Capital Flows and the Global Collateral Cycle

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Global Collateral Disparities Explain

- Capital flows and trade between otherwise identical regions like U.S. – Europe.
  - Explains permanent trade deficit.
- Explains international financial cycle in which prices, gross capital flows, and trade imbalances all co-move.
  - Explains why asset price ups and downs become more extreme with international trade instead of reduced by diversification.

Motivation

- International trade classically explained by
  - differences in preferences (Chinese want to save), or
  - differences in endowments (developed countries have more capital than developing countries), or
  - differences in productive technology (again between developed and developing countries), or
  - Idiosyncratic shocks that invite co-insurance

Motivation 1

- Need to explain big international flows between similarly developed and endowed regions like U.S. – Europe.
  - Explain how U.S. runs permanent trade deficit

Motivation 2

- Explain why globalization seems to have exacerbated financial - leverage cycle.
  - Raised asset price volatilities instead of dampening them through diversification.
- Explain pro-cyclical
  - asset prices,
  - trade imbalances,
  - other gross flows

Two Recent Explanations of Trade Imbalances Between Identical Countries

- Trade because one country has access to more sophisticated financial contracts, which reduces their precautionary savings, raising rates and attracting foreign investment.
- Dollar is global currency.

- These don’t explain the cycle or extra volatility.
  - We shall assume universal trade of all contracts.
  - No money in our model.

References

Global Imbalances (market completeness, ability to supply financial assets, sharing idiosyncratic risk, funding costs): Caballero, Farhi, Gourinchas (2008), Mendoza, Quadrini, Ríos-Rull (2009), Angeletos-Panousi (2011), Maggiori (2015). Bruno-Shin (2014).Willen (2004).

Gross flows: Lane, Milesi-Ferretti (2007), Obstfeld (2012), Shin (2012), Bruno-Shin (2014).

FI and comovement: Caballero-Simsek (2016).

International Financial Cycle: Helene Rey (2015)

References (One country)

- Collateral General Equilibrium
  - Kiyotaki-Moore 1997
  - Geanakoplos 1997, Geanakoplos-Zame 2007
    - endogenous collateral constraint with uncertainty, GE
- Leverage Cycle:
  - Scary Bad News induced crashes via Δ in leverage
  - Geanakoplos 1997, 2003, 2010
- Securitization Cycle:
  - Bigger crashes
  - Fostel-Geanakoplos (2012, 2015), Gong-Phelan 2015

Our Explanation for Global

- Collateral Technology Disparities
  - Assets in U.S. can be used as collateral in more sophisticated ways. That explains capital flows and permanent trade deficit.
  - The opportunity to use collateral changes with uncertainty: scary bad news. That explains global collateral disparity cycle above and beyond usual leverage cycle.

- Otherwise identical economies with identical shocks.

Collateral Technology Differences Exist

- $ Trillions of American collateral back promises.
  - $50+ Trillions of American houses, cars, businesses etc used annually as collateral for mortgages and loans.
  - $15+ Trillions of American mortgages, auto loans, corporate loans, student loans, etc tranched into different pieces then pooled as securitizations.
    - American securitizations > 50% of GDP
    - European securitizations < 7% of GDP
- Other countries can't tranche (Europe), some can't even collateralize (India).
- American firms don't tranche foreign collateral.

Collateral Technology Disparities Emerge Because

- Collateral requires reliable records of ownership and contracts, a court system, and police to enforce seizure in case of default.
- Tranching requires elaborate accounting systems and sophisticated tax laws and honest trustees.
- Most countries aren’t up to all that.

Basic Facts

- $2 Trillion of capital Inflows into US each year
- $15+ Trillion of US Securitizations outstanding
  - $2-$3.5 Trillion per year
  - 14-18% owned by Foreigners, all advanced
  - 12% of foreign total owned by Europe = $300 Billion
- US – EU Trade balance (goods-services) = $ 60 Billion
- Securitizations, Gross Flows collapsed in 2008
  - And to smaller extent in 2020

1) Collateral Technology Differences Create Global Flows

- Home creates tranches that Foreign cannot create, or cannot create enough of.
- Foreigners buy these, because of internal heterogeneity, creating global inflows (of money) to home.
- Surprisingly, Home also buys tranches from Foreign even though they can be replicated at Home, because the prices are cheap, creating global outflows from Home. Huge gross flows, small net flows.

2) Collateral Technology Disparities Create Failure of Law of One Price so Home can run permanent trade deficit

- Home assets worth more than identical Foreign assets, so Home richer.
- Equivalently, Home can sell a replicating portfolio of tranches of Foreign bonds at a higher price than the bonds Home buys.
- This enables Home to finance a permanent trade deficit.

3) Specific Home Collateral Advantage

- Consists in creating counter-cyclical tranches out of cyclical collateral.
  - Either safe collateral which Foreign cannot
    - Subprime tranching innovation
  - Or negative beta collateral which Foreign cannot
- U.S. AAA bonds are in practice negative beta assets.
  - Flight to safety in crises raises their prices
  - Interest rates fall in crises, raising their prices

4) Effects of Collateral Technology Disparities is Pro-Cyclical

- Because when things go bad, anticipated volatility usually goes up, meaning that anticipated bad state value goes down. Scary Bad News. (Geanakoplos 2003,2010.)
- When things go well, anticipated volatility usually goes down, meaning that anticipated bad state value goes up.
- Scary bad news limits creation of negative beta tranches.
- Hence effects of collateral technology disparities are pro-cyclical.
- In particular, asset prices, gross international flows, and trade imbalances are pro-cyclical.

Two Assumptions

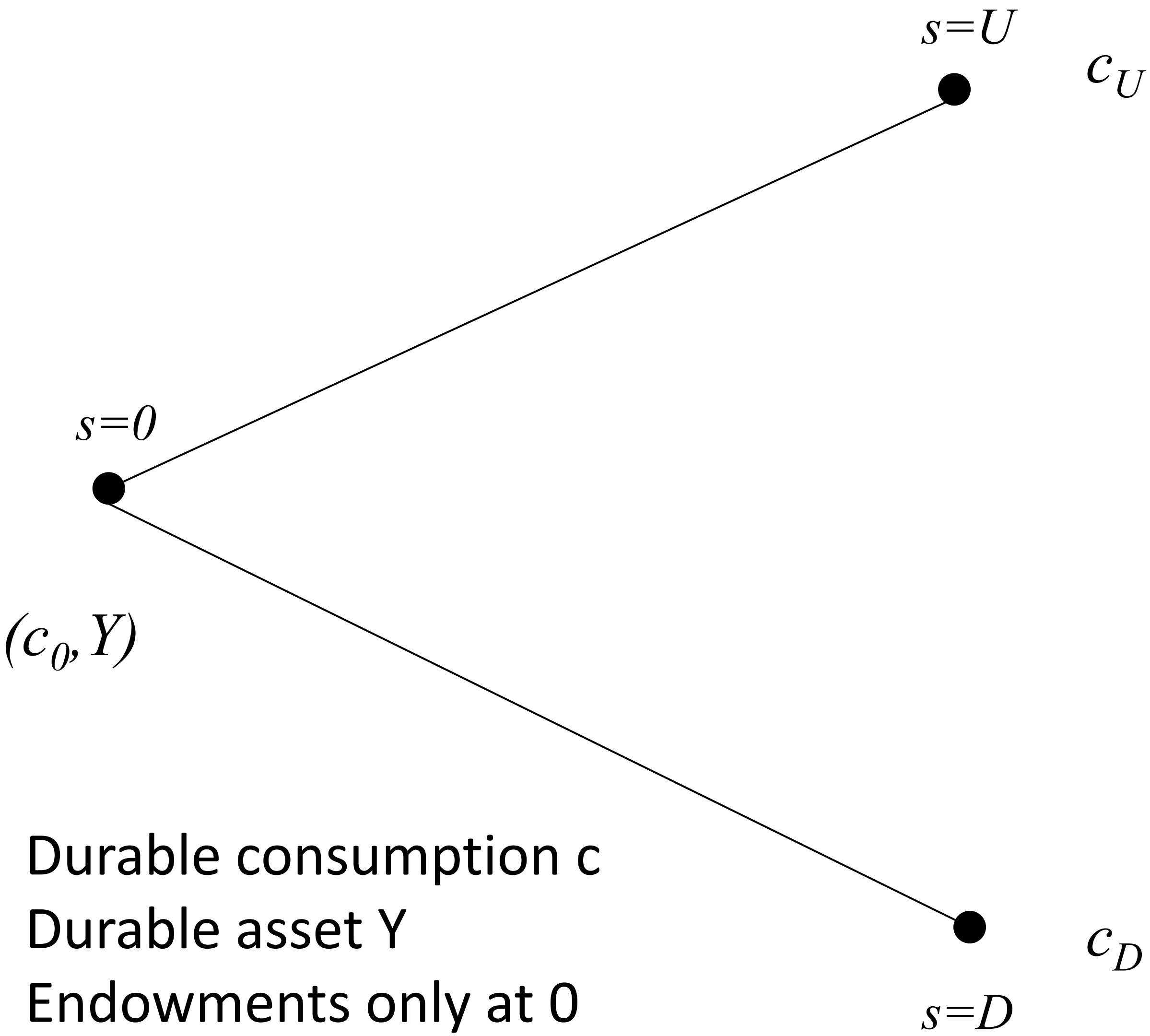
- Home can use assets as collateral to create tranches Foreign cannot.
- Agents are heterogeneous, so they want to trade these created tranches.

Simple GE Model with Collateral

- First static economy illustrating ideas.
- Then dynamic economy to get cycle.

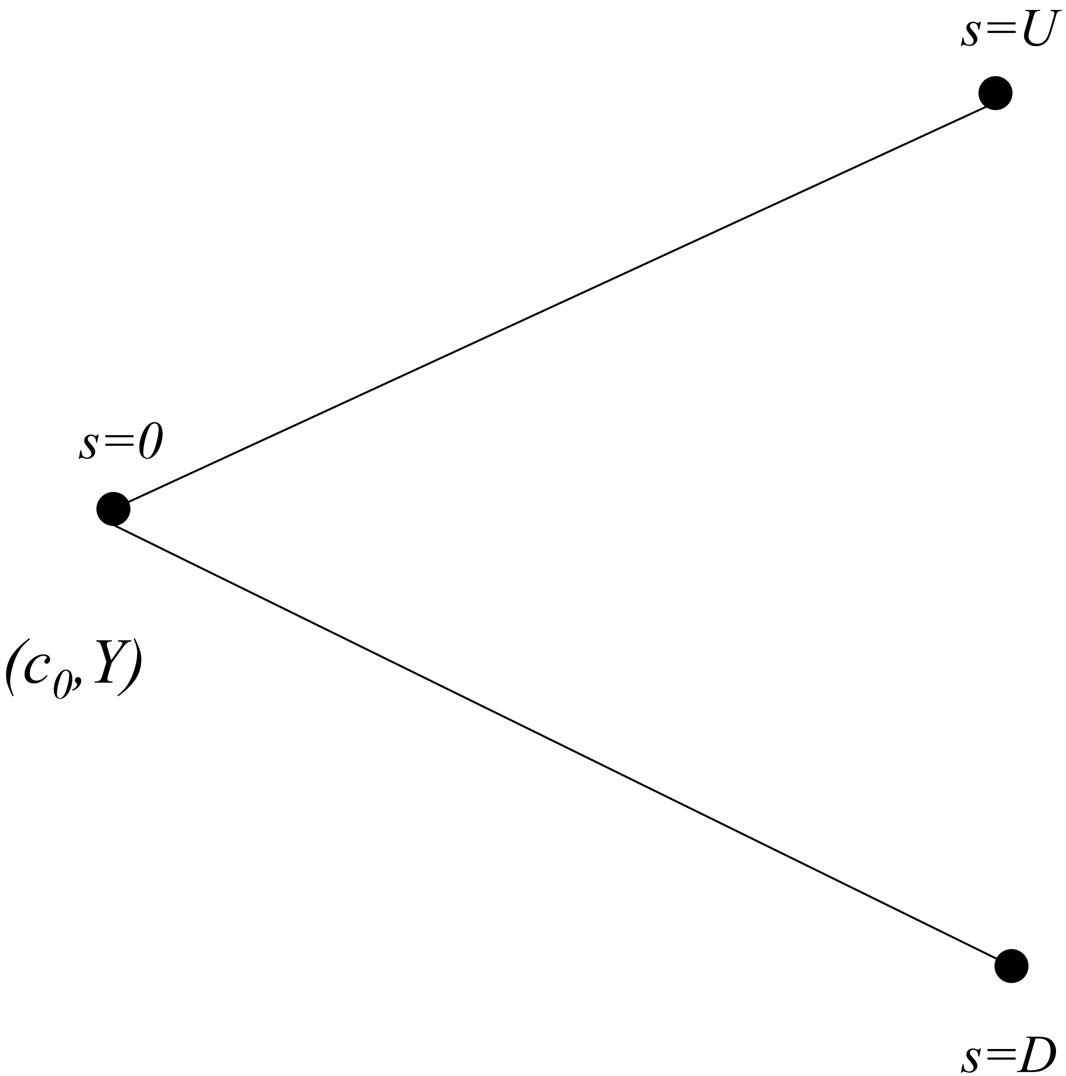
- Two goods, linear utilities, continuum of heterogeneous agents to get marginal buyer.
- All for simplicity.
- Called C – model in Geanakoplos 2003, 2010, Fostel-Geanakoplos (2012 etc).

Tree of States and Commodities



Durable consumption c
Durable asset Y
Endowments only at 0

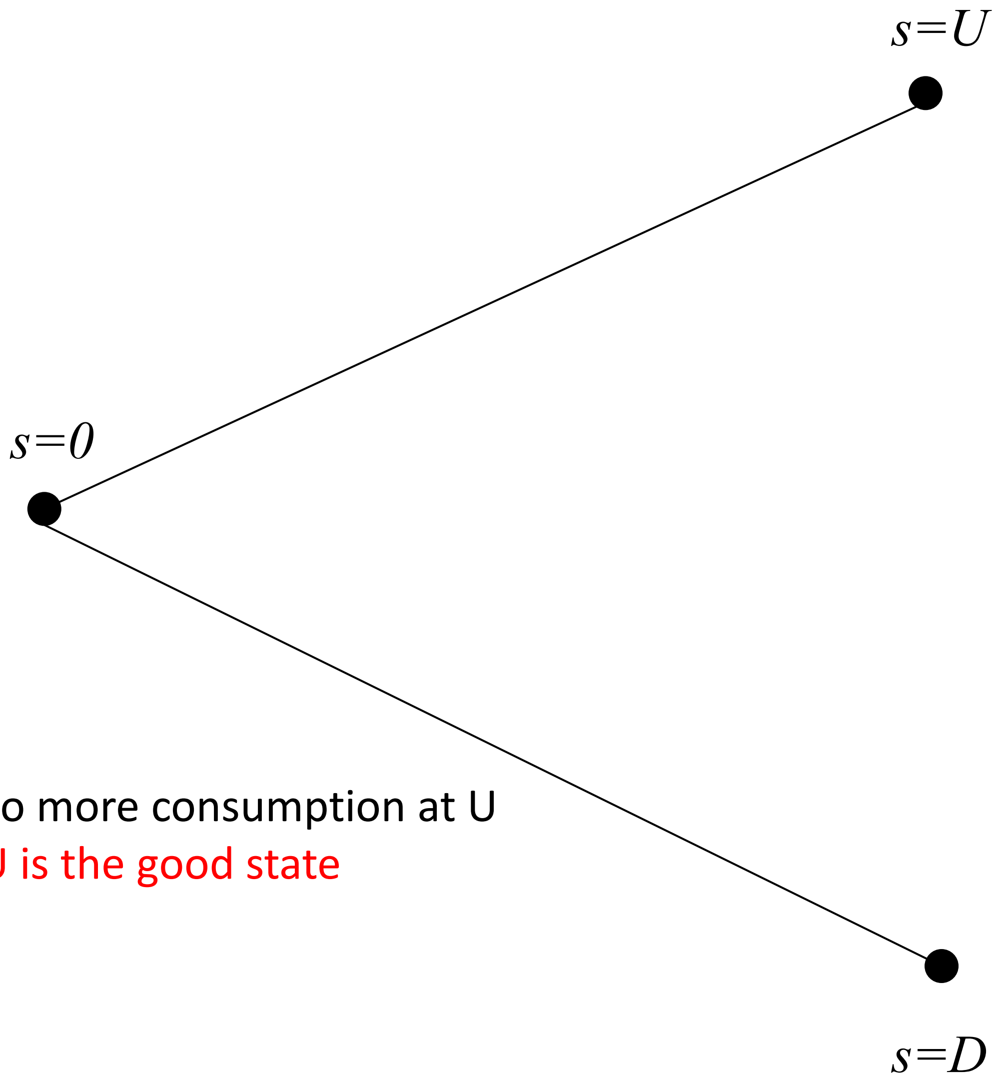
Durability/Production Hypothesis



$$c_U = F_U(c_0, Y) = c_0 + d_U Y$$

$$c_D = F_D(c_0, Y) = c_0 + d_D Y$$

Durability/Production Hypothesis



	One unit of Y_0	One unit of c_0
$s=U$	d_U	1
$s=D$	$d_D < d_U$	1

So more consumption at U

U is the good state

Agents

Continuum of agents $i \in I = [0, 1]$.

Risk neutral.

No discounting.

$i=1$

$i=0$

Utilities and Endowments

Expected utility to agent i is

$$U^i(c_0, Y, c_U, c_D) = \gamma(i)c_U + (1 - \gamma(i))c_D$$

Each agent $i \in (0,1)$ has initial endowments only at time 0:

$$e^i = (e_0, e_Y, 0, 0)$$

Utility comes only from final period. With linear Utility, nothing gained from allowing early consumption

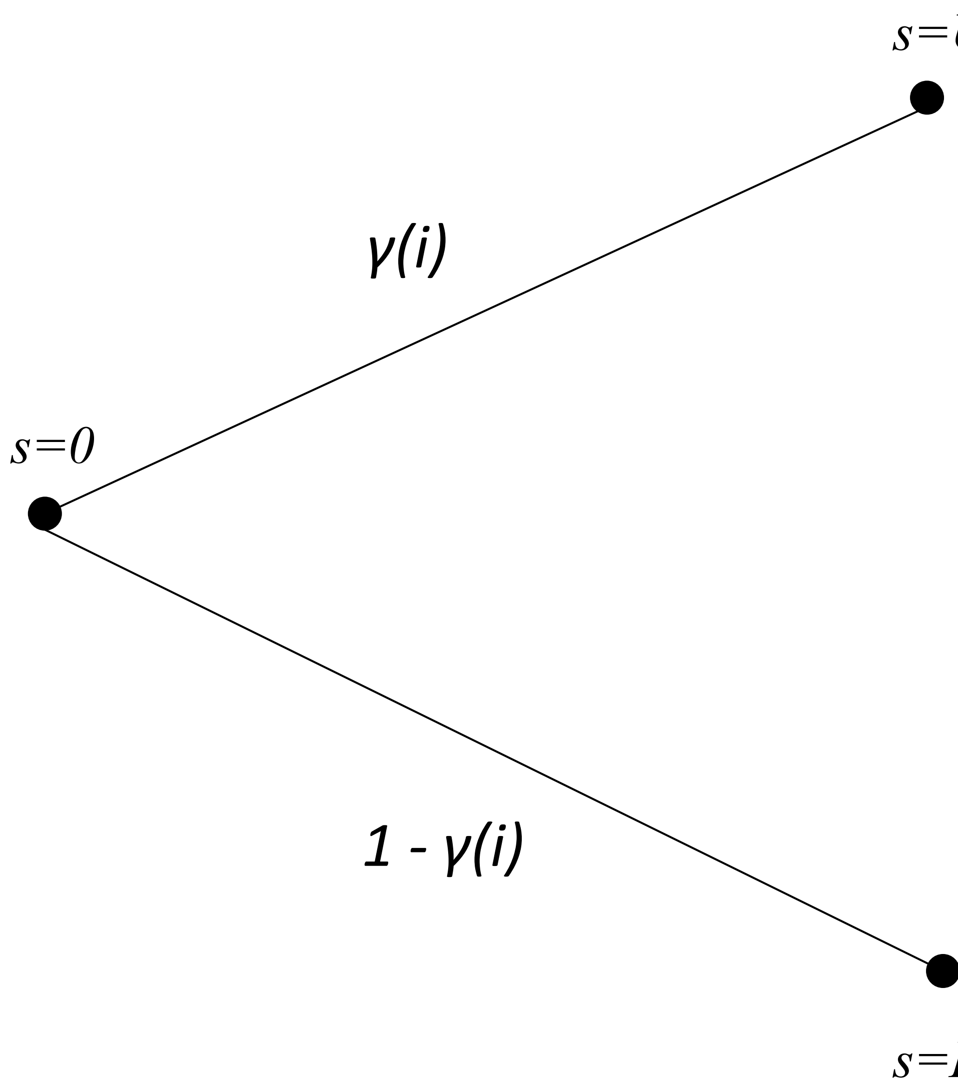
Agent Heterogeneity reason for trade

The only source of heterogeneity is in subjective probabilities,

$$(\gamma_U^i, \gamma_D^i) = (\gamma(i), 1 - \gamma(i)).$$

We assume $\gamma(i)$ increasing and continuous.

