

The Failure of a Clearinghouse: Empirical Evidence

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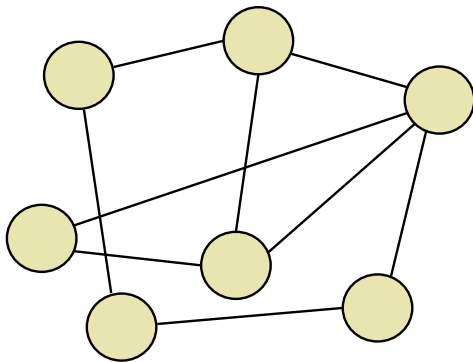
November 2017

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- **Central clearing counterparties (CCPs)** become widespread

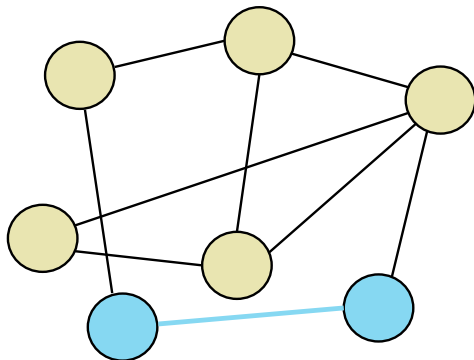
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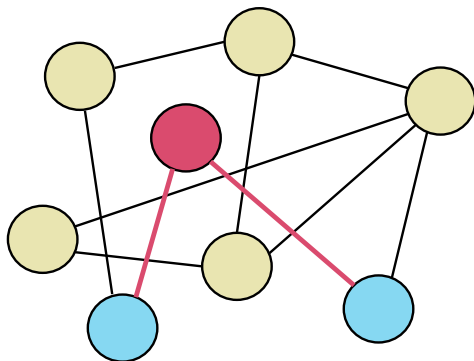
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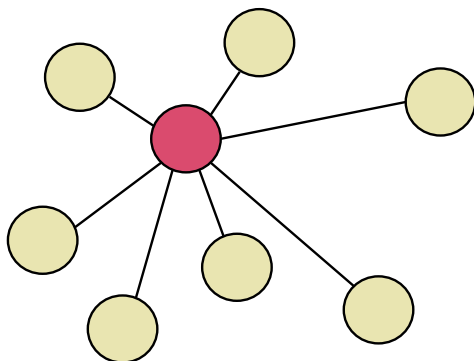
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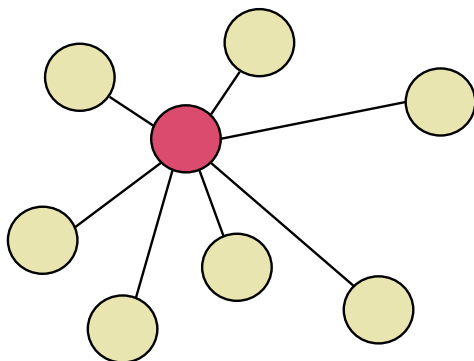
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- CCPs expected to improve financial stability
 - CCPs insure counterparty risk; netting benefits

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- New risk: **CCP default**
 - Dramatic effects on markets and macro stability ([Duffie, 2015](#))
 - LCH Swapclear: 269 trillion USD outstanding
 - Rare events: Three cases known in history, no existing study

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 - Failure of CCP in Paris Commodity Exchange in 1974
 - Unique descriptive evidence: novel, hand-collected, archive data
 - CCP risk management outside and around distress

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 - Unique descriptive evidence: novel, hand-collected, archive data
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- Implications: **CCP capital structure & default management**

CCP capital structure

- Matched book

Out-of-the-money transactions Collateral held	In-the-money transactions Amounts owing to members
Other assets	Equity

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Theory of CCP risk management

- **Charter value effect**

- Preserve cash flows associated with continuation of CCP
- Be tough with distressed member
- → Protect surviving members

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■ Risk-shifting effect

- Strict risk management: Equity may be impaired
- Lenient risk-management: Equity may be preserved
- Ex: If a price reversal occurs
- Risk-shifting: Be lenient with distressed member
- → At the expense of surviving members

