A New Structure for U. S. Federal Debt

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Abstract

We propose a restructuring of U. S. Federal debt. All debt should be perpetual, paying coupons forever with no principal. The debt should be composed of the following: 1) Fixed-value, floating-rate, electronically transferable debt. Such debt looks like a money-market fund, or reserves at the Fed, to an investor. 2) Nominal perpetuities. This debt pays a coupon of $1 per bond, forever. 3) Indexed perpetuities. This debt pays a coupon of $1 times the current consumer price index (CPI). 4) Debt should be sold in a form that is free of all income, estate, capital gains, and other taxes. 5) Variable coupons. The government should have the right to temporarily reduce or eliminate coupons without triggering legal default. 6) Swaps. The Treasury transact in simple swap contracts between these securities.

This structure will help to achieve the goals of debt management, macroeconomic, and financial stability.

1 Introduction

We propose a restructuring of U. S. Federal debt. All debt should be perpetual, paying coupons forever with no principal payment. The debt should be composed of:

1. Short-term debt: This debt has a fixed value of $1.00. It pays a floating rate, it is electronically transferable, and sold in arbitrary denominations. The rate should follow the interest paid on reserves by the Federal Reserve. Such debt looks to an investor like a money-market fund, or reserves at the Fed.

2. Nominal perpetuities: This debt pays a coupon of $1 per bond, forever.

3. Indexed perpetuities: This debt pays a coupon of $1 times the current consumer price index (CPI).

4. Tax free: All debt should be sold in a version, that is free of all income, estate, capital gains, and other taxes.

5. Variable coupon: Some if not all long-term debt should allow the government to vary the coupon rate without triggering legal default.

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6. Swaps: The Treasury should manage the maturity structure of the debt, and the interest rate and inflation exposure of the Federal budget by transacting in simple swaps among these securities.

While this seems like a lot of securities, it represents a considerable simplification relative to current U. S. debt. This structure will help to achieve the goals of debt management, and of macroeconomic and financial stability.

The goals for the structure and management of U. S. Federal Debt are, and should be,

1. Funding deficits at minimal cost to the taxpayer, and maintaining an asset structure by which the U.S. can borrow quickly and cheaply in time of need.

2. Providing liquid and useful securities that the market desires, that enhance financial and macroeconomic stability, and that the Government has a natural advantage in producing.

3. Managing the risks of interest rate and other adverse events to the U. S. budget and to the economy.

The first goal is uncontroversial, and a stated goal of Treasury debt management\(^1\). The modifications to U. S. debt that we suggest will just make that job a bit easier.

The second goal can be seen as a consequence of the first. If the U. S. can issue securities that are more liquid, more useful, or otherwise more valuable to investors, then the U. S. will be able to borrow larger amounts at lower rates. But the second goal has a direct primary policy purpose as well. The government provides public goods that it has a unique ability to produce, such as roads, defense, measurement standards, and currency. U.S. Treasury debt has unique financial features: It is uniquely liquid and insulated from default. But U.S. Treasury debt can be better structured to fill those economic and financial needs.

The third goal is more central in academic than policy analysis, but it is nonetheless important. If interest rates rise, and the U. S. has borrowed entirely short-term, then annual deficits must rise to pay the greater interest costs. For example, if interest rates rise to 5%, and $18 trillion of debt is all short maturity, then Congress must either raise taxes, lower spending, or borrow an additional $900 billion a year. Long-term debt may be more expensive, as is all insurance. But that fact just means the maturity structure problem is interesting rather than trivial, not that the problem is unimportant. More generally, active management of Treasury debt has become a part of economic policy. The recent quantitative easing by the Fed, essentially changing the maturity structure in private hands in an effort to stimulate the economy, is only the beginning of such efforts. Our recommendations amount to a set of tools that allow the implementation of many such ideas.

Our general view is that the Treasury should issue a smaller, simpler and hence more liquid set of securities. It is better for financial intermediaries to tailor a wide variety of products to specific retail demands. That structure emphasizes the Treasury’s unique ability, which is

to provide default-free liquid debt. However, we also expand substantially the span or state-contingency of Treasury debt, by offering tax-free, better-indexed, fully fixed value, and variable-coupon versions. This greater span will enhance the effectiveness of debt-management policy.

A second theme: Computing, communication, law, the structure of financial markets, and financial engineering have changed a lot. These changes open up possibilities and needs for government debt that previously did not exist. Hence, the “21st century” in our title.

Ours is the economic question: How could the structure of U.S. Government debt change to better achieve these goals? There are legal question: How many of these changes could or should the Treasury undertake of its own accord, how many need higher-level Administration action, and how many need enabling legislation? We do not limit analysis of economic possibilities by an amateurish analysis of current legal limitations, or an even more amateurish analysis of current political limitations. In part, if we agree on the desirability of a certain debt structure as a whole, then the legal and political landscape can change. A deeper legal question is, to what extent does the structure of the debt reflect legal, tax, and accounting conventions with no deep economic basis? Implementation requires one to understand these constraints, but legal, tax and accounting conventions can also change when there is a good reason to do so.

This paper is informed by a long economic literature on optimal taxation, optimal maturity structure of government debt, optimal state-contingency of government debt, monetary-fiscal policy coordination, and so forth. We do not tie the analysis to a particular model in this tradition, or to a particular model’s recommendation for optimal debt management and monetary policy. Our goal is to assemble the tools recommended by this literature, leaving just how and when to use those tools in the background.

Any paper on government debt should start with a nod to the Modigliani-Miller theorem. If markets are frictionless, if taxes are lump sum, and if representative agent conditions hold, then the structure of government debt is irrelevant. In particular, any gains or losses the government makes on its bond portfolio are paid by the same taxpayers who are bond holders. Our analysis is rooted in thee particular failures of this theorem: Government bonds and money have important liquidity and collateral value in the financial system, taxes distort, and default and inflation are costly. Government financial problems are therefore real problems, and default or inflation of government debt occasion real problems.

2 Perpetual debt

All of the debt we describe is perpetual, offering coupon payments but no principal payment date.

2.1 Why?

Perpetual debt offers several distinct advantages. Market depth and liquidity is the first advantage.

Each kind (floating, fixed, etc.) of perpetuity is one security no matter what its issue date.
Literally, it shares one cusip. When the U.S. sells more debt, it issues more of the same security rather than create a new security. When the U.S. wants to pay back debt, it repurchases existing quantities of the same security.

The November 2014 Monthly Statement of the Public Debt lists $12,421 billion dollars of marketable debt, spread over 365 distinct marketable securities: 32 bills (average issue size $45b, total $1,440b), 225 notes (average $36b, total $8,190b) 67 bonds (average $23b, total $1,563b), 37 TIPS (average $28b total $1,064b), and 4 floating-rate notes (average $38b, total $151b).

Converted to perpetuities, there will be only a handful of distinct securities: floating, fixed, indexed, perhaps multiplied by taxable and tax free. Each issue will have trillions of dollars outstanding, not tens of billions.

The depth of each market means that perpetual debt should be more liquid, and have greater usefulness as collateral, than current debt.

Already, U.S. debt is valued for its liquidity and collateral value. For example, Krishna-murthy and Vissing-Jorgensen (2012) document that interest rate spreads rise with the total quantity of U.S. debt, suggesting a “money-like” liquidity and collateral value. The existence of an on-the-run/off-the-run spread is testament to the demand for liquidity of on-the-run securities, and the unnecessary illiquidity of the off-the-run securities. But even a purchaser of an on-the-run security only has that liquidity for so long.

That spread exists because most Treasury bonds end up in the figurative sock drawer of pensions, insurance companies, and so forth, and are not actively traded once they leave the hands of the primary dealers who buy them from Treasury and sell them to such final investors. The spread is maintained because, among other reasons, you cannot short a 5 year off-the-run bond and deliver a 5 year on-the-run bond. The bonds may be economically identical, but they are different securities, and have different prices and different liquidity.

Perpetual debt simply ends this whole business. The entire stock of debt will be as liquid as the latest on-the-run issue, because it is the latest on-the-run issue. And that liquidity will be greater than now, since the size of an issue will be worth trillions, while the latest on-the-run issue is less than $50 billion.

That additional liquidity and collateral value should benefit the financial system, benefit financial stability, and it should should in turn enable the government to issue more debt at lower interest rates.

Lack of roll overs is a second advantage of perpetual debt. About half of U.S. debt is rolled over every two years. The Treasury sells new debt to pay off the old debt.

There is some concern that the U.S. might, someday, face a roll over crisis in which new investors are simply not willing to buy new debt to pay off old debt. That concern may or may not be valid. But with perpetual debt, that concern vanishes. The worst investors can do is all to try to sell debt at the same time to each other, pushing prices down and interest rates up, and to refuse new issues. But there simply cannot be a failed roll over.

3An “on the run” security is the most recently issued bond. Thus, for example, the yield of a 5-year old 10-year bond is typically higher, and liquidity lower, than the yield of an equivalent just-issued 5-year bond.
Less dramatically, but more practically, bond dealers earn a bid-ask spread on the entire stock of debt each time it is rolled over. Perpetual debt eliminates that drag, to the combined benefit of the taxpayer and the eventual bond holder. Bond dealers are likely to object.

We address other advantages of and objections to perpetual debt in the specific contexts of floating rate, fixed rate, indexed, etc. debt.

3 Fixed-value, floating-rate debt

On the short end of the maturity spectrum, the U. S. Treasury should issue perpetual, fixed-value, floating-rate, electronically transferable debt in arbitrary denominations. We need a sexy name. Treasury electronic money? E-dollars? Treasury reserves; T-reserves? Fixed-value floaters?

The value of this debt is always $1.00 per bond. That value is guaranteed by a Treasury promise always to buy or sell such debt at a price of $1.00. If a bank delivers $1.00 of reserves to the Treasury, the Treasury issues one bond, and vice versa. If an individual or nonbank institution wants to buy or sell a bond, they direct their bank or clearing bank to deliver or receive reserves to the Treasury. Or they can invest or redeem directly via the Treasury website.

Anyone also has the right to pay taxes or receive government payments directly from fixed value debt. If you owe $1,000 in taxes, and you have $1,000 of fixed-value Treasury debt, you can simply settle that payment at face value without going through banks and reserves. That right will fix the face value at $1.00 as well. More deeply, in a world with vanishing monetary frictions, the right to pay taxes with maturing government debt is an important anchor for the price level.

Unlike current floaters, these securities are perpetual, with no fixed maturity date. From the customer’s view, this Treasury debt then looks like a money market fund, or reserves at the Fed.

The floating rate is paid daily, by incrementing the number of bonds in the investor’s account. The full equivalence of fixed-value debt and reserves means there is no reason to daily send reserves to a separate bondholder’s account.

The Treasury has the legal right to set the floating rate as it wishes. The legal right in this security is the right to a $1 value, to exchange the security for $1 of reserves and hence of currency at any time. It is, literally, zero maturity debt. The right to leave at any moment guarantees the investor’s rate of return. In this respect, zero-maturity floaters are unlike today’s floating rate debt, which can suffer capital losses, and for which rules for setting the interest rate matter.

Within this right, however, the Treasury obviously needs a well thought out and explicitly described policy for setting the floating rate.

The value of the floating rate can be set in a variety of ways. This choice takes some good engineering but in the end has little consequence. The demand curve for such debt will be a very steep function of the offered interest rate, leaving not much room for discussion anyway.
If the Treasury offers a lot greater rate than interest on bank reserves, it will be swamped with banks clamoring to exchange reserves for Treasury floaters. If the Treasury offers a lot greater rate than the general collateral repo rate, Libor, Federal Funds or other overnight rate it will similarly be swamped. If the Treasury offers a lot less than these rates, nobody will want to hold its debt.

We think that the Treasury should benchmark the floating rate to the interest that banks receive on reserves at the Federal Reserve. That policy eliminates potential arbitrage opportunities between reserves and floating-rate treasuries. That policy makes clear the intent of this security: to offer the same security as banks have at the Fed – electronically transferable interest-paying money – to the general public. That policy also clearly preserves the Treasury-Fed understanding that the Fed is in charge of short-term interest rate policy.

The Treasury could conduct periodic auctions to reset the rate, in the manner of auction-rate securities. The Treasury could pay an index tied to market rates, such as the Federal Funds rate, repo rates, or Libor. Current floaters pay the same rate as the auction of 13-week bills, which is essentially this index mechanism. The Treasury could set the rate directly as a policy tool, or give the Federal Reserve that power. The main difference between all these methods is how much control Treasury wants to keep over the quantity of such debt outstanding.

Our suggestion that the Treasury pay a rate benchmarked to the Fed’s interest on reserves requires the Fed to maintain its currently-envisioned operating procedures, consisting of abundant excess reserves, paying interest on reserves within basis points of market rates, and using interest on reserves as the policy instrument. If the Fed chooses to go back to previous operating procedures, in which it pays no interest on a small quantity of reserves, then the Treasury will have to choose another of these interest-rate setting mechanisms.

3.1 Why?

Economists have long dreamed of interest-paying money. It fulfills Milton Friedman’s (1969) “optimal quantity” of money without deflation. Paper money is free to produce, so the economy should be satiated in liquidity. The economy gains the area under the money demand curve, which Lucas (2003) estimated as at least 1% of GDP.

More importantly, interest-paying Treasury money – which this is – offers important benefits for financial stability. Our economy invented inside interest-paying electronic money in the form of money market funds, overnight repurchase agreements, and short-term commercial paper, and found it useful. But that money failed, suffering a run in the 2008 financial crisis. Treasury-provided interest-paying electronic money is immune from conventional runs. Money market funds 100% backed by fixed-value Treasury debt cannot suffer a run. (For more on financial stability benefits, see Cochrane 2014b.)

By analogy, in the 19th century, the Treasury provided coins. Banks issued notes. Notes were convenient, being a lot lighter than coins. But there were repeated runs and crises involving bank notes. The U.S. government issued paper money, which might inflate, but cannot suffer conventional default. That money eventually drove out private banknotes, and that source of financial crises was permanently ended. (Crises involving demand deposits did not end, but the U.S. tried a different policy response, involving deposit insurance and regulation.)
In the 21st century, the Treasury has exactly the same natural monopoly in providing default-
free and run-free electronically-transferable interest-paying money to private parties. It should
do so.

Treasury debt is already very liquid and “money-like.” Fixed-value electronically-transferable
floating-rate debt will be even more liquid and desirable than short-term bills and current floaters
are. Its bid-ask spread will be set entirely by technological limitations. You can’t have asym-
metric information or price pressure of a fixed-value security. The market depth will be several
trillions, rather than the tens of billions of typical bills. It can be more liquid even than bank
reserves, since anyone can hold Treasury debt but only banks can hold reserves. Recent episodes
in which Treasury debt had interest below reserves are evidence that such inversion of liquidity
is possible.

