

Measuring BrokerDealer Routing Risk and Transparency Using SEC Rule 606 Disclosures

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I. Objective / Business Problem

Retail investors expect their broker-dealers to route orders to venues that provide best execution for orders that are non-directed. However, routing decisions can be influenced by payment for order flow (PFOF), where venues financially incentivize brokers to send orders their way. Although SEC Rule 606 mandates quarterly disclosure of routing practices, these reports are highly technical and difficult for the average investor to interpret.

This project develops a broker-level routing risk framework that simplifies this data into clear, comparable metrics, enabling retail investors to better evaluate whether their broker's routing patterns align with their best interests. The framework focuses on quantifying the extent to which routing decisions may be influenced by financial incentives (payment risk) and assessing how consistent or volatile a broker's routing behavior is over time (stability risk).

II. Why the Problem is Important

Understanding these factors is critical because they directly impact execution quality, which determines the prices investors receive for their trades. High payment influence can create conflicts of interest, as brokers may prioritize venues offering the largest incentives rather than those delivering the best prices or fastest execution. High concentration in routing can also limit competition between venues, potentially reducing opportunities for price improvement. Equally important is routing stability, frequent, unexplained changes in venue selection can signal shifting incentives or opportunistic strategies, undermining investor confidence. By translating complex regulatory disclosures into clear, broker-level risk indicators, this analysis bridges the gap between mandated transparency and actionable insight, empowering retail investors to make more informed decisions about where to place their trust.

III. Data Description

The dataset was constructed from publicly available SEC Rule 606 XML disclosures for three major U.S. broker-dealers: Charles Schwab (CHAS), Fidelity Brokerage Services LLC (FBS), and National Financial Services LLC (NFS). The analysis spans 14 recent quarters in monthly broker-level format. In addition to the original variables, several new columns were calculated to quantify routing concentration, payment influence, and behavioral stability over time.

Table 1 in the appendix lists each column extracted from the monthly Rule 606 statistics. Table 2 details the monthly venue-level metrics used to build the quarterly dataset in Table 3. Table 3 summarizes the quarterly aggregated dataset, combining broker- and security-type-level metrics into routing risk scores based on venue concentration, payment influence, and routing stability.

For more details please refer to the jupiter notebook in the linked GitHub:
https://github.com/crystalleat/Rule606_BrokerRouting_Risk

IV. Methodology

Raw SEC Rule 606 XML disclosures were parsed into a structured dataset containing broker, venue, security type, order percentages, and payment metrics. The data was aggregated to the broker × security type level.

Market concentration was measured using the Herfindahl-Hirschman Index (HHI), widely used by regulators and economists. The HHI sums the squares of venue level order shares. Higher HHI values indicate more concentrated routing, potentially reducing competition and execution quality. Routing stability was measured as the quarterly standard deviation of monthly HHI values for each firm and security type. Higher values indicate greater variability in venue concentration within the quarter, suggesting less consistent routing patterns that may be influenced by payment incentives, shifts in liquidity provider relationships, or other market structure changes. Payment influence was assessed with net payment per hundred shares (CPH), normalizing payments across securities of different prices. Higher CPH values signal stronger monetary incentives that may conflict with best execution obligations.

A composite routing risk score was then calculated by equally weighting normalized HHI, market-order CPH, and routing volatility. Scores range from 0 (low risk) to 1 (high risk) and serve as the core measure for Tableau visualizations, enabling firm-level comparisons, trend analysis, and identification of high-risk routing behavior.

V. Key Findings

Tableau Dashboard (Table 4):

<https://public.tableau.com/app/profile/crystal.lead/viz/BrokerDealerRoutingRiskandIncentiveAnalysisSECRule606/Dashboard1>

Overall Routing Risk Patterns

NFS and FBS generally show the lowest routing risk scores across security types, reflecting a diversified venue mix, minimal payment incentives, and stable routing behavior over time. In contrast, CHAS exhibits elevated routing risk in OtherStocks and SP500, driven by higher venue concentration and greater variability in routing patterns.

