

Liquidity Constraints and Non-market Clearing: A Recipe for Recession?

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Abstract

- In their ‘workhorse model of money and liquidity’, Kiyotaki and Moore (2008) show how tightening credit constraints can cut current investment and future aggregate supply.
- But aggregate demand matches current supply via a flex-price ‘Pigou effect’
- Switching from a flex-price to a fix-price framework means that demand failures can emerge after a liquidity shock.
- This extension of the KM framework offers a more attractive synthesis than has Michael Woodford.



The Winter's Tale

Queen Hermione imprisoned for sixteen years: then there was reconciliation

Time for a change in Macro?

- discredited and discarded in the stagflation that followed the oil price shocks of the 70s and 80s, **the Keynesian paradigm** of macroeconomic stabilisation has suffered in silence for many years.
- but the new **DSGE paradigm** failed to predict the 'credit crunch' - or explain its effects.
- time for reassessment - and reconciliation?

Woodford's Synthesis

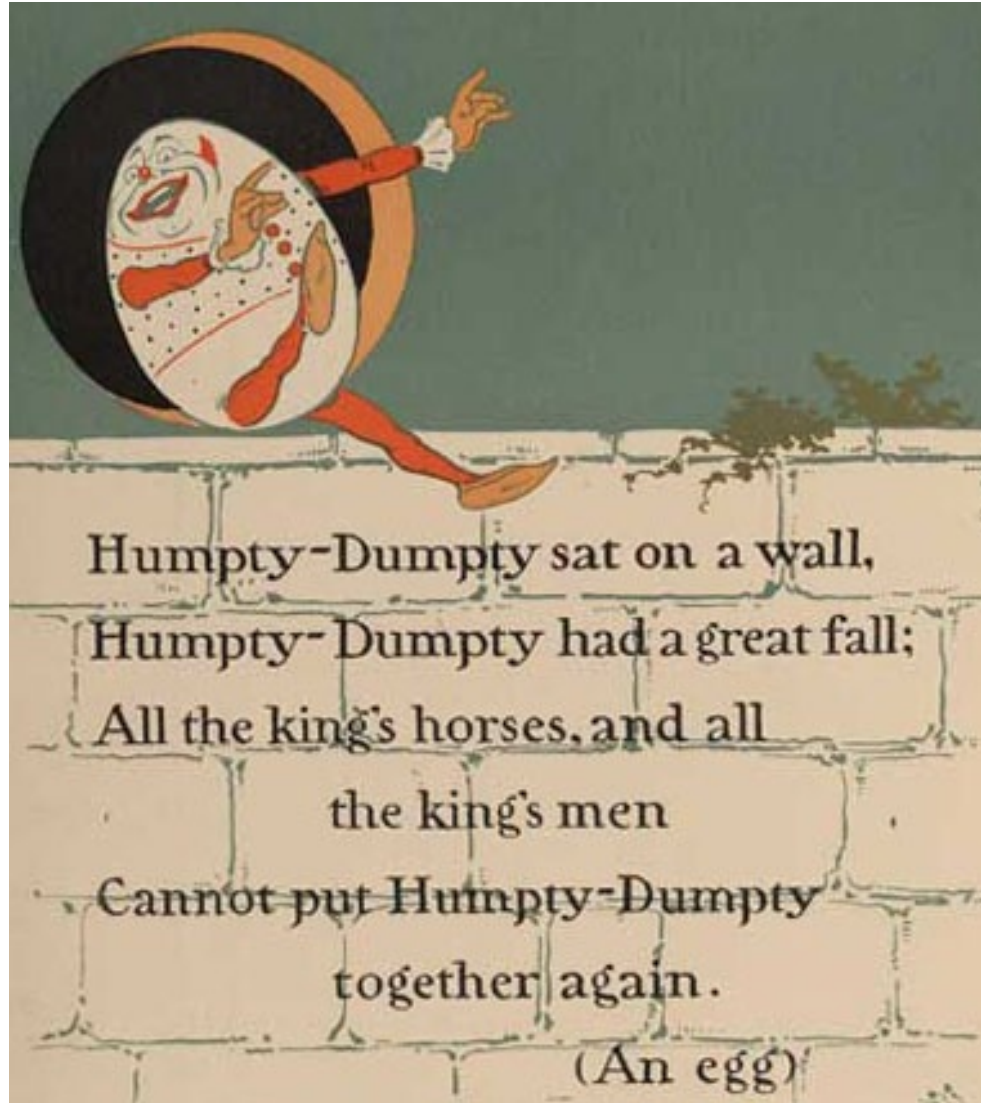
Interest and Prices (2003)

- marked decisive shift in monetary economics from looking at the **quantity** of money to the **cost** of borrowing (i.e. from Friedman back to Wicksell)
- inspired by an over-arching vision: to create a **new synthesis** reconciling mainline macroeconomics with dynamic General Equilibrium, as practised by RBC theorists in particular.

Woodford's synthesis: the New Paradigm

	Supply conditions	Goods market	Money market
RBC (representative agent with RE)	Productive efficiency (Flex-price, FE)	Inter-temporal optimisation (Euler equation)	Efficient contracts (money an epiphenomenon)
Keynesian Orthodoxy	Fix-price, UE (Phillips curve)	Agg. Demand (IS)	Liquidity Preference (LM)

Hammond's view of GE without credit constraints?