Utility Hypothesis



Assume $\gamma(i)\uparrow$ *as i* $\uparrow$

High i are optimists

High i want to buy U payoffs

Middle i are neutral

Middle i want to buy safe assets

Low i are pessimists

Low i want to buy D payoffs

Collateralized Financial contracts

A financial contract is an ordered pair

$$j = \Big((j_U, j_D), 1_Y \Big)$$

Promise: $j = (j_U, j_D)$ denotes the promise in units of consumption good in each final state.

Collateral: 1_Y denotes one unit of asset Y used as collateral.

- Only Y used as collateral (not c)
- Includes short selling as special case, assuming you need collateral to short sell.

Actual delivery of contract j is (non-recourse):

$$(\delta_U, \delta_D) = \left(\min(j_U, d_U), \min(j_D, d_D)\right)$$

Price π

Residual held by borrower

$$(d_U - \delta_U, d_D - \delta_D)$$

Effective Price

$p_Y - \pi$

Borrower must have wealth!

Interpretation of contract as Tranching

- Holder of collateral uses it to back one promise.
- That effectively tranches collateral payoffs into two pieces, a (senior) piece the lender holds and the (junior) residual piece the borrower holds.
- Alternatively, could imagine an intermediary buys the collateral and splits it into two tranches and then sells the pieces.
- Competition would drive intermediary profits to zero.
- $p_Y = (p_Y - \pi) + \pi$
- As if collateral tranched and original owner owns the tranches. Trade then occurs in tranches, not in Y. Like debt and equity.

Contract is a collateralized loan.

Price of contract $j \in J$ is π_j.

An agent can borrow π_j today by selling the contract j in exchange for a promise (j_U, j_D) tomorrow.

Let $\varphi_j > 0\,(< 0)$ be the number of contracts j bought (sold) at time 0.

Collateral Technology J

- J = set of available contracts

Agent Budget Set when each Collateral backs one loan

$$B^i(p,\pi) = \Big\{ (c_0, y, \varphi, c_U, c_D) \in R_+^{L_0} \times R^J \times R_+^{L_T} :$$

$$c_0 + py + \sum_{j\in J} \varphi_j \pi_j \le e_0 + pe_Y,$$

Each unit of y backs
One promise

$$\sum_{j\in J} \max(0, -\varphi_j) \le y,$$

$$c_s = F_s(c_0, y) + \sum_{j\in J} \varphi_j \min(j_s, d_s), s \in S_T \Big\}.$$

Collateral equilibrium for $E = (S, \{c,Y\}, (\gamma(i),(e^i_{C0}, e^i_{Y0})_{i\in I}, F, J)$

$((p,\pi),(c_0^i, y^i, \varphi^i, c_U^i, c_D^i)_{i\in I}) \in (R_+ \times R_+^J) \times (R_+^{L_0} \times R^J \times R_+^{L_T})^I$
such that

1. $\int_0^1 c_0^i di = e_0$

2. $\int_0^1 y^i di = e_Y$

3. $\int_0^1 \varphi_j^i di = 0 \ \forall j \in J$

4. $(c_0^i, y^i, \varphi^i, c_U^i, c_D^i) \in B^i(p,\pi), \forall i$ and $(c_0, y, \varphi, c_U, c_D) \in B^i(p,\pi) \Rightarrow U^i(c_0, y, \varphi, c_U, c_D) \leq U^i(c_0^i, y^i, \varphi^i, c_U^i, c_D^i), \forall i$

Multiple Tranches?

- We have allowed for one loan, or equivalently two tranches, for each collateral.
- More generally could allow for many tranches, but typically would need more notation, as in Geanakoplos-Zame 2013.
- They showed that when J allows for every possible tranche, equilibrium tranching will always be into Arrow securities.
- With two states, perfect tranching requires only two tranches, so our notation covers it.

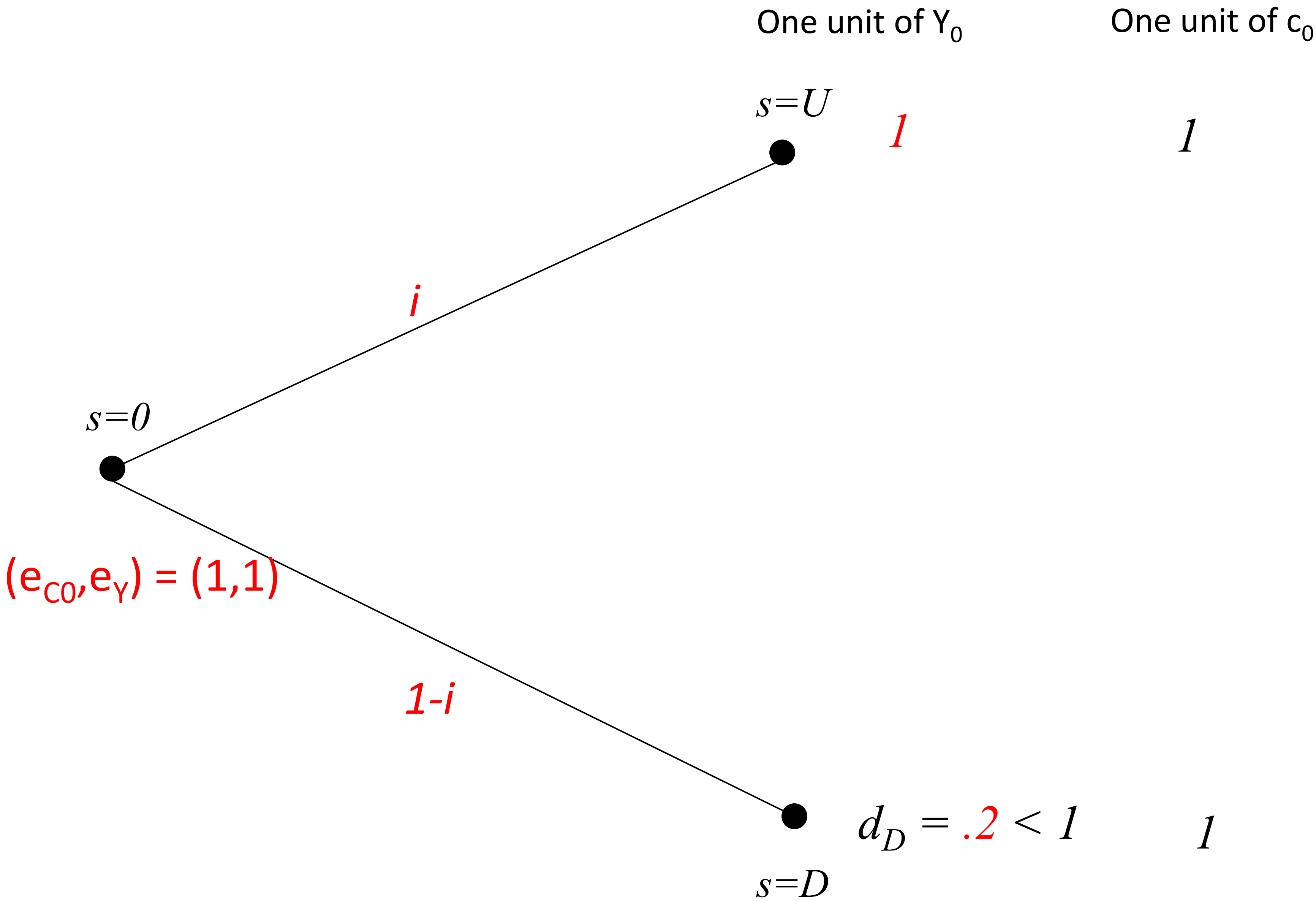
Collateral Technology J

- J = set of available contracts

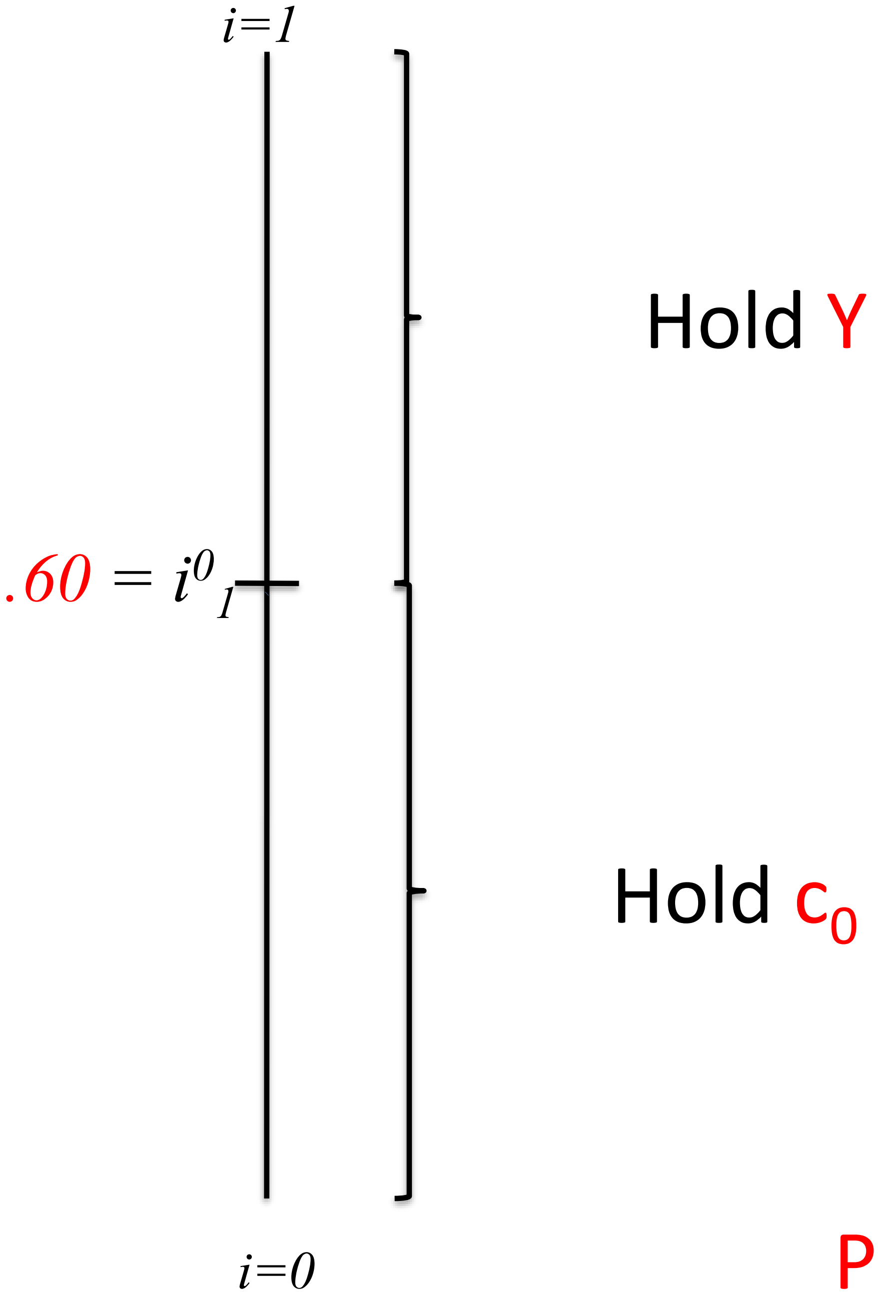
Leading Examples

- India: $J^0 = \phi$
  - No collateral
- Europe: $J^* = \{(j,j): j > 0\}$
  - Riskless promises
- U.S.: $J = \{(j_{U,}j_D) \geq 0\}$
  - All promises

Example



India Autarkic Equilibrium



$P_Y^0 = .68 = MU(i^0_1)$

Europe Autarky Equilibrium

Europe Autarky Contracts

For all $J^* = \{j : j = ((j, j), 1_Y)\}$. Contracts are non-contingent promises (collateralized debt).

Trade in:

risky asset Y^* and durable good c^*.

non-contingent promises j (debt contracts or loans) using the asset Y^* as collateral.

Europe Contracts

Agents can trade any contract j, and every contract is priced in equilibrium. In this sense leverage is endogenous.

But which contract(s) are traded in equilibrium?

In Europe autarky equilibrium, as if $J^* = \{j^* = (d_D, d_D)\}$

Theorem:

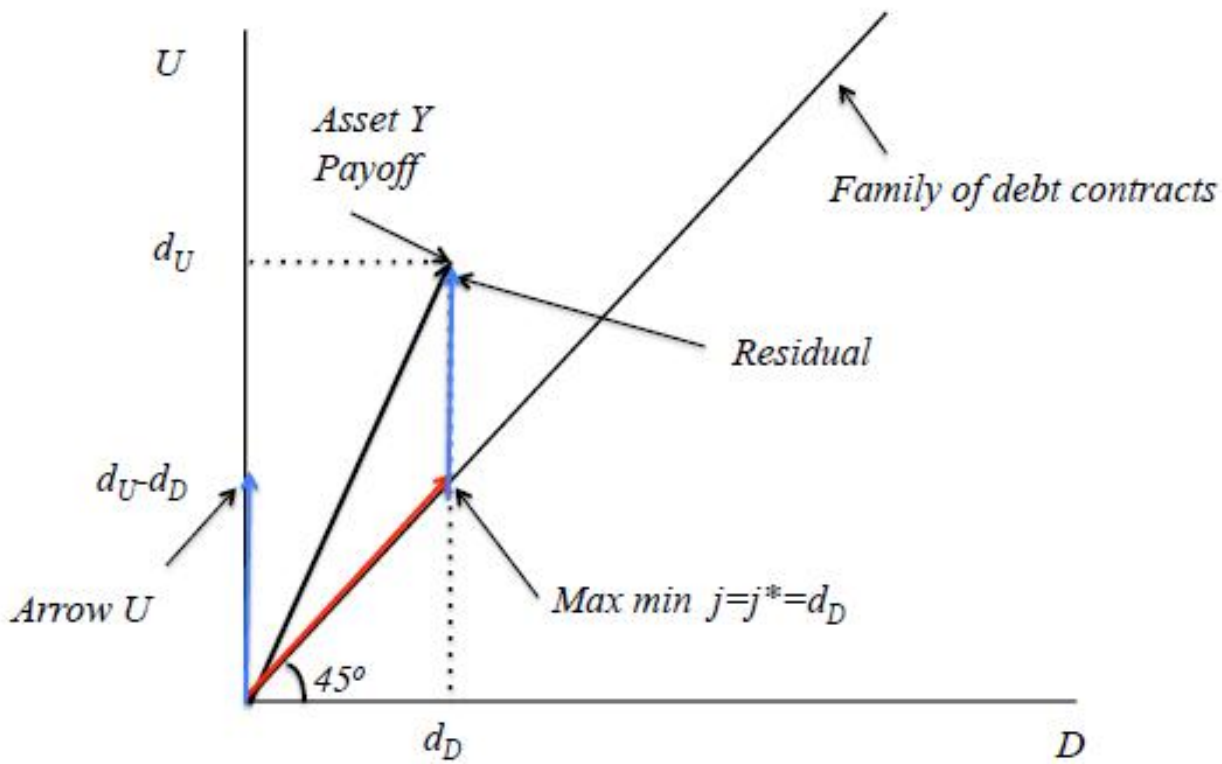
In the C-model the only contract traded in equilibrium is the default-free maxmin contract $j^* = d_D = .2$ and the risk-free rate is zero ($\pi = .2$).

Geanakoplos (2003, 2010) and Fostel-Geanakoplos (2012)

Endogenous Leverage

What does it mean to leverage Y?

Leverage tranches Y into Up Arrow securities and a riskless bond



Amount of riskless bonds limited by d_D
Riskless bond has same payoffs as durable consumption

Europe Autarky effectively

- Has trading in Up Arrow securities, riskless real bonds, and consumption.
- Consumption and riskless bonds are perfect substitutes.
- So like trade in two goods.

Europe Autarky

$i=1$

Leverage Y^*: buy Y^* and sell $j^*=j_D$ (buy Arrow U^*)

$.69 = i^*_1$

Buy the riskless bond $j^*=d_D$ and consumption good, c^*.

$i=0$

P* = .75

Geanakoplos 2003, 2010

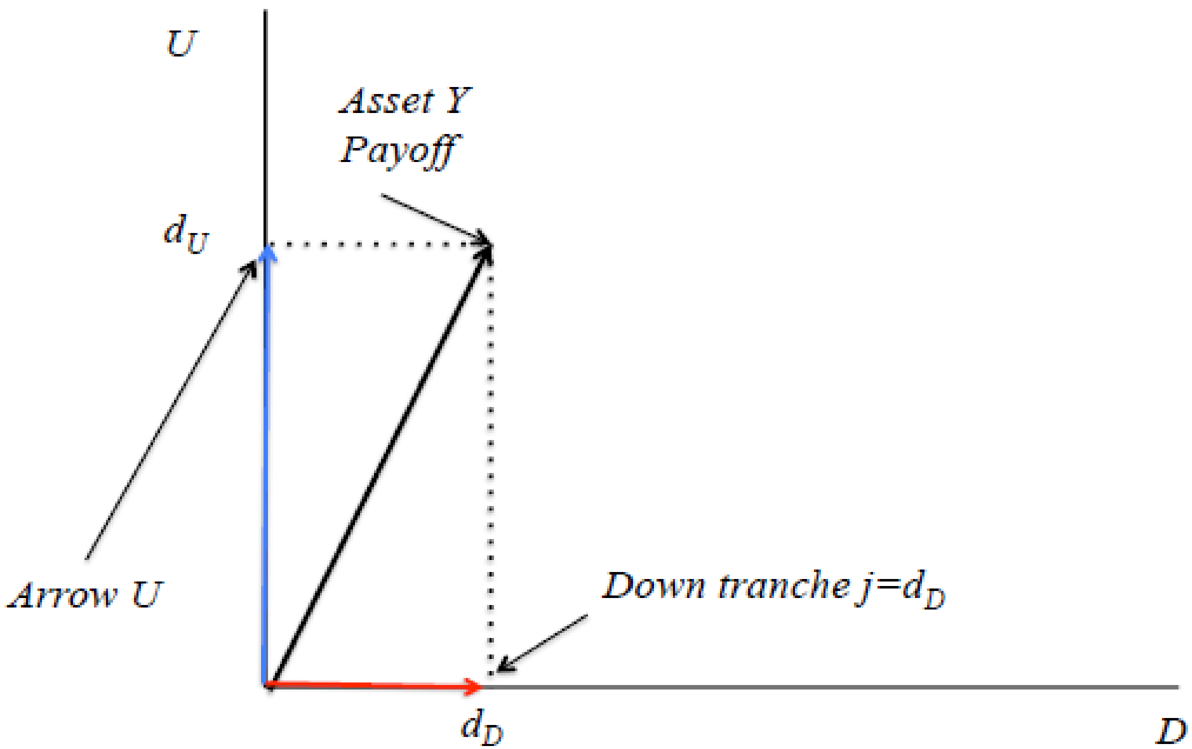
U.S. Autarky Equilibrium

In U.S. autarky equilibrium, as if $J = \{(0, d_D)\}$

J consists of the single promise $j_T = ((0, d_D), 1_Y)$, which implies agents can completely tranche Y.

Agents can sell a "down tranche" against one unit of the Home risky asset Y.

What does it mean to tranche Y?



Amount of Arrow Down securities limited by d_D

Tranching splits the cash flows into and Arrow U and an Arrow D.

