Financialization, Intraday Institutional Trading, and Commodity Market Quality

Vikas Raman, University of Warwick

Michel A. Robe, American University and CFTC

Pradeep Yadav, University of Oklahoma

Emerging Markets Finance Conference in collaboration with Vanderbilt Law School

December 15, 2016

What is Financialization?

- Midway through the previous decade, institutional financial actors, driven by "non-commercial" motives, started assuming a much greater role in commodity markets.
    - The market share of institutional financial traders more than doubled, from less than 20 percent of all open futures and futures equivalent option positions in 2000 to more than 40 percent in 2008 (Büyükşahin et. al, 2008).
    - "*$260 billion is invested in commodity funds, 20 times the level of 2003*" (*Economist,* 2009).
- This development is often dubbed the "financialization" of commodities (UNCTAD, 2011; Cheng and Xiong, 2014).

Concerns about Financialization

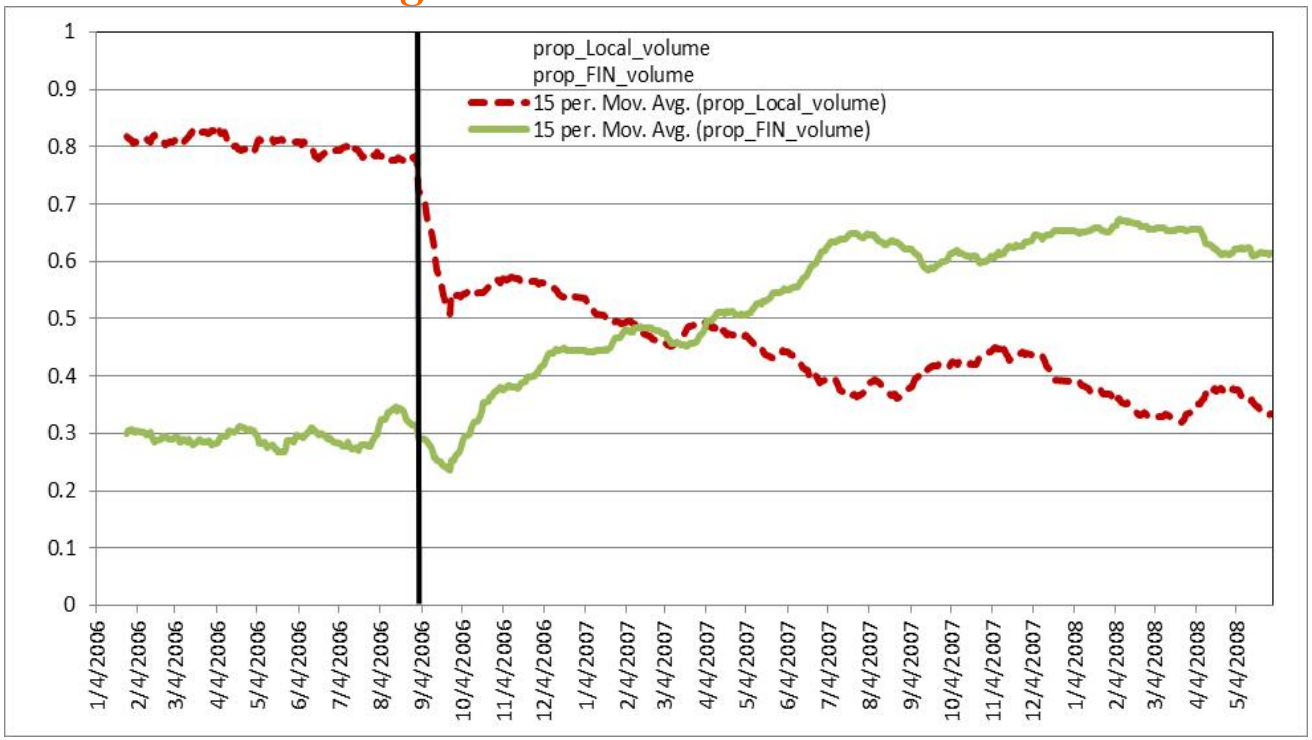
- Polarized views on whether financial investors have affected commodity prices
  - The bubble view: financialization had caused a gigantic bubble in energy and agricultural commodities in 2007-2008.
    - Michael Masters, in his 2008 testimony to the U.S. Senate, argued that futures market speculation had caused a bubble in oil prices in 2007 and 2008, leading to significantly higher energy costs for consumers. This "bubble" view was later echoed by former Congressman Joseph Kennedy II, extended to grain commodities in a U.S. Senate report in 2009, and also was advocated by then British Prime Minister Gordon Brown and French President Nicolas Sarkozy in 2009.
  - The business-as-usual view: there was no bubble and thus no problem
    - E.g., Krugman (NYT 2008), Stoll and Whaley (JAF 2010), Irwin and Sanders (Energy Econ 2012)
- Rejecting one extreme view does not justify the other: the truth might be more nuanced.
  - Financialization has transformed commodity markets in subtle ways, some good, some bad.
    - Need to analyze specific mechanisms.
    - Caution against blank generalizations.

Academic Research on Financialization

- Financialization has spawned substantial academic research.
  - Overnight positions and trading strategies of commodity index traders (CITs) and managed money traders, and on their relevance to the daily, weekly, or monthly distributions of commodity returns: risk premia (e.g., Acharya, Lochstoer, and Ramadorai, JFE 2013; Singleton, MS 2014).
  - Price levels (e.g., Henderson, Pearson, and Wang, RFS 2015; Hamilton and Wu, Int. Econ. Rev., 2015), and volatility (e.g., Brunetti, Büyükşahin, and Harris, JFQA 2016).
  - Co-movements with other asset markets (e.g., Tang and Xiong, FAJ 2012; Büyükşahin and Robe, JIMF 2014; Cheng, Kirilenko, and Xiong, ROF 2014; Başak and Pavlova, JF 2016).
- All extant research has focused on positions held for days or months.

Intraday Financialization

- Surprisingly little attention has been paid to another major aspect of financialization – the massive growth of ***short-horizon trading by institutional financial traders, with positions held intraday rather than overnight***.



Daily trading by Financial Institutional Traders increased dramatically in Crude-Oil futures since 2006

Questions Addressed

- **We investigate the impact of *intraday financialization* on commodity market pricing efficiency and liquidity.**

- ***Do institutional financial traders make prices more efficient by reducing the magnitude of pricing errors?***
  - ***Pricing error measured as deviations from an information efficient "fundamental" price as in Fotak, Raman, and Yadav (JFE 2014) or Hasbrouck (RFS 1993).***

- ***Do institutional financial traders improve market liquidity by:***
  - ***Reducing bid-ask spreads?***
  - ***Improving market depth?***
  - ***Reducing customer order imbalances?***

- ***Contribute to two strands of the literature: financialization and institutional trading.***

Hypothesis 1: Intraday Financialization and Pricing Efficiency

- **For commodity markets,** Singleton (MS 2014) and Sockin and Xiong (JF 2015) develop models, arguing that, due to globalization, commodity market participants face severely heightened informational frictions (about physical supply, demand, and inventories); that these frictions generate confusion about demand; and the associated financial speculation, may cause the magnitude of pricing errors to increase for extended periods.
  - Focus is on **pricing errors that may persist over weeks or months** rather than on intraday pricing errors.