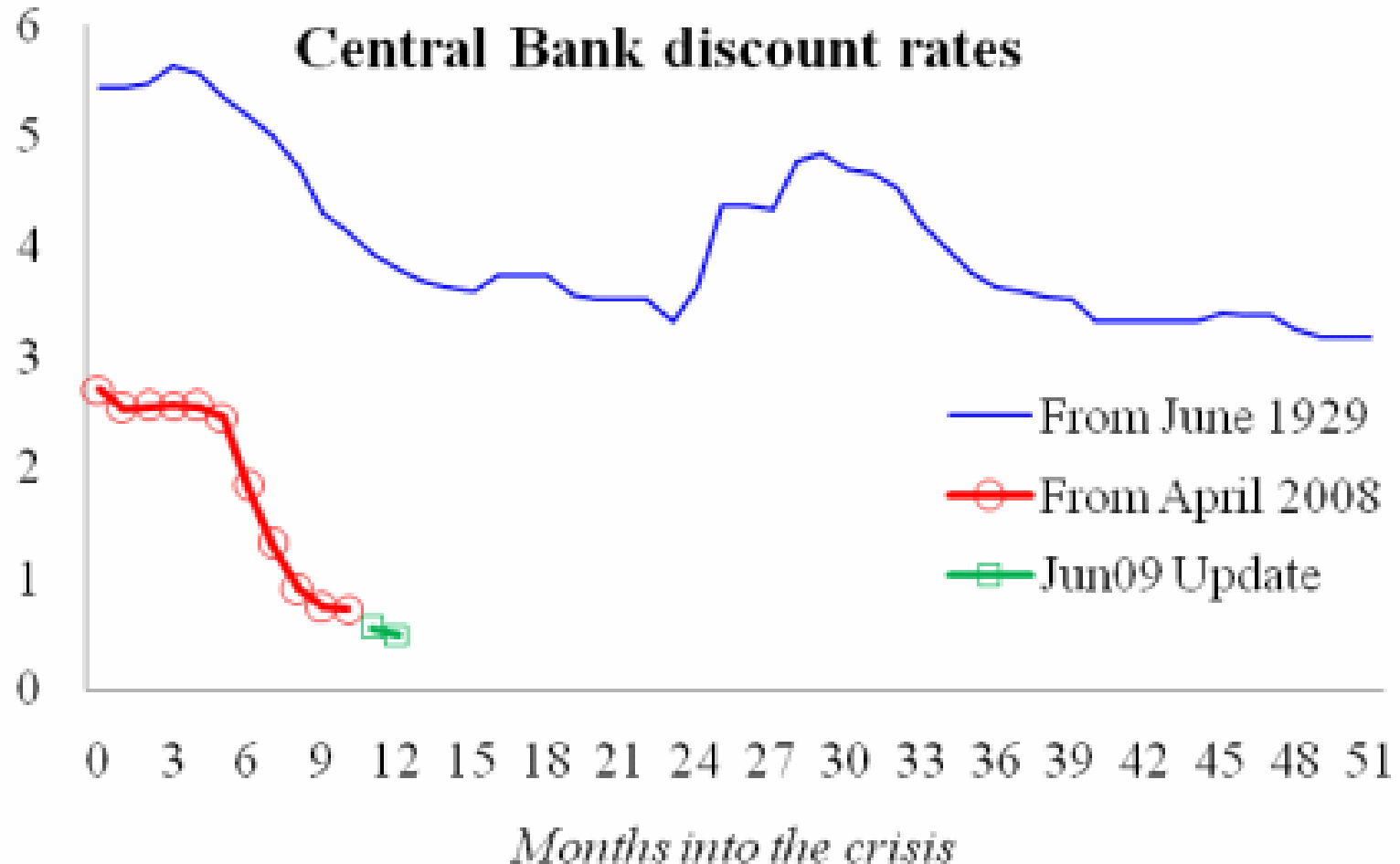
The Arrow Debreu paradigm at risk?

- In the absence of collateral or other credible enforcement – the ‘core’ of the inter-temporal GE model is **not sub-game perfect**, Peter Hammond (1979)
- If true for Arrow-Debreu paradigm of GE, it is also true for the DSGE specialisation developed for macroeconomics
- Does it matter?

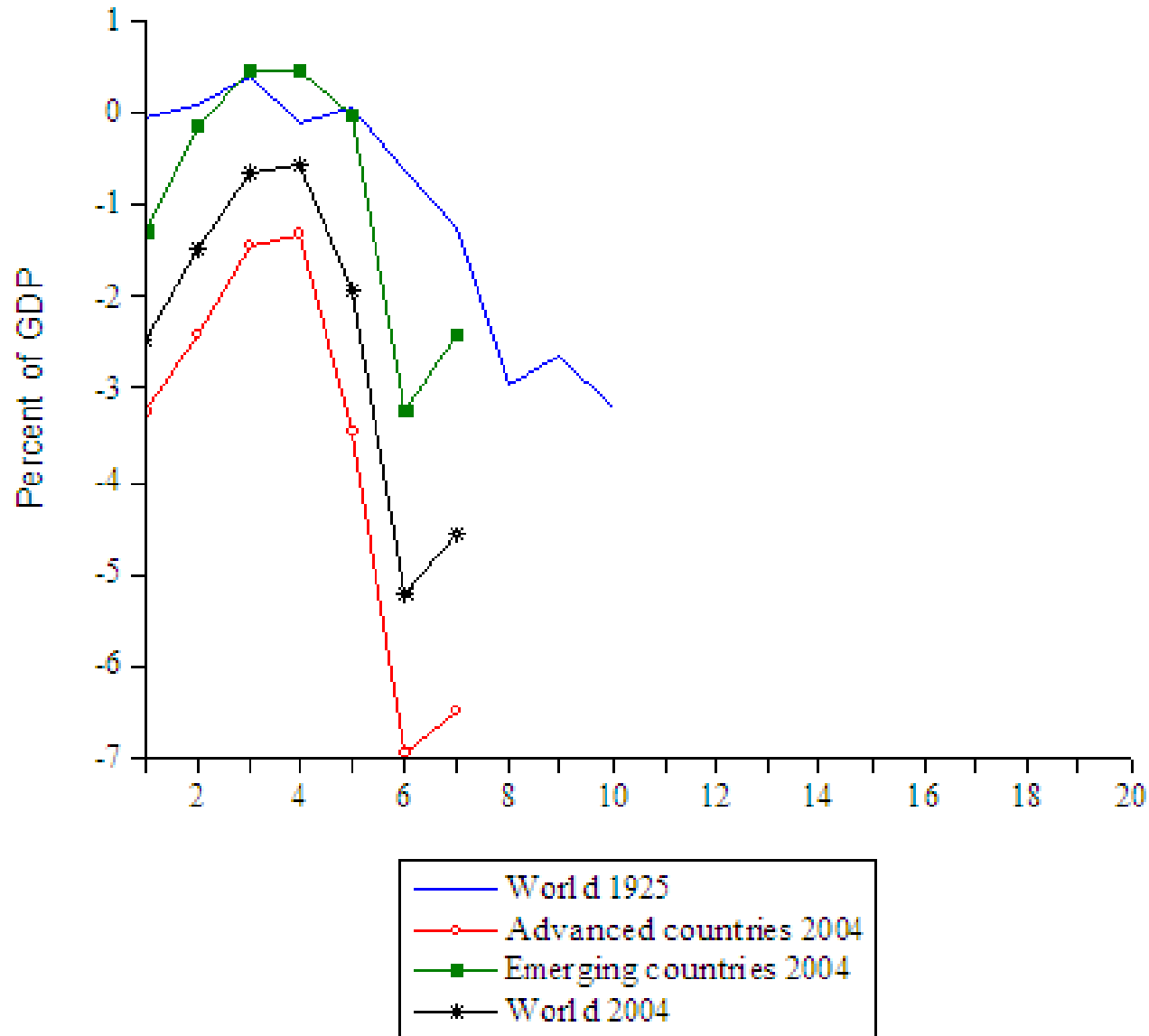
Great Moderation has succumbed to credit crunch

