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Public Wealth in the United States

by Fabien Gonguet and Klaus-Peter Hellwig

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Public Wealth in the United States

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Abstract

We analyze the US public sector balance sheet and project it forward under the assumption that current policies remain in place. We first document the history of the balance sheet and its components since World War II, with a detailed account of its evolution during and after the global financial crisis. While, based on assets and liabilities alone, public sector net worth is negative, additional challenges arise from commitments to future spending implied by current legislation and demographic trends. To quantify the risks to the balance sheet, we then apply the macroeconomic scenarios from the Federal Reserve's bank stress test to the public sector balance sheet.

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I. INTRODUCTION

This paper analyses the evolution of the United States' public sector balance sheet and projects it forward to analyze the fiscal position in a comprehensive manner. Balance sheets are a useful device for assessing the financial health of a household, enterprise, or government. By summarizing all assets and liabilities, they provide a measure of solvency – the extent to which the promises implied by the liability side are backed by real assets and claims on other entities. When assessing the financial position of private corporations, both sides of their balance sheets are equally considered. Fiscal policy analysis, by contrast, is often limited to the evolution of government debt. While, for many countries, this is due to data limitations, the rich data available for the US allow us to conduct a more comprehensive analysis.

We analyze the consolidated public sector balance sheet between 1945 and 2016 and thus bring to light the evolution of US public sector net worth. While the US government publishes financial statements and statistical reports for all levels of government, these are not consolidated across the public sector, and thus we fill a gap in this area. In a purely descriptive analysis, we first summarize the evolution of the stocks of assets and liabilities since World War II. Following Buiter (1983), we then combine the data with projections of macroeconomic dynamics and policies to estimate the government's *intertemporal* balance sheet. That is, we incorporate the government's largest asset (its power to tax) and its largest liabilities (the promises of future expenses implied by current legislation) in the analysis, allowing to analyze the sustainability of the US fiscal position under current policies.[2]

We expand the existing literature on fiscal sustainability in the US along several dimensions, building on Traa and Ivashenko (2009) who analyze the federal government's balance sheet and estimate an intertemporal balance sheet.[3] We revisit their forward-looking analysis from the perspective of 2016 and expand the scope to include state and local governments. Subnational governments account for a considerable share of US fiscal policy, spending about 14 percent of GDP and employing one-eighth of the workforce.[4] Our backward-looking analysis includes the entire post-World War II period, documenting the long-run evolution of the balance sheet as well as the more dramatic changes in its composition during and after the global financial crisis. We also expand the balance sheet to cover the entire public sector, including public corporations. Our descriptive analysis thus

[2] See Traa and Carare (2007) for a non-technical discussion of public sector balance sheets.

[3] See CBO (2018) and US Treasury (2018) for other recent work on long-term sustainability at the federal government level.

[4] See Fisher (2010) for more background on the role of state and local governments in the US economy.

complements work by Piketty and Zucman (2014) who study the evolution of wealth, including government wealth, in several advanced economies over a long-time horizon.[5]

The intertemporal balance sheet underscores the large fiscal adjustment needs. Under our baseline assumptions, we find that current fiscal policies in the US are not viable in the long-term: under existing policies, current financial and non-financial assets combined with future tax revenues are not sufficient to fulfill all the promises made to constituents and creditors. To keep all of its *explicit* promises (for example, public pensions) without overburdening future generations, the government needs to change policies to either raise an additional 2.6 percent of GDP in revenue per year or reduce some of the *implicit* promises (for example health care, social security, education) to current generations.

Our assessment of fiscal sustainability rests on the assumption of positive future interest-growth differentials. While this assumption is in line with assumptions made by other policy institutions, including the US authorities, it is worth pointing out that, when interest rates remain below GDP growth rates in the long run, concerns about a sovereign's solvency are no longer warranted – a point made in Barrett (2018) and Blanchard (2019). However, given the uncertainty surrounding the future path of interest and growth rates and given the immense potential cost of underestimating future interest rates, we take a cautious approach to the issue.

The materialization of fiscal risks could further impair public sector net worth, that is, the difference between total assets and total liabilities of the public sector. The historical analysis shows how the evolution of public sector net worth has been affected by shocks to asset prices, housing market conditions, and growth. We project the values of individual assets under different shock scenarios to quantify the risk exposure of different assets on the public sector balance sheet. We find that, while risks to the mortgage portfolios of the major two government-sponsored enterprises (GSEs) and student loans held by the federal government warrant vigilance, they are dwarfed by the potential losses through the equity portfolios of state and local government pension funds.

The high quality of public sector balance sheet data allows both for a consolidated overview and for more granular analyses, both of which can provide useful context to ongoing policy debates. For example, quantitative easing (QE) – the Fed's policy to purchase long-term public debt using reserve deposits issued to banks – has led to an expansion of the Fed's balance sheet, an increase in its exposure to interest rate risk, as well as an increase in the federal government's average debt maturity. From a consolidated perspective, however, QE did *not* lead to an expansion of the balance sheet, and the average maturity of public sector liabilities declined, with interest rate risk being shifted from the federal government to the central bank. In other instances, however, aggregation can obscure

[5] Other recent work on public sector balance sheets in advanced economies includes Brede and Henn (2018) who study the case of Finland.

channels of risk propagation, since risk sharing between states is limited, as is the insurance against local or regional shocks provided to municipalities by the federal government. Hence, a more granular approach is needed for the analysis of state and local governments.

The case of the United States also illustrates how the assessment of financial health can depend on accounting conventions. While the public debate focuses on general government debt securities, unfunded defined benefit pension obligations, which are explicitly backed by the government, are significant.[6] Similarly, Kotlikoff (2015) points out that, while not a contractual obligation, social security payments are a promise made by the government that, from an economic perspective, resembles debt service payments (though social security policies can be changed over time).

Some important caveats need to be considered when analyzing the public sector balance sheet for policy purposes. First, unlike for many private corporations, net worth *per se* should not be seen as a policy objective. Rather, it is a measure of policy space, delimiting the set of feasible policies within which the government can operate. Using that space to respond to shocks can be welfare enhancing even if it reduces public sector net worth. A prime example is the global financial crisis, when countercyclical stimulus measures reduced public sector net worth while concurrently supporting private sector net worth. Second, while historical balance sheet analysis helps us gather the facts about how public wealth has evolved over the past decades, interpreting these facts would require a model of how asset prices, economic activity, fiscal, and monetary policy interact. Unlike most private businesses and households, governments are usually not price takers. That is, policy analysis should take into account that changes in the size and composition of the balance sheet may have an impact on prices, exchange rates, interest rates, and economic activity.[7] A case in point for these caveats is the restoration of public net worth between World War II and the early 1980s which, to some extent was driven by high inflation. Like a tax, inflation led to transfers of wealth from the private to the public sector, with ambiguous effects on welfare. Moreover, if inflation was itself a consequence of fiscal and monetary policy, then it is linked with the balance sheet in more than one direction. Finally, the cyclicality of asset prices needs to be taken into account when assessing policy space, in order to avoid procyclical expenditures.

The paper is structured as follows. Section II builds the static public sector balance sheet for the year 2016, discussing data sources and limitations. Section III analyzes the evolution of the public sector balance sheet since the end of World War II, both consolidated and by

[6] And the value of these liabilities is sensitive to the methodology regarding underlying discount rates.

[7] Monetary policy is a prominent example for how governments use their ability to affect relative prices in the economy. The ability to incur losses to pursue its policy objectives is a hallmark of central bank independence. Considerations of "crowding in" and "crowding out" effects of public investment are another example.

subsector, with a focus on the past fifteen years and on the years around the global financial crisis. Section IV estimates and analyzes the public sector intertemporal net worth. Finally, section V presents the results of a fiscal stress test applied to the public sector balance sheet.

II. BUILDING THE STATIC PUBLIC SECTOR BALANCE SHEET

The US public sector balance sheet (PSBS) brings together assets and liabilities held by all public entities, based on publicly available data. Estimates on assets and liabilities for all public entities in the US (federal government, state and local governments, as well as public corporations, including the Federal Reserve System (Fed)) are published every quarter by the Fed (*Financial Accounts of the United States – Z.1*). Data for the general government and the central bank are also reported as part of the IMF Government Finance Statistics (GFS) framework. Though data at the sectoral level are readily available, building the PSBS requires a consolidation of cross-holdings of assets and liabilities across these sectors. We report numbers compiled in the October 2018 IMF Fiscal Monitor (2018b), which, in addition to official US statistics, include IMF estimates on subsoil assets. Annex 3 details data sources and assumptions. At the time of this writing, the latest year with full data availability is 2016.

The public sector balance sheet provides a more comprehensive picture of the fiscal position than general government debt. General government gross debt amounted to about 107 percent of GDP in 2016 while public sector net financial worth – the difference between financial assets and liabilities – was -101 percent of GDP. While debt and net worth currently happen to be of similar magnitude, there have been substantial differences in the past, as debt liabilities are only one driver of financial net worth. Figure 1 provides a simplified breakdown of the difference between general government gross debt and public sector net worth. Key elements include:

- **Nonfinancial assets of the general government**, which represent 84.5 percent of GDP, including 10.7 percent of GDP in natural resource assets and 73.8 percent of fixed assets. These fixed assets are mostly equipment (including defense) but also contain real estate.

- **General government financial assets and liabilities.** Financial assets represent about 26 percent of GDP, including student loans (6 percent of GDP), as well as equity, mortgage loans, and short-term assets. On the liability side, one mostly finds guarantees to federal, state, and local government pension funds (see below).

- **Public corporations,** which carry significant assets and liabilities. Public corporations in the US include:[8]

[8] Nonfinancial public corporations in the United States are part of the general government sector. The enterprises making up the public corporation sector in the US are all financial.

- ***federal, state and local government employee retirement funds***. These pension funds manage the pension liabilities to government employees and hold a diverse portfolio of equity, loans, debt securities, and other financial assets.[9] With most government employees enrolled in defined-benefit pension funds, and the asset position significantly inferior to the significant stock of accumulated pension liabilities (54 percent of GDP); this mismatch is covered by a guarantee from federal, state and local governments, recorded as an asset in the balance sheet of pension funds. [10]

- ***Government-sponsored enterprises (GSE)*** and GSE-backed mortgage pools. GSEs carry a significant portfolio of mortgage assets (37 percent of GDP), which they use as collateral for the issuance of mortgage-backed securities. While only the largest GSEs (Freddie Mac and Fannie Mae) are currently under federal conservatorship, we count all GSEs as public corporations, consistent with Fed's classification.[11] We assume that any shortfall between assets and liabilities is (explicitly or implicitly) covered by the federal government, throughout the entire period of analysis.

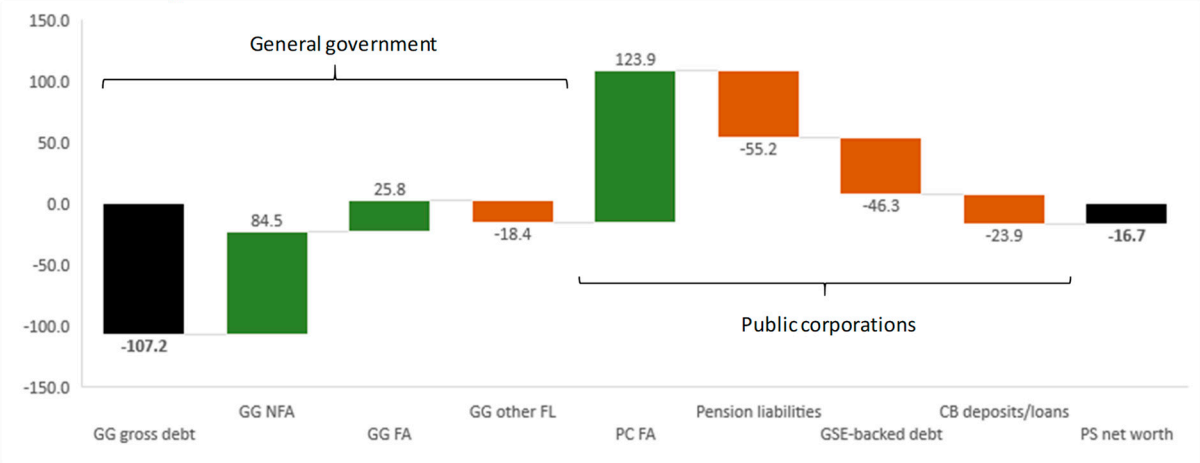
- ***the Federal Reserve***, which holds a large portfolio of Treasury securities and GSE-issued debt and securities (23 percent of GDP), covering its activities as a monetary authority (issuance of currency, deposits…). The Fed's main liabilities are reserve deposits of commercial banks.

[9] Note that the responsibilities of these retirement funds are limited to government employees. Retirement benefits from Social Security are paid from general government resources, and the assets of the Social Security Trust Fund (i.e., special issue Treasury securities) are consolidated within the general government sector.

[10] Liabilities are estimated by the Bureau of Economic Analysis as the present value of future pension benefit payments to current and past government employees, accrued until end-2016.

[11] Other GSEs are Federal Home Loan Banks, Fannie Mae, Freddie Mac, Farmer Mac, Farm Credit System, the Financing Corporation, and the Resolution Funding Corporation. The Student Loan Marketing Association (Sallie Mae) was included until its privatization in 2004.

Figure 1. United States: From General Government Gross Debt to Public Sector Net Worth
(in percent of GDP, 2016)



Source: IMF staff calculation. Public sector cross-holdings are not consolidated in this figure.