The market

■ Paris Commodity Exchange

- Futures on sugar, cocoa, coffee
- Trading through 35 **registered brokers** → Also clearing members
- Execute orders on behalf of clients, including retail investors
- Short positions: commodity producers; **long positions: retail investors**

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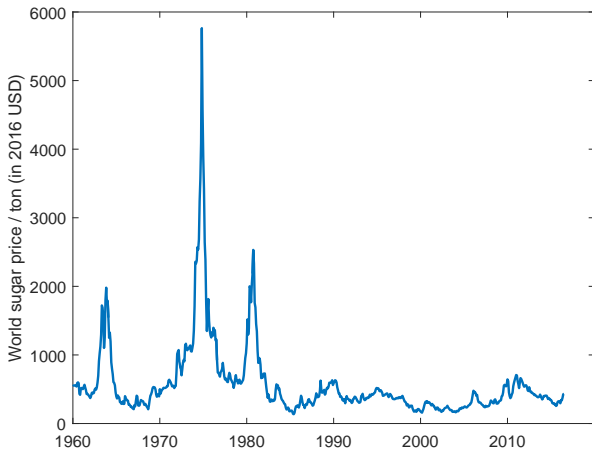
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■ CCP: *Caisse de Liquidation des Affaires en Marchandises* (CLAM)

- All trades centrally cleared → CLAM takes counterparty risk
- Risk managed by calling initial + variation margins
 - **Initial margins**: Paid at initiation of contract
 - **Variation margins**: Called daily based on price fluctuations
- If default on margins: Liquidate member's position
- If loss: equity absorbs; no additional waterfall

The 1974 sugar price boom

- Nov. 1973 - Nov. 1974: Six fold increase in **global** sugar prices
 - 1,300 to 8,100 FRF: 1 1974 FRF \approx 0.85 2015 USD
 - Limited free market + Embargoes + Bad crops + Fear of shortage



The 1974 sugar crisis

- **Boom in sugar prices:** Until Nov. 21st, 1974
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- **Closure of sugar market:** Dec. 3rd, 1974 to Jan. 1976
 - Market closes under pressure of CLAM + registered brokers
 - Negotiation + Judicial battle about loss allocation
 - Resolution of the CLAM, re-open with new CCP

Archive data

- **Department of Commerce + Paris Chamber of Commerce**
 - Legal, judicial and statistical documents, notes, confidential reports
 - → Exposures of CLAM, brokers and investors
 - → Account and transactions by Nataf
 - → Financial position on all of Nataf's clients

- **Bank of France**
 - Supervisory reports and notes
 - Balance sheet data

- **Stock price data** from *Cours authentique et officiel*

- **Sugar price data** from *Les Echos*.
 - Spot/future in Paris, London and New York

First cause of failure: Pool of investors

- Buyers of futures: Mostly **retail investors**
 - Policies to encourage retail participation
- **High turnover**: Buy at high prices

	Min	10pc	25pc	50pc	Mean	75pc	90pc	Max
Average buy price	2,084	4,879	5,525	6,201	6,080	6,784	7,275	8,005
Month	Jan.	Oct.	Oct.	Nov.	Nov.	Nov.	Nov.	Nov.

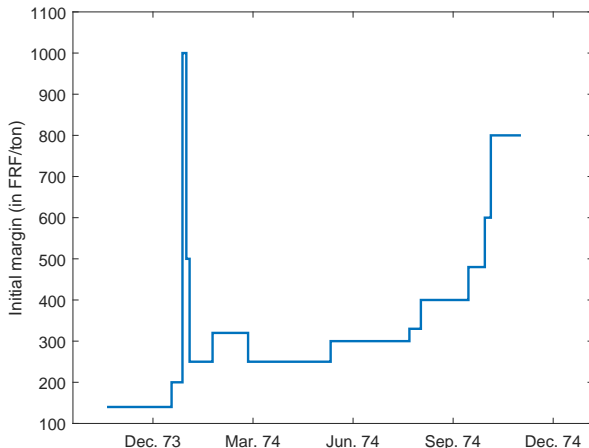
- **Massive retail investor defaults**
 - At 6,217 FRF/ton: 49.6% of defaults
- **No retail trading in London and New York**
 - Diversified and sophisticated financial institutions
 - Same price dynamics did not trigger investor defaults