- US unemployment rate has doubled from 4.8 per cent to 9.5 percent and may peak at 10.5-11
- “the world is currently undergoing an economic shock every bit as big as the Great Depression shock of 1929-302” Eichengreen and O’Rourke (2009).
- “The good news is that the policy response is very different”

Central Bank Discount Rates – Now and Then



Budget Surpluses and Deficits – Now and Then



After DSGE, what next?

- Woodford and Curdia (2008) have heterogeneous consumers and financial intermediation with time-varying spreads
- Need to spread-adjust the Taylor rule
- Kiyotaki and Moore (2008) have heterogeneous investors and liquidity constraints. Suggests a new consensus: the complement of Woodford (2003)

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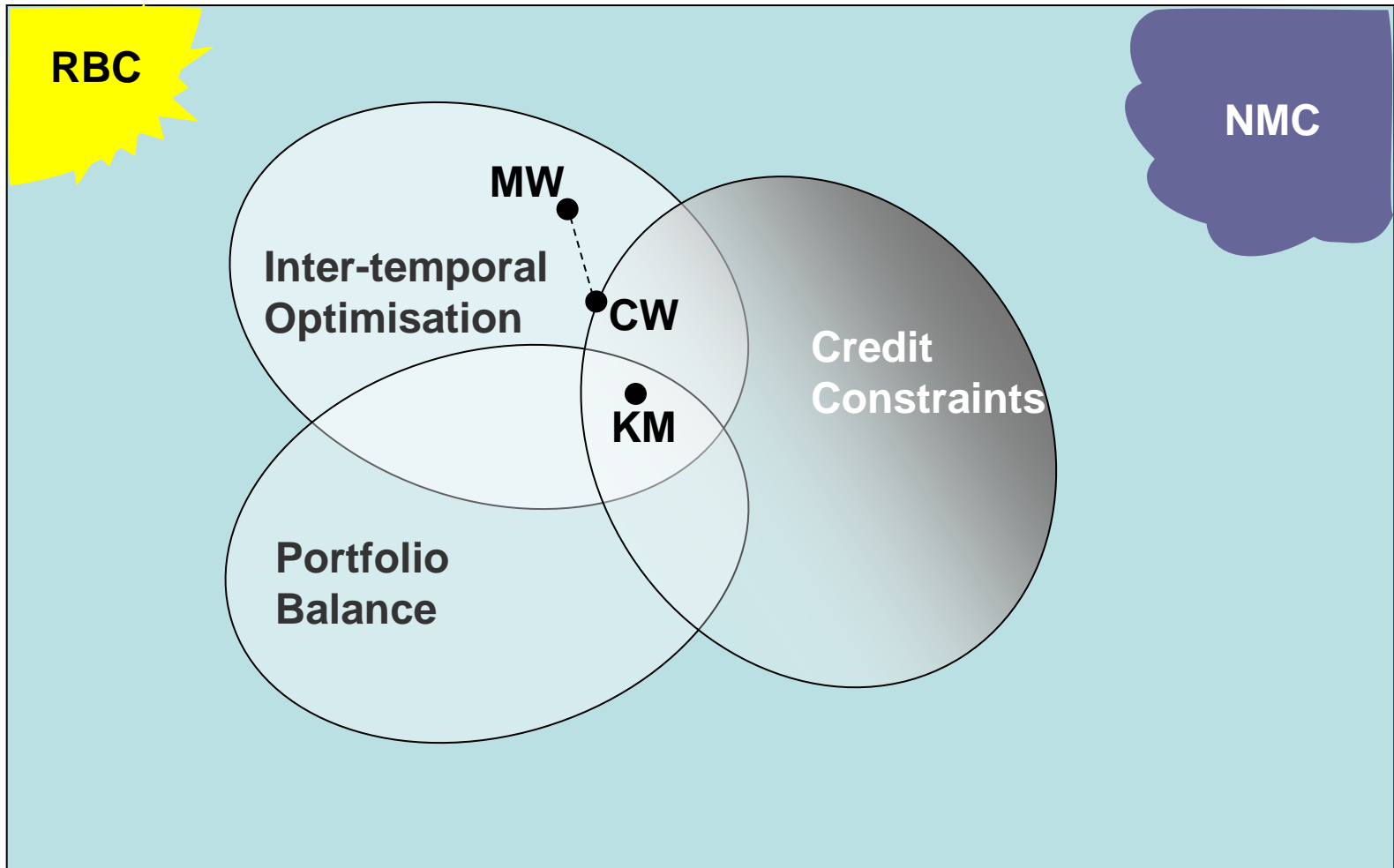
KM(2008) framework

- addresses the Hammond critique of DGE: firms cannot borrow at will - with real consequences for composition of output.
- credit market imperfections leads to a precautionary demand for money.
- offers a structured enhancement of the existing paradigm: so Real Business Cycle theory must now change its name!
- but have they gone far enough?

Adding Non Market Clearing (NMC)

- can the framework Kiyotaki and Moore have developed achieve a new synthesis between DGE and orthodox macroeconomics?
- which includes financial intermediation and **liquidity shocks**
- and their potential effects on **output and employment**
- what about adding NMC? With money wages and prices fixed, goods and labour markets may fail to clear (as in fix-price macroeconomics).

