# IMF Working Paper

# The U.S. Federal Debt Outlook: Reading the Tea Leaves

*Oya Celasun and Geoffrey Keim*

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**The U.S. Federal Debt Outlook: Reading the Tea Leaves[1]**

**Prepared by Oya Celasun and Geoffrey Keim**

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**Abstract**

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| **This Working Paper should not be reported as representing the views of the IMF.** The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate. |

We show that fiscal policies reflecting a primary balance response to higher debt in line with historic experience would significantly increase the likelihood of reaching the debt targets of the U.S. administration in the medium term. Deficits and debt are higher under current budgetary proposals and IMF projections for real activity and interest rates, which do not include a reaction of policies to rising primary deficits. Under the IMF staff's current economic projections, a primary fiscal adjustment of about 3.5 percent of GDP would be needed to achieve a debt level of about 70 percent of GDP in 2020.

Author's E-Mail Address:  ocelasun@imf.org; gkeim@imf.org

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[1] The authors thank Charlie Kramer, David Robinson, and Martin Sommer for useful comments.

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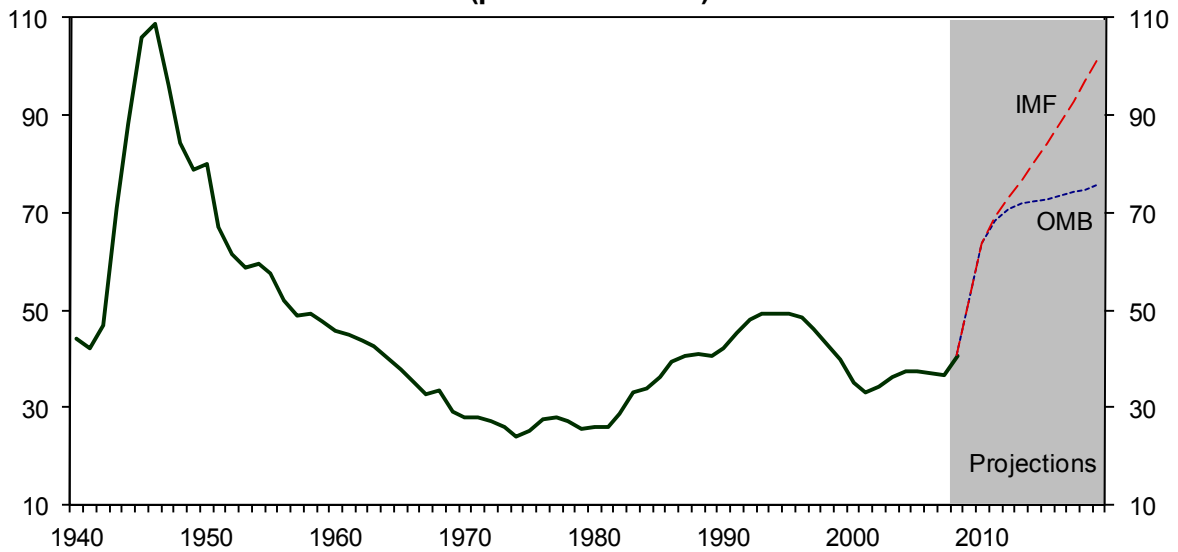
# I. INTRODUCTION

The publicly held debt of the U.S. federal government rose sharply in 2008 and 2009 due to the decline in economic activity, and discretionary measures to stimulate the economy and stabilize financial markets. Looking ahead, the path of U.S. federal government is subject to an unusual degree of uncertainty, partly because of the continued large risks affecting the economy and partly because the future course of fiscal policies are uncertain. The Administration has put a forth a wide array of fiscal policy proposals in the FY 2010–11 budgets but many of these proposals are yet to be legislated by the U.S. Congress.

Current federal debt projections vary greatly across forecasters reflecting the significant disagreement on the economic outlook and the future path of fiscal policies (Figure 1).[2] Past experience with official budget forecasts portrays a record of large deviations between projections and outturns, given the inherent difficulty of predicting future policies and economic conditions. Against this backdrop, carefully assessing the risk profile of debt projections is important since the public debt outlook has potential implications for borrowing costs in the United States and abroad, and limits the set of feasible future fiscal policies.[3]

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[2] The staff's fiscal projections are based on the Administration's FY 2011 budget proposal adjusted for differences in the staff's versus the Office and Management and Budget's macroeconomic projections.

[3] The empirical literature suggests that an increase in publicly held U.S. federal debt of one percent of GDP raises long-term real U.S. Treasury debt yields by 2-5 basis points. See, for instance, Laubach (2007) and Engen and Hubbard (2004). A number of studies, in turn, suggest that emerging market sovereign bond yields increase with U.S. government debt yields.

**Figure 1. U.S. Federal Debt Held by the Public
(percent of GDP)**



Sources: Office of Management and Budget and Fund staff estimates.

