

# Open-Economy Macroeconomic Models: MSc

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- Joint analysis of output, real exchange rate, trade balance
- Cyclical frequency: nominal rigidities
- High correlation between NER and RER
- Nominal exchange rate an asset price
- Welfare depends on consumption, work effort
- Dynamic analysis

- UIP

$$i_{t+1} = i_{t+1}^* + e_{t+1} - e_t$$

$[i \approx \log(1 + i)]$ ; [nominal depreciation  $\iff \uparrow e$ ]

- Money demand

$$m_t - p_t = -\eta i_{t+1} + \phi y_t$$

- Real exchange rate

$$q = e + p^* - p$$

- Output demand

$$y_t^d = \bar{y} + \delta(e_t + p^* - p_t - \bar{q})$$

# Slow Price Adjustment

- Price dynamics

$$\begin{aligned} p_{t+1} - p_t &= \psi(y_t^d - \bar{y}) + (\tilde{p}_{t+1} - \tilde{p}_t) \\ \tilde{p}_t &= (e_t + p_t^* - \bar{q}_t) \end{aligned}$$

- Real exchange rate dynamics

$$\Delta q_{t+1} = -\psi\delta(q_t - \bar{q})$$

- $0 < \psi\delta < 1$

# Solving the Model

- Assume  $p^* = \bar{y} = i^* = 0$
- Re-write money demand as

$$m_t - e_t + q_t = -\eta(e_{t+1} - e_t) + \phi\delta(q_t - \bar{q})$$

which implies

$$\begin{aligned}\Delta e_{t+1} &= \frac{e_t}{\eta} - \frac{(1 - \phi\delta)}{\eta} q_t - \left( \frac{\phi\delta\bar{q} + m_t}{\eta} \right) \\ &= \frac{e_t}{\eta} - \frac{m_t}{\eta} - \frac{q_t}{\eta} + \phi\delta(q_t - \bar{q})\end{aligned}$$

