



# The Facts About Liquidity, Competition, and Volatility

**NASDAQ**<sup>®</sup>

## Two Kinds of Volatility and Why they Matter to Listed Companies

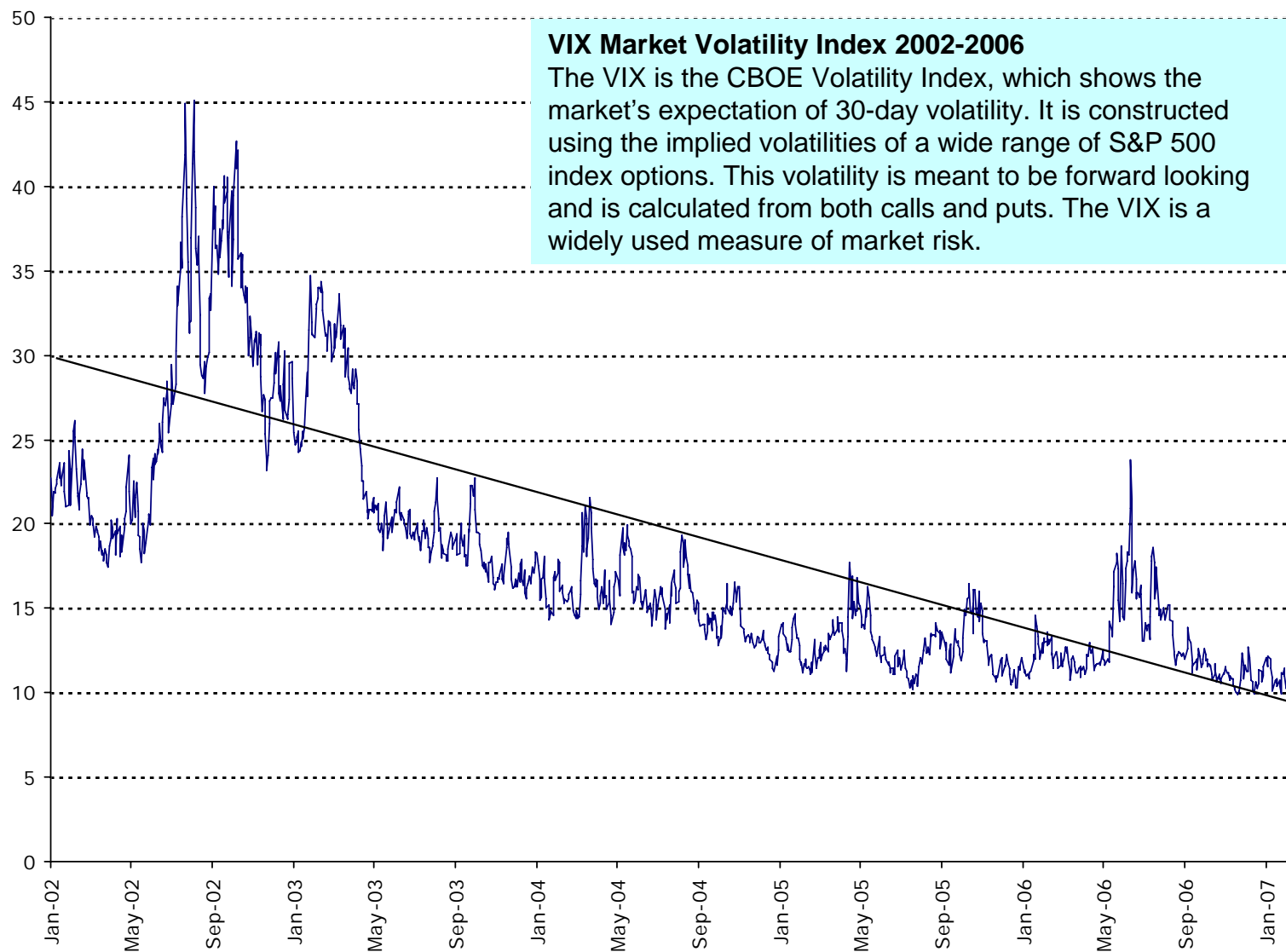
Stock price volatility is important to all public companies because volatility is used to calculate both employee stock options expense and a stock's trading costs. However different measures of volatility are used for each of these calculations:

- **Implied or Historical Volatility based on information is used for options expensing**
- **Intraday or Range Volatility based on trading noise is used to measure trading costs**