Options Trading Incentives and Concentration

Options trading generally appears as a medium-risk category across brokers overall, with elevated CPH often occurring alongside concentrated routing patterns (HHI). This overlap can suggest that financial incentives play a role in routing decisions, raising potential concerns about conflicts between payment arrangements and execution quality. However, in the case of options, a high HHI may be partially explained by the naturally limited number of active options venues. As a result, elevated concentration scores in this asset class may not always indicate opportunistic or conflicted routing, but should still be monitored for patterns that exceed what is typical for the options market structure.

Incentives vs. Market Concentration

Across security types, the relationship between broker incentives and market concentration reveals a consistent trade off: higher payment incentives are often associated with less diversified routing. This trend is most pronounced in options but is also present to a lesser degree in OtherStocks. Such concentration, when combined with strong payment incentives, could indicate increased risk of reduced execution competition. It is likely not as prevalent in SP500 stocks due to the deeper liquidity pool and broader venue participation, which naturally disperses order flow.

Routing Volatility Over Time

Quarterly routing volatility, measured as the standard deviation of monthly HHI values within each quarter, highlights clear differences in stability between brokers. FBS and NFS maintain relatively stable venue concentration across the observed period, while other brokers, particularly in certain security types, exhibit larger quarter-to-quarter variability. Such fluctuations suggest shifts in routing behavior that may be driven by incentives or changing liquidity relationships, potentially impacting execution quality and predictability. All three brokers displayed moderate routing volatility for Options. This reflects a market structure with a naturally limited number of active venues, where concentration (HHI) is consistently high, but shifts in monthly order allocation between these venues still occur. These small reallocations prevent volatility from being low, even though the overall venue mix remains relatively stable.

VI. Conclusion & Recommendations

Conclusion:

This analysis of SEC Rule 606 data reveals that the way your broker routes your trades can vary a lot, and these differences may affect the prices you get. NFS and FBS generally show the lowest routing risk, meaning trades are spread across more venues, payments from venues are smaller, and routing patterns are steady over time. CHAS, on the other hand, shows higher risk in OtherStocks and SP500, with options across all brokers often routed to a small set of venues that pay the broker more, a setup that could influence where your order goes.

By combining measures of concentration (HHI), payment incentives (CPH), and routing stability, the Routing Risk Score makes it easier to see which broker security type combinations might carry more risk for you as a trader. The Tableau dashboard translates these complex metrics into a visual format so you can quickly spot where your broker's practices might differ from what you expect.

Recommendations for Individual Investors:

- **Be Cautious with Options Trading:** High payments and high concentration in options routing may mean your broker has stronger incentives that could impact execution quality.
- **Compare Across Brokers:** If you see consistently higher risk scores for your broker in the products you trade most, it might be worth routing practices of other brokers and switching between brokers based on the type of trade you want to do.

- **Watch for Changes Over Time:** Sudden jumps in routing volatility or payments may signal a change in strategy and something to monitor if you trade actively.

VII. Future Work

This analysis focuses on combining routing concentration, payment incentives, and routing stability into a single risk score, but there is significant room to expand both scope and depth. Future work could include:

- **Broker Coverage Expansion:** Incorporate additional U.S. broker-dealers to provide broader market comparisons and give retail traders more reference points.
- **Longer Historical Analysis:** Extend the dataset to cover more years, capturing changes in broker routing strategies over market cycles.
- **Product/Venue-Level Deep Dives:** Conduct separate deep-dive studies for Options, SP500, and OtherStocks to highlight risks specific to each product type. And deep dives into trade types such as marketable orders, marketable limit orders, and others to understand differences between order types versus routing practices.
- **Interactive Retail Tools:** Build a public-facing tool that lets investors search their broker and see a simplified routing risk profile for the products they trade.

These extensions would make the analysis not only more robust but also more directly actionable for retail investors deciding where and how to trade.