The Treasury should facilitate electronic transactions in this fixed-value debt. Its existing
services such as Treasury Direct, Direct Express and Pay.gov are an important foundation.
Exchange and settling via Treasury accounts can be handled among large financial institutions
just as Fedwire handles the exchange of reserves and current Treasury debt.

However, the Treasury does not necessarily have a comparative advantage in the information-
technology of designing and operating large-volume low-cost secure transactions services, espe-
cially ones open to retail customers. An industry of money market funds and electronic exchanges
should be allowed and encouraged to offer transactions services accounts backed by fixed value
treasuries. I should be able to buy a cup of coffee by bumping a cell phone and transferring $2.53
of an account consisting of or backed 100% by fixed-value treasuries. And paying something like
bitcoin’s minuscule transactions fees rather than the 4% fee charged by credit card companies
to do so. One-day wholesale clearing by the Treasury itself, as the Fed offers for reserves, should
be enough to support those activities.

The key point: If fully invested in fixed-value treasuries, and walled off from bankruptcy
of related or sponsoring financial institutions, such intermediaries need next to no regulation.
They are pure transaction intermediaries, not banks.

3.2 Objections

3.2.1 Prices and Quantities.

By setting a fixed price, the Treasury must lose some amount of control over the quantity of
this debt that is outstanding.

It’s not clear that rigid control of the quantity of outstanding short-term debt is necessary.
Via swaps and long-term debt the Treasury will still control the overall quantity of debt and its
exposure to interest rate fluctuations.

Unwanted fluctuations in quantities need not be large. To receive a Treasury floater, one
must give the Treasury reserves, which the Treasury then deposits at the Fed. The total quantity
of Treasury floaters plus reserves in private hands is thus constant. From an economic point of
view, and drawing the consolidated budget constraint around Fed and Treasury, Treasury floaters
and Fed reserves are exactly the same security. Allowing the split to vary while controlling the
overall level is just like allowing the split between reserves and currency to vary freely while controlling their overall level.

If controlling more tightly the level of Treasury fixed value debt is important, the Treasury could use periodic auctions to reset the rate, thus fixing the quantity at the auctions but allowing small spreads between the Treasury floating rate and reserves to emerge. Auctions run the risk however of temporary liquidity-induced interest rate spikes, as only very specialized bond traders will show up for auctions.

Management of the offered interest rate seems a better alternative: If the Treasury wishes to expand short-term debt, it simply increase the rate a few basis points relative to interest on reserves interest on reserves, and vice versa.

For this reason, as well as to adapt to possible changes in Fed policy, we think it best that the Treasury not legally tie itself to a rule or interest-rate setting mechanism in offering the debt. The Treasury can retain authority to set the rate as it wishes. It should announce the policy, which is to benchmark the rate to the rate paid by the Fed or to other market rates, and a policy of small discretionary changes relative to that benchmark as needed to manage the size of the debt.

3.2.2 Why not the Fed?

From an economic point of view, the same benefits accrue if the Federal Reserve opens up interest-paying reserve accounts to the general public, and dramatically increases the size of its balance sheet, buying up most of the Treasury’s short-term debt to issue such reserves.

The Fed has already started opening up reserves to large non-bank financial institutions and corporations, through the reverse repo and segregated account mechanisms. (The latter are not reserves directly, but offer essentially 100% reserve-backed bank accounts.) The Fed is still a long way from opening up reserves for all. It is also actively debating whether even to maintain the current large balance sheet, let alone allow a big expansion.

There are some good political-economy reasons why it might be better for the Treasury, rather than the Fed, to offer fixed-value floating-rate transferable debt outside the banking system. The Fed is a central bank, and traditionally only transacts with banks or other large financial institutions. Offering accounts directly to the public is a big institutional change. This proposal will eliminate many sources of profit for banks. The Fed may naturally be reluctant to do that, to be seen to be undermining banks by offering services directly to the public. The Treasury already sells to the public, and has done so historically. If people can buy bonds from the Treasury webpage, why not a “bond” that happens to work just like a money market account?
3.2.3 Monetary Policy and Price Level Determination

This proposal removes what little is left of the traditional distinction between “money” and “bonds.” The traditional story is that bonds come only in large denominations, and are for that and other reasons unsuitable for transactions. People hold non-interest-paying money for quick liquidity and transactions. The Federal Reserve, by controlling the quantity of money, controls the price level. Fixed-value, floating-rate, electronically transferable Treasury debt, held in large quantities so that we are satiated in liquidity, undermines all that. Must we hobble Treasury debt for price level control?

No. We crossed that Rubicon long ago. The Federal Reserve’s large balance sheet and trillions of dollars of interest-paying excess reserves undid it. The Fed’s plan to keep large interest-paying excess reserves in the future undoes it. Private interest-paying electronic money in the form of money market funds, overnight repo, commercial paper, auction-rate securities, and so forth undid it long ago.

Monetary theory is now based entirely on interest rate targets, not the rationing of non-interest-bearing cash. The experience of stable inflation with no control at all of monetary aggregates, and despite enormous quantities of electronic interest-paying inside money, confirms the theory. If banks can have interest-paying reserves and large-scale nonreservable funding, if financial institutions can have a large shadow-banking system, and if the Treasury can offer short term debt so liquid it pays a lower rate than bank reserves, all without undermining price-level control, the minor extension of floaters and bills to fixed value debt will not have a dramatic effect. (For more on price level control with abundant reserves and interest-paying money, see Cochrane 2014c.)

This proposal also fundamentally weakens many of the legal controls separating monetary and fiscal policy, and undermining monetization of the debt. For example, there is no economic reason that the Treasury cannot simply pay for government purchases or transfers by creating new fixed-value debt and giving it to the seller, rather than going through the trouble of auctioning debt, obtaining reserves, and writing checks with the reserves. As another example, once debt has a fixed $1.00 fixed value, the dance by which the Fed must buy debt on the open market and may not buy directly from the Treasury has no more practical meaning. Abundant interest-paying reserves have already undermined the economic rationale for these restrictions, which were restrictions against funding the government with non-interest bearing debt.

On the other hand, our proposal really is a small change to existing institutions. The Treasury already issues abundant, highly liquid, very short-term debt in the form of bills. It issues floating-rate notes. If these have not undermined some deep foundation of economic stability, the small changes to floating-rate notes we propose surely will not cause a collapse.

3.2.4 Credit

A common objection is that banks need to offer fixed-value deposits in order to supply credit to the economy. If the Treasury offers attractive fixed-value deposits instead, banks will be deprived of a key source of funds and will not be able to offer enough credit.

This argument falls apart on simple accounting. We advocate replacing existing short-term
Treasury debt, composed of bills and short-dated notes, with fixed-value floating-rate debt. The total amount of government debt in private hands remains unchanged, so the total amount invested in the banking system and private credit markets must remain unchanged as well.

The Fed has issued reserves and bought mortgage-backed securities. If the Treasury did the same thing – if Treasury debt were so popular that the Treasury needed to buy assets to fill demand – that still would not impede the supply of credit, just as the Fed’s actions have not done so. The Treasury would take savings and invest in mortgages. The banks wouldn’t get to profit from intermediation, and the tricky political question of credit allocation would emerge, but money once invested in mortgages remains invested in mortgages, just through a different intermediary. The view that issuing deposit-like debt sucks savings away from credit creation, for a given volume of total government debt, is simply false. The size of government debt does matter. The form of government debt does not, when simply counting flows of available savings.

3.2.5 Accounting

One reason that current floaters have a two year maturity, rather than being perpetual, is simply the question of how to account for their maturity.

Fixed-value perpetual floaters are zero maturity debt. Perpetuities have infinite maturity but finite duration. “Maturity” of coupon debt, and any variable-coupon debt or debt with call or other options, is a fairly meaningless concept. Weighted average maturity is a misleading guide to the Treasury’s interest-rate exposure, the frequency of rollovers, or much of anything else important. It’s time to change the accounting, not to structure the debt around fairly meaningless numbers. The duration, convexity, three-factor sensitivities, and schedules of debt coming due, treating coupons and principal symmetrically, are better measures.

More deeply, much of the Treasury’s accounting, such as the Treasury Bulletin and Monthly Statements of the Public Debt, report face values of long-term debt. There is no meaningful face value of a perpetuity, so the Treasury will have to report market values, or use a benchmark yield. But these accounting issues should not get in the way of useful securities.

Reduced to a handful of simple highly liquid perpetuities, the market value of debt will not be hard to compute.

Historical approximations and accounting conventions made sense for difficult fixed-income arithmetic before the advent of computers and modern financial theory. They no longer makes sense, and should not be an impediment to introducing valuable securities.

4 Long-term debt

The U.S. should introduce perpetual long-term debt. This debt pays a $1 coupon per bond, forever. Eventually, the U.S. should replace all long-term debt with perpetuities.

As interest rates rise and fall, the price of perpetual debt will rise and fall. The Treasury will auction the debt at whatever price the market will pay. If (hopefully, when) an era of surpluses returns, the U.S. will repurchase outstanding debt.
Coupons of perpetual debt can be paid in shares of floating-rate debt, since the latter always carry the right to obtain reserves and therefore currency, and perhaps more importantly they can be used for tax payments.

With both long-term and short-term debt held in electronic book-entry form, the coupons of perpetual debt could be paid daily, much simplifying the accounting of Treasury debt purchases. Accrued interest and calendar mathematics would disappear. This feature is not essential however. If quarterly or annual coupon payments are preferred, for example to facilitate stripping, that structure would work nearly as well.

4.1 Why?

As explained above, perpetual debt folds all existing issues into one security, thus greatly deepening the market, liquidity and collateral value of long-term debt. Perpetual debt is the only way to produce a single security whose characteristic does not change with the passage of calendar time. We should be rewarded with lower interest rates for the taxpayer as well as a better-functioning monetary and financial system.

4.2 Objections and variations

4.2.1 Price impact

One may worry that the government would face price impact in repurchasing debt, unduly raising financing costs. In our judgment, this is not a substantial problem.

The Treasury’s repurchases will be widely pre-announced. Purchases to repay debt as a consequence of budget surpluses will convey no inside information about interest rate movements, the theoretical basis for a bid-ask spread and price impact. They will take place slowly over time.

The Treasury sells debt with little price impact, via its well-worked out auction mechanisms. Since 2000, the Treasury has had a well-worked-out buyback program, that has successfully repurchased outstanding issues, even illiquid and off-the-run issues. If the Treasury were to buy back debt in an even deeper and more liquid market, via an auction process similar to the current buyback program, why would the Treasury pay any greater premium? And we should compare this premium to the steady loss of bid/ask spreads on principal rollovers in current debt.

4.2.2 Call option and face value

One might want to complicate the debt by adding a call option – say, perpetuities can always be repurchased for no more than $100. We do not think such a provision is desirable.

A call option complicates bond pricing a lot. There is no simple formula for the value of a callable perpetuity.
A call option either requires a stated formula for when the call will be exercised, or it adds speculation about when the government will exercise of this option, and great political pressure to call or not, with billions of dollars on the line.

If all debt has the same call option – say $100 – then calling debt to reissue debt with the same call option makes no sense. If the debt were to be called, it would have to be called in order to issue debt with a different value of the call option, or to call the entire stock of long-term debt and issue short-term debt in its place. The former adds more needless complexity – a spectrum of perpetual debt with different call values. The latter eliminates long-term debt altogether, implying an enormous change in the maturity structure of the public debt. If only part of the debt is called, then whose debt is called and whose is left alone?

And to what end? If it is to avoid the price impact of repurchasing debt on the market, adding a call option seems like a minor savings and a major headache. And call options like anything else must be paid for. Ex-post, if rates decline, the debt can be funded at a lower rate. But ex-ante, the government gets a lower price for the debt.

The call option does not obviously help state-contingent government finance. A call option is exercised when interest rates are low and bond prices are high. The right to buy at $100 something that otherwise would be worth $200 is valuable. But times when interest rates are low are good times for government finance. The government can just issue new debt at high prices. If protection from vicissitudes of the bond market is the goal, the Treasury should want put options, the right to sell debt at high prices in bad times.

If after all this, call options are thought to be valuable, it would be better for the Treasury to buy call options directly in the derivatives market. There is no reason in a modern financial market for the Treasury to bundle the bond with the call option. Then the Treasury can then buy and exercise call options on only a fraction of the debt rather than discriminate between bond holders. And bond investors can segment into those that want to understand and trade options, and those who do not.

The Treasury has a long tradition of adjusting the coupon rate so that bonds are issued as close to par as possible. One could imagine bundling perpetuities so that the price at issue was roughly constant – when interest rates are 3%, sell a “three percent” perpetuity at $100, and so on. But there is really no reason to do this. Tying the securities together would complicate the maturity structure with distinct issues. It is simpler just to sell $1 perpetual coupons for whatever the market will bring.

4.2.3 Coupon bonds and history

An obvious objection: since so much corporate and government debt consists of coupon bonds, surely there is a strong economic reason for this structure? We are not able to find one.

In fact, nominal coupon debt is not uniform. Many other structures do and have existed, arguing at least against the inevitability of coupon debt.

Government perpetuities are not a new radical idea. Some of the first government debt, backed by tax revenues, consisted of annuities and perpetuities. The towns of Douai and Calais sold annuities and perpetuities in 1260 (Kohn 1999 p. 5). Venice created the first Monte in
1262, issuing perpetual debt paying 5% interest semi-annually. Most government debt in this period was, like modern municipal debt, guaranteed by specific tax revenues.

Venice’s debt, and that of following Monti such as Florence’s, were also fully transferable, publicly traded, in markets facilitated by brokers. Bonds were recorded in book-entry form, and could be be “encumbered with a lien as security for loans, for real estate transactions (to protect against defects of title), and for dowries. Indeed, shares were preferred to other forms of security because no litigation was necessary in case of default.” (Kohn 1999 p.10.) The value of government debt as collateral goes back a long way too! We shied away from suggesting that the Treasury similarly act as custodian and record the use of Treasury debt as collateral, mostly on a sense that in the 21st century a better developed set of private financial intermediaries can better handle that business. That’s not a strong judgment. If the 13th century Venetian government could do it, maybe the 21st century American government can do it as well. The U.S. Treasury also has an excellent monitoring, enforcement and debt-collection technology in the IRS.

More recently, perpetuities were the nearly exclusive source of financing for 19th century Britain, including a 250% debt to GDP ratio at the end of the Napoleonic wars (Homer and Sylla 1996, p. 189 ff.) Some early American debt was also issued without fixed maturity, starting with Alexander Hamilton’s refunding of the 1790s (p. 293).

These 19th century perpetuities had a call option, for example being described as “3% perpetuities” when the government had the right to repurchase each £3 of coupons for £100. Hamilton’s debt was “redeemable at the pleasure of the government at 100.”