This paper has two objectives—to evaluate the fiscal uncertainty stemming from economic conditions, and to compare debt profiles under different assumptions regarding future fiscal policies. The paper quantifies the uncertainty surrounding medium-term debt projections using fan charts—frequency distributions for debt over the horizon 2011–20—based on empirically plausible constellations of shocks to real output and interest rates. The fan charts are used to evaluate debt profiles under two alternative assumptions for the evolution of the primary balance: the primary balance path implied by the President's FY 2011 Budget Proposal versus a primary balance path implied by estimated past fiscal policy adjustments to changing debt levels and the output gap.

The rest of the paper is structured as follows. Section II provides an overview of the past record of budget and economic projections. Section III presents historic estimates of a primary surplus reaction function. Section IV presents fan charts of federal debt held by the public for the 2011–20 periods. Section V discusses the policy implications of the analysis.

## II. FEDERAL BUDGET PROJECTIONS—THE HISTORIC RECORD

There are two sources of official federal budget projections in the United States. The Office of Management and Budget (OMB) annually presents projections of the federal budget and debt through for the next five to ten years (and updates them in the summer under the Mid-Session Review). The Congressional Budget Office (CBO) also estimates the deficit and debt implications of the President's budgetary proposals. The CBO additionally produces biannual "baseline" projections of the Federal budget under the assumed continuation of current laws and policies (i.e., not taking into account any
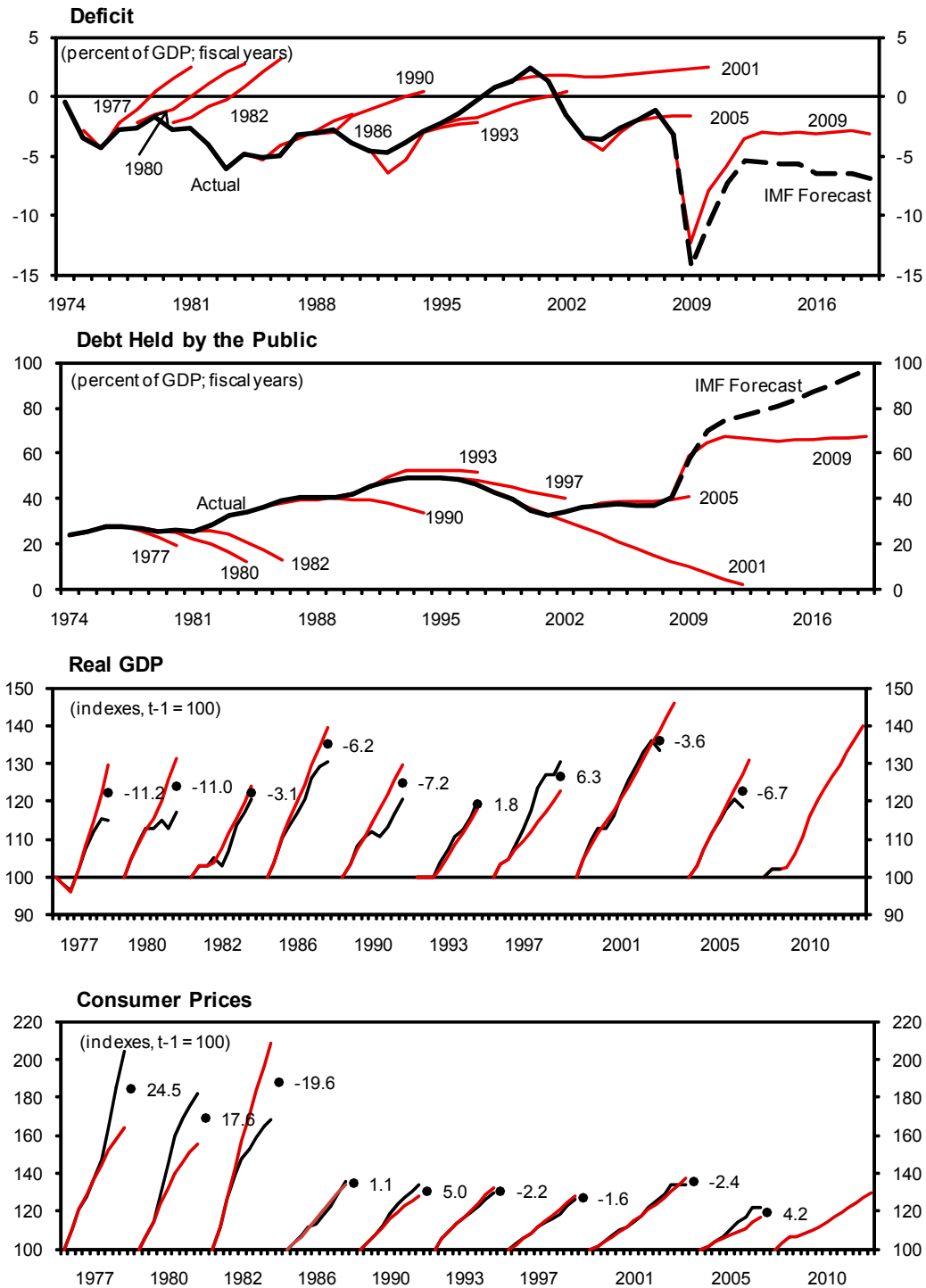
proposals that are yet to be legislated). None of these projections are meant to provide an objective prediction of fiscal balances in the medium-term, but rather projections under particular sets of policy and economic assumptions. Yet, they are the main sources of information available to the public on the likely future course of the fiscal path, and are, hence, closely watched. The IMF's fiscal projections usually take the President's Budget Proposal as a starting point, making adjustments for differences in underlying economic assumptions and for the likelihood of the enactment of various policies, where appropriate.