## Implied Volatility and Options Expensing

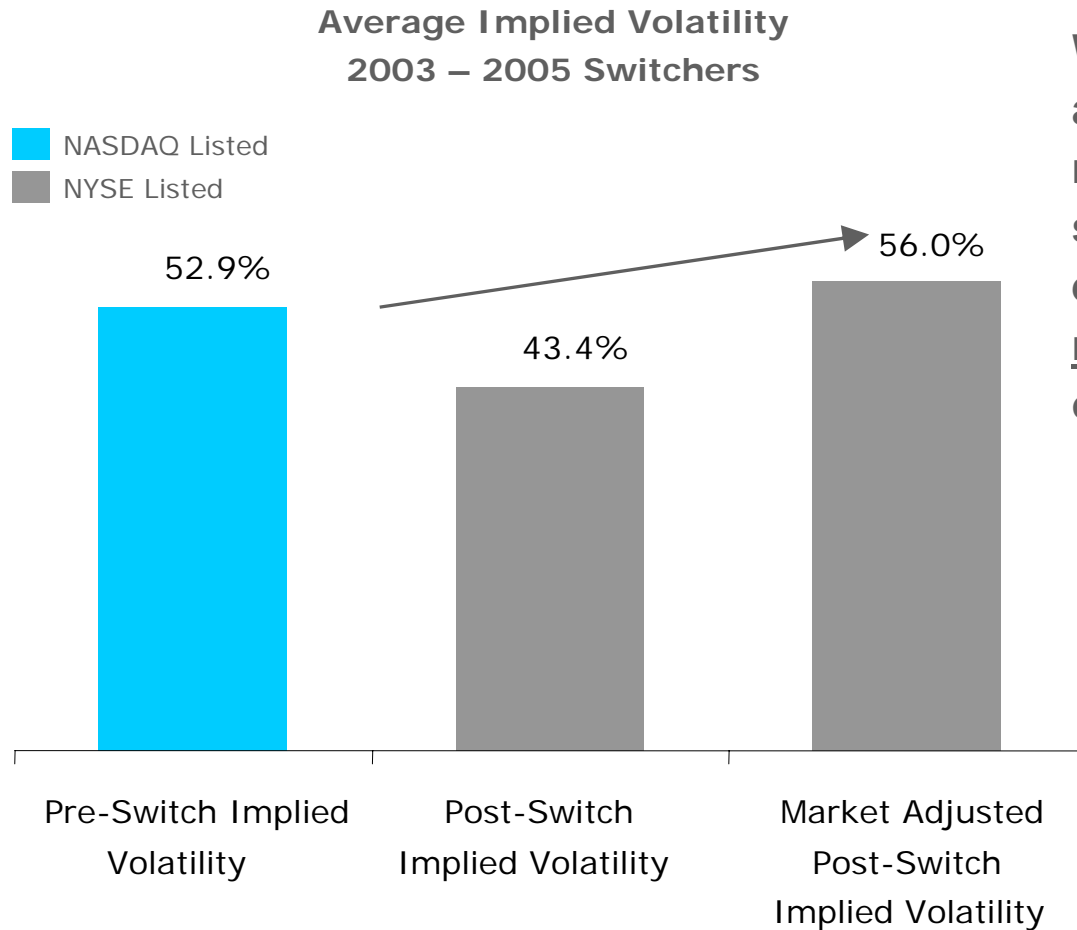
- A stock's price permanently changes because of information:
  - > Government and Regulation – economy wide changes in the demand for stocks and bonds;
  - > Competition and Customers – industry specific events;
  - > Investors and Speculators – changing opinions about the prospects for a company.
- Higher volatility results in higher options expense and the potential to be more valuable, but employees dislike volatility.

# Implied Volatility has Steadily Declined Across All Markets Since 2002



Source: Bloomberg

# Companies that have Switched to the NYSE have seen Increased Implied Volatility After Switching



When implied volatility is adjusted to factor in the overall market declines in volatility seen on the previous slide, exchange switchers have seen a net increase in implied volatility on the NYSE.

Source: Bloomberg. Volatility was adjusted for each switcher using the CBOE S&P 500 Volatility Index.