- Similarly, several extant empirical studies examine, e.g., whether trading activities related to commodity index derivatives or other commodity-linked financial products have deleterious effects on prices at **daily or longer horizons**:
  - E.g., Hamilton and Wu (Int. Econ. Rev. 2015), Henderson, Pearson, and Wang (RFS 2015), and Irwin and Sanders (Energy Econ 2012).

- The focus of this paper is on ***short intraday horizons***.

Hypothesis 1: Intraday Financialization and Pricing Efficiency

- **For equity markets**, there is extensive empirical evidence suggesting that institutional investors are more informed relative to other investors. For example:
  - Hendershott, Lidvan, and Schürhoff (JFE 2015) document that institutional investors anticipate the nature of news announcements prior to their release.
  - Boehmer and Kelley (RFS 2009) find a positive relation between institutional shareholdings and the relative informational efficiency of stock prices.
  - Badrinath, Kale, and Noe (RFS 1995) find that the returns of stocks with high institutional ownership lead those with low institutional ownership.
  - Chordia, Roll, and Subrahmanyam (JFE 2011) find empirical evidence that institutional trading results in an overall increase in information-based trading.
  - Campbell, Ramadorai, and Schwartz (JFE 2009) show that institutions arbitrage stock mispricings around earnings announcements.
- However, this evidence is focused on longer horizon institutional ***investors*** (with stock holdings and who engage in fundamental research on earnings and other news and announcements) rather than on intraday focused institutional ***traders*** engaged primarily in ***short-horizon liquidity provision and trading on the order flow*** – who are the focus of the present paper.

Hypothesis 1: Intraday Financialization and Pricing Efficiency

- Relevant extant research is that on **fast or automated** traders showing that these fast traders – who likely are institutional – improve price discovery in equity markets (Brogaard et al, RFS 2014) and currency markets (Chaboud et al, JF 2014).

- Hendershott, Lidvan, and Schürhoff (JFE 2015) argue that institutions should be better informed because of superior information (in terms of access, gathering, and processing skills) and better financial and analytical resources. ⇥ Thus, increased intraday trading by institutional financial traders should reduce pricing errors at intraday horizons.

- However, De Long et al (1990) show that short-horizon investors could have adverse effects on pricing efficiency because of reluctance to arbitrage pricing inefficiencies as the latter may last beyond the arbitrageurs' trading horizon.

- Irrespective, intraday financialization would increase capital available for financial traders to fulfill more continually the risk-sharing role of futures markets, and thereby reduce pricing errors.

Hypothesis 1: Intraday Financialization and Pricing Efficiency

- It is an empirical question whether institutional financial trading increases pricing efficiency.
  - ↠ Providing an answer is important for regulators and market participants, since the role of institutional traders has skyrocketed with the growth of voluntary market-making needs in the wake of changing financial market architectures.

- Given extant findings that fast automated traders improve price discovery in other financial markets, and given that these fast traders may be organized as institutional traders, we need to differentiate between the effects of institutional financial traders per se, and the effects of just fast traders.

- Hence, we test for the beneficial effects on the variance of pricing errors of increases in:
  - Overall institutional financial trading
  - A measure of financialization that only considers non-automated traders.

Hypothesis 2: Intraday Financialization and Liquidity

- Following the arguments in Hendershott, Lidvan, and Schürhoff (JFE 2015):
  - First, institutional financial traders have better cash resources than individual traders do.
    - Hence, their entry into intraday trading and liquidity provision should significantly increase overall availability of, capital for liquidity provision – thereby increasing depth and reducing customer trade imbalances.
  - Second, institutional financial traders have greater direct access to information, and greater resources for processing information.
    - So, they are better able to effectively manage their inventories and control risks.
    - Consequently, they can take greater position risks in individual liquidity-provision trades and can supply liquidity at lower costs.
    - This should reduce spreads and increase depth.
  - Third, an increase in institutional financial trading necessarily increases competition among liquidity providers, potentially leading to more aggressive pricing and participation.
    - This should again reduce spreads and customer trade imbalances.

Hypothesis 2: Intraday Financialization and Liquidity

- If institutional traders are better informed than other market participants over intraday horizons, financialization should arguably increase the extent of information-based trading.
    - Theoretical models of Boulatov and George (RFS 2013) and Goettler, Parlour, and Rajan (JFE 2009) show that informed agents gravitate towards supplying liquidity rather than taking liquidity, a prediction that is also consistent with the earlier empirical results of Kannel and Liu (JFE 2006).
    - They should be able to do so at lower cost since they need to make a relatively lower provision for adverse selection losses to more informed traders.
- Given that algorithmic trading improves intraday liquidity (Hendershott, Jones, and Menkveld, JF 2011). we undertake tests that identify the beneficial impact on market liquidity of two alternative measures of financialization:
    - An overall measure that includes fast algorithmic traders
    - A narrower measure that excludes them.

Overall Contribution

- We add to the financialization literature by being the first to study the impact of the trading and liquidity provision of institutional financial traders with explicitly short intraday horizons.
  - Our results are consistent with the flow of institutional risk capital into intraday liquidity provision driving market quality improvements.

- Our research also complements the extensive literature on the impact of institutional trading.
  - We are the first to investigate the impact of short intraday horizon trading of both fast and non-fast institutional financial traders, and to show that they both contribute to intraday market quality (albeit in different ways).

- Finally, while our findings pertain to commodity markets, they are directly relevant to all electronic order-driven markets where liquidity provision is voluntary.
  - Insofar as most equity and many other financial markets are now organized as electronic order-driven markets with voluntary liquidity provision, our results on the beneficial impact of the flow of institutional risk capital into liquidity provision and short-horizon trading are potentially of wide applicability.