The past record of budget projections shows a strong tendency for "optimistic" budget forecasts. Comparing fiscal outturns to the OMB's budget projections from the initial year of each presidential term since 1977, one observes a much larger frequency of cases where the medium-term budget surplus was overestimated and the level of future debt was underestimated (Figure 2). The key exceptions are the budget projections made in fiscal years 1993 and 1997, partially reflecting an unexpected turnaround in economic activity after those years.

While errors in predicting future real GDP have been significant contributors to budget forecast errors, they leave a large part of the variation in budget forecast errors unexplained. A scatter plot of budget and real GDP forecast errors show that large errors in projecting future economic activity tends to correlate with large errors in projecting future balances (Figure 3). However, a simple regression of budget projection errors on real GDP and CPI inflation forecast errors can explain only about 12 percent of the variation in budget errors, with CPI projection errors not contributing systematically to budget projection errors. That is, the evolution of future discretionary fiscal policy actions—and not just the automatic response of the budget balance to the economic cycle—have led to significant deviations of budget balances from their previously projected levels.

Taken together, these stylized facts highlight the benefits of quantifying and assessing both the economic and fiscal policy risks surrounding public debt projections, as a complement to the deterministic projections that derive debt paths from a given set of policy actions embedded in the proposed budget. For instance, budgetary projections can be combined with empirically-realistic probability distributions for key economic variables to yield probability distributions for future debt under current policy proposals. Alternatively, probability distributions for economic variables could be augmented with behavioral assumptions for future policies. One possible augmentation would be a primary surplus reaction function estimated from past policy behavior. Combined with stochastic forecasts of macroeconomic variables, such a fiscal policy reaction function could be used to judge current policy proposals in terms of their implications for the future expected debt profile. The following sections provide such stochastic analysis.

## Figure 2. Fiscal and Economic Forecast Errors

**Deficit**

(percent of GDP; fiscal years)

1977  1980  1982  1986  1990  1993  2001  2005  2009

Actual

IMF Forecast

1974  1981  1988  1995  2002  2009  2016

**Debt Held by the Public**

(percent of GDP; fiscal years)

IMF Forecast

1993  1997  2009  2005  1990  2001

Actual

1977  1980  1982

1974  1981  1988  1995  2002  2009  2016

**Real GDP**

(indexes, t-1 = 100)

-11.2  -11.0  -3.1  -6.2  -7.2  1.8  6.3  -3.6  -6.7

1977  1980  1982  1986  1990  1993  1997  2001  2005  2010

**Consumer Prices**

(indexes, t-1 = 100)

24.5  17.6  -19.6  1.1  5.0  -2.2  -1.6  -2.4  4.2

1977  1980  1982  1986  1990  1993  1997  2001  2005  2010

Note: Forecasts are compared to data collected from historical vintages and are not the currently published series. This method helps to limit the role new methodologies or revised data have on the forecast errors.
Sources: Budget of the Federal Government (various years), Federal Reserve Bank of St. Louis' ALFRED database, Bureau of Economic Analysis, Bureau of Labor Statistics, Haver Analytics, and Fund staff calculations.

**Figure 3. GNP/GDP Forecast Errors and Deficit Forecast Errors**



Note: Forecasts are compared to data collected from historical vintages and are not the currently published series. This method helps to limit the role new methodologies or revised data have on the forecast errors.
Sources: Budget of the Federal Government (various years), Federal Reserve Bank of St. Louis' ALFRED database, Bureau of Economic Analysis, Bureau of Labor Statistics, Haver Analytics, and Fund staff calculations.

## III.  HISTORIC FISCAL POLICY BEHAVIOR IN THE UNITED STATES: HOW DO POLICY MAKERS RESPOND TO DEBT AND ECONOMIC CYCLES?

The most relevant past episode to the current fiscal outlook is the aftermath of the Second World War, when a combination of strong real economic growth, low real interest rates and primary surpluses brought about an impressive reduction in federal debt held by the public (see the Appendix). Current circumstances are unlikely to lead to strong real growth in the near-to-medium term, underscoring the importance of future primary surpluses in bringing down debt.[4]

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[4] See Barrerra, Estevao, and Keim (2009) for an analysis of U.S. potential GDP growth prospects.