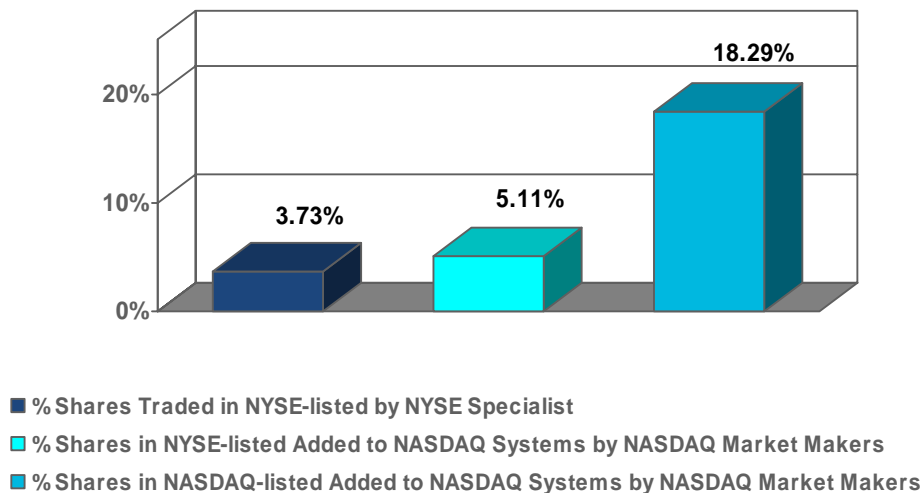
## Short Term Volatility and Trading Costs

- Volatility in a stock's price reflects uncertainty about the future.
- Minute to minute, a stock's price changes based on the orders of aggressive buyers and sellers:
  - > Professional traders (such as specialists and market makers), as well investors, normally provide liquidity for aggressive buyers and sellers.
  - > When there is insufficient liquidity to satisfy buyers or sellers, prices can become volatile.
- This *short term volatility* is a type of trading cost, just like commissions and taxes.
  - > When prices are more stable, aggressive buyers or sellers would get better prices.
- A good market design seeks to minimize trading costs, including short term volatility.

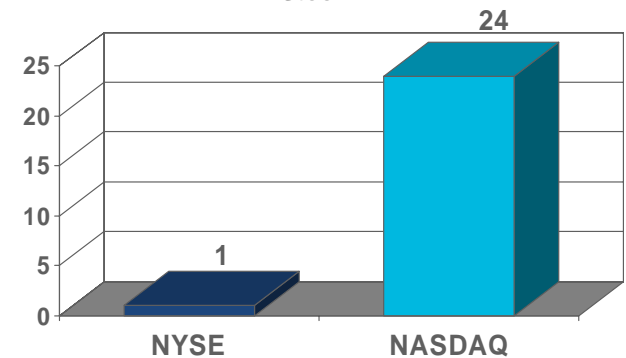
# NASDAQ Open Market Concept Promotes Competition and Liquidity

NASDAQ's open market design brings together over 250 market making firms all competing to provide liquidity on a level playing field with no special rules or advantages for anyone. This means more liquidity for investors.

Volume Traded as a Percentage of Total Consolidated Volume  
March 2007



Total Number of Specialists per NYSE Stock and  
Average Number of Market Makers per NASDAQ  
Stock

