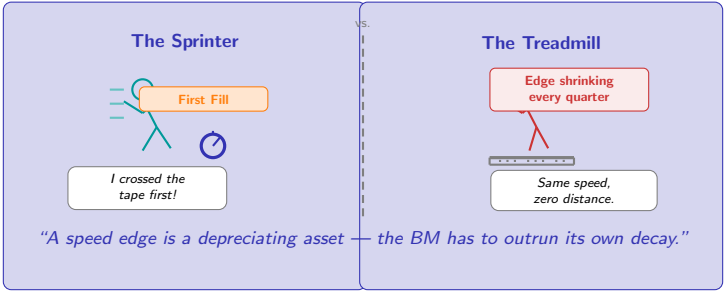
# Algorithmic Trading Business Models

Every speed edge is a depreciating asset — the BM has to outrun its own decay

Digital Finance


The Sprinter
First Fill
I crossed the tape first!
vs.
The Treadmill
Edge shrinking every quarter
Same speed, zero distance.
"A speed edge is a depreciating asset — the BM has to outrun its own decay."

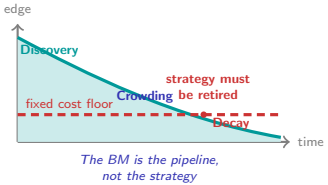
# Why Does an Edge That Wins on Tuesday Vanish by Friday?

**The Half-Life of an Edge**

A profitable algorithmic strategy is a public secret. Once it works at scale, prices begin to reflect it. Other firms reverse-engineer the trade flow they observe; venues respond with new order types; co-location racks (servers rented inside the exchange's own datacentre to shave microseconds off the round-trip) fill up. The friction the edge exploited shrinks toward nothing.

- Each edge has a private decay clock — nobody sees it die in real time; it simply stops being profitable.
- Returns from a stale strategy turn negative once compliance, rebate, and infrastructure costs survive its profits.
- The sustainable BM is not one strategy — it is a pipeline that retires dead strategies and ships fresh ones faster than the market retires them.

The BM question is therefore not "how fast can you trade?" but "how fast can you replace what no longer works?"



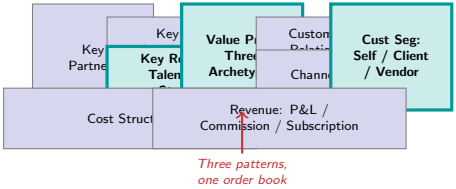

**Value Proposition (BMC) anchor: the durable proposition is a renewal pipeline, not any single strategy. Single-strategy firms die with the strategy.**

# Which Canvas Blocks Distinguish a Prop Shop from a Broker from a Vendor?

**Three Archetypes, One Canvas**
Algorithmic-trading firms split into three distinct Business Model Canvas patterns even though they all touch the same order book:

- **Prop shop:** customer = self. Revenue = principal trading P&L. Key resources = research talent, low-latency stack, capital. Costs are mostly absorbed; output is variable.
- **Broker / agency:** customer = institutional client. Revenue = commissions plus rebates. Key resources = client coverage team, smart-order-router, venue relationships. Costs scale with volume.
- **Vendor / platform:** customer = other trading firms. Revenue = subscriptions or per-message fees. Key resources = software IP, market-data licences, support. Costs are largely fixed.

The Canvas reveals that the three archetypes do not just earn money differently — they answer to different customers, hold different key resources, and carry different cost structures. Confusing them explains many failed pivots.



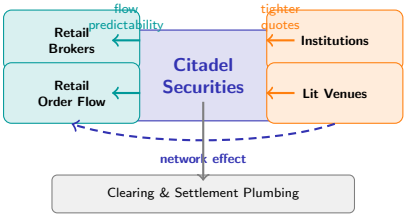

**Osterwalder Canvas anchor: Customer Segments + Key Resources + Revenue Streams together determine whether the firm earns from itself, from clients, or from peers.**

# How Does Citadel Securities Turn Internalisation into a Two-Sided Liquidity Platform?

**The Citadel Securities Case**

Citadel Securities (US-headquartered wholesale market maker spun out of the Citadel hedge-fund group) sits between retail brokers and institutional venues. Retail brokers route customer orders to wholesale market makers in exchange for *payment for order flow* (a per-trade rebate the market maker pays the broker for the right to see and fill that flow first). The market maker then either *internalises* the trade (fills it from its own inventory rather than sending it to a public exchange) or routes it onward. Citadel Securities absorbs predictable retail flow on one side and warehouses risk against institutional and exchange-bound orders on the other.