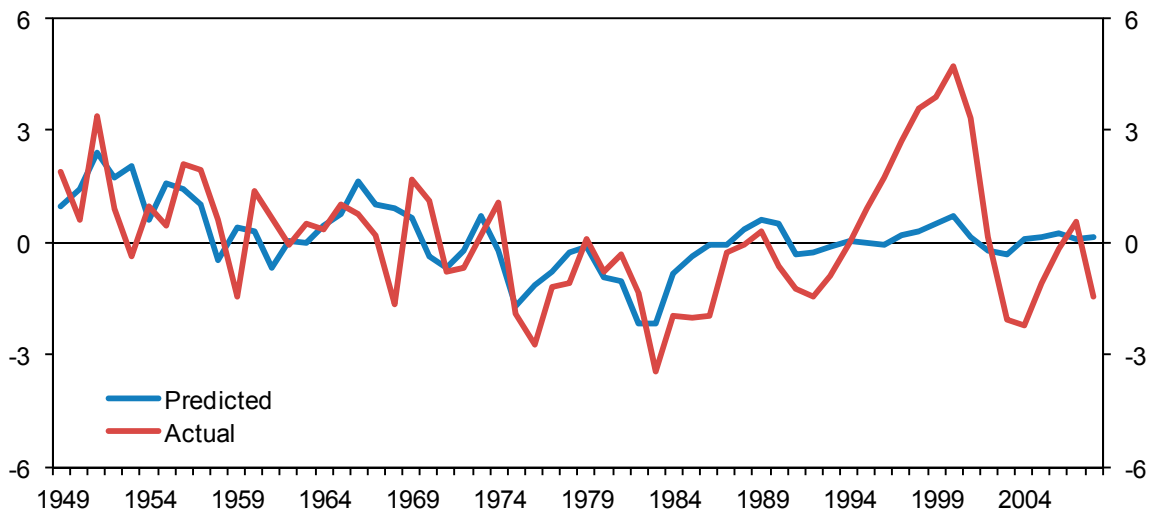| Table 1.  Determinants of the Primary Balance | |
|---|---|
| Lag of debt as a percent of GDP | 0.039 ** |
| | [0.015] |
| Contemporaneous output gap as percent of GDP | 0.310 *** |
| | [0.083] |
| Constant | -1.717 ** |
| | [0.658] |
| | |
| R-squared | 0.28 |
| Observation period | 1948-2008 |
| Number of observations | 60 |

Notes:  Standard errors are shown in brackets. *** and ** denote significance at the 1% and 5% levels, respectively. Ordinary least squares estimation. Dependent variable, the unified Federal Government Primary Balance as a percent of GDP.

Systematic evaluations of fiscal balances suggest that federal primary budget balances in the United States have historically increased rapidly in response to higher debt and the deviation of real GDP from potential output.[5] A simple estimated fiscal reaction function for the period 1949–2008 suggests that the primary balance has risen on average by 0.039 percent of GDP for a one percentage point of GDP increase in debt held by the public (Table 1). This result can be interpreted as indicating policymakers have bolstered public finances in response to increases in debt, and suggests that fiscal policy has on average been responsible.[6] In addition, the primary balance has on average increased by 0.310 percentage points of GDP in response to a one percentage point increase in the deviation of output from potential, illustrating the sensitivity of the federal government balance to economic conditions. Notably, however, actual surpluses exceeded the predicted levels quite significantly in most of the 1990s, but fell short of the model predictions over most of the 2000s (Figure 4). Hence, while such an estimated reaction function is not necessarily the best predictor of the policy path in any given point in time, it has the advantage of summarizing the long-run historic tendency in primary surplus behavior, and can be used as a benchmark for generating debt projections.

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[5] See for instance, Bohn (1998). This specification follows the base specification in Bohn (1998), who uses a somewhat different measure of cyclical variations in output and also includes a measure of temporary government spending. Estimating the reaction function over more recent time periods results in comparable coefficient estimates.

[6] Bohn (1998) shows that a positive coefficient on lagged debt in the primary balance reaction function would rule out an unstable debt path in the long-term (but a small coefficient would mean that debt stabilizes at a high level). The magnitude of the coefficient we estimate, 0.039 percent of GDP for each percentage point of GDP increase in debt, exceeds the average differential between ex-post real interest rates and growth in the United States ( e.g., 0.018 over 1985-99), which implies that the stabilization would be quite rapid if policymakers follow the reaction function.

**Figure 4.  Actual and Predicted Primary Balances, 1949-2008
(percent of GDP)**



Sources:  Office of Management, Haver Analytics, and Budget and Fund staff estimates.