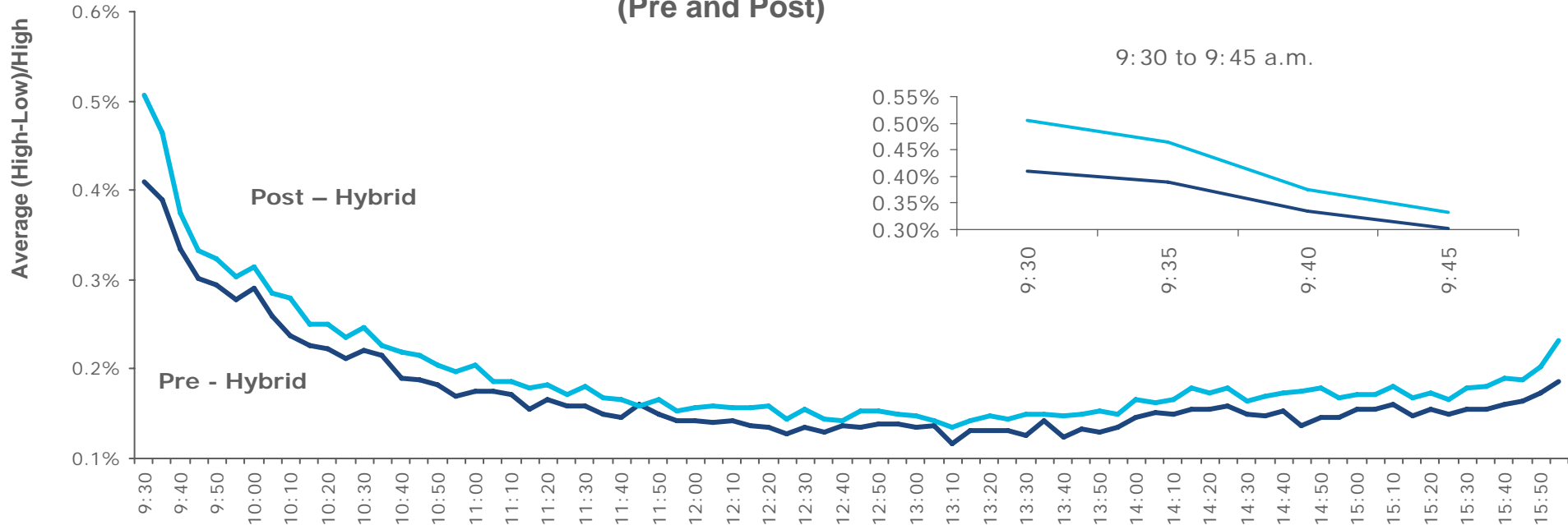


Data Sources: NYSE March 2007 Broker Volume Report and  
NASDAQ.

# The NYSE Hybrid and Volatility

Intraday volatility for stocks traded on the NYSE has increased with the Hybrid.

### Intraday Volatility for Hybrid Stocks (Pre and Post)



*Intraday Volatility is calculated by taking the average price of high minus the low, divided by high.*

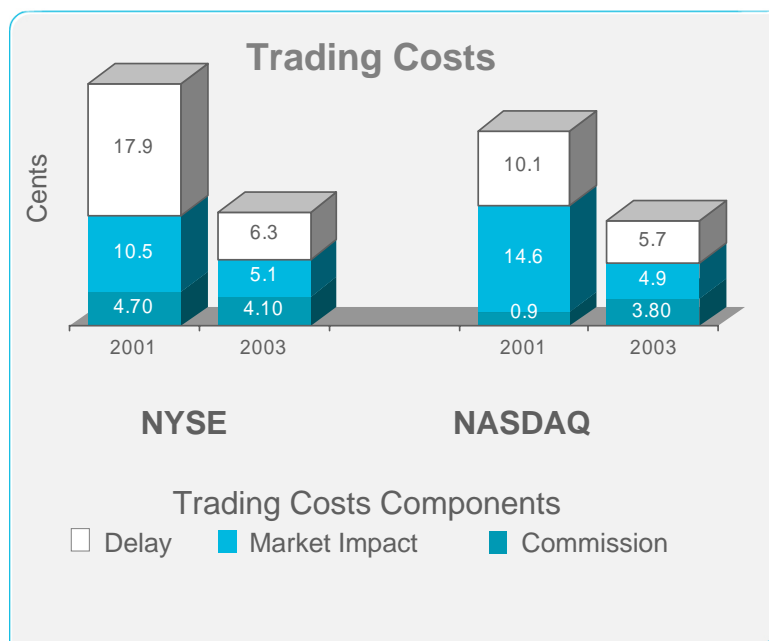
*Data Source: NASDAQ. Pre-Hybrid – September 2006. Post-Hybrid – November 2006.*

# GAO Report Findings

In May 2005 the U.S. Government Accountability Office (GAO) performed an in-depth analysis of the securities markets post decimalization.

## The GAO study found:

- Trading costs were lower on NASDAQ pre and post decimalization.
- NASDAQ stocks experienced less intraday volatility than NYSE stocks both before and after decimalization.



Price Change Period	NYSE Stocks		NASDAQ Stocks	
	Before Decimals	After Decimals	Before Decimals	After Decimals
Hourly	1.00%	0.79%	0.97%	0.75%
10 a.m. to 4 p.m.	2.48%	1.99%	2.37%	1.87%