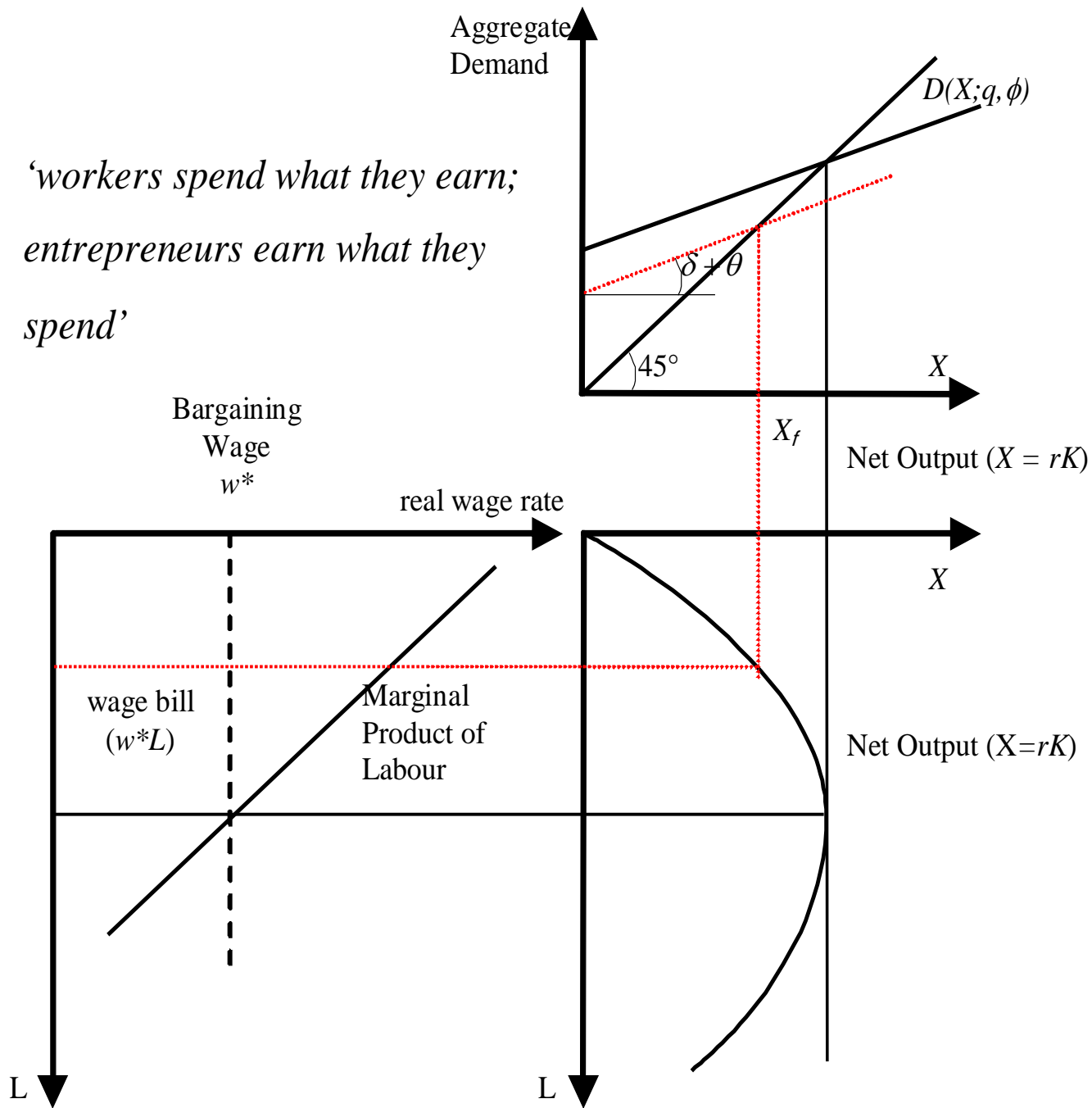
Broad macroeconomic perspectives



Fix price macro

- If prices are inflexible downward, there will be no Pigou effect to stabilise aggregate demand in the face of a fall of investment
- A fall in demand will contract employment if the real wage is determined by bargaining, as argued for the UK in Layard and Nickell, Alan Manning.
- Graphical representation follows

*'workers spend what they earn;
entrepreneurs earn what they
spend'*



Liquidity constraints

- Kiyotaki and Moore (2008) Liquidity, Business Cycles, and Monetary Policy
- Money and equity
- Money is liquid
- Equity is not (completely) liquid
 - only a fraction of holdings can be sold each period
 - Only a fraction of newly produced capital goods can be financed by issuing new equity

Investment

- Entrepreneurs can only finance investment using money, selling existing equity claims to others, raising equity on new capital, and spending out of current income

Workers

- Spend what they get
- Rational and forward-looking, but impatient and credit constrained.
- No borrowing
- They can hold money and equity if they choose
- Save nothing
- Consumption equals wages

Entrepreneurs

- May (prob π) or may not (prob $1-\pi$) have an idea for a profitable investment
- Those with no ideas (no investment)
 - Consume
 - Save in form of money and equity holdings
- Those with an idea (Investors)
 - Buy new capital goods
 - Issue equity against them
 - Use money, other equity holdings, and current income to finance investment

Liquidity constraints

- Entrepreneurs can raise equity against up to a fraction θ of new investment.
- They can sell off a fraction ϕ_t of pre-existing equity (theirs and others) n_t
- Money is perfectly liquid

$$n_{t+1} \geq (1 - \theta)i_t + (1 - \phi_t)\lambda n_t$$

$$m_{t+1} \geq 0$$

Entrepreneur's budget constraint

- Budget:

$$c_t + i_t + q_t(n_{t+1} - i_t - \lambda n_t) + p_t(m_{t+1} - m_t) = r_t n_t$$

- p – price of money; q – equity price
- λ – 1-depreciation rate
- n equity held by entrepreneur
- Objective - max exp U: $E_t \sum_{s=t}^{\infty} \beta^{s-t} \log(c_s)$

Production

- CRS / C-D production function, capital and labour

$$y_t = A_t k_t^\gamma l_t^{1-\gamma}$$

- KM: wage clears labour market
- DM: fix money wage and price level – entrepreneurs keep the surplus

$$y_t - w_t l_t = r_t k_t$$

Aggregate Demand

Investment demand

$$(1 - \theta q_t) I_t = \pi \left\{ \begin{array}{l} \beta \left[(r_t + \lambda \phi_t q_t) K_t + p_t M_t \right] \\ -(1 - \beta)(1 - \phi_t) \lambda q_t^R K_t \end{array} \right\}$$