Second cause of failure: Risk management instruments

- **Was risk management lenient during the boom?**
 - Data on all changes in initial margins in 1974

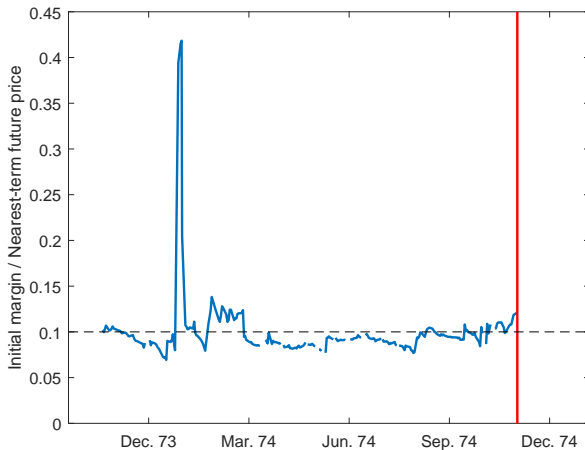
Second cause of failure: Risk management instruments

- Initial margin in FRF per ton of sugar



Second cause of failure: Risk management instruments

- Initial margin / Nearest-term future sugar price



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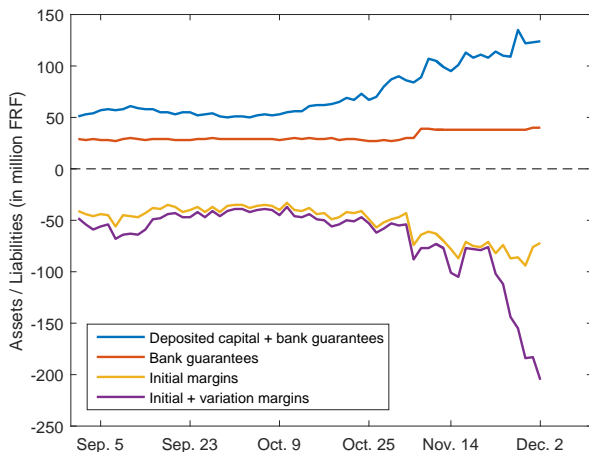
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Balance on CCP account = Deposited capital + External bank guarantees
– Initial margins – Variation margins



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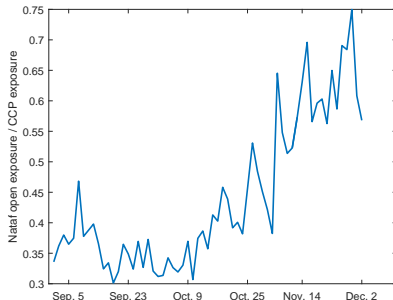
- **Quality of margins**

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- **Average margin levels were well-managed**

Second cause of failure: Risk management instruments

- **Build-up of large position (Nataf)**
 - 56% of CCP exposure on day of default
 - CLAM did not use potential member-specific surcharges



- Theory: **Rationales for penalizing large exposures**
 - 10% initial margins sufficient if liquidation at limit down
 - But: Limit down are not market clearing prices
 - Liquidating (large) exposures subject to frictions

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- **Cumulative abnormal return** from $\tau - 5$ to $\tau + 5$

$$C\bar{A}R(\tau - 5, \bar{\tau}) = \sum_{t=\tau-5}^{\bar{\tau}} \left(\frac{1}{N} \sum_{i=1}^N AR_{it} \right).$$