## IV.  THE OMB'S AND IMF'S BUDGET PROJECTIONS FOR 2009–20

The OMB remains significantly more optimistic than IMF staff on the overall future path of the recovery. For instance, the differential between real interest rates on new borrowing and real GDP growth—a key determinant of the rate of debt accumulation—is projected by OMB at about half a percentage point or less over the medium term, while IMF staff projections put the projected differential at about 2 percentage points.

IMF staff make projections for U.S. federal government deficits by making adjustments to OMB's budget projections on the basis of the differential between staff's and OMB's assumptions on future real GDP growth, the GDP deflator, and interest rates on Treasury debt (of three-month and ten-year maturities). The elasticities IMF staff use to determine how budgetary outcomes will differ from those projected by the OMB on the basis of deviations in economic variables were chosen to broadly replicate the OMB's sensitivity analysis for revenues and expenditures to key economic variables (The President's FY 2010 Budget Proposal, Analytical Perspectives, Table 12–4).

Adjusted to reflect the IMF staff's economic projections, the FY 2011 budget proposal would push federal debt held by the public to about 105 percent of GDP by 2020.[7] Revenues would be slightly lower than projected by the OMB, but expenditures would be

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[7] The Administration's FY 2011 budget projects debt to reach levels comparable to those that would be obtained under the assumption of historical fiscal behavior, but with much less primary fiscal effort.

significantly higher reflecting the higher costs of debt service and the inherently slow response of entitlement expenditures to changes in the path of real GDP growth.

As discussed in more detail in the next section, the policy proposals under the FY 2011 budget would lead to a significantly higher level of debt than the path of primary surpluses implied by historical policy behavior. Under the staff's baseline macroeconomic projections, if primary balances from 2012 onwards were to follow the relationship estimated in Section III using historical data, debt would stabilize immediately around 68 percent of GDP (Table 2). That is, if the rising debt levels lead policymakers to respond by adjusting fiscal policy early, with a magnitude consistent with the behavior observed in the past, upward pressures on debt would diminish significantly. If instead policymakers gradually shift toward policies implied by the estimated historic reaction function over the period 2012–20, debt would stabilize slightly above 80 percent of GDP in the medium term. While that adjustment path represents a significant improvement over the baseline path under the FY2011 budget proposal, it would still leave debt at a suboptimally high level in the medium term.

| Table 2. Primary Deficits and Debt under Staff's Baseline Projection and under Historic Primary Surplus Behavior (percent of GDP; fiscal years) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| **Primary deficit** | | | | | | | | | | |
| Staff's baseline based on FY 2011 budget | 6.9 | 3.7 | 2.8 | 2.6 | 2.9 | 3.1 | 2.9 | 2.7 | 2.9 | 2.9 |
| Historic behavior (2012 onwards) | 6.9 | -0.7 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 |
| Gradual shift towards historic behavior | 6.9 | 2.8 | 1.7 | 1.1 | 0.8 | 0.4 | -0.1 | -0.6 | -1.0 | -1.5 |
| OMB budget projection | 6.6 | 3.0 | 1.7 | 1.1 | 0.9 | 0.7 | 0.5 | 0.2 | 0.5 | 0.7 |
| | | | | | | | | | | |
| **Debt held by the public** | | | | | | | | | | |
| Staff's baseline based on FY 2011 budget | 69.3 | 73.2 | 76.6 | 80.2 | 84.3 | 88.6 | 93.0 | 97.3 | 101.9 | 106.8 |
| Historic behavior (2012 onwards) | 69.3 | 68.7 | 68.2 | 68.0 | 67.8 | 67.7 | 67.7 | 67.7 | 67.8 | 68.0 |
| Gradual shift towards historic behavior | 69.3 | 72.3 | 74.5 | 76.5 | 78.3 | 79.8 | 80.9 | 81.5 | 81.8 | 81.7 |
| OMB budget projection | 69.3 | 71.0 | 71.9 | 72.3 | 72.9 | 73.6 | 74.2 | 74.8 | 75.9 | 77.2 |

Notes: Primary balances under historic behavior are calculated on the basis of the estimated reaction function shown in Table 1. Primary balances under a gradual shift toward historic behavior are given by the weighted average of the baseline IMF staff projection and the primary balance implied by the estimated historic reaction function. Under the gradual shift scenario, the weight on the primary balances derived from the historic reaction function is 0.2 in 2012 and smoothly rises to 1 in 2020.

Sources: Office of Management and Budget and IMF staff estimates.

