Comments on “An economical model of the business cycle” by Pascal Michaillat and Emmanuel Saez

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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

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

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:
  \[ r = i - \pi = \delta - \bar{c} \varepsilon \omega'(0) \]

- Nominal rate determined, given \( \pi \), or \( \pi \) 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, \( \pi = i - \delta + \bar{c} \varepsilon \omega'(0) \), 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
- 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
    \[ 1 + \tau(x(t)), \tau'(\cdot) \geq 0. \]
  - 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 $\pi$ 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 $\pi$ but monetary policy does not control $\pi$.”

- Using the LM curve, $i = i(M(0), c, x)$, model becomes two equations in $c$ and $x$:

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

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

- With $P(0)$ fixed and $\pi$ 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 – \( c, \pi, \) and \( x \).
- So fix \( \pi \) 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:

\[ x_t = E_t x_{t+1} - \sigma (i_t - E_t \pi_{t+1} - r_t) \]

\[ \pi_t - \bar{\pi} = \beta E_t (\pi_{t+1} - \bar{\pi}) + \kappa x_t \]

\[ i_t = r_t + \bar{\pi} + \delta (\pi_t - \bar{\pi}) \]

- Three equations in \( x_t, \pi_t, i_t \) 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 \( \pi \).
  - Away from ZLB, \( r = i - \pi \) and role eliminated by fixing \( \pi \) 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.