Paper Money

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Outline

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- We start with some current policy puzzles where models that ignore the fiscal theory reach a dead end.
- We list some of the implications of fiscal theory, without at first laying out a complete formal model, and apply the insights to the puzzles.
- Then we present a couple of very simple fiscal theory models that capture some of the insights we have claimed.

Why proceed this way?

- My impression is that in the 1990's FTPL was perceived as esoteric, complicated, counter-intuitive, and relevant to policy at most in mis-managed developing economies.
- The idea here is to show that it is relevant to the most prominent current macro-policy issues, that it provides intuitively useful insights, and that its principles can be understood in simple models.
- If I'm successful, you will want to read more high-powered and realistic FTPL models that are in the literature, and figure out how to teach the theory to undergraduate and graduate students.

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- The first two are stories about inflation, in which the price level itself is to start with given by history. The last is not a story about determination of either inflation or the price level — it is a theory of indeterminacy.

Where the simple stories fall short: The Fed's expansion

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- The liquidity trap can explain why monetary expansion has not raised output or inflation much, but the absence of inflation response to the high unemployment rate is a puzzle for simple versions of the Phillips curve.
- Those who claim the balance sheet expansion is inflationary sometimes characterize it as "printing money", or "expanding the monetary base", but those characterizations of it would make sense only if, contrary to current fact, the Fed could not raise the interest rate on reserves.

Where the stories fall short: The ECB's pledge to defend the Euro

- The European Central Bank expanded its balance sheet about as much as did the Fed, though not quite as fast.
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- Some analysts are concerned that such an intervention would be inflationary, but the ECB, like the Fed, pays interest on reserves and could raise that rate if inflation threatened.

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- But raising rates in the presence of inflation threats is what central banks have always done. It always has generated protest and opposition, because raising rates dampens business activity.
- The question is, why is resistance to interest rate rises now any more difficult or unpopular than usual? Does it have anything to do with the balance sheet of the ECB or the Fed?

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- There are answers to these questions, but they require discussing fiscal and monetary policy jointly.

Why are rates on Southern-tier Euro debt so high relative to the UK, the US, and Japan?

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Italy	117	4.96
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The latter three issue nominal debt in their own currencies. Why does this make such a difference?

Outline

FTPL

- This is another one-equation, oversimplified theory that can't explain everything we've been observing.
- Its essence is that the price level is the ratio of outstanding nominal government bonds to the discounted present value of future real primary surpluses.
- In any model where holders of debt are not willing to hold wealth in the form of government debt growing at the real interest rate without spending it, this is an equilibrium condition:

$$\frac{B_t}{P_t} = E_t \sum_{s=1}^{\infty} \rho^{-s} \tau_{t+s}.$$

This is not a new theory

- Wallace's "A Modigliani-Miller Theorem for Open Market Operations" (1981) displayed a model with careful treatment of fiscal policy in which he showed that with fiscal policy fixed, open market operations had no effect on prices or output.
- In the 1990's, Leeper, Woodford, Cochrane, Schmitt-Grohe, Uribe, Benhabib and I wrote papers incorporating fiscal theory into macro models, showing that conditions for existence and uniqueness of the price level could not be assessed properly unless fiscal policy behavior and the government budget constraint were incorporated into the model

Insights from FTPL

- The effects of monetary policy actions depend on the kinds of fiscal policy actions they stimulate, and if they stimulate none, monetary policy cannot control the price level.
- Some form of "fiscal backing" is essential for determinacy of the price level.
- Central bank "independence" should not mean that all connections between monetary and fiscal policy authorities are severed.
- Nominal and real government debt are quite different, as are inflation and outright default.

Outline

The need for reliable fiscal response to Fed action

- The way you convert a fiscal theory model into one of the familiar simple old kind in which policy is one-dimensional is to assume "passive" (sometimes called for reasons I never understood "Ricardian") fiscal policy.
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- In this case the details of fiscal policy don't matter to the equilibrium (assuming lump sum taxes) and random variation in taxes and revenues have no effects on prices or output.
- The response can be delayed, but it must be *unbounded*. That is, primary surplus τ must increase at least in proportion to real debt b, no matter how great b becomes.