## V. STOCHASTIC SIMULATIONS OF FEDERAL GOVERNMENT DEBT HELD BY THE PUBLIC

To generate stochastic forecasts of the key variables driving debt dynamics, a vector autoregression (VAR) model is estimated for real GDP growth and real interest rates on three-month and 10-year Treasury debt covering the period 1953–2009. A large number of stochastic forecasts are then derived from the estimated equation system, with shocks to the variables sampled from the estimated joint error probability distribution.[8]
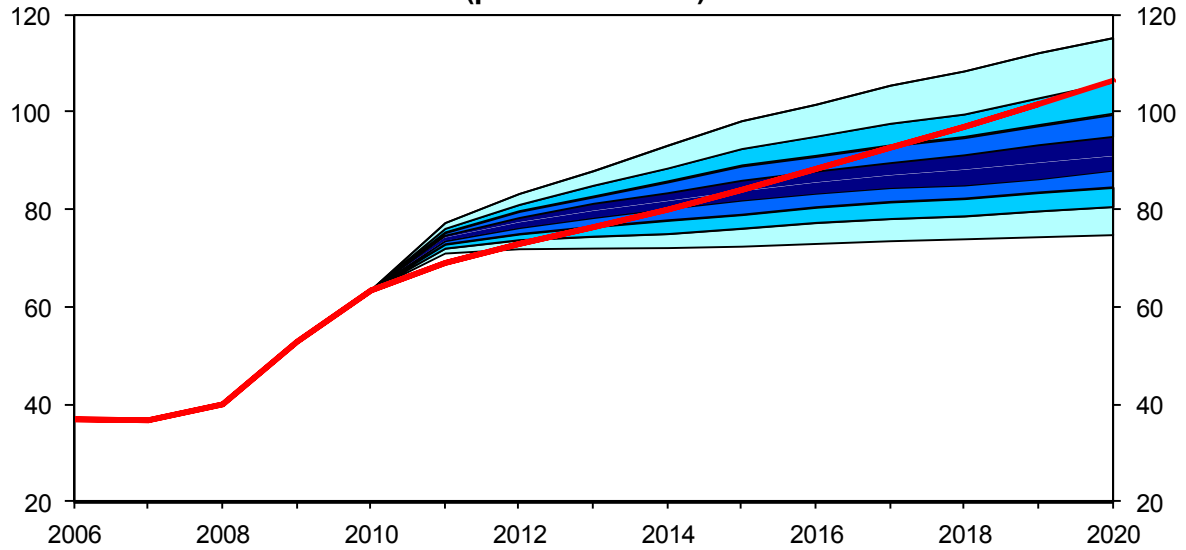
In a first step, we quantify the uncertainty around debt projections based on the FY 2011 budget. Stochastic forecasts of growth and real interest rates derived from the estimated VAR model, combined with the primary surplus path implied by the FY 2011 budget (adjusted for the differences between growth and interest rate forecasts underpinning the budget versus the staff's baseline economic projections), underscore the significant degree of uncertainty stemming from the economic environment (Figure 5).[9] Importantly, with more than 80 percent probability, debt in 2020 would be higher than the Administration's projection of 77 percent of GDP.[10] Further, with about 20 percent probability, debt would exceed staff's baseline debt projection of about 105 percent of GDP for 2020.

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[8] For a description of the methodology see Celasun, Debrun, and Ostry (2006).

[9] In this exercise, the primary balance path as a share of GDP is assumed to follow IMF staff's baseline projections, but the interest rate/growth differential which determines interest costs follow the stochastic VAR forecasts.

[10] The IMF staff's baseline debt projection is higher than the mean path of the simulated debt distribution since the average economic forecast based on the VAR estimated over 1953-2009 is more favorable than the economic assumptions under the IMF staff's baseline. VAR forecasts are likely to over-predict growth going forward, since they do not take into account the output loss associated with financial crises (documented, for instance, by Cerra and Saxena, 2008). The IMF's GDP projection allows for a financial crisis effect.
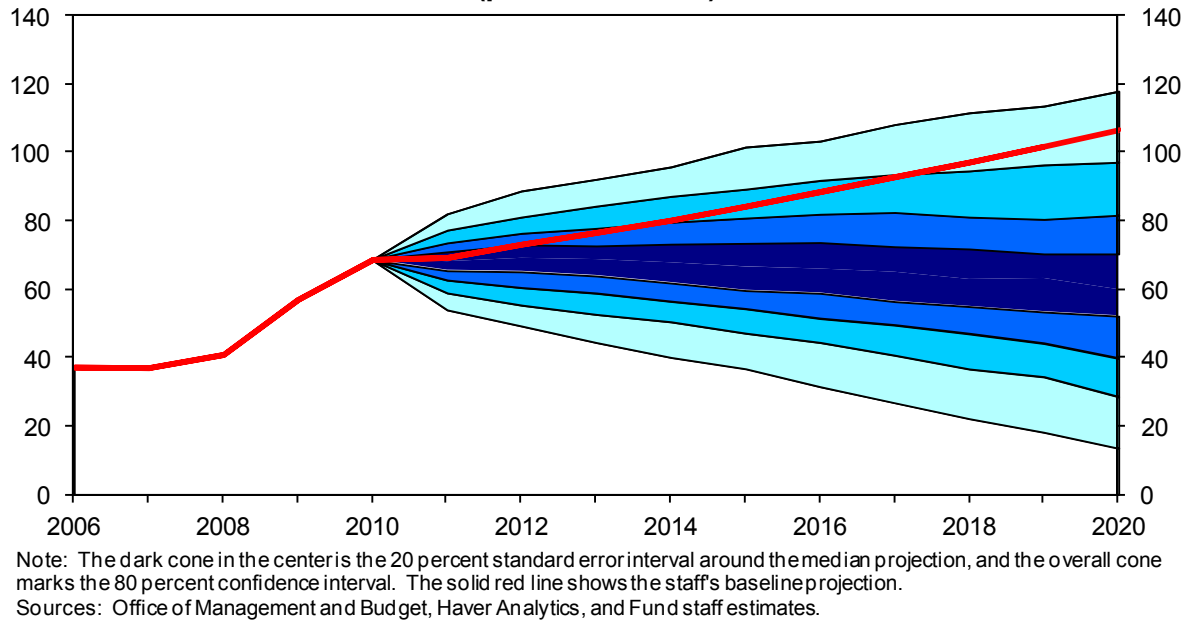
**Figure 5.  Debt Profile Under Projected Primary Surplus Behavior**
**(percent of GDP)**



