to supporting the GAO in developing and disseminating cutting edge analytic tools and techniques. With solid institutional support and by leveraging existing government, academic, and private-sector analytical resources, the GAO could play a leading role in developing cutting-edge advances in the analytical sciences that would allow the government to better simulate economic activity and test the impact of alternative policies.

## Conclusion

Conventional analytical techniques consistently fail to produce useful forecasts or policy direction for the U.S. political economy. Major sources of uncertainty over the next 25 years include legislative actions, particularly those related to tax and spending rates; the impact of structural change in the global economy on domestic economic growth, which affects incomes, revenues, and prices; military and emergency spending; and mandatory spending on veterans benefits, government retirement benefits, social security, and health care costs. Recent advances in the computational sciences allow analysts to use agent-based modeling to better understand behavior and future outcomes in complex social systems like economies and federal fiscal management. The U.S. is uniquely positioned to take a leading role in developing the next generation of estimation tools and techniques in economics and policy analysis but as the largest consumers of estimation analytics, it is up to Congress and the executive branch to invest in innovation and demand that their advisors experiment with new approaches. The GAO can and should play a key role. In the meantime, we should be skeptical about *all* arguments about how best to address debt and deficits, treating them not as well-informed and technically correct truths, but as well-intended but largely imaginative and often wishful thought experiments.

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