Cross-holdings of assets and liabilities within the public sector are significant and represent a potential channel through which fiscal risks can spread. There are four main groups of cross-holdings within the public sector in the US: (i) Treasury securities, GSE-backed securities and GSE-issued debt held by the central bank (23 percent of GDP), most of which has been acquired in the context of the quantitative easing policy after the global financial crisis; (ii) claims by defined benefit pension funds on their sponsoring government to cover unfunded pension liabilities (20 percent of GDP); (iii) Treasury securities held by federal government employee retirement funds as part of their asset portfolio (10 percent of GDP); (iv) Treasury and GSE-backed securities held by state and local governments (6 percent of GDP).

Table 1 provides a consolidated view of the public sector balance sheet in the US in 2016. While Table 1.a. adheres to the GFS classification of subsectors, Table 1.b. breaks down the public sector into two spheres according to the key cross-holding relationships described above. Hence, the "Federal sphere" covers the federal government, GSEs (part of which are under federal conservatorship), federal government employee pension funds (for which asset/liability mismatches are guaranteed by the federal government) and the Federal reserve (which holds a significant portfolio of Treasury and GSE-backed debt securities). The "state and local sphere" covers subnational governments and state and local government employee pension funds (for which asset/liability mismatches are guaranteed by their respective sponsoring governments).

Table 1. United States: Public Sector Balance Sheet in 2016 (percent of GDP)

1.a. According to GFS sector classification

percent of 2016 GDP	General Government (GG)				Public Corporations (PC)					*Consolidation between GG and PC*	TOTAL
	Federal government	State / local governments	*Consolidation*	Total	GSEs	Pension funds	Central Bank	*Consolidation*	Total		
Assets	**40.9**	**73.2**	***-3.8***	**110.3**	**46.3**	**53.7**	**23.9**	**-11.9**	**112.0**	*-46.5*	**175.8**
Nonfinancial	28.4	56.1	*0.0*	**84.5**	0.0	0.0	0.0	0.0	**0.0**	*0.0*	**84.5**
Financial	12.5	17.1	*-3.8*	**25.8**	46.3	53.7	23.9	-11.9	**112.0**	*-46.5*	**91.3**
Liabilities	**99.5**	**31.4**	***-3.8***	**127.1**	**46.3**	**53.7**	**23.9**	**-11.9**	**112.0**	*-46.5*	**192.5**
Financial	98.0	31.4	*-3.8*	**125.6**	46.3	0.0	23.9	-11.9	**58.3**	*-46.5*	**137.3**
Pension liabilities	1.5	0.0	*0.0*	**1.5**	0.0	53.7	0.0	0.0	**53.7**	*0.0*	**55.2**
Net Worth	**-58.5**	**41.8**		**-16.7**	**0.0**	**0.0**	**0.0**		**0.0**		**-16.7**
(excl. land and nat. res.)				-27.4							-27.4
Net Financial Worth	**-86.9**	**-14.3**		**-101.3**	**0.0**	**0.0**	**0.0**		**0.0**		**-101.3**
Nominal GDP ($bn)	*18,624.5*										

1.b. According to most significant cross-holdings

percent of 2016 GDP	Federal sphere						State / local sphere				*Consolidation between spheres*	TOTAL
	Federal government	GSEs	Federal pension funds	Central Bank	*Consolidation*	Total	State / local governments	State / local pension funds	*Consolidation*	Total		
Assets	**40.9**	**46.3**	**21.1**	**23.9**	***-46.5***	**85.7**	**73.2**	**32.6**	**-10.1**	**95.8**	*-5.7*	**175.8**
Nonfinancial	28.4	0.0	0.0	0.0	*0.0*	**28.4**	56.1	0.0	0.0	**56.1**	*0.0*	**84.5**
Financial	12.5	46.3	21.1	23.9	*-46.5*	**57.3**	17.1	32.6	-10.1	**39.7**	*-5.7*	**91.3**
Liabilities	**99.5**	**46.3**	**21.1**	**23.9**	***-46.5***	**144.2**	**31.4**	**32.6**	**-10.1**	**54.0**	*-5.7*	**192.5**
Financial	98.0	46.3	0.0	23.9	*-46.5*	**121.7**	31.4	0.0	-10.1	**21.4**	*-5.7*	**137.3**
Pension liabilities	1.5	0.0	21.1	0.0	*0.0*	**22.6**	0.0	32.6	0.0	**32.6**	*0.0*	**55.2**
Net Worth	**-58.5**	**0.0**	**0.0**	**0.0**		**-58.5**	**41.8**	**0.0**		**41.8**		**-16.7**
(excl. land and nat. res.)						-69.2						-27.4
Net Financial Worth	**-86.9**	**0.0**	**0.0**	**0.0**		**-87.0**	**-14.3**	**0.0**		**-14.3**		**-101.3**
Nominal GDP ($bn)	*18,624.5*											

Sources: Government Finance Statistics; Board of Governors of the Federal Reserve; and IMF staff calculations.

III. EVOLUTION OF THE US' PUBLIC SECTOR BALANCE SHEET SINCE 1945

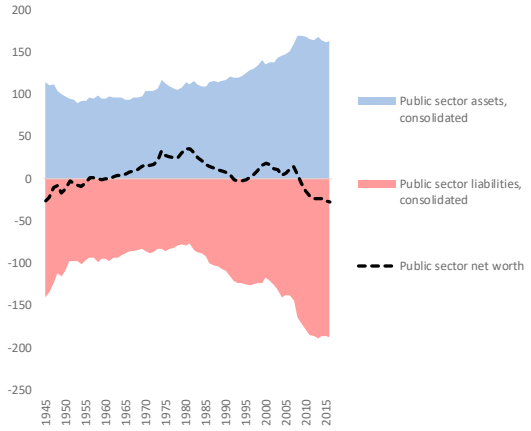
A. EVOLUTION OF THE CONSOLIDATED PUBLIC SECTOR

Following a gradual recovery after the Second World War, public sector net worth peaked in the early 1980s (Figure 2).[12] After reaching 35 percent of GDP in 1980, net worth has been on the decline, reaching -27 percent of GDP in 2016. The overall decline since the 1980s mainly reflects the federal government's position, whereas state and local government net worth has fluctuated around a level of 40 percent of GDP (Figure 3). With general government net savings persistently negative since the 1960s, fiscal policy has done

[12] In this section, unless otherwise specified, net worth excludes land and natural resource assets, due to data limitations before 2001.

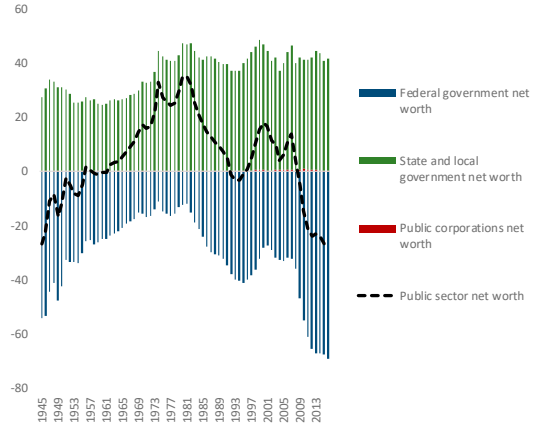
little to increase net worth. Only during the consolidation of the late 1990s did net worth improve due to fiscal policy.

Figure 2. United States: Public Sector Assets and Liabilities since 1945 (percent of GDP)



Source: IMF staff calculation

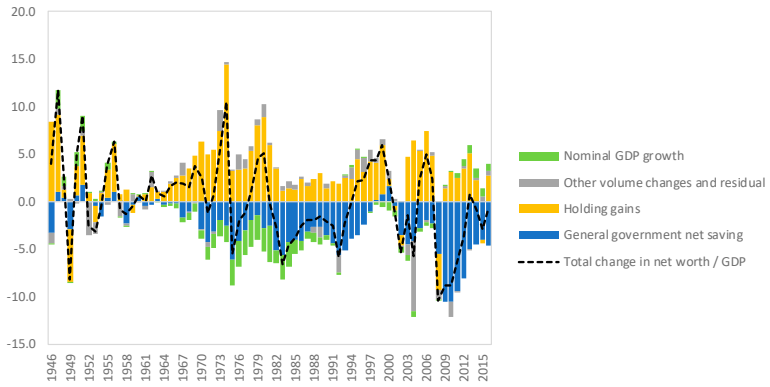
Figure 3. United States: Evolution of Public Sector Net Worth since 1945 (percent of GDP)



Source: IMF staff calculation

A large share of the evolution of net worth is explained by valuation changes (Figure 4). For example, prices of nonfinancial assets increased considerably during high-inflation period of the 1970s. Changes in corporate equity valuations have also affected the balance sheet positively, with the exception of the aftermath of the dot-com bubble in the early 2000s as well as the global financial crisis.

Figure 4. United States: Annual Changes in Public Sector Net Worth, 1946–2016
(in percent of GDP)

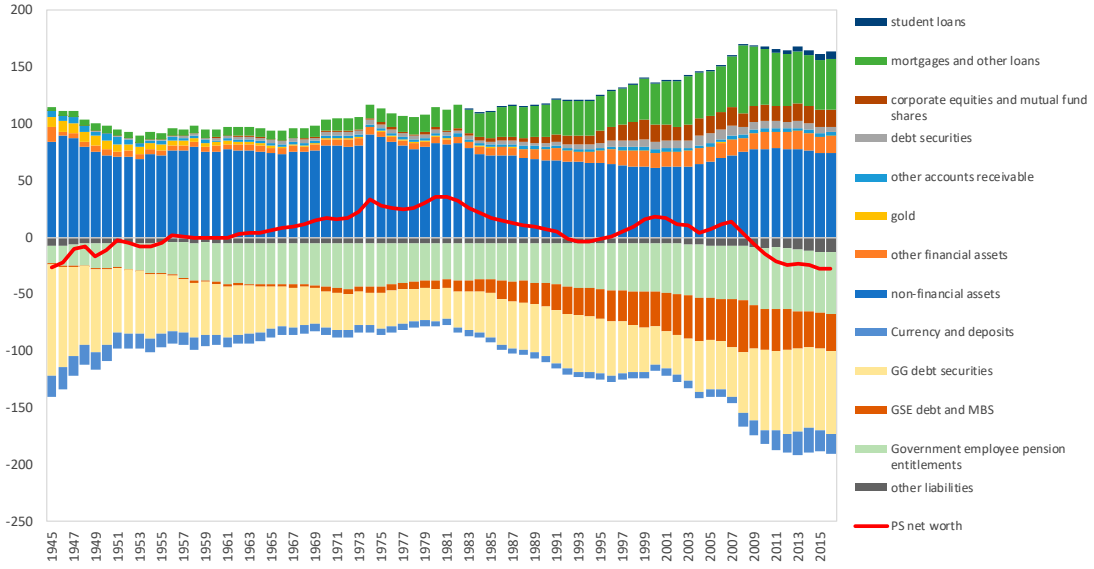


Source: Board of Governors of the Federal Reserve; IMF staff calculations

The size of the balance sheet has grown steadily over time (Figure 5). Financial assets have gained dramatically in importance over time, particularly since the early 1980s, whereas nonfinancial assets declined slightly as a share of GDP. While in 1945 financial assets on the

consolidated balance sheet consisted mainly of gold, deposits in commercial banks, and tax receivables, these items now account for less than three percent of financial assets, as the public sector holds a large portfolio of loans, debt securities, equities, and other assets, totaling about 90 percent of GDP.

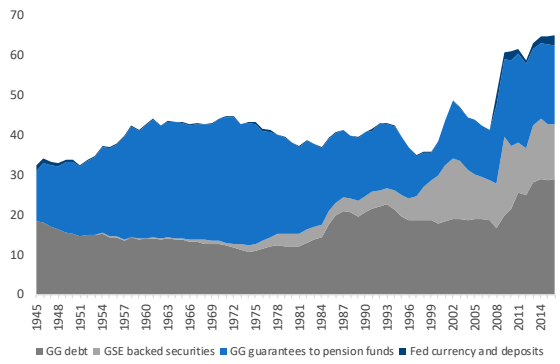
Figure 5. United States: Consolidated Public Sector Balance Sheet, 1945–2016
(in percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculations.

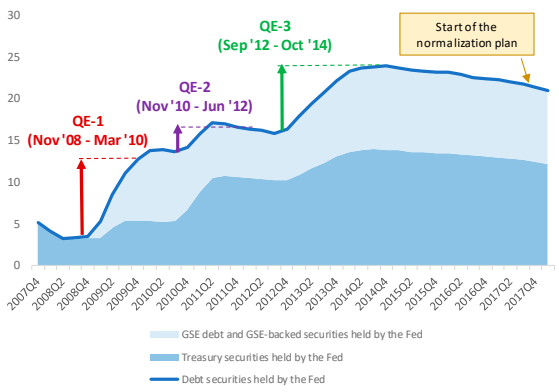
Cross-holdings have increased over time, particularly in times of financial turmoil (Figure 6). Cross-holdings of Treasury securities and GSE-issued debt have more than tripled over fifty years, held by GSEs, pension funds, state and local governments and the Federal Reserve. In the years following the global financial crisis, the Fed's intervention to stabilize asset markets and its subsequent policy of quantitative easing (QE) involved the purchase of large amounts in GSE debt, GSE backed securities, and Treasury securities over the period 2008–14 (Figure 7). As a result, the consolidated public sector balance sheet did not grow from QE, contrary to that of the Fed's balance sheet. The unwinding of QE has been initiated by the Fed in late 2017 ("normalization plan"), again without any expected effect on the size of the public sector balance sheet. Another significant type of cross-holding claims by state and local pension funds on their governments have fluctuated with the valuation of their equity portfolios. During the boom of the late 1990s, pension fund assets increased substantially, leading to a reduction of the size of the shortfall compensated by the general government. By contrast, in the global financial crisis, the decline in equity values led to an increase in the funding gap, requiring larger compensations from the government.

