Summary of Cochrane, J.H. "Understanding Fiscal and Monetary Policy in 2008-2009"

Takashi Kano

University of Tokyo

tkano@e.u-tokyo.ac.jp

Financial System Forum

@University of Tokyo

January 8th, 2010

Introduction

- John Cochrane's view about the US monetary and fiscal policies in 2008-2009.
- His perspective toward near future.
- Realistic possibility of "fiscal inflation" based on the Fiscal Theory of Price Level (FTPL).
- Conventional monetary policy splitting between M and B does not matter under current zero interest rates.
- Expectations of fiscal solvency matters for the aggregate price level and current inflation.
- Main mechanism: govn't will inflate the economy in future to devalue huge outstanding debts instead of paying off the debts by future fiscal surplus.
- If people expect so now, inflation occurs now.
- **No empirical test of any testable hypothesis: just a theoretical but quite plausible hunch.**

Backgrounds: the FTPL

- FTPL: Leeper (1991), Woodford (1995), Sims (1994), Cochrane (2001, 2005).
- Coordination between fiscal and monetary policies in aggregate price level determination (e.g., Sargent and Wallace's (1981) "unpleasant arithmetics").
- FTPL stresses dominance of fiscal side over monetary side.
- Cochrane (2005): no need to use money demand function for unique equilibrium aggregate price level.
- FTPL argues that aggregate price is uniquely determined by "fiscal valuation equation."

Money demand and govn't budget "constraint"

- Standard neoclassical monetary models consist of money demand function and govn't "budget constraint" with real govn't bonds b_t with real rate r_t.

$$M_t^d V(.) = P_t Y_t, \tag{1}$$

$$G_t = T_t + \frac{M_t - M_{t-1}}{P_t} + \frac{b_t}{1 + r_t} - b_{t-1}. \tag{2}$$

- Forward iteration of equation (2) with an suitable transversality condition yields the govn't "intertemporal budget constraint"

$$\frac{M_{t-1}}{P_t} + b_{t-1} = E_t \sum_{i=0}^{\infty} D_{t,t+i} \left(S_{t+i} + \frac{i_{t+i}}{1 + i_{t+i}} \frac{M_{t+i}}{P_{t+i}} \right). \tag{3}$$

where $D_{t,t+i}$ is the market discount factor equal to $\prod_{s=t}^{t+i} \frac{1}{1+r_s}$.

Fiscal valuation equation

- FTPL rather emphasizes govn't nominal bonds B_t

$$G_t = T_t + \frac{M_t - M_{t-1}}{P_t} + \frac{B_t(1+i_t)^{-1} - B_{t-1}}{P_t}. \qquad (4)$$

- Forward iteration of equation (4) with an suitable transversality condition yields the "fiscal valuation equation"

$$\frac{M_{t-1} + B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} D_{t,t+i} \left(s_{t+i} + \frac{i_{t+i}}{1+i_{t+i}} \frac{M_{t+i}}{P_{t+i}} \right).$$

- Outstanding govn't total debts $(M_{t-1} + B_{t-1})/P_t$ must be matched by the expected present discounted value of future govn't primary surplus $s_t \equiv T_t - G_t$ and seignorage revenue. If RHS is different from LHS, the price adjusts.
- Seignorage is usually small in developed countries.

Fiscal inflation

- Fiscal valuation equation

$$\frac{M_{t-1} + B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} D_{t,t+i} s_{t+i}. \tag{5}$$

- Given the initial predetermined govn't total debts $M_{t-1} + B_{t-1}$, the current aggregate price level P_t is uniquely determined by the "expected" present discounted value of future govn't primary surplus.
- Suppose bad news on future surplus s_{t+i}.
- People expect that the govn't debts should be paid off by printing more money and inflation in future.
- Expectations of future inflation lead to a surge of current aggregate demand and current inflation.
- "Too much total nominal govn't debt chasing too few goods."

Monetary vs. fiscal regimes

- Usual monetary policy tries to affect aggregate price level P_t by splitting govn't liabilities between money and bonds given money demand function (1)

$$M_t^d V(.) = P_t Y_t.$$

- Conventional monetary policy targets short-term interests to affect the velocity (or, opportunity costs of holding cash) $V(i_t, .)$.

Monetary vs. fiscal regimes (con't)

- Need a policy coordination by which monetary and fiscal policies agree on the same price level.
- In "money-dominant regime," money demand function (1) determines the price level P_t given some monetary policies and then fiscal side follows the price level by choosing surplus to satisfy the fiscal valuation equation (5) ex post consistently.
- In "fiscal-dominant regime," fiscal valuation (5) determines the price level, then money demand determines money supply endogenously.