# Equilibrium Relations

- $\Delta e = 0 \implies$

$$e_t = (1 - \phi\delta)q_t + \phi\delta\bar{q} + m_t$$

- $\Delta q = 0 \implies$

$$q_t = \bar{q}$$

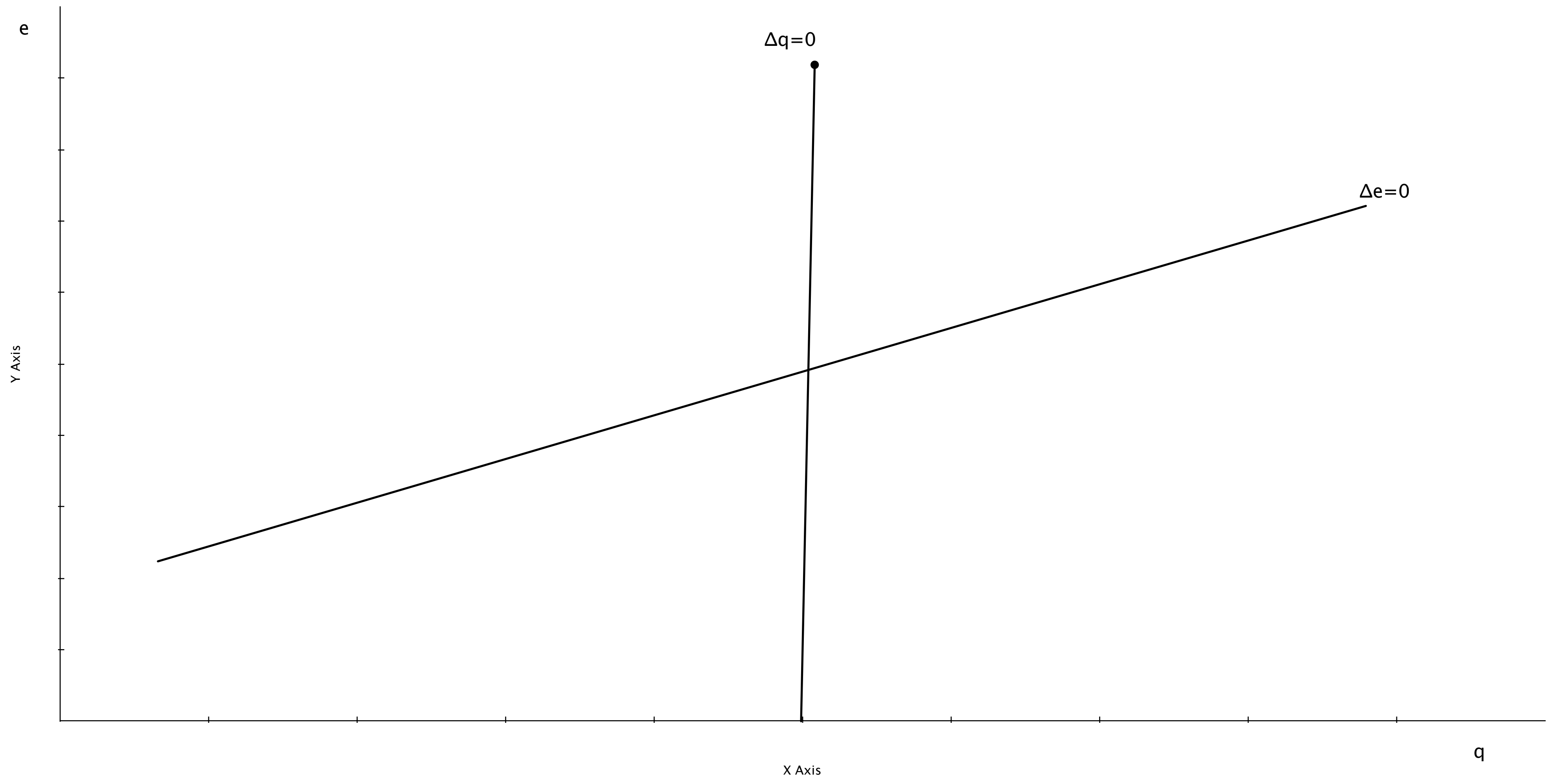
- In steady state

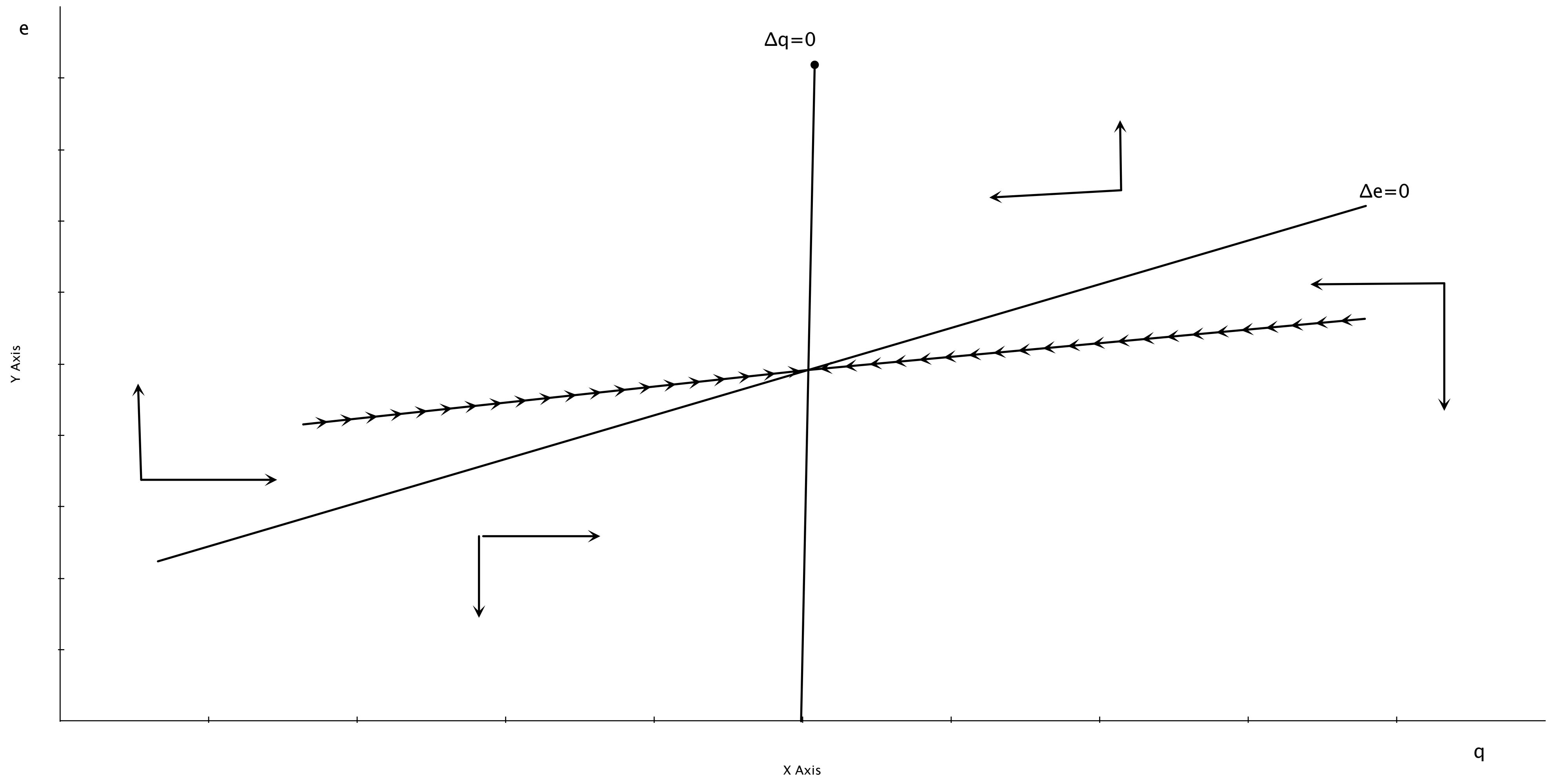
$$\bar{p} = \bar{m}$$

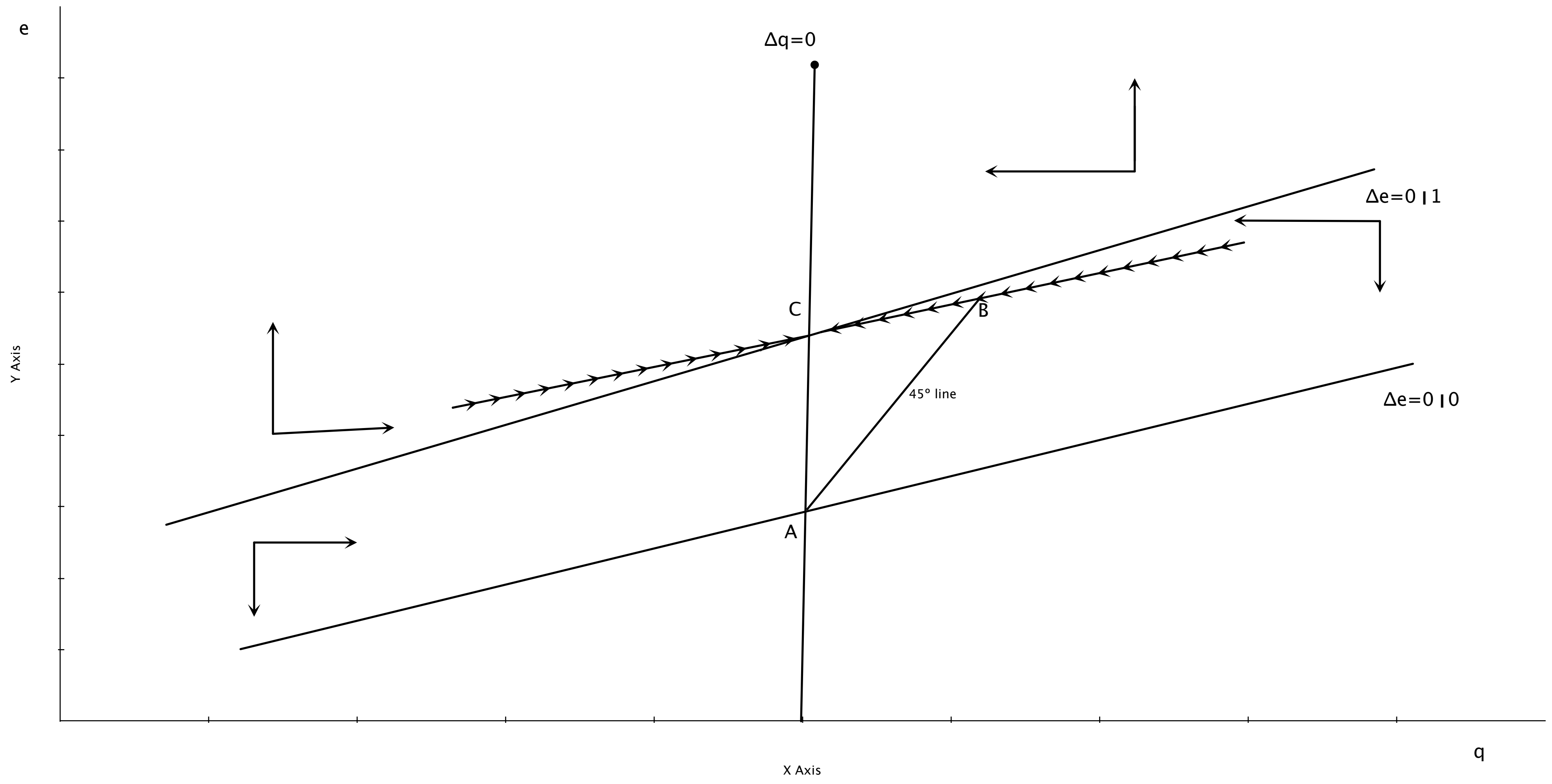
$$\bar{e} = \bar{m} + \bar{q}$$

- Impact effect of shifts in  $e$

$$\Delta q = \Delta e$$







# Intuition for Overshooting Result

- $\phi\delta < 1$ : at fixed  $i$ , increase in money demand less than increase in money supply
- Need reduction in  $i$  to clear money market
- $i < i^*$  requires expectation of appreciation:  $\Delta e_0 > \Delta e_{SS}$