Data

- **CFTC Confidential TSS Data**
  - All intraday **transaction** records for West Texas Intermediate (WTI) sweet crude oil futures on the New York Mercantile Exchange (NYMEX) between March 1st, 2006 and March 15, 2008
  - **Information** collected
    - Commodity and delivery month
    - Quantity traded and price
    - Transaction date and time:
      - For electronic trades, time stamp assigned to the trades when both sides were matched
      - For open outcry trades done in the pit, imputed trade time stamp
    - Trader Type
    - Buyer and seller ID codes + TSS classifications
      - Anonymized *(we don't know who they are, just their IDs)*

Proxying for Intraday Financialization

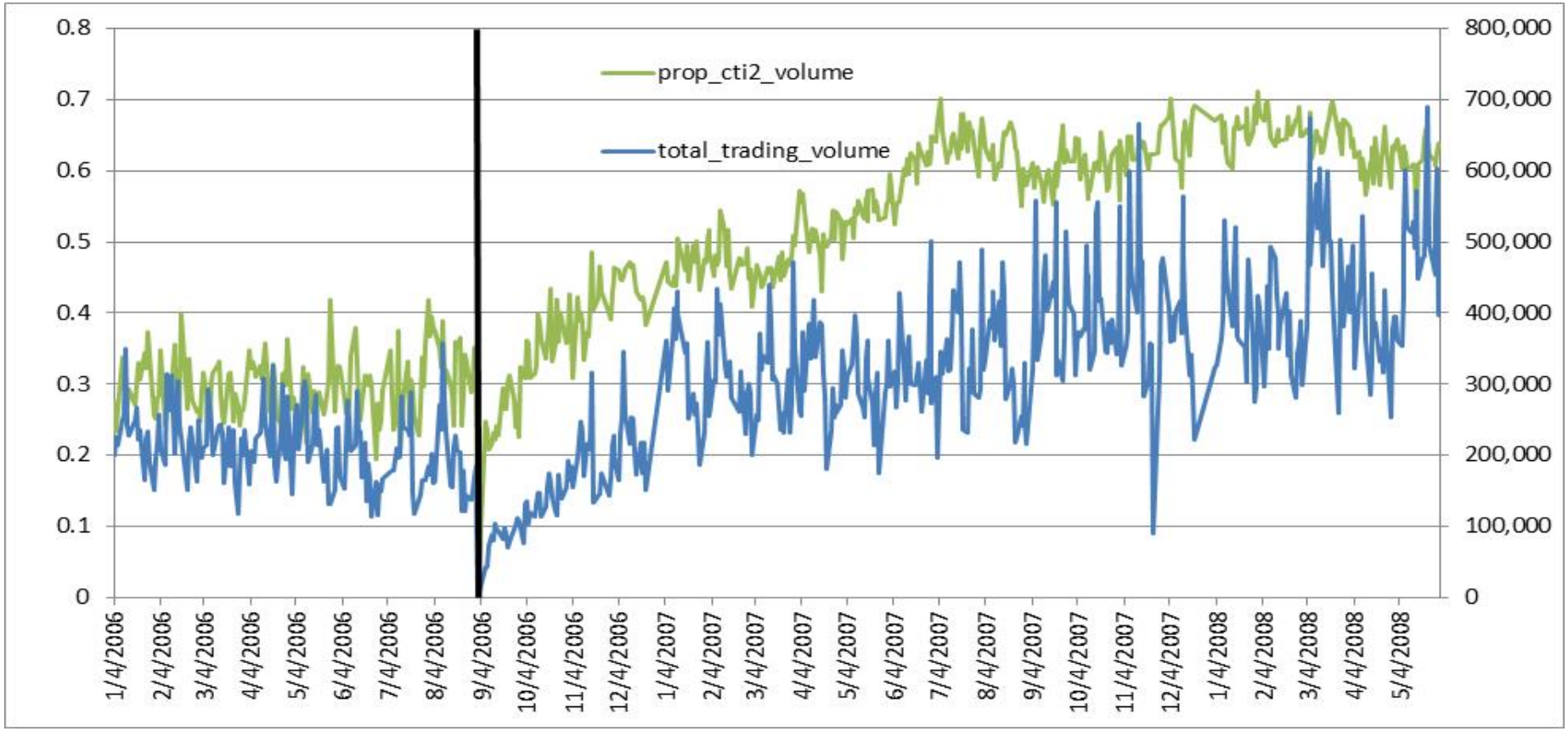
- We proxy intraday financialization by the volume of trading by institutional corporate members – designated Customer Type Indicator CTI2 in the CFTC database.

- CTI2 traders are: "***Hedge funds, commodity pools, banks, futures commission merchants ("FCMs"), foreign brokers, broker/dealers, commodity trading advisors, introducing brokers, commercial entities, proprietary trading firms*** and other corporate entities are eligible for corporate membership."

- CTI-2 traders are overwhelmingly (>99%) financial traders, i.e., traders without a commercial exposure to the underlying (physical) commodity.

- Their focus is on *intraday* trading and provision of liquidity: *post*-electronification, the median level of hourly inventory turnover of the CTI-2 group is as high as 92% (comparable to a similar 88% figure for Locals but as against 0% for traders in the customer group).

Intraday Financialization



Framework

- Generally difficult to test: Endogeneity problem
    - Financial Institutional traders trade more because market quality is better.
    - Market quality may improve due to increased trading by FINs.

- To circumvent this problem, we use an ***exogenous event*** – introduction of electronic trading – to instrument financial trader participation.

    - In September, 2006, NYMEX introduced electronic trading in the Crude oil market

    - This event removed the barriers to participation in the crude oil market and facilitated the participation of financial traders

    - More importantly, the event is exogenous to any pre-existing market conditions in the crude oil market

Electronification

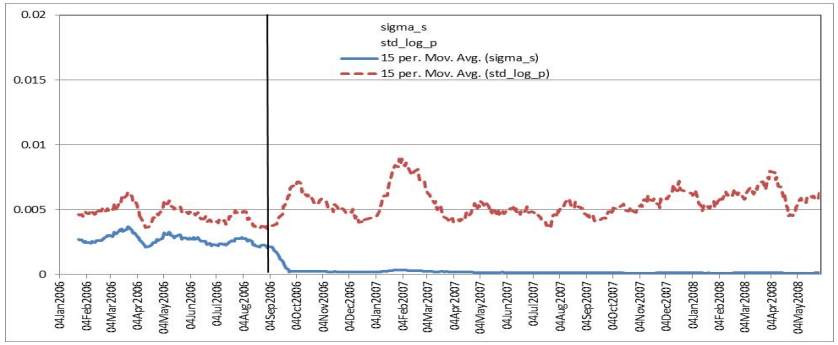
- Electronic trading opened up access to markets beyond the ambit of financial intermediaries dedicated to an exchange floor.
  - Open access hugely increased competition for erstwhile financial intermediaries and radically altered the nature of the players engaged in financial intermediation, and the strategies used by them.
  - Open access led to a significant influx into these markets of institutional financial traders motivated solely by short-term trading profits, without any commercial interests or positions.

- Expectation would be for an increase in market quality due to wider access, as in Barclays et al (2000) for NASDAQ, and Naik and Yadav (2003) for London Stock Exchange.