Aggregate demand ('IS curve')

$$r(x_t) K_t = I_t + (1 - \beta) \left\{ \begin{array}{l} \left[r(x_t) + (1 - \pi + \pi \phi_t) \lambda q_t \right] \\ \left[+ \pi (1 - \phi_t) \lambda q_t^R \right] \end{array} \right\} K_t + p_t M_t$$

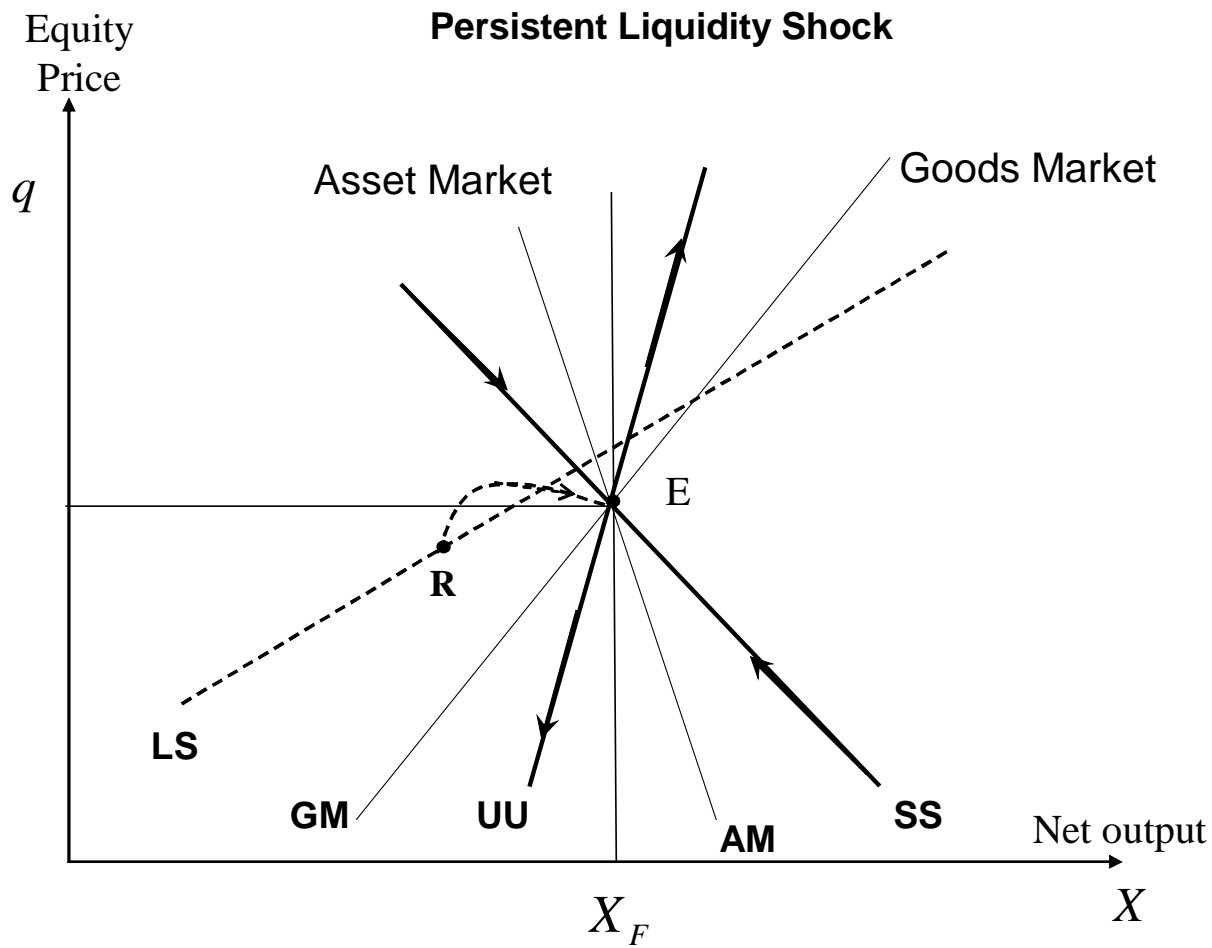
$$q_t^R \equiv \frac{1 - \theta q_t}{1 - \theta}$$

Portfolio Balance

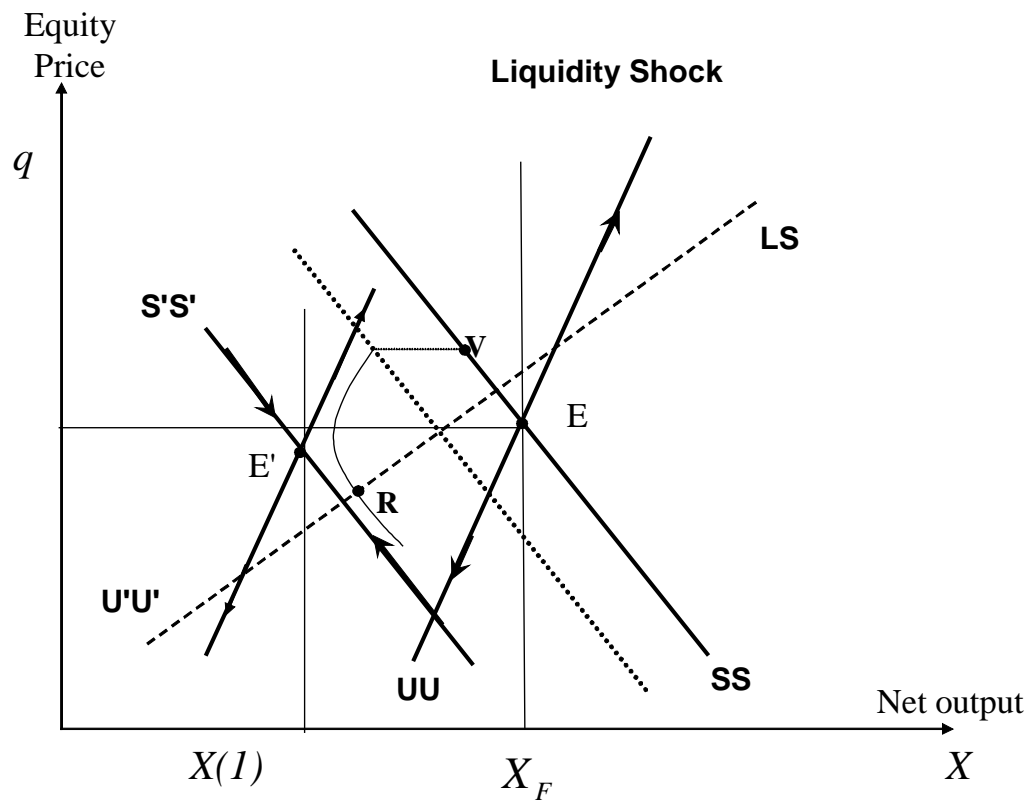
$$(1 - \pi) E_t \left[\frac{(r_{t+1} + \lambda q_{t+1}) / q_t - p_{t+1} / p_t}{(r_{t+1} + \lambda q_{t+1}) N_{t+1}^s + p_{t+1} M} \right] =$$