The call options in these perpetuities seem in our reading quite different from the modern concept. They seem to us better thought of as principal repayments with uncertain timing, allowing the government to pay debt back when it happens to be flush with cash rather than face a fixed roll-over date at which a war, panic, or other turmoil might be going on. Historically, governments issuing fixed-maturity debt were often unable to repay the debts at maturity, and forced to various expedients such as issuing new kinds of debt in place of the promised redemptions of old debt. Homer and Sylla report that the first U.K. issues of fixed maturity debt were not popular, because investors worried that the government might have to roll over the principal in time of stress. Thus, our modern sense is that a call option is an interest-rate derivative, exercised when interest rates are low, and quickly funded by the painless sale of new debt with a larger call option, does not seem to describe how the call option functioned historically.

Historic government debt was sold without the kind of highly developed financial intermediaries we have today. Thus, repurchasing debt, held by individuals spread throughout a country communicating with early 19th century technology, at market rates, would have been quite a challenge. What we view as a “call option” seems more like the only possible way for the government to repurchase debt. But no longer.

Corporate bonds, which first emerged in large quantities with railroad construction in the 19th century, originally had very long maturities. Homer (1975) reports that at the turn of the century, prime issues were “usually 100 year maturities and noncallable. One popular maturity matured in 2361.” More recently, Disney issued 100 year coupon bonds. These bonds pose an interesting question: why bother with the principal payment?
Corporate perpetuities do exist though they are rare. INZ is the ticker for perpetual, exchange-traded debt sold by ING.

There are several legal and accounting reasons why corporations might want to issue, and their investors to demand, debt with coupons and a principal payment rather than perpetuities, long-term zero-coupon debt, or self-amortizing debt such as mortgages, i.e. coupons without a principal.

In default, corporate bondholders are paid in proportion to the undiscounted face or principal amount of the bonds, rather than a fraction of the market value of similar bonds. This fact gives a strong reason why investors would demand a security with a stated principal value, and coupons to bring the market value near par at issue and not that far from par thereafter.

From an economic point of view, however, there is no reason that corporate bonds could not give their holders in bankruptcy the right to a fraction of the market value of similar bonds, or a fraction of a pre-determined par value, dispensing with the principal payment. But rewriting laws isn’t that easy.

Perpetuities may also be disfavored as they too closely resemble preferred stock. The IRS may refuse to count perpetuities as ‘debt” for the deductibility of tax payments, and accounting or banking regulation may not count such perpetuities as “debt” as an asset. Bankruptcy courts may put perpetual debt below other long-term unsecured debt. Going back ages, the notion that “I borrowed $1,000” so “I owe you $1,000” is deeply held in law and custom as the definition of debt, with interest representing the carrying cost of the money.

There will be no similar difficulties with the IRS and banking regulators in the treatment of U.S. Federal debt. U.S. government debt is, we also hope, less likely to default, reducing the importance of these considerations. The U.S. has defaulted before, most recently in the abrogation of gold clauses. The recent debt limit controversy raised the possibility of a technical if not economically driven default, so a legal statement of rights in default will be an important part of perpetuity design. An otherwise meaningless par value, say $20 (corresponding to a 5% interest rate) could work. The right of the government to suspend coupons, discussed below, will be helpful in such a context. Valuing the debt at purchase price would not work as the whole idea is to make the security uniform, and if different issue dates have different standing in bankruptcy that ruins the uniformity of the security. Similarly, value = 1/yield is an easy enough formula for a bankruptcy court, but yields are likely to spike in advance of default.

Holders of unsecured debt might wish their debt to correspond to tangible assets or concrete investment projects. Corporations typically do not have infinitely-lived tangible assets or investment projects against which to borrow. (Mickey mouse might be the exception!) Before WWII, most U.S. corporate debt was in fact mortgaged against specific assets, and the duration of assets naturally limited the duration of debt. U.S. Federal debt is backed by the stream of net surpluses that the U.S. government can extract from taxpayers, which is a much longer-lived asset. Since the stream of primary surpluses grows over time, the asset corresponding to government debt is of extremely long duration.

U.S. mortgages are self-amortizing finite-maturity debt, which among other things reminds us that such debt can exist. You pay a sequence of coupons for a fixed time, with no bullet principal payment. Mortgage-backed securities have the same structure. The existence of the underlying asset (house) which can be seized on default adds to the suggestion that corporate
principal is there to establish a claim in default. But Canadian mortgages last 5 years only with a principal payment due. Until the 1930s, U.S. residential mortgages also had floating rates, and a bullet payment at the end of 5 to 10 years. (Green and Wachter 2005.) So there is nothing magic about the structure of mortgages either. On the other hand again, such mortgages were almost always rolled over – until the Great Depression which prompted the change to long-maturity mortgages in the U.S. – so the finite maturity can be looked at mainly as a way to float the rate every few years.

One might adduce incentive, asymmetric information, debt vs. equity conflict, or other corporate-finance theories for the structure of corporate debt. Such theories don’t obviously transfer quickly to sovereign debt.

In summary, we do not see a well-established question to which finite-maturity coupon debt with a large principal repayment is the definite answer, nor historical uniformity of this kind of debt. We thus don’t see an indication that there is something deeply wrong with perpetual government debt for a modern government of an advanced country, with its own currency, and well away from concerns of default.

4.2.4 Wholesale, Retail, and Hedging

Fixed-income markets feature demands for and supplies of a great variety of securities. Institutions want to match specific liability streams, corporations and financial institutions want to hedge specific fixed income risks.

Investors wanting intermediate durations can of course hold a portfolio of Treasury floaters and perpetuities. But clearly there is a demand for much more specialized securities.

As a general vision, it seems best for the government to provide a few, simple, very deep, very liquid benchmark securities. These securities focus on the broadest possible categories of demand. They also focus on the needs of investors who demand liquidity. By being furthest from default, government securities can be uniquely liquid.

It is better for financial intermediaries to create products that fill the many, varied and shifting specialized needs of retail individual, financial, and corporate clients. Here we include coupon and zero coupon bonds in all their variety, customized swaps, caps, floors and other derivatives, along with annuities, life insurance, pension products, estate planning products, and other retail investments. Though demand for government debt might also be increased by matching retail customer needs more closely than our simple perpetuities, the Treasury does not have a comparative advantage in creating illiquid fixed income securities tailored to the needs of particular customers, let alone the unique advantage that is usually the hurdle for government provision of a good or service. The overall demand for Treasury securities will arguably be as great or greater if those securities are designed as good inputs, along with mortgages, corporate bonds, and other investments, and good hedges for private intermediation to meet retail demand.

In that vision, however, it is natural to suggest that the Treasury provide securities designed to facilitate price discovery and hedging for the financial industry. On this basis, for example, it has been suggested to us that the Treasury should continue to offer a spectrum of coupon bonds, so that intermediaries can better price and hedge corporate coupon bonds.
We do not judge this consideration reason enough for the Treasury to continue the current practice of issuing many different coupon bonds and bills.

First, the STRIPs program should and will likely continue. This program facilitates stripping of coupon bonds into their underlying zero coupon elements. So, even if the Treasury only sells fixed value floaters and fixed coupon perpetuities, intermediaries will have access to a deep and liquid market for zero-coupon debt. As the Federal Reserve Bank of New York explains:

“Under the STRIPS program, U.S. government issues with maturities of ten years or more became eligible for transfer over Fedwire. The process involves wiring Treasury notes and bonds to the Federal Reserve Bank of New York and receiving separated components in return. This practice also reduced the legal and insurance costs customarily associated with the process of stripping a security. In May 1987, the Treasury began to allow the reconstitution of stripped securities.”

Since there are an infinite number of zeros in each perpetuity, it is better to strip perpetuities into an economically meaningful number. A perpetuity is also equal to (say) 30 zero coupon bonds and a 30-year futures contract, a commitment to deliver a full perpetuity in year 30. If perpetuities can always be assembled and disassembled via the STRIP mechanism in this way, and each year the 30 year future disassembled into a new strip and a new future – or, perhaps, once per decade – then it will be easy for the current stripping process to create a deep market in zeros. Zero coupon STRIPS based on perpetuities should be more abundant and more liquid than those based on individual government bonds, since the distinction between principal and coupon STRIPS will vanish and there is only one security to reconstitute.

We suggested that perpetuity coupons be paid daily. Zero coupon bonds are more useful at discrete periods. Thus, the perpetuity could pay at fixed dates – say once per year on December 31, and strips pay at the same time. But then the perpetuity must be traded with accrued-interest accounting during the year. Better, we think, is to keep the specification that perpetual coupons are be credited daily. Zero coupon bonds can still be delivered once per year – say, December 31. The zero coupon bond then delivers a year’s worth of coupons, brought forward at the floating rate. For example, if the floating rate is a constant 5% through the year, then $1.00 worth of coupons generates a $1.05 December 31 payment to the zero-coupon holder.

Second, with the advent of computers and modern fixed-income modeling, financial intermediaries do not need to observe very similar Treasuries in order to price and hedge corporates and other retail offerings.

Almost all movements in the Treasury yield curve can be spanned with level, slope, and curvature factors. Today, it is simple enough to price and hedge any fixed income instrument with securities that span these factors.

The combination of floaters and perpetuities naturally span “level” and “slope” factors in the Treasury term structure. So in the modern, computerized world, at most intermediaries would need a liquid and deep “curvature” factor as well, to fulfill the idea that the government provides a full set of hedging securities. (In fact, to model the current Treasury yield curve

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4 http://www.ny.frb.org/aboutthefed/fedpoint/fed42.html

5 Here we specify continuous compounding, so the 5% floating rate means that the value $V$ of a floating-rate investment grows at $dV = rV dt$ with $r = 0.05$. Thus, the daily payment at 5% rate is $e^{0.05/365} - 1 = 0.274 \, \text{¢}$ per dollar invested, and a dollar invested Jan 1 would yield exactly 5 ¢ of interest at the end of the year, continuously compounded. In general, the zero-coupon holder receives not $1 \times e^{\int_0^1 r(t) \, dt}$ at the end of the year, but $1 \times e^{\int_0^1 r(t) \, dt}$.  

16
accurately, one also needs to account separately for bills with under one year maturity, on the run vs. off the run spreads, and spreads that emerge between high coupon and low coupon bonds. See Pancost 2013. The latter two should disappear under our proposal. The former is likely due to the accounting treatment of securities under one year maturity.)

A curvature factor is long intermediate-maturity zeros and short both long and short ends. In a world without extra Treasury securities, it is easy enough for intermediaries to create a standardized hedging instrument between themselves. For example, they could create zero coupon bonds by stripping, as they do now, and either hedge directly with the zeros, or hedge via a standardized swap contract that is long middle maturities and short long maturities and short maturities.

Third, corporate bonds are in majority callable. Valuing or hedging a corporate bond is not so simple as looking up the equivalent Treasury and tacking on a credit spread. Furthermore, credit and liquidity spreads are themselves fairly high-tech issues these days, and anyone who can do that right can hedge a bond with level slope and curvature instruments. Similarly, valuing and hedging mortgages and mortgage-backed securities involves valuing the prepayment options and default. In both cases, whatever uncertainty there is due to spreads between coupon treasuries and the stripped zeros is dwarfed by other considerations.

Fourth, hedging retail fixed income securities, including call options, prepayment options, and state-contingent default, also requires one to measure, model, and hedge interest-rate volatility. Volatility is poorly spanned by any combination of discount bonds, and credit and liquidity spreads. These are all activities best suited to private contracts among intermediaries.

4.2.5 Alternatives

The question, then, is not whether an adequate number of liquid hedging instruments can exist to fill out the term structure. They will. The question is whether the Treasury should supply a different quantity than is implied by the flat face value of zeros that perpetuities imply. Will some sort of “scarcity premium” for intermediate-duration securities exist, so that it is wise both for economic policy and for issuing debt at low rates for the Treasury to issue more intermediate-duration debt than our combination of fluxed-value and fixed-coupon debt implies?

We don’t think so. But, if such a premium emerges and if it does appear useful for the Treasury to offer additional securities in the middle of the yield curve, we offer two alternatives that maintain as much of the simplicity and liquidity as possible, in place of the current dizzying variety of coupon bonds.

First, the Treasury could issue additional zero-coupon bonds, matching the terms of strips. To enhance liquidity, they should be exactly the same as strips. The Treasury could strip its own bonds and retain some of the strips.

Or, perhaps, this is the sort of thing that the Fed should do. The Fed could buy perpetuities, strip them, issue strips in the middle of the term structure, and keep the long and short-dated maturities. In the QE episodes the Fed took on management of long-term interest rates and perceived demands at the long vs short end of the curve. Taking on management of intermediate maturity supply, to meet the needs of the financial industry, is not a big step.
Second, the Treasury could issue a single additional perpetuity with a geometrically declining coupon. This security would have a duration in between the quite long duration of the perpetuity and the zero duration of floating rate debt. It would also have less convexity at low yields than perpetuities have.

To be specific, imagine a perpetuity with a coupon \( e^{g(t-t_0)} \) that grows at the rate \( g \). For example, it could be defined as $1 in \( t_0 = 2020 \), declining at \( g = -0.02 \) or 2% per year thereafter. The market price of this security \( P_t \) implies a yield \( y_t \) defined by

\[
P_t = e^{g(t-t_0)} \int_{s=0}^{\infty} e^{(g-y_t)s} ds = \frac{e^{g(t-t_0)}}{yt - g}.
\]

For example, at a 5% yield, the regular \( g = 0 \) perpetuity would have a price and duration of 20. A perpetuity with a 5% declining coupon would then have a price and duration of 10.

The price of the declining-coupon perpetuity is a function of time. However, it would swiftly be quoted as a multiple of the current coupon, or a coupon yield, \( P_t/e^{g(t-t_0)} \) or \( e^{g(t-t_0)}/P_t \) which have no time dependence.

The duration and convexity of this security are

\[
D = -\frac{1}{P} \frac{dP}{dy} = \frac{1}{y - g},
\]

\[
C = -\frac{1}{P} \frac{d^2P}{dy^2} = \frac{2}{(y - g)^2}.
\]

For reference, the duration and convexity of a n-year zero coupon bond with price \( P = e^{-my} \) are \( D = n \) and \( C = n^2 \).

To illustrate how a level perpetuity, a declining-coupon perpetuity, and a zero coupon bond compare, Figure 4.2.5 plots price vs. yield for the three bonds. The figure adjusts the quantities so that each bond has value $100 at a yield of 5%.

As yields decline, the declining-coupon perpetuity and 10 year zero gain price at the same rate. At these parameters they have the same 10 year duration.

Both duration and convexity of the perpetuities vary, increasing as yields decline. This behavior is strongest for the level perpetuity, whose price rises to infinity as its yield declines to zero.