VIII. References

Charles Schwab. (n.d.). *SEC Rule 606 disclosures*. Retrieved from <https://public.s3.com/rule606/chas/>

Fidelity Investments. (n.d.). *SEC Rule 606 disclosures*. Retrieved from <https://clearingcustody.fidelity.com/trade-execution-quality/sec-rule-606>

Investopedia. (n.d.). *Herfindahl–Hirschman Index (HHI)*. In *Investopedia*. Retrieved from <https://www.investopedia.com/terms/h/hhi.asp>

OpenAI. (2024). *GPT-4o* [Large language model]. OpenAI. <https://openai.com>

U.S. Securities and Exchange Commission. (n.d.). *Rule 606 of Regulation NMS: Disclosure of order routing information*. Retrieved from <https://www.sec.gov/rules/final/34-43590.htm>

IX. Appendix

Table 1. Monthly Venue-Level Metrics from Rule 606

Column Name	Description
firm	Broker-dealer name (e.g., "Fidelity Brokerage Services LLC", "Charles Schwab").
date	Month reference date (month start set during processing).
yr_qtr_mo	Year-Quarter-Month label YYYY-QX-MM (e.g., 2024-Q3-07).
security_type	Product bucket (e.g., SP500, OtherStocks, Options).
hhi_monthly	Monthly HHI concentration across venues for the broker/security type.
yr_qtr	Year-Quarter label YYYY-QX (e.g., 2024-Q3).
venue_name	Execution venue receiving routed orders.
order_pct	Share of total orders routed to this venue (% of broker's flow for the month/security type).
market_pct	Market orders share routed to this venue (percent of broker's monthly flow).
marketable_limit_pct	Marketable limit orders share routed to this venue (percent).
non_marketable_limit_pct	Non-marketable limit orders share routed to this venue (percent).
other_pct	"Other" orders share routed to this venue (percent).
net_pmt_paid_rcv_market_orders_usd	Net payment/fee for market orders at this venue (USD total in month).
net_pmt_paid_rcv_market_orders_cph	Net payment/fee for market orders (cents per 100 shares) at this venue/month.
net_pmt_paid_rcv_marketable_limit_orders_usd	Net payment/fee for marketable limit orders (USD total).
net_pmt_paid_rcv_marketable_limit_orders_cph	Net payment/fee for marketable limit orders (CPH).
net_pmt_paid_rcv_non_marketable_limit_orders_usd	Net payment/fee for non-marketable limit orders (USD total).
net_pmt_paid_rcv_non_marketable_limit_orders_cph	Net payment/fee for non-marketable limit orders (CPH).
net_pmt_paid_rcv_other_orders_usd	Net payment/fee for "Other" orders (USD total).
net_pmt_paid_rcv_other_orders_cph	Net payment/fee for "Other" orders (CPH).
material_aspects	Free-text disclosure from the XML describing material aspects/conflicts and routing arrangements.

Table 2. Monthly Venue-Level Metrics

Column Name	Type	Description
firm	object	Broker-dealer name (e.g., "Fidelity Brokerage Services LLC", "Charles Schwab").
date	datetime64[ns]	Month reference date (month start set during processing).
yr_qtr_mo	object	Year-Quarter-Month label YYYY-QX-MM (e.g., 2024-Q3-07).
security_type	category	Product bucket (e.g., SP500 , OtherStocks , Options).
hhi_monthly	float64	Monthly HHI concentration across venues for the broker/security type.
yr_qtr	object	Year-Quarter label YYYY-QX (e.g., 2024-Q3).
venue_name	object	Execution venue receiving routed orders.
order_pct	float64	Share of total orders routed to this venue (% of broker's flow for the month/security type).
market_pct	float64	Market orders share routed to this venue (percent of broker's monthly flow).
marketable_limit_pct	float64	Marketable limit orders share routed to this venue (percent).
non_marketable_limit_pct	float64	Non-marketable limit orders share routed to this venue (percent).
other_pct	float64	"Other" orders share routed to this venue (percent).
net_pmt_paid_rcv_market_orders_usd	float64	Net payment/fee for market orders at this venue (USD total in month).
net_pmt_paid_rcv_market_orders_cph	float64	Net payment/fee for market orders (cents per 100 shares) at this venue/month.
net_pmt_paid_rcv_marketable_limit_orders_usd	float64	Net payment/fee for marketable limit orders (USD total).
net_pmt_paid_rcv_marketable_limit_orders_cph	float64	Net payment/fee for marketable limit orders (CPH).
net_pmt_paid_rcv_non_marketable_limit_orders_usd	float64	Net payment/fee for non-marketable limit orders (USD total).
net_pmt_paid_rcv_non_marketable_limit_orders_cph	float64	Net payment/fee for non-marketable limit orders (CPH).
net_pmt_paid_rcv_other_orders_usd	float64	Net payment/fee for "other" orders (USD total).
net_pmt_paid_rcv_other_orders_cph	float64	Net payment/fee for "other" orders (CPH).
material_aspects	object	Free-text disclosure from the XML describing material aspects/conflicts and routing arrangements.