$$\pi E_t \left[\frac{p_{t+1} / p_t - [r_{t+1} + \phi_{t+1} \lambda q_{t+1} + (1 - \phi_{t+1}) \lambda q_{t+1}^R] / q_t}{[r_{t+1} + \phi_{t+1} \lambda q_{t+1} + (1 - \phi_{t+1}) \lambda q_{t+1}^R] N_{t+1}^s + p_{t+1} M} \right]$$

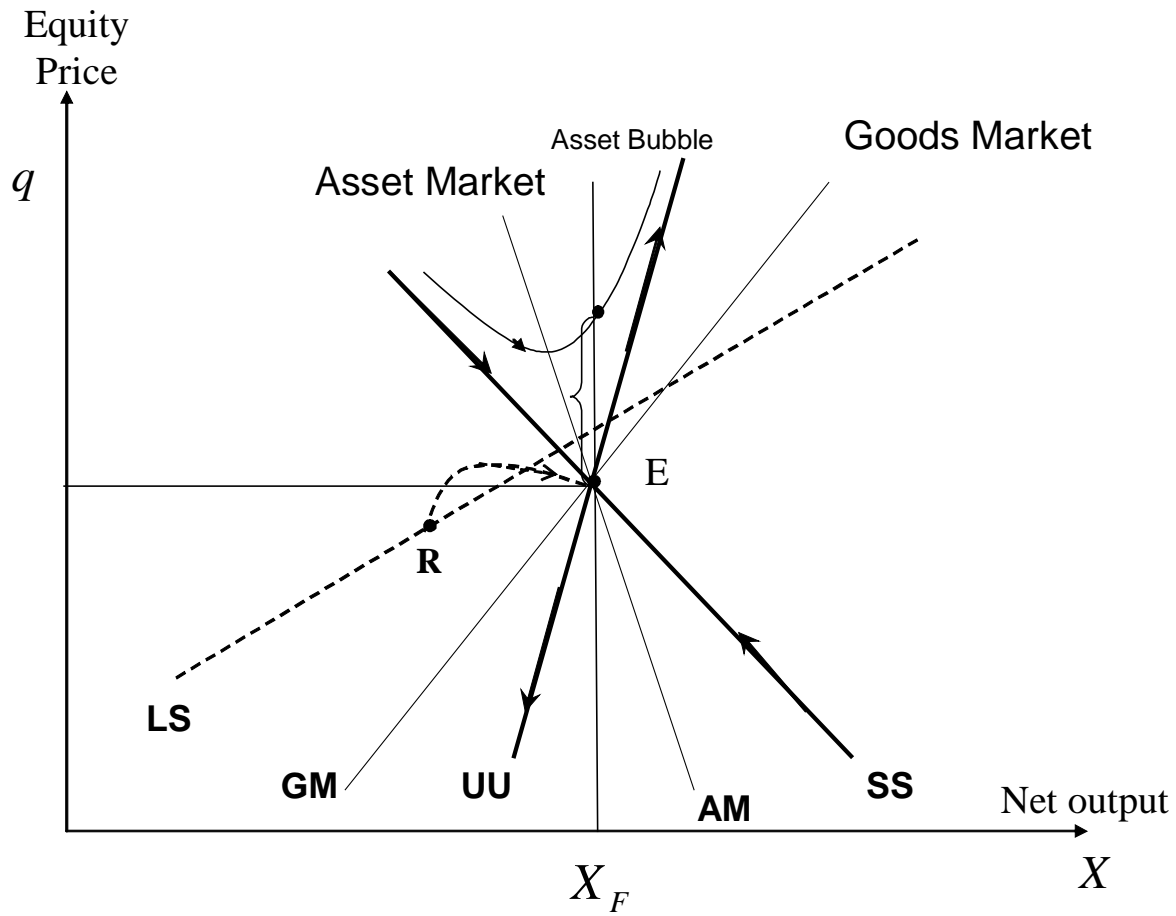
$$N_{t+1}^s = \theta I_t + \phi_t \pi \lambda K_t + (1 - \pi) \lambda K_t$$



