Global Collateral: How Financial Innovation Drives Capital Flows and Increases Financial Instability

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Introduction

- Massive gross international capital flows among developed economies
- Evidence that financial integration increases volatility and co-movement
- (We think) evidence suggests capital flows not just driven by diversification/liquidity motives
Introduction
Collateral-driven flows

- We provide a model of **collateral-driven** capital flows which increase volatility of asset prices and flows
- We define financial innovation as **new collateral** or **new promises** backed by collateral
- We show that cross-border differences in ability to collateralize financial promises are enough to generate capital flows
Introduction

Intuition

- Trade in financial assets allows countries to share scarce collateral
- Our insight is that the extent to which a country can collateralize assets is the feature that differentiates countries that are otherwise similarly financially developed
- Our model gives precise predictions for global flows, asset prices, and the volatility of flows and prices
Results from Static Model:

- Foreign buys Home assets (which are **better collateral**) and Home buys Foreign assets (which are **cheaper**)
- Home runs **current account deficit** financed by asset sales
- Financial integration **increases Home** asset prices and **decreases Foreign** asset prices
Results from Dynamic Model:

- Financial integration **increases volatility** of asset prices in **both** countries
- Gross and net flows **collapse** following bad news
Related Literature


Presentation Outline

1. General Equilibrium Model with Collateral
2. Static Model of Global Flows
   2.1 Autarky Leverage
   2.2 Autarky Tranching
   2.3 Financial Integration
3. Dynamic Model of Global Flows
The Model
Asset Payoffs, Uncertainty

- 2 periods, with uncertainty given by $S = \{0, U, D\}$
- Risky asset $Y$, durable goods $X$ (risk-free asset)
- Price of $Y$ at 0 is $p$, price of $X$ normalized to 1

Parameterization for talk:

\[
\begin{align*}
Y & \\
\uparrow U & \quad \downarrow Y \quad d_U^Y = 1 \\
0 & \quad \quad d_D^Y = 0.2 \quad 1
\end{align*}
\]
Continuum of risk-neutral investors indexed by $i \in (0, 1)$ with preferences

$$U^i(c_U, c_D) = \gamma_U^i c_U + \gamma_D^i c_D$$

Subjective probabilities only source of heterogeneity

Higher $i$ more optimistic ($\gamma(i)$ increasing and continuous)

Each investor endowed with $(e^X, e^Y)$ units of $(X, Y)$
A financial contract consists of promised payments backed (w.l.o.g.) by 1 unit of $Y$ serving as collateral

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

Contract $j$ promises $(j_U, j_D)$

Denote the set of contracts by $J$

Contract $j \in J$ has price $\pi^j$
The Model
Financial Contracts and Collateral

- Repayment enforceability problems: collateral enforces repayment
- Agents default whenever promise exceeds value of collateral (i.e., $j_s > d_s^Y$)
The Model
Financial Innovation and Collateral

- In our model, financial innovation changes the set of contracts $J$
- Main analysis focuses on differences in available promises
- Leverage: **non-contingent** promises (debt)

$$J^Y = \{j : j = ((j, j), 1)\} \text{ for all } j$$

- Tranching: **contingent** promises—(w.l.o.g.) single promise, “down tranche”

$$j^T = (0, d_Y^D)$$
A collateral equilibrium is a set of allocations, asset prices, and contract prices such that agents optimize and markets clear.

For talk we parametrize model with

- **Endowments**: \( e^Y = e^X = 1 \)
- **Beliefs**: \( \gamma(i) = 1 - (1 - i)^2 \)
- **Results are completely robust**
Presentation Outline

1. General Equilibrium Model with Collateral

2. **Static Model of Global Flows**
   2.1 Autarky Leverage
   2.2 Autarky Tranching
   2.3 Financial Integration

3. Dynamic Model of Global Flows
Consider 2 countries, Home and Foreign (*), as just described.

Completely symmetric in everything except countries have different sets of financial contracts, $J \neq J^*$

- Asset payoffs for $Y$ and $Y^*$ identical
- Investors have same preferences
- Home investors endowed with one unit each of $Y, X$
- Foreign investors endowed with one unit each of $Y^*, X^*$
Countries have different abilities to collateralize assets, different $J$'s

- Foreign assets can be leveraged (used to issue non-contingent debt)
- Home assets can be tranched (used to issue contingent promises)
1. General Equilibrium Model with Collateral
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3. Dynamic Model of Global Flows
Leverage: agents can use one unit of $Y^*$ to issue **non-contingent** promises (debt) $(j,j)$

Every contract $j$ is **priced** in equilibrium

Which contract(s) **traded** in equilibrium?
In equilibrium, the only traded contract is default-free, \( j = 0.2 \) (see Fostel-Geanakoplos 2012)

- Optimists buy risky asset and borrow using asset as collateral, borrowing 0.2 for every unit of \( Y^* \)
- Pessimists hold goods \( X^* \) and risk-free debt