Second cause of failure: Risk management instruments

	Cumulative abnormal return	95% confidence interval	<i>p</i> -value
$\tau - 5$	-0.001	[-0.014 ; 0.011]	0.590
$\tau - 4$	0.001	[-0.020 ; 0.021]	0.471
$\tau - 3$	-0.000	[-0.021 ; 0.020]	0.521
$\tau - 2$	-0.004	[-0.028 ; 0.020]	0.658
$\tau - 1$	-0.000	[-0.028 ; 0.028]	0.504
τ	0.006	[-0.025 ; 0.036]	0.336
$\tau + 1$	0.006	[-0.025 ; 0.036]	0.331
$\tau + 2$	0.013*	[-0.009 ; 0.035]	0.097
$\tau + 3$	0.017**	[0.001 ; 0.034]	0.022
$\tau + 4$	0.013*	[-0.005 ; 0.032]	0.067
$\tau + 5$	0.023***	[0.007 ; 0.039]	0.006

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- Implied probability of default is non-zero

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- → CLAM is acting to protect Nataf

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- **Channel**
 - Trades registered at the CLAM at the end of the day
 - Rearrange counterparties and prices before novation

Third cause of failure: Risk-shifting

	Dependent variable: Execution price of buy orders			
Avg. exec. price of existing trades	-0.020** (0.028)	-0.016* (0.057)		
Size of existing position			-0.279*** (0.000)	-0.247*** (0.000)
Volume of trade		-0.185*** (0.000)		-0.097** (0.027)
N. Obs.	69	69	74	74
R^2	0.993	0.995	0.995	0.995
Fixed effects	D, MAT	D, MAT	D, MAT	D, MAT

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- Investors close to default get better execution prices
- Results consistent, but less significant, for sell orders

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- **CLAM asks minister to close the market** (Dec. 3rd)
 - **Article 22** sets a settlement price if closure
 - Settlement at the average price over past 20 trading days
 - Here: 7,400 FRF per ton, above price on Dec. 2nd, 6,200 FRF
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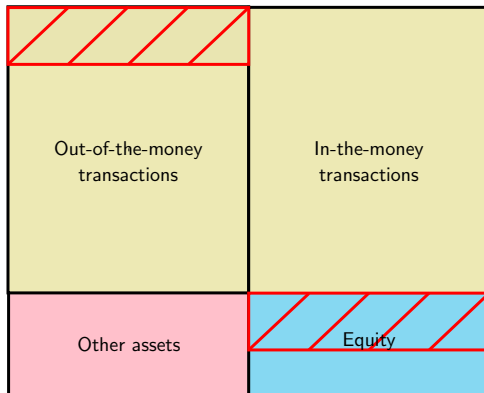
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- Push for Article 22 → **Manipulate settlement price**

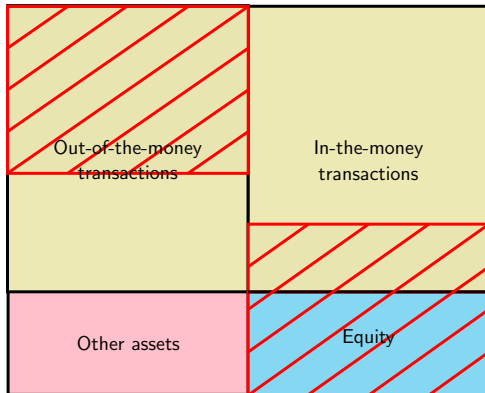
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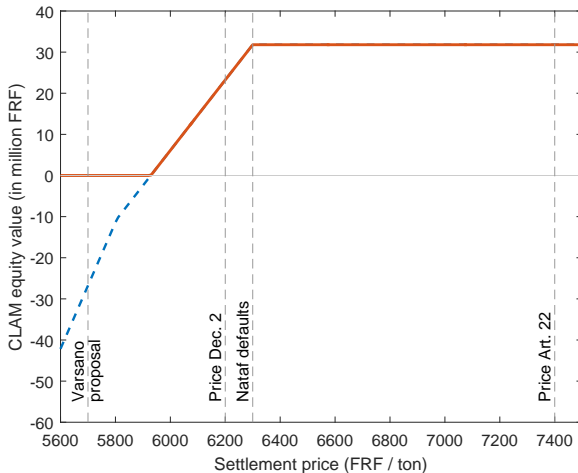
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- CLAM close to region where **equity value function is convex**