"Money as stock (Cochrane 2005)"

- Govn't budget constraint with real bonds (3) and fiscal valuation equation with nominal bonds (5) can be rewritten as, respectively,

$$b_{t-1} = E_t \sum_{i=0}^{\infty} D_{t,t+i} \left(s_{t+i} + \frac{M_{t+i} - M_{t+i-1}}{P_{t+i}} \right),$$

and

$$\frac{B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} D_{t,t+i} \left(s_{t+i} + \frac{M_{t+i} - M_{t+i-1}}{P_{t+i}} \right).$$

- Real debt b_t works like debt in corporate finance, which must be repaid or explicitly default.

- Nominal debt B_t works like equity: its price can absorb shocks to expected future cashflows. Govn't can manipulate P_t by issuing nominal debt similar to firms' "stock split."

Long-term debt

- With long-term bonds, total nominal value of govn't outstanding bonds is $B_{t-1} = \sum_{j=1}^{\infty} Q_t(t+j)B_{t-1}(t+j)$.
- $Q_t(t+j)$ is the market price of outstanding j-year govn't bond $B_{t-1}(t+j)$, in particular, $Q_t(t+j) = \beta^j E_t P_t / P_{t+j}$ under a constant real rate $\beta(1+r) = 1$.
- Fiscal valuation equation is

$$\frac{B_{t-1}}{P_t} = \frac{\sum_{j=0}^{\infty} Q_t(t+j)B_{t-1}(t+j)}{P_t} = E_t \sum_{i=0}^{\infty} \beta^j s_{t+i}.$$

- Shocks to current and future surplus can be absorbed by relative prices $Q_t(t+j)$ as well as current price P_t.

Long-term debt (con't)

- With outstanding long-term debts, govn't can trade off current for future price level because

$$\sum_{j=0}^{\infty} \beta^j E_t \left(\frac{1}{P_{t+j}} \right) B_{t-1}(t+j) = E_t \sum_{i=0}^{\infty} \beta^j s_{t+i}.$$

- Govn't can achieve any sequence of expected inverse of future P_{t+i} by selling or buying long-term debts consistent with the above constraint (Cochrane, 2001).

- Suppose that govn't sells $B_t(t+i)$. This lowers price $Q_t(t+i)$ or $E_t(1/P_{t+i})$. Given the outstanding long-term debts $B_{t-1}(t+i)$ and the expected surplus, the fall in $E_t(1/P_{t+i})$ lowers current price P_t.

- Higher expected future price for lower current price.

An inflation scenario

- Suppose a negative shock in expected surplus

$$\Delta S = (E_t - E_{t-\Delta}) \sum_{i=0}^{\infty} \beta^j s_{t+i}.$$

- Suppose that the economy starts with a constant price P. Then,

$$\sum_{j=0}^{\infty} \beta^j \left(\frac{1}{P_{t+j}} - \frac{1}{P} \right) B_{t-1}(t+j) = \Delta S,$$

or

$$\sum_{j=0}^{\infty} \beta^j \left(\frac{P}{P_{t+j}} - 1 \right) W_{t-1}(t+j) = \frac{\Delta S}{S},$$

where $W_{t-1}(t+j)$ is the fraction of j-year bond

$$W_{t-1}(t+j) = \frac{B_{t-1}(t+j)}{\sum_{j=0}^{\infty} \beta^j B_{t-1}(t+j)}.$$

An inflation scenario (con't)

- Consider a hypothetical one-time jumping price path

$$P_{t+j} = \begin{cases} P, & \text{if } j < T, \\ P\pi_T^{j-T}, & \text{if } j \geq T \end{cases}$$

- Then,

$$\sum_{j=T}^{\infty} \beta^j \left(\frac{1}{\pi_T^{j-T}} - 1 \right) W_{t-1}(t+j) = \frac{\Delta S}{S}.$$

- Given $\Delta S/S = -0.1$ and actual US $W_{t-1}(t+j)$, we can solve inflation rate π_T for each T.

- Figure 1: the actual US maturity structure of federal debt on Jan 31, 2009.

An inflation scenario (con't)

- Figure 2: π_T for each T.

An inflation scenario (con't)

- Figure 2: π_T for each T.
- Figure 3: Inflation and price paths.

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- Figure 4: Term structure and inflation rate.

An inflation scenario (con't)

- Figure 2: π_T for each T.
- Figure 3: Inflation and price paths.
- Figure 4: Term structure and inflation rate.
- Bottom lines
  1. With long-term debt, the govn't avoids sudden jump of current price level and smooth inflation toward future.
  2. A shock to expected future surplus is likely to result in the first instance by a rise in long-term interest rates.
  3. The longer the govn't puts off the inevitable inflation, the larger the cumulative price increase must be.