Effects of a temporary liquidity shock – linearized phase diagram



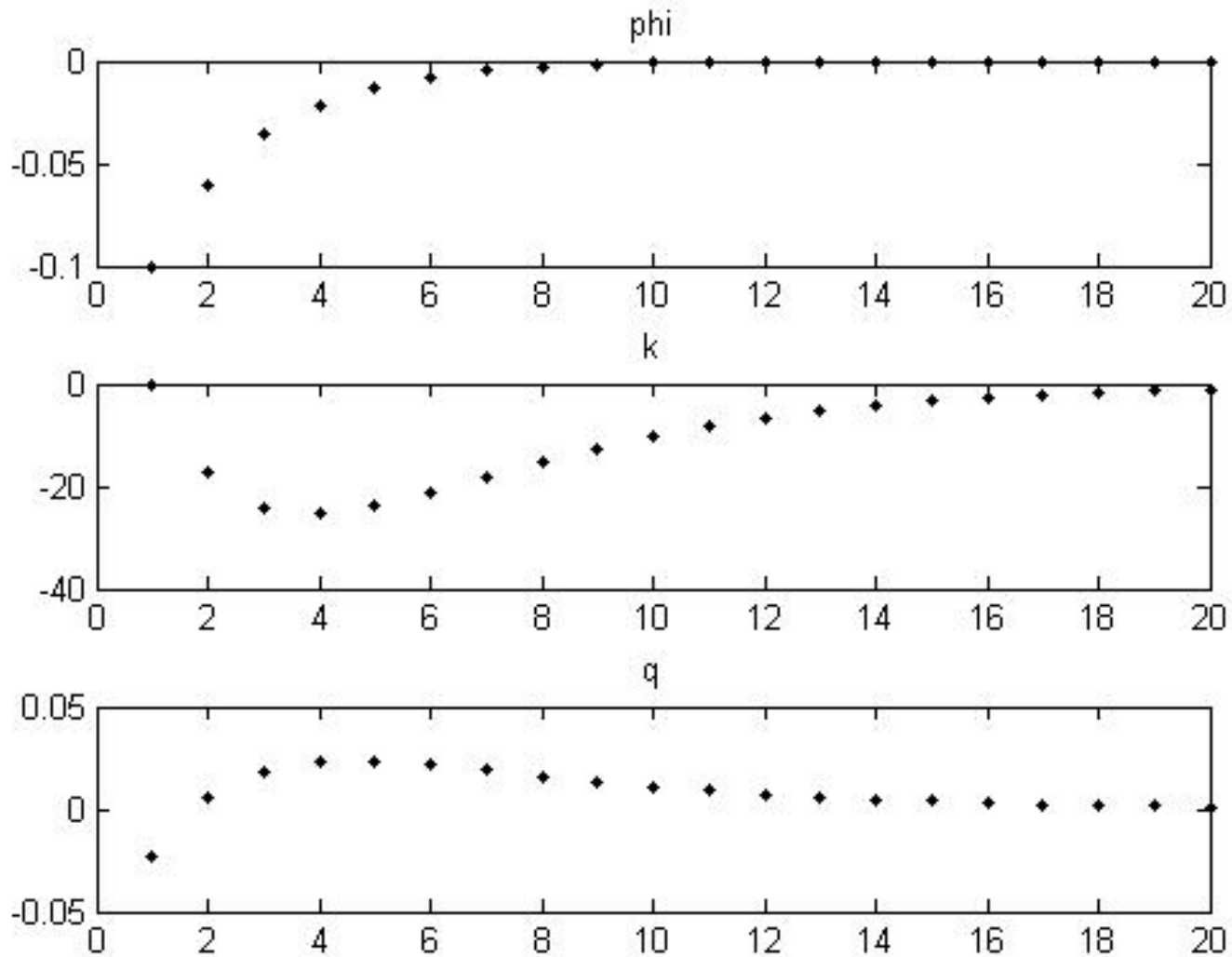
Liquidity shock which persists



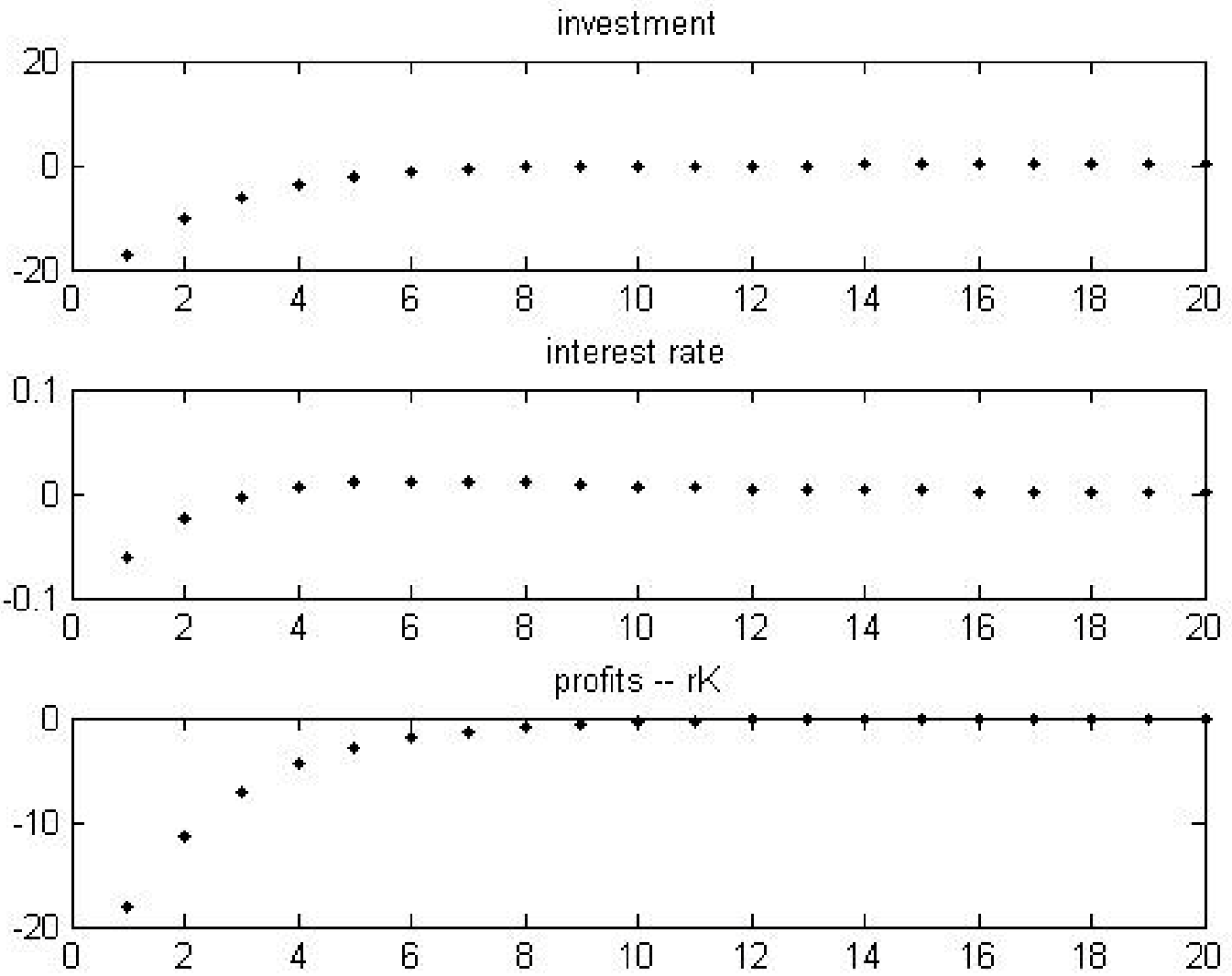
Collapsing asset bubble

'Calibration'

- $\varphi = 0.2$ (fraction of existing assets an entrepreneur can sell);
- discount factor $\beta = 0.96$;
- fraction of new capital against which an entrepreneur can raise equity, $\theta = 0.4$;
- probability of an entrepreneur having an idea for an investment, $\pi = 0.2$;
- the annual survival rate of the capital stock $\lambda = 0.8$.
- $M = 50$; price of money $p = 1$.
- $\rho = 0.6$ (survival rate of shock to φ)
- Steady state: $q = 1.12$; $r = 0.252$; $K = 296$; $Mp/K = 0.169$.