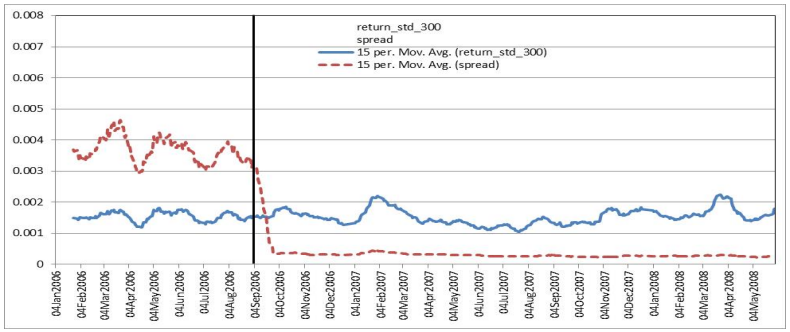
- Electronification per se should also improve market quality in the crude-oil market, as it earlier did in the equity markets (Jain, 2005).

Electronification and Market Quality

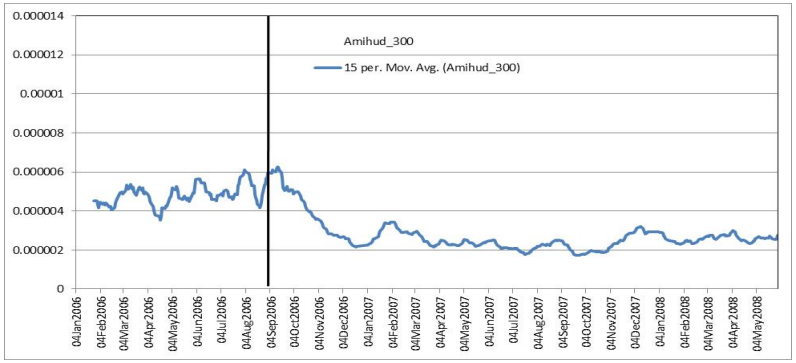
Panel A: Pricing Errors (*PE_Variance* and *Price_Volatility*)



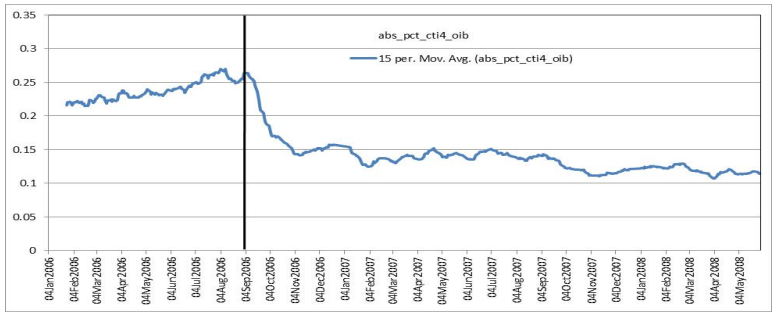
Panel B: *Spread* and *Volatility*



Panel C: Inverse Depth (*Amihud Ratio*)



Panel D: Customer Demand Imbalances (*AbsOIB*)



- Significant improvements in all market quality measures

Electronification and Market Quality

	Pre-Electronification	Post-Electronification	Difference	Pct. Difference	p-value
FIN	29.64%	55.01%	25.37%	85.59%	<.001
Spread	0.37%	0.03%	-0.34%	-91.94%	<.001
Amihud	4.90	2.66	-2.24	-45.76%	0.604
AbsOIB	23.85%	13.48%	-10.37%	-43.48%	<.001
PE_Proportion	58.87%	3.73%	-55.14%	-93.66%	<.001

- Significant improvements in spreads, customer order imbalances, and pricing errors

Electronification and Financialization

- We clearly find that electronification markedly improved market quality measures.

- But we are concerned about financialization, not electronification.
    - How do we tease out the respective impacts of electronification and financialization?

- Solution: exploit **cross-sectional differences in the rates of financialization** across the futures term structure

- We find that the benefits of electronification are positively related to the extent of financialization.
    - **key measures of market quality** (bid-ask spreads, market depth, customer trade imbalances) and pricing efficiency **all improved due to financialization**.

Electronification and Financialization

- We need to differentiate between the respective impacts of electronification and financialization.

- Electronification can improve market quality by:
  - Improving *pre*- and *post*-trade transparency in the market, and reducing information asymmetry.
  - Cutting fixed operating and order processing costs.
  - Both should affect both short and long-term contracts

- Additionally, **open access**, as a result of electronification, attracts new groups of traders, predominantly institutional financial traders, because it offers access to a transparent market where all traders have an opportunity to voluntarily provide and demand liquidity. Unlike the Pits, where *Locals* enjoyed clear access advantages.
  - The new traders do not necessarily trade long and short term contracts equally.

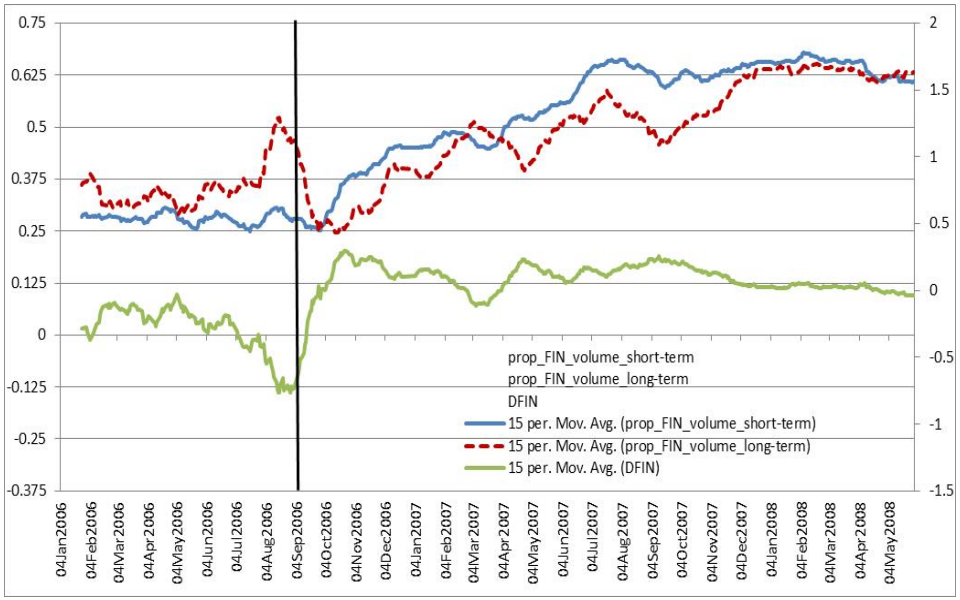
Electronification and Financialization

- Not all contract maturities are expected to experience the same amount of interest from financial traders.
  - First, institutional financial traders have shorter trading horizons than other traders. Intuitively, they should thus trade more in short-term than in long-term contracts (Ederington and Lee, JFQA 2002).
  - Second, the two front contract months and the nearest three Decembers account for the preponderance of the intraday directional and calendar spread trading in the WTI futures market.
    - This is the case both before electronification (Neuberger, RFS 1999), and after electronification (Büyükşahin *et al.*, WP 2015).

