Comments on "An economical model of the business cycle" by Pascal Michaillat and Emmanual Saez

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An economical model of the business cycle

- Michaillat and Saez develop a model with similarities to a traditional IS-LM-AD-AS model.
- They argue model is consistent with two key features of the U.S. economy:
  - very sluggish inflation;
  - prolonged periods at the ZLB.
- They also argue model provides new insights, particularly regarding the effects of aggregate supply shocks at the ZLB.

An economical model of the business cycle: key features of the model

- Wealth enters the utility function of the representative household.
  - Allows *steady-state* equilibrium real interest rate to be sufficiently negative to generate prolonged periods at ZLB.
  - Wealth effect provides channel for fiscal policy in form of helicopter drops of money to affect demand at the ZLB.
- Trading frictions are introduced into the labor/product market.

The IS-LM model with wealth in utility but without trading frictions

- Given their specification of utility, the steady-state IS curve is

$$c = \left[\frac{\delta - (i - \pi)}{\omega'(0)}\right]^{\varepsilon} = \left[\frac{\delta - r}{\omega'(0)}\right]^{\varepsilon}$$

where $\delta = \beta^{-1} - 1$ and $\omega'(a)$ is the marginal utility of wealth evaluated at $a = 0$. They use the FOC for money holdings to eliminate i from IS to obtain an AD curve.

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- In a NK model with money-in-the-utility function, policy sets i and the LM determines real money balances. The AD curve in this case is simply the IS curve.

The model with wealth in utility but without trading friction.

- Without trading frictions, steady-state aggregate supply is

$$c = \bar{c}.$$

- With consumption determined by AS, AD determines real interest rate:

$$r = i - \pi = \delta - \bar{c}^{\frac{1}{e}}\omega'(0)$$

- Nominal rate determined, given π, or π determined given i.
  - In former case, LM determines $m = M/P$. Monetary policy determines level of P by choosing M but it doesn't choose m.
  - In latter case, $\pi = i - \delta + \bar{c}^{\frac{1}{\varepsilon}}\omega'(0)$, LM again determines $m = M/P$. Monetary policy determines inflation – by picking i – but not m.

The second key ingredient: trading frictions

- Paper is part of a large and growing literature that incorporates trading frictions into macroeconomic models.
  - Labor markets – huge literature
  - Product markets – Burdett and Judd (1983), Rudanko and Gourio (2011), Kaplan and Menzio (2013).
  - Labor and credit markets – Wasmer and Weil (2004), Petrovsky-Nedeau and Wasmer (2013).
  - Labor and product markets – Farmer (2008, 2012), Bai, Ríos-Rull, and Storesletten (2012), Michaillat and Saez (2013) and this paper.
- Michaillat and Saez (2013) provides an extensive literature review.

The second key ingredient: trading frictions

- Matching frictions for labor services.
- To hire labor requires posting job ads which themselves require labor services, as in Farmer (2008, 2012).
- Two consequences:
  - Output available for consumption is net of labor used up in recruiting services:
$$c = [f(x(t)) - \rho x(t)]\, k$$
  - Cost of a unit of consumption is
$$1 + \tau(x(t)),\ \tau'(.) \geq 0.$$
  - Both depend on x, a measure of tightness (job ads divided by total labor force).

Model with wealth in utility function and trading frictions: away from the ZLB

- AD under an interest rate policy becomes

$$c = \left[\frac{\delta - r}{[1 + \tau(x)]\,\omega'(0)} \right]^{\varepsilon}.$$

  - Increase in tightness increases cost of consumption; consumption falls.

- AS is

$$c = [f(x) - \rho x]\, k.$$

  - Increase in tightness makes it easier for firms to sell, output rises; as long as $f'(x) > \rho$, consumption rises.

- Two equations, but three unknowns – c, r, and x.

How do markets equilibrate?

"The immediate impact of changes in demand and supply is to be found in order-books, waiting lines, inventories, delivery dates, output, hours of work, employment...Such quantitative adjustments are the first signals of changes in the demand-supply relationship. Shifts in relative prices come later and in a less apparent way." Malinvaud 1977, p. 9.

- Michaillat and Saez turn Marshall on his head:
  - Alfred Marshall's short-run, long-run analysis in which "prices adjust more rapidly than quantities, indeed so rapidly that the price adjustment can be regarded as instantaneous." (Friedman 1970, page 207)
  - "In equilibrium, given a price, tightness adjusts to equalize AD and AS curve." (M-S, page 2)
- Relevant price an intertemporal one – the real interest rate.