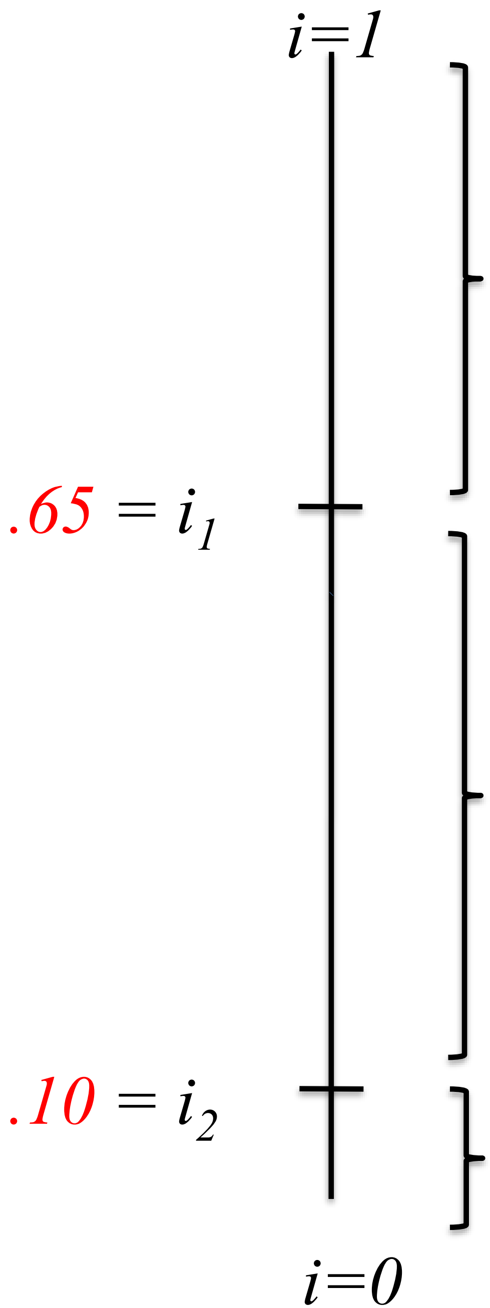
The buyer of the asset is effectively buying an Arrow U security.

The lender is effectively buying an Arrow D security.

U.S. Autarky effectively

- Has trading in Up Arrow securities, Down Arrow securities, and consumption.
- So like trade in three goods.

U.S. Autarky



Tranche Y: buy Y and sell Down tranche j_T (buy Arrow U)

$P_Y = .83$

$P_T = .18$

Hold consumption good c.

Buy Down tranche j_T i.e. buy Down Arrow Security

Fostel-Geanakoplos 2012

International Equilibrium

- Home = U.S.   Collateral Technology J.
- Foreign = Europe   Collateral Technolog J*

- Collateral technology applies to goods Y and Y*, not to who owns them.

International Equilibrium

- Home assets perfectly tranched, Foreign assets leveraged.
- Everybody can now buy
  - Up Arrow securities (made in Home and Foreign)
  - Down Arrow securities (made only in Home)
  - Consumption (from both) and riskless bonds (made only in Foreign)
- Riskless bonds and consumption are perfect substitutes, as are U Arrow and U* Arrow.
- So effectively trade 3 goods.

After financial integration, the regime in both countries (marginal buyers) will be the same since countries' fundamentals are identical except for J.

International Equilibrium

$i=1$

Tranche Y and leverage Y^* (buy Arrow U and U^*).

$.67 = \hat{\imath}_1$

Hold riskless bond $j^* = d_D$ and consumption goods c and c^*.

$P^\wedge_H = .86 > .83$

$P^\wedge_F = .73 < .75$

$P^\wedge_T = .19 > .18$

$.05 = \hat{\imath}_2$

Buy the Down tranche j_T.

$i=0$

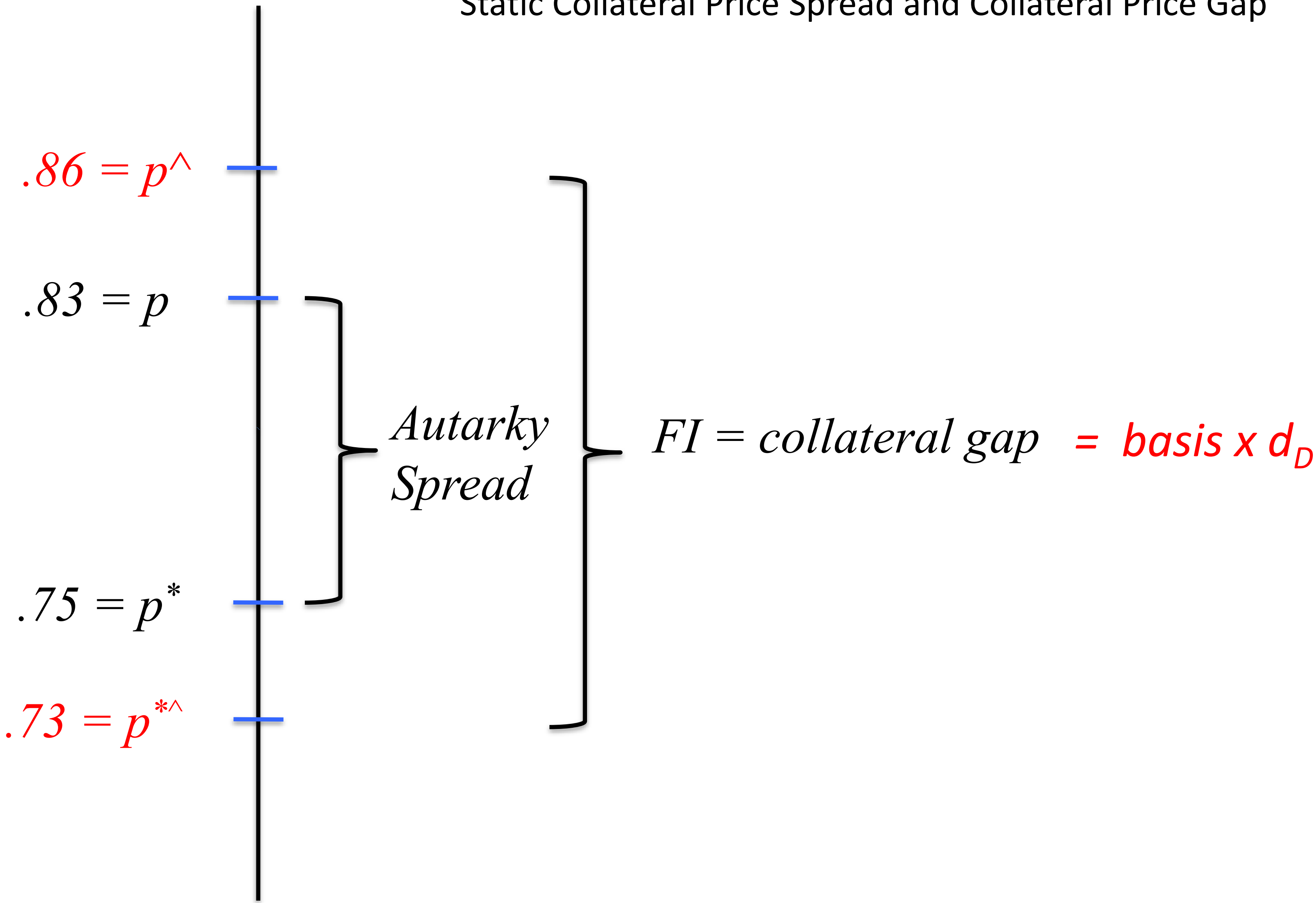
Proposition 1: Gross Flows go in Both Directions despite identical countries.

- Proof: Foreign wants to buy down tranche it can't create itself. Foreign must sell bonds or consumption to get Arrows (in fact both).
- Foreign will also buy Up arrow securities since Home makes so much more of them.

Proposition 2: Law of one Price Fails. Asset Prices Diverge.

- After trade, the price of Y rises and the price of Y* falls.
- After trade, price of Y is higher than price of Y*. Called collateral gap because due to fact Y is better collateral.
- After trade the basis = price of Arrow Up security + price of Arrow Down security – price of riskless bond is positive.
- Collateral gap = basis x d_D.

Static Collateral Price Spread and Collateral Price Gap



Proposition 3: Home runs permanent trade deficit, i.e. at 0, U, D.

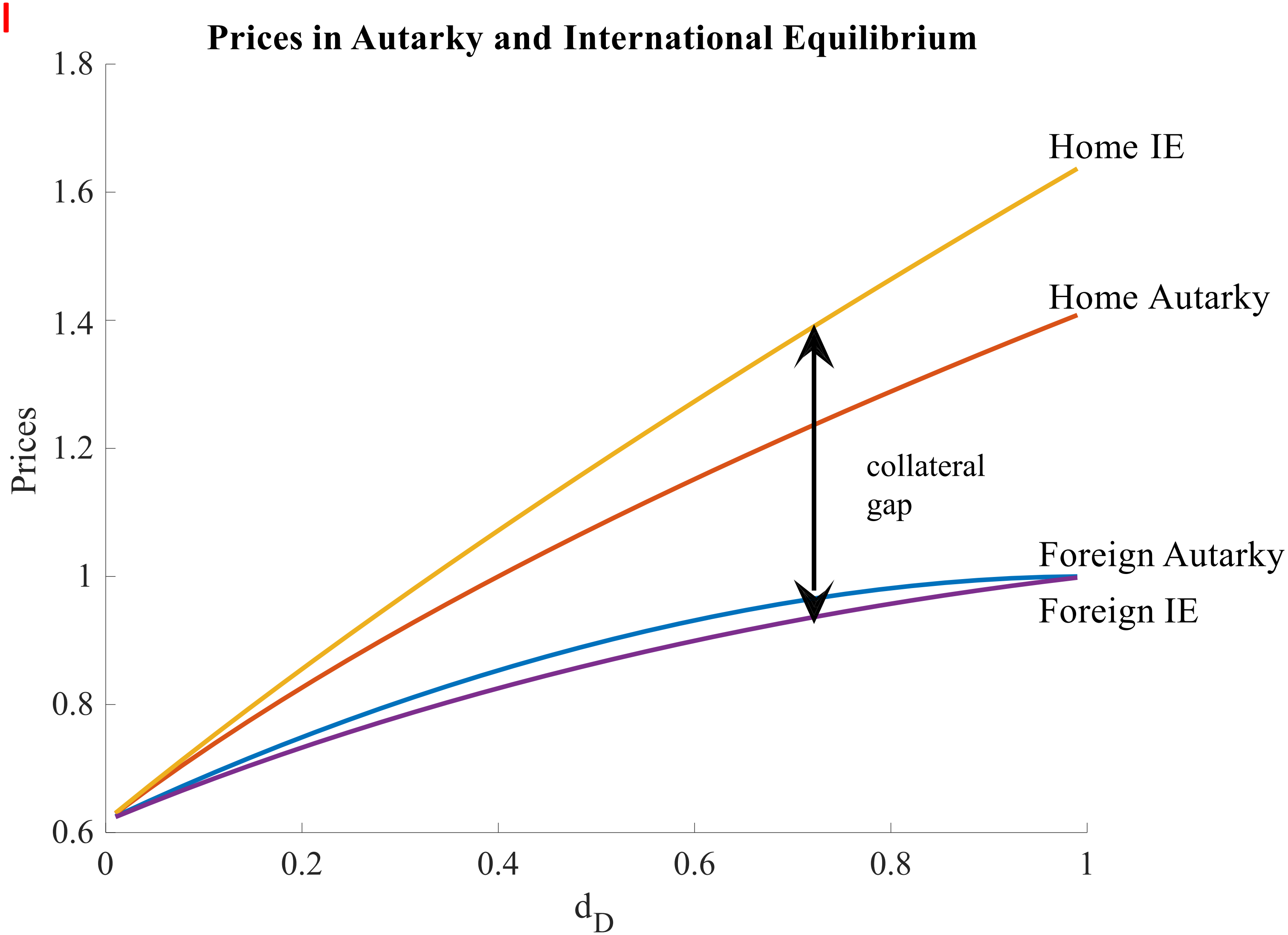
- Home trades valuable Arrow Ups and Downs in exchange for Bonds and Consumption, selling a portfolio that pays strictly less than just the bonds for the same total price. Hence in states U and D Home receives net payments beyond its durable consumption, which Home uses to purchase more consumption.

Proposition 4: Prices, collateral gap, and trade imbalances rise with d_D

- Naturally because d_D quantifies what Home can do but Foreign cannot. Create down tranches.
- Proposition 4 only confirmed in example. Other propositions proved generally.