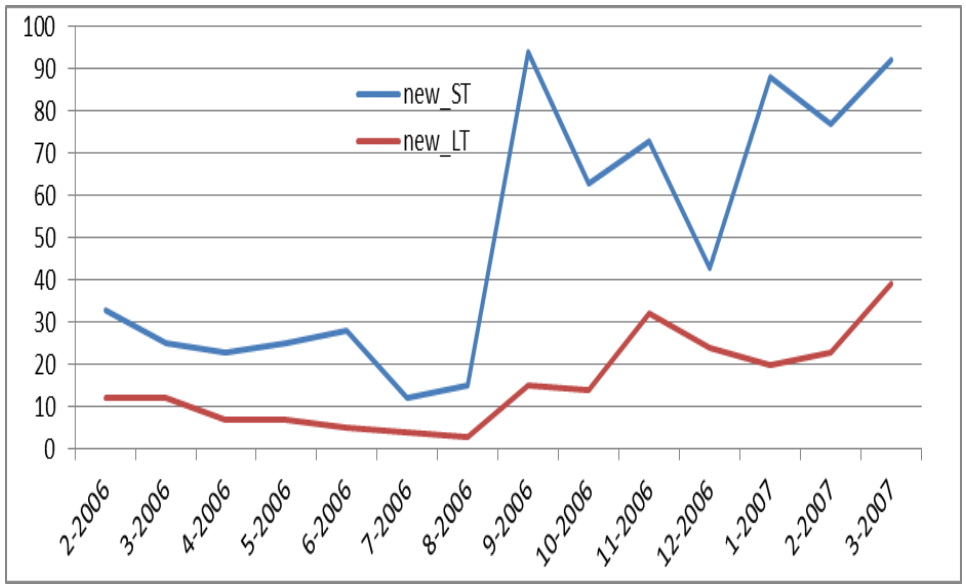
- If financialization impacts market quality, one can therefore expect the market quality of the WTI futures market to evolve differentially at different points of the futures term structure.

Electronification and Financialization

Panel A: Financial trading volume in short-term *vs*. long-term crude oil contracts



Panel B: Entry of new institutional financial traders in short-term *vs*. long-term WTI crude oil futures



Electronification and Financialization

	Pre-Electronification	Post-Electronification	Difference	p-value
FIN_Short-Term	28.10%	41.42%	13.32%	<.001
FIN_Long-Term	36.27%	37.48%	1.21%	0.312
ΔFIN	-30.42%	9.54%	39.96%	<.001

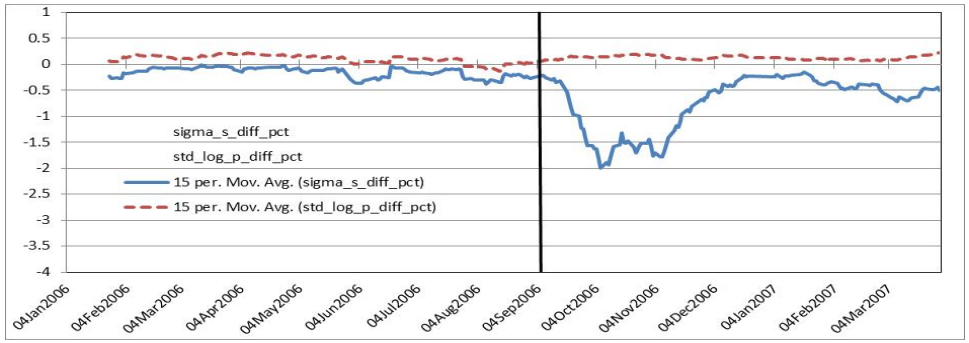
- We use this exogenous increase in the relative participation of new financial traders (short-term contracts w.r.t long-term contracts)
- And examine how this increase in relative participation effects the relative change in market quality variables.

- The change in the average level of market quality variables (across all contract maturities) around electronification is the sum total effect of electronification and financialization.
- The relative change in market quality variables around electronification, after controlling for pertinent factors, is the effect of the difference in the influx of financial traders into short-term and long-term contracts due to electronification.

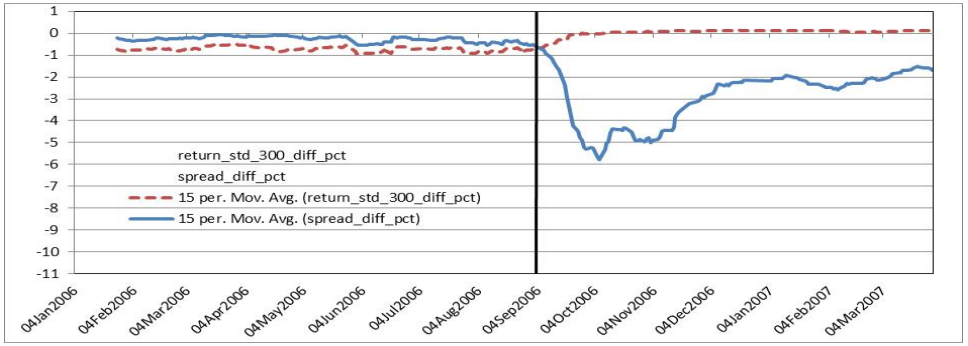
Financialization and Market Quality

- Relative FIN is positively related with relative improvement in all metrics of market quality.

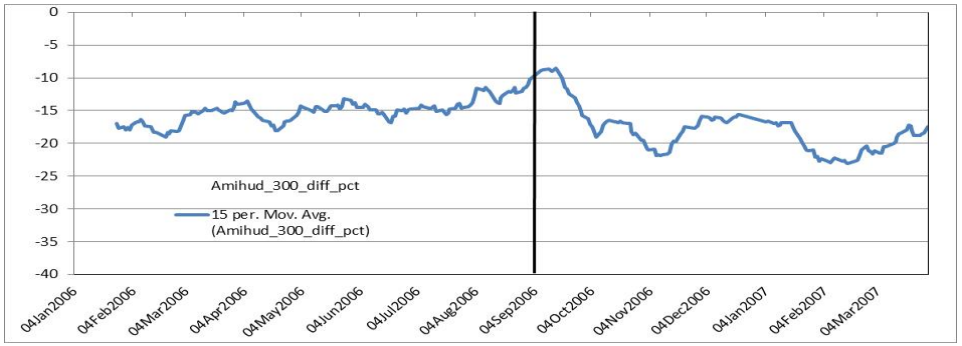
Panel E: Δ*PE_Variance* and Δ*Price_Volatility*



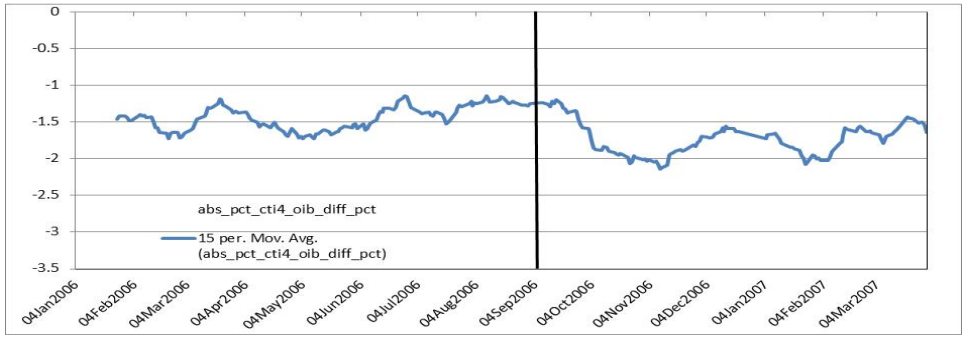
Panel A: Δ*Spread* and Δ*Volatility*



Panel B: Δ*Amihud*



Panel C: Δ*AbsOIB*



Financialization and Market Quality

- Relative FIN is significantly and positively related with relative improvement in all metrics of market quality.

