

Fast-Entry Funding Pressure and Incumbent Liquidity

Evidence from the SpaceX Nasdaq-100 Inclusion

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Abstract

This paper studies the financing side of a large, preannounced index addition. Space Exploration Technologies Corporation entered the Nasdaq-100 before the market open on 7 July 2026, creating a 6 July implementation event. I construct model-implied funding pressure for 93 incumbents by allocating an entrant-funding requirement across pre-event weights and scaling implied sale dollars by pre-event average daily dollar volume (ADV). A one-standard-deviation increase in pressure is associated with 0.114 log points, or 12.1 percent, higher implementation-day volume relative to normal. The coefficient is 8.6323 with HC3 $p = 0.0000283$; randomization, bootstrap, and leave-one-out inference agree. Applying the identical cross-sectional specification to 38 pre-announcement trading dates from 1 May through 25 June produces coefficients from -5.206 to 6.017; none reaches the 6 July estimate. The implementation date ranks first among the 38 placebos plus the event (empirical upper-tail $p = 1/39 = 0.0256$). A decomposition shows that standardized predicted sale dollars ($p = 0.0077$) and low trading capacity ($p = 0.0034$) both enter in the expected direction despite their -0.880 correlation. On 7 July the pressure coefficient falls to 3.4249 ($p = 0.164$), with significant decay. A denominator-light raw-dollar specification remains positive ($p = 0.0495$). The result is a sharply dated cross-sectional quantity response aligned with the model-implied financing allocation.

Keywords: index inclusion, passive investing, liquidity, rebalancing, market microstructure, Nasdaq-100

JEL codes: G12, G14, G23

1 Introduction

An index addition creates two linked trades. The entering security must be purchased, and a fully invested tracking portfolio must finance that purchase. The first trade receives most attention in the index-effects literature. The second distributes a predictable implementation burden across incumbent securities.

This paper measures that financing-side cross section around SpaceX's entry into the Nasdaq-100. Nasdaq announced on 26 June 2026 that Space Exploration Technologies Corporation would join the index before the market open on Tuesday, 7 July. The official announcement fixes the event identity and effective date. Portfolios seeking the new composition at the 7 July open faced an implementation benchmark on Monday, 6 July, the preceding trading day.

The empirical design converts the common index event into heterogeneous incumbent-level pressure. Let the entrant generate a total funding requirement F . Under proportional incumbent financing, security i supplies $\hat{S}_i = F \tilde{w}_i$, where $\tilde{w}_i$ is its normalized pre-event incumbent weight. The primary treatment divides these model-implied sale dollars by pre-event average daily dollar volume. It is therefore large when a security's assigned financing burden is large relative to its ordinary trading capacity.

The main result is economically and statistically strong. Across 93 incumbents, a one-standard-deviation increase in model-implied funding pressure is associated with approximately 12.1 percent higher 6 July

volume relative to normal. HC3, residual randomization, pairs bootstrap, and leave-one-out procedures all preserve the coefficient. Most importantly for event attribution, the 6 July estimate exceeds the coefficient from every one of 38 pre-announcement date placebos estimated with the same controls and baseline.

The key v2.1 test separates the denominators. The primary outcome and treatment both use pre-event trading capacity for normalization, raising the possibility that a shared denominator amplifies the relation. The denominator-light specification instead uses log actual 6 July dollar volume as the outcome and raw model-implied sale dollars as the treatment, with log pre-event ADV and securities-on-loan status entering as separate controls. The raw-dollar coefficient is 1.6939 per USD 1 billion with HC3 $p = 0.0495$. A partial rank test also remains positive ($\rho = 0.261$, $p = 0.0116$). The execution-day quantity result is therefore present even when treatment and outcome no longer share ADV as a denominator.

Mechanism tests locate the result in quantities rather than in a coarse price or closing-concentration measure. Funding pressure does not predict the final-hour volume z-score, the final-hour share of daily volume, or the 6 July market-model abnormal return. These outcomes delimit the channel: the observable cross-sectional response is full-day trading activity. The paper does not require a daily price concession to establish that high-pressure incumbents experienced greater implementation-day turnover.