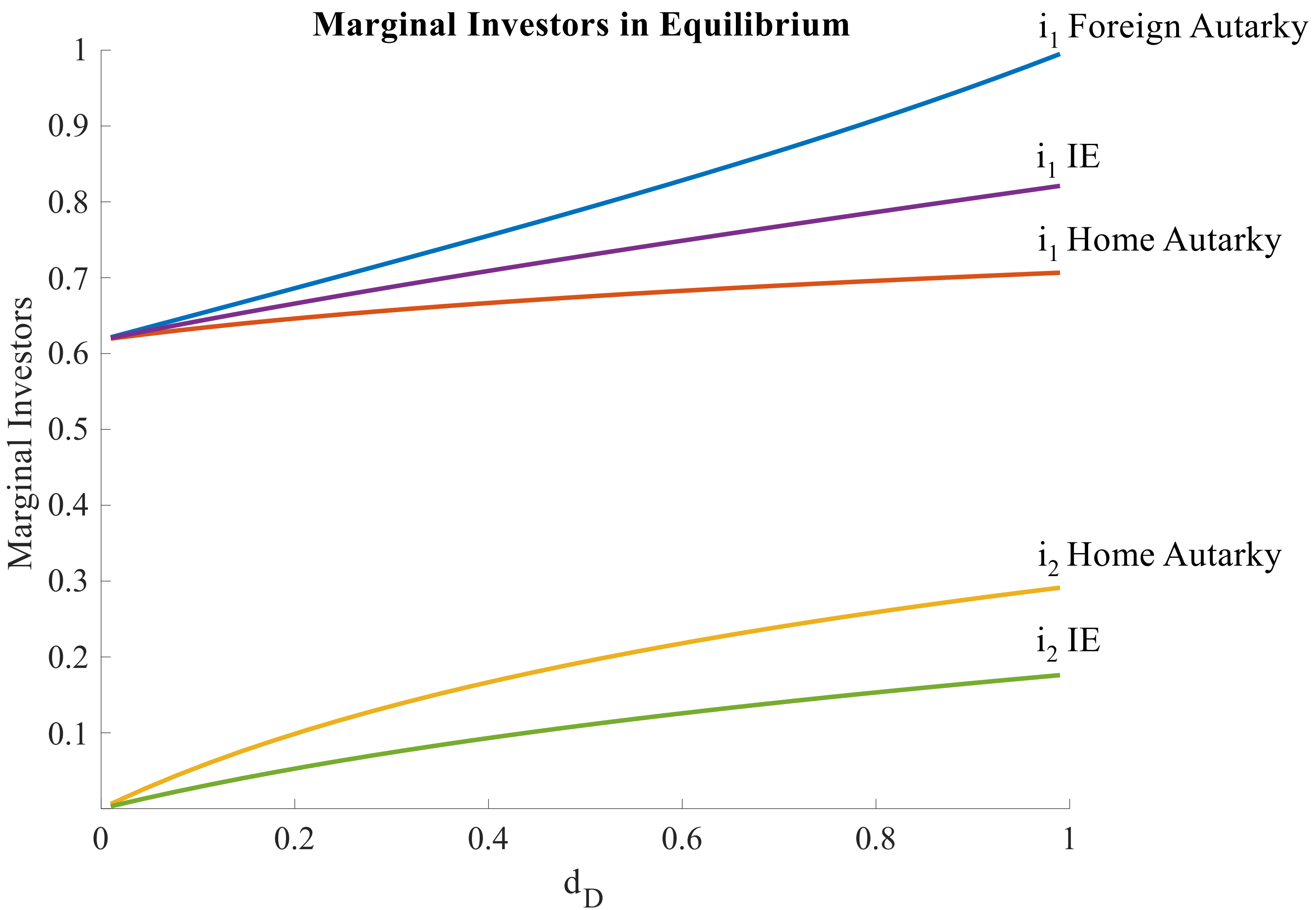
International Equilibrium

$\gamma(i) = i$

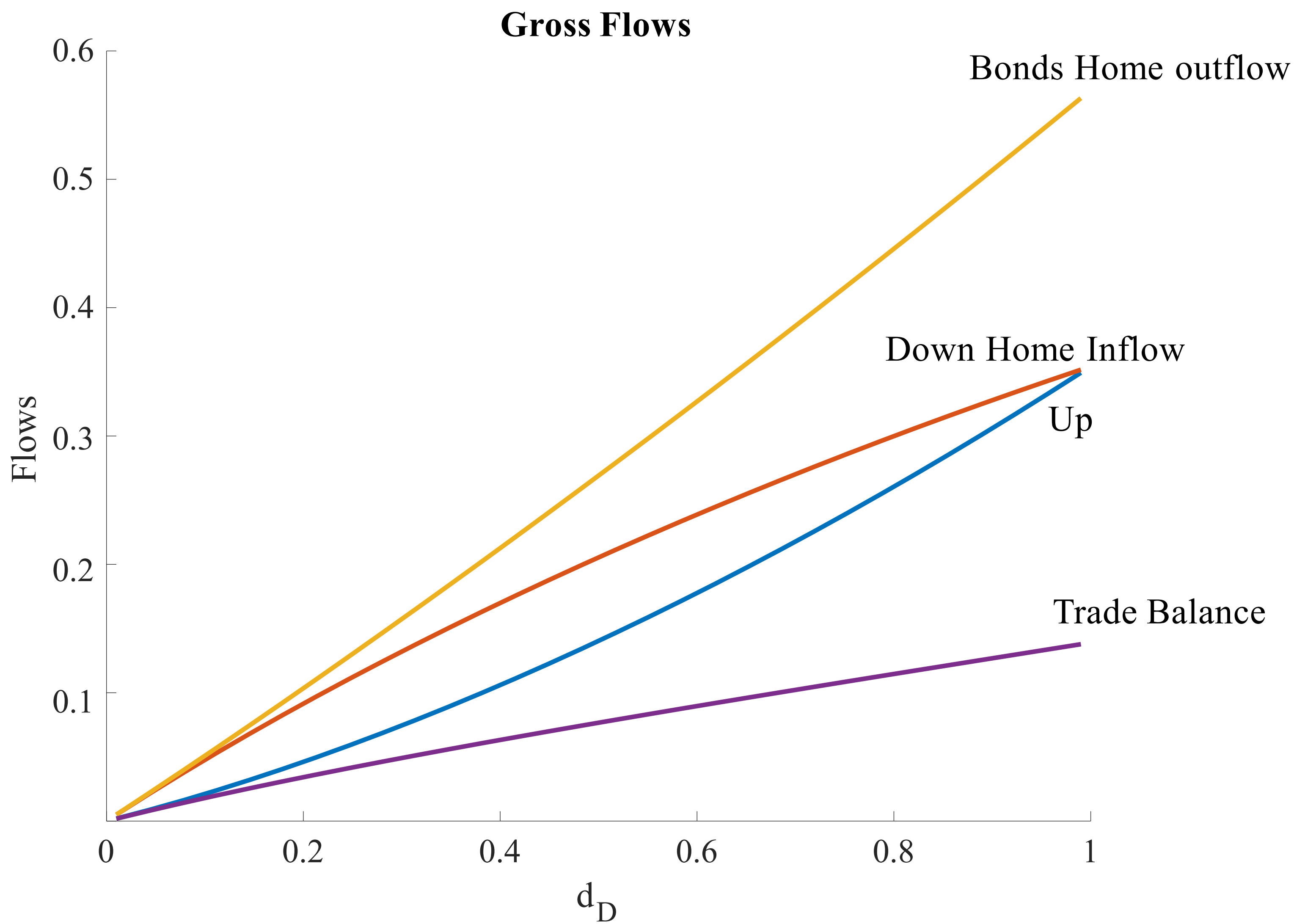


Collateral gap grows with d_D

International Equilibrium



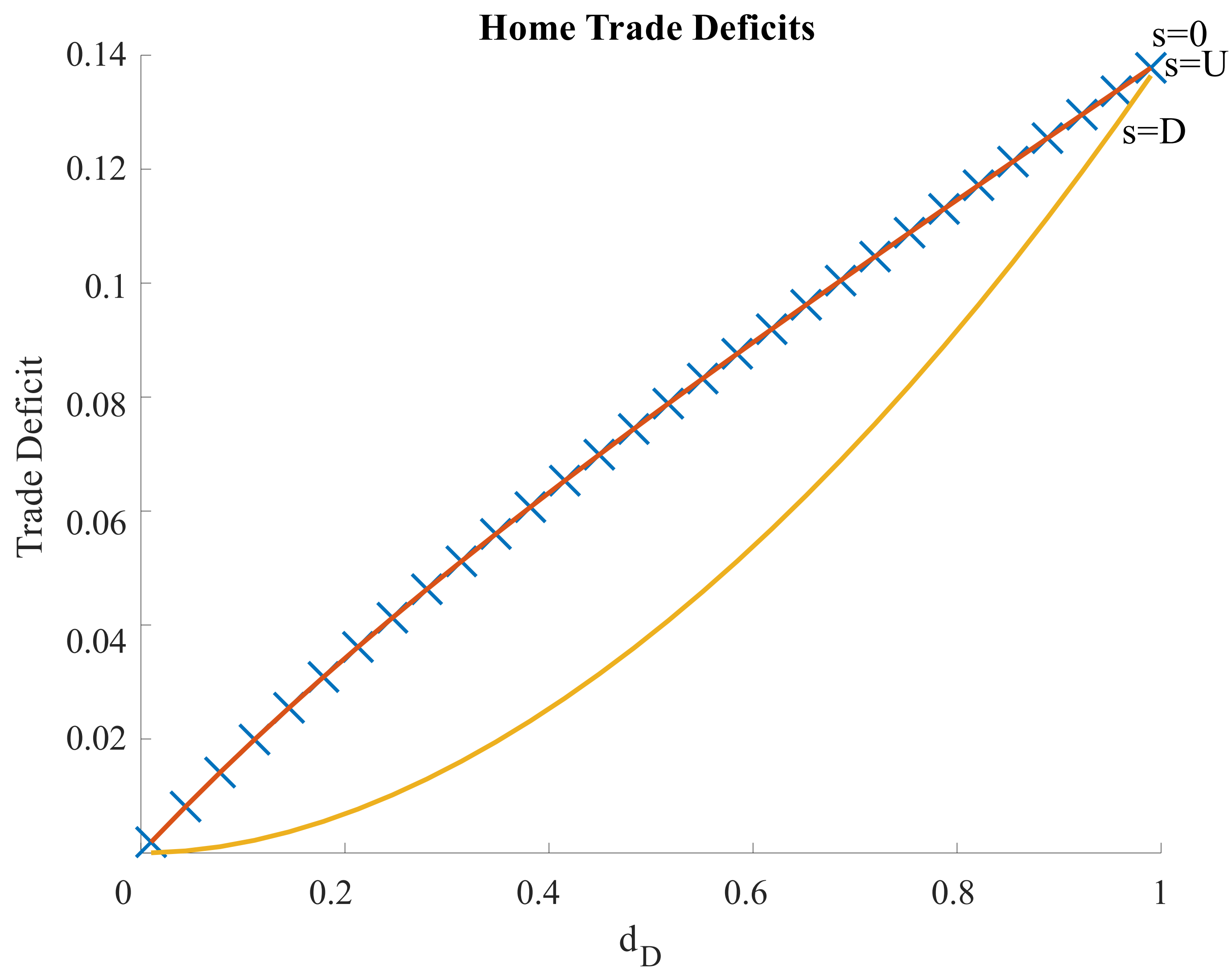
International Equilibrium



Gross flows and trade imbalance grow with d_D

Trade Balance vey small compared to gross flows

International Equilibrium



Permanent trade imbalance growing with d_D

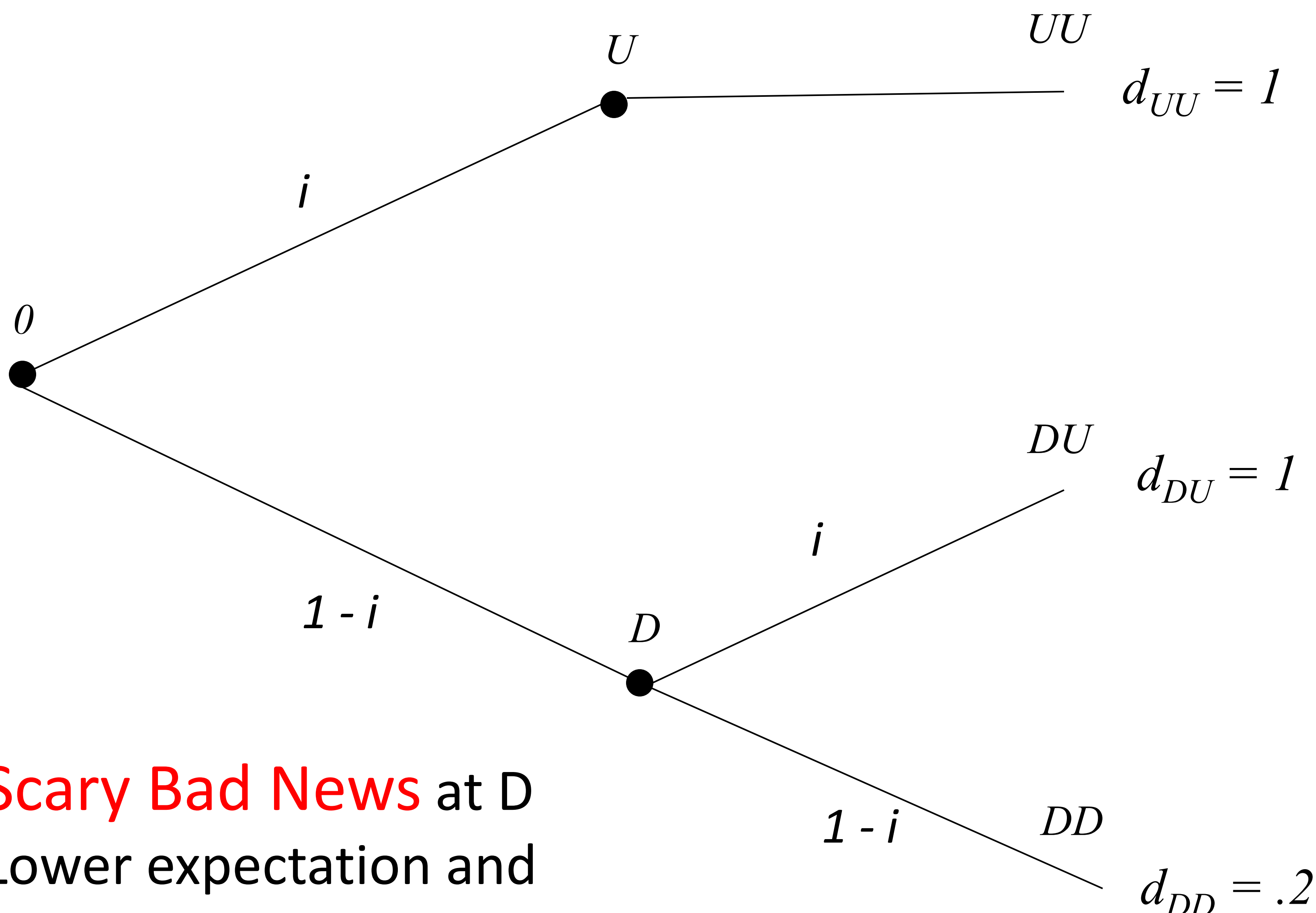
Dynamic Model

We use a dynamic, 3-period C-model to consider the effects of financial integration on volatility of flows and prices.

Multiple periods needed to see volatility.

Get much bigger effects with same production as static.

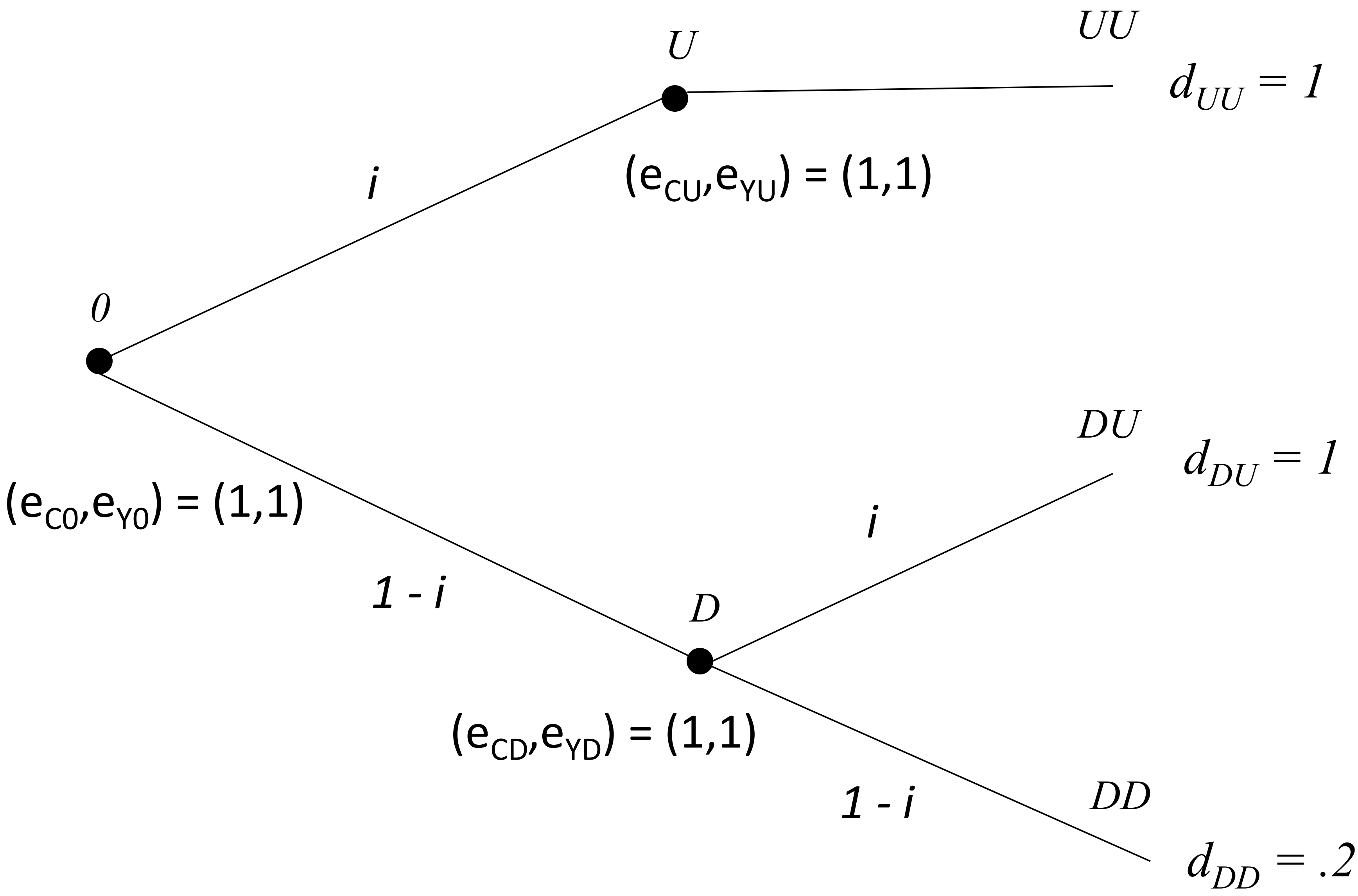
Dynamic Example



Scary Bad News at D
Lower expectation and
Higher volatility

Optimist at 0 stays relatively optimistic at D

Dynamic Example



Dynamic Foreign Autarky

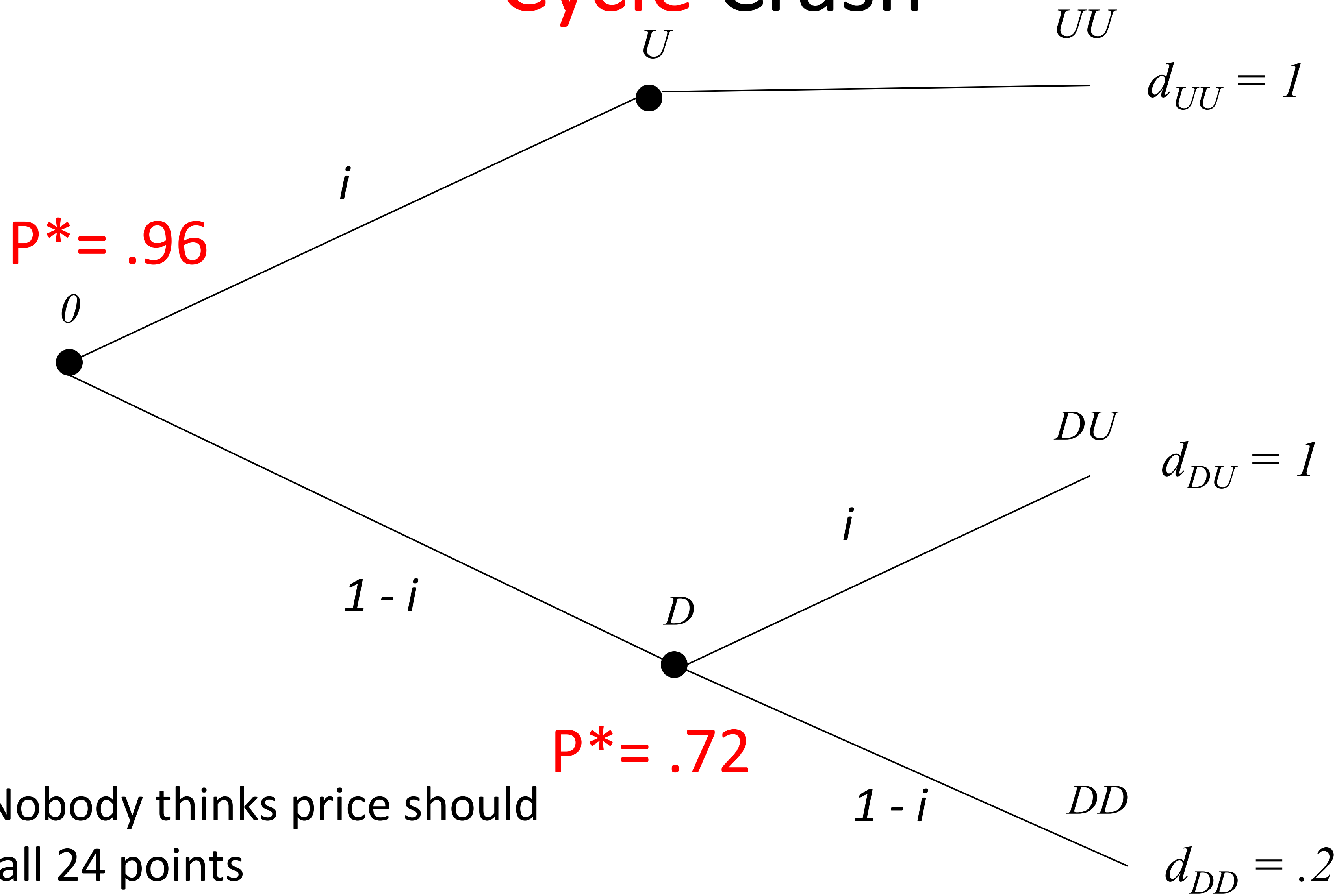
Dynamic Foreign Autarky Contracts

Contracts are non-contingent one-period promises (collateralized debt).

In each period still the maxmin contract is the only traded: $j_0^* = p_D^*$ and $j_D^* = d_{DD}$.

Regime in each state $s = 0, D$ as in the static model. Regime

Dynamic Foreign Autarky Leverage Cycle Crash



Nobody thinks price should fall 24 points

Adapted from Geanakoplos 2003, 2010

Leverage Cycle Volatility

In the Leverage Cycle the price fall for three reasons:

1) **Bad news.**

2) There is a **wealth re-distribution** away from the more enthusiastic buyers after bad news.

3) There is a **margin call** after bad news.

Can issue less non-contingent debt
After scary bad news.

Dynamic Foreign Autarky

s=0

$i=1$

Leverage Y^*

$.88 = i^*_0$

Buy the bond $j = p^*_D$ *and consumption good.*

$i=0$

s=D

$i=1$

Leverage Y^*

$.65 = i^*_D$

Buy the bond $j = d_{DD}$ *and consumption good.*

$i=0$

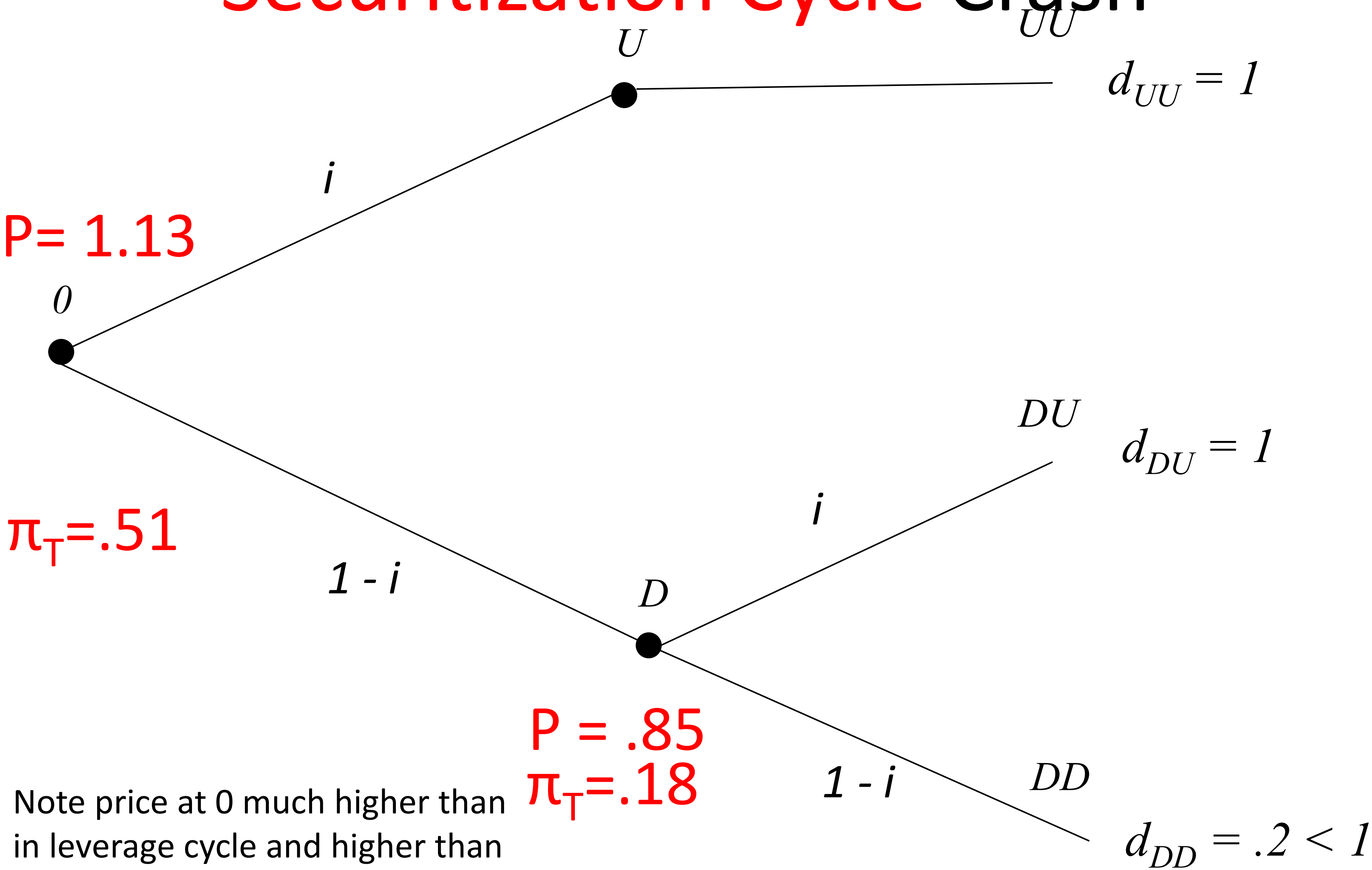
Dynamic Home Autarky

Dynamic Home Autarky Contracts

Contracts are down one-period tranches : $j_0^T = (0, p_D)$ and $j_D^T = (0, d_{DD})$.