- **Multi-sided platform:** retail brokers on one side, institutional venues on the other, with the market maker bridging.
- **Cross-side network effects:** more retail flow improves the price-improvement signal offered to institutional counterparties, which in turn justifies tighter quotes back to retail.
- **Chicken-and-egg:** broker-routing relationships were bootstrapped first by guaranteeing price improvement; institutional relationships followed once flow scale was demonstrated.
- **Result:** a venue role inside the official venue stack — invisible to the end-investor yet structurally indispensable.




**Platform-economics anchor: a wholesale market maker is structurally a two-sided platform. The flywheel is invisible to the end investor but defines the BM.**

# How Did Virtu Start as a Pure Market Maker and End as an Execution-Services Stack?

*Unbundling* = pulling one service out of a historical bundle and offering it alone; *rebundling* = stacking adjacent services onto that foothold once trust is established.
Clayton Christensen (Harvard Business School) argued disruptors start narrow and cheap, earn trust, then expand upward — the *unbundling* phase followed by the *rebundling* phase.

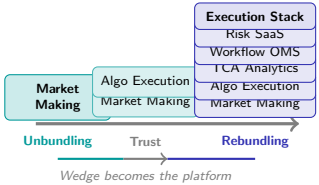
**Christensen's Cycle on a Trading Desk**

**Phase One — Unbundling:** Virtu (US-listed electronic market-making firm, headquartered in New York) launched as a pure principal market-maker — one job, posting two-sided quotes across many venues and asset classes. No brokerage business, no analytics product.

**Phase Two — Trust Earned:** Sell-side counterparties learned to trust the firm's quoted prices and risk-warehousing reliability. Counterparty access compounded into something closer to a relationship than a transaction.

**Phase Three — Rebundling:** Execution algorithms sold to clients on top of the same infrastructure; transaction-cost analysis (TCA — a report comparing the client's fill prices against a benchmark price, used to judge execution quality) sold as a separate product; a workflow stack that touches order entry, routing, execution, and post-trade analytics.

The Virtu arc is a textbook unbundling-to-rebundling case: the wedge was principal liquidity provision; the rebundle is an execution platform that serves the very institutions whose flow it once simply absorbed.



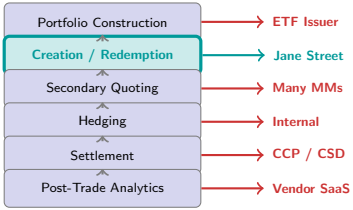

**Christensen anchor: the durable winners turn a wedge into a platform. Virtu rebundled the very workflow whose flow it originally absorbed.**

# Where in the Trade Lifecycle Does Jane Street Insert Itself in the ETF Value Chain?

**The ETF Authorised-Participant Wedge**

*Value chain* = the ordered sequence of activities a service passes through. Evans and Wurster (BCG) argued that when information is cheap, each link of an information-rich chain can be split off to a specialist — the chain deconstructs into independent layers.

Jane Street (US-headquartered proprietary trading firm specialising in ETFs and other basket products) inserts itself into one such layer. The trade lifecycle for an exchange-traded fund spans many specialised links: portfolio construction, primary *creation / redemption* (the mechanism where an authorised participant exchanges a basket of underlying shares with the ETF issuer for new ETF units, or vice versa), secondary quoting, hedging, settlement through a *CCP / CSD* (central counterparty and central securities depository — the clearing plumbing that steps in between the two trade sides and records the final ownership transfer), and post-trade analytics. Each link is contestable.




- **Portfolio construction** — handled by the ETF issuer.
- **Creation / redemption** — the authorised-participant link where Jane Street operates.
- **Secondary market quoting** — competitive quoting on lit venues with the underlying basket.
- **Hedging** — continuous risk management across constituent securities.
- **Settlement** — standard clearing infrastructure.
- **Post-trade analytics** — workflow tools sold separately.

The critical insight: Jane Street does not own the issuer relationship, nor the end-investor. It owns the connective layer between primary issuance and secondary trading. That position lets it capture risk spread, price-improvement spread, and information advantage from seeing the flow on both sides of the basket.

**Evans-Wurster anchor: the connective link between primary issuance and secondary trading is the most defensible piece of the ETF chain.**

# Is Two Sigma's Quant-Research Edge a Compounding Asset or a Series of Decaying Bets?

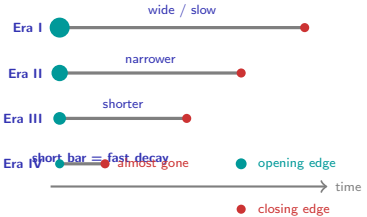
(In business-model language, a *moat* = a competitive advantage that rivals cannot easily copy.)

**Why Half-Life Is the Real Moat Question**

Two Sigma (US-headquartered quantitative-research trading firm based in New York) earns its margin from the gap between when it discovers a signal and when the rest of the market reflects that signal. The width of that gap at discovery is exciting; the length of time until the gap closes is what the BM lives or dies on.