	Pre-Electronification	Post-Electronification	Difference	p-value
Spread_Short-Term	0.35%	0.03%	-0.32%	<.001
Spread_Long-Term	0.41%	0.10%	-0.31%	<.001
Δ*Spread*	-28%	-304%	-276%	<.001
Amihud_Short-Term	1.04	1.07	0.03	0.604
Amihud_Long-Term	15.00	20.00	5.00	<.001
Δ*Amihud*	-14.87	-18.43	-3.56	<.001
AbsOIB_Short-Term	17.09%	12.36%	-4.73%	<.001
AbsOIB_Long-Term	40.85%	33.19%	-7.66%	<.001
Δ*AbsOIB*	-143.74%	-175.26%	-31.52%	<.001
PE_Proportion_Short-Term	55.35%	4.12%	-51.23%	<.001
PE_Proportion_Long-Term	69.61%	8.90%	-60.71%	<.001
Δ*PE_Proportion*	-27.73%	-132.27%	-104.54%	<.001

Financialization and Market Quality: Two-Stage Regressions

- We use the electronification of the crude-oil futures markets as an instrument for the relative participation of financial traders in short-term contracts in our analyses as follows:

- First Stage: $\Delta FIN_t = \alpha_1 + \beta_1 Electronification + \gamma_1 C_t + \theta_t$
- Second Stage: $\Delta M_t = \alpha_2 + \beta_2 \widehat{\Delta FIN_t} + \gamma_2 X_t + \epsilon_t$

  - ΔFIN_t = relative difference between short-term and long-term contracts' participation of financial traders;
  - $\widehat{\Delta FIN_t}$ = predicted value obtained from the first stage;
  - ΔM_t = relative difference between short-term and long-term contracts' relevant market quality measure (such as Bid-Ask spreads)

- Analysis Period: January, 2006 to March, 2007

Financialization and Market Quality: First Stage Regression

Independent Variable	Model 1		Model 2	
Intercept	-0.30	<.001	-0.08	0.508
Electronification	**0.40**	**<.001**	**0.37**	**<.001**
VIX			-0.02	0.018
EIA_Inventory			0.06	0.247
Lead_Inventory			0.01	0.868
GSCI_Roll			0.07	0.069
Contract_Exp_Day			-0.08	0.313
Day of the Week			YES	
N	299		299	
Adj RSq	30.65%		32.15%	

- The coefficient of 0.40 implies that, *post*-electronification, the relative participation of financial traders in short-term contracts increased by as much as 40%.
- Prior to electronification, institutional financial traders participated more in long-term contracts than in short-term contracts, as indicated by the intercept of -0.30.
- There is clearly a statistically and economically significant link between $Electronification$ and the difference in institutional financial traders' participation in short-term *vs*. long-term contracts.
- Consistent with graphical and univariate evidence.

Financialization and Spreads: 2nd-Stage Regression

- Spreads: a one standard deviation increase in the difference in financialization, widens the differences in bid-ask spreads by 0.76 standard deviations, or 94% of its mean value.

Parameter	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Intercept	-0.95	<.001	1.57	0.019	-1.06	<.001	0.91	0.089	0.89	0.088	1.56	0.016
Δ*FIN_Predicted*	**-4.22**	**<.001**	**-3.64**	**<.001**	**-4.36**	**<.001**	**-3.89**	**<.001**	**-3.89**	**<.001**	**-3.64**	**<.001**
Δ*Volume*			-3.13	<.001			-2.42	<.001	0.80	<.001	-3.12	<.001
Δ*Customer Volume*									-2.40	<.001	-0.05	0.912
Δ*Volatility*	0.86	<.001	0.81	<.001	0.83	<.001	0.80	<.001	-0.11	0.823	0.81	<.001
EIA_Inventory	0.26	0.165	0.26	0.154	0.28	0.132	0.28	0.129	0.28	0.129	0.26	0.151
Lead_Inventory	0.00	0.998	0.02	0.884	0.02	0.901	0.03	0.824	0.03	0.835	0.02	0.890
GSCI_Roll	0.48	<.001	0.44	0.001	0.53	<.001	0.49	<.001	0.49	0.001	0.44	0.001
Contract_Exp_Day	-0.05	0.788	-0.11	0.547	-0.08	0.689	-0.11	0.513	-0.11	0.543	-0.10	0.570
September,2006					-1.10	0.041	-0.94	0.079	-0.94	0.080		
Dependent Lags	2		2		2		2		2		2	
Day of the Week	YES		YES		YES		YES		YES		YES	
N	299		299		299		299		299		299	
Adj RSq	73.71%		74.75%		75.25%		75.81%		76.80%		75.69%	

Financialization and Depth: 2nd-Stage Regression

- Amihud Ratio: a one standard deviation increase in the difference in financialization widens the percentage difference in Amihud ratios by 0.80 standard deviations, or 28% of its mean value.

Parameter	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Intercept	-8.09	<.001	6.66	0.059	-9.01	<.001	9.15	0.010	7.97	0.024	5.51	0.118
ΔFIN_Predicted	**-16.17**	**<.001**	**-11.00**	**<.001**	**-17.42**	**<.001**	**-11.76**	**<.001**	**-11.34**	**<.001**	**-10.60**	**<.001**
ΔVolume			-17.24	<.001			-22.03	<.001	-5.38	0.022	-15.99	<.001
ΔCustomer Volume									5.67	<.001	4.92	0.038
ΔVolatility	5.91	<.001	5.62	<.001	5.95	<.001	5.63	<.001	-20.81	<.001	5.66	<.001
EIA_Inventory	0.28	0.736	0.21	0.799	0.32	0.689	0.27	0.732	0.07	0.928	0.02	0.976
Lead_Inventory	-0.72	0.395	-0.62	0.441	-0.71	0.397	-0.58	0.461	-0.66	0.406	-0.70	0.393
GSCI_Roll	-0.29	0.678	-0.72	0.315	-0.26	0.711	-0.78	0.247	-0.62	0.366	-0.57	0.433
Contract_Exp_Day	-2.66	0.019	-2.71	0.030	-2.78	0.011	-2.94	0.014	-2.53	0.033	-2.32	0.060
September,2006					2.63	0.096	4.61	0.008	4.76	0.007		
Dependent Lags	2		2		2		2		2		2	
Day of the Week	YES		YES		YES		YES		YES		YES	
N	299		299		299		299		299		299	
Adj RSq	38.23%		41.81%		39.04%		44.45%		45.35%		42.52%	

Financialization and Customer Order Imbalances: 2nd-Stage Regression

- Customer OIB : a one standard deviation increase in the difference in financialization widens the percentage difference in Customer OIBs by 0.58 standard deviations, or 19% of its mean value.