Is this change in duration and convexity a problem? We don’t see why it should be. Coupon bonds also have duration and convexity that rises as yields decline. An investor who wished to have constant duration or convexity would have to rebalance. But constant duration and convexity are not deep portfolio objectives. Anyone hedging would adjust duration exposure routinely.

The sharp rise in duration of perpetuities for low yields makes it appear that the bonds become riskier. But yield volatilities are lower at low interest rates. And portfolio theory for long-term bonds does not focus on one-period mean and variance of prices.

The price behavior of the level perpetuity can be looked at the other way. Perpetuities would likely be quoted in terms of their coupon yield not price, “5 percent” not “$20.” Thus,
Figure 1: Price vs. yield. Quantities of each security are adjusted to yield a value of 100 at 5% yield.

at low yields, yield volatility would likely be very low. 10% price volatility means 50 basis points of yield volatility at a 5% yield. But 10% price volatility means only 10 basis points of yield volatility when yields have fallen to 1%. Like our unfortunate habit of measuring energy efficiency in miles per gallon rather than gallons per mile, the correct set of units can make measurements clearer.

More technically, the infinite convexity of infinite-maturity zero coupon bonds means that the asymptotic long rate cannot fall, and thus in stationary models it is constant (Dybvig, Ingersoll, and Ross 1996). In like fashion, the infinite convexity of perpetuities at a zero yield means the zero yield is never seen and perpetual yields must become less volatile as they decline.

Bottom line: Since coupons after 30 years or so are so heavily discounted, perpetuities will not behave a lot differently from long-maturity Treasuries.

Adding a call option also cuts off the price rise as yields decline, but introduces negative convexity at low rates, and a large set of bond-pricing headaches.

Over time, the geometric-decay coupon will decline in value. It would be convenient to occasionally renormalize them. For example, every time the coupon falls below 10¢ in value, the
Treasury can implement a 1 for 10 reverse split. With the security held in book-entry form, this is easy to do. Level perpetuities might also be occasionally split in this way, but that will most conveniently happen along with a currency reform that lops some zeros off the dollar.

5 Tax-free debt

The Treasury should issue all debt, and long-horizon perpetuities in particular, in a form for which coupon and capital gains are free of all tax, including personal and corporate income tax and estate taxes.

Interest on Federal debt is already exempt from state and local income taxation. The exemption should be extended to estate taxes and capital gains taxation.

Strips created from tax-free debt should enjoy the same tax-free status.

5.1 Why?

Borrowing and then taxing the interest is a curious contract. The point of borrowing money is for the government to give up some of the future stream of tax revenue in order to get resources today. By taxing future interest, the government obtains less revenue today, undoing some of the transfer.

Tax-free debt will sell for a higher price than taxable debt. That transfers more money from the future to the present, which is the whole point of the government’s borrowing.

Tax-free debt is not a present to taxable investors. They essentially pay the eventual taxes on interest voluntarily in a higher upfront price.

To see how this works, an investor with tax rate $\tau$ will pay $P = \int_{t=0}^{\infty} e^{-rt}(1-\tau) \, dt = (1-\tau)/r$ for a taxable perpetuity that pays a constant $1$, where $r$ represents the discount rate for after-tax cashflows. To raise $\$X$, the government must sell $B = X/P = Xr/(1-\tau)$ bonds. Then, net of taxes, the government pays interest $B(1-\tau) = Xr$ per period. Therefore, the amount that the government pays in net interest to borrow $\$X$ is completely independent of the tax rate.

This example emphasizes important principles of taxation. Taxing incomes or streams of dividends is not the same thing as taxing rates of return. If the government taxes incomes or streams, prices will change, potentially leaving rates of return unaffected. Equivalently, in this simple argument we essentially assumed a flat supply of capital at the after-tax rate of return $r$. Flat supply curves mean that taxes only affect quantities, not prices, and suppliers do not bear any burden of taxation. We examine the flat supply curve assumption below. In a large deep and global capital market, it’s a good place to start. For now, its possibility helps to clarify that taxing incomes and rates of return are different things.

A second principle: Taxes on existing capital are different from long-run taxation of rates of return. Raising taxes on interest would benefit the government after bonds have been sold, as a form of lump-sum capital taxation. But once burned, twice shy investors will not offer the same price the next time around. We consider here only steady state, long-run, taxation in which
prices fully reflect following payments, not the classic opportunity for a just-this-once capital levy. Much of the intuition in favor of taxation of interest confuses the benefits of a capital levy after bonds have been bought with the opportunity for ongoing taxation of rates of return.

Our algebra makes it seem like a wash, as revenue and rate of return are the same no matter what the tax rate. But the upfront price of non-taxable debt is paid voluntarily, and all at once. The revenue from taxable debt is collected later at a much greater cost in time, effort, enforcement, lawyer and accountant fees, and evasion. Taxable investors will be willing to “pay” in the form of lower interest rates not just the amount they save in taxes later on, but the amount they save in these costs and the costs of inefficient financial arrangements used to lower tax burdens of investment. These costs are substantial. Revenue received by the government is substantially less than the statutory tax rate, especially for corporations and high-wealth individuals, and even more so for estate taxation. And the lawyer fees and distortions are lost to everyone.

To model this issue, let the statutory tax rate be \( \tau \), let the proportional costs of tax avoidance be \( c \), and let tax revenue received by the government be \( \rho \), each per $1 of coupons. We have \( \rho + c < \tau \) so tax avoidance is worthwhile to the investor. The taxable investor is willing to pay
\[
P = \frac{1 - \rho - c}{r}
\]
for taxable debt, but he or she is willing to pay
\[
P = \frac{1 - \rho}{r}
\]
for tax-free debt. The government gains the present value of avoidance costs.

Simplicity is another main argument for tax-free debt. Treasury taxation is not simple, and the taxation of TIPS in particular, is complicated. Properly tax-sheltering any investment is a complex process. Put as much as possible into 401(k), 403(b), IRA, Roth IRA, 526, etc. Carefully time capital gains and losses. Plan estates carefully, setting up trusts early, gifting properly, arranging capital gains to occur post-gift, and so forth. To a taxable investor, buy it once and forget about all that has a great appeal.

Now, not all investors are taxable, and not all pay the same rate. In the first instance, the presence of non-taxed (or well tax sheltered) investors who are willing to pay more, \( P = 1/r \), for taxable government debt simply drives the taxable investor out of the market, as we will verify is pretty much the case. Thus, offering tax-free debt is also a way to broaden demand for Treasury debt by bringing taxable investors back to its market.

Taxing capital gains of Treasury debt is a particularly curious practice. The price of debt is stationary. If the price falls today, it must rise eventually in order to end up at face value. Thus, a capital gain today is guaranteed to be matched by a capital loss in the future. Taxing realized capital gains, however, makes treasuries less liquid for taxable investors, who must avoid taking gains when prices are high, or take and offset or carry forward temporary losses. Eliminating capital gains tax for Treasury investments would make them easier to buy and sell and thus more liquid. (Capital gains on municipal debt are taxed, leading to complex tax avoidance strategies there too. If capital gains become tax-exempt, taxpayers should not be able to use capital losses to offset other gains.)

A substantial proportion of the taxation of Treasury debt is taxation of nominal interest due to inflation. A fairly broad conclusion of any optimal-taxation thought that taxing inflationary gains is a bad idea.

The theory of optimal taxation generally recommends not taxing interest, or rates of return, at all. Taxation of interest distorts the decision to consume now vs. consume later, and discour-
ages saving and investment. (We review this literature below.) As in our simple example, there
is effectively a flat supply curve, meaning that rates of return bear no burden of taxation, and
the attempt merely distorts quantities. Perhaps in bit by bit real-world accommodation to these
ideas, the government now maintains an absurdly complex system of tax sheltered investments
mentioned above. Tax-free federal debt would be a far simpler security to provide for some of
the same purposes.

By marketing what should be a very popular and liquid security, the government could sell
more debt at low interest rate.

5.2 Taxation of Treasury debt

Treasury debt is subject to both interest and capital gain taxation. Bonds issued at discount gen-
erate annual interest tax liabilities though they do not pay interest until due. Bonds purchased
at premium generate a loss which can be amortized against ordinary income.

There are some small precedents for tax-free or at least tax-advantaged Treasury debt. Treasury debt is exempt from state and local income taxes. For savings bonds, federal taxes can be deferred until bonds are redeemed or reach final maturity. Interest can be excluded from tax all together if the bondholder pays college tuition in the year bonds mature or are sold. Historically, the Treasury allowed some debt to be used at par to pay taxes, even if its current value was below par. The Treasury has just started the myRA program, in which people can start a Roth IRA with Treasury investments. This is functionally tax-exempt treasury debt, though with a lot of complex rules attached.

Most of all, interest on Treasury debt can be sheltered. Standard portfolio advice puts
interest-bearing debt into tax-sheltered or tax-deferred vehicles such as 401(k), IRA or Roth
IRA accounts. Deferring taxes allows the rate of return to cumulate and can add up to a
substantial reduction in overall taxes. Mitt Romney’s $100 million IRA based on capital gains
of carried interest is a famous example.

In evaluating these provisions, it’s important to distinguish income taxes from taxes that
actually distort rates of return. Thus tax deferral can amount to tax exemption of rates of
return. For example, IRAs allow returns to cumulate tax free, but they are taxed as ordinary
income on withdrawal. Nonetheless, they give no distortion to the intertemporal margin, or
even a subsidy if your tax rate declines. If you earn income $Y$, pay income taxes $\tau Y$ leaving
after-tax income $(1 - \tau)Y$, and then are able to invest with a tax-free return $(1 + r)$, you end
up with $(1 - \tau)(1 + r)Y$. If you earn income $Y$, are able to invest all the pre-tax earnings in an
IRA that allows a tax-free return $(1 + r)$, you have $(1 + r)Y$ in your retirement account. You
pay income taxes on withdrawal, leaving $(1 - \tau)(1 + r)Y -$ exactly the same amount.

Rate-of-return taxation can also be avoided by putting Treasury investments through tax-
preferrred intermediaries, such as pension funds, especially in the case of government or nonprofit
employees, or life insurance companies.

The point of all this is that even for taxable investors, the government is already collecting
well below the statutory rates of taxation on interest. Yet at a great cost in complexity.

6 https://www.treasurydirect.gov/indiv/research/articles/res_invest_articles_tax_adv_0604.htm
Taxation of Treasury interest and capital gains matters when interest rates are high and volatile. As we write, short term rates are still zero, and the long-forecast rise in rates has yet to happen. If the U.S. heads to a configuration something like Japan’s over the last few decades, with zero interest rates and no interest rate volatility, then taxation of Treasury debt (like inflation adjustments, below) will no longer be much of an issue. This point is a much under-appreciated benefit of the Friedman optimal quantity of money: tax distortions disappear.

Yet, this configuration is not yet accepted as desirable, let alone likely to persist. Thus, it remains worthwhile to think about a structure of Treasury debt that will be important if we return, as envisioned, to “normal” two percent inflation and four percent interest rates, which vary over time. In fact, a time when taxes are low is probably the best time to think rationally about how to structure Treasury debt, because billions of dollars are not on the line!

5.3 Heterogenous tax rates, tax clienteles and tax efficiency

The most natural objection is that different people pay different tax rates, where our simple example used a single tax rate. If taxable and tax-free bonds give the same return at a cutoff tax rate $\tau^*$, then it seems that tax-free debt is a present to investors with higher tax rates, leading the government to pay more interest overall to finance a given debt. More generally, it may be viewed as a “loophole,” the sort of thing that should be eliminated in a quest to broaden the base, lower rates, and simplify the tax system.

Though one jumps quickly to an implied subsidy to high-tax-rate investors, by the same logic the current system also offers a subsidy to low-tax and non-taxed investors, including endowments, central banks, government holders, nonprofit corporations, many pension funds, and so forth. They receive an interest rate set by a marginal taxable investor, yet pay no tax. One could equivalently speculate that by offering non-taxable debt to everyone, they would receive the non-taxable rate like everyone else.

This intuition is not correct in general. Its validity depends, among other things, on the supply curve, on the availability of alternative investments, and thus the question of what price investors will offer for debt. If all investors have access to alternatives with the same after-tax return $r$, then in fact the opposite intuition holds, and uniformly tax-free debt gives the lowest interest cost to the government. The reason is the usual one: when capital can move to higher rates of return, you can give some taxpayers presents but you can’t force other taxpayers to suffer low returns.

5.3.1 Example in which tax-free debt lowers interest costs

If all investors have a best alternative after-tax risk-adjusted (liquidity-adjusted, etc.) return $r$, then no investor will buy government debt for less than a return of $r$. If the government offers tax-free debt, it pays net interest $r$ on all the debt. If the government offers taxable debt, only investors whose tax rates are low enough to generate an after-tax return greater than $r$ will buy it. Adding it all up, if the government sells any taxable debt to taxable investors, it pays a higher net rate of return than it would by simply offering non-taxable debt to everyone. There is just no way for the government on net to pay less than $r$ on its debt when those who are
supposed to suffer lower returns can leave.

Here is a simple example, following Miller’s (1977) tax-clientele demand curve for debt, which derives this result. (Dybvig and Ross 1986 present a more recent and detailed clientele model). Suppose that people in tax bracket \( \tau \) demand \( X_\tau = PB_\tau \) dollars of debt, buying \( B_\tau \) bonds at price \( P \). A bond is a claim to a perpetual $1 pre-tax coupon, so \( B_\tau \) bonds pay a stream of \$B_\tau \) each year. Investors are willing to buy government bonds up to value \( X_\tau \) so long as they can earn at least their their best alternative after-tax risk-adjusted return \( r \). They are thus willing to pay up to \( P = (1 - \tau)/r \) for each taxable perpetuity. Each tax-bracket’s demand for government debt can be represented by a step function: they demand \( X_\tau \) at any price less than \( P = (1 - \tau)/r \), any amount between zero and \( X_\tau \) at that price, and and zero above that price.

The government sells \( X \) dollars of taxable debt, inelastically, in a uniform price auction. A price above \( 1/r \) attracts zero demand. A price \( P = 1/r \) attracts the tax-free investors, giving total demand \( X^d = X_0 \). Lower prices then sweep out the demands of taxable investors at higher and higher tax brackets. At price \( P \), which we can index by the marginal investor’s tax rate \( \tau^* \) with \( P = (1 - \tau^*)/r \), total demand is \( X^d = \int_0^{\tau^*} X_\tau d\tau \). The equilibrium price, and the implied tax rate \( \tau^* \) of the “marginal investor” who sets that price, is given by supply = demand \( X = \int_0^{\tau^*} X_\tau d\tau \). (Usually, the “marginal investor” concept is a fallacy, since all investors are on their margins. In this model, everyone but the last investor to buy is at a corner, so the concept makes sense.)