Figure 6. United States: Public Sector Cross-Holdings (percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation

Figure 7. Federal Reserve's Total Debt Holdings, 2007–18 (percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation

B. Evolution by Subsector

General Government: Non-financial Assets

The stock of non-financial assets held by the general government has hovered around 75 percent of GDP on average since 1945, with a shift of ownership from the federal to the state and local governments. The ratio of federal government fixed assets to GDP has continuously declined since the mid-1970s (Figure 8), with prolonged episodes of low or negative net capital formation. This has also led to a consistent increase of the average age of total federal government assets, from 14 years in the 1960s to 24 years in 2016.[13] Concurrently, the ratio of fixed assets owned by state and local governments to GDP has almost doubled since 1945. Structures and buildings currently form the bulk of general government nonfinancial assets, most of which owned by state and local governments (Figure 9). The value of these assets has benefited from the housing price boom in the early 2000s, accounting for the increase in total nonfinancial fixed assets up to the global financial crisis. The defense sector still accounts for most of the equipment assets and for the majority of federal government fixed assets, though this share has been decreasing consistently since the 1970s (Figure 10). Finally, to complete the picture, one should consider general government subsoil assets, which are highly sensitive to changes in market prices and account for most of the short-term fluctuations in the nonfinancial asset portfolio of the general government (Figure 11).

[13] See BEA, Fixed Assets Accounts Tables

Figure 8. General Government Fixed Assets (percent of GDP)

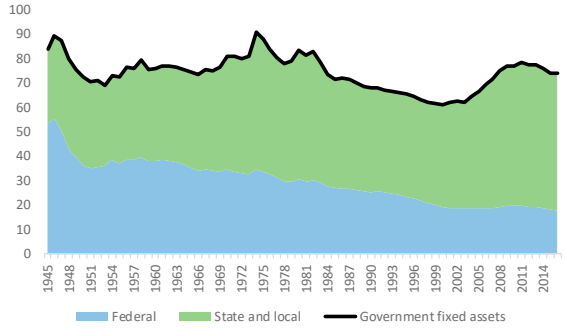


Figure 9. Categories of General Government Fixed Assets (percent of total)

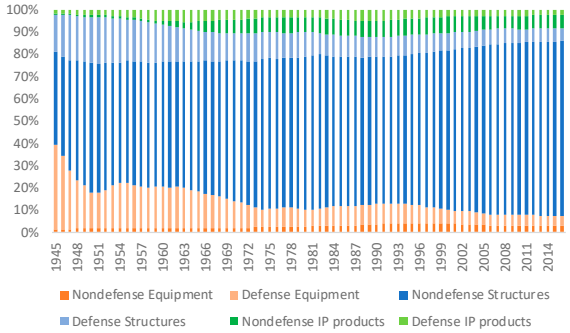


Figure 10. Federal Government Fixed Assets by Purpose (percent of GDP)

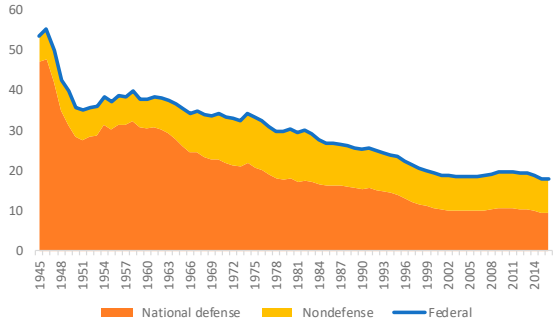
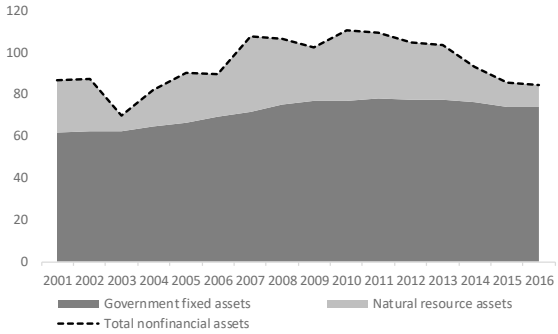


Figure 11. Total General Government Nonfinancial Assets (percent of GDP)



Source: BEA; Board of Governors of the Federal Reserve; IMF staff calculations.

General Government: Financial Assets and Liabilities

Financial assets of the federal government declined steadily as a share of GDP until 2008 (Figure 12). Assets mostly consist of short-term assets as well as loans to state and local governments and mortgages (e.g., through Ginnie Mae and the Department of Veterans Affairs). Since the financial crisis, however, the federal government has substantially expanded its holdings of student loans, which reached 5.9 percent of GDP in 2017. Though the federal government had mostly provided guarantees to private lenders on student loans since the 1960s ("Stafford loans"), it shifted its focus to offering direct loans, first gradually in the 1990s, then fully in 2010 under the Health care and Education Reconciliation Act.[14] More than three quarters of all student loan debt is now held by the federal government.[15]. By contrast, the impact of the 2008 Troubled Asset Relief Program (TARP) and the bailout of General Motors were relatively small and temporary (see II.C.).

[14] See, e.g., Dynarski (2014) for more institutional background on student loans.

[15] Note that student loans cannot be discharged in a personal bankruptcy.

State and local government financial assets have grown substantially, especially since the 1970s (Figure 13). State and local governments hold a considerable portfolio of debt securities, equities, and mortgages. A large share of the portfolio consists of claims on other public sector entities, including the federal government and GSEs. These cross-holdings have grown over time, especially in the 1980s.

Figure 12. United States: Federal Government Financial Assets (in percent of GDP)

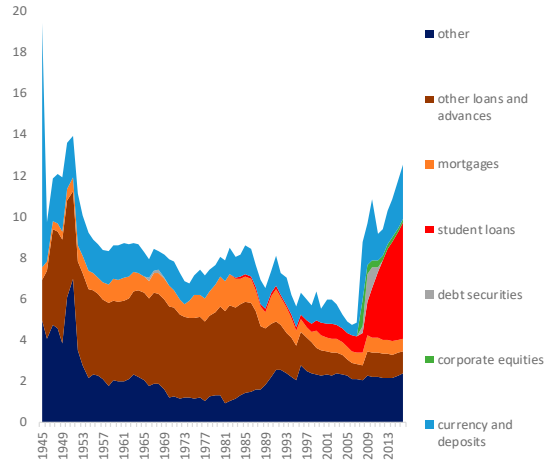
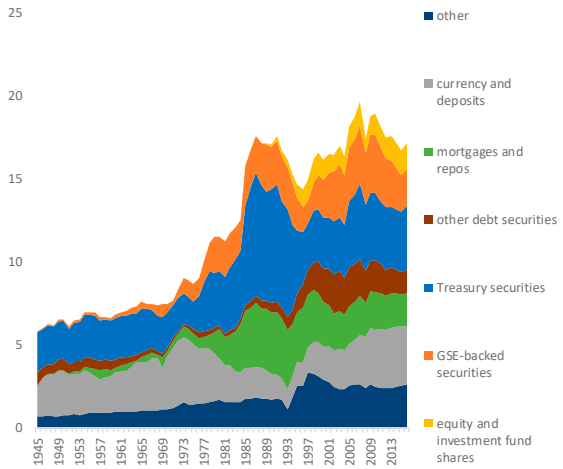


Figure 13. United States: State and Local Government Financial Assets (in percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation

General government liabilities consist mostly of debt securities, loans, and guarantees to defined benefit pension funds to cover unfunded pension liabilities. The evolution of federal government liabilities has mostly been driven by debt: Treasury debt securities have more than doubled since 2000 (Figure 14). Due to strong fiscal rules, state and local governments are more constrained in their ability to run deficits and issue debt. Still, since these rules do not extend to pension benefits, the size of their liabilities has been volatile, driven by guarantees to state and local retirement funds (Figure 15).

Figure 14. United States: Federal Government Liabilities (in percent of GDP)

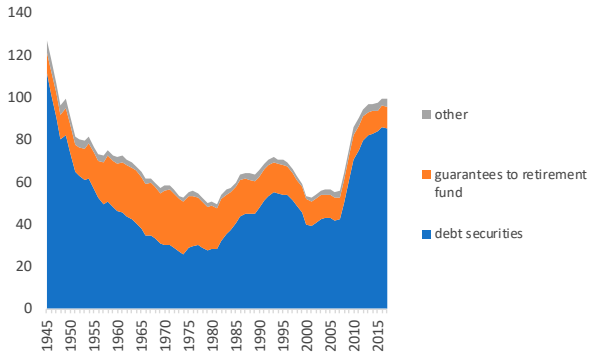
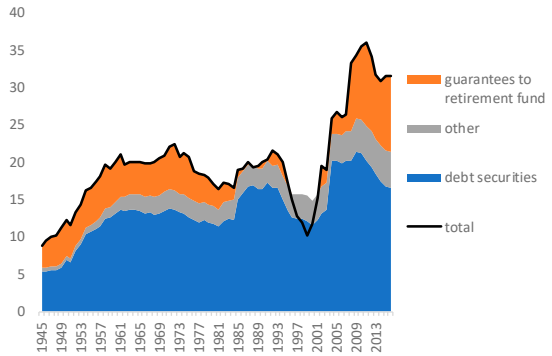


Figure 15. United States: State and Local Government Liabilities (in percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation

Note on Figure 15: In the late 1990s, the overfunding of state and local pension funds led to the recording of negative claims of pension funds on their respective state and local governments.

GOVERNMENT EMPLOYEE RETIREMENT FUNDS

Taken as a whole, government employee pension fund assets are significantly smaller than their fast-growing liabilities[16], with general government covering for the shortfall.

- Guarantees provided to ***federal government pension funds*** (Figure 16) have been shrinking since the early 1980s when the unfunded Civil Service Retirement System (CSRS) was closed to new entrants and replaced with the Federal Employee Retirement System (FERS) which is legally obliged to remain fully funded, including through a guarantee from the federal government if necessary. It is worth noting that, since CSRS and FERS both invest exclusively in Treasury securities, the distinction between funded and unfunded liabilities is an artificial one. In both cases, all federal pension benefit liabilities, which by far exceed the value of assets held by the federal pension funds, are backed by a promise from the federal government.

- The funding status of ***state and local government pension funds*** (Figure 17) has been volatile, as pension liabilities have been on a consistent increase, while assets (equities for the most part) have gone through ups and downs. During the late 1990s,

[16] This paper uses pension liability numbers reported by the Federal Reserve in the financial accounts of the United States. De facto, it uses discount rate assumptions guided by US government accounting standards, which recommend using long-term expected rates of return on pension plan assets to measure liabilities. According to Rauh (2017), using market-valuation techniques would triple the amount of unfunded liabilities relative to what is currently reported.

when stock prices soared, pension funds became overfunded, leading to negative claims on governments.

Figure 16. United States: Federal Government Retirement Fund Assets and Liabilities (in percent of GDP)

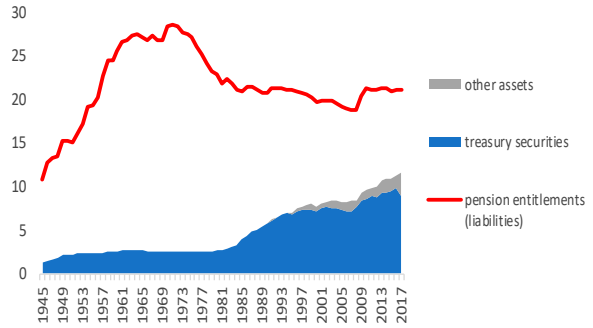
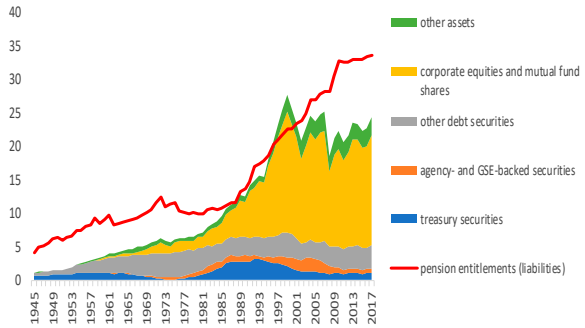


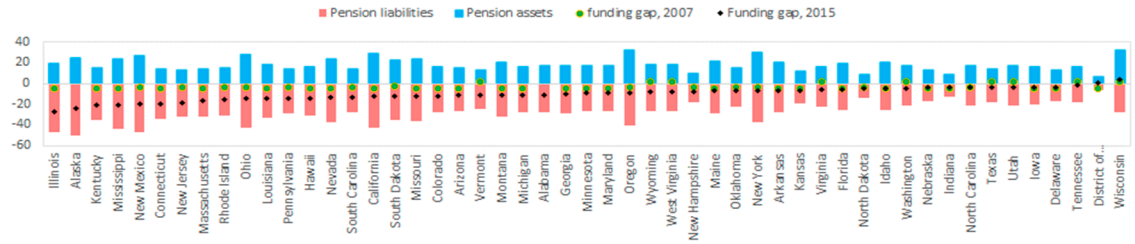
Figure 17. United States: State and Local Government Retirement Fund Assets and Liabilities (in percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation

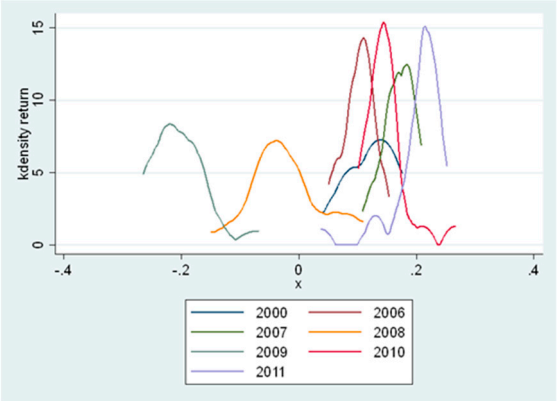
The aggregate current shortfall of state and local pension funds masks substantial heterogeneity in funding status across states. Funding status ranges from a surplus of 4.3 percent of state GDP in Wisconsin to a gap of 27 percent of GDP in Illinois (Figure 18). In most cases, the funding status has deteriorated considerably since 2007, driven by large negative returns during the global financial crisis. There is substantial variation in returns across funds (Figure 19), which account for a considerable share of the heterogeneity in funding gaps. Shoag (2014) reports a within-year standard deviation of returns across state pension plans of 2 to 3 percentage points and a cross-sectional standard deviation in cumulative 20-year returns of nearly 100 percentage points.