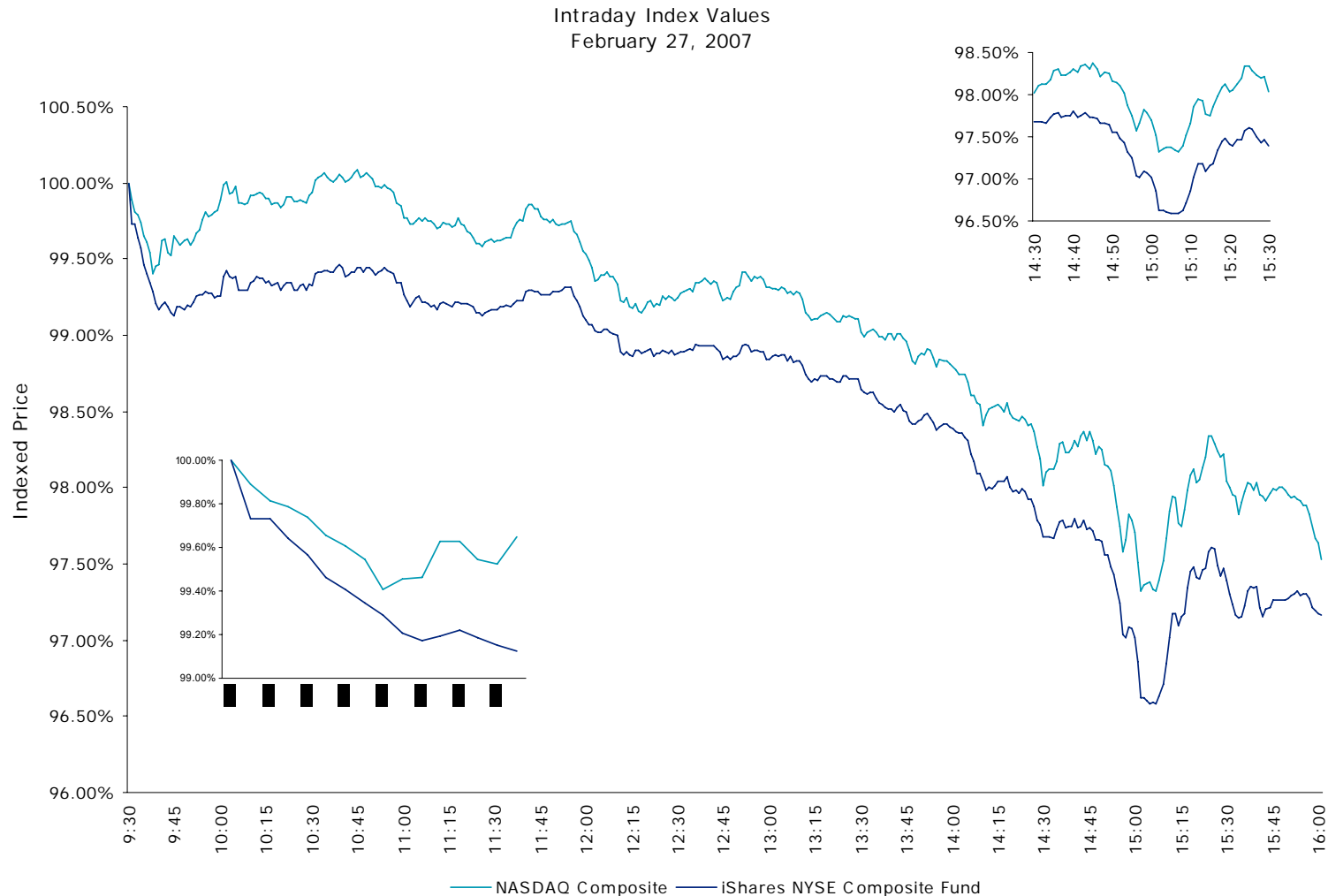


Source: GAO analysis of Plexus Group data.



# Markets Under Stress

When markets are stressed by an in rush of sellers, the ability to provide liquidity becomes critical. How did the two markets do on February 27, 2007.



# Conclusions

- There are two kinds of volatility that public companies need to know about – implied volatility and intraday volatility.
- Implied volatility is used to calculate employee stock options expense, while intraday volatility is used to calculate trading costs.
- Implied volatility has decreased across all markets since 2002.
  - > Companies that switched to the NYSE during this time have also seen decreased implied volatility, but attributing this drop in volatility to the switch rather than the market, industry or company-specific factors would be inaccurate.
  - > After switching to the NYSE, these companies saw a net increase implied volatility on a market-adjusted basis.
- NASDAQ-listed stocks were shown to experience less intraday volatility and lower trading costs than NYSE-listed stocks in a study conducted by the U.S. GAO.
- The NYSE Hybrid system has led to increased intraday volatility.