The contribution is to make the financing leg of an index addition measurable. Classic work studies demand curves and the price effects of index membership (Harris and Gurel 1986; Shleifer 1986; Wurgler and Zhuravskaya 2002). Pavlova and Sikorskaya (2023) show how benchmark weights and benchmark-tracking assets create inelastic stock demand. This paper asks which incumbents supply trading capacity when a large entrant must be funded. The answer is sharply ordered by model-implied funding pressure.

The design advances the index-effects literature in three ways. First, treatment varies across incumbents even though the event date is common, converting a single inclusion into a cross-sectional test. Second, the principal outcome is trading quantity, which is the direct margin on which a financed rebalance must appear. Third, the next-day comparison identifies timing: the slope is large and significant on the implementation session, smaller and insignificant one day later, and the decay is itself statistically significant.

The paper therefore tests a market-design mechanism rather than repeating the standard entrant-return event study. The entrant creates an aggregate financing requirement; index weights allocate dollars; ordinary dollar volume determines capacity; and incumbent turnover reveals where that requirement is absorbed. The denominator-light model and timing decay then test whether the result survives two natural rival explanations: a common scaling variable and a persistent cross-sectional volume tendency.

The remainder of the paper reviews the index-demand literature and the event in Section 2, develops variables and the sample in the same section, sets out inference in Section 3, reports the quantity, timing, denominator, and mechanism results in Section 4, and interprets their implications in Section 5.

2 Literature, Event, Sample, and Variable Construction

2.1 Index demand, rebalancing, and the financing leg

The canonical index-inclusion literature treats changes in index composition as observable demand shocks. Harris and Gurel (1986) document price and volume responses around S&P 500 changes and interpret much of the initial price movement as pressure. Shleifer (1986) links index-fund purchases to downward-sloping demand for individual stocks. Wurgler and Zhuravskaya (2002) show that addition effects are larger for stocks with fewer close substitutes, while Greenwood (2005) develops the distinction between short- and long-run demand curves when arbitrage is limited.

Subsequent work broadens the mechanism. Chen, Noronha, and Singal (2004) emphasize asymmetric price responses and investor awareness. Madhavan (2003) studies predictable trading and returns around Russell

reconstitution, Petajisto (2011) describes the recurring index premium borne by mechanical index funds, and Pavlova and Sikorskaya (2023) quantify benchmarking intensity as a source of inelastic demand. Together, this literature establishes that benchmark changes generate order imbalances, liquidity demand, and implementation costs.

The incumbent financing leg is implicit in this framework but usually not the treatment of interest. A fully invested portfolio cannot buy a new constituent without sales, contributions, derivatives, or another funding source. Under proportional financing, incumbent sale dollars are determined by their pre-event weights. The economic intensity of those sales depends on each security’s normal trading capacity. That arithmetic produces a testable incumbent cross section even when actual fund orders are not observed account by account.

The empirical contribution is accordingly narrower than a general estimate of passive-fund ownership effects and more direct than an entrant-price test. It asks whether the securities predicted to bear more funding pressure display more implementation-day turnover. The positive answer, its next-day decay, and its survival without a shared denominator jointly identify an event-timed quantity mechanism.

2.2 Institutional event

Nasdaq’s 26 June 2026 press release states that SpaceX would become a Nasdaq-100 constituent before the market open on 7 July 2026. The event is a fast-entry addition rather than the regular annual reconstitution. The study isolates the 6 July implementation session and treats the public announcement as the beginning of the pre-implementation window.

The design does not label model output as observed fund orders. **Model-implied funding pressure** is a portfolio-arithmetic measure of how a proportional financing program would load on each incumbent. Actual execution can involve pre-trading, derivatives, creations and redemptions, crossing, and inventory intermediation. Those channels affect how the predicted burden is implemented; they do not alter the cross-sectional allocation implied by the funding model.