- Asset price \( p^* \) equals “payoff value” plus “collateral value”
Autarky in Foreign (leverage)
Equilibrium Regime

\[
i = 1
\]

Optimists buy \( Y^* \) with leverage

\[
i^Y = 0.63
\]

Marginal \( Y^* \) investor

\[
i = 0
\]

Pessimists buy \( X^* \), debt
Presentation Outline

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Autarky in Home

- Agents can use Home asset $Y$ to issue down tranche $j^T$ delivering $\begin{pmatrix} 0 \\ 0.2 \end{pmatrix}$
  - Optimists buy risky asset and issue tranche using asset as collateral, borrowing $\pi^T$ for every unit of $Y$
  - Moderates hold goods $X$
  - Pessimists hold down tranche
- Asset price $p$ equals “payoff value” plus “collateral value”—but the collateral value is higher because $Y$ is better collateral
Autarky in Home (tranching)

Equilibrium Regime

Optimists: buy $Y$
sell down tranche $j^T$

Marginal $Y$ buyer

Moderates: hold goods $X$

Marginal tranche buyer

Pessimists: buy down tranche $j^T$
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Financial Integration

- With financial integration, countries trade assets and financial promises (debt, tranches)
  - All agents can use Home asset $Y$ as collateral to issue down tranches
  - All agents can use Foreign asset $Y^*$ as collateral to issue debt
  - All agents can buy debt and tranches
- After financial integration, same marginal buyers in each country (countries’ fundamentals are identical, only $J$ and $J^*$ different)
Financial Integration
Equilibrium Regime

\[ i = 1 \]

- Optimists: buy \( Y \), sell \( j^T \)

\[ i^M = .78 \]

- Opti-moderates: buy \( Y^* \), sell debt

\[ i^Y = .61 \]

- Marginal \( Y, Y^* \) investor

\[ i^T = .05 \]

- Moderates: hold goods \( X, X^* \), risk-free debt

\[ i = 0 \]

- Marginal tranche investor

- Pessimists: buy down tranche \( j^T \)
Financial Integration
Theoretical Results

- **Proposition 1:** With financial integration, Home price always exceeds Foreign price: \( \hat{p} > \hat{p}^* \) (true in autarky if \( \gamma(i) \) concave)

- **Proposition 2:** Financial integration increases Home price and decreases Foreign price: \( \hat{p} > p \) and \( \hat{p}^* < p^* \)

- **Proposition 3:** Home runs a current account deficit, financed by the sale of risky assets.
### Financial Integration

**Equilibrium Prices**

<table>
<thead>
<tr>
<th></th>
<th>Autarky</th>
<th>Financial Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p$</td>
<td>1</td>
<td>1.029 ↑</td>
</tr>
<tr>
<td>$p^*$</td>
<td>0.893</td>
<td>0.878 ↓</td>
</tr>
<tr>
<td>$\pi^T$</td>
<td>0.168</td>
<td>0.182 ↑</td>
</tr>
<tr>
<td>$\pi^{0.2}$</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

- Foreign **demand for tranches increases collateral value of $Y$** (Home Bubble)
- Foreign price falls because Home asset is attractive alternative (relative collateral value falls)
Our model predicts the following financial flows:

- Foreign buy 0.495 of $Y$
- Home buy 0.456 of $Y^*$
- Home buy 0.04 of $X^*$

Flows driven by desire to share scarce collateral.

Flows affected by borrowing capacity of risky assets, captured by $d_Y^D$. 

Financial Integration

Comparative Statics: Flows increase with borrowing capacity $d_D^Y$
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Dynamic Model of Global Flows

- Static model predicts flows and price changes
- We use a 3-period model to consider the effects of financial integration on volatility of asset prices and flows
Dynamic Model of Global Flows
Asset Payoffs with Three Periods

\[
\begin{align*}
0 & \quad \text{1} \quad \text{1} \\
D & \quad \text{1} \quad \text{1} \\
U & \quad \text{1} \quad \text{1} \\
UU & \quad \text{1} \quad \text{1} \\
\end{align*}
\]
Dynamic Model of Global Flows

Key results:

- **Price crashes increase** in both countries
- **Flows collapse** following bad news,
- with bigger collapse the greater the decrease in borrowing capacity
Dynamic Model of Global Flows
Comparative Dynamics: Gross Flows

Fin Int w Lvg and Tranching

Flows Ratio StateD/State0

- F buy Y
- H buy Y*

\( d \)
Dynamic Model of Global Flows
Comparative Dynamics: Net Flows

Fin Int w Lvg and Tranche

Flows Ratio StateD/State0

\( d_{DD}^{Y} \)
Conclusion

- Financial innovations in one country—tranching versus just leverage—can drive capital flows
- Cross-border flows emerge as a way of sharing collateral
- Financial integration increases price volatility globally
- Flows collapse following bad news