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- **Sugar professionals contribute** on top of margin haircuts
 - 15 million FRF to finance the agreement
- All assets of the CLAM liquidated
 - Large shareholders sell for 1 FRF per share
 - Retail shareholders sell for 100 FRF per share
 - **No direct government contribution** (but public ownership of banks)

Conclusion and policy implications

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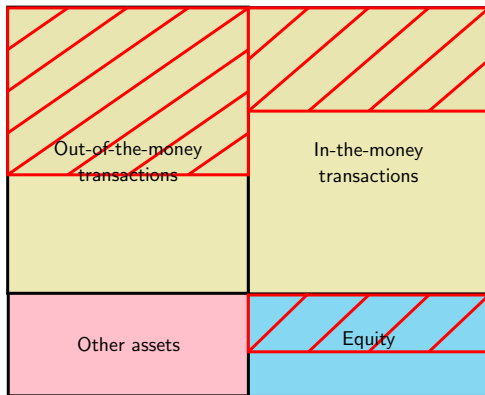
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 - Large member position
 - Risk-shifting incentives
- **Better CCP capitalization** can reduce risk-shifting
- **Better CCP governance** can reduce risk-shifting
 - More power to members that attach greater value to continuation
 - Member-owned CCPs likely to prefer continuation
 - **Rules versus discretion:** less likely to delay default

Policy implications: Default waterfalls

■ Default waterfall

- Tranches of equity
- Members junior to residual equity (CoCo-like)



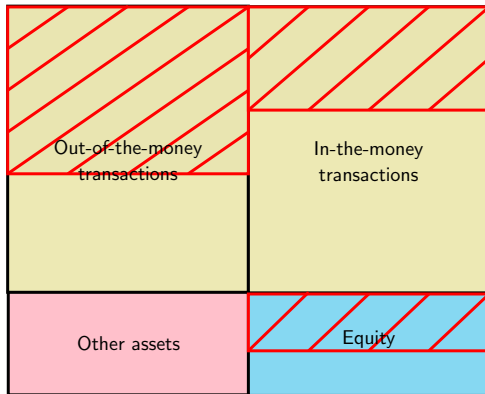
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- **Mitigate risk-shifting**

- Equity not only residual claimant



Policy implications: Default waterfalls

■ Default waterfall

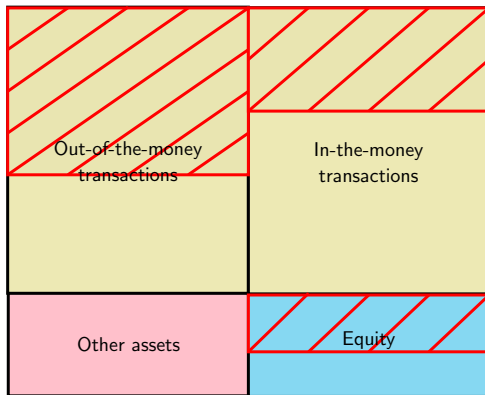
- Tranches of equity
- Members junior to residual equity (CoCo-like)

■ Mitigate risk-shifting

- Equity not only residual claimant

■ Increase renegotiation set

- Lower sensitivity of equity to settlement prices



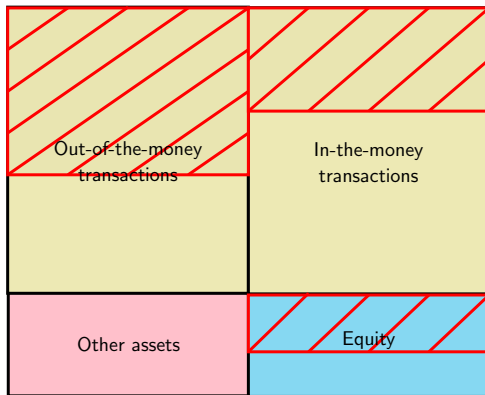
Policy implications: Default waterfalls

■ Default waterfall

- Tranches of equity
- Members junior to residual equity (CoCo-like)

