Liquidity and the Threat of Fraudulent Assets

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fraudulent behavior in asset markets

in this paper:

• Asset’s vulnerability to fraud affects its liquidity.

• Fraud: Individuals can produce deceptive versions of existing assets

• Examples of fraud throughout history:
  • Clipping of coins in ancient Rome and medieval Europe
  • Counterfeiting of banknotes during the first half of the 19th century
  • Identity thefts
  • originating/securitizing bad loans
  • cherry picking bad collateral for OTC credit derivatives
what we do

- Setup a model where

1. many assets differ in vulnerability to fraud
2. assets are traded over the counter
3. agents can use assets as collateral or means of payment

- Solve for terms of OTC bargaining game
- Solve for asset prices: implications for liquidity premia
Main findings

- Assets differ in liquidity
  
  How much of it can be used as collateral or means of payment

- Cross-sectional liquidity premia

  1. Liquid assets, with low vulnerability to fraud sell above fundamental value
  2. Partially liquid assets, with intermediate vulnerability to fraud
     sell above fundamental value, but for less than liquid assets
  3. Illiquid assets, with high vulnerability to fraud
     sell at fundamental value
Main findings (cont’d)

• Policies
  • Open-market purchases targeting partially liquidity assets can reduce welfare
  • Policies targeting illiquid assets can increase welfare.

• Liquidity crisis explained by a heightened threat of fraud
related literature

- Macro models in which assets have limited re-salability

- Private information and money
  Williamson Wright (1994), Nosal Wallace (2007) among many others

- Asset pricing when moral hazard generates limited pledgeability
  Holmstrom Tirole (2011) among many others

- Asset pricing with adverse selection
  Rocheteau (2009), Guerrieri Shimer (2011) among many others
the economic environment
a model with monetary frictions

- Two periods, continuum of risk neutral agents, discount $\beta \in (0, 1)$:
  
  measure one of buyers, measure one of sellers

- $t = 0$: buyers and sellers trade assets in a competitive market

- $t = 1$: buyers and sellers trade goods in a decentralized market

  a buyer is matched with a seller with probability $\sigma$

  lack of commitment, limited enforcement

  $\Rightarrow$ no unsecured credit

  $\Rightarrow$ assets become useful as means of payment or collateral

- End of $t = 1$: assets pay off their terminal value
assets and the threat of fraud

Assets come in (arbitrary) finitely many types $s \in S$

- supply of $A(s)$ shares, with terminal value normalized to 1
- type-specific vulnerability to fraud
- at $t = 0$, for a fixed cost $k(s)$, can create type–$s$ fraudulent assets
  - zero terminal value zero
  - may be used in decentralized trades
  - undistinguishable from their genuine counterpart
  
  high cost $k(s) \implies$ low vulnerability to fraud
some interpretations

- Counterfeiting of money
  \[ k(s) = \text{cost of printing equipment} \]

- Fraudulent or bad collateral
  - houses used as collateral in consumer loans
  - assets used as collateral for credit derivative contracts
  \[ k(s) = \text{cost of stealing identity} \]
  - or informational cost to identify bad assets

- Securitization fraud
  - bad mortgages bundled inside mortgage-based securities
  \[ k(s) = \text{fee and/or bribe to rating agencies} \]
  - or cost of producing false documentation
bilateral trade under the threat of fraud
Intuition

Positive cost to produce fraudulent assets (various across assets)
\[\Downarrow\]
Seller rejects an offer such that the transfer of assets is above some threshold
\[\Downarrow\]
Seller’s acceptance prob. decreases in the transfer of assets
\[\Downarrow\]
In eqm, buyer never offers a transfer such that the prob. seller rejects the offer is positive
\[\Downarrow\]
An upper bound on the transfer of assets

Asset-specific endogenous liquidity constraint (resalability constraint)
For now take asset prices $\phi(s) \geq \beta$ as given