Model with wealth in utility function and trading frictions: What closes the model?

- M-S: Assume π and initial price level are fixed exogenously.
  - "**The price process responds neither to equilibrium variables nor to monetary policy.**" (p. 12)
  - "**The money supply, $M(t)$, must also grow at the rate π but monetary policy does not control π.**"
- Using the LM curve, $i = i\left(M(0), c, x\right)$, model becomes two equations in c and x:

$$c = \left[\frac{\delta - i\left(M(0), c, x\right) + \pi}{\left[1 + \tau(x)\right]\omega'(0)}\right]^{\varepsilon}$$

$$c = \left[f\left(x\right) - \rho x\right]k.$$

- With $P(0)$ fixed and π given, monetary policy is able to set real money balances and therefore *steady-state c and x.*

Model at the ZLB

- At the ZLB, AD becomes

$$c = \left[\frac{\delta + \pi}{[1 + \tau(x)]\,\omega'(0)} \right]^{\varepsilon}.$$

- AS is

$$c = [f(x) - \rho x]\,k.$$

- Two equations in three endogenous variables – c, π, and x.
- So fix π exogenously to close model.
  - This is key to their results on supply shocks at the ZLB – a negative supply shock cannot raise inflation, lower the real rate of interest, and stimulate aggregate demand.
- Helicopter drops of money are effective at the ZLB – they affect marginal utility of wealth.
  - However this is fiscal policy, not monetary policy.

The Michaillat-Saez model: characterization of monetary policy

- So who sets inflation?
- Steady-state inflation fixed exogenously, but this is similar to the situation in a new Keynesian model:

$$x_t = \mathrm{E}_t x_{t+1} - \sigma\left(i_t - \mathrm{E}_t \pi_{t+1} - r_t\right)$$

$$\pi_t - \bar{\pi} = \beta \mathrm{E}_t\left(\pi_{t+1} - \bar{\pi}\right) + \kappa x_t$$

$$i_t = r_t + \bar{\pi} + \delta\left(\pi_t - \bar{\pi}\right)$$

- Three equations in x_t, π_t, i_t and $\bar{\pi}$.
- Steady-state inflation $\bar{\pi}$ is set by the central bank's target (and commitment, in Cochrane's terms, to blow up the world if inflation deviates from target).

Closing the model: determining inflation

- Standard simple macro model: real interest rate ensures AD equals AS.
  - At ZLB, $r = -\pi$ and M-S eliminate role of real interest rate by fixing π.
  - Away from ZLB, $r = i - \pi$ and role eliminated by fixing π and assuming monetary policy sets the steady-state nominal rate.
- Multiple equilibrium a sign of a missing equilibrium condition:
  - Job posting and a wage setting assumption in a DMP model.
  - Farmer adds a beliefs function or animal spirits.
- M-S add competitive search with posted prices ala Moen (1997), Bai, et. al. (2012) plus they add costly price adjustment.

Adding a Phillips curve and short-run dynamics

- Competitive search with costly price adjustment yields a Phillips curve.
  - Steady-state inflation still fixed exogenously (at zero).
  - Tightness and inflation positively correlated – Phillips curve.
  - Competitive search ensures tightness is efficient in steady state.
- Implications:
  - Positive aggregate demand shock increases tightness, inflation and output.
    - ★ But starting from steady state, a positive aggregate demand shock reduces consumption.
  - Positive aggregate supply shock decreases tightness, inflation *and output*.
    - ★ So oddity of a negative aggregate supply shock causing an expansion in a NK model at the ZLB is replaced by a negative aggregate supply shock causing an output expansion away from the ZLB.

Conclusions

- Interesting avenue for research:
  - Emphasis on non-price mechanisms for market clearing promising.
  - Opens up formal role for Malinvaud's "...order-books, waiting lines, inventories, delivery dates....".
- But:
  - Results seem broadly consistent with what we already think we know.
  - Effects of aggregate supply shocks:
    - ★ Reverse odd NK implications at ZLB, but only by simply assuming inflation can't respond.
    - ★ Reverse reasonable short-run NK implications when inflation is made endogenous.
  - Characterization of monetary policy in terms of M.
- What would be nice to see:
  - Extension of model to provide insights into financial and real linkages.