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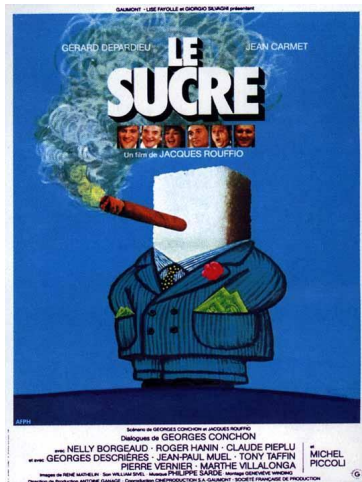
■ Increase renegotiation set

- Lower sensitivity of equity to settlement prices

■ Trade-off with skin-in-the-game

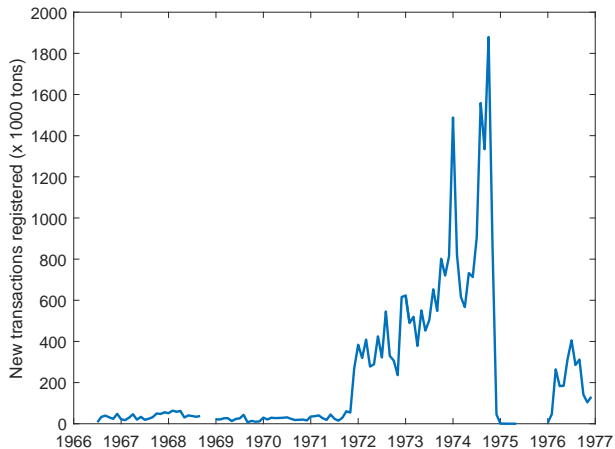
- Optimal design is open question

For more entertainment



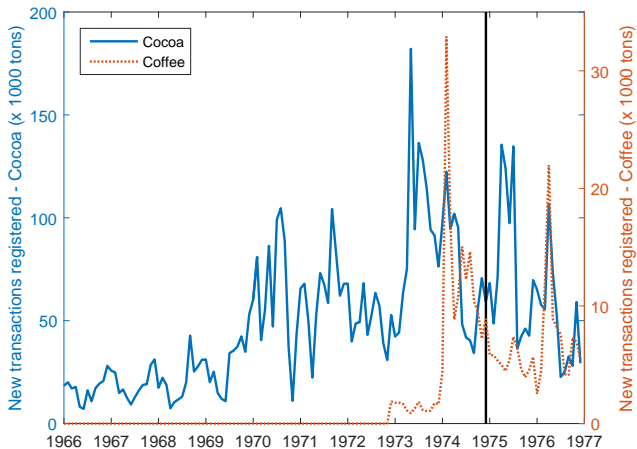
Appendix

New transactions registered — Sugar

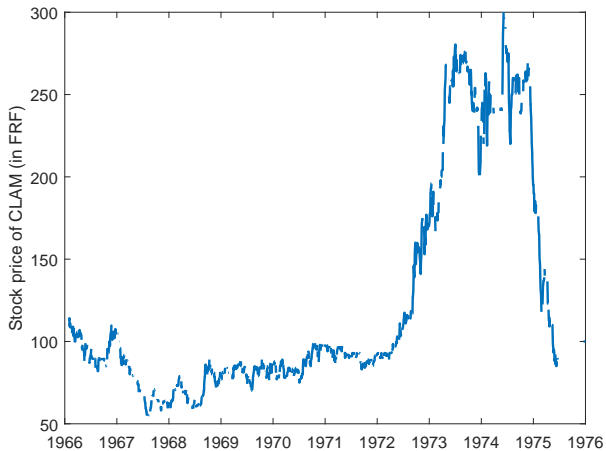


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New transactions registered — Coffee and cocoa