Regime in each state $s = 0, D$ as in the static model. Regime

Dynamic Home Autarky
Securitization Cycle Crash



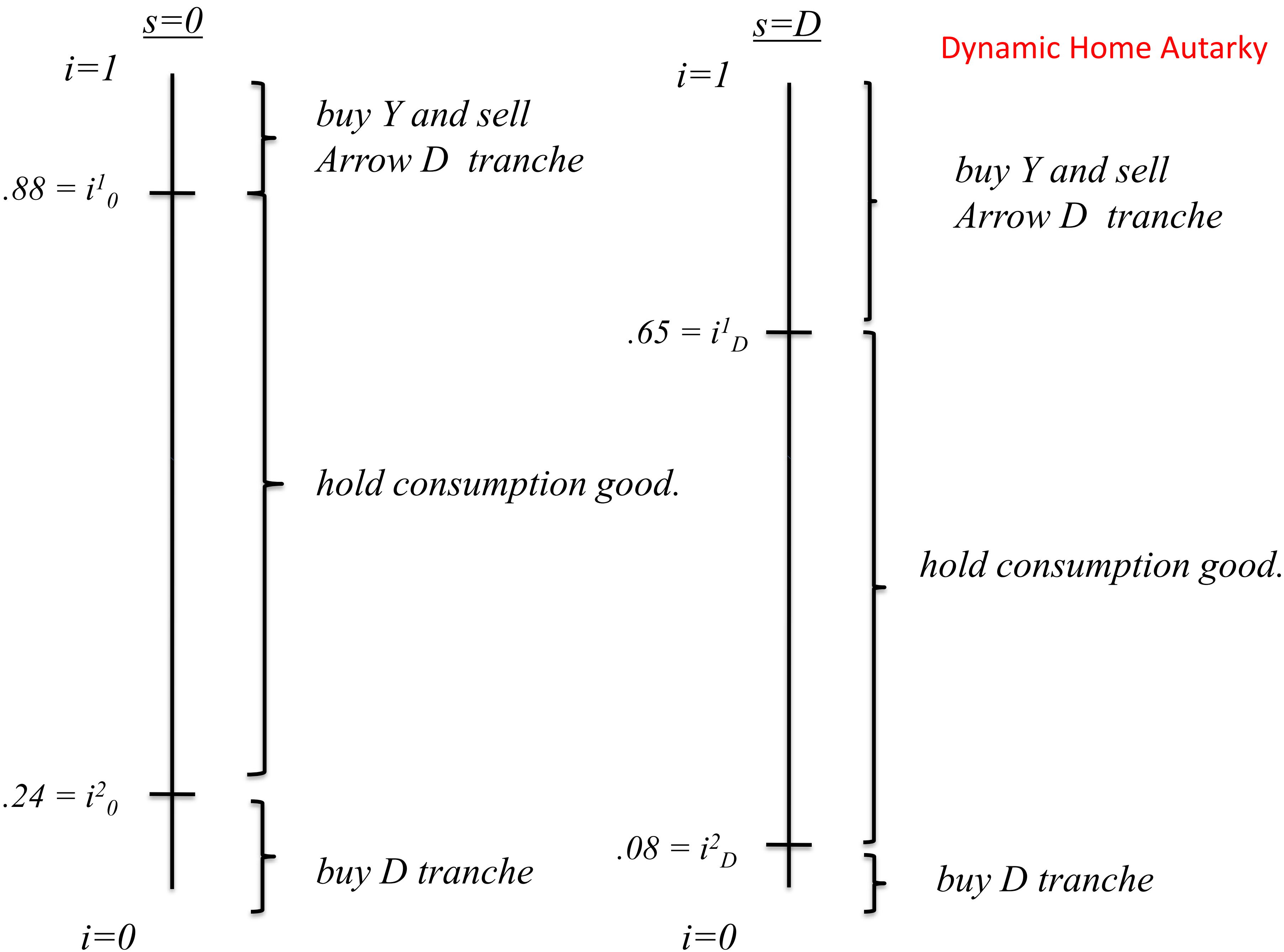
Note price at 0 much higher than in leverage cycle and higher than Price of consumption which pays (1,1,1) > (1,1,0.2)

Adapted from Fostel-Geanakoplos 2014

Dynamic Home Autarky Volatility

- Crash comes for very similar reasons as leverage cycle, but crash is bigger.
- Amount of down tranche that can be carved out of Y drops at D. It is the nature of scary bad news to come with worse downside risk.

Dynamic Home Autarky



Dynamic Home Autarky
Securitization Driven Prices Crash

Home experiences a <u>Securitization Cycle</u>:

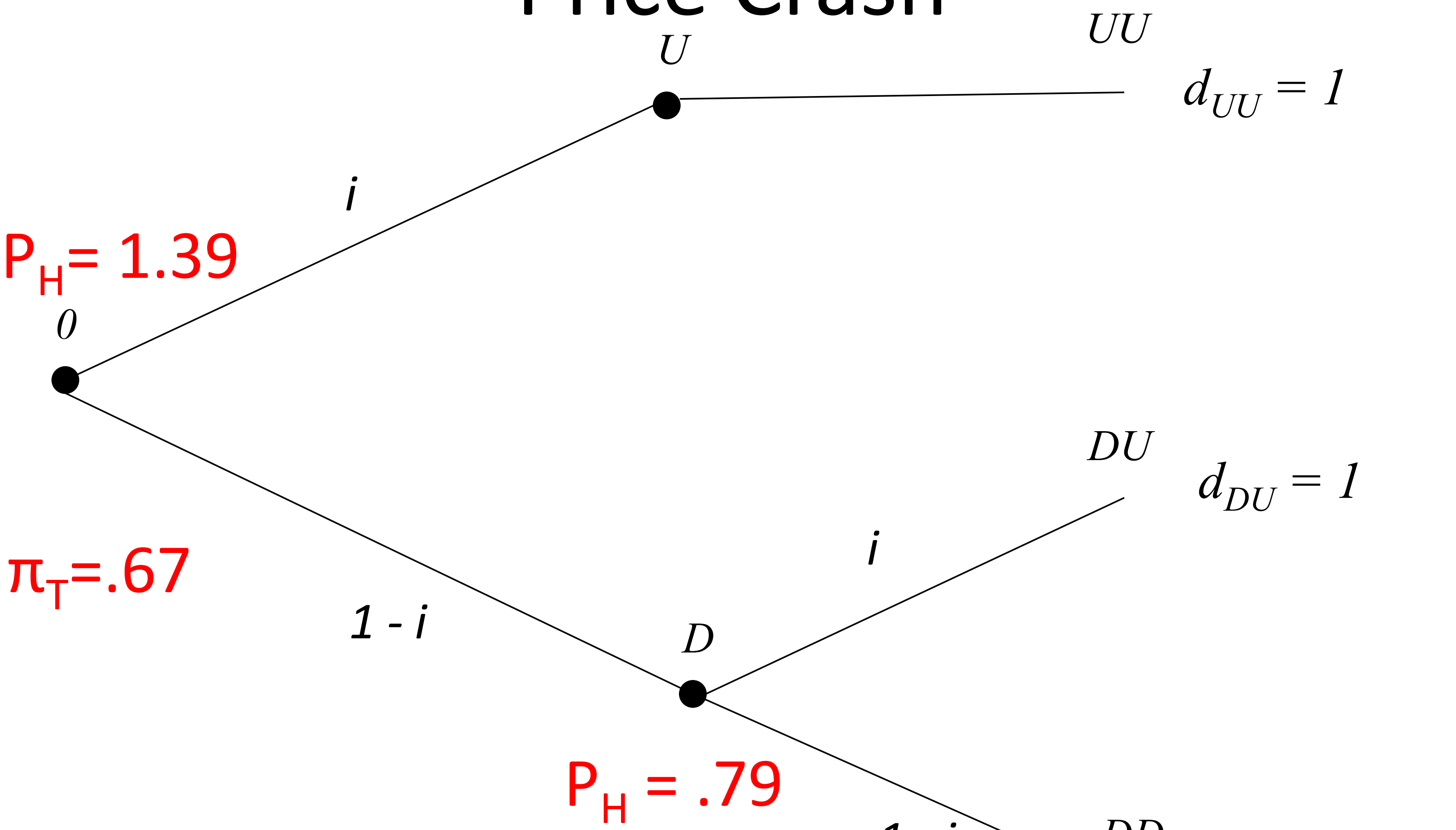
The amplification mechanism is even stronger than in the leverage cycle, since the movements in collateral values and wealth re-distribution are much bigger.

	$s = 0$	$s = D$	Crash
p^*	1.13	.85	41%
π_T	.51	.18	64%

Dynamic International Equilibrium

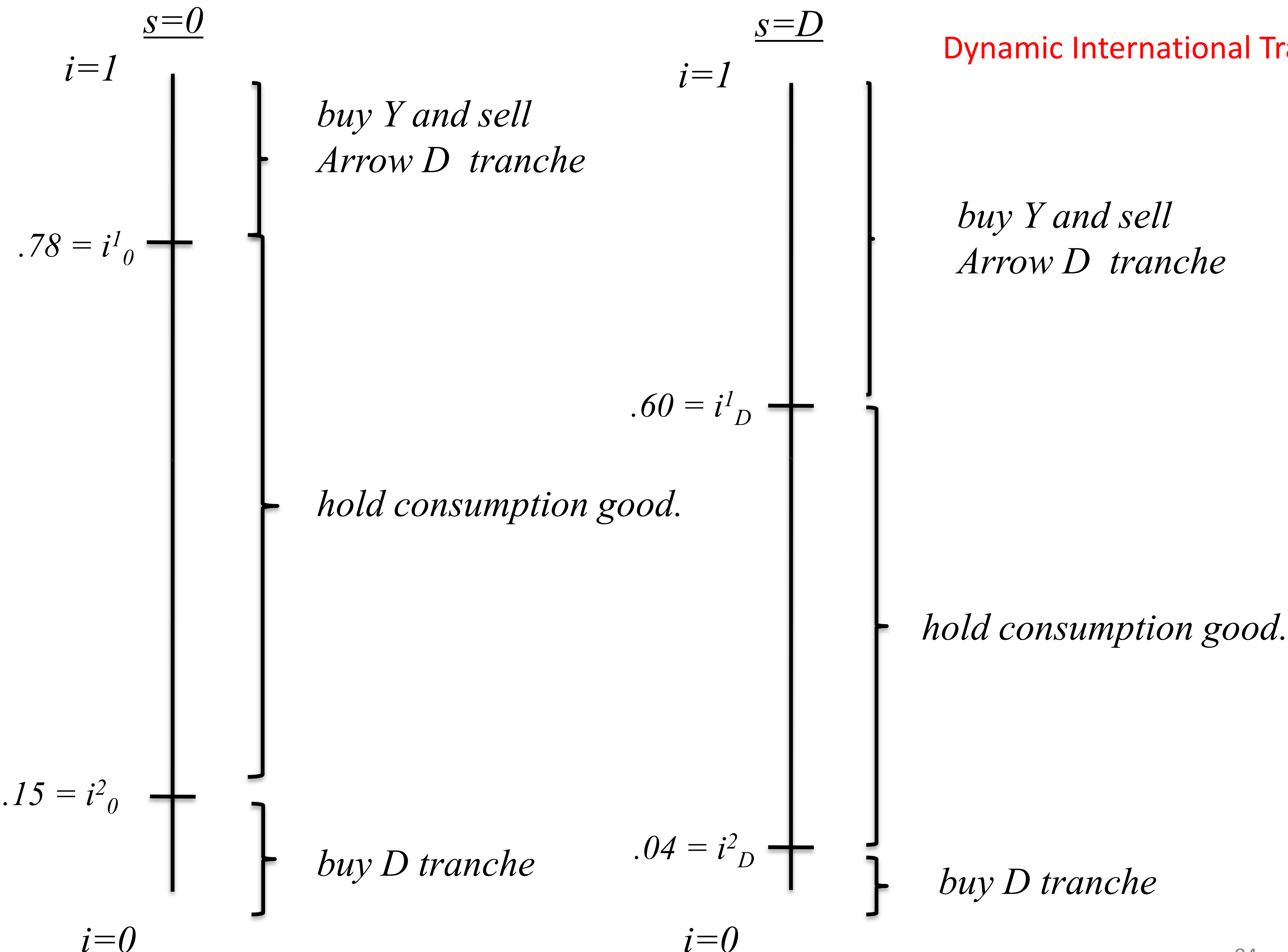
- The comparisons to autarky are analogous to the static case.
- The dynamic international equilibrium displays a crash from 0 to D for similar reasons as in the dynamic autarkic cases.
- International trade exacerbates the problems for both Home and Foreign.

Dynamic International Equilibrium
Price Crash



Note price at 0 much higher than in securitization cycle.

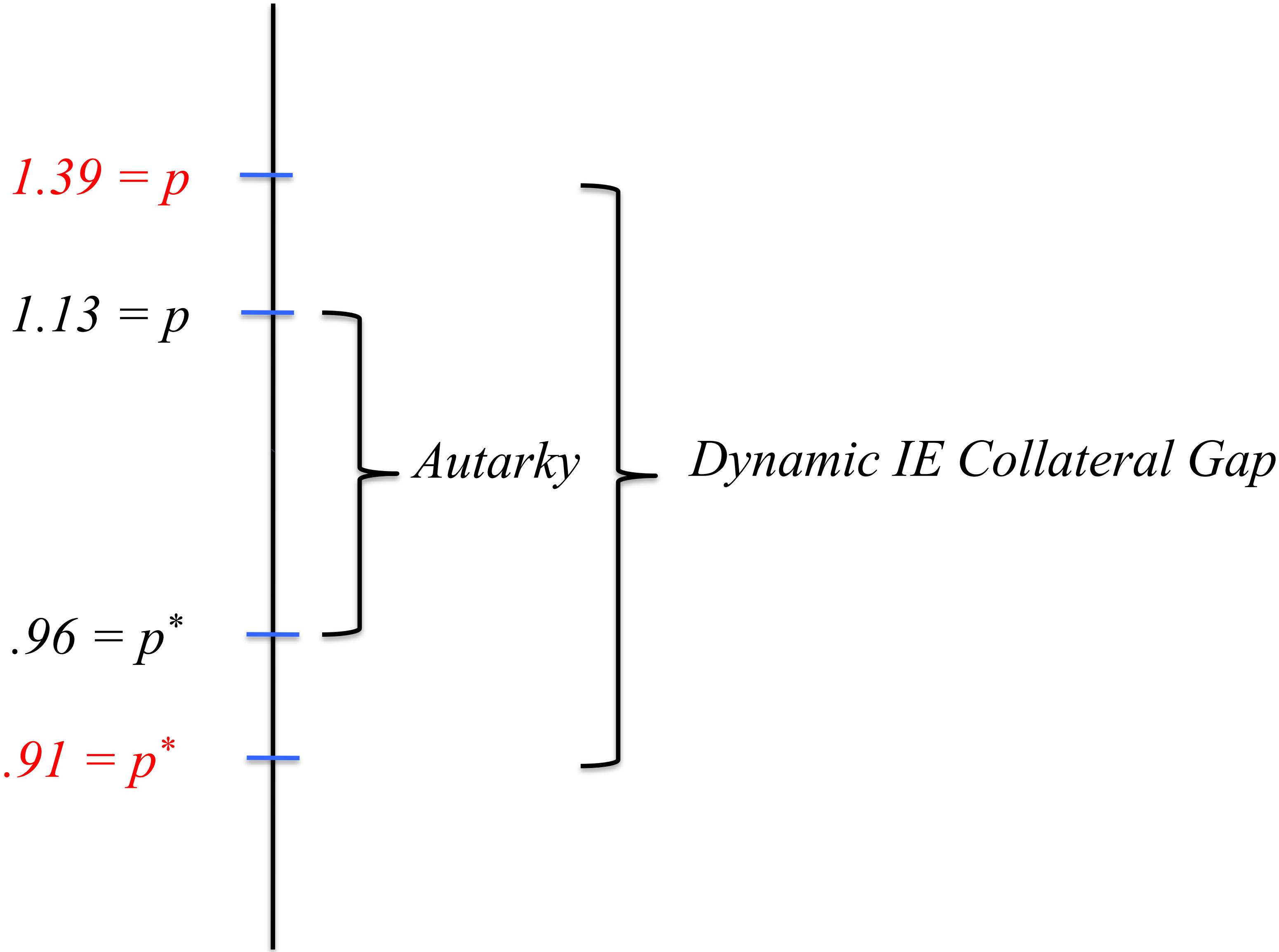
Dynamic International Trade



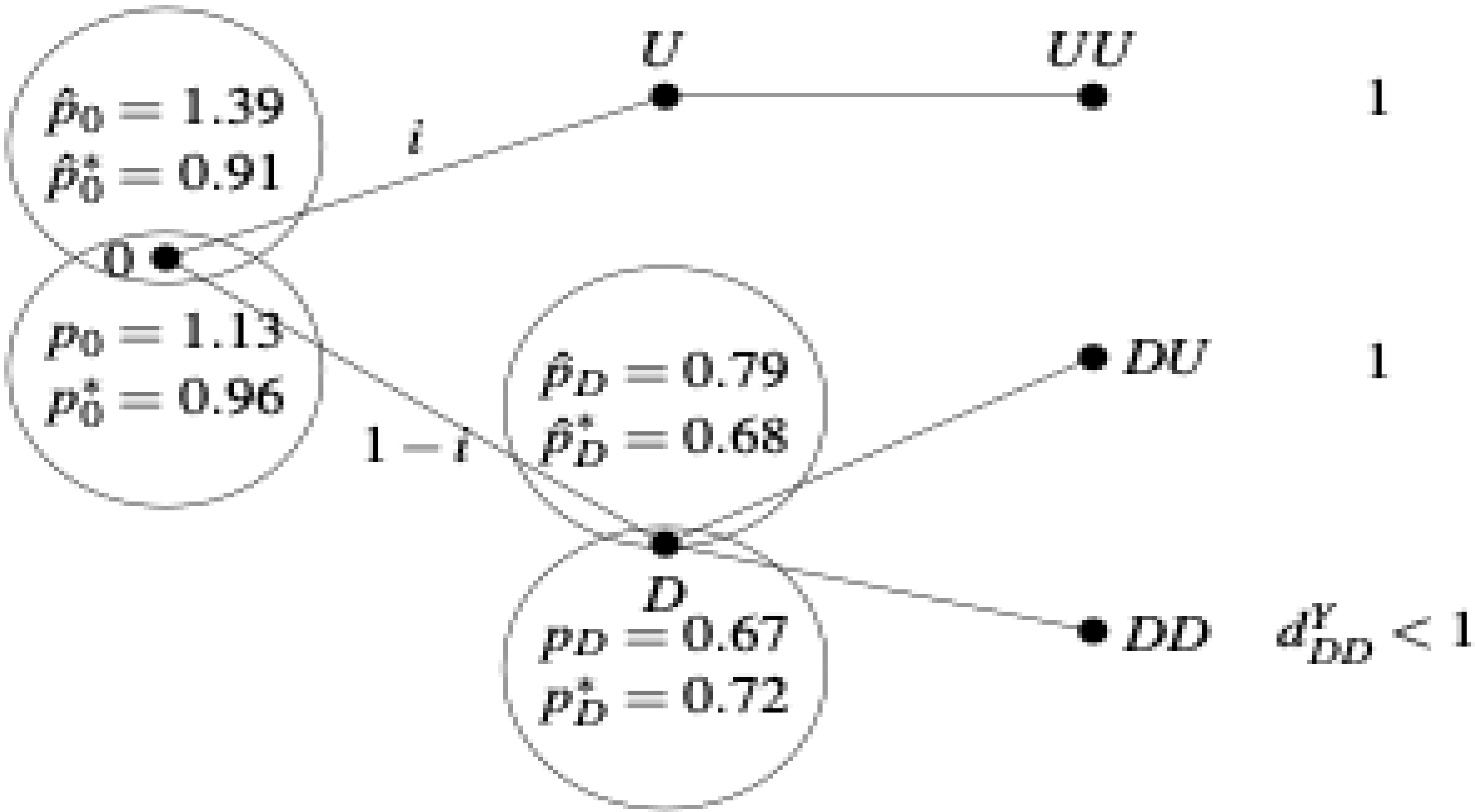
Dynamic International Equilibrium Volatility.

- International Trade creates much bigger divergence in prices in the dynamic model than in the static model.
- The reason is that the dynamic model is analogous to the static model but with a big p_D replacing a smaller d_D. And we already know that increasing d_D increases the collateral gap.