Impulse responses to a negative liquidity shock



Impulse responses to negative liquidity shock

Credit crunch

- With firms who want to invest more credit constrained - and workers income constrained - no Pigou effect to stimulate entrepreneurial consumption, a 'credit crunch' causes recession.
- The antidote discussed by KM should work here too: **Quantitative Easing** as the government supplies liquidity in exchange for corporate securities.

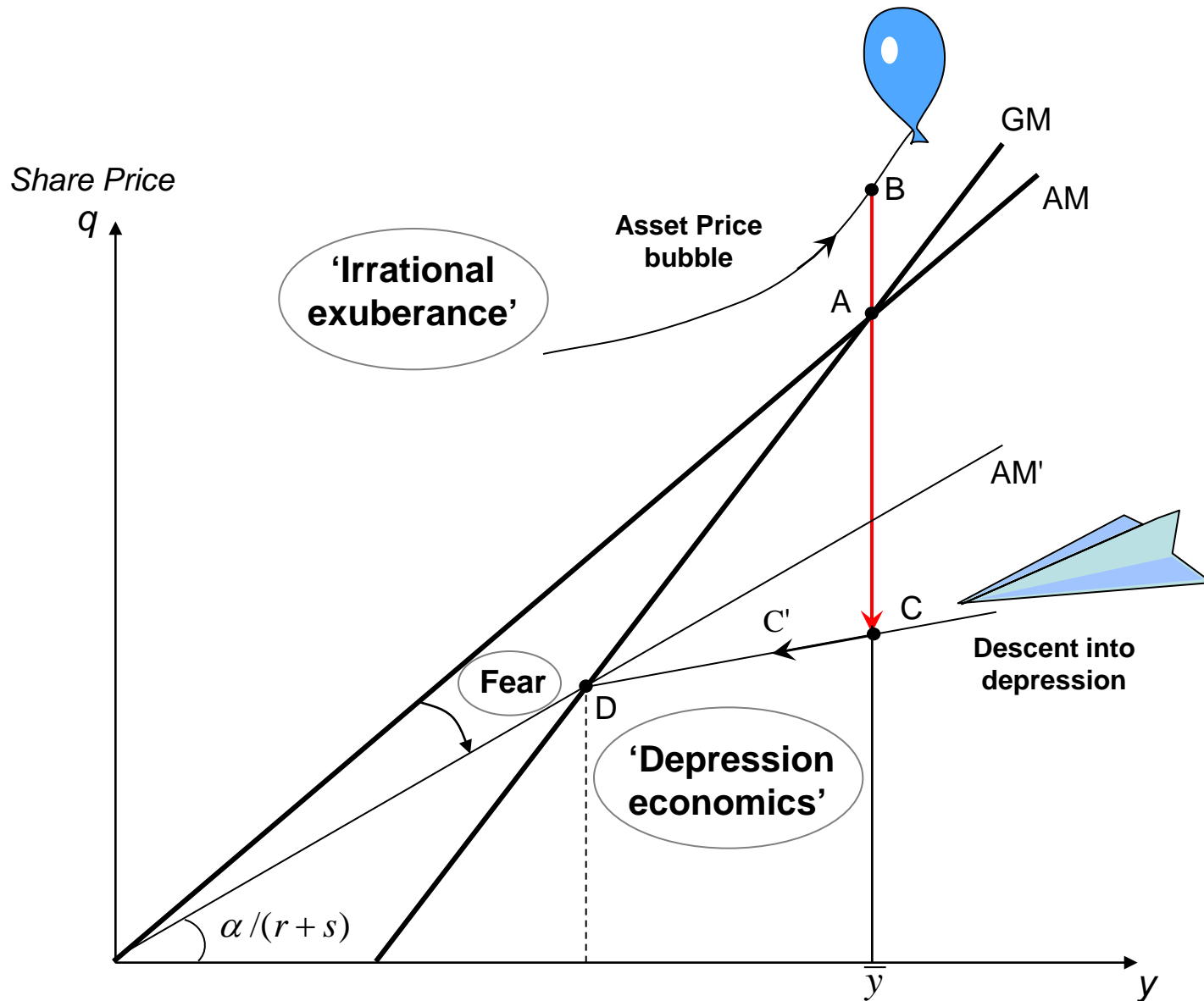
Behavioural aspects

- What if there is what Laibson calls ‘fractured arbitrage’?
- Phase diagram can also be used to portray effects of an asset price bubble
- This is a way of including what Akerlof and Shiller refer to in their book ***Animal Spirits***
- Another would be to change π , with less innovation in recession –Paul DeGrauwe’s approach to Animal Spirits?

Olivier Blanchard 'Output and the stock market'

- To show how the KM approach has achieved a synthesis between orthodox macro and DSGE, note that they provide **modern micro foundations** for the simple fix price macro model of Blanchard (AER 1981).
- There too a bubble leads to a boom
- And a credit crunch can lead to recession

Boom and Bust (or Animal Spirits) in the Blanchard model



Conclusion

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Conclusion (contd)

- So workhorse model developed by KM supplies a **micro-founded framework** for looking at stabilisation policy – so long as wages and prices are not flexible enough to ensure continuous market clearing.
- outcome is superior to the current paradigm in that it **addresses Hammond critique**.
- adding **innovation slowdown** and/or asset mis-pricing (**bubbles**) would provide added realism, at a time when stock markets have fallen by half