The price of perpetuities is then given by the highest participating tax bracket, \( P^* = (1 - \tau^*)/r \). Investors \( \tau < \tau^* \) buy \( B_\tau = X_\tau/P^* = X_\tau r/(1 - \tau^*) \) bonds. The government pays, and they receive, net coupons

\[
(1 - \tau)B_\tau = r \frac{(1 - \tau)}{(1 - \tau^*)} X_\tau,
\]

so their rate of return is

\[
\frac{r (1 - \tau)}{(1 - \tau^*)}.
\]

Thus, all participating investors are getting a rate of return greater than or equal to their outside alternative, since all participating investors are in less than or equal to the marginal tax bracket. All investors with higher tax bracket do not participate. In this sense, the tax rules for government debt are a subsidy to low-tax investors. The government’s yield, the total net coupon payment divided by initial borrowing \( X \) is then

\[
r \int_0^{\tau^*} \frac{(1 - \tau)}{(1 - \tau^*)} \frac{X_\tau}{X} d\tau.
\]

The government must pay more than \( r \) on average.

This model gives a downward-sloping demand curve for government debt, but not from the usual mechanisms of liquidity, segmented markets, preference for maturity, signaling of future monetary policy and so forth. The downward sloping demand comes simply by sweeping out marginal tax rates as debt must be sold to higher and higher tax clienteles. This model also says that the yield ratio between government and municipal bonds should be related to the tax rate of the marginal investor for government bonds, not the maximum Federal marginal rate. Thus the “muni bond puzzle” that this interest spread seems low is not much of a puzzle in this context. If there were not much Federal debt so it could all be sold to non-taxable investors, there would be no Federal-municipal spread at all.
Now we can analyze properly what happens if the government sells some tax-free debt. Let the government split its supply into taxable $X^T$ and nontaxable $X^{NT}$ issues, with $X = X^T + X^{NT}$.

The low-tax clientele will buy the taxable issues. But by offering a lower amount of these issues, the government will not have to sweep so deeply into the high tax brackets, and thus it will earn a higher price, and pay a lower net return on the low tax issues.

Let $\tau^{**}$ denote the maximum tax rate that buys taxable debt when the government issues both taxable and non-taxable debt, determined by $X^T = \int_0^{\tau^{**}} X_\tau d\tau$. We will have $\tau^{**} \leq \tau^*$ since the government sells less taxable debt $X^{NT} < X$.

Investors with $\tau > \tau^{**}$ now offer to buy the non-taxable debt. They will offer a price $P = 1/r$ and buy what the government offers at that price. The government will pay $r$ on their debt.

The government’s total interest payments are now

$$\int_0^{\tau^{**}} \frac{(1-\tau)}{(1-\tau^{**})} \frac{X_\tau}{X} d\tau + \frac{X^{NT}}{X} r$$

Overall the government pays less by offering tax free debt than it did by offering only taxable debt.

In this class of debt structures, the government pays the lowest overall cost if the government sells taxable issues only to non-taxable buyers, so that the marginal investor has a tax rate of zero, and the government can pay only the non-taxable rate of return. If $X^T$ is small enough, $\tau^{**} = 0$, $P = 1/r$, and the government pays only a rate of return $r$ on taxable debt. The government can also simply sell only non-taxable debt, which gives the same result.

This model is admittedly stylized. Still, the model captures the important real-world considerations: 1) Selling debt at taxable rates, i.e. reflecting a price offered by a marginal taxable investor, to non-taxed or less-taxed investors, implies a subsidized rate of return to low-taxed investors. Selling non-taxed debt to all investors removes that subsidy. 2) The idea that the government does better by taxing the yields of high-rate investors relies on the belief that such investors will still buy government debt despite suffering rates of return lower than they can get elsewhere. Why would they do that?

### 5.3.2 Example in which taxable debt lowers interest costs

With a model in hand, one can spot the central assumption: That all investors have access to the same after-tax risk and risk and liquidity-adjusted outside opportunity $r$. This Miller’s (1977) explicit assumption. One might say “yes, municipal bonds,” but another might swiftly answer that the government should get rid of the municipal bond exemption.

Here is the opposite possibility. Suppose each investor paying tax $\tau$ has a best outside opportunity that yields an after-tax rate of return $(1-\tau)r$, not $r$. All his or her investment possibilities are taxed and at the same rate. Now each investor is willing to pay the same price

$$P = \int_{t=0}^{\infty} e^{-(1-\tau)r t} (1-\tau) dt = \frac{1}{r}$$
for taxable perpetuities. Each investor $\tau$ is willing to pay even more

$$P = \int_{t=0}^{\infty} e^{-(1-\tau)rt} dt = \frac{1}{(1-\tau)r}$$

for tax-free perpetuities.

If the government issues only taxable perpetuities in this case, who buys them is indeterminate as each investor is indifferent. Let $\hat{X}_\tau < X_\tau$ denote the dollar value of debt actually bought by tax rate $\tau$. The government pays net interest

$$r \int (1-\tau) \frac{\hat{X}_\tau}{X} d\tau < r$$

on the debt $X$, so it’s in the government’s interest to get the debt in the hands of the highest tax bracket taxpayers.

If the government issues a mix of taxable and non-taxable perpetuities, then the high-tax investors will buy the non-taxable perpetuities. We will sweep out a similar demand curve for non-taxable debt starting at the highest tax rates. The marginal bidder will offer a price $P = 1/[(1-\tau^{**})r]$. The price and marginal tax rate $\tau^{**}$ will be set by supply = demand for non-taxable debt $X^{NT} = \int_{\tau^{**}}^{1} X_\tau d\tau$. Each high-tax individual buys bonds $B_\tau = X_\tau / P = X_\tau (1-\tau^{*})r$ which is also the amount of net interest he or she receives, and the government pays.

Thus, the government’s overall rate of return is now

$$r \int_{\tau=0}^{\tau^{*}} (1-\tau) \frac{\hat{X}_\tau}{X} d\tau + \int_{\tau^{*}}^{1} (1-\tau^{*}) \frac{X_\tau}{X} d\tau$$

(2)

This quantity could be either higher or lower than with all taxable debt in (1).

The distribution of $\hat{X}_\tau$ was not determined, all investors being indifferent with taxable debt, in (1), so long as $X = \int \hat{X}_\tau d\tau$. The distribution of $\hat{X}_\tau$ in the first term of (2) is similarly not determined so long as it adds up to the debt not bought by non-taxed investors. What we do know is that all high-tax investors participate in the right hand term of (1), so above $\tau^{*}$, $\hat{X}_\tau = X_\tau$ there.

Thus, if in (1) the taxable debt was in the hands of high-tax-rate investors, so the left hand term of (2) was already zero, then replacing $1-\tau$ with $1-\tau^{*}$ in the right hand term will raise the government’s interest costs. This is the case for not allowing tax-free debt.

However, if in (1) the taxable debt was in the hands of low-tax-rate investors, so that $\hat{X}_\tau = 0$ for $\tau \geq \tau^{**}$, then the government’s interest costs will decline. The government will attract all the high-tax-rate investors to participate, shifting holdings from the left-hand term of (2) to its right-hand term.

In sum, introducing tax-free debt can raise the government’s interest costs if 1) high-tax investors receive lower after-tax returns on all their outside investment opportunities, and 2) taxable government debt is already in the hands of high-tax investors.
5.3.3 Which is right?

The issue is now clear: What are the after-tax returns available to high tax-rate investors, with which government debt must compete? Does our world look more like the first example, in which taxable debt largely serves a non-taxed clientele, or like the second example, with taxable debt evenly strewn through the tax rate distribution?

Miller (1977) argued for the first view, that the same after-tax alternative return $r$ is available to all investors. He argued that the tax rate on stocks is essentially zero, as one can hold stocks that pay most of their returns as capital gains and then not realize capital gains. There are many opportunities to shield investments in tax-deferred strategies, mentioned above. Investments in real estate, privately held businesses, and other non-market investments offer many other opportunities to shield rates of return from taxation. In sum, the effective marginal tax rate of alternative rates of return is surely substantially less than the taxation of interest on Treasury securities, even if not exactly zero.

Very few U.S. taxable investors hold long-term Treasury debt, which argues for the first model of the facts and also argues that in the second model, little taxation would be lost by replacing taxable with non-taxable debt.

We give some sense of these facts by putting together various numbers on Treasury holdings. The latest *Treasury Bulletin* Table OFS-1 lists $18$ trillion outstanding debt. Of this, $5$ trillion is non-marketable and held by government accounts, $2.8$ trillion held by the Federal Reserve (meaning, transformed into currency or reserves), leaving $10$ trillion held by private investors. Of this, Table OFS-2, excerpted in Table 1, whittles away many nontaxable investors.

<table>
<thead>
<tr>
<th>Table 1: Ownership of Treasury Securities. ($Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total public debt</td>
</tr>
<tr>
<td>SOMA and Intragovernmental holdings</td>
</tr>
<tr>
<td>Total privately held</td>
</tr>
<tr>
<td>Depository institutions</td>
</tr>
<tr>
<td>U.S. savings bonds</td>
</tr>
<tr>
<td>Private Pension funds</td>
</tr>
<tr>
<td>State and local government pension funds</td>
</tr>
<tr>
<td>Insurance companies</td>
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<tr>
<td>Mutual funds</td>
</tr>
<tr>
<td>State and local governments</td>
</tr>
<tr>
<td>Foreign and International</td>
</tr>
<tr>
<td>Other investors(1)</td>
</tr>
</tbody>
</table>

Note: *Treasury Bulletin* Table OFS-2, values for December 2013. (1)Includes individuals, Government-sponsored enterprises, brokers and dealers, bank personal trusts and estates, corporate and non-corporate businesses, and other investors

$5.8$ Trillion – more than half – is held by foreigners, who are by and large not paying U.S.
taxes. *Foreign Portfolio Holdings*\(^7\) Table 12 lists that almost all of the debt held by foreigners is $4.9 trillion “long-term” debt, of which $3.6 trillion is held by “foreign official” investors, largely central banks who most certainly are not paying U.S. taxes. The report does not define “long-term,” but if we take the loosest definition of greater than one year, we can read the *Treasury Bulletin* Table FD-5 which end of 2013 lists $6.5 trillion debt greater than one year outstanding. That means that only $1.6 trillion long-term debt held by any U.S. investor. The rising yield curve means that more taxable interest comes from longer maturity debt, so the fact that long-maturity debt is so overwhelmingly held by foreign non-taxable investors is a double whammy for the collection of taxes on interest.

Back to Table OFS-2, $1.1 trillion is held by mutual funds. To the extent those mutual funds are held by non-profit or tax-exempt entities, or in tax-exempt or deferred accounts, they escape taxation. Private pension funds are tax-favored\(^8\) if not tax exempt, and State and local governments pay no Federal taxes. Savings bond interest can be deferred or eliminated. We’re down to $1.2 Trillion held by “Other investors,” which includes “individuals, Government-sponsored enterprises, brokers and dealers, bank personal trusts and estates, corporate and non-corporate businesses, and other investors.” In other words, it includes a mix of tax status – individual, corporate, profit or nonprofit – tax brackets and tax-avoidance strategies.

The Flow of Funds\(^9\) Table L.209 p. 99 gives a similar breakdown; of $12,756 total Treasury, budget agency and federal mortgage debt held by the public, the Household sector holds only $547 “bills and other Treasury securities”) Corporate and non corporate business hold $40 and $52 billion each, and the rest of the world $6 trillion.)

In sum, the vast majority of Treasury debt is held by investors who are paying low or no tax rates on interest they receive. We already live by and large in a world in which taxable Treasury debt is held by the tax-exempt clientele, and the world in which offering tax-free debt to high tax-rate investors would not give them a big present relative to the rate of return they are earning now on Treasury debt.

Ideally, the question “How much revenue does the U.S. earn by taxing interest on Treasury debt?” should be possible to answer from IRS tax return data. We have not found a source that attempts it calculation.

To be clear, lowering interest costs is not the beginning and end of optimal taxation. If anything, this is a maximize government revenue objective, find the top of the Laffer curve, not the proper objective of maximizing welfare. And the models are very simplistic. But the intuition that offering tax-free debt will lower government revenues or be a present to high-income taxpayers is not in general correct, and quite plausibly incorrect.

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\(^8\)[http://www.taxpolicycenter.org/taxtopics/encyclopedia/pensions.cfm](http://www.taxpolicycenter.org/taxtopics/encyclopedia/pensions.cfm)

5.4 Municipal Debt

The tax clienteles issue is one of the main complaints against the Federal tax deductibility of interest on municipal debt. People in marginal tax brackets above the breakeven rate seem to be getting a good deal. The municipal tax deduction is said to be “inefficient” in that much of the desired Federal interest subsidy to municipal finance goes into the pockets of high tax bracket taxpayers. Though not directly related to our question, it is worth surveying these ideas which naturally suggest that offering tax-free Treasury debt is a bad idea.

5.4.1 The Muni spread puzzle

The breakeven condition for holding tax-free debt is that its rate \( r^{TF} \) and the taxable rate \( r^T \) obey \((1 - \tau)r^T = r^{TF}\). Thus one can read the breakeven tax rate \( \tau^* = 1 - r^{TF}/r^T \) from the ratio (not difference) of tax-free to taxable yields. This calculation typically gives a result significantly below the maximum individual marginal Federal rate, a fact known as the “muni-bond puzzle.” For example, as of December 29 2014, the 2, 5, and 10 year AAA municipal rates are 1.06, 1.31 and 2.14%, while the corresponding Treasury rates are 0.64, 1.70, and 2.21%, yielding implied tax rate of -6.2%, 22.9% and 3.2%.

For example, Beek (1982) notes that the yield ratio of nontaxable to taxable debt has exceeded the maximum marginal tax rate, indicating that the supply of nontaxable debt has reached down to a clientele with less than the highest rate. Therefore, some of the benefit of the Federal subsidy to state and local governments implied by the tax exemption is flowing to high tax investors, not as intended to the state and local governments. Among other solutions, he recommends a coordinated reduction in supply.

Not so fast, however, says an extensive literature. One can read low implied tax rates as simply measuring the effective marginal rate, after wealthy individuals use all their complex tax-avoidance strategies. Arguments such as the simple model just presented easily drive Treasury debt to reflect a tax rate below the maximum marginal rate. If there are enough tax-free investors to buy all the Treasury debt, the spread between taxable and nontaxable rates will be zero. Miller’s (1977) analysis argues that the municipal spread should be anchored by supply, not demand, and hence should equal the corporate tax rate. As Miller notes, just who is subsidized by whom is a bit up for debate, too. He notes that in the ensuing equilibrium, universities and other low or no tax bracket investors get to invest at the higher taxable rate.