Figure 18. Funding Status of State and Local Government Retirement Funds, 2007 and 2015 (in percent of state GDP)



Sources: BEA; and IMF staff calculations.

Figure 19. Cross-State Distribution of State Pension Fund Asset Returns



Sources: US Census Bureau; and IMF staff estimates.

THE FEDERAL RESERVE SYSTEM

The global financial crisis marks a turning point in the evolution of the Fed's balance sheet. Until the early 1990s, the Fed's balance sheet had been gradually shrinking as a percentage of GDP, reflecting financial deepening, and stayed roughly constant in size thereafter (Figures 20 and 21). In 2008, banks came to the discount window to refinance themselves when markets dried up, leading to an increase in Fed lending. In addition, the Fed intervened to stabilize markets for mortgage-backed securities issued or backed by GSEs.

The Fed's balance sheet expanded further with the QE policy over the period 2008-2014, but this does not show at a consolidated public sector level. The QE policy was adopted in the wake of the global financial crisis, in order to support economic activity, mostly through purchases of treasuries and GSE debt. It is noteworthy that the lion's share of Fed assets (and all of assets taken up by the Fed as part of QE) consists of claims on other public sector entities (see also Figures 6 and 7). As a result, when looking at the consolidated public sector balance sheet, the impact of QE on the asset side has been negligible.[17] And on the liability side, QE has led to a shortening of maturities, as the Fed issued reserve deposits to purchase long-term treasury and GSE securities from the public. Hence, at the public sector level, QE is best understood as a debt management operation, or as a swap of federal government interest recipients from the public to the Fed (Figure 22).

[17] This stands in contrast to the ECB which has purchased corporate bonds under its QE program or the Swiss National Bank with its purchases of international equities.

Figure 20. United States: Federal Reserve Assets (in percent of GDP)

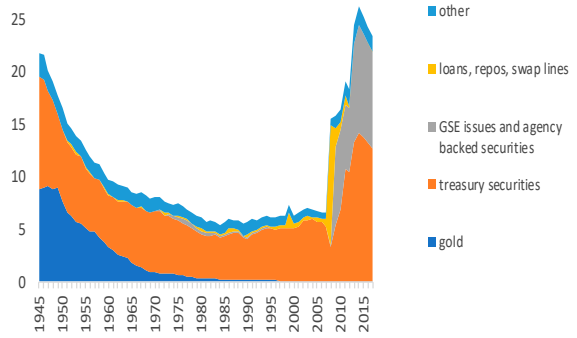
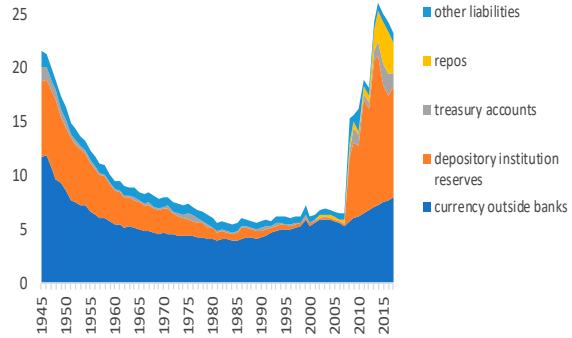
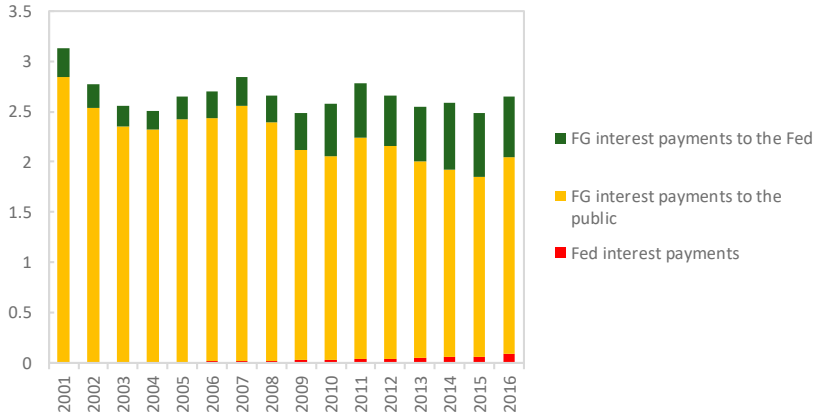


Figure 21. United States: Federal Reserve Liabilities (in percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculations

Figure 22. United States: Interest Payments by the Federal Reserve and the Federal Government (in percent of GDP)



Source: BEA, IMF staff calculations. Note: FG interest payments to the Fed are proxied using the Fed's interest receipts in the Integrated Macroeconomic Accounts.

GOVERNMENT SPONSORED ENTERPRISES

Government sponsored enterprises, notably Freddie Mac and Fannie Mae, and mortgage pools backed by these entities have grown considerably over time.[18] Their activities represent one of the largest post-war government interventions in the U.S. economy. By issuing some of the first mortgage backed securities (MBS) and collateralized

[18] The distinction between GSEs and GSE-backed mortgage pools is more of an accounting issue than an economic one. Indeed, in 2010, GSEs moved a large share of mortgages from GSE-backed mortgage pools – and associated liabilities – onto the GSE balance sheet – an accounting change that did not reflect any economic transaction.

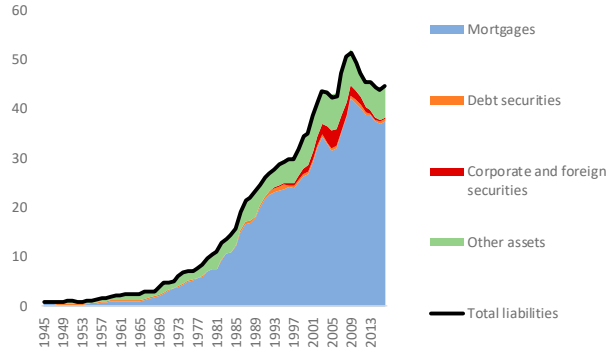
mortgage obligations, they were also a main driver of financial innovation in the late 1970s and 1980s.[19] Securitization allowed savings from other markets in the US and from abroad to be channeled into local mortgage markets. Mortgage assets held by GSEs grew from 1 percent in 1960 to more than 30 percent in the early 2000s (Figure 23).

Investment in riskier assets in the years prior to the global financial crisis put Fannie Mae and Freddie Mac in a difficult financial position. On top of the issuance of MBS, GSEs also issue "agency debt", backed by a portfolio of diverse assets, such as mortgages, agency MBS or other securities. In the 2000s, as the subprime mortgage market quickly developed, GSEs started to invest in riskier "non-agency MBS", securities issued by private investment banks and backed by pools of subprime mortgages. Fannie Mae and Freddie Mac owned a portfolio of over $300 billion of corporate mortgage-backed securities by the end of 2007. As for their core credit guarantee business, while GSEs can only guarantee mortgages conforming to specific criteria on size and quality, the overall exposure to credit risk increased – for instance, between 2003 and 2007, loans with loan-to-property value ratios above 90 percent grew from 7 to 16 percent of total newly purchased loans for Fannie Mae. When the subprime crisis hit, and commercial banks froze mortgage investments and securitization, GSEs increased their guarantee activities to preserve access to affordable housing and liquidity on the secondary housing market. However, in the second half of 2007 and first half of 2008, Fannie Mae and Freddie Mac posted very significant losses, due to credit losses on guaranteed mortgages, and mark-to-market losses on the risky investment portfolio (Figure 24). By mid-2008, though technically solvent, it can be argued that Fannie Mae and Freddie Mac were in fact insolvent on an economic basis (Frame et al., 2015).[20]

[19] Prior to that, mortgage lending was in the hands of Savings and Loan banks, and their lending was constrained by the deposits they could raise in their respective local markets.

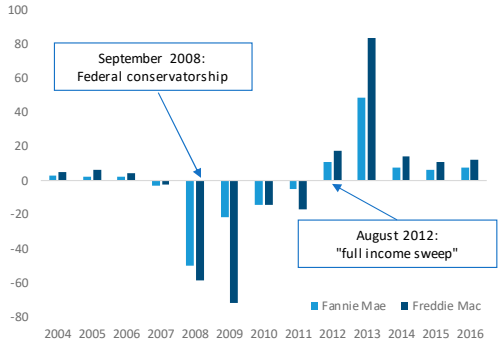
[20] In their Q2 2008 earnings, the book value of Fannie Mae's and Freddie Mac's equity capital was positive, above statutory minimum requirements. However, this calculation included significant deferred tax assets (which would not be of use in the short term due to weak profit perspectives). Furthermore, their reported fair market value of assets, net of liabilities, was much lower, and even negative for Freddie Mac.

Figure 23. GSE and GSE-backed Mortgage Pools: Assets and Liabilities (percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculations.

Figure 24. GSEs: Net Income, 2004–2016 (billion US dollar)



Source: FHFA.

Under federal conservatorship, the balance sheets of Fannie Mae and Freddie Mac became less risky. In September 2008, the Federal Housing Finance Agency (FHFA) was appointed as conservator, taking up the responsibilities of directors, officers and shareholders of both companies. In addition, senior preferred stock purchase agreements were signed with the US Treasury, granting both firms the ability to draw on cash capital from the Treasury, in exchange for senior preferred stock and, since 2012, remitting all profits to the federal government ("full income sweep"). The agreements also planned for the wind-down of the two firms' investment portfolios. These announcements, complemented by quantitative easing by the Fed (see Figure 21), led to a stabilization of the mortgage market. The credit profile of both Fannie Mae and Freddie Mac has also improved, with higher average credit scores on guaranteed mortgages. Investment portfolios were reduced and recomposed, with private-label securities almost fully disappearing from the balance sheets. The cost for the federal government was significant at first: over the period 2008-2011, Fannie Mae and Freddie Mac drew up a cumulative $187.5 billion on the Treasury. Since then, both firms have gone back to posting positive profits, which have all been remitted to the Treasury under the agreements (Figure 24).

C. Impact of the Global Financial Crisis on the Public Sector Balance Sheet

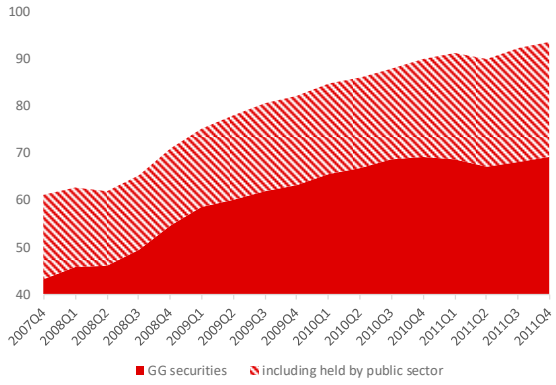
The 2008–09 global financial crisis led to a fast and lasting accumulation of debt liabilities, while the stock of public sector assets slightly decreased. The most significant effect was a rapid increase in the debt-to-GDP ratio, due to the contraction in output, the collapse of tax revenues, automatic stabilizers, and countercyclical policy measures. The issuance of treasury and municipal securities represented more than 30 percent of GDP over four years (2008–11, Figure 25). As seen above, a part of this increase was financed by other public sector entities whose holdings increased by 7 percentage points of GDP over the same

2008–11 period, mostly due to the first waves of quantitative easing. On the asset side, the fast reduction of the stock of mortgage assets (-7 percentage points of GDP between 2008 and 2011) was partly offset by the fast build-up of the federal government's student portfolio (which tripled over the same period).

The impact of federal government bailouts of nonfinancial and financial corporations which occurred during the global financial crisis was temporary and relatively limited. More than $400 billion of toxic equities and debt securities were purchased by the federal government under the Troubled Asset Relief Program (TARP) program launched in 2008, providing liquidity to major private American companies such as American Investment Group (AIG), Citigroup, Bank of America or General Motors. All holdings were ultimately sold – by the end of the program in 2014, proceeds recovered from these sales even overcame total purchases. The impact of TARP on the balance sheet became hardly visible within three years (see corporate equities in Figure 12).

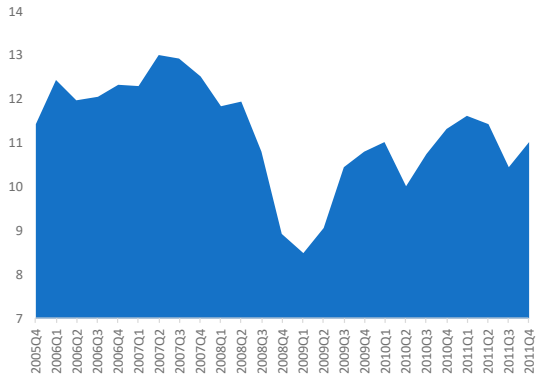
Crisis-related valuation effects were mostly transitory or non-apparent. In 2008, revaluation effects led to a 4 percent of GDP drop in total corporate equity assets of state and local pension funds (Figure 26). These losses were, however, quickly recovered when stock market prices picked up. Furthermore, the impact of the collapse of real estate prices on the valuation of general government fixed assets appeared with a lag and was much more limited, as many of these NFAs are not real estate, as revaluation of the portfolio takes time and as some assets are valued at their historical cost.