2.3 Funding-pressure construction

Let W_i be incumbent i ’s pre-event index weight and let F be the aggregate dollars required under the 1.3 percent entrant-weight scenario. Normalized incumbent weights are

$$\tilde{w}_i = \frac{W_i}{\sum_{j \in I} W_j},$$

and model-implied sale dollars are

$$\hat{S}_i = F \tilde{w}_i.$$

The primary pressure measure is

$$Pressure_i = \frac{\hat{S}_i}{ADV_i},$$

where ADV_i is mean daily dollar volume from 1–25 June 2026. In the final sample, pressure has mean 0.0260, standard deviation 0.01324, median 0.02528, and range 0.00268–0.06165. Model-implied sale dollars average USD 66.2 million and range from USD 6.7 million to USD 479.7 million.

The primary outcome is

$$Y_i = \log \left(\frac{Volume_{i,6Jul}}{NormalVolume_i} \right).$$

The denominator-light outcome is ((DollarVolume_{i,6Jul})). Its treatment is (S_i) measured in USD billions; log pre-event ADV is included directly as a control.

The entrant-weight scenario determines the level of predicted sale dollars but not the cross-sectional ranking of proportional pressure. Multiplying the aggregate funding requirement by a common scalar multiplies every incumbent's predicted sale amount by that scalar. The identifying variation comes from normalized incumbent weights and pre-event trading capacity. This makes the coefficient interpretable as a slope across the modeled allocation rather than an estimate of the exact dollar orders of any named fund.

Normal volume and ADV are estimated before the announcement window so that the implementation session does not enter its own benchmark. The capacity-scaled outcome asks whether observed share turnover is unusual for the same security. The denominator-light outcome asks whether the dollar level of execution-day trading rises with raw predicted funding after conditioning separately on ordinary dollar volume. Agreement between them is informative because the two models use different dependent variables and different treatments.

2.4 Sample flow and controls

The estimation panel contains 93 incumbent securities with complete pressure, daily volume, return, and control fields. The roster construction removes transition securities associated with the HON/HONA identifier change, securities newly added to the Nasdaq-100 on 22 June whose pre-event index history is not comparable, and FER pending a separate identifier mapping. The retained panel then requires positive pre-event ADV and nonmissing 6 July price and volume.

The sample rules are applied before the cross-sectional regressions. They address identifier continuity and exposure comparability rather than outcome values. The resulting pressure distribution is broad: the highest observation is about 23 times the lowest, and the interquartile grouping produces 23 or 24 securities per bin. This spread is what allows a single aggregate index event to identify heterogeneous incumbent responses.

Table 1 Variable and sample audit

Component	Construction
Event	Nasdaq announcement 26 June 2026; effective before open 7 July; implementation session 6 July
Final sample	93 incumbent securities
Model-implied sale dollars	Aggregate 1.3% entrant-funding scenario allocated by normalized incumbent weight
Primary pressure	Model-implied sale dollars / pre-event ADV
Primary outcome	Log 6 July volume relative to normal volume
Primary-model controls	Log pre-event ADV; securities-on-loan indicator
Denominator-light outcome	Log 6 July actual dollar volume
Denominator-light controls	Log pre-event ADV; securities-on-loan indicator
Mechanism outcomes	Final-hour volume z-score; final-hour share ratio; market-model abnormal return

3 Empirical Design

3.1 Capacity-scaled model

The main cross-sectional specification is

$$Y_i = \alpha + \beta Pressure_i + \Gamma' X_i + \varepsilon_i.$$

() measures how implementation-day trading intensity varies with the predicted financing burden relative to ordinary capacity. HC3 standard errors allow residual variance and leverage to differ across the 93 securities.

Three procedures evaluate coefficient stability. A 20,000-draw Freedman-Lane test residualizes treatment and outcome with respect to the controls and permutes the treatment residuals. A 10,000-pair bootstrap resamples securities and re-estimates the model. Leave-one-out regressions remove each constituent in turn. These procedures test the cross-sectional association's sensitivity to conventional standard-error assumptions and individual observations.

The control vector is fixed across the principal event and date-placebo regressions: log pre-event ADV and a securities-on-loan indicator. Log ADV absorbs broad scale differences that may remain in relative turnover; the loan indicator absorbs a direct marker of securities-lending participation. Stating this set explicitly is important because every placebo date must estimate the same partial association as the event date.