Scenarios where the Fed raises interest rates and it doesn't work

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- The Fed has a lot of long debt on its balance sheet, whose value would fall sharply if interest rates rose.
- This could cause it to have negative net worth at market value.
- Though some have raised this a reason for concern about the expanded balance sheet, it does not seem to me a major concern.
- The power to pay interest on reserves means the Fed can contract without doing it through open market operations, so it need not "run out of assets to sell".

The possibility of failed fiscal response

- A more serious concern is the possibility of failure of public confidence in the "passive" fiscal response.
- A rise in interest rates raises the "interest expense" component of the budget, thereby increasing the deficit and causing nominal debt to grow.
- Growth in nominal debt is in itself inflationary. There is an FTPL equilibrium — recognizing its existence was one of the main new insights in the theory — in which fiscal effort does not respond unboundedly to real debt and interest rate policy does not respond strongly to inflation.
- In that case, inflation is determined by the growth rate of the nominal debt, and interest rate increases increase inflation.

What if?

- Interest expense, with rates now extremely low, is still around $400 billion, a little under 10% of the US federal government current expenditures.
- A rise of rates to 6%, from around 2% now, would make this closer to 30% of the budget, larger than it has ever been.
- What would be the legislative reaction? It could not be expenditure cuts alone, because there is a "zero lower bound" on expenditures. Would Congress find a way to assure investors that tax rates will be pushed as high as necessary?
- If not, we might well be in the FTPL's passive money / active fiscal equilibrium where the Fed, knowing that interest increases are inflationary, keeps rates stable, while Congress is faced with learning that its fiscal actions directly determine inflation.

Outline

Nominal debt as equity in the surplus

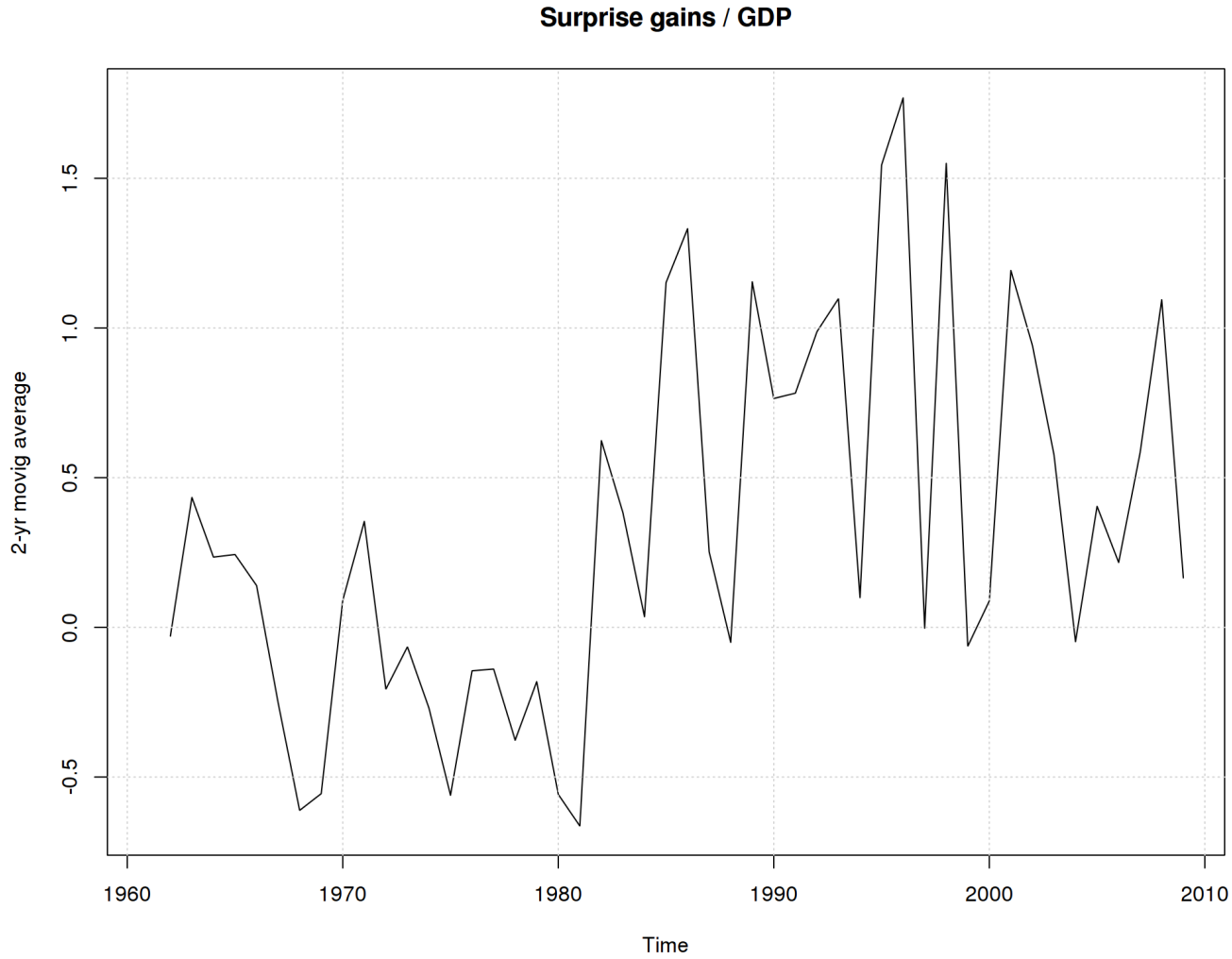
- As John Cochrane among others has pointed out, market valuation of nominal government debt satisfies the same mathematics as market valuation of equity issued by a private firm, with primary surpluses playing the role of future profits.
- Since nominal debt promises to pay only costless paper, it is never necessary for it to default, just as there is no notion of "default" on an equity security.
- Just as a highly leveraged firm is in a fragile situation, a country whose debt is primarily real is in a fragile situation.
- The simple $b = \tau/\rho$ formula applies whether the debt is real or nominal, but with nominal debt shocks to future τ can be absorbed in changes in inflation and prices, while with real debt they can make delivering on the contractual obligations impossible, triggering a chaotic default.