Figure 25. General Government Securities, by Holder (percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation.

Figure 26. Equity Portfolio of State and Local Pension Funds (percent of GDP)



Source: Board of Governors of the Federal Reserve; IMF staff calculation.

IV. THE INTERTEMPORAL PUBLIC SECTOR BALANCE SHEET

A. ADDING THE INTERTEMPORAL COMPONENT TO THE BALANCE SHEET

The present values of future revenue and expenditure are significant assets and liabilities which do not appear in the static balance sheet. Governments hold the sovereign prerogative to collect taxes, which constitutes a large asset. They are, however, also bound by the promise of delivering certain services and transfers, which imply future expenditures. The intertemporal balance sheet incorporates these future revenue and primary expenditure flows into the analysis by adding their present values as assets and liabilities to the static balance sheet. As a result, the intertemporal balance sheet is inherently more uncertain than the static balance sheet, as the intertemporal component relies on long-term projections on the evolution of revenues and expenditures, themselves dependent on a set of assumptions on the macroeconomic environment and future fiscal policy (see Annex 1).

Present values are computed over a 50-year horizon. To compute the present value of fiscal flow x over T years, future flows are discounted by discount rate r_t and summed, as follows:

$$PV^T(x,t) = \sum_{i=t+1}^{t+T} \frac{x_i}{\prod_{j=t+1}^{t+i}(1+r_j)}$$

We choose to set a horizon of 50 years (i.e. T=50), as macroeconomic, demographic and fiscal projections beyond that horizon are very uncertain.[21] All flows are discounted using the projected effective nominal interest rate on general government debt.[22]

Macro-fiscal projections for the United States are devised over a 50-year horizon in order to produce a baseline intertemporal balance sheet. Annex 1 details the projections underlying the intertemporal balance sheet. The key choices are as follows:

- **Medium-term forecasts (2018–23)** are taken from the April 2018 IMF World Economic Outlook (WEO) database. Macro-fiscal projections take the impact of the Tax Cuts and Jobs Act (2017) into account, implying lower tax revenue and higher real GDP levels.

- **Looking into the long-term (2024 and beyond),** output projections are based on a neoclassical growth model, informed by the expected evolution of the demographic structure. Long-term fiscal forecasts are driven by the impact of demographics on

[21] Extending the horizon by 15 years would multiply the present value of primary balances by a factor of about 1.4, while looking at the infinite horizon would multiply it by 6.7.

[22] This implicitly assumes a deterministic setting or one in which policy makers are risk neutral.

expenditure trends[23] (lowering the primary balance by 10 points of GDP by 2067), only partly offset by the expected long-term evolution of federal revenue (+2.6 points of GDP by 2067[24]) and non-age-related expenditure (-1.3 percent of GDP by 2067).

Assumptions regarding the interest-growth differential are crucial. We assume that, in the long run, effective nominal interest rates for the general government are larger than nominal GDP growth, consistent with the CBO's long-term assumptions on growth and federal government interest rates as well as the observation that borrowing costs are higher for local governments. [25] As a result, positive primary balances are required to make fiscal policy sustainable in the long run. With a negative interest-growth differential, any bounded path for primary deficits would be sustainable, as pointed out in Barrett (2018).[26]

In choosing a positive interest-growth differential, this analysis takes a more conservative approach than other recent work. The argument that, with negative interest-growth differentials, large primary deficits are not inconsistent with fiscal sustainability has gained more prominence recently. Blanchard (2019) prominently points out that, in times of low interest rates, "public debt may have no fiscal cost". Indeed, in a deterministic world with low average future interest rates, the sustainability of current policy should not be a concern. In practice, however, the are two points to consider. First, there is considerable uncertainty around the future path of interest-growth differentials. Even for the past, Barrett (2018) cannot reject positive differentials. And second, the cost of being wrong about r - g exhibits a discontinuity at zero: Even if the likelihood is small, wrongly assuming a negative r - g (i.e., running into a potential fiscal crisis) could be a lot costlier in expected terms than wrongly assuming a positive r - g (i.e., making costly but orderly fiscal adjustment).

To analyze the sustainability of current policies, we exclude fixed nonfinancial assets, focusing on the intertemporal *financial* net worth, inclusive of natural resource assets. A positive intertemporal net worth (IFNW) means that future primary balances are sufficient

---

[23] For more information on this approach, see Amaglobeli et al. (2016).

[24] This includes the effect of real bracket creep on the individual income tax (+1.4 percent of GDP) and the expiration of several individual provisions of the Tax Cuts and Jobs Act (+0.7 percent of GDP). According to CBO, beyond 2028, the macro-fiscal effects of the permanent provisions of the tax reform should be modest, though highly uncertain.

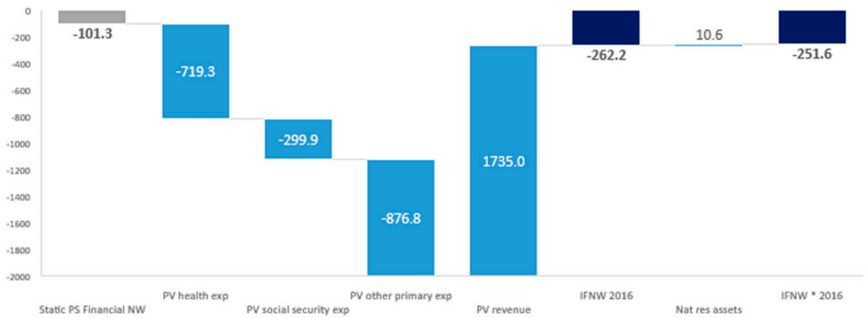
[25] In the baseline scenario, long-term nominal growth (3.8 %) is lower than the long-term discount rate, that is set as the effective long-term interest rate for *general government* debt (4.4 %), meaning that the present value over an infinite horizon is finite. CBO's long-term nominal growth projection is identical, while its projection for interest rates on *federal government* debt is 4.1% (consistent with historically higher rates for subnational governments).

[26] Note that intertemporal net worth is undefined when interest-growth differential is negative and $T \to \infty$.

to fully cover the country's net liabilities, while a negative IFNW means that current policies may not be fully financed over time.[27] In principle, fixed nonfinancial assets could be sold to cover spending needs or reduce liabilities. However, to the extent that these assets are productive, such operations would lead to reduced economic activity and hence lower the tax base in the future. Hence, we assume that assets are already implicitly included in our calculations through the present value of tax revenues, and by excluding them from the analysis we avoid the risk of double-counting. In practice, fixed assets that could be sold tend to be relatively limited in most economies (Bova, 2013), meaning that they are hard to mobilize to cover financing needs. For instance, in the US, disposal of federal nonfinancial assets has only reached a cumulative ½ percent of GDP over the past twenty years. Though the fixed asset portfolio could potentially be optimized through a change in asset mix for instance and some assets can be monetized, buildings or structures eventually sold could often lead to new expenditure needs (through rents or leases for example) which would over time offset the initial gain from the sale. Natural resource assets, by contrast, should be included in the analysis, as they are marketable and are not included in the productive capital stock. In the following, we note IFNW* the sum of IFNW and natural resource assets.

The highly negative IFNW* shows that the baseline scenario is not feasible. The no-policy-change assumption embedded in the baseline scenario leads to the general government's fiscal deficit significantly increasing over time, especially due to the growing weight of age-related expenditure. The present value of primary balances is highly negative, at -161 percent of GDP. Adding this intertemporal component to an already negative financial static net worth leads to a highly negative IFNW* of -252 percent of GDP in 2016 (Figure 27). Under current policies, the US' fiscal position is hence unsustainable.

Figure 27. United States: Intertemporal Financial Net Worth under the Baseline Scenario
(2016, percent of GDP)



Source: IMF staff calculations

[27] Over the infinite horizon, INW should be non-negative to fulfill the intertemporal budget constraint. Over a finite horizon, a negative INW may be sustainable though if the whole adjustment burden is assumed to be covered by generations beyond the considered timeframe.

B. Assessing the Fiscal Adjustment Need

A fiscal consolidation scenario could bring IFNW* back to sustainable territory. Holding everything else constant, a one percent of GDP permanent increase in the primary balance from 2019 onwards would improve the IFNW* by 49 percent of GDP. Cutting the gap between the baseline and a zero-IFNW* in half would require an adjustment by some 2.6 percent of GDP. In order to fully cancel out the negative IFNW*, a permanent fiscal adjustment of 5.1 percent of GDP from 2019 onwards would be needed.[28]

In interpreting these estimates, some caution is warranted. They provide an order of magnitude of the needed adjustment but are computed under partial-equilibrium assumptions, in which economic activity and interest rates are not affected by the fiscal adjustment. In a general equilibrium framework in which public borrowing crowds out private investment, the adjustment need may well be lower. Moreover, as noted above, assumptions on interest rates are crucial.

Macro-fiscal feedback mechanisms imply that adjustment should be gradual. Our approach abstracts from the fact that changes in government policy affect economic activity, so that the *ceteris paribus* assumption is a strong one. Were the government to adjust spending or raise revenue by 2.6 percent of GDP overnight, it would most certainly cause a new recession and might even reduce public sector net worth further.

Postponing the fiscal adjustment would increase its cost. As the primary deficit is projected to consistently increase in the baseline scenario, the present value of primary balances keeps getting more negative over the years. This is especially due to the aging of the population and the associated projected fast increase of health and social security expenditure. Hence, a delayed fiscal adjustment starting in 2024 would have to be 0.7 percent of GDP higher in order to ensure fiscal sustainability.

The adjustment needed to restore net worth is larger than the adjustment of debt alone. The IMF's debt sustainability analysis estimates that a medium-term general government primary surplus of about 1¼ percent of GDP could lead to the public debt ratio decreasing in a durable manner; this corresponds to a fiscal adjustment of about 3 percent of GDP by 2027, largely in line with CBO estimates.[29] According to our calculations, a permanent 3 percent of GDP fiscal adjustment starting in 2019 would bring the present value of primary balances

[28] Note that these estimates are sensitive to the time horizon. See US Treasury (2018) for estimates of the adjustment need for the federal government.

[29] The CBO estimates that to ensure that the federal debt-to-GDP ratio in 2048 is equal to its current level, a permanent fiscal adjustment of 1.9 percent of GDP from 2019 onwards would be necessary. For the federal debt-to-GDP ratio to decrease to its 50-year average by 2048, the permanent fiscal adjustment should total 3 percent of GDP.

close to zero. However, such an adjustment would not fully resolve the gap between current assets and liabilities, in particular relative to existing government employee pensions.

According to IMF (2018a), options for fiscal adjustment should include reforming social security and increasing the federal revenue-to-GDP ratio. Based on CBO estimations[30] expanded into the long-term, a federal tax package adopted in 2019, which would include the creation of a carbon tax, the creation of a broad-based 5 percent value-added tax and the increase of excise taxes on fuels, could yield more than 70 percent of GDP of present-value primary balances over 50 years.[31] A social security reform which would include the use of chained inflation (instead of traditional consumer price index) for the indexation of social security benefits from 2019, the submission of high earnings to social security payroll tax and the acceleration of the planned increase in retirement age could improve the present value of primary balances by more than 50 percent of GDP.

V. STRESS-TESTING THE US PUBLIC SECTOR BALANCE SHEET

Looking at the impact of the 2008–09 global financial crisis can only provide a partial answer to what would occur to the balance sheet in the event of another crisis. Though key characteristics of the public sector balance sheet in 2008 are still relevant to this day (exposure to credit and equity price risk, large pension liabilities), the size and composition of the balance sheet has changed. Furthermore, the evolution of the balance sheet in the few years following the crisis has been driven in part by policy measures. These measures have had a complex impact on the intertemporal balance sheet – the 2009 stimulus package in particular has led to the accumulation of further debt, and its positive impact on economic activity (and consequences on future fiscal flows or asset prices) remains difficult to measure or isolate (see, e.g., Batini et al., 2014 and CBO, 2015).

Applying a fiscal stress test to the public sector balance sheet provides some insight on how a stress scenario could affect current public sector assets and liabilities and future resource flows. The fiscal stress test methodology (IMF, 2016) allows an assessment of how the balance sheet would be affected by the occurrence of a macroeconomic shock under a no-policy-change scenario. The fiscal stress test relies on the projection of the static balance sheet three years forward under baseline and shock scenarios. Future fiscal flows are also reduced because of the shock, as GDP levels remain consistently below the levels that are projected without the shock. It is assumed that no countercyclical fiscal policy measures are

[30] CBO (2016).

[31] On the other hand, cancelling the sunset clauses embedded in the 2017 Tax Cuts and Jobs Act could cost at least 10 percent of GDP, depending on the intensity of the macroeconomic feedback effects of the tax cuts.

taken. As experienced during the Global Financial Crisis, such measures would lead to a further accumulation of debt while allowing for a faster economic recovery.

We set up two adverse shock scenarios based on the Federal Reserve's banking stress test medium-term macroeconomic scenarios.[32] For the period 2018–20, the two macroeconomic shock scenarios are aligned with the Fed's February 2018 "adverse" and "severely adverse" supervisory scenarios (Figure 28).

- ***Under the Adverse scenario,*** the US economy faces a moderate recession in 2018, with real GDP declining by 2.1 percent. The unemployment rate rises to 7 percent in 2019. Average yields on Treasury securities are cut in half in 2018, while equity prices fall by 25 percent, and real estate prices by about 10 percent. The economy starts to pick up in 2019 and 2020, with a return to positive growth, a slow decline in unemployment, and the reversal of most of the drop in Treasury yields and equity prices.