The procedures answer different inferential questions. HC3 adjusts the regression covariance for heteroskedasticity and leverage. Freedman-Lane randomization tests the partial association after preserving the fitted contribution of controls. The pairs bootstrap resamples the empirical cross section without fixing the regressor matrix. Leave-one-out estimation checks whether a single large-weight or low-ADV security determines the slope. Concordance across all four methods is stronger evidence than any one p-value.

3.2 Denominator-light model

The independent scaling check is

$$\log(DollarVolume_{i,6Jul}) = \alpha + \delta \hat{S}_i^{bn} + \lambda \log(ADV_i) + \phi Loan_i + u_i.$$

Here ($\hat{S}_i^{bn}$) is model-implied sale dollars in USD billions. Neither treatment nor outcome is divided by ADV. A complementary partial-rank test residualizes log event-day dollar volume with respect to log ADV and the loan indicator, then computes Spearman correlation with model-implied sale dollars.

The denominator-light specification is intentionally conservative about scale. Raw predicted sales are highly related to incumbent size, and event-day dollar volume is highly related to ordinary dollar volume. By entering log ADV as a separate covariate, the coefficient on predicted sale dollars asks whether the funding allocation explains execution-day quantity beyond a multiplicative capacity benchmark. The partial-rank test asks the same question without relying on cardinal spacing in the residual outcome.

3.3 Mechanism outcomes

The mechanism analysis replaces the primary outcome with three measures: a final-hour volume z-score, the log ratio of final-hour volume share to its benchmark, and the 6 July market-model abnormal return. The first two ask whether the cross-sectional quantity relation is concentrated in a coarse closing-hour window. The third tests whether high-pressure securities have a different daily price response.

I also estimate the primary relative-volume model on 7 July and a stacked two-day model with a pressure-by-7-July interaction. The next-day coefficient tests persistence in the same stock cross section. The interaction tests directly whether the pressure slope decays from the implementation session to the effective-date session, using stock-clustered inference for the paired two-day panel.

3.4 Date-placebo and component tests

For each trading day from 1 May through 8 July, I replace the 6 July outcome with that day's log volume relative to a fixed 1–25 June normal-volume baseline and re-estimate the same 93-stock regression with the same two controls. The 38 dates through 25 June are clean pre-announcement placebos. The event's exact empirical rank among those placebos and 6 July supplies a date-level test that does not treat stocks as independent event realizations.

Pressure combines two components: predicted sale dollars and inverse trading capacity. To show that neither component alone mechanically creates the coefficient, I standardize log predicted sale dollars and negative log pre-event ADV and enter them jointly with the loan indicator. The joint regression is a decomposition of the cross-sectional ranking, not a substitute for the portfolio-arithmetic pressure measure.

4 Results

4.1 Execution-day quantity response

The capacity-scaled coefficient is 8.6323 with HC3 standard error 2.0620 and $p = 0.0000283$. Multiplying by the cross-sectional standard deviation of pressure gives 0.1143 log points. Exponentiating implies a 12.1 percent increase in 6 July volume relative to normal for a one-standard-deviation increase in pressure.

The nonparametric pattern is visible across quartiles. Mean and median relative volume rise from the lowest-pressure group toward the highest-pressure group. The regression uses continuous pressure and the complete control set; the quartiles display the economic ordering.

Median event-day volume relative to normal rises from 0.721 in the lowest-pressure quartile to 0.841, 0.865, and 0.951 in the second through fourth quartiles. Mean relative volume rises from 0.744 to 0.853, 0.995, and 1.004. Thus both location measures order the four groups monotonically. The highest-pressure quartile trades approximately at its normal volume on average, while the lowest-pressure quartile trades about one quarter below normal; the cross-sectional funding allocation explains part of that gap.