- $t = 0$: buyer chooses a portfolio of assets
  - genuine assets of type $s$ at price $\phi(s)$
  - fraudulent assets of type $s$ at fixed cost $k(s)$

- $t = 1$: buyer matches with seller and makes an offer specifying that
  - the seller produces $q$ units of goods for the buyer
  - the buyer transfers a portfolio $\{d(s)\}$ of assets to the seller

- The seller accepts or rejects. If accepts:
  - the buyer enjoys $u(q)$
  - the seller suffers $c(q) = q$
equilibrium concept and refinement

- Perfect Bayesian equilibrium

- A standard difficulty: PBE puts little discipline on sellers’ beliefs
  
  ... lots of equilibria, some of them arguably unreasonable

- In and Wright’s (2011) refinement: the “reverse order game”
  
  the buyer first commits to an offer \((q, \{d(s)\})\)
  
  then the buyer chooses:
  
  how much genuine and fraudulent assets to bring
  
  subject to offer \(\{d(s)\}\) feasible

- This pins down beliefs

- And this selects the best equilibrium for the buyer
equilibrium outcome

- There is no fraud in equilibrium
  - fraud with proba 1 is not optimal
    the buyer might as well offer $d(s) = 0$, and not incur $k(s)$
  - fraud with proba in $(0, 1)$ is not optimal
    lowering the proba of fraud effectively raises payment capacity
- The seller accepts the offer with probability one
  - the buyer could increase $q$ and $\{d(s)\}$
  - the seller would accept probabilistically to discipline the buyer
  - with fixed cost of fraud: not optimal
equilibrium asset demands and offers

After an equilibrium offer:

- no fraud in equilibrium
- the seller accepts the offer with probability one

Moreover, equilibrium asset demand and offer maximize

\[-\sum_{s \in S} \left[ \phi(s) - \beta \right] a(s) + \beta \sigma \left[ u(q) - \sum_{s \in S} d(s) \right]\]

with respect to \(q, \{a(s)\}, \{d(s)\} \geq 0\), and subject to

Seller’s IR: \( q \leq \sum_{s \in S} d(s) \)

Buyer’s no-fraud IC: \( [\phi(s) - \beta + \beta \sigma] d(s) \leq k(s), \) for all \( s \in S \)

Feasibility: \( d(s) \leq a(s), \) for all \( s \in S \)
Intuition

No fraud IC constraints

- Eliminates buyers’ incentives to bring fraudulent assets

\[
(\phi(s) - \beta + \beta\sigma) \cdot d(s) \leq k(s)
\]

net cost of offering \(d(s)\) genuine assets \(\leq\) cost of fraud

- Asset specific resalability constraint:

\[
d(s) \leq \frac{k(s)}{\phi(s) - \beta + \beta\sigma}
\]

- Create endogenous limits to assets resalability foundations for the constraints in Kiyotaki Moore (2001)
asset prices and liquidity
asset prices at $t = 0$

- $A(s)$: asset price

- $\frac{k(s)}{A(s)}$: cost of fraud per unit of asset

- $\beta \sigma + \xi$: no-fraud IC is slack when buyers hold and spend $A(s)$ but spend less

- $k(s)/A(s) = \text{cost of fraud per unit of asset}$
asset prices at $t = 0$

- illiquid
- partially liquid
- liquid

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\[ \beta + \xi \]

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no-fraud IC is slack when buyers hold and spend $A(s)$

\[ \frac{k(s)}{A(s)} \]

- $k(s)/A(s)$ = cost of fraud per unit of asset
- $\xi = \beta\sigma (u'(q) - 1)$
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\[\text{asset price} \downarrow \]

\[
\begin{array}{c}
\text{illiquid} \\
\text{partially liquid} \\
\text{liquid}
\end{array}
\]

\[\frac{k(s)}{A(s)} \rightarrow \]