More deeply, the long asset pricing literature devoted to the municipal spread notes the many ways in which the world departs from the simple example. (Longstaff 2011 is a good recent review.) Municipal bonds include credit risk. Municipal bonds are notoriously illiquid. Municipal bonds traded above comparable Treasuries in the financial crisis of 2008 and substantially afterwards, as clear an indication that one cannot simply read a tax rate off the ratio of yields as one could want. Municipal bonds can be used for complex tax strategies involving capital gains and losses, which enhances their value (Green 1993, Constantinides and Ingersoll 1982). For example Green (1993 p. 236) argues that high-tax individuals will offset taxable interest received with tax-deductible interest expense. Thus taxable yield curves are not so taxable. On p. 244 Green explains the amortization premium. If tax rates fall, or interest rates rise, a

\[\text{http://finance.yahoo.com/bonds/composite_bond_rates}\]
municipal holder can take the tax loss, roll the proceeds over to a new issue, and earn the higher return in untaxed interest.

In a recent and sophisticated attempt to control for all these factors, Longstaff (2011) finds the average marginal tax rate implied by the municipal spread is 38%, just about the same as the Federal maximum rate in his sample. Longstaff also finds a substantial risk premium. In good times, investors are pushed to higher marginal tax brackets. Thus, taxable debt has a negative beta, depressing its yield relative to simple non stochastic models. Longstaff finds that this difference accounts for about 10 percentage points of the implied tax rate.

In sum, one should not too quickly read a lesson about offering tax-free debt from the spread of municipals over corporate and Treasury debt.

5.4.2 Municipal Inefficiency

The tax-deductibility of municipal bond interest has long been criticized, and many tax reform proposals eliminate it. It seems that much of the lost tax revenue is going into the pockets of wealthy taxpayers, not to the intended municipal recipients of Federal subsidy. The tax-deductibility of municipal interest seems to be considered one of many loopholes that should be closed.

But intertemporal margins are not loopholes in the way different sources of income can be.

In an influential tax reform proposal, Bradford (1977) argues on this basis that interest on State and local bonds should be fully taxable. He writes

The difference in interest costs that the State or local government would have to pay on taxable bonds and that which they actually pay on tax-exempt bonds is borne by the Federal Government in the form of reduced revenues. The subsidy is inefficient in that the total cost to the Federal Government exceeds the value of the subsidy to the State and local governments in the form of lower interest payments. Estimates of the fraction of the total Federal revenue loss that is not received by the State and local governments vary widely, but the best estimates seem to be in the 25- to 30-percent range.

Alas he provides no citations for the latter figure.

As with the case of Federal interest taxation, above, the inefficiency is not so obvious on second thought, once one considers prices, supply responses, and alternatives available to investors.

If a municipality issues $X^m$ debt at yield $r^{NT}$, less than a taxable yield $r^T$, if all of its investors would have bought the debt at the higher taxable rate and fully paid taxes on that rate, then the Federal Government gives up $\int X^m \tau r^T d\tau$ where $X^m\tau$ denotes dollar holdings of municipal debt by tax bracket $\tau$ and $X^m = \int X^m \tau d\tau$. The municipality gains lower interest payments $X^m(r^T - r^{NT})$. If (the best case for the argument) only investors with tax rate above the breakeven $\tau > \tau^* = 1 - r^{NT} / r^T$ bought municipal debt, and those exact same investors would have bought the same amounts $X^m\tau$ of taxable debt, then one can say that the Federal
Government’s loss exceeds the municipal gains by

\[
\int_{\tau^*}^{1} (\tau - \tau^*) X^m \tau \, d\tau.
\]  

(3)

If there are many bondholders with taxes above the cutoff rate \(\tau^*\), then this loss will be substantial compared to the value of the interest subsidy \(X^m (r^{T} - r^{NT})\).

But that’s a long string of “ifs.” It is likely that municipal debt is held by high-tax-rate investors. (Feenberg and Poterba 1991 confirm this finding in tax return data.) It is less likely that if municipalities were to sell taxable debt instead, that the same investors would buy this taxable debt, Federal taxable debt, or any taxable debt, and it is even less likely that they would pay the full tax rate on that debt rather than shelter it. After all, that’s why they’re buying municipal bonds in the first place!

A more likely scenario is that taxable municipal debt would be bought by the clientele with tax rate \(\tau \leq \tau^*\) that is buying taxable Federal and corporate debt, and the high-tax investors pursue alternative investments as above. Then the best the Federal Government can hope is to earn \(\tau^* X^m\) on the interest. The loss in (3) is exactly zero.

### 5.4.3 Municipal bonds and tax policy

To be clear, we are not big fans of municipal bonds and their special tax treatment. The point is only that this particular argument for their inefficiency strikes us as tenuous, and in particular a tenuous basis on which to oppose tax-free Treasury debt.

A main objection to tax-free Treasury debt will likely come from municipalities, universities, and other issuers of tax-free debt, and the brokers and intermediaries who make substantial spreads placing that debt. That’s great for investors – the municipal bond market is notoriously illiquid, and plagued with very large and customer-unfriendly spreads. See Green, Hollifield, and Schürhoff (2007) for a chilling view. This is a different kind of “inefficiency,” which is there in large quantity. We argue for Federal tax-free debt in part to offer investors a much better tax-free security than is provided by municipal bonds.

We also agree with critics of municipal debt that if the Federal government wishes to subsidize municipal and other tax-free borrowing, or to placate this constituency, a straightforward Federal interest-rate subsidy would be far better. Direct-payment Build America bonds embodied much of this philosophy. If for no other reason, then the subsidy would be on the budget, recognized as such, and the recipients named. The Federal government subsidizes a lot of debt, including home mortgages, student loans, small businesses, farmers, large exporters, and so on. At least subsidizing municipal borrowing though an interest subsidy insulates the Federal Government from default risk, unlike most of the other Federally subsidized borrowing programs.

We also do not wish to endorse the entire current tax system. The point here is, leaving all that aside, even if the current tax system stays the way it is, the small step of creating completely tax-free Treasury debt is useful.
5.5 Optimal taxation and redistribution

One reason for our proposal comes from the classic view of dynamic public finance that taxing rates of returns is a bad idea. Since we also explained the wide variety of methods that people use to escape taxation of rates of return, one might argue that the world is close to that ideal already. But it does so at extraordinary and needless complexity. In the case of Treasuries much of that complexity comes by avoiding Treasury debt altogether, leaving it to the tax free clientele.

Here, we examine the natural objections to the proposition that lower taxes on rates of return are desirable. The most basic objection is a sense that tax-free debt is a present to high-tax investors, that high income investors should pay a greater share of their income, including capital income in taxes.

At a basic level, this objection confuses taxation of labor income, just-this-once taxation of wealth, and taxation of rates of return. Rather than one word “capital taxation” for the latter two, it would be better to use separate words, and “rate-of-return” taxation in particular.

Even if the argument were correct, taxation of interest on the debt is hardly the only place in which tax deductions or exemptions have greater value for high tax-rate people or corporations. The charitable deduction, the home mortgage interest deduction, the deductibility of educational and medical expenses, and so forth, all have greater value to high-tax-bracket people than to low ones. If we’re going to worry about tax deductions disproportionately benefitting high-tax-rate investors, Treasury debt is pretty far down the list.

The classic view of dynamic public finance states that taxing rates of return is a bad idea. It especially says that trying to redistribute by trying to force different people to face different rates of return is a bad idea. Raise revenue by taxing consumption, uniformly across goods. Redistribute income, if you wish to do so, with labor income taxes and subsidies or expenditures. Taxing interest introduces a tax distortion into the intertemporal allocation of consumption, encouraging consumption today and discouraging savings and capital formation. Don’t do that.

This result comes from the Ramsey optimal-tax framework, which asks how a government should raise revenue in a way that minimizes economic distortions. (Chalmley 1986, Judd 1985. See Atkeson, Chari, and Kehoe 1999 for an excellent review.) The logic holds as well in the Mirrlees (1971) tradition of optimal redistribution with moral hazard. It is robust to many natural generalizations of assumptions.

Mankiw, Weinzierl, and Yagan (2009) summarize the literature and intuition nicely, relating capital taxation to three common principles of optimal taxation. First, capital is an intermediate good, using current consumption to produce future consumption. Taxing capital violates the principle that governments should only tax final goods. Second, taxing capital means altering the rate of return, and thus making consumption in the future more expensive than consumption today. This wedge violates the uniform taxation principle that homothetically preferred goods should be taxed at the same rate. Since consumption further in the future is taxed at a higher and higher rate as the rate of return tax accumulates, the violation of the uniform tax principle is extreme. Third, the supply of savings is, in the long run, highly elastic. In a closed economy, people save less until the after-tax rate of return is the same as it was before. In an open economy, the after-tax rate of return is fixed globally. This violates the principle not to tax
highly elastic goods. Summarizing, Mankiw, Weinzierl, and Yagan write “the logic for low capital taxes is powerful: the supply of capital is highly elastic, capital taxes yield large distortions to intertemporal consumption plans and discourage saving, and capital accumulation is central to the aggregate output of the economy.”

Mankiw, Weinzierl, and Yagan (2009) summarize the optimal labor taxation and redistribution literature by recommending low and flat labor income taxes at high income. This view comes from the elasticity of incentives, effort, and, perhaps most importantly, human capital formation, to labor income taxation. Needless to say, this conclusion has been the object of a lot of controversy more recently, with calls for much greater redistributive taxation, especially of the “1%.” However, by and large, the optimal-taxation branch (as opposed to political, social justice, or other non-economic considerations) of this literature recommends high labor income taxation and does not substantially alter the argument in favor of large tax distortions in rates of return.

Diamond and Saez (2011) is specific and famous response to the classic views summarized by Mankiw, Weinzierl, and Yagan (2009), so we use them as an example to investigate the countervailing views. Diamond and Saez’s central point is to argue for high and increasing marginal labor income tax rates especially at high incomes. But Diamond and Saez also “argue that capital income should be taxed.” They argue that the results prescribing a uniform and zero tax rate on rates of return “are not robust enough to be policy relevant.” Primarily, that means that they distrust intertemporal optimization: “the result relies critically on the assumption that individuals make consistent rational decisions about savings behavior across very long horizons,” “the recent behavioral economics literature has cast much doubt on the standard model of intertemporal decision making” and “empirical analyses of gifts and bequests, while clearly showing concerns about heirs, are not supportive of the rigorous version of the dynasty model.”

Recognizing, perhaps, that definitions of “policy-relevant” may vary, and that picking away at assumptions is not very convincing, however, they write “In the end, persuasive arguments for taxing capital income are that there are difficulties in practice in distinguishing between capital and labor incomes, that borrowing constraints make full reliance on labor taxes less efficient, and that savings rates are heterogeneous.”

The point about distinguishing between capital and labor income well-taken. But that point is not relevant for the taxation of interest and capital gains on Treasury securities. That distinction may offer a potential reason for compromise: tax capital income that is potentially masqueraded labor income – carried interest, executive stock option gains, etc. – but do not tax Treasury interest or capital gains, because we know Treasury bond holdings are not hidden labor income.

Most of all, Diamond and Saez don’t offer an alternative, nor offer citations. They don’t say what the optimal tax on capital is or how economics ought to think about it. How much capital taxation do “borrowing constraints” and heterogeneous “savings rates” imply? Their entire discussion on the point (p.177-183) is a critique of the theorem that the capital tax rate should be zero. But they do not offer a single argument in favor of their “single qualitative recommendation: capital income should be subject to significant taxation.” In fact, typical behaviors they adduce to criticize intertemporal optimization often lead to myopic behavior, under saving, and hence argue for a subsidy rather than a tax on rates of return. They even
say so: “This concern adds support to the case for tax-favored retirement savings accounts coming from concern of inadequate savings by some (because saving for retirement involves long horizons). Conversely, the presence of such accounts supports higher taxation capital income than without such a savings option.” (p. 179) Who “some” is, why not “everyone,” and why the presence of complex tax-sheltered accounts supports high taxation out of those accounts is not explained.

More deeply, the argument over progressive labor income taxes goes back to simple principles: just how elastic is labor income tax revenue with respect to labor income taxes, and how much economic distortion do those taxes create? (Especially over the long run, when human capital accumulation kicks in.) The principles apply to rate-of-return taxation. But here the arguments seem much harder. Progressive capital taxation in the cause of redistribution means taxing rates of return more highly for high wealth people. But high-wealth people are exactly those least likely to suffer from myopic biases, most likely to be worried about bequests and estates, and most able to avoid rate-of-return taxation. Or to move abroad. Or to move money abroad. Corporations are even better at moving capital abroad to escape rate-of-return taxation. The standard elasticity arguments would point to taxing rates of return for lower income people. Which is exactly what most governments including our own do – implied marginal taxation of savings in social programs, college aid, and so forth are high. Financial repression (postal savings accounts) hits low income people, not high income. All this – which we do not mean to approve of by mentioning it – we works to the opposite goal of redistribution. A rule against intertemporal distortions might benefit low income people!

Many other papers have supplied calculations of non-zero optimal capital taxes, by quantitatively specifying some of these frictions. Conesa, Kitao and Krueger (2009) is an excellent example. They study a complex calibrated simulation model with many frictions to undo the classic zero-capital-tax theorem. Among others, they posit overlapping generations with no annuities or intentional bequests, and unintentional bequests equally distributed lump-sum to the living. There is no schooling or human capital accumulation. Households enter market with exogenously determined productivity that varies by age, and person, and random shocks, and no insurance markets, justifying redistribution. They find a 36% optimal capital tax. In their model, capital taxes stand in for age-dependent income taxes, so two intertemporal distortions offset. However, the sensitivity of such results to the detailed modeling of frictions have so far kept them from “policy-relevant” summaries such as Diamond and Saez’.

We conclude that despite a robust debate, the classic case for removing intertemporal distortions remains strong.

5.6 Alternatives

The natural alternative will be to offer tax deductions on interest or capital gains earned on Federal debt via the tax code. This will allow Congress to maintain the appearance of progressive taxation, and to limit the tax deductibility in various ways, as it limits participation in other rate-of-return shelters. The myRA program is essentially this structure.

This natural “compromise” really achieves few of the goals. It does not make anything simpler. It does not attract the high-tax clientele back to Treasury debt. Most of all, deductibility provisions in the tax code can always be revisited. That may be good, as the tax-extenders
are, for an annual renegotiation between legislators, lobbyists, and beneficiaries, but it is not
good for initial investment and raising the market price of Treasury debt, where one wants a
guarantee that tax exclusion will last forever.