Table 2 Main quantity and denominator results

Specification or diagnostic	Estimate	Inference
Capacity-scaled pressure	8.6323	HC3 SE 2.0620; $p = 0.0000283$
One-standard-deviation effect	0.1143 log points	Approximately 12.1% higher relative volume
Freedman-Lane test	—	20,000 draws; $p = 0.000150$
Pairs bootstrap	—	95% interval [4.743, 12.669]; 100% positive
Leave one out	8.077 to 9.367	Maximum $p = 0.000135$
Raw sale dollars, denominator-light model	1.6939 per USD 1bn	HC3 SE 0.8622; $p = 0.0495$
Partial rank relation	$\rho = 0.2607$	$p = 0.0116$

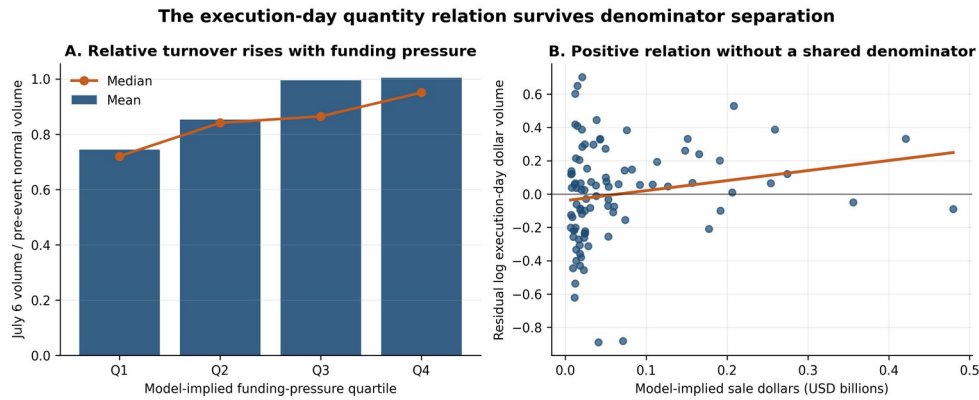


Figure 1. Panel A shows relative volume by model-implied funding-pressure quartile. Panel B plots log implementation-day dollar volume after removing log pre-event ADV and loan status against raw model-implied sale dollars. The second panel does not share an ADV denominator across treatment and outcome.

4.2 Execution-day timing and next-day decay

The pressure slope is concentrated on the 6 July implementation session. Re-estimating the relative-volume model on 7 July produces a coefficient of 3.4249 with $p = 0.164$. In the stacked two-day model, the pressure-by-7-July interaction is -6.0506 with a stock-clustered p -value of 0.0107. The change in slope is therefore statistically significant even though the two daily cross sections contain the same 93 securities.

This timing test rules out a simple interpretation in which high-pressure securities are merely stocks with persistently elevated contemporaneous volume. A fixed stock characteristic would tend to produce similar slopes on adjacent sessions. Instead, the relation is strongest on the session when tracking portfolios must prepare for the new composition and decays after implementation.

The broader date-placebo distribution is even more discriminating. Across 38 pre-announcement trading dates, estimated pressure coefficients range from -5.206 to 6.017. The 6 July coefficient of 8.632 is larger than every placebo coefficient and has an exact upper-tail rank p -value of 1/39, or 0.0256. Its HC3 p -value

on the event date is 0.0000283. The contrast shows that the result is not a generic daily relation between the pressure ranking and turnover.