2008-2009: "More of both"

- Large increase in demand for both of money and govn't debt.
- "Flight to quality" or "Flight to liquidity".
- In the Fall of 2008, only govn't bonds were acceptable as collateral b/c if you had a bond, you could borrow a dollar.
- Money and govn't bonds are almost perfect substitute under very low interest rates on govn't bonds.
- $M + B$ matters, not M relative to B (conventional monetary policy).
- A rise in $M + B$ is equivalent to a fall in aggregate demand (C+I).

2008-2009: "More of both" (con't)

- Increase in demand for $M_t + B_t$ without any change in perspective of fiscal surplus.
- Rise in demand lowered interest rates on govn't bonds.
- Fiscal valuation equation

$$\frac{M_{t-1} + B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} D_{t,t+i} s_{t+i}.$$

implies that such a fall in discount rate is deflationary (a fall in P_t).

2008-2009: Accommodative policies

- In first stage, Fed and U.S. Treasury accommodated a massive demand for both money and govn't debt in exchange of private debt.
  1. Fed continued to decrease "Treasuries" in its asset side by selling in exchange for private debts.
  2. Fed created "Treasury Supplementary Financing Account" in its liability side to support the Treasury's selling securities.
- In second stage, starting in Sept 2008, Fed expanded its balance sheet rapidly (printing money).
- To do this, Fed bought private assets instead of buying TBs.
- Overall supply of govn't debt did not fall (cf. conventional open-market operations).
- Figure 5

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$\Rightarrow$ **Many of the govn't innovative policies can be understood as ways to accommodate this demand.**

Fiscal stimulus

- Winter 2009, Govn't engaged in a large fiscal stimulus trying to raise aggregate demand.
- Will these actually stimulate (here inflate) the economy?

$$\frac{M_{t-1} + B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} D_{t,y+i} s_{t+i}.$$

1. If additional debt $M + B$ corresponds to expectations of higher future taxes or lowering spending, not stimulative (Ricardian).
2. If additional debt and larger short-term deficits corresponds expectations that future surplus will not be raised, the debt issued can raise aggregate demand and inflation (non-Ricardian).

$\Rightarrow$ **If you expect the debts will be monetalized or inflated away in future (i.e., non-Ricardian expectations), you try to dump it today, causing inflation right away.**

Quantitative easing policy: why not inflate?

- Quantitative easing policy: increase in M in exchange of B.
- Can't inflate because only $M + B$ matters under near zero interest rate. Need fiscal cooperation with non-Ricardian expectations.
- What about "helicopter money" to inflate?
- "Helicopter money" is at heart a fiscal operation: it is spent as a govn't transfer issuing govn't debt.
- Even helicopter money is not stimulative if the debt is paid off with higher taxes in future.
- To be effective, such a policy should be non-Ricardian: people need to expect that new money does not correspond to higher future fiscal surplus.

Why no inflation in Japan during the 1990s?
$\Rightarrow$ **People are not convinced that the government would fail to pay off its debts**.

What are expectations?

- Govn't dramatic deficit projections and small tax policy proposals in Jan and Feb 2009: non-Ricardian stimulative expectations.
- Main problem of the long-term budget projection stems from Social Security and Medicare: sooner or later govn't should do something: Ricardian expectations.
- By the Spring of 2009, govn't statement turned its tone to more conservative: concern overlong-turn budget deficits.
- Bernanke's testimony on Jun 3 worries about long-term deficits.
- Catch-22: govn't wants to stimulate the economy but cannot commit to non-Ricardian expectations that large deficits are not paid off in future because of its fear against financial and economic chaos of resulting inflation.
- Govn't dilemma? Same as in the case of Japan?

What are expectations? (con't)

- Ricardian or non-Ricardian?
- Bond markets and fiscal valuation give us a measure of private expectation.
- If govn't sells additional debts and the private sector does not believe that debt will be paid off by more tax, i.e., non-Ricardian, only bond prices fall, interest rate rises, and govn't collect no real revenue.

  $\Rightarrow$ **Relatively stable interest rates and the fact that govn't is collecting a lot of revenue by bond selling suggests Ricardian expectations.**

Fed's exit strategy

- Dramatic monetary expansion: Huge reserve and rapid growth of M1.
- Can Fed soak up all monetary expansion by rising short-term interest rate?
- Yes. No substantial *monetary* problem prevents Fed from selling the TBs to soak up reserve and M.
  - No connection between the amounts of Bank's lending and monetary aggregates
  - Not enough TBs in Fed's asset side (Feldstein, 2009)? Why not issuing new TBs if possible?
  - Just a matter of Fed's political will of doing so now.
- **More question: fiscal constraint.**

