Persistent Appreciations and Overshooting: A Normative Analysis

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Appreciations

Episodes of large and persistent appreciations of real exchange rate

Many sources:

- Absorption of large capital inflows
- Inflation stabilization policies
- Exchange rate adjustments in trading partners
- Favorable price shock for commodity producers
- Discovery of natural resources (Dutch disease)

Slow adjustment in recoveries

- Persistent appreciations drains resources of export sector, lead to destruction/bankruptcies
- May slow down export sector recovery once things turn around
- Depressed input demand from consumers + depressed input demand from export sector
- Real exchange rate overshooting

Policy question

Is there a need to intervene to protect the export sector?

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A: no

Add extra ingredient: financial constraint

A: in some cases

Related work

- ’Dutch disease’ (Corden, Krugman, van Wijnbergen)
- Broader problem: preventive measures during appreciations and current account deficits (Blanchard)
- Financially constrained exporters (Chaney, Manova), their response to big depreciations (Fitzgerald-Manova)
- Financial development and the negative effects of macro volatility (Aghion-Bacchetta-Ranciere-Rogoff, Aghion-Angeletos-Banerjee-Manova)

Model

- three goods: tradable T, non-tradable N, capital
  - price of N (RER): p_t
  - price of capital: q_t
  - T numeraire
- two countries: home, foreign
- two groups in home country: consumers, entrepreneurs

Preferences

Consumers:

$$\mathrm{E}\sum \beta^t \theta_t \left(\log c_t^T + \log c_t^N\right)$$

preference shock θ_t

Entrepreneurs and foreign consumers:

$$\mathrm{E}\sum \beta^t c_t^T$$

Shocks

First shift to θ_A, then shift to θ_D w.p. δ

$$\theta_A > \theta_D$$

D absorbing state

complete markets

Endowments

Consumers sell 1 unit of labor inelastically

Entrepreneurs, period 0:

$$a_0 \text{ tradable goods}$$
$$n_{-1} \text{ production units}$$

Technology

Tradable sector

- f of tradable good to create one production unit
- (*Leontief*) 1 production unit produces 1 tradable using 1 labor
- (*No mothballing*) if production unit inactive $\rightarrow$ destroyed

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Non-tradable sector

- 1 unit of labor produces 1 unit of NT
- $\longrightarrow$ wages are equal to p_t

Financial constraint

No commitment on entrepreneurs' side

Portfolio of entrepreneurs:

$$a(s_{t+1}|s^t) \geq 0$$

Equilibrium: consumers

Consumers' optimality + complete markets

Demand for NT

$$c_t^N = \kappa \frac{\theta_t}{p_t}$$

- shock: persistent shift in demand for non tradables
- κ endogenous depends on present value of wages p_t

Equilibrium: export units and NT consumption

Market clearing in labor market + Leontief in T sector:

$$c_t^N + n_t = 1$$

Market clearing for used units + creation/destruction margin:

$$\begin{array}{rcl} q_t & \in & [0, f] \\ n_t & > & n_{t-1} \text{ implies } q_t = f \\ n_t & < & n_{t-1} \text{ implies } q_t = 0 \end{array}$$

- q_t price of used unit

Characterization

Proposition

Equilibrium is characterized by:

Phase A

$$p(s^t) = p_A > 1 \qquad q(s^t) = 0$$

Phase D

$$p(s^t) = p_{D,j} < 1 \qquad q(s^t) = f$$

- D, j: j-th period after reversal
- Assumption: θ_A / θ_D and n_{-1} sufficiently large

Phase D: recovery of export sector

Cost of creating a unit

$$f$$

Net present value of profits

$$\frac{1}{1-\beta}(1-p_D)$$

Equilibrium value of p_D

$$p_D = 1-(1-\beta)f$$

Phase A: operational losses and option value

Cost of keeping a unit operational

$$p_A - 1 > 0$$

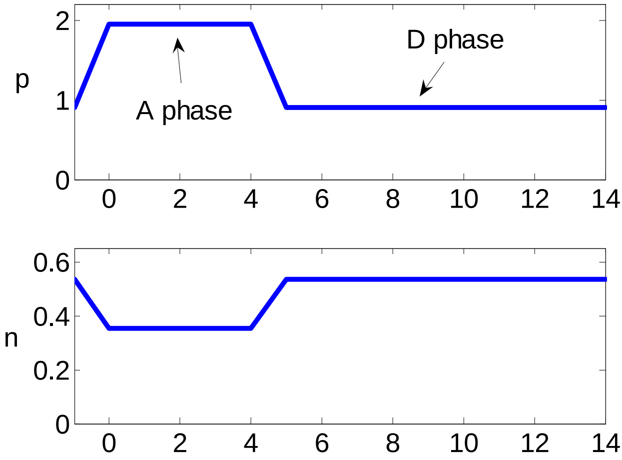
Expected benefit

$$\beta \delta f$$

Equilibrium value of p_A

$$p_A = 1 + \beta \delta f$$

First best



First best (large a_0)