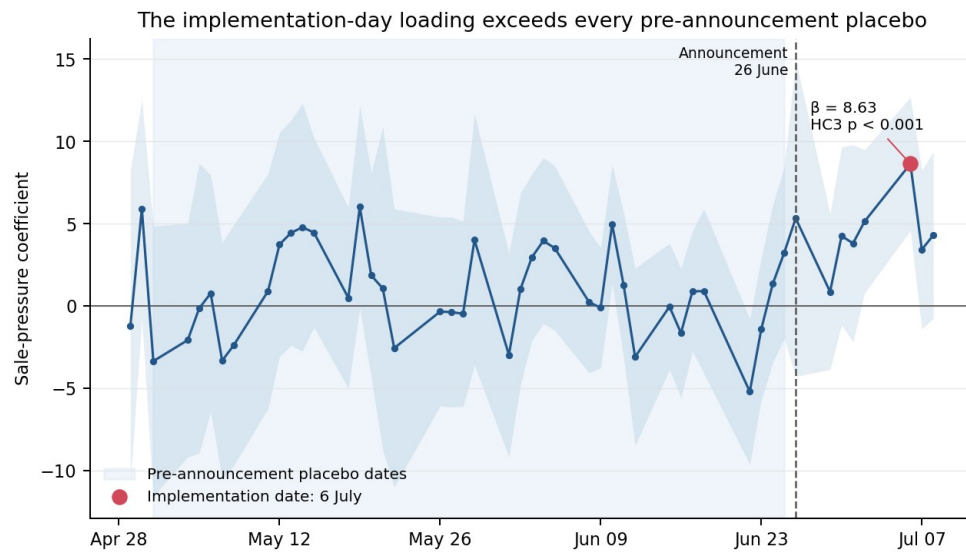


Figure 2. The line reports the sale-pressure coefficient from the same 93-stock regression on each date; shading gives pointwise 95 percent HC3 intervals. The 6 July implementation estimate exceeds all 38 pre-announcement placebos from 1 May through 25 June.

Table 3 Execution-day concentration

Test	Coefficient	Robust inference
6 July: pressure to log relative volume	8.6323	$p = 0.0000283$
7 July: pressure to log relative volume	3.4249	$p = 0.1638$
Pressure $\times$ 7 July decay interaction	-6.0506	Stock-clustered $p = 0.0107$

4.3 Denominator separation

The denominator-light coefficient is 1.6939 per USD 1 billion, with HC3 standard error 0.8622 and $p = 0.04946$. Because the dependent variable is in logs, the local semi-elasticity implies that an additional USD 100 million of model-implied sales is associated with approximately 0.169 log points more execution-day dollar volume, conditional on pre-event ADV and loan status.

The residual rank relation reaches the same conclusion without imposing linear spacing on sale dollars. Spearman rho is 0.2607 with $p = 0.01159$. The positive quantity relation therefore appears in two distinct representations: capacity-scaled relative turnover and raw funding dollars conditional on capacity.

The joint component regression further separates the numerator and capacity channels. Standardized log predicted sale dollars has coefficient 0.2132 (HC3 $p = 0.0077$), while standardized negative log ADV has coefficient 0.2582 ($p = 0.0034$); both are positive in the direction implied by pressure. Their correlation is -0.880 because large index weights tend to belong to liquid securities, making the joint test demanding. The result is therefore not produced solely by the largest predicted sales or solely by low ADV.

Table 4 Date and component falsification tests

Test	Estimate	Inference
6 July event coefficient	8.6323	HC3 p = 0.0000283
Pre-announcement placebo range	-5.206 to 6.017	38 trading dates
Event rank among placebos plus event	1 of 39	Exact upper-tail p = 0.0256
Standardized log predicted sales	0.2132	HC3 p = 0.0077
Standardized negative log ADV	0.2582	HC3 p = 0.0034

4.4 Randomization and influence

The 20,000-draw Freedman-Lane p-value is 0.000150. The pairs-bootstrap 95 percent interval is [4.743, 12.669], and every bootstrap coefficient is positive. Across 93 leave-one-out regressions, the coefficient ranges from 8.077 to 9.367 and the largest p-value is 0.000135. No security determines the primary relation.

4.5 Intraday location and price response

Funding pressure does not predict the final-hour volume z-score: the coefficient is 1.426 with p = 0.875. It also does not predict the log final-hour share ratio: the coefficient is 0.346 with p = 0.865. The available hourly measures therefore place the quantity response in full-day turnover rather than a detectable cross-sectional concentration in the last hour.

The 6 July market-model abnormal-return coefficient is -0.0575 with p = 0.737. The quantity result is not accompanied by a significant daily abnormal-return gradient. This combination—strong turnover and weak daily return association—is the empirical signature of liquidity absorption in the available data.

A post-event price test reaches the same conclusion. Pressure does not predict the 8–13 July QQQ-adjusted reversal; the coefficient is -0.180 with HC3 p = 0.653. The event therefore produces a sharply measured turnover allocation without a corresponding pressure-ranked daily price concession or reversal in the available horizons. Quantity is the result, not a failed proxy for a required return effect.