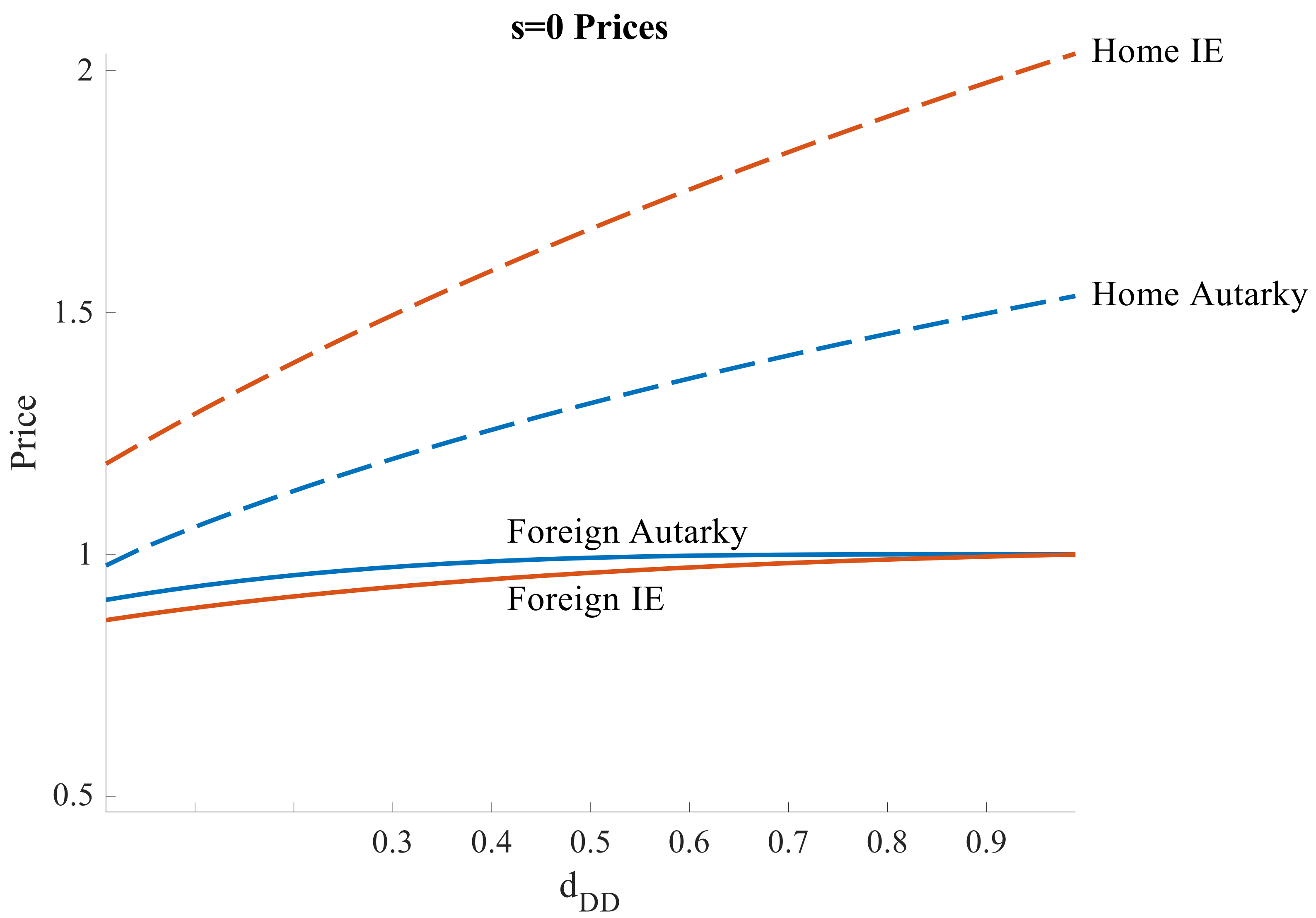
Dynamic Collateral Price Spread and Collateral Price Gap



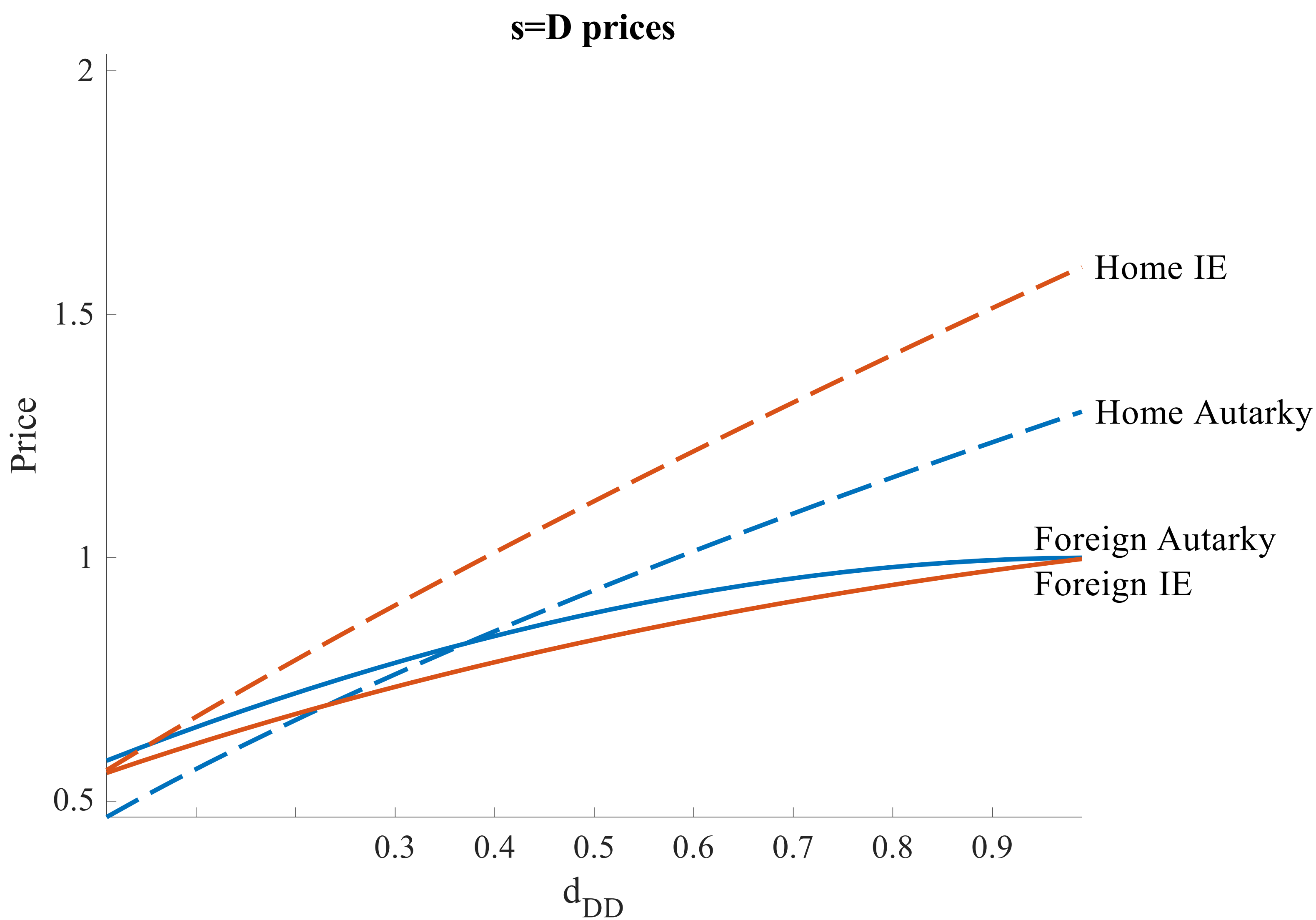
Dynamic Payoffs and Prices



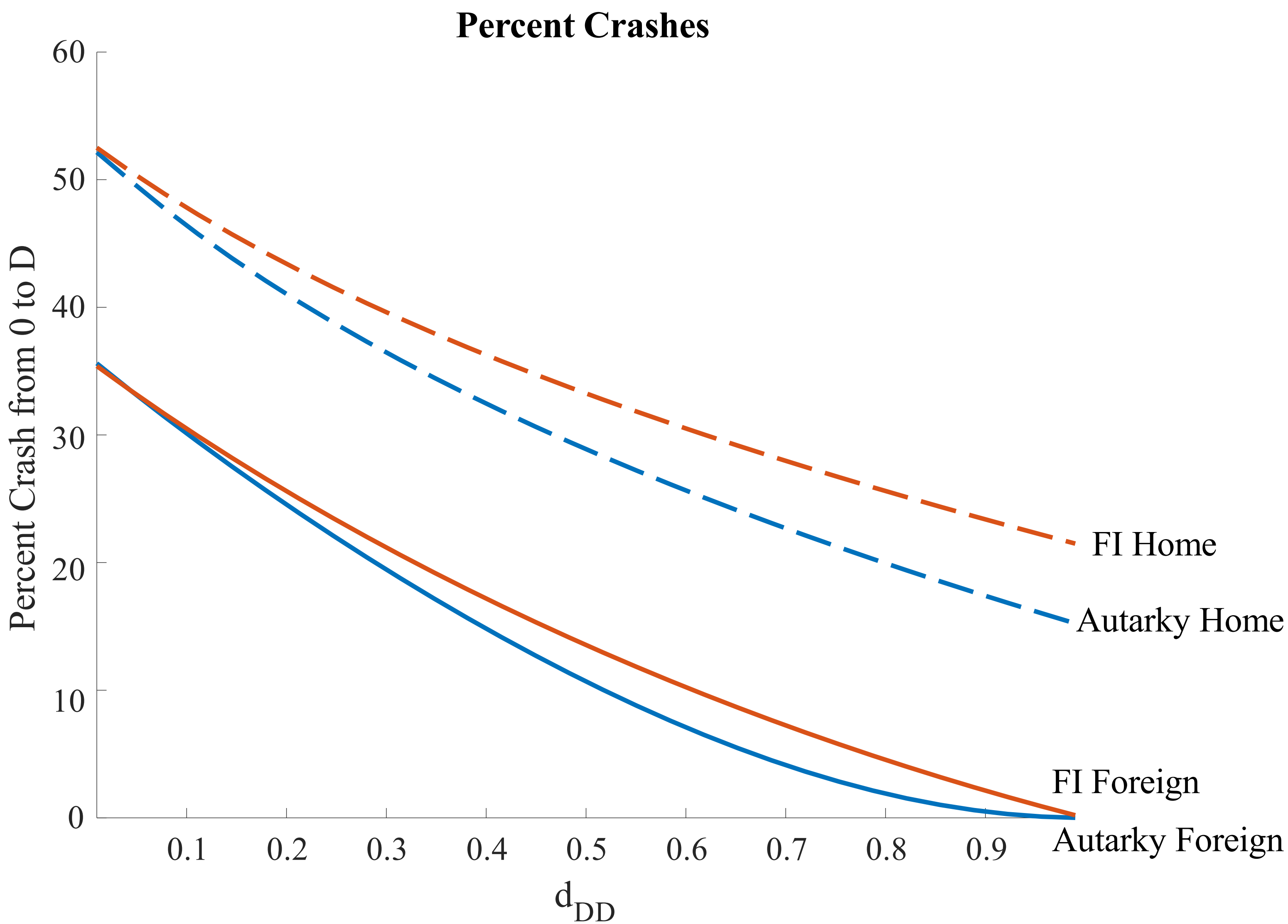
International Equilibrium



International Equilibrium



Dynamic Results: Price Crash



- After bad news, asset prices fall more under financial integration

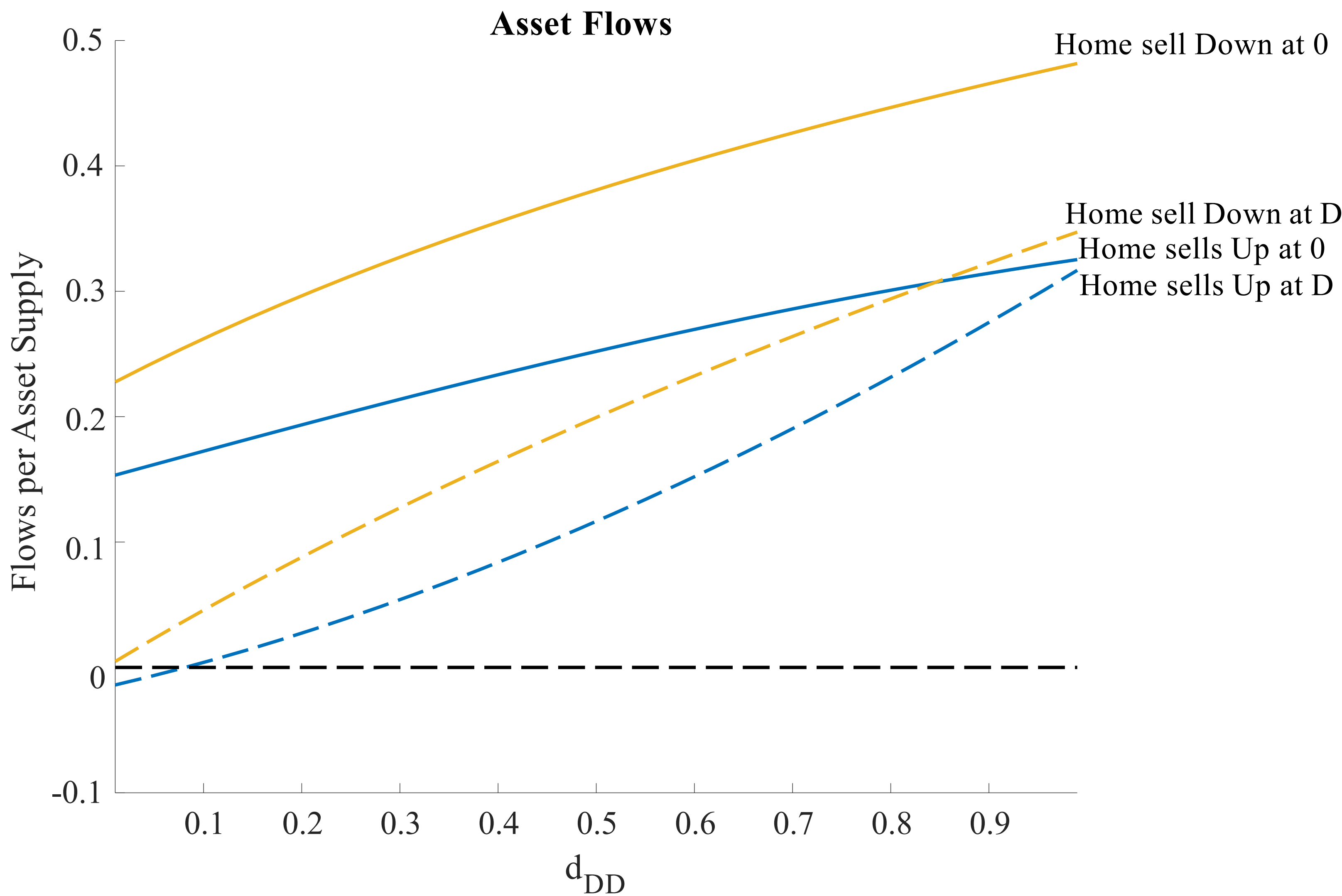
Co-Movements

- Collateral technology disparity shrinks at D due to scary bad news.

Dynamic International Equilibrium Co-Movements

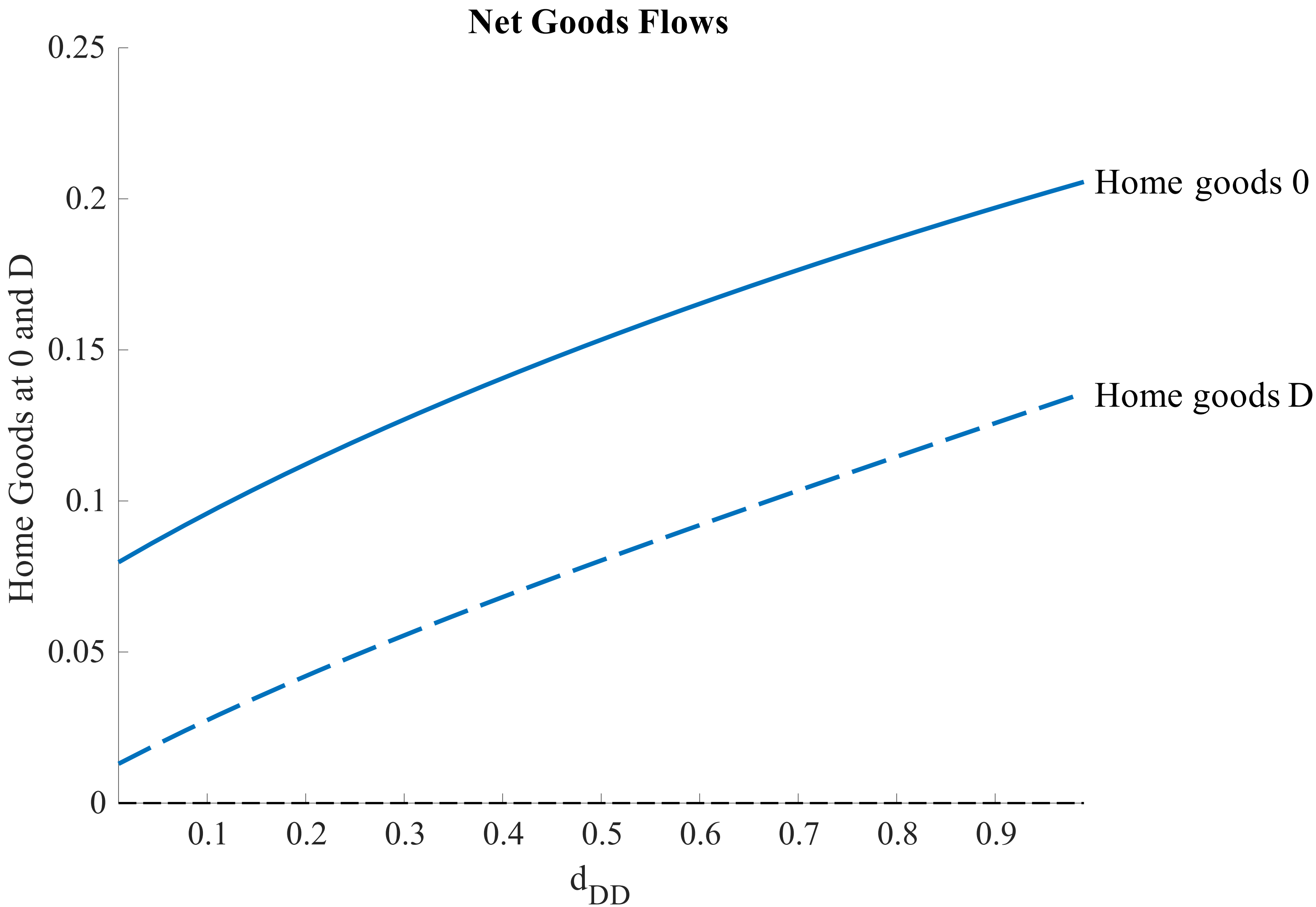
- The reason is that the move from 0 to D worsens the down risk from p_D/p_0 to d_{DD}/p_D.
- That creates a securitization crash.
- The collateral technology advantage of Home is reduced at D, since Home can create less securitizations.
- We know from the static case that a drop in securitizations reduces the collateral gap and gross flows and the trade imbalance.

Dynamic Results: Gross Flows Collapse



- Gross capital flows collapse after negative shock
- Magnitude larger under integration than in autarky

Dynamic Results: Net Flows and Trade Balance Collapse



- Net capital flows collapse
- Trade deficits shrink sharply after crises

End

Empirical comments

- Must quantify effects
- How many securities did European banks buy in 2006-7? What fraction of gross flows was that?
- How big were securitizations pre 2008?
- Compare that to Treasuries.

Contract is a collateralized loan.

Price of contract $j \in J$ is π_j.

An agent can borrow π_j today by selling the contract j in exchange for a promise (j_U, j_D) tomorrow.

Let $\varphi_j > 0\,(< 0)$ be the number of contracts j bought (sold) at time 0.

Static Economy

- $E = (S, \{c,Y\}, (\gamma(i),(e^i_{C0}, e^i_{Y0})_{i\in I}, F, J)$
- S = states in tree
- {c,Y} = commodities consumption good and collateral asset
- $\gamma(i)$ = subjective probability of agent I
- (e^i_{C0}, e^i_{Y0}) = endowments of agent i at 0.
- I = set of agents
- F = durability/production function
- J = set of promises available with collateral technology

Agent Budget Set

$$B^i(p,\pi) = \Big\{ (c_0, y, \varphi, c_U, c_D) \in R_+^{L_0} \times R^J \times R_+^{L_T} :$$

$$c_0 + py + \sum_{j \in J} \varphi_j \pi_j \leq e_0 + pe_Y,$$

Each unit of y backs
One promise

$$\sum_{j \in J} \max(0, -\varphi_j) \leq y,$$

$$c_s = F_s(c_0, y) + \sum_{j \in J} \varphi_j \min(j_s, d_s), s \in S_T \Big\}.$$

Collateral equilibrium for $E = (S, \{c,Y\}, (\gamma(i),(e^i_{C0}, e^i_{Y0})_{i\in I}, F, J)$

$((p,\pi),(c_0^i, y^i, \varphi^i, c_U^i, c_D^i)_{i\in I}) \in (R_+ \times R_+^J) \times (R_+^{L_0} \times R^J \times R_+^{L_T})^I$
such that

1. $\int_0^1 c_0^i di = e_0$

2. $\int_0^1 y^i di = e_Y$

3. $\int_0^1 \varphi_j^i di = 0 \ \forall j \in J$

4. $(c_0^i, y^i, \varphi^i, c_U^i, c_D^i) \in B^i(p,\pi), \forall i$ and $(c_0, y, \varphi, c_U, c_D) \in B^i(p,\pi) \Rightarrow U^i(c_0, y, \varphi, c_U, c_D) \leq U^i(c_0^i, y^i, \varphi^i, c_U^i, c_D^i), \forall i$

Static Model

Consider a 2-country C-model:

Home and Foreign (denoted by $*$).