- ***Under the Severely Adverse scenario,*** a severe recession hits the US, with respectively a 6.3 and 0.6 percent decrease of real GDP in 2018 and 2019. Unemployment climbs to 10 percent in 2019. The assumed global aversion to long-term debt securities leads to a steeper yield curve, as short-term rates fall to zero while long-term rates stay unchanged. Equity prices fall by more than 60 percent in 2018, and real estate prices by 25 percent. The economy only starts to pick up in 2020.

Fiscal flows would be significantly negatively affected by the shocks (Figure 28).[33] The deficit-to-GDP ratio is severely hit under both scenarios, due to the rapid drop in tax revenue and expenditure rigidities.

- In times of serious crisis, **revenue-to-GDP ratios** tend to drop (IMF, 2016), as several revenue heads decrease much more than GDP. In the months following the start of the global financial crisis, individual and corporate income tax revenues dropped – due to a sharp decrease in individual nonwage income (including capital gains, interests, and income from businesses) and in corporate profits. Under the shock scenarios, we assume that the revenue-to-GDP ratio temporarily decreases by 2.5 / 4.0 percentage points, before slowly reverting to the baseline ratio. These non-

[32] See Federal Reserve Board (2018). The Fed is required to conduct annual banking stress tests under the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act. In that context, the Fed prepares a baseline scenario as well as an adverse and a severely adverse scenario. These scenarios cover 28 macroeconomic variables describing the domestic and international economic developments. They are updated every year. In our scenarios, we assume no change in oil prices.

[33] From this paragraph on, impacts of the shocks on the balance sheet are presented as follows: [adverse scenario] / [severely adverse scenario].

linearities are more moderate than those observed during the global financial crisis, when revenues declined further due to tax cuts under the 2009 American Recovery and Reinvestment Act.

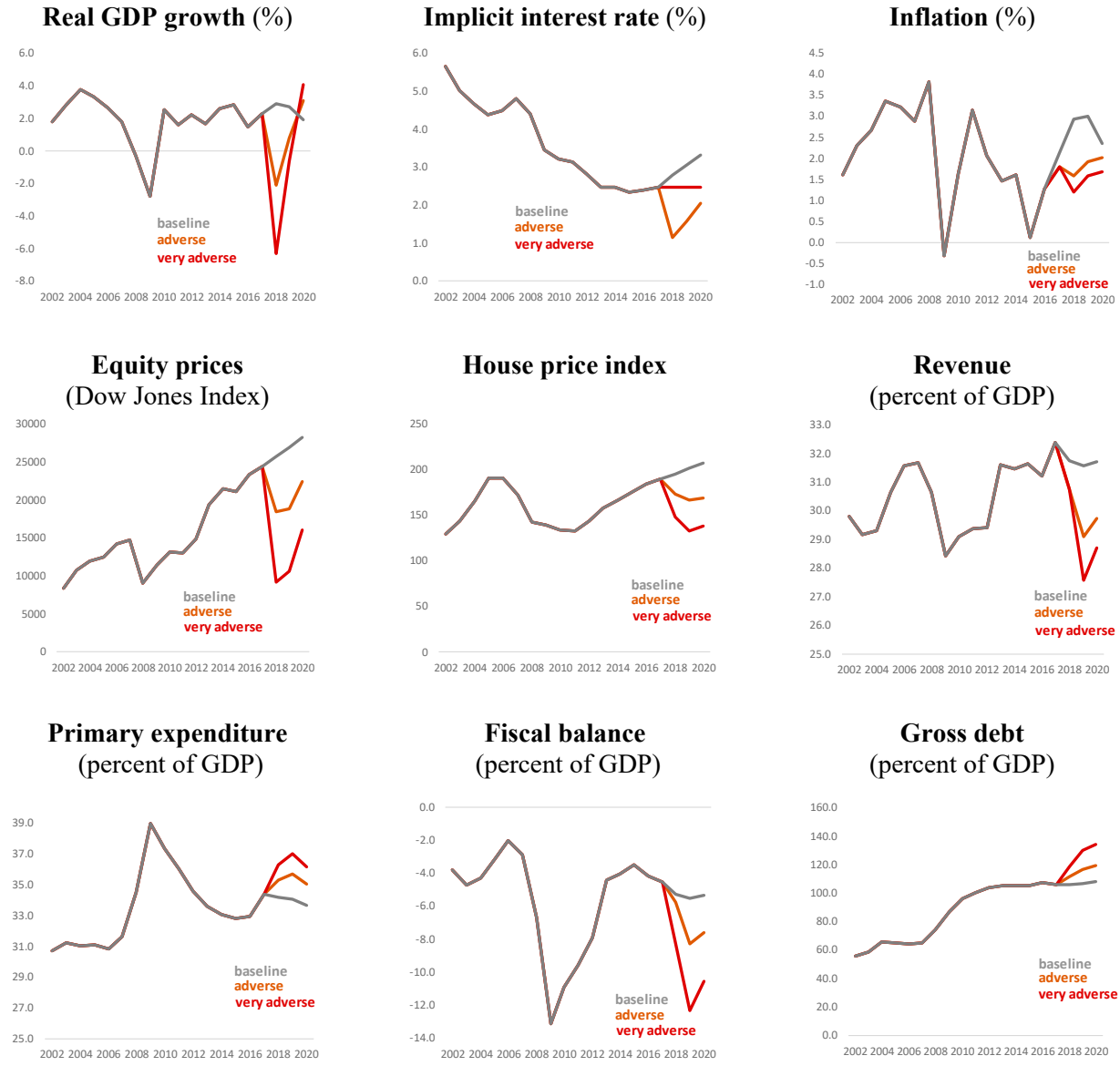
- On the contrary, **expenditure-to-GDP ratios** tend to increase. Wages or pensions represent a significant share of total spending, and these expenditure items cannot be easily adjusted downward in nominal terms when GDP drops. Under both shock scenarios, we assume that non-age-related spending remains equal to the baseline scenario in nominal terms – meaning that the expenditure-to-GDP ratio increases under both shocks. Age-related expenditure-to-GDP ratios are kept stable – this accounts for the fact that health costs will not increase as much as under the baseline scenario.

Asset revaluation bears significant consequences for the static balance sheet. The revaluation effects for each type of public sector asset are calculated according to the methods described in Annex 1.

- ***Nonfinancial assets (NFA)***, and real estate more specifically, are affected by the collapse of real estate prices. Over the whole portfolio, we assume that 20 percent of the previous year's price change is translated into NFA revaluation effects (see Annex 1, Figure A1. b). Revaluation hence plays negatively in 2019 and 2020. Overall, relative to the baseline scenario, nonfinancial assets fall by 2.5 / 5.6 percent of baseline GDP in 2020.

- ***Corporate equity assets***, three quarters of which are held by state and local pension funds, are significantly hit by the shocks. The most significant revaluation happens in 2018. In 2020, relative to the baseline scenario, state and local pension fund assets are expected to drop by 3.4 / 7.3 percent of baseline GDP. This deepens the asset/liability mismatch, but this is neutral for the pension funds' balance sheets, as the mismatch is ultimately sponsored by state and local governments. If, as during the global financial crisis, equity prices pick up and go back to the baseline within a few years, revaluation effects quickly cancel out. However, a mismatch, even temporary, can pose a liquidity issue to some state or local governments, which may experience financial distress a consequence.

Figure 28. Macroeconomic and Fiscal Variables under Baseline and Stress Scenarios



Source: Board of Governors of the Federal Reserve; IMF staff calculations

We estimate that loan losses would have a limited impact on the static balance sheet.

- About 4.0 / 6.5 percent of ***federally-held student loans*** would not be paid back over the period 2018-2020, leading to a portfolio loss of 0.1 / 0.3 percent of baseline GDP. This relatively limited impact on the student loan portfolio is consistent with the strong recovery power of the federal government in case of default, the rarity of discharge cases, and rules in place allowing for temporary relief (deferment, forbearance, grace periods, etc.). The impact is however uncertain, as little historical

data is available. In addition, it relies on a no-policy-change assumption, which may not hold due to voter pressures for forbearance in a downturn.

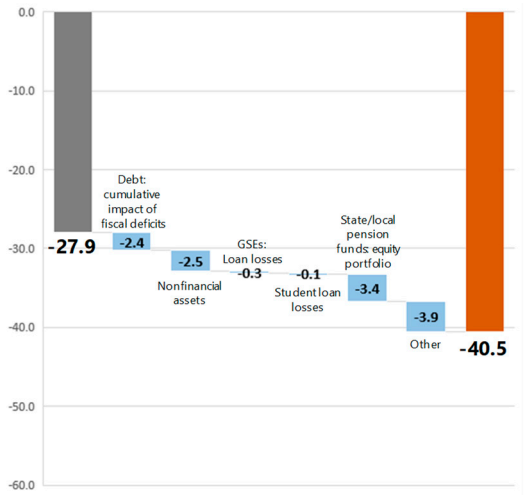
- Losses on the much larger ***mortgage loan portfolio held by GSEs*** are also limited at a cumulative 0.4 percent / 0.6 percent of baseline GDP over three years. These estimates do not directly compare with the potential treasury drawdowns, as they do not include the consequences of the shock on other assets, the impact of valuation allowances on deferred tax assets or the effect of provisioning rules. However, they are of similar magnitude to the Federal Housing Finance Agency (2017) estimates, which look only two years ahead. Under a severely adverse scenario, the FHFA calculates that a potential incremental treasury draws by Fannie Mae and Freddie Mac of about $100bn over two years (0.4 percent of baseline GDP) would be necessary. Ultimately, any mismatch on the balance sheet of GSEs will be offset by the federal government.

Overall, under these two shocks, a 13 (respectively 26) percent of baseline GDP decrease in US public sector static net worth is projected to materialize by 2020 (Figure 29 and Table 2). The steep decline in revenue affects the fiscal balance negatively, leading to a rapid accumulation of debt. Overall, relative to the baseline scenario, these deepened fiscal deficits lead to a further 2.4 / 8.7 percent of baseline GDP of debt by 2020. However, the steep decrease of public sector net worth would be largely driven by asset revaluation effects, explaining about 8 / 15 percent of GDP of the total decrease in public sector net worth in 2020 relative to the baseline. Expected student and mortgage loan losses are relatively small at -0.4 / -0.9 percent of baseline GDP. Loan losses for GSEs would ultimately lead to higher federal government debt, due to the ongoing federal conservatorship of Fannie Mae and Freddie Mac.

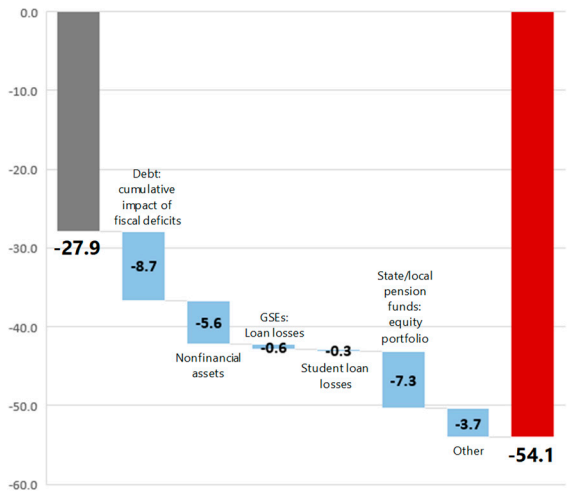
Future fiscal resources are also to be significantly affected by the shocks, making a fiscal adjustment even more necessary. Due to the persistent loss in the level of real GDP caused by the shocks, the intertemporal amount of resources available for discretionary fiscal policy would be significantly smaller under both shock scenarios than under the baseline. Stress events would hence make the necessary adjustment process more difficult.

Figure 29. Static Net Worth in 2020
(percent of 2020 baseline GDP)

a. Under the Adverse Scenario



b. Under the Severely Adverse Scenario



Source: IMF staff calculations.

Table 2: Stress Test Results
(percent of baseline GDP)

	Baseline scenario				Adverse scenario			Severely adverse scenario		
	2017	2018	2019	2020	2018	2019	2020	2018	2019	2020
Static Public Sector Net Worth	**-18.3**	**-21.4**	**-24.7**	**-27.9**	**-27.7**	**-35.9**	**-40.5**	**-35.8**	**-47.8**	**-54.1**
General Government	**-18.3**	**-21.4**	**-24.7**	**-27.9**	**-27.7**	**-35.9**	**-40.5**	**-35.8**	**-47.8**	**-54.1**
Assets	***109.4***	***106.0***	***102.5***	***100.6***	***106.0***	***100.6***	***97.8***	***105.9***	***98.4***	***94.6***
Nonfinancial	83.5	80.5	77.4	75.6	80.5	75.6	73.0	80.5	73.5	70.0
Financial	25.9	25.5	25.1	25.0	25.5	25.0	24.8	25.5	24.9	24.6
Liabilities	***127.7***	***127.4***	***127.2***	***128.5***	***133.7***	***136.6***	***138.4***	***141.8***	***146.2***	***148.6***
Debt securities	96.9	97.3	97.7	99.2	97.0	99.0	101.8	98.9	103.8	108.5
Others	30.8	30.2	29.4	29.3	36.7	37.5	36.6	42.9	42.4	40.1
Public Corporations and Central Bank	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Assets	***111.5***	***108.6***	***104.9***	***102.9***	***107.8***	***103.4***	***100.9***	***108.4***	***104.4***	***102.1***
Nonfinancial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Financial	111.5	108.6	104.9	102.9	107.8	103.4	100.9	108.4	104.4	102.1
Equity	*18.5*	*18.3*	*18.0*	*18.0*	*13.1*	*12.5*	*14.1*	*6.4*	*6.9*	*9.8*
Others	*93.0*	*90.4*	*86.9*	*84.9*	*94.8*	*90.9*	*86.7*	*102.1*	*97.5*	*92.3*
Liabilities	***111.5***	***108.6***	***104.9***	***102.9***	***107.8***	***103.4***	***100.9***	***108.4***	***104.4***	***102.1***
Accrued pension liabilities	53.9	52.0	50.8	50.4	52.5	50.4	49.3	52.4	50.9	50.2
Others	57.7	56.6	54.1	52.5	55.4	53.0	51.6	56.1	53.5	51.9
Memorandum items										
Nominal GDP ($bn)	19391	20438	21577	22440	19386	19908	20849	18535	18725	19699

Source: IMF staff calculations

VI. Conclusion

By analyzing the evolution of its public sector balance sheet and projecting it forward, this paper sheds new light on the fiscal position of the United States and its exposure to fiscal risks. The need for a significant fiscal adjustment in the US is a well-known result of CBO's long-term forecasting work and IMF's debt sustainability analyses. By looking beyond debt and including public sector assets and other liabilities in the intertemporal analysis, the paper reveals that the fiscal adjustment need is in fact more significant than what the analysis based on debt alone indicates. The paper also illustrates a shift since the crisis in where major fiscal risks lie and how they could spread. While the balance sheet of government-sponsored enterprises has shrunk and become less risky under federal conservatorship, funding shortfalls for state and local pension funds have emerged as a source of fiscal fragility. In the event of a severe shock, the paper estimates that balance sheet effects outside the realm of debt expose public sector net worth to a negative impact almost double in size to the expected accumulation of debt. And some potential hot-button topics are emerging, such as the fast-growing federal portfolio of student loans.