Note:  The dark cone in the center is the 20 percent standard error interval around the median projection, and the overall cone marks the 80 percent confidence interval.  The solid red line shows the staff's baseline projection.
Sources:  Office of Management and Budget, Haver Analytics, and Fund staff estimates.

  What would the debt profile look like if future primary balances instead followed patterns in historic primary surplus behavior, exhibiting a significant response to higher debt and output gaps? Combining the estimated historical primary surplus reaction function with stochastic forecasts of real GDP growth and real interest rates—and allowing for empirically realistic shocks to the primary surplus—imply a much more favorable median projection but slightly larger variation around the median path (reflecting the realistic uncertainty embedded into projected primary surplus behavior) (Figure 6).

**Figure 6.  Debt Profile Under Historic Primary Surplus Behavior
(percent of GDP)**



Note:  The dark cone in the center is the 20 percent standard error interval around the median projection, and the overall cone marks the 80 percent confidence interval.  The solid red line shows the staff's baseline projection.
Sources:  Office of Management and Budget, Haver Analytics, and Fund staff estimates.

The results suggest that if the federal government on average adjusts the primary surplus as it has done in the past—implying a stronger improvement in the primary balance than under the staff's baseline budget projections—the probability that debt in 2020 would exceed the Administration's projection of 77 percent of GDP would be less than 40 percent. Notably, with more than 80 percent probability, debt would be lower than the level it would reach by 2020 under the IMF staff's baseline.

## VI.  CONCLUSIONS

Taking account of the joint stochastic distribution of real growth and real interest rates suggest significant uncertainty around the debt projections, with risks tilted toward a higher level of debt at the end of the forecast horizon, especially if primary surpluses do not rise to the same degree in response to rising debt as they have on average since 1949.

Under the staff's baseline economic projections for the January 2010 World Economic Outlook, stabilizing debt at about 70 percent of GDP over the 2015–20 period would require an adjustment of about 3.5 percent of GDP relative to the primary surplus path implied by the FY 2011 budget. With nondefense discretionary expenditures near historical lows and significant cuts in mandatory spending programs hard to achieve in the near term, most of the burden would need to fall on revenues, which on a general government basis are significantly lower than in most other large advanced economies.

Policymakers could stabilize debt rapidly if they set primary federal budget balances in line with the estimated historic fiscal reaction function. However, the change in the primary budget balance that would result from a switch to historic behavior would be significantly larger than any adjustment that has occurred since the end of World War II. But if the adjustment were delayed, then a sizable debt buildup as shown in the gradual adjustment scenario in Section IV would occur.

The tension between the needs to maintain adequate stimulus before a durable recovery is achieved and to secure sustainability in the face of aging and crisis related fiscal pressures calls for a delicate balancing act. It has been suggested that curbing the future growth rate of health care costs and implementing readily available policy options to reduce future net social security expenditures would relieve this tension. It is certainly true that long-run fiscal finances not only in the United States but also in many other advanced economies are unsustainable in the absence of such reforms. However, it would be too optimistic to assume that solely relying on actions to cut future health and aging-related expenditures would be enough to avert the potentially negative implications of the future fiscal path on growth. Thus, it is important that a credible and sizable fiscal adjustment is undertaken once a sustainable recovery is firmly entrenched. There are two basic reasons that bolster this view.