Identical Countries Except for Collateral Technology J vs J*

Fundamentals in both countries are as described before.

The only difference between the two countries is in the level of financial innovation as described by the sets J and J^*.

Countries have different abilities to collateralize assets.

Foreign can promise (j,j)
Home can promise anything (j,k)

Foreign:

can leverage the risky asset.

Home:

tranche the risky asset (a more sophisticated technology).

Analysis:

(i) Autarky in Foreign.

(ii) Autarky in Home.

(iii) Financial Integration.
= International Equilibrium

General Propositions
Also an illustrative example

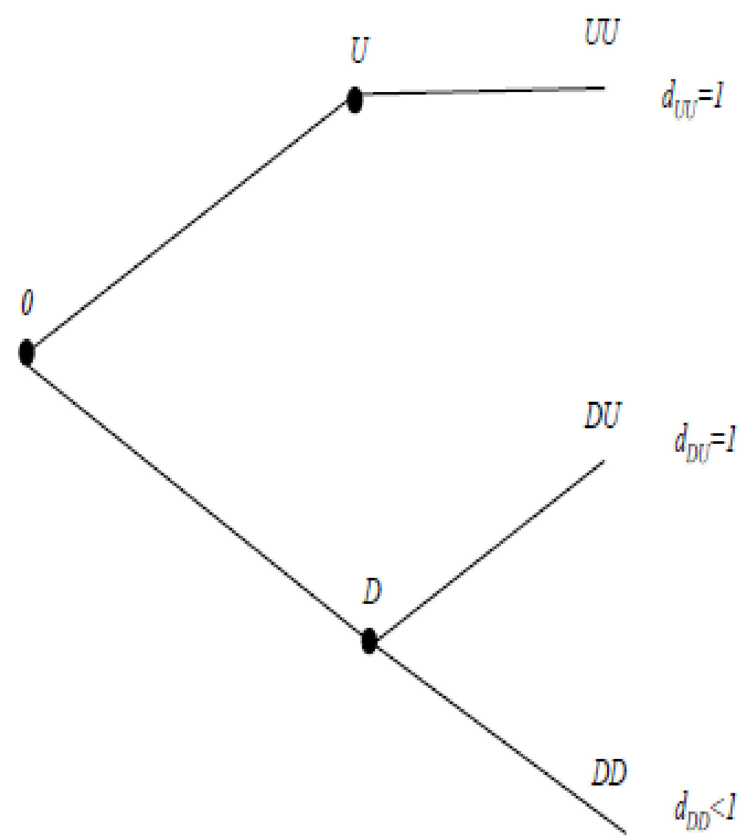
Dynamic Model

Time $t = 0, 1, 2$.

Different vintages of risky assets, all paying only at the end.

Y is a risky asset paying $0 < d_{DD} < d_{UU} = d_{DU}$ and c a durable consumption good

Prices in states 0 and D by p_0 and p_D.



The down risk after D (which itself is bad news) is much bigger than after 0.
This is scary bad news. Nothing bad happens at D, just the expectation of bad.

Dynamic Model Contracts

- Contracts are all one period contracts
- Any one period promise can be backed by Home Y.
- Only non-contingent one period promises can be backed by Foreign Y*.

Dynamic Model Equilibrium

- The equilibrium equations are similar to the combination of two static models, one starting at 0 and the other at D.
- At 0 the role of d_D is played by P_D.
- However, p_D is endogenous.
- Also, the marginal utility of money at D in the dynamic model is not the same for each agent, whereas it was in the static model.
- Nevertheless, the marginal utility of money at D is still increasing in i, just as the probability is by hypothesis in the static model. So similar analysis.

Dynamic Example

Agents consume only at the end:

$$U^i = ic_{UU} + i(1-i)c_{DU} + (1-i)^2 c_{DD}$$

and have initial endowments of commodities in all non-terminal states (different vintages).

Financial contracts are one-period contracts.

Dynamic Example

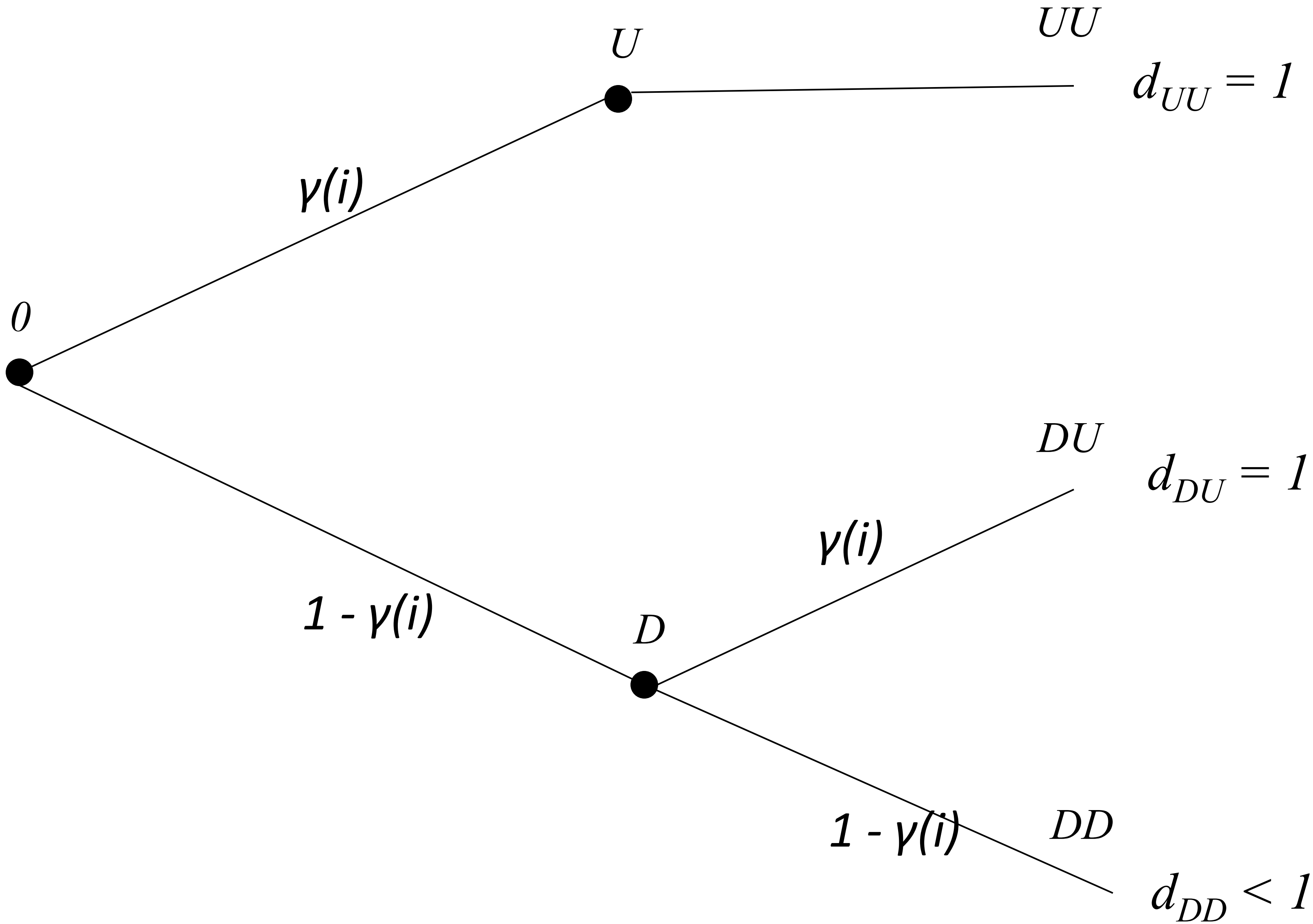
We parametrize the model as before:

Endowments: $e_s^Y = e_s = 1, s = 0, U, D$.

Asset payoffs: $d_{UU} = d_{DU} = 1$ and $d_{DD} = .2$.

Beliefs: $\gamma(i) = i$.

Dynamic Example

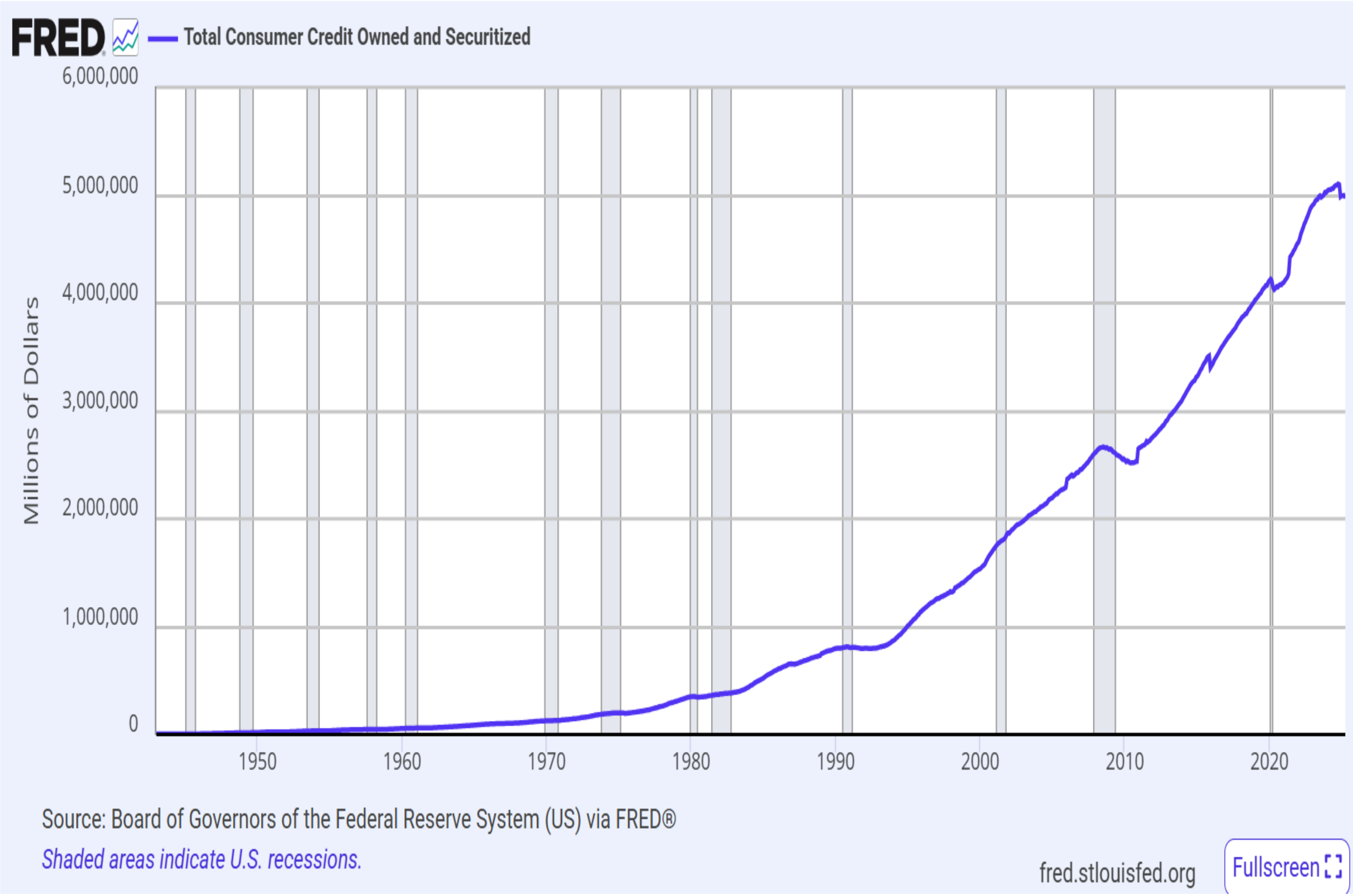


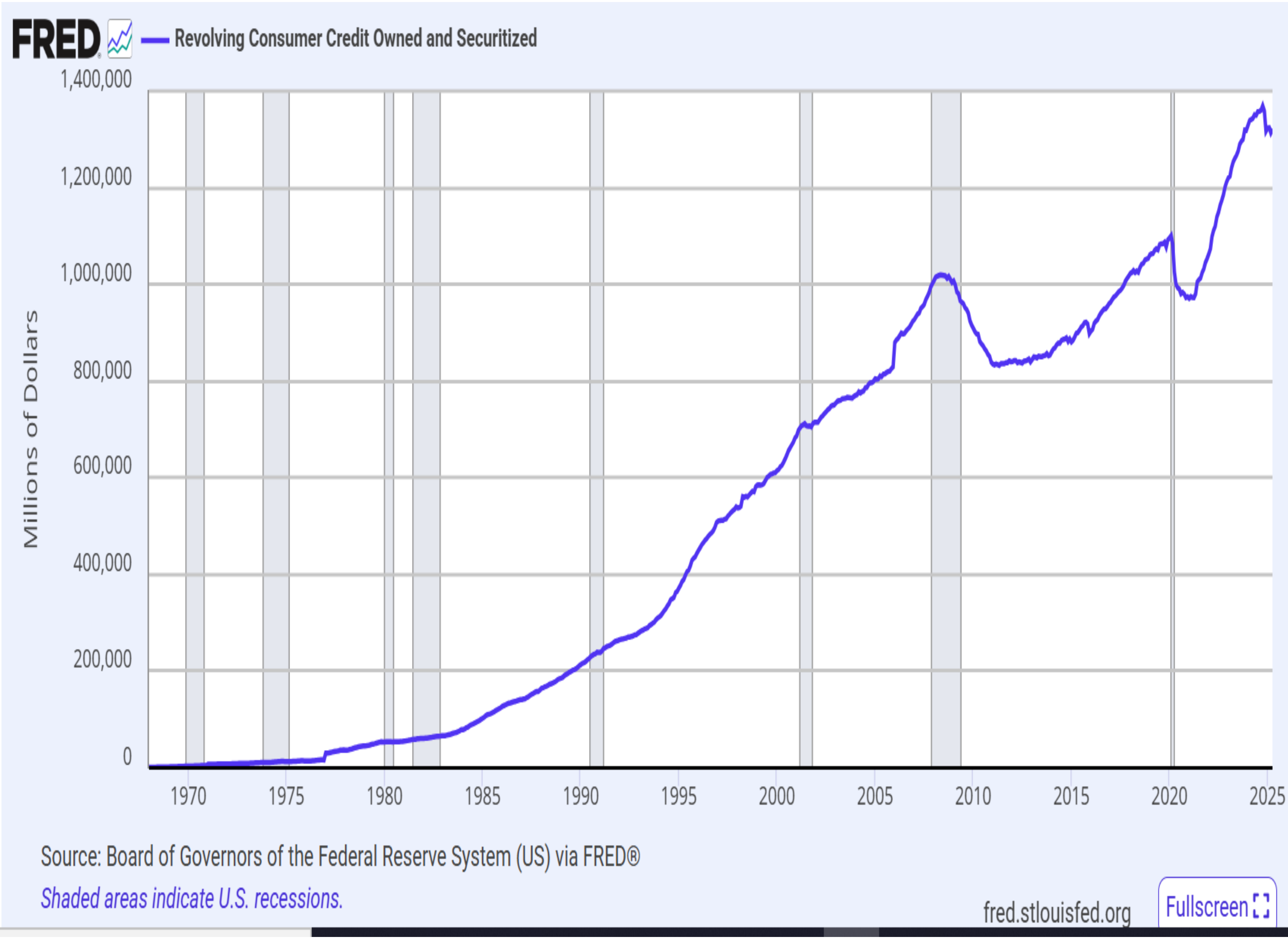
Tree of States and Commodities

Time $t = 0, 1$.

Two states of nature $s = U, D$ at time 1.

Commodities: $L_0 = \{c_0, Y\}$, $L_s = \{c_s\}$, $s = U, D$.


FRED
Total Consumer Credit Owned and Securitized
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Millions of Dollars
1950
1960
1970
1980
1990
2000
2010
2020
Source: Board of Governors of the Federal Reserve System (US) via FRED®
Shaded areas indicate U.S. recessions.
fred.stlouisfed.org
Fullscreen


FRED
Revolving Consumer Credit Owned and Securitized
Millions of Dollars
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
Source: Board of Governors of the Federal Reserve System (US) via FRED®
Shaded areas indicate U.S. recessions.
fred.stlouisfed.org
Fullscreen

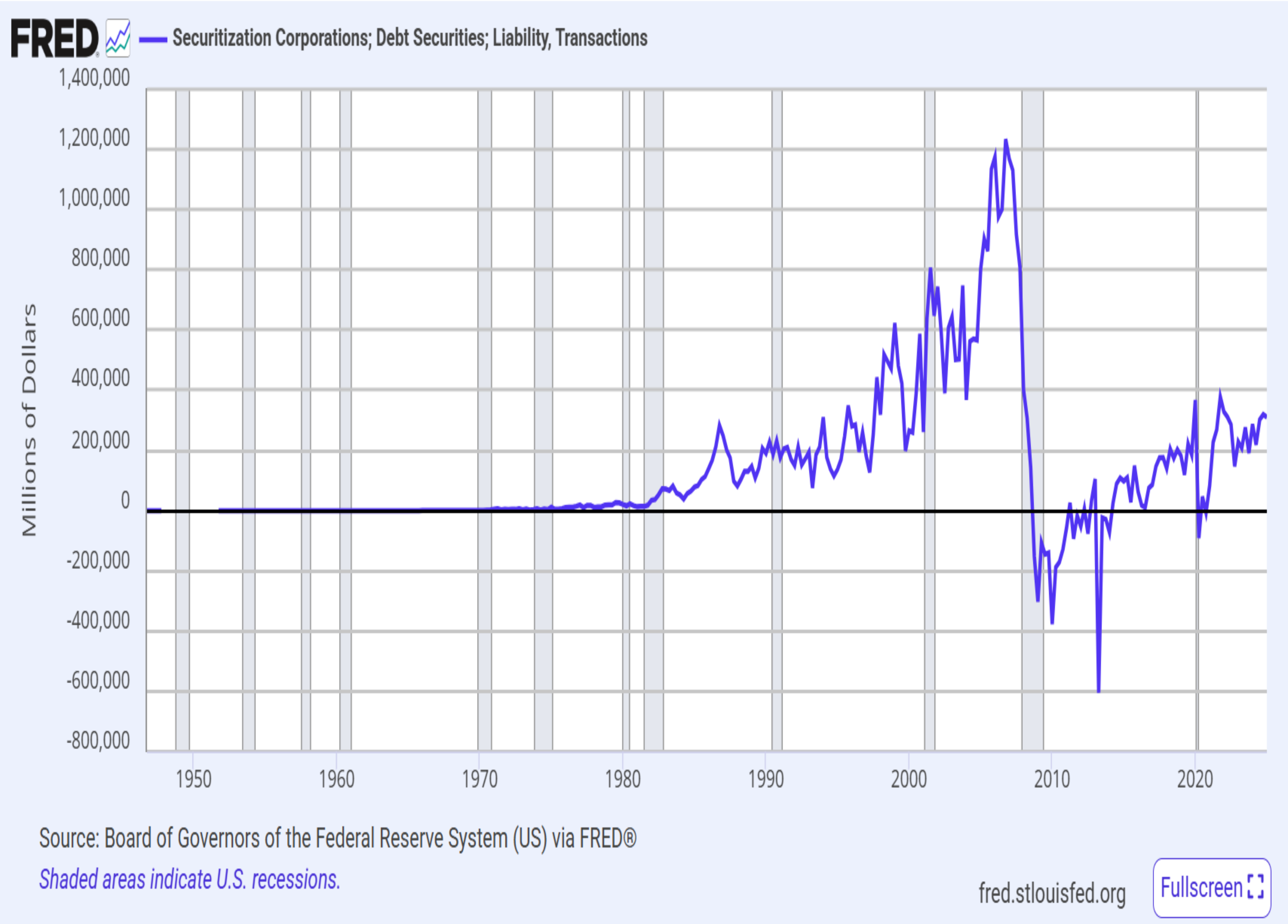
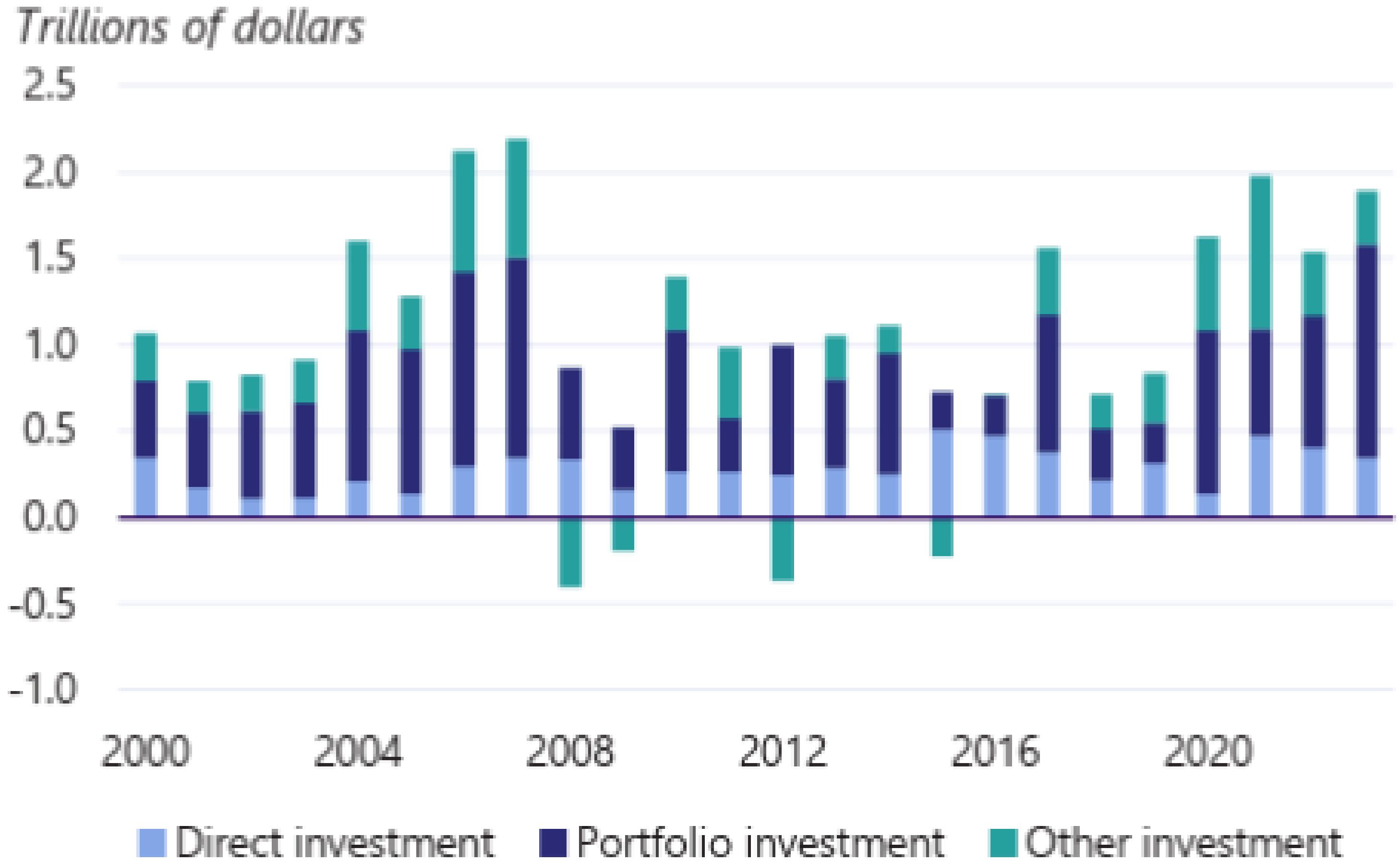