5.7 Politics

Though by and large we steer clear of political economy considerations, one seems worth men-
tioning in this context. Who holds Federal Debt has implications for its repayment. Alexander
Hamilton federalized state debt, in the classic tale, in part to create a class of bondholders who
would support the Federal Government and its power to tax, in order to ensure repayment of
the debt. Current U.S. debt is held predominantly by Federal Agencies, foreigners and primarily
foreign governments, and institutions such as pension funds and nonprofit endowments. Tax-free
federal debt would encourage holding by high-tax bracket domestic investors. The fact that such
investors are politically powerful adds to a constituency in favor of repayment and disinflation.

Of course, like all political arguments, one can make the opposite case as well. Many com-
menters would like to see more inflation, and see an evil cabal of well-connected high wealth
investors standing in the way of a desirable inflationary default by governments, homeowners,
and other debtors.

Either way, the political consequences of attracting a clientele that currently holds little
Federal debt is a worthwhile point to debate.

6 Indexed debt

Indexed debt, like all debt, should be perpetual. Indexed debt should pay a coupon equal to $1
times the current consumer price index. In 2014, the CPI is about 230. Index debt sold today
would thus pay a coupon of $2.30 for each bond. If the CPI rises to 250 in 2020, then indexed
debt will pay a coupon of $2.50. If the CPI declines to 200, then indexed debt will pay a coupon
of $2.00.

The Treasury should offer indexed debt in non-taxable form as well, in which all interest and
capital gains are exempt from all federal, state and local taxes including income tax, corporate
tax, and estate tax.

6.1 Why?

TIPS were a great start. But now let’s do it right. TIPS only increase coupons and principal
for inflation; they do not decrease coupons in the event of deflation. TIPS are keyed to the price
level at their issue date – coupons and principal cannot fall below this level – so TIPS include
an inflation option and new issues are different than old issues even of the same maturity and
coupon. TIPS have a complex tax treatment. Among other issues, increases in principal due to
inflation trigger tax payments due immediately. This heterogeneity and complex tax treatment
hinders their collection into tax-efficient mutual funds, and muddies their use as inflation hedges.
TIPS are, partially as a result, illiquid, and not nearly as popular as economists expected.
Our indexed debt, like our non-indexed debt, becomes one security, one cusip, no matter when issued. This simplicity and much greater market depth should dramatically improve its liquidity.

In portfolio theory, a non-taxable indexed perpetuity is the “riskless asset” for long-term investors that should be the cornerstone of every long-term investor’s portfolio (Campbell and Viceira 2001, Wachter 2003, Cochrane 2014a.). What you really care about is the stream of consumption you and your heirs can achieve, not the mark-to-market value of your portfolio at some point in the future. If you invest in an indexed perpetuity, you can consume a steady amount forever.

By contrast, there really is no portfolio problem to which 30 years of coupons and a big principal payment are the answer. If 50 years of portfolio theory means anything, this should become a very popular asset.

The popular perpetuities of the Victorian age were essentially non-taxable indexed perpetuities. Under the gold standard, they offered a real payment immune from substantial inflation. And income and wealth taxation was light. At least there is a historical precedent for the popularity of such a security.

Indexed perpetuities should offer the Treasury lower-cost financing than nominal perpetuities. Protection from inflation risk is worth something to investors. (Yes, we are again assuming that inflation risk premiums are valued differently by the Treasury and investors; that the Treasury is willing to bet on lower inflation than investors; and that the Modigliani-Miller theorem for government debt fails.) The yield curve was downward-sloping or flat in the 19th century. (Homer and Sylla) Most economically-based term structure models produce a downward sloping average real term structure. Long-term real debt is the “riskless asset” for a long-run investors, so those investor need compensation for the greater long-run reinvestment risk of short-term assets. (Campbell, Shiller and Viceira 2009). The TIPS and UK inflation-indexed yield curves have also typically been flatter or more inverted than the corresponding nominal yield curves. A better security should enhance this phenomenon.

In sum, as with all these innovations, offering a simple, liquid, and popular security should allow the Treasury to finance deficits at lower cost, as well as to improve the functioning of financial markets.

TIPS already serve an important monetary policy function: They allow the Federal Reserve to obtain a direct measure of market-based inflation expectations. However, the illiquidity and complex tax treatment of TIPS makes that tea-leaf reading more obscure than it needs to be. The spread between our tax-exempt indexed perpetuities and our tax-exempt nominal perpetuities (or strips or swaps based on these securities) would provide a far cleaner measure of expected inflation. It’s still not as easy as yield spread equals expected inflation, as the inflation risk premium enters all such calculations. But a cleaner yield spread will help. (CPI swaps and other derivatives can be and are also used to measure inflation expectations, but these are even more narrowly traded.)

One can imagine even more daring monetary policy functions. As the Fed experimented with buying long-term debt to affect the slope of the yield curve during the various QEs of 2008-2014, the Fed could buy and sell indexed vs non indexed debt, or engage in swap transactions, to affect that spread. The Fed could even target the indexed vs. non-indexed spread to control expected
inflation. The Fed (or Treasury) could freely buy and sell bonds at a fixed price ratio (bring us one nominal perpetuity and we will give you an indexed perpetuity with 2% lower yield), or offer to engage in swap contracts at a fixed spread. This monetary policy would function essentially as an expected CPI standard, mirroring the functioning of the classical gold standard. (For more details, see Cochrane 2014b.)

None of this is necessary, of course. They are just indications of the many ways that a clean indexed perpetuity could be a useful security for government and private finance.

6.2 Objections and Extensions

An indexed perpetuity gives the infinite-horizon investor inflation protection, but it does not directly provide inflation protection for shorter-horizon returns.

Inflation-indexed perpetuities can, and should, be stripped just like nominal perpetuities. This stripping would yield a market in zero-coupon inflation-indexed bonds. (And, a rolling long-term futures contract.) In turn the zero-coupon bonds are natural inflation hedges for discrete-horizon returns, or can be assembled to be inflation hedges for other nominal fixed income instruments.

The price index is a tricky issue. First, the CPI is imperfect. Changes – improvements, we hope – in its measurement will impact coupon payments. For example, the change from fixed to chain-weighted CPI was an improvement. The treatment of housing costs and quality changes will surely improve. Most of all, the future will likely include more internet-harvested real-time data, following the example of the MIT Billion Prices Project[11].

Second, governments in serious inflations, and with outstanding inflation-indexed debt, have been known in the past to meddle with the CPI calculation.

Current TIPS simply specify that the holder will be paid based on the CPI as calculated by the Labor Department. If the Labor Department changes its calculation, you make or lose money. This institutional separation seems to be enough to satisfy bond holders. We also note the widespread acceptability of derivatives contracts based on indices whose calculation involves many fewer safeguards than the BLS calculation of the CPI. And recent scandals involving some of those derivatives. One might wish some additional legal protection for indexed bond holders, but not being experts at the legalities of sovereign debt contracts we leave the issue here.

7 Variable-coupon debt

The U. S. should issue long-term debt with an explicit right of the government to raise or lower the coupon, without triggering legal default.

The coupon will function much like the dividend payment of a corporation, or more precisely like the interest payment of preferred stock. Though perpetuities pay say, a $1 coupon, the government has the right to suspend coupon payments, or to lower them, say to 50¢, in times of

temporary fiscal stress. The expectation that the government will restore coupons again when
the temporary exigency has passed will give the debt value during the reduction of coupons, and
allows the government to sell debt in the first place. The government does not have the right to
devalue fixed-value debt relative to reserves and currency.

Variable-coupon perpetuities allow the government to quickly adapt to temporary fiscal
distress by lowering coupons, without triggering default or inducing inflation. Both default and
inflation incur far-reaching economic damage far beyond the need to lower coupon payments for
a while, or to reduce the value of outstanding debt. Imagine, for example, how much easier the
Greek debt crisis would have been if Greece did not need to roll over any debt, and had the
legal authority to simply reduce or eliminate coupon payments for a while.

7.1 Rules, Reputations and Temptations

Proposals for government debt with variable coupon or principal repayment have been around
for a while. Most recently, Eduardo Borensztein and Paolo Mauro (2004) advocated debt with
repayment linked to GDP growth. Mark Kamstra, and Robert Shiller (2010) have advocated
“Trills,” bonds whose repayment varies with the level of GDP. When GDP and tax revenue
are low, the government then automatically lowers the coupon payments. In good times the
government raises the payments.

There are good arguments for varying coupons to follow a rule of this sort. A rule reduces the
uncertainty about the coupons, and commits the government against the temptation of lowering
coupons and never raising them. A rule functions like the promise to pay coupons of traditional
debt: Violation of the rule can trigger legal actions, asset seizures, or other formal sanctions in
addition to a more visible loss of reputation, all of which are recommitments to ex-post costs
that raise the incentives to pay the expected coupons.

There are disadvantages to rules as well. Coupons that are lowered based on GDP or GDP
growth cannot be raised or lowered based on other exigencies, such as a war, a sudden fiscal
shock like a banking crisis, bankruptcy of states or their pensions, a sharp commodity or terms
of trade shock, and so forth. In fact, events such as these are more related to genuine debt
crises than are GDP growth numbers. One could write more rules, to create a richly complex
state-contingent debt, but it seems fairly pointless to try to do so. Corporations do not pay
dividends mechanically linked to sales or profit numbers for just these reasons.

Coupons could be freely variable, like corporate dividends. We think however that the best
structure would be for variable coupon debt to resemble noncumulative preferred stock. The
usual coupon is $1. The government has the right to suspend or to lower coupon payments,
with a statement about the temporary exigency that leads to this decision. When the exigency
is over, the government will restore the $1 coupon. It will not and will not be expected to pay
back the missed coupons, with or without interest. Nor is the government expected to raise
coupons above $1. (Or $1 × CPI for indexed debt.)

The solid expectation of a return to coupon payments – hopefully reinforced by experience
– should avoid a collapse in the value of the debt during a coupon suspension, and even to allow
the government to still borrow in long-term debt markets. A “normal” $1 coupon rather than
fully-floating coupons seems a better structure for government debt. Otherwise, the level of the
coupon will become a continual political debate.

Yes, governments will be tempted to lower coupons. And there will be strong forces resisting that temptation as well, or pressing for a rise in coupons. First, a large class of voters, owners of the debt, will be furious at any permanent reduction in coupons. These bondholders act as the shareholders of a corporation do, to demand dividend payments and force a change of management if they are unhappy with dividends. From the founding of the Bank of England, through Hamilton’s assumption of revolutionary war debt to the present, powerful bondholders help to have debts repaid or not inflated away. Offering tax-free debt to attract a clientele of high-tax-rate domestic investors will have a double advantage in this case. Second, any reduction in coupons that is not quickly or predictably reversed will damage the value of the debt and the government’s ability to issue new debt, both immediately and later. A desire to build up its creditworthiness and maintain the value of its debt will impel the government to pay coupons, to raise them where possible, and to clearly explain why coupons are suspended and under what contingencies they will be repaid. Third, our structure of “preferred equity,” with a stated coupon, a statement of reasons for its suspension, and a tradition of returning as swiftly as possible to the stated coupon, is a “rule” or at least a “tradition” whose violation will bring political pressure.

The temptation to lower coupons is not qualitatively different from the temptation to inflate nominal debt, or the temptation to default explicitly on nominal, indexed, or foreign-currency debt. A government that can issue nominal debt and not inflate it away, that can issue foreign currency debt and not default, has already solved the first-order precommitment issues needed to issue variable-coupon debt and not immediately lower the coupons. The rest is the small – but not insignificant – difference in the costs of default, inflation, and excessive ex-post lowering of coupons.

7.2 Literature and history

Lucas and Stokey (1983) present the classic derivation of optimal state-contingent debt payments. The option for state-contingent default allows more smoothing of distorting taxes.

Without legal costs, their “default” can be interpreted as actual default, as inflation, or as our proposed reduction in coupon payments. Our proposal that suspended payments are not eventually paid back means that a suspension is an ex-post tax on bondholders, who lose the present value of suspended coupons.

Cochrane (1998, 2001, 2005) (and many works cited there) interprets inflation as a Lucas-Stokey state-contingent default. The government debt valuation formula, which states that nominal debt divided by price level equals the discounted present value of future real primary surpluses, works just like the present value formula for stocks. Thus, reductions in the value of future real surpluses translate into lower values of outstanding debt via inflation, just as reductions in the value of future dividends translate into lower share values via price reduction. This adjustment of the value of debt to the value of future surpluses via inflation has the advantage of being automatic, just like declines in share values, not needing government action. It also avoids default costs. For these features, Sims (2001) argues for nominal debt rather than indexed or foreign-currency debt.
However, inflation also engineers a transfer from private lenders to borrowers, and in the presence of price-stickiness will drag down the macroeconomy as well.

Schmitt-Grohé and Uribe (2004, 2005) argue that the price-stickiness argument has great force. With just a small amount of price-stickiness, the advantages of implicit state-contingent default – minimizing tax distortions – are swamped in their models by the macroeconomic effects of sticky prices. They choose greater tax distortions rather than inflation, but their analysis would likely favor variable-coupon debt over both periodic inflation and larger tax distortions.

Dragging private debt and the macroeconomy into state-contingent “default” may have some advantages from the perspective of political economy or corporate finance of sovereign debt, however. Dragging the private economy along with government default widens the group of voters who are opposed to inflation and implicit default. (Cochrane 2005.) A desirable government state-contingent default may also coincide with the desirable private state-contingent defaults. This view is motivates current advice for large inflation in the U.S. and Eurozone, to wash away the perceived “overhang” or “balance sheet drag” of large debts.

Long-term nominal debt is already a good fiscal stabilizer (Cochrane 2001, Debortoli, Nunes, and Yared 2014.) When bond investors see trouble ahead, the relative price of long-term debt can fall. If the government has issued only short term debt, then either the price level must rise or the government faces a roll-over crisis. Long-term debt gives the government some time to figure out how to pay it back. But eventually it too must be paid. Long-term debt, like corporate long-term debt, is not as effective as equity, since it does eventually come due.

In sum, nominal government debt is really equity, whose price varies automatically. But it is equity whose price is tied up with macroeconomic distortions. Indexed or foreign currency government debt is really debt, which must be repaid in real terms or defaulted on. But default carries large costs as well. Long-term government debt, like long-term corporate debt, can postpone the day of reckoning, but not eliminate it. Our proposal essentially introduces preferred stock into government finance. Its relative value (price in terms of currency) will vary, as does that of long-term debt, absorbing some fiscal stress. Its dividend can also be cut, absorbing additional fiscal stress before that stress spills into repayment of short-term debt and hence inflation.

History is replete with temporary, and sometimes permanent, suspensions of interest payments on government debt, followed by increases in payments in order for governments to reestablish credibility to borrow anew.

For centuries, the UK suspended convertibility of currency and hence government debt into gold during wars. It then restored convertibility at par after the war. The expectation of this restoration buoyed the value of currency and debt during the war, and the restoration gave bondholders confidence to lend in advance and during the next war. However, this policy led to some inflation during the war, followed by sometimes painful disinflation after the war, as famously in the 1920s. Suspending coupons on long-term debt should help to isolate government finances from inflation and these undesirable macroeconomic consequences.