- Interaction of goods market and asset market

- $\phi\delta > 1$  : undershooting dynamics
- Not derived from microfoundations
- Limited treatment of dynamics
- Welfare analysis not possible

- Microfoundations
  - Imperfect competition
  - Nominal rigidities (prices; wages)
- Dynamic optimisation
- Welfare analysis
- Policy evaluation

- Obstfeld-Rogoff (1995) “Redux” model
- Analytical models (survey - Lane JIE 2001)
- Large-scale simulation models
  - IMF GEM
  - FED Sigma
  - BoE BQM
  - many others ...

# NOEM: Key Features

- Leisure in utility function
  - Separable  $U(C) + V(L)$
  - Non-separable  $U(C, L)$ ;  $U_{CL} \neq 0$
- International risk sharing
  - Complete - no cross-border wealth effects
  - Incomplete - valuation effects important
- Elasticities of substitution
  - Home versus foreign goods
  - Tradables versus nontradables
- Nature of nominal rigidities
  - Producer currency pricing (PCP)
  - Local currency pricing (LCP)
  - Time-dependent (Taylor; Calvo) versus state-dependent (Mankiw, Rotemberg-Woodford) pricing

- Expansion of  $Y_T$ : offsetting terms of trade movement
  - $\varepsilon_{H,F} = 1$ : constant expenditure shares, comovement in real incomes
- Current account dynamics
  - CA surplus today implies positive NFA - future consumption rises, future labour supply falls
  - Welfare depends on  $PV(C)$ ,  $PV(L)$
- GDP not a sufficient statistic