Fiscal constraint on an exit strategy

- What really matters is govn't ability to issue new debt by credibly promising higher future surplus.
- If people believe that new bonds won't be paid off by fiscal surplus in future, new bond sale just lowers bond price and yields no revenue to soak up money.
- How close the U.S. to this fiscal limit? Not very.
- Will Fed run out of TBs? Does govn't need to bail out Fed?
- The reserve of a few hundred billion is not enough to hit the fiscal limit.
- **Govn't has both the ability and fiscal capacity to rapidly unwind its monetary expansion.**

Fiscal inflation: more danger

- In sum, Fed's recent monetary expansion won't lead to an inflation.
- More worry is on fiscal inflation: a sharp drop in expectations in future surplus s or a rise in the risk premium term R that forces inflation directly through fiscal valuation equation.
- Wide spread agreement of this danger: "…. the US govn't inflate away its debt." (Krugman, 2009).
- Fiscal inflation has happened in the past: France after WWI, and so on.

Does current debt-GDP ratio matter?

- The current U.S. debt/GDP ratio is 40 %, smaller than those of many other countries like around 180 % of Japan.
- Long-run CBO forecasts reach 100 % in 2022 and 200 % in 2035.
- Does current Debt-GDP ratio matter for inflation?
- Fiscal valuation equation says that inflation occurs now as soon as people think that future debt/GDP ratios grow uncontrollably.
- Why now inflation now with CBO long-run debt-GDP forecasts?
- People expect that govn't will do something on Social security and Medicare soon.

$\Rightarrow$ **Real issue is prospective deficits and expected future debt/GDP ratios.**

Crowding out? Inflation after monetalization?

- Crowding out story: current fiscal deficits matter because they raise interest rate and crowd out investment. If the Fed keeps interest rate low, this will lead inflation.
  - Nothing like the crowding-out mechanism in fiscal valuation equation. Inflation can occur even without current deficit.
  - Higher long-term interest rates matter not because they crowd out investment but because they are sign of expected future inflation.

- Will Inflation come only after the Fed monetalizes govn't deficits?

  $\Rightarrow$ **Fiscal inflation, a flight from dollars, will occur when people expect future monetalization, not current seignorage.**

Credit guarantees and the fiscal limit

- Explicit credit guarantees: Fannie Mae and Freddie Mac debt and TARP bank debt, and so on.
- Implicit guarantees: No failure of financial firms, bailouts of more industrial firms, state and local govn't, pension plans, sovereign debt indirectly via IMF loom .....
- Two effects of credit guarantees
  1. Poor surplus news kicking us against the fiscal limit.
  2. Surpluses becomes not independent of the price level: credit guarantees becomes costly (cheaper) if the price level is down (up). More incentive for govn't to inflate now?

$\Rightarrow$ **Credit guarantees make matters worse than actual deficits suggest.**

Growth effects of tax and the fiscal limit

- The fiscal limit: no more revenue by rasing taxes, i.e., at the top of the **present value** of the Laffer curve.
- The effect of tax on growth is crucial in this case.

$$PV = \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i \tau Y_{t+i} = \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i \tau (1+g)^i Y_t = \frac{\tau Y_t}{r-g},$$

and

$$\frac{\partial \log PV}{\partial \log \tau} = 1 + \frac{\partial \log Y}{\partial \log \tau} + \frac{1}{r-g}\frac{\partial g}{\partial \log \tau}.$$

- $\frac{1}{r-g}$ takes usually a large number: a small growth effect is enough to hit the fiscal limit $\frac{\partial \log PV}{\partial \log \tau} = 0$.
- Rise in taxes to pay out debts should not distort growth at least. If people expect it, inflation right now.

Shifting the Phillips curve: stagflation?

- So far the paper uses "inflation" and "stimulus" almost identically.
- But in the short-run, a stimulative inflationary policy might boost output reducing "output gap."
- Sometime, people think that a small inflation is acceptable along with the short-run downward-sloped Phillips curve (i.e., tradeoff between inflation and unemployment rates).
- But don't forget our experiences of "stagflation" in the 1970s and recent hyperinflation in Zimbabwe.
- Fiscal inflation shifts the expectation-augmented (new-Keynesian) Phillips curve upward resulting "stagflation."

Worst case scenario more realistic for Japan? (Kano's interpretation)

- **Turning point:** When will expectations for Japan turn out to be non-Ricardian?
- Pessimistic forecasts on future economic growth, population growth, saving rate, ... and future govn't surpluses (future debt/GDP ratios).
- Investors on govn't securities will quite suddenly bailout the JGBs.
- Dramatic rise in long-term interest rates due to expected future inflation (monetalization).
- "Flight from Yen": current inflation.
- Phillips curve shifts up without "anchoring" expected inflation.
- Welcome to "stagflation!"

Several signs?

A Happy New Year!