Nominal debt as a cushion

- As has been widely noted, the southern-tier European countries that are now paying high rates on debt would probably have used inflation and devaluation to cushion the adverse shocks they've faced, were they not all now in EMU.
- Giving up this cushion is a substantial cost, which was possibly not recognized as the EMU was initially formed. Institutional reform in the EMU needs to look for replacements, perhaps along the lines of the cross-state programs in the US that provide some automatic cushioning, like deposit insurance and unemployment compensation.
- Most macro models still treat government debt as real.
- There seem to be two ways to justify this (other than that it is a modeling shortcut): passive fiscal policy makes real and nominal debt equivalent; or *using* the nominal-debt cushion is not part of an optimal policy.

We use the nominal-debt cushion all the time

- Holders of nominal government debt receive a stochastic stream of real returns.
- Surprise changes in inflation and (for long debt) interest rates cause unanticipated gains and losses.
- This is true even with passive fiscal policy.
- There is a question as to whether it good policy to use such shocks to returns on debt as a fiscal cushion, but whether this is true or not, the shocks are occurring. Debt does not behave as would real debt.


Surprise gains / GDP
2-yr movig average
-0.5
0.0
0.5
1.0
1.5
1960
1970
1980
1990
2000
2010
Time

Liquidity and the lender of last resort

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- A central bank with fiscal backing from a Treasury that can issue nominal debt is the most powerful form of a lender of last resort.
- A lender of last resort must be an entity that, when worries about counterparty risk have become widespread, affecting even institutions previously considered sound, can issue liabilities of its own that are free of counterparty risk, using the proceeds to make purchases in frozen credit markets or to lend to institutions in liquidity binds.
- Acting as a lender of last resort, though historically it has usually been profitable, requires taking on risk.

Fiscal backing for the lender of last resort

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- In buying temporarily illiquid private assets by creating interest bearing deposits, a central bank is issuing nominal government debt. It is free of counterparty risk only if this debt is truly backed by fiscal commitments.
- Is this true of the ECB now? Would it be true if the ECB intervened as lender of last resort in the event of a speculative attack on southern tier EMU sovereign debt?
- The crisis has made it clear to EMU members that the lender of last resort function involves taking on risk, and that resolution of this risk could end up shifting resources among countries.
- Giving up the systemic lender of last resort function for the ECB would be giving up another of the main benefits of nominal debt issue.

Outline

Is using the nominal debt fiscal cushion suboptimal?