- \(k(s)/A(s)\) = cost of fraud per unit of asset
- \(\xi = \beta \sigma (u'(q) - 1)\)
Three-tier categorization of assets

output = \( q = \text{aggregate liquidity} \), \( L \equiv \sum_{s \in S} \theta(s)A(s) \)

as long as \( L < q^* \) s.t. \( u'(q^*) = 1 \), otherwise \( q = q^* \)

- Liquid assets: \( \theta(s) = 1 \)
  
  IC constraint doesn’t bind when buyers hold and spend \( A(s) \)

- Partially liquid assets: \( \theta(s) = 1 \)
  
  IC constraint binds when buyers hold and spend \( A(s) \)

- Illiquid assets: \( \theta(s) = \frac{k(s)}{\beta \sigma} < 1 \)
  
  IC constraint binds, buyers hold \( A(s) \) but spend less
more on partially liquid assets

- Have the same $\theta(s)$ as liquid assets but have a lower price
  - liquidity premia $< \text{social value of their liquidity services}$
- Why?
  - Because: pecuniary externality running through the IC constraint
    - a high price reduces asset demand in two ways
      - through the budget constraint (no externality with that one)
      - through the IC constraint, b/c raise incentive to commit fraud
- Welfare calculations in reduced-form models are inaccurate
some applications
balanced budget open market operations

- e.g., the NY Fed sells Treasuries from its portfolio to purchase MBS

1. Using liquid assets to purchase partially liquid assets
   - Liquid assets have higher prices
     - one share of liquid asset buys more than one share of partially liquid assets
   - but liquid assets and partially liquid assets have the same \( \theta(s) \)
   - \( L, q, \) interest rates, and welfare go down

2. Using liquid assets to purchase illiquid assets
   - marginally illiquid assets do not contribute to \( L \)
   - \( L, q, \) interest rates, and welfare go up
regulatory measures

retention requirement:

- in the time $t = 1$ market, have to retain $\rho(s)$ % of assets offered
- for this exercise: assume cost of fraud is $k_f(s) + k_v(s)d(s)$

the trade off:

- the bad: mechanical reduction in asset resalability
- the good: increases the cost of committing fraud

... b/c, for any given offer, need to produce more fraudulent assets
regulatory measures (cont’d)

• Negative impact on liquid assets

  the no-fraud IC constraint is not binding

• Negative impact on partially liquid assets

  partial equilibrium: relax the no-fraud IC constraint
  general equilibrium: offer $\uparrow$, asset demand $\uparrow$, asset price $\uparrow$

  $\Rightarrow$ tightens back IC constraint
  in the end... just a reduction in resalability

• Positive impact on illiquid assets

  general eq effect does not operate
  because offer $< \text{asset demand}$
flight to liquidity

concentration of demand towards liquid assets, widening of yield spreads

• Increase in $\sigma$ the frequency of trade in the $t = 1$ market
  interpretation: need for collateral $\uparrow$

• Two effects going in opposite directions
  liquidity demand increases: dominates for liquid assets, price increase
  fraud incentives increase: dominates for partially liquid assets price decrease so no-fraud IC constraint binds

• The set of liquid assets shrinks
  The set of partially liquid and illiquid assets expands
flight to liquidity

\[ \text{asset price} \]

illiquid \hspace{1cm} partially liquid \hspace{1cm} liquid

\[ \beta + \xi \]

\[ \beta \]

\[ 0 \]

\[ k(s) / A(s) \]
time varying liquidity

- with quasi-linear preferences à-la Lagos Wright
- model easily extendable to a multiperiod-multiassets economy

  terminal value becomes cum dividend price next period

- expectations of future liquidity premia matter
  they feed back into current liquidity premia

- our main result: excess volatility
  self-fulfilling fluctuations can arise
  but they are confined to liquid assets
conclusion

- A fraud-based model of liquidity premium
- An explanation for price and liquidity differences
- Implications
  - open-market operations
  - regulatory measures
  - flight to quality
  - time varying liquidity