Table 3. Quarterly Routing Risk Inputs & Scores

Column Name	Type	Description
firm	object	Broker name as reported in Rule 606 (e.g., "Fidelity Brokerage Services LLC", "Charles Schwab").
yr_qtr	object	Year-quarter label YYYY-QX (e.g., 2024-Q3).
security_type	category	Security bucket for the order flow (e.g., SP500, OtherStocks, Options).
hhi_quarterly	float64	Quarterly Herfindahl-Hirschman Index of venue concentration (higher = more concentrated routing).
routing_consistency_quarterly	float64	Std dev of monthly HHI within the quarter (higher = more volatile/less stable routing).
net_pmt_paid_recv_market_orders_cph	float64	Net payment-for-order-flow for market orders , cents per 100 shares (CPH), averaged over the quarter.
net_pmt_paid_recv_marketable_limit_orders_cph	float64	Net PFOF for marketable limit orders, CPH, averaged over the quarter.
net_pmt_paid_recv_non_marketable_limit_orders_cph	float64	Net PFOF for non-marketable limit orders, CPH, averaged over the quarter.
net_pmt_paid_recv_other_orders_cph	float64	Net PFOF for other order types, CPH, averaged over the quarter.
hhi_norm	float64	Min-max normalized hhi_quarterly within security_type (0-1).
routing_consistency_quarter_norm	float64	Min-max normalized routing_consistency_quarterly within security_type (0-1).
net_pmt_paid_recv_market_orders_cph_norm	float64	Min-max normalized net_pmt_paid_recv_market_orders_cph within security_type (0-1).
routing_risk_score	float64	Composite = average of hhi_norm , net_pmt_paid_recv_market_orders_cph_norm , and routing_consistency_quarter_norm (0-1; higher = higher routing risk).

Table 4. Routing Behavior & Incentives Analysis Dashboard

<https://public.tableau.com/app/profile/crystal.lead/viz/RoutingBehaviorIncentiveAnalysis/Dashboard1>

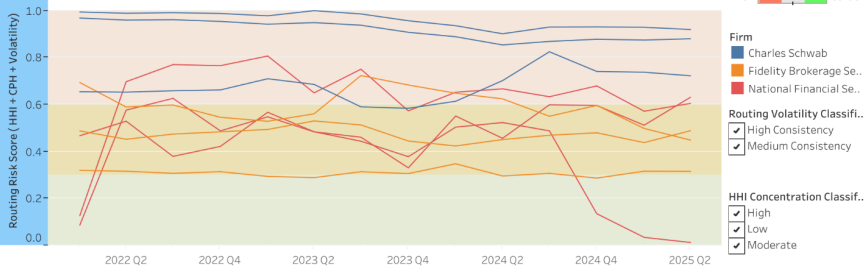
BrokerDealer Routing Behavior & Incentive Analysis

Key Takeaways:
Fidelity BrokerDealers: Lowest routing risk across all securities.
Charles Schwab: Higher risk in OtherStocks & SP500.

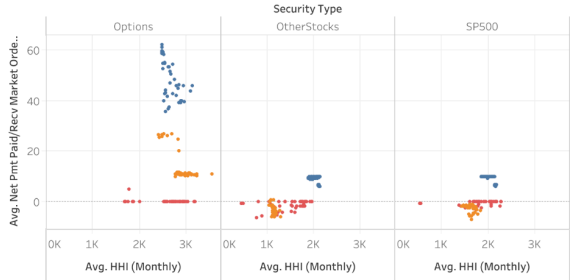
Relative Risk Levels

Firm	Security Type	
Charles Schwab	Options	
	SP500	
	OtherStocks	
Fidelity Brokerage Services LLC	Options	
	SP500	
	OtherStocks	
National Financial Services LLC	Options	
	SP500	
	OtherStocks	

Routing Risk Trends by Firm & Security Type



Broker Incentives vs Market Concentration (HHI vs CPH)



Quarterly Routing Volatility (HHI Std Dev)