Further analysis could build on the analyses and findings in this paper. A more granular analysis of the funding status of state and local pension funds, along with the use of different discount rate assumptions, could provide a more accurate picture of the actual mismatch facing these funds, and could help inform policy advice on pension reform scenarios. Further analysis of mortgage loan and student loan data could be carried out to refine our model to assess losses related to these types of assets in case of a shock. Lastly, it would be interesting to repeat the stress test exercise on a regular basis, in order to update baseline assumptions and take stock of potential changes in the fiscal environment.

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ANNEX 1. PROJECTING THE INTERTEMPORAL PUBLIC SECTOR BALANCE SHEET: UNDERLYING ASSUMPTIONS AND PROJECTIONS

To compute the intertemporal public sector balance sheet for the United States, consistent with the methodology set out in the October 2018 Fiscal Monitor (IMF, 2018b), it is necessary to estimate the intertemporal component, based on a long-term macro-fiscal scenario. To then project the balance sheet forward into the medium-term, this scenario needs to be supplemented by assumptions on asset and liability transactions as well as on asset revaluation.

1. Medium-term (2018–2023)

The baseline scenario is based on the April 2018 WEO macro-fiscal projections. The scenario takes into account the impact of the 2017 Tax Cuts and Jobs Act, with a peak static fiscal cost of 1.3 percent of GDP in 2019 and a peak dynamic positive impact on real GDP levels of about 1.2 percent in 2020, which offsets part of the cost of the reform through extra revenue. An implicit interest rate is computed using WEO's gross debt and interest expenditure scenarios. The implicit interest rate increases from 2.5 percent in 2017 to 3.5 percent in 2023.

We make the following assumptions on asset and liability transactions:

- ***for the general government***, the rapid accumulation of financial assets in the past five years, especially due to the fast increase of the federal government's student loan portfolio, is extended into the forward years. The incurrence of liabilities is computed as the residual from the WEO's net lending path minus transactions in financial assets. The net capital formation scenario is based on WEO projections. It is assumed that there are no transactions on the natural resource asset portfolio.

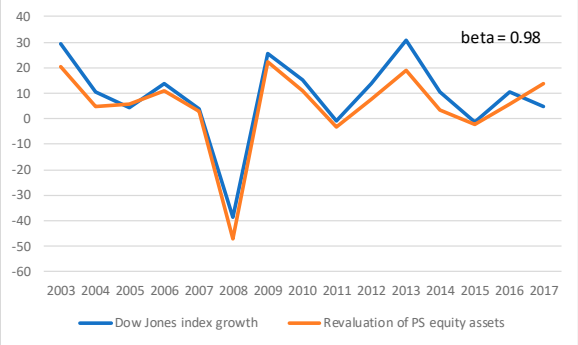
- ***for public corporations***, the average transactions of financial assets over the five last years, guided in particular by a continued increase of the mortgage loan portfolio, are carried through in the medium-term. Existing pension liabilities are assumed to grow at the same pace as the present value of pension expenditure. The incurrence of other liabilities is a residual, under the assumption that the operating balance of public corporations is equal to zero, its average over five years.

Price scenarios are needed to assess the revaluation effects on public assets and liabilities in the medium-term. Valuation changes for equity assets are proxied by the evolution of the Dow Jones Total Stock Market Index, forecast at 5 percent every year by the Federal Reserve (Figure A1.a). Natural resource assets are revalued at 3 percent every year (assumed evolution of global Brent crude oil prices), while the revaluation of other nonfinancial assets depends on the one-year-lagged evolution of the house and commercial real estate price indexes, for which we retain the Fed's scenario. Results show that about 20% of price changes are reflected in the following year's revaluation of nonfinancial assets

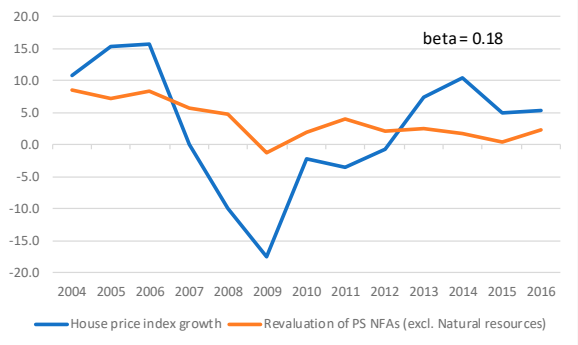
other than natural resources (Figure A1. b), consistent with practices of lagged and partial revisions of the value of the existing nonfinancial asset portfolio.

Figure A1. Projections of Medium-term Valuation Changes under Baseline Assumptions

A1. a. Revaluation of equity assets and evolution of Dow Jones index (%)



A1. b. Revaluation of nonfinancial assets and lagged evolution of house prices (%)



Source: IMF staff calculations.

We use the historical relationship between loan losses and macroeconomic variables to assess the evolution of the public sector loan portfolio over the medium-term (Annex 2). To our knowledge, there are no publicly available time series on losses on loans held by the public sector, namely GSEs and federal student loans. A second-best solution is to assess the relationship between quarterly net loan losses[34] for the banking sector and a set of macroeconomic variables (house prices, unemployment rate, mortgage interest rate) using a vector autoregression (VAR) model. We then apply the regression results to project public sector loan losses into the medium-term.[35] Partial data on Freddie Mae and Fannie Mac shows that GSE loan losses in the years 2010 and 2011 were considerably lower than those recorded in the banking sector as a whole. One possible explanation is that GSE-held mortgages are backed by better-quality collateral than for classic loans, so that the losses on delinquent loans are lower than on unsecured commercial or consumer credit. Hence, for GSE-held loans, we scale the projected loan losses by a factor of 1/3.

The projections also include the impact of the unwinding of quantitative easing. The baseline scenario is consistent with the Federal Reserve's announcements: 420 billion worth of debt assets (Treasury bonds and GSE-backed securities) to be dropped in 2018, followed

[34] Net loan losses are equal to the difference between charge-offs and recoveries on allowances for loan losses.

[35] Only the second lag of changes in house prices and changes in the unemployment rate (contemporaneous and second lag) are statistically-significant explanatory variables for the change in loan losses.

by 600 billion in 2019, 2020 and 2021. This is offset by the concurrent decrease of the Fed's currency and deposit liabilities by the exact same amount.

2. Long-term (beyond 2024)

Macro-fiscal projections in the long-term are largely based on a growth accounting approach developed by FAD (Figure A2).[36] This approach allows to take into account the impact of changes in the demographic structure of the US on labor and productivity. The population projections are drawn from the medium-fertility rate scenario of the United Nations' *World Population Prospects*, and are broken down by five-year cohorts, by age and gender. Under that scenario, the share of the population over 60 years old increases from 20 percent in 2015 to 30 percent in 2075. This aging process leads to a slow erosion of the contribution of labor to growth. Under an assumed constant total factor productivity growth, real GDP growth is expected to decrease slowly and moderately, from 1.9 percent in 2020 to 1.8 percent in 2075 (with some minor oscillations). Nominal GDP results from a deflator set at 2 percent. The implicit interest rate is assumed to gradually reach a long-term level within fifteen years (4.4 percent).

Under current policies, fiscal costs related to aging are expected to significantly increase over the long-term. According to FAD projections, public health expenditure is projected to double within 60 years as a share of GDP, from about 9 percent of GDP in 2017 to 18 percent of GDP by 2070.[37] This is due both to the aging of the population (expenditure is higher for older age groups) and to the observed trend that health care costs per capita grow on average faster than GDP per capita. The cost of pensions should increase from 8.3 to 10.3 percent of GDP between 2017 and 2070. We use CBO's latest long-term outlook projections for social security expenditure, expected to increase from 4.9 to 6.3 percent of GDP within 30 years.

We use CBO's assumptions on the long-term evolution of revenue and non-age-related expenditure flows as a share of GDP. Federal government revenue flows are expected to increase by 2.6 percent of GDP from 2024 to 2048 (and constant as a share of GDP beyond 2048), due in part to the expiration of some provisions of the Tax Cuts and Jobs Act (0.7 percent) and to structural features of the individual income tax, including real bracket creep (about 1.2 percent of GDP). Primary expenditure other than age-related spending is assumed to decline by 1.1 percent between 2018 to 2028 (based on the historical downward trend for federal discretionary spending) and remain constant as a share of GDP beyond 2028. Our

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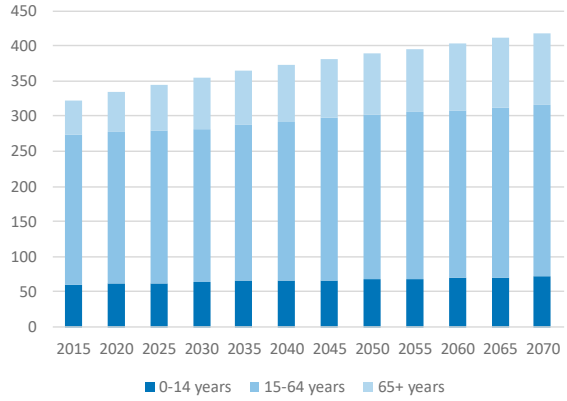
[36] Amaglobeli et al., *How to Assess Fiscal Implications of Demographic Shifts: A Granular Approach*, How-To Note, IMF, September 2016.

[37] This is consistent with the fast increase in the cost of major federal health care programs projected by CBO in its *2018 Long-term Outlook* (from 5.9 percent of GDP in 2018 to 10.6 percent of GDP in 2048).

scenario implicitly keeps subnational revenue and expenditure constant relative to GDP over the long-term.

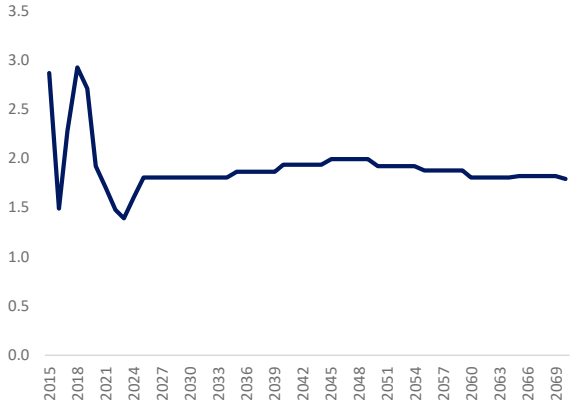
Figure A2. United States: Long-term Projections under Baseline Scenario

a. Population by age group (millions)



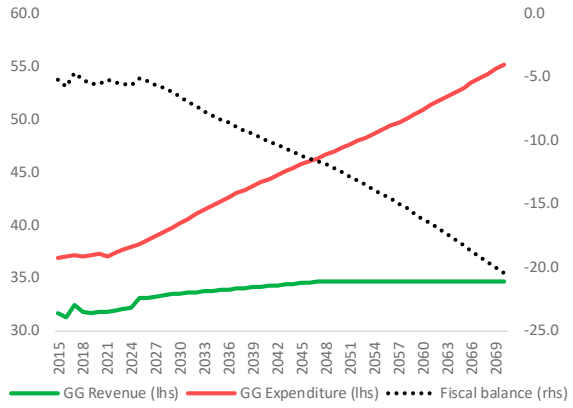
Source: United Nations.

b. Long-term real GDP growth (percent)



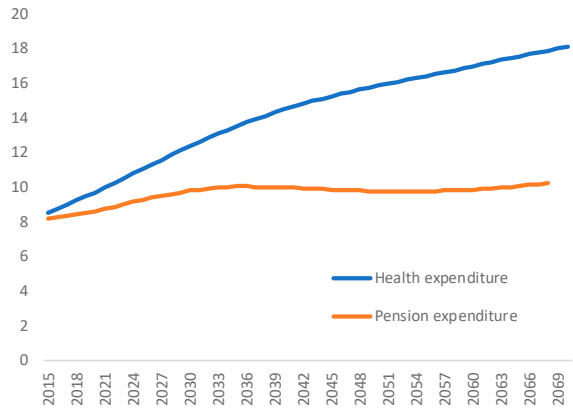
Source: WEO / IMF staff calculations.

c. Key fiscal variables (percent of GDP)



Source: WEO / IMF staff calculations.

d. Health and pension expenditure (percent of GDP)



Source: IMF staff calculations.