Parameter	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Intercept	-1.20	<.001	-1.31	<.001	-1.30	<.001	-1.16	<.001	-0.85	0.009	-0.98	0.003
Δ*FIN_Predicted*	**-0.72**	**<.001**	**-0.76**	**<.001**	**-0.85**	**<.001**	**-0.81**	**<.001**	**-0.94**	**<.001**	**-0.90**	**<.001**
Δ*Volume*			0.14	0.742			-0.17	0.682	-0.52	0.183	-0.25	0.540
Δ*Customer Volume*									1.54	<.001	1.55	<.001
Δ*Volatility*	0.06	0.332	0.06	0.325	0.07	0.263	0.06	0.299	0.05	0.368	0.04	0.395
EIA_Inventory	-0.18	0.043	-0.17	0.044	-0.17	0.056	-0.17	0.056	-0.11	0.163	-0.12	0.135
Lead_Inventory	-0.13	0.123	-0.13	0.122	-0.13	0.138	-0.13	0.146	-0.10	0.208	-0.11	0.178
GSCI_Roll	0.17	0.007	0.18	0.007	0.18	0.004	0.18	0.005	0.13	0.031	0.12	0.040
Contract_Exp_Day	-0.20	0.113	-0.20	0.111	-0.03	0.758	-0.21	0.088	-0.33	0.005	-0.32	0.007
September,2006					0.27	0.047	0.28	0.045	0.25	0.084		
Dependent Lags	2		2		2		2		2		2	
Day of the Week	YES		YES		YES		YES		YES		YES	
N	299		299		299		299		299		299	
Adj RSq	17.61%		17.35%		18.72%		18.48%		30.01%		29.10%	

Financialization and Pricing Errors: 2nd-Stage Regression

- Pricing Error: a one standard deviation increase in the difference in financialization widens the percentage difference in Pricing Error volatility by 0.35 standard deviations, or 59% of its mean value.

Parameter	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Intercept	-0.68	<.001	0.75	0.072	-0.65	<.001	0.42	0.338	0.37	0.397	0.70	0.086
ΔFIN_Predicted	**-1.03**	**<.001**	**-0.64**	**0.002**	**-0.92**	**<.001**	**-0.64**	**0.001**	**-0.61**	**0.003**	**-0.60**	**0.004**
ΔVolume			-1.71	0.001			-1.30	0.019	-1.23	0.025	-1.64	0.001
ΔCustomer Volume									-0.33	0.244	-0.34	0.231
ΔPrice Volatility	1.30	<.001	1.28	<.001	1.29	<.001	1.27	<.001	1.26	<.001	1.27	<.001
EIA_Inventory	0.01	0.953	0.01	0.926	0.01	0.908	0.01	0.896	0.00	0.971	0.00	0.998
Lead_Inventory	0.20	0.107	0.21	0.088	0.21	0.086	0.21	0.078	0.21	0.086	0.20	0.098
GSCI_Roll	0.24	0.001	0.21	0.001	0.24	0.001	0.22	0.001	0.23	0.001	0.22	0.001
Contract_Exp_Day	-0.20	0.179	-0.21	0.153	-0.18	0.144	-0.19	0.129	-0.16	0.195	-0.18	0.211
September,2006					-0.53	0.034	-0.43	0.115	-0.42	0.115		
Dependent Lags	2		2		2		2		2		2	
Day of the Week	YES		YES		YES		YES		YES		YES	
N	299		299		299		299		299		299	
Adj RSq	35.32%		37.20%		37.60%		38.49%		38.52%		37.23%	

Financialization and Market Quality: SVAR Analysis

- We restrict the sample period from April 1st, 2007 to May 31st, 2008 in order to avoid any overlap with the two-stage regression sample period and to test whether our results from the previous section persist even in stabilized market conditions.
- We use a 6-variable SVAR model to jointly explain and quantify the roles of volatility and financialization in explaining the behavior of our market quality metrics.
- When ordering variables, we place ΔFIN and $\Delta Return\_Volatility$ before market quality variables.
- We obtain qualitatively similar results independent of whether $\Delta Return\_Volatility$ or ΔFIN is ordered first *vs*. second of the SVAR variables.
- We obtain qualitatively similar results with different orderings of the market quality variables.
- For tractability, given our focus on impact of financialization on market quality, we discuss results when ΔFIN is placed first with the following ordering: ΔFIN, $\Delta Return\_Volatility$, $\Delta Spread$, $\Delta Amihud\ Measure$, ΔABS_{OIB}, and $\Delta PE\_Proportion$.

Financialization and Market Quality: SVAR Analysis

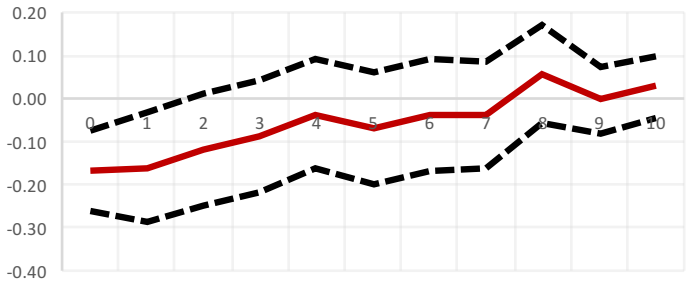
- With our structural restrictions, we are assuming that the extent of financialization is not contemporaneously affected by market volatility or market quality.

- Likewise, we posit that market volatility is contemporaneously and instantaneously affected by the extent of financialization but not by various aspects of market quality.

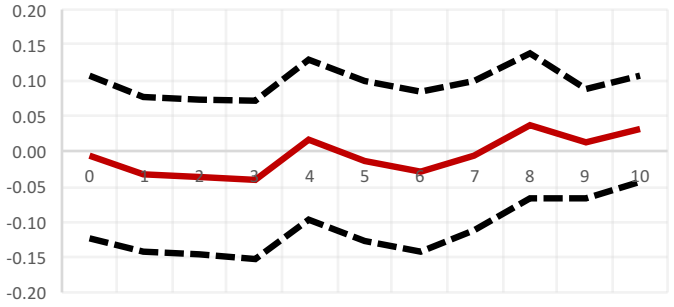
- We also assume that each of our measures of liquidity and pricing efficiency are contemporaneously and instantaneously affected by financialization and by market volatility, but affect the latter with a lag.