- Early signals had wide opening edges and slow decay — the pipeline could be small.
- Modern signals have narrower opening edges and faster decay — the pipeline must be large and continuously refreshed.
- Each new generation of strategy faces shorter half-lives because more firms run the same searches on the same data.
- The structural moat is therefore the research velocity, not any particular strategy.

The dumbbells on the right show the pattern: the left dot is the opening edge, the right dot is the closing edge, the bar length is the strategy lifetime. Newer eras: shorter bars, smaller gaps.




**Arbitrage anchor: the moat is research velocity, not any single strategy. Half-life shrinks every era as more firms race the same data.**

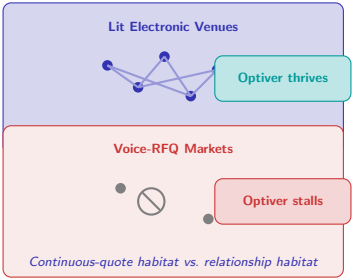
# Why Does Optiver's Continuous-Quote Model Thrive on Lit Options Venues but Stall in Voice-RFQ Markets?

**The Venue-Architecture Lesson**

Optiver (Dutch-headquartered proprietary options-trading firm, founded in Amsterdam) runs its BM around *continuous two-sided quoting* in exchange-traded options: software posts both a buy and a sell quote on every listed contract, every moment the market is open, and updates them as prices move. Each contract is one of many, every quote is electronic, every trade clears the same way. The market structure is the customer.

- In lit, electronic options venues, continuous quoting earns its margin from a steady stream of small, interleaved trades.
- In *voice-RFQ markets* (request-for-quote markets where trades are arranged by phone or chat rather than by an electronic order book) the same firm has no edge — the counterparty is selected by relationship, and the speed advantage is irrelevant.
- Where venues mix, the BM survives only inside the electronic share of flow.
- Pivoting a continuous-quote firm into voice flow rarely works: the cost structure, hiring profile, and risk system all assume electronic plumbing.

The lesson generalises: every algorithmic firm has a venue habitat. Outside it, the firm is structurally illegible.




**Context-dependency anchor: each algorithmic firm has a venue habitat. The same BM that wins on lit electronic venues is illegible in voice-RFQ markets.**

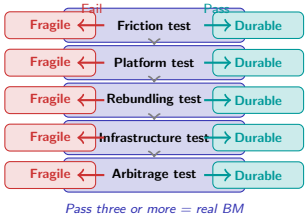
# Which Five Tests Tell You Whether an Algorithmic Firm Will Outrun Its Own Decay?

**The Five-Test Framework Applied**

1. **Friction test:** which specific friction does the firm remove — access to liquidity, reliability of fills, or execution cost? Jane Street names its friction cleanly: the creation / redemption gap between an ETF basket and its underlying shares. A firm that cannot name its friction is exposed.
2. **Platform test:** does the order flow come from a single side or from cross-side network effects? Citadel Securities is multi-sided; a single-strategy prop shop is not.
3. **Rebundling test:** can the firm add an adjacent product on top of its wedge — algorithms, analytics, workflow — once trust is earned? Virtu is the canonical case.
4. **Infrastructure test:** is the venue habitat itself expanding or contracting? Optiver wins where electronic venues spread, stalls where voice-RFQ persists.
5. **Arbitrage test:** how fast does the typical strategy's edge decay, and is the research pipeline replenishing fast enough? Two Sigma's BM rises or falls on this metric.

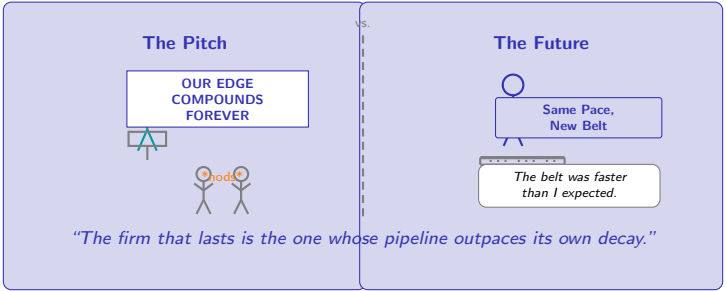
*Regulatory arbitrage* = a firm earns profit specifically because it faces a lighter rulebook than its competitors, not because it is better at the underlying business. The advantage lasts only as long as the rulebook gap does.

A firm passing three or more tests has a real BM. A firm passing only the first one has a strategy.




*Pass three or more = real BM*

**Synthesis anchor: the firm that survives is the one whose pipeline replenishes faster than its strategies decay. Pass three of five tests; otherwise it is just a strategy.**




*"The firm that lasts is the one whose pipeline outpaces its own decay."*