The calculation of present values is highly sensitive to the discount rate assumptions. Assumptions used across the paper are broadly consistent with those made by the CBO or the Government Accountability Office (see Table A2). The discount rate used in the calculation of present values of future revenues and expenditures is the implicit interest rate. The higher the discount rate, the lower the present value. Table A1 provides a brief analysis of the sensitivity of the present value of revenues and of the primary balance to discount rates. A one-shot, one-point increase in 2018 would diminish the 2017 present value of revenue by about 16 percent of 2017 GDP and increase the 2017 present value of primary balance by 1.6 percent of 2017 GDP. A permanent extra point over the whole 50-year period would

decrease the present value of revenue by some 350 percent of GDP, while improving the present value of primary balance by 41 percent of GDP.

Table A1. Sensitivity of Present Values to Discount Rates

Assumption	Impact on 2017 PV of primary balance (in percentage point of 2017 GDP)	Impact on 2017 PV of revenue (in percentage point of 2017 GDP)
+10 basis points in 2018	+0.2	-1.7
+100 basis points in 2018	+1.6	-16.4
+10 basis points in 2028	+0.1	-1.3
+100 basis points in 2028	+1.4	-13.0
+10 basis points in 2018–2027	+1.5	-15.0
+100 basis points 2018–2027	+14.1	-143.0
+10 basis points to LT rate	+2.2	-15.6
+100 basis points 2018–2067	+41.2	-353.2

Source: IMF staff calculations

Table A2. Comparison of macroeconomic projections with those from other institutions

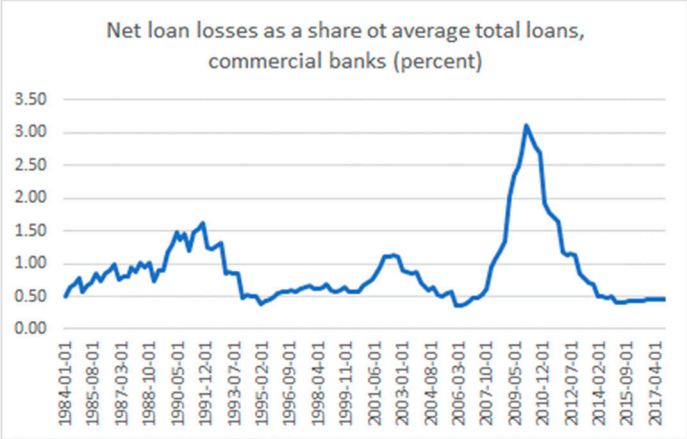
		FAD	CBO (1)	GAO
Real GDP growth	2018–28	1.9	1.9	1.9
	2029–68	1.9	1.9	2.1
Inflation	2018–28	2.2	2.1	2.1
	2029–68	2.0	2.0	2.1
Nominal interest rates (2)	2018–28	3.5	3.1	3.1
	2029–68	4.3	3.9	3.7 / 3.8

Notes: (1) CBO projections only until 2048; (2) CBO and GAO project interest rates for federal government debt only. Rates for subnational government debt being historically higher, FAD projections for general government debt are consistent with those of CBO and GAO for federal debt.

ANNEX 2. ESTIMATING A VAR MODEL FOR LOAN LOSSES

We estimate the historical relationship between loan losses and macroeconomic variables from available data using a vector autoregression (VAR) model and then apply these estimates to the given macroeconomic scenarios. The first obstacle in this exercise is data availability. To our knowledge, long disaggregated data series on mortgage loan losses and student loan losses are not available, neither at the aggregate level, nor at the level of GSEs.[38] We therefore use the quarterly series "Net Loan Losses to Average Total Loans for Banks" from the Federal Reserve Bank of St. Louis, for which data is available from 1984, as our measure of loan losses. This approach comes with several caveats:

- Mortgages are backed by collateral, so that the losses on delinquent loans are lower than on unsecured commercial or consumer credit.
- Student loans respond differently to shocks than mortgages and commercial loans as they could be more sensitive to unemployment dynamics and less responsive to real estate prices.
- The options for distressed borrowers to restructure loans vary across loan categories. In many states, mortgages can be defaulted on without going through a bankruptcy procedure. By contrast, student loans are difficult to be discharged even in a personal bankruptcy.



[38] Data constraints had also led to the exclusion of GSEs from default probability estimations for the 2015 FSAP stress test. (see IMF, 2015).

While time series on GSE loan losses are not available, losses in the years 2010 and 2011 were considerably lower than those recorded in the banking sector as a whole. We therefore scale the projected loan losses by a factor of 1/3.

Using quarterly data, the level of loan losses (as a share of total loans) are regressed on a set of seasonal fixed effects and on three exogenous variables:

- The change in unemployment rate (BLS, monthly)
- The change in the national house price index (all transactions)
- The change in the real 30-year mortgage interest rate (Freddie Mac, weekly)

For each of these variables, contemporaneous values and three lags are included. All variables are downloaded from the Federal Reserve Bank of St. Louis and quartered.

To assess the out-of-sample performance of the model, the figure below compares actual values with those predicted based on estimations up to 2007q4. The model captures about half of the increase in loan losses. Adding the GFC episode to the estimation sample will make the model more responsive to shocks.

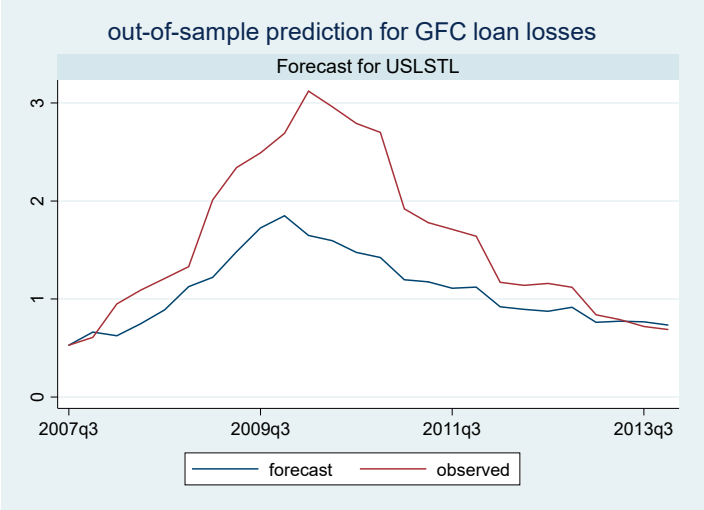


Table A2 below shows the regression results. Only few variables are statistically significant. These are the second lag of changes in house prices and changes in the unemployment rate (contemporaneous and second lag). Loan losses are also highly persistent.

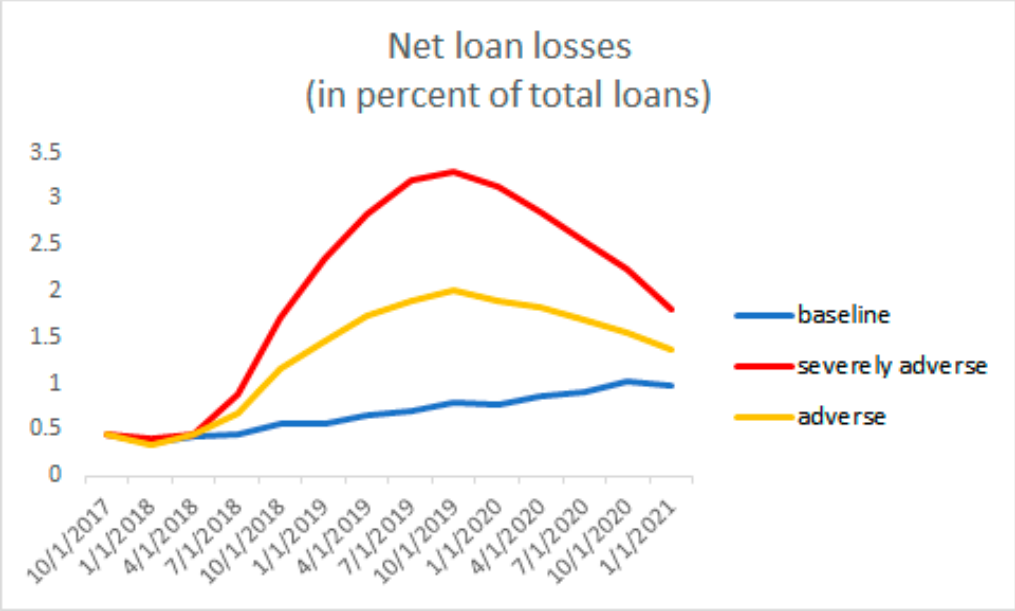
Table A2: VAR Model Results for Net Loan Losses

Dependent variable: Net Loan Losses		
	coefficient	p-value
Dep. Var.		
1st lag	0.89	**0.00**
2nd lag	0.10	0.38
3rd lag	-0.14	**0.07**
Change in unemployment rate		
contemporaneous	0.11	**0.04**
1st lag	0.08	0.20
2nd lag	0.10	0.10
3rd lag	0.08	0.16
Pct. change in house prices		
contemporaneous	1.73	0.27
1st lag	1.92	0.27
2nd lag	-6.29	**0.00**
3rd lag	-0.70	0.67
Change in real interest rate		
contemporaneous	0.02	0.51
1st lag	-0.01	0.71
2nd lag	0.02	0.45
3rd lag	-0.02	0.43
Number of observations	132	
R-squared	0.97	

Note: Regression includes quarterly dummies

Applying the regression coefficients to the DFAST scenarios leads to the projected paths of loan loss ratio as shown in the figure below. In the severely adverse scenario, the peak of loan losses as a share of total loans would be slightly above those witnessed during the GFC.

In the severely adverse scenario, the total loan losses between 2018–20 would be USD 89 billion higher than under the baseline, compared to 187.5 billion in total actual GSE drawings on the Treasury as of end-2016. Note that this exercise does not take into account provisioning rules or impacts on tax assets.


Net loan losses
(in percent of total loans)
3.5
3
2.5
2
1.5
1
0.5
0
10/1/2017
1/1/2018
4/1/2018
7/1/2018
10/1/2018
1/1/2019
4/1/2019
7/1/2019
10/1/2019
1/1/2020
4/1/2020
7/1/2020
10/1/2020
1/1/2021
baseline
severely adverse
adverse

ANNEX 3. DATA SOURCES AND ASSUMPTIONS FOR THE CONSTRUCTION OF THE STATIC PUBLIC SECTOR BALANCE SHEET[39]

A. Central/General Government

Authorities' submission to STA for dissemination in GFS Yearbook database.

Estimates for the stock of mineral and energy resources correspond to the present value of the expected pre-tax cash flows resulting from their commercial exploitation. Sources and methods for these estimates differ by type of commodity.

The value of stocks of oil and gas were estimated using the following data sources:

1.1. Production: Rystad database (only government owned fields)

1.2. Prices (in USD): WEO forecasts available at the end of the reference year

1.3. Costs of production (in USD): Rystad database

Sources 1.1, 1.2, and 1.3 were used to calculate future USD cash flows over an 85-year horizon. The net present value of the cash flows was calculated using a discount rate of 4.5%, which is equal to the average (2000–22) long-term (10-year) government bond yields in WEO plus one percent.

The value of stocks of coal, metals and other minerals were estimated using the following data sources:

2.1. Estimates (in constant 2014 USD prices) from the World Bank's "The Changing Wealth of Nations 2018" report, for years 2000, 2005, 2010, and 2014

2.2. United States Geological Survey data on 2016 reserves and 2014–16 production by commodity and by country, where available

2.3. Prices (in USD): WEO actual commodity prices for 2000–16

2.4. US Department of Interior Natural Resources Revenue Data (available at https://revenuedata.doi.gov/explore/#all-production), including information on production for federal lands and water.

Estimates for years not covered in source 2.1 were obtained through linear interpolation of the available observations. Estimates for 2015 and 2016 follow the evolution of reserves in those years, for those commodities for which reserve data are available (source 2.2). Where

[39] For details on the general framework for the construction of public sector balance sheets, please refer to the methodological annex (Annex 1.2) of October 2018 IMF Fiscal Monitor.

these are not available (cases where reserves for a particular commodity are small in relative terms), the assumption was that the value of the stocks is unchanged from 2014 onward.

The obtained estimates were converted to current USD prices, using the price index obtained through WEO actual commodity prices (source 2.3). These estimates were pro-rated using information on government ownership (source 2.4).

B. Central Bank

Authorities' submission to STA of Central Bank Survey through Standardized Report Format.

C. Nonfinancial Public Corporations

(none; NFPCs are consolidated in general government data)

D. Financial Public Corporations

For FPCs other than the Central Bank:

Fed's Financial Accounts of the United States - Z.1, available at

https://www.federalreserve.gov/releases/z1/ (vintage March 8, 2018)

Financial accounts (tables F.x) and financial balance sheet (tables L.x) of the following entities:

- Federal Government Employee Retirement Funds (Tables F.119 and L.119)
- State and Local Government Employee Retirement Funds (Tables F.120 and L.120)
- Government-Sponsored Enterprises (GSE) (Tables F.125 and L.125)
- Agency- and GSE-Backed Mortgage Pools (Tables F.126 and L.126)

No data adjustments, other than the consolidation of Agency- and GSE-backed securities held by Pension Funds and GSEs.

For Total FPCs ("NPCT Time Series" worksheet)

Calculated as aggregation of CB and other FPC, less:

- Fed's holdings of agency- and GSE-backed securities;
- GSEs' checkable deposits at the Fed.

E. Public Sector

Calculated as aggregation of GG and Total FPC, less:

- Fed's holdings of general government securities;
- Federal government deposits at the Fed;
- GSEs and Government Employee Retirement Funds' holdings of government (federal and municipal) securities;
- Government holding of financial public corporations' equity;
- Claims of Government Employee Retirement Funds on the government units as pension managers.