Any debt or equity contract needs some mechanism to induce repayment. Corporations that issue equity give their investors control rights. If sufficient dividends are not paid, the shareholders can kick out the management. Corporate debt is a promise to pay, and creditors can seize collateral or place the company in bankruptcy.
A huge sovereign debt literature studies the question whether sovereigns can get along without such devices, whether and to what extent extent to which reputations and rules can substitute for legal enforcement of contracts or other binding precommitments. Bulow and Rogoff (1989) argue that reputation alone is not enough for small countries. Kydland and Prescott (1977) offer the classic analysis of discretion vs. recommitment. Eaton and Fernandez (1995) and Aguiar and Amador (2014) are recent reviews. A superficial summary is that reputations may help, but additional precommitment mechanisms or other formal structures to help to induce repayment are valuable.

We have alluded to some of these mechanisms, including the political power of bondholders, and the political costs of violating rules and traditions. In our view, these are sufficient to allow discretionary variable coupon debt of the sort we have described to function, for a government that is already able to pre-commit not to default or inflate standard kids of debt. We do not think a legally binding rule linking payments to GDP or other indices is necessary, and worth the loss of flexible state-contingency. However, slight changes to contract design to raise those costs are a worthy topic for elaboration.

8 Swaps

The Treasury should originate and trade swap contracts between all of its perpetual debt. A fixed-for-floating swap exchanges the fixed $1 per year coupon of perpetual debt for the floating payments of fixed-value debt. Similarly, the Treasury should establish markets in indexed vs. $1 perpetuities.

8.1 Why?

One of the Treasury’s main obligations is to manage the maturity structure of government debt.

The Treasury typically adjusts the maturity of its issues with the goal of funding the debt at the lowest long-run cost to taxpayers. First, this means trying to figure out violations of the expectations hypothesis, or equivalently the nature of risk premiums in the term structure of interest rates, and issuing debt where it is “cheap.” It’s not an easy job, as any bond trader will attest: If long-term rates are low, that may represent an opportunity for taxpayers to borrow long, or it may represent correct market expectations that short rates will be lower in the future, so the Treasury can do even better by rolling over short-term debt. Second, this means figuring out points on the maturity curve or flavors of securities that are temporarily cheap due to liquidity needs. Again, selling at cheap maturities is beneficial to the taxpayer. Selling debt in maturity buckets that have temporarily high prices for either reason is also socially beneficial.

The Treasury’s choice of maturity structure also affects the Federal budget’s exposure to interest-rate risk. If the Treasury funds the entire debt with perpetuities, then a rise in interest rates has no effect on the budget. If the Treasury finds the entire debt with one-month bills, and interest rates rise, then Congress must either raise taxes, cut spending, or authorize more borrowing – a claim against higher future surpluses – to pay the higher interest costs. With nearly 100% of GDP outstanding, these effects are substantial.
Finally, changes in maturity outstanding can produce changes in the time path of inflation and of other macroeconomic aggregates. The Fed’s quantitative easing and operation twist are based on that idea. Cochrane (2001) and (2014c) gives a more extensive analysis of such possibilities.

Currently, the Treasury only manages interest exposure and maturity structure by relatively small changes in the maturity of newly-offered debt. The Treasury needs a tool to quickly and cheaply adjust the maturity structure of its debt. The answer is simple. Like any bank desiring to manage its duration exposure, the Treasury should engage in swap transactions.

Swap contracts will allow the Treasury to separate the liquidity provision and interest rate risk management functions. A large part of our motivation for floating-rate debt is that there is a “money-like” demand for default-free fixed-value floating-rate debt. Given that demand, the government will serve the economic interests of the country, promote financial stability, and pay less interest overall by issuing fixed-value floating rate debt. But the government need not in doing so take on the large implied interest rate risk of short-term financing. By issuing the floating-rate debt and then swapping fixed for floating payments, the Treasury can separate the goals of liquidity provision, issuing at the cheapest maturity, and the goals of managing interest rate risk.

Swap contracts also allow the Treasury to quickly adjust interest rate exposure, or inflation exposure, of the Federal budget. Though markets for our simplified Treasury securities should be quite deep and liquid on the margin, it is to be expected that a large fraction of securities will be in the proverbial sock drawers of long-term investors. Buying and selling a few trillion dollars of debt would be difficult. Buying and selling a few trillion dollars of swap contracts would be much simpler, as much less cash needs to be moved. This is why even very small banks routinely adjust interest exposure via swaps rather than by buying and selling bonds.

With sufficient variable-coupon debt, the government could adjust coupons to offset interest-rate induced shocks to the budget. But that is a coarse mechanism best left to counter unexpected large shocks, not to manage interest rate risk. Similarly, corporations vary dividend payments in extreme circumstances and not as a routine measure to offset interest-rate risk.

8.2 Counterparts and implementation

Who will buy swaps? First of all, the same banks, financial institutions, foreign central banks, insurers, pensions, and others that deal in and hold Treasury debt. The security that is ideal for the Treasury to manage interest rate risk is also ideal for these institutions to manage interest rate risk, or to take interest rate risk for a price.

But what if the counterparties fail? Swaps are collateralized, so that despite the large payments involved, the Treasury’s exposure to credit risk is minimal – at worst, the mark-to-market loss in one day’s interest-rate movements. And the Treasury has certain advantages over other derivatives creditors in getting paid on the failure of financial institutions, especially those designated as “systemically important,” which means just about all the likely swap counterparties. Furthermore, fixed-for floating swaps are very simple plain-vanilla transactions. Surely the huge Dodd-Frank bureaucracy, and the Fed’s regulators and stress-testers, charged with supervising very complex risks undertaken by financial institutions, can adequately monitor interest-rate
exposure in plain-vanilla swap transactions with the Federal government.

But the market can be broader. Currently, swap transactions are only available to relatively large financial institutions. The very simple structure of Treasury swaps could open up a retail market. Homeowners concerned about the effect of interest rate increases on their mortgages, or small businesses worried about their rent and leases, could buy swaps on the Treasury website, just as they buy bills and savings bonds.

Since we will observe the price of fixed-coupon perpetuities in liquid markets, and since the value of floating-rate debt is always $1, pricing and reselling of Treasury swap contracts will be easy. This fact allows for a simple structure of Treasury swap markets, and opening them up to small business and retail customers.

There are many different ways to implement a swap. We think the following contract is the most appropriate for the Treasury to offer. Denote the price of perpetuities, which pay $1 coupon, at time $t$ by $P_t$, their yield $y_t = 1/P_t$, and denote the floating rate $r_t$. For each $\$1$ of notional coupon value, the Treasury will pay (or receive) in each time interval $\Delta$ (e.g. $\Delta = 1/365$) an amount $(1 - P_t r_t) \Delta + (P_{t+\Delta} - P_t)$ into the counterparty’s holdings of floating-rate, fixed-value debt.

If yields rise, and prices fall, the counterparty starts losing money. At some point, the counterparty will have to top up their holdings of floating-rate debt. If the counterparty’s holdings drop to zero, the contract is canceled. Entering the swap contract does not cost any money, just as entering a standard swap contract involves no immediate payment. However, the counterparty had better have some collateral handy if prices turn against him, just as for a regular swap.

Now, how does this work? A swap that uses floating-rate debt as collateral, marked to market daily, is the same thing as financing the purchase of a perpetuity. If the Treasury lends you $\$P_t$, and you use it to buy one perpetuity, then the next day you receive a coupon $\$1 \times \Delta$, you pay interest $P_t r_t \Delta$, and the value of your long term bond increases or decreases by $(P_{t+\Delta} - P_t)$. These are exactly the payments specified by our contract.

If an investor has $P_t$ worth of floating-rate bonds, then entering this swap contract is exactly the same thing as selling those bonds and buying one perpetuity. In fact, the Treasury could completely integrate swap contracts and long-term bond sales, by only offering floating-rate debt and swap contracts. However, we think for marketing purposes a special “long term debt” will be useful.

How is this contract different from a regular swap? The most important difference is the nature of collateral. If the Treasury starts to lose money on the contract, it credits the counterparty’s floating-rate account. This is equivalent to cash – it’s exchangeable for cash on demand – so it’s the best collateral one can ask for. If the counterparty starts to lose money relative to the Treasury, however, the counterparty has to come up with floating-rate Treasury debt, essentially cash. A conventional swap contract would allow the counterparty to post other collateral, so if the counterparty didn’t have a lot of (interest-paying) cash, but did have other eligible securities, the counterparty could pledge those instead.

In our view, the Treasury should not be in the business of taking, evaluating, seizing, and selling collateral. A party who wishes to post such collateral should use that collateral for a
collateralized loan from a financial institution, and then use the proceeds of the loan to increment their Treasury floating-rate holdings. Or, such a party should enter directly into the secondary swap market with financial institutions. If any government agency is going to be in the business of collateralized lending using private collateral, that should be the Federal Reserve.

Fixed-value floating-rate Treasury debt will not be scarce. Getting the Treasury involved in collateral in order to economize on its use does not seem to us worth the cost of getting Treasury involved in taking private securities as collateral.

The remaining differences are smaller, but all to the advantage of the simplicity and liquidity of our contract. If the Treasury were to enter regular swap contracts, then each contract would be different, based on a different initial value of the perpetuity. In our system, there is a single contract which is the same for everyone. Regular swap contracts are not sold, but typically counterparties enter offsetting swaps and wait for both to mature. That would be impractical for perpetual debt. Regular swap contracts are not marked to market and closed out every day. The event of seizing collateral is extreme and happens only in bankruptcy. But Treasury debt does not suffer the illiquidity of the underlying securities in typical swap contracts, and more so the illiquidity of collateral.

The unique nature of the Treasury and Treasury debt means that it can implement swap contracts with our much simpler structure. The other features of standard swap contracts are simply not necessary.

9 Concluding comments

Twenty-first century financial, communication, and information technology has changed the functions of government debt.

Most notably, short-term debt has become interest-paying money, because short-term debt can now be traded with a speed that only non-interest-bearing notes could once achieve. Now, you could in principle pay for coffee by transferring interest-bearing Treasury securities.

Government debt lies at the foundation of investment portfolios, and is a source of liquidity and collateral throughout the financial system.

We will be for a generation in an era of very large government debts, whose financing will impinge on annual deficits. But our government will also need the ability to borrow additional sums quickly, if a recession, war, banking crisis, state or local government debt crisis, pension crisis or other events emerge.

The structure of government debt also has important implications for macroeconomic state and stability, for the functioning and stability of the financial system, and for the susceptibility of the U.S. to economic, political and fiscal shocks.

Modernizing the structure of government debt in the ways we have outlined can help the U.S. Treasury and Federal Reserve to meet these challenges more effectively.

We have introduced a set of tools, but only briefly touched on some of the vast literature recommending how to use them. These tools span the modern literature on government fiscal,
debt, and monetary policy. That literature is not yet definitive on how the tools should be used. For example, should the Treasury issue primarily short-term debt, to harvest the term premium, or long-term debt, to insure the Treasury and the price level against fiscal shocks? (Greenwood, Hanson, Rudolph, and Summers 2014 argue for the former; Cochrane 2001 for the latter.) More deeply, how much debt of each category should Treasury sell? Should it fix prices instead and let at least relative quantities be endogenous? Under what circumstances should it temporarily reduce coupon payments? How should it change quantities and prices in response to macroeconomic, financial, and fiscal events? There is a large literature discussing these questions. It does not yet provide definitive answers But that is not a reason not to introduce the tools. In fact, having the tools in hand will spur better thought on how to use them.

The maturity question also affects monetary policy. While the Treasury has been borrowing long to take advantage of low rates and to lock in low financing costs, the Fed has been buying up the long debt in quantitative easing. Each has offset the other’s actions. Greenwood, Hanson, Rudolph, and Summers (2014) point out this loggerhead, and advocate a new Fed-Treasury accord, so we know who is in charge of the maturity structure.

More generally, use of all of our tools has simultaneous repercussions for fiscal policy – debt service costs, and the exposure of the budget to shocks – for monetary policy as it is now broadly construed, for the macroeconomy, inflation, financial market structure, health and stability. For example, selling more indexed vs. non-indexed debt exposes the budget to more inflation risk, but also may affect the macroeconomy and path of inflation. As another example, we advocated selling more floating-rate debt precisely to substitute for shadow-banking and engender more financial stability, which is typically the concern of the financial stability part of the Fed and the various Dodd-Frank agencies. Use of our tools thus broadly affects the Fed, Treasury, financial regulatory agencies, and subdivisions that normally do not coordinate. While we have spoken of “government” actions, a larger coordination or “accord” will clearly be desirable.

We have introduced fixed-value floating-rate, indexed and nominal perpetuals, each in taxable and tax-free form, and long-term debt in flavors that allows and does not allow reductions in coupon payments. In our view, not all these securities are necessary. We recommend issuing all debt in tax-free form only. As analyzed above, this form will yield higher prices for the Treasury, and eliminate an implicit subsidy to non-taxed investors. We recommend that all long-term debt contain the legal right to reduce coupon payments. This is a feature that would be used very sparingly. Perhaps the height of the Civil War was the only time that the U.S. has experienced fiscal difficulties serious enough to warrant even consideration of such a move. WWII might have been financed with debt whose coupons would start at War’s end. But when it’s needed, the more debt that can have coupons reduced, the better. We think the U.S. should issue both nominal and indexed debt, however, as that distinction will give better control of inflation. If the U.S. were to issue only one kind of long-term debt, that should be indexed, since floating-rate debt will be nominal. However, we describe all of the forms of debt in a small bow to realism, as keeping a few extra forms of debt does little harm, at least initially.

As we write, short-term rates are essentially zero. Long-term nominal rates are very low (2.5%) and long-term TIPS rates are tiny (0.5%). Inflation is between one and two percent, and trending slowly down. The U.S. government remains the safe haven for investment, and though our debt and long-term deficits are not as healthy as they could be, we’re in a lot better shape than most of Europe and Japan, so demand for U.S. debt is likely to remain strong.
All these facts mean that many of our innovations are not pressing. Inflation indexation is only pressing when inflation is volatile. The tax treatment of interest only matters if there is any interest, and the tax treatment of capital gains only matters if there is volatility in prices.

However we regard these facts as a propitious time to rethink Treasury debt. The calm, which may come before the storm, is a good time to mend the sails. It seems unlikely that the new configuration is permanent, that over the next century, the U.S. will not experience some substantial inflation, some increase in interest rate level and volatility such that tax distortions are important, or some fiscal stress limiting its ability to borrow. Putting large changes in the structure of government debt in place during the heat of such events will be a lot harder than it will be to do so now.

10 References