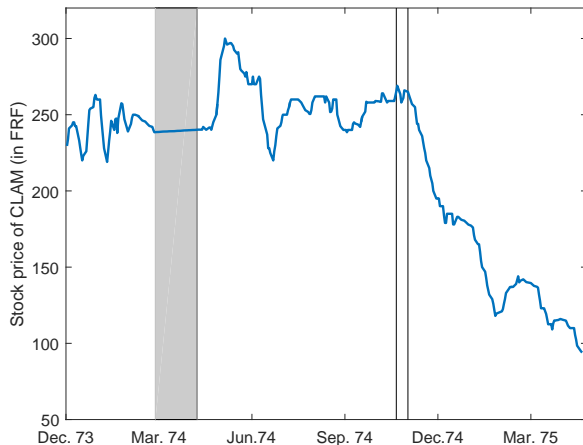


CLAM stock price — 1966-1975



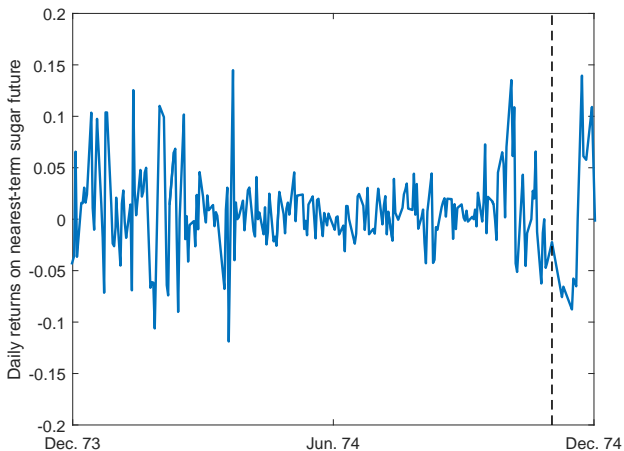
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CLAM stock price around failure



Daily returns on nearest-term contract

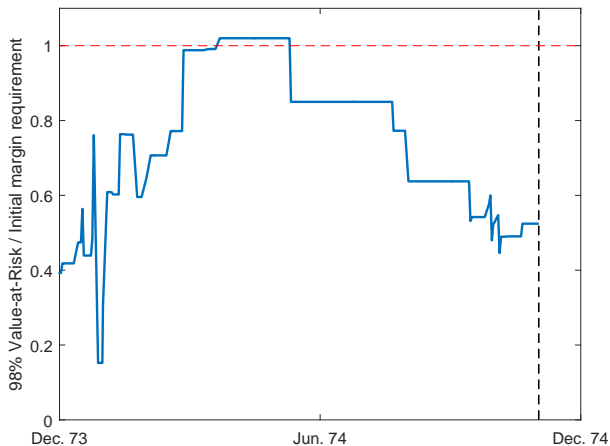
- Volatility of sugar prices not markedly higher



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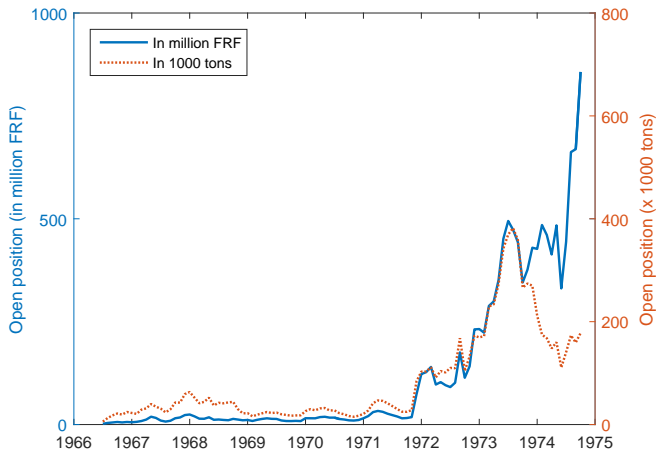
Valut-at-Risk (VaR)

- 98% VaR / Initial margin requirement is decreasing



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Open position



Open position / Market capitalization