Financialization and Market Quality: SVAR Analysis

- Effect of ΔF on $\Delta Spread$: an increase in ΔFIN results in a negative and significant effect on $\Delta Spread$ contemporaneously on day t, and also on day $t+1$. That is, an increase in the relative financialization of short-term contracts leads to a decrease in their relative bid-ask spreads.

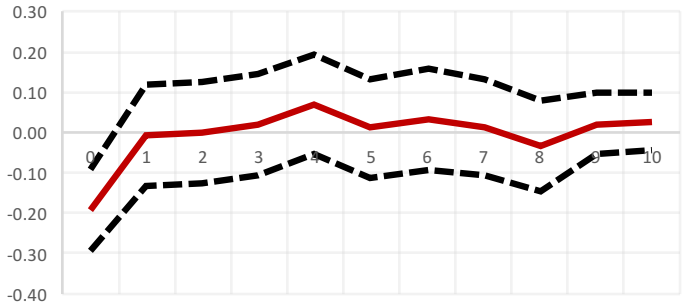


- Effect of ΔF on $\Delta Amihud$ is statistically insignificant

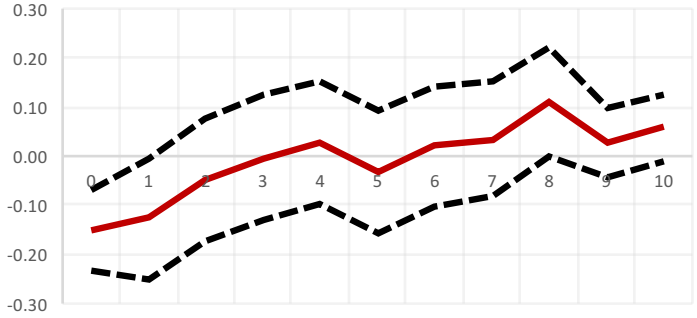


Financialization and Market Quality: SVAR Analysis

- Effect of ΔF on $\Delta ABSOIB$ is negative and significant.



- Effect of ΔF on Δ *PE_Proportion* is negative and significant, also at lag 1.



Fast and Non-Fast traders and Market Quality

- Hendershott, Jones, and Menkveld (2011) show that algorithmic trading improves several intraday market liquidity metrics.

- Also, HFT improve intraday price discovery for equities (Brogaard, Hendershott, and Riordan, 2014) and pricing efficiency for currencies (Chaboud *et al*. 2014).

- Hence, here we ask

  - Are some of our results are driven wholly or in part by the rise of high-speed algorithmic trading, given that such algorithmic traders could be institutional traders?

Fast and Non-Fast traders and Market Quality

- We follow Raman, Robe, and Yadav (2016), and identify fast automated institutional traders ("FLP" for short) as those CTI-2 traders who trade more than 1,000 times a day, and carry less than 5% of their daily trading volume overnight (making them largely intraday traders).

- Intraday financial institutional trading studied in the previous sections is split into two new measures:
  - FIN_Non_FLP, which we calculate after removing all fast automated intraday institutional traders from our set of institutional financial traders;
  - FIN_FLP, the component of financialization that is due to the onset of institutional fast machine trading.

- Analogous to our preceding analyses, we employ difference between short-term and long-term contracts for both the measures of financialization in the regression analysis.

Fast and Non-Fast traders and Market Quality

Parameter	ΔSpread		ΔAmihud		ΔAbsOIB		ΔPE_Variance	
Intercept	0.06	0.923	4.52	0.279	-1.17	<.001	0.40	0.425
Δ*FIN_Non_FLP_Predicted*	**-6.24**	**<.001**	**-28.21**	**<.001**	**-1.75**	**<.001**	**0.10**	**0.842**
Δ*FIN_FLP*	**-1.24**	**<.001**	**1.73**	**0.085**	**-0.16**	**0.107**	**-0.69**	**0.002**
Δ*Volume*	-2.72	<.001	-24.68	<.001	-0.57	0.132	-1.01	0.048
Δ*Customer Volume*	-0.45	0.333	-5.84	0.014	1.50	<.001	-0.43	0.104
Δ*Volatility*	0.65	<.001	5.35	<.001	0.03	0.595		
Δ*Price Volatility*							1.25	<.001
EIA_Inventory	0.53	0.010	1.68	0.056	-0.03	0.746	-0.04	0.750
Lead_Inventory	0.07	0.655	-0.56	0.482	-0.09	0.261	0.22	0.070
GSCI_Roll	0.98	<.0001	2.00	0.042	0.27	<.001	0.18	0.041
Contract_Exp_Day	-0.43	0.054	-4.51	0.001	-0.42	<.001	-0.08	0.555
September,2006	-0.55	0.321	3.92	0.030	0.34	0.034	-0.14	0.666
Dependent Lags	2		2		2		2	
Day of the Week	YES		YES		YES		YES	
N	299		299		299		300	
Adj RSq	76.66%		45.10%		30.21%		42.27%	

- Non-Fast financial institutional traders improve market liquidity, but no effect of pricing efficiency.
- Fast financial institutional traders improve pricing efficiency and improve spreads, but do not improve market depth – in fact, they make it worse – and improve customer imbalances very weakly.
- Indicates significant qualitatively different roles for both fast and non-fast traders.

Conclusions

- The NYMEX introduced electronic trading to its energy futures marketplace on Sep 5th, 2006. Focusing on crude oil futures, we document that this change in market structure increased the participation rate of short-horizon intraday institutional financial traders, and that the rates of this intraday financialization were different for short- and long-dated contracts.

- We use this exogenous event as an instrument to measure the causal effect of intraday financialization on oil futures market quality (bid-ask spreads, depth, order imbalances, and pricing errors).

- Exploiting cross-sectional variation in the rates of intraday financialization, we document economically and statistically significant improvements in each of these market quality proxies due to intraday financialization.
  - We also show that while fast automated institutional financial traders significantly improve pricing efficiency and spreads, the other slower, non-automated institutional financial traders also contribute significantly to market quality by improving all aspects of liquidity, including depth and customer order-imbalances.

Overall Contribution

- We add to the financialization literature by being the first to study the impact of the trading and liquidity provision of institutional financial traders with explicitly short intraday horizons.
  - Our results are consistent with the flow of institutional risk capital into intraday liquidity provision driving market quality improvements.

- Our research also complements the extensive literature on the impact of institutional trading.
  - We are the first to investigate the impact of short intraday horizon trading of both fast and non-fast institutional financial traders, and to show that they both contribute to intraday market quality (albeit in different ways).

- Finally, while our findings pertain to commodity markets, they are directly relevant to all electronic order-driven markets where liquidity provision is voluntary.
  - Insofar as most equity and many other financial markets are now organized as electronic order-driven markets with voluntary liquidity provision, our results on the beneficial impact of the flow of institutional risk capital into liquidity provision and short-horizon trading are potentially of wide applicability.