First, under current budgetary proposals, federal debt held by the public in the U.S. is set to double to 80 percent of GDP from its pre-crisis level in merely five years and will continue to rise without further fiscal action. Aging and health related spending are not the key drivers of this debt build-up. If the estimates of the interest effect of debt in the academic literature are taken at face value, such a rise in debt could add 100–200 basis points to long term government yields. It is hard to argue that allowing for a further expansion of debt from such levels would not pose risks to real growth; in fact the economic costs of raising taxes to keep debt at this level are likely to be far outweighed by the potential costs of inaction and uncertainty.[11]

Second, there are no well-understood and easy solutions to the problem of curbing health care costs—the most important factor in long run fiscal spending. As frequently emphasized by the CBO, serious reductions in the trajectory of costs could prove elusive and will require constant policy effort, experimentation, and immense political determination. Betting on the sure implementation and success of measures without creating space for maneuver in case of delays or failures would be risky. The uncertainty around potential actions to curb health care costs is a key reason why a medium run fiscal correction is needed—in addition to urgently taking the steps to address the entitlements problems—before the aging on the population makes the latter even more politically challenging.

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[11] Reinhart and Rogoff (2010) document that real growth is significantly lower when public debt exceeds 90 percent of GDP.
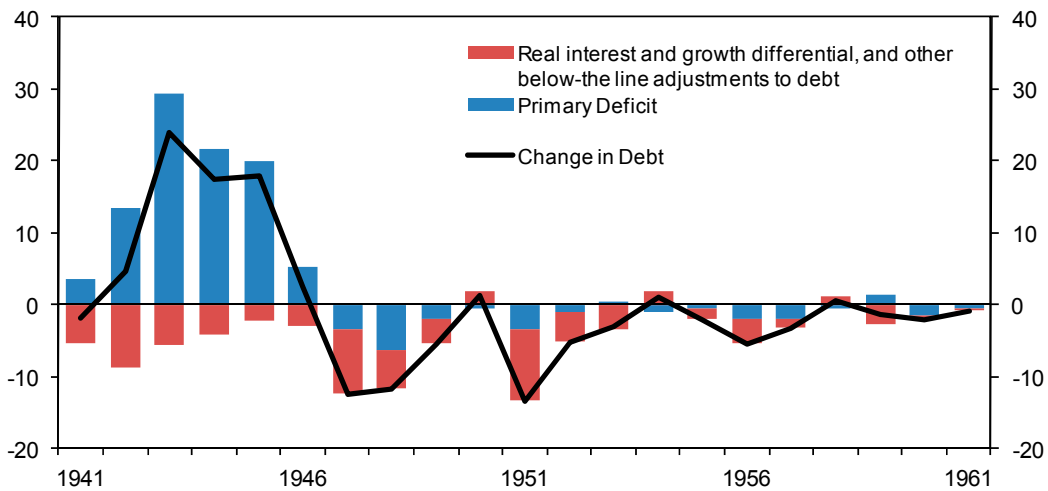
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**APPENDIX. DEBT REDUCTION AFTER THE SECOND WORLD WAR**

U.S. federal debt held by the public climbed from 42 to 108 percent of GDP over the period 1941–46. It was brought down back to 42 percent of GDP in the subsequent seventeen years, by 1963. A very favorable real interest rate/growth dynamic and, to a lesser extent, primary fiscal surpluses, contributed to the debt reduction in the post-WWII era (Figure A1 and Table A1):

- The primary balance averaged 1.4 percent of GDP and was in surplus in 14 out of the 17 years between 1946 and 1963.

- All other factors—given by the change in debt minus the primary balance—made a large contribution to deficit reduction, averaging 2.5 percent of GDP over the 1946–63 period. This residual component is predominantly driven by the differential between interest rates and output growth, which was unusually low during that period mainly due to strong real growth as well as low long-term interest rates given the Fed's interest rate pegging policy (which lasted until 1951).

**Figure A1. Soures of Change in Federal Debt Held by the Public (percent of GDP)**



Sources: Office of Management and Budget and Fund staff estimates.

| Table A1.  Sources of Change in Federal Debt Held by the Public (percent of GDP; unless otherwise noted) | | |
|---|---|---|
| | Primary balance | All other factors |
| 1946-63 | -1.4 | -2.5 |
| 1963-84 | 0.5 | -0.9 |
| 1985-99 | -0.3 | 0.7 |
| *Memoranda:* | | |
| | Real GDP growth* | Real ten-year treasury bonds** |
| 1946-63 | 3.8 | 1.1 |
| 1963-84 | 3.5 | 2.3 |
| 1985-99 | 3.3 | 5.1 |

* Percent change, annual average. ** Percent, p.a.

Notes:  Real GDP growth data do not cover years prior to 1947. Real ex-post ten-year treasury bond rates are not available prior to 1952.

Sources:  Office of Management and Budget, Board of Governors of the Federal Reserve System, Haver Analytics, and Fund staff estimates