Cutoff $\hat{a}^{fb}$

Result *If* $a_0 \geq \hat{a}^{fb}$ *financial constraint not binding*

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Result *If $a_0 \geq \hat{a}^{fb}$ financial constraint not binding*

High wealth a_0 needed for two reasons:

- cover losses in A
- cover investment costs in first period of D

$$(p_A - 1)n_A + \delta\beta f \cdot (n_D - n_A) \leq (1 - (1 - \delta)\beta)a_0$$

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Low a_0

Prices no longer pinned down by intertemporal margin

Limited ability to exchange financial assets for physical capital

$$p_A - 1 < \beta\delta f \qquad \text{constrained appreciation}$$

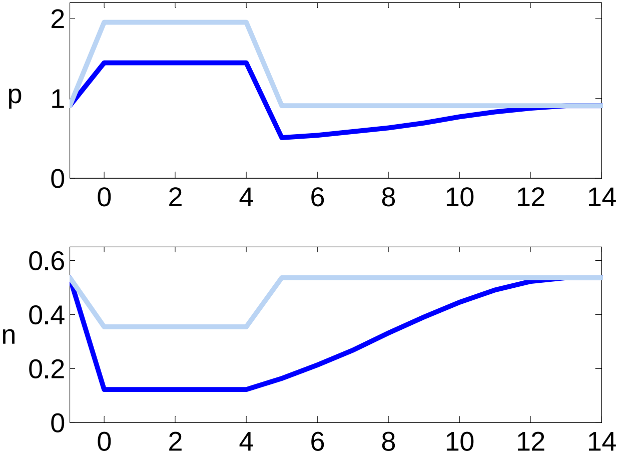
$$f + p_{D,0} - 1 < \beta f \qquad \text{overshooting}$$

Low a_0 (continued)

Result *If* $a_0 < \underline{a}$ *then constrained appreciation and overshooting*

- in D phase firms invest using retained earnings
- eventually $p_{D,J} = p_D^{fb}$ for some $J > 0$

Constrained equilibrium



Exchange rate policy

Exchange rate appreciation in A leads to

$\longrightarrow$ more destruction in A

$\longrightarrow$ slower recovery in D

Policy: Relieve pressure on demand for NT, increase n_A, save units for the recovery

Q: Is this policy welfare improving?

Policy instruments

- no transfers between consumers and entrepreneurs
- taxes on consumption of T/NT, rebated lump-sum to consumers

interventions with effects in this direction:

- contractionary fiscal policy
- policies to encourage savings
- currency interventions/reserves management (?)

Planner problem

Planner chooses:

- state contingent path for $c^T(s^t), c^N(s^t)$

Takes as given:

- market clearing in labor market $n(s^t) = 1 - c^N(s^t)$
- entrepreneurs' optimality

  Map $n(.) \rightarrow p(.), a(.), c^{T,e}(.)$

- maximize consumers' utility for fixed entrepreneurs' utility

Perturbation

Increase n_A locally, around CE

Effects on consumers' welfare (leaving entrepreneurs indifferent)

Result If constrained appreciation and overshooting then:

$$dU_c > 0$$
$$dU_e = 0$$

Perturbation (continued)

Change n_A locally, around CE

$$\begin{aligned}\frac{dU_c}{dn_A} &= -\theta_A u'(1-n_A) + p_A \lambda + \\ &\quad + \lambda \left(\frac{\partial p_A}{\partial n_A} n_A + \beta \delta \frac{\partial p_{D,0}}{\partial n_A} n_{D,0} \right)\end{aligned}$$

- λ lagrange multiplier on consumers BC
- first row zero (private FOC)

Inefficient destruction

If constrained appreciation + overshooting ($p_A < p_A^{fb}$ and $p_{D,0} < p_D^{fb}$) then

$$\frac{\partial p_A}{\partial n_A} n_A + \delta\beta \frac{\partial p_{D,0}}{\partial n_A} n_{D,0} = 1 - p_A + \beta\delta f > 0$$

- total wage loss today = cost of saving an extra unit
- total wage gain tomorrow = savings in investment costs

Inefficient destruction (continued)

If $p_{D,0} < p_D^{fb}$ (overshooting) then:

$$\frac{dU_e}{dn_A} = \frac{\partial c_{D,0}^{T,e}}{\partial n_A} = 0$$

- all extra funds tomorrow go to investment

Optimal policy

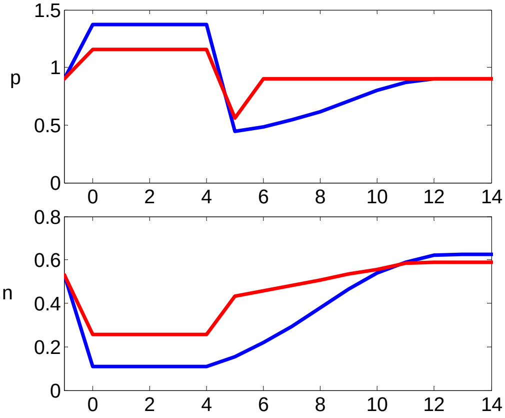
Optimal policy if no constrained appreciation? Intervention during *recovery* phase still good