FRED
Securitization Corporations; Debt Securities; Liability, Transactions
Millions of Dollars
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
-200,000
-400,000
-600,000
-800,000
1950
1960
1970
1980
1990
2000
2010
2020
Source: Board of Governors of the Federal Reserve System (US) via FRED®
Shaded areas indicate U.S. recessions.
fred.stlouisfed.org
Fullscreen

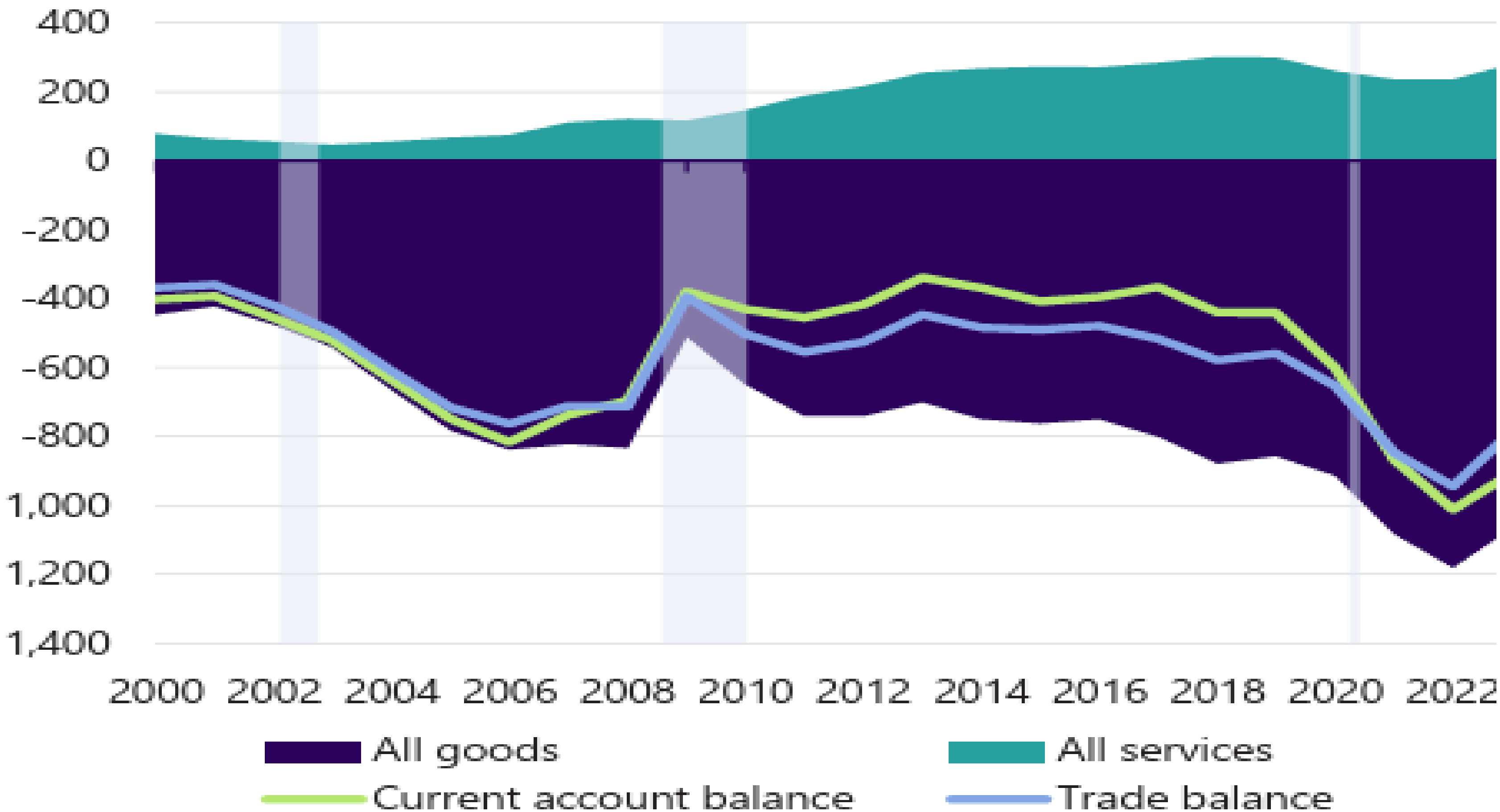
Figure 6-3. U.S. Capital Inflows



Council of Economic Advisers
Sources: Bureau of Economic Analysis; CEA calculations.
2025 Economic Report of the President

Figure 6-1. U.S. Trade and Current Account Balance

Billions of dollars



Council of Economic Advisers

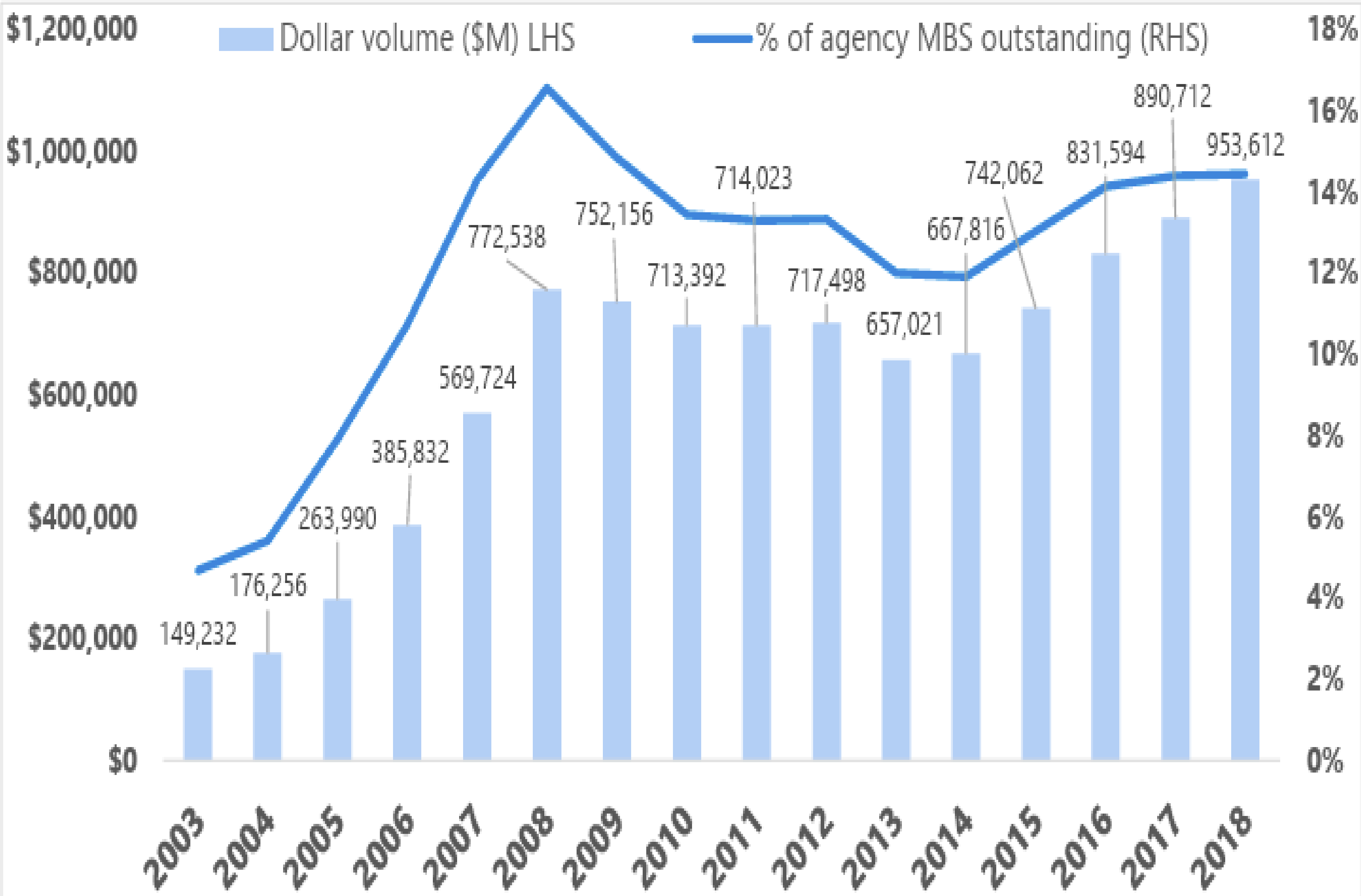
Sources: Census Bureau; Bureau of Economic Analysis; CEA calculations.
Note: Trade data are on a balance of payments basis. Gray bars indicate recessions.
2025 Economic Report of the President

- Inflows into US
  - Portfolio investments (Stocks and bonds),
  - Foreign direct investment (get control - factories),
    - We do more in foreign than they do in US
  - cross border lending (loans)
- 41% of all inflows go to US
- Pre-pandemic 23%
- But international flows down after 2020

MBS Investments

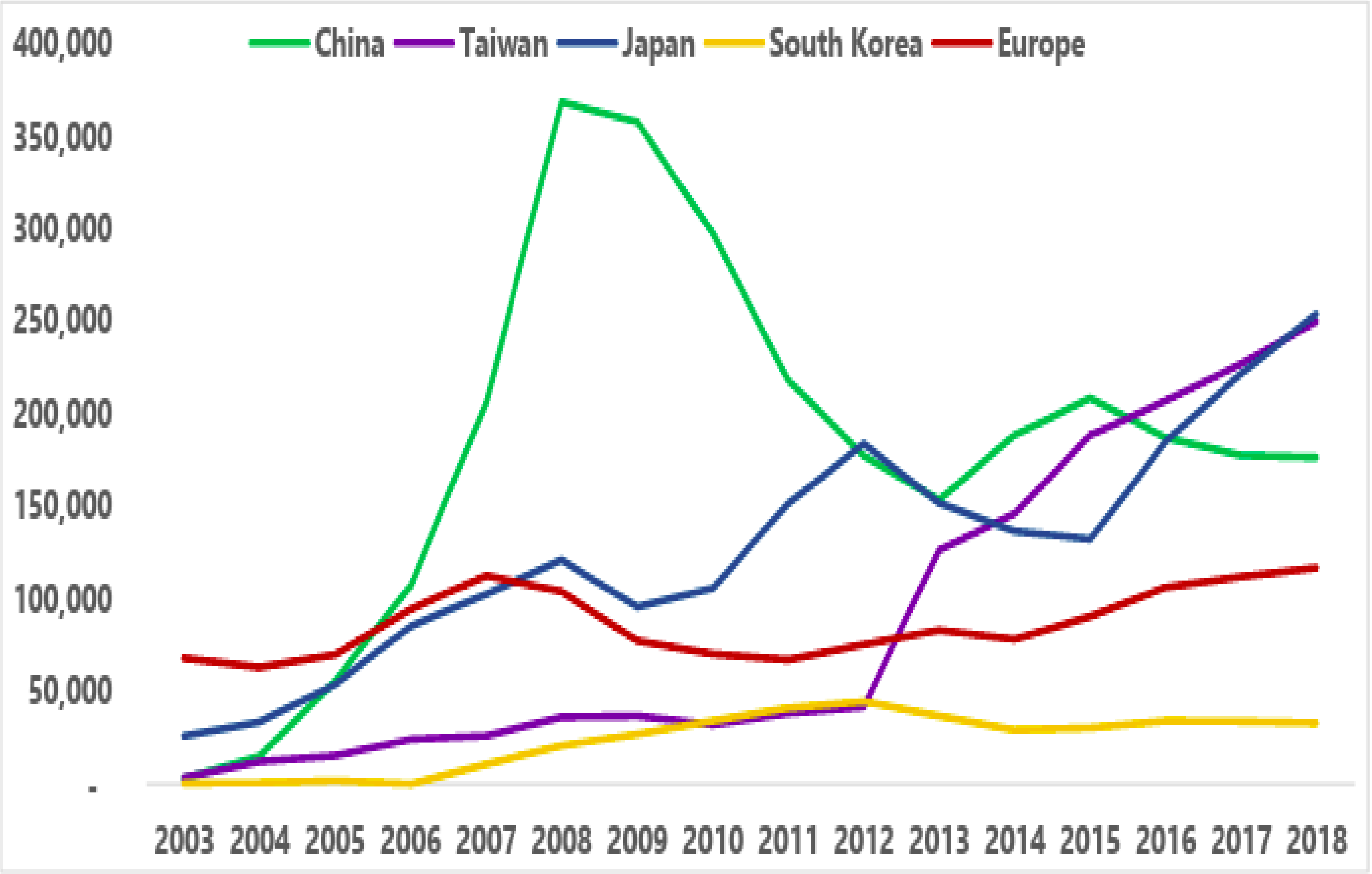
- Foreign investments went from 14% to 18%

Agency MBS Owned by Foreign Entities

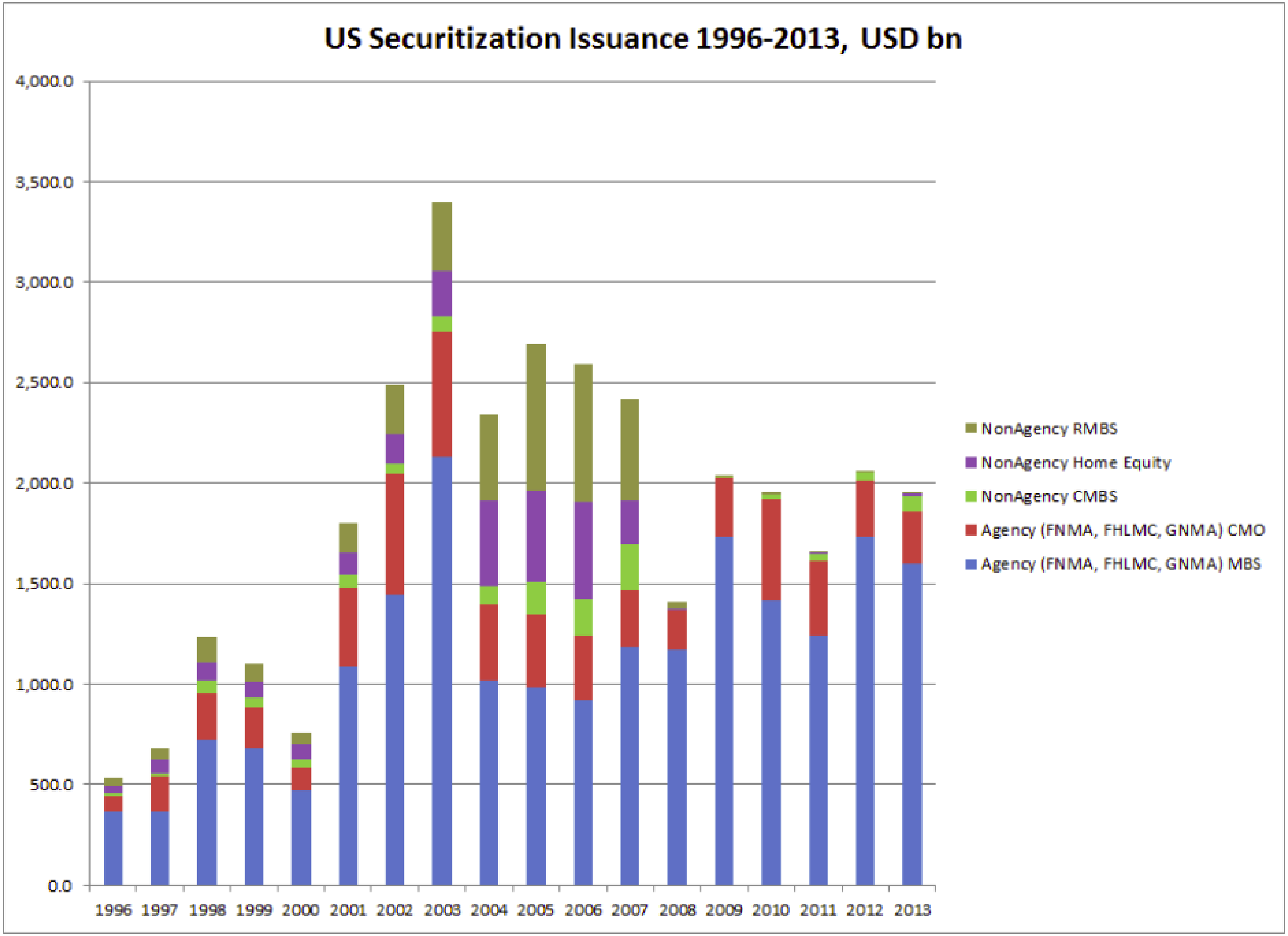


Source: Urban Institute calculations based on US Treasury International Capital and SIFMA data.

Agency MBS held by China, Japan and Taiwan, South Korea (USD Millions)



Source: Urban Institute calculations based on US Treasury International Capital data.



Source: SIFMA

US-EU Balance of Trade

- 2024
  - EU runs E 198 billion of goods surplus
  - And E 148 billion services deficit for
  - EU surplus of E 50 Billion in 2024
- 2023
  - EU runs E 157 billion of goods surplus
  - And E 109 billion services deficit for
  - EU surplus of E 48 Billion in 2023

US-EU Balance of Trade

- 2022
  - EU runs E 157 billion of goods surplus
  - And E 109 billion services deficit for
  - EU surplus of E 48 Billion in 2022
- 2021
  - EU runs E 157 billion of goods surplus
  - And E 109 billion services deficit for
  - EU surplus of E 48 Billion in 2023

Causes of trade imbalance

- US run trade deficit every year but one since 1982. Why?
- Higher foreign savings rate
  - Helps American investment, so good
- Government policies
  - Gaining market share and taking advantage of increasing returns