- In flex-price models with distorting taxes, it is generally a good idea to smooth tax rates.
- The nominal debt fiscal cushion, if interest rates and taxes are held constant, provides approximately optimal tax smoothing in such models.
- Several papers, though, including ones by Schmitt-Grohe and Uribe and by Siu, show that in models with New Keynesian types of price stickiness, the costs of the inflation required to use the nominal debt cushion are high, so that optimal policy instead involves very substantial responses of tax rates to fiscal shocks and little use of surprise capital gains and losses to debt holders.

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- These models counterfactually assume one-period debt, however. When debt is long-term, absorbing fiscal shocks through inflation can be spread out over time, with the initial response being in the interest rate, not the price level. This greatly changes the optimal degree of stabilization of tax

The model

- Rather than follow Siu and Schmitt-Grohe / Uribe in specifying a model where the costs of distortionary taxes and inflation are micro-founded, I extend Barro's more starkly simplified model that simply postulates dead-weight loss quadratic in tax rates.
- We add to his model endogenous determination of the price level, consol debt, and a quadratic cost to deviations of inflation from steady state.

The model

$$\max_{A,B,R,a,\tau} -\frac{1}{2}E\left[\sum_{t=0}^{\infty}\rho^{-t}\left(\tau_t^2+\theta\left(\frac{P_t}{P_{t+1}}-1\right)^2\right)\right] \quad \text{subject to}$$

$$\frac{B_t}{P_t}+\frac{A_t-A_{t-1}}{a_tP_t}=R_{t-1}\frac{B_{t-1}}{P_t}+\frac{A_{t-1}}{P_t}-\tau_t+g_t$$

$$\rho=R_tE_t\frac{P_t}{P_{t+1}}$$

$$\rho=E_t\left[\frac{P_t}{P_{t+1}}a_t\left(1+\frac{1}{a_{t+1}}\right)\right]$$

What comes out of the model with θ infinite or zero

- When θ is very large, so the inflation cushion is extremely costly, we reproduce Barro's conclusion that optimally τ is a martingale.
- When θ is zero and debt is constrained to be non-negative, the optimal policy with full commitment is to default on initial debt, then issue new debt if initial g_t is above its long-term average. The new taxes τ_t should be at a level to service the expected stream of interest costs of the debt.
- In the future, once debt is issued, it is optimal to keep the taxes constant, absorbing all random fluctuations in g with surprise inflation and deflation.

With moderate θ

- At intermediate values of θ, and with all debt in the form of one-period bonds (i.e. $A_t \equiv 0$), The optimal response of τ to g shocks is substantial. τ is not nearly constant, and only modest use is made of the nominal debt cushion.
- With all debt in the form of consols, (i.e. $B_t \equiv 0$), the optimal response to a shock in g involves only a tiny change in τ. a_t and P_t/P_{t+1} respond, permanently.
- With consol debt, in other words we return to nearly constant τ, but with surprise capital gains and losses being generated by permanent shifts in the inflation rate and long interest rate.

Responses to temporary unit g shock, one-period debt

	time			
	0	1	2	3
b	0.4329	0.4329	0.4329	0.4329
r	−0.0000	−0.0000	−0.0000	−0.0000
π	0.0476	0.0000	0.0000	0.0000
τ	0.0433	0.0433	0.0433	0.0433

Note: The one-time shock of $g = 1$ would increase debt by 1 if there were no response of taxes, interest rate or inflation. Steady state b is 10, so first-period inflation of .05 reduces real debt by .5. Real interest rate is .1, so a permanent increase of .5 in debt is financed by permanent increase of .05 in taxes.

Responses to temporary unit g shock, consol debt

	time			
	0	1	2	3
b	0.06929	0.06929	0.06929	0.06929
a	0.00839	0.00840	0.00840	0.00840
π	0.00762	0.00763	0.00763	0.00763
τ	0.00693	0.00693	0.00693	0.00693

Note: See notes to previous table. An initial increase of .008 in the consol rate a from the steady state value of .1 produces a decline in real debt of 8%, or 0.8, which absorbs most of the unit shock in g. The inflation response must be permanent to sustain the permanent shift in a.

Outline

An agenda

- I hope I've convinced you that FTPL emerges when standard methods and common sense are applied to current policy dilemmas and to current macroeconomic models of fiscal-monetary interaction.
- It should be the standard approach to modeling monetary policy, not treated as an esoteric or arcane special case.
- Its principles can be illustrated in models that could be made accessible to undergraduates, and we should be using such models in undergraduate macroeconomics and monetary economics courses.