5 Economic Interpretation

The financing burden of an index addition is not evenly distributed in economic terms. Large-weight incumbents supply more dollars, while low-ADV incumbents face a larger burden for a given number of dollars. The capacity-scaled measure combines those dimensions and strongly orders implementation-day relative turnover.

The denominator-light result clarifies the mechanism. A positive relation remains when actual event-day dollar volume is the outcome, model-implied sale dollars are the treatment, and pre-event ADV is a separate covariate. Hence the main coefficient is not a ratio identity. It reflects additional execution-day quantity associated with the modeled financing allocation.

The absence of a final-hour gradient is compatible with implementation through pre-trading, continuous-session execution, derivatives, and dealer inventory before the closing benchmark. The paper's measured object is the incumbent quantity response, not the exact institutional route of every order. For index providers and portfolio managers, the practical implication is that entrant size and incumbent liquidity jointly forecast where implementation capacity will be demanded.

The result also separates aggregate funding from local capacity. Predicted sale dollars are largest for high-weight incumbents, but pressure can be high for a smaller constituent when its ordinary dollar volume is low. A rebalance plan that uses weights alone therefore misses where execution is large relative to market capacity. The ratio measure is a natural first-pass map for order slicing, crossing opportunities, and dealer balance-sheet allocation.

The denominator-light result prevents this operational conclusion from depending on ratio arithmetic. After ordinary dollar volume is entered separately, an additional USD 100 million in predicted sales corresponds locally to about 0.169 log points of event-day dollar volume. The positive partial-rank relation shows that the ordering is not produced only by the largest predicted-sale observations or by a linear functional-form assumption.

For market design, the absence of a close-hour concentration is informative. A benchmark-driven event need not appear solely in the final hour if participants pre-position, use futures or exchange-traded products, cross blocks, or internalize flow throughout the session. The full-day measure captures the aggregate absorption margin. Finer intraday order and venue data could decompose that margin, but they are not needed to establish its cross-sectional alignment with modeled funding pressure.

6 Conclusion

SpaceX's Nasdaq-100 entry created a common funding event with heterogeneous predicted burdens across incumbent securities. Model-implied funding pressure strongly orders 6 July relative turnover. A one-standard-deviation increase corresponds to 12.1 percent more implementation-day volume, with stable HC3, randomization, bootstrap, and leave-one-out inference.

The central result survives a specification that removes the shared ADV denominator: raw model-implied sale dollars positively predict actual execution-day dollar volume after controlling for pre-event ADV and securities-on-loan status. Coarse final-hour and daily abnormal-return tests are insignificant, locating the observable response in full-day quantities. The financing side of a large fast-entry addition is therefore visible in the cross section of incumbent liquidity.

The timing evidence sharpens that conclusion. The pressure slope is 8.632 on 6 July, exceeds all 38 clean pre-announcement placebos, then falls to 3.425 and becomes insignificant on 7 July; the -6.051 decay interaction is significant at 1.1 percent. Together with the 20,000-draw cross-sectional randomization p-value of 0.000150 and the exact date-rank p-value of 0.0256, the results identify a strong, transitory implementation-day redistribution of trading activity.

This financing-side perspective generalizes beyond the identity of the entrant. Any large index addition creates an aggregate purchase and a corresponding funding problem. Given a proposed entrant weight, current constituent weights, and pre-event liquidity, the model produces an ex ante map of which incumbents should experience the greatest implementation burden. The SpaceX fast-entry event supplies a clear validation of that map.

Declarations

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This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The author declares no competing financial or non-financial interests.

Data and code availability

The official event announcement is publicly available from Nasdaq. The replication package contains the processed 93-security cross section, pressure and denominator audits, timing and mechanism outputs, bootstrap and randomization summaries, and estimation code. Underlying licensed market data remain subject to their original provider terms; the processed variables, event definitions, identifiers, and source manifest needed to audit the reported analysis are included.

Use of generative AI

Generative AI tools were used for limited coding assistance and minor editorial support. All research design, analysis, interpretation, and final content were determined and verified by the author.

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