In general optimal to combine intervention in *A* and *D*

Hindrances:

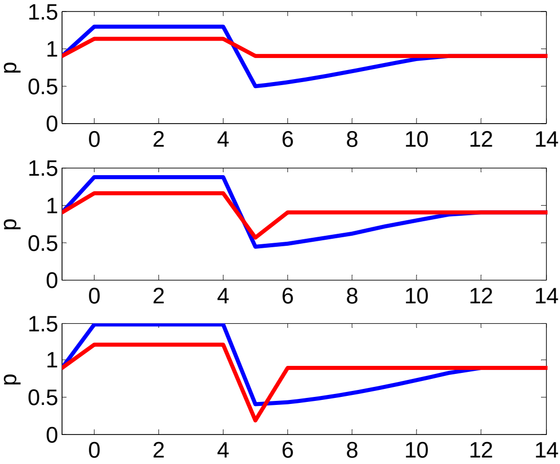
- real wage rigidities in recovery
- nominal wage rigidities + peg

Optimal policy (continued)



blue - CE, red - optimal policy

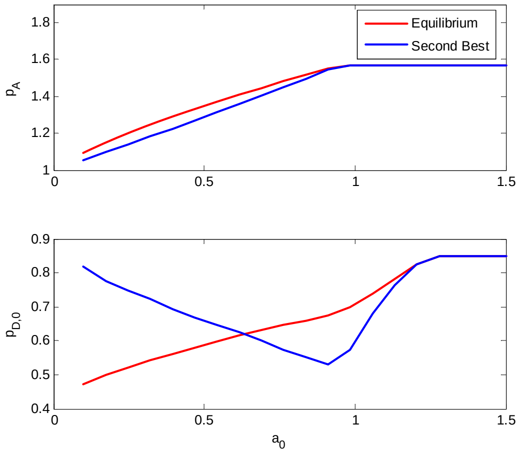
Three cases



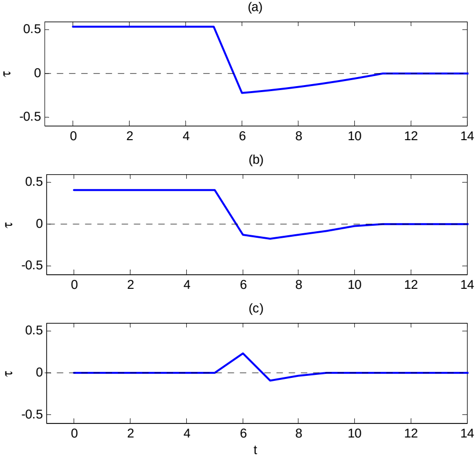
Three cases (continued)

- First case, low a_0
  - intervention in A is very effective
  - tax NT in A and subsidy in D
  - subsidy eventually vanishes
- Second case, middle a_0
  - intervention in A is effective but also leave some for D
  - all intervention in D frontloaded
- Third case, high a_0
  - intervention more effective in D
  - over-overshooting

a_0 and intervention (against CE)



Implementation: tax on nontradable



Persistence

How does δ affect the equilibrium, the incentive to intervene?

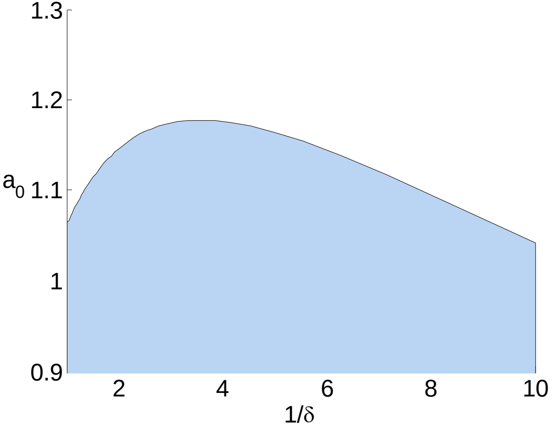
- High δ: switch is very likely

  small losses, easy to hedge

- Low δ: switch is very unlikely

  optimal to destroy many units also in first best, easy to hedge

Persistence (continued)



shaded region - positive taxes

Conclusions

- Appreciation can generate excessive destruction
- For inefficiency, it is crucial that there is a constrained recovery
- Trade-off wage cut in A v. faster recovery in D
- Menu of intervention depends on initial conditions: more constrained entrepreneurs, more preventive policy