US Options and Volatility Market Client Demographics

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Focus

- Introduction
- US listed options volume trends
- European investor demand
- Comparing market structures
- Key takeaways
- Panel discussion
- Q&A session
US listed options volume trends
US options trading continues to increase; 2014 volume on pace to reach the second highest level on record...

Annual US Options Trading Volume 2000 to 2014

2000 to 2014 CAGR: 14%

Billions of contracts

0.7 0.8 0.8 0.9 1.2 1.5 2.0 2.9 3.6 3.6 3.9 4.6 4.0 4.1 4.2

Source: OCC, TABB Group estimates

Key Drivers

- Demand for index and ETF products
- Strong growth in weeklies
- Return of the retail investor
- Insatiable demand for volatility exposure

Volume by type of option 2014:H1

- Single Stock: 56%
- Index: 10%
- ETF: 35%

Source: OCC
…despite anemic volatility over the past several years. What happens when volatility returns?
US options liquidity is highly concentrated in large cap names with a growing proportion of trading occurring in short term expirations.

Concentration of Liquidity by Volume Tier

- Liquidity in US option markets is concentrated, with 71% of trading occurring in the top 100 names.
- Index and ETF options dominate most active symbols.
- Most active single stock names include large cap companies and story stocks.
- Weekly expirations a growing part of the market.

Source: OCC, TABB Group estimates
Weekly options continue to grow in popularity; more expirations and symbols support the growing share of volume

- Weeklies now have 5 consecutive expirations
- 377 symbols available for trading

Volume of Options with Weekly Expirations

Source: OCC, Hanweck Associates, TABB Group estimates
Volatility events drive ETF & index trading; volatility products have become a key part of the asset class…

- Index and ETF options account for a growing share of total volume.
- 7 of top 10 most actively traded options are index or ETF products
- Represent 82% of top 10 volume
- Favored product for investors seeking to hedge sector exposure

Top Ten Options Traded by Volume

<table>
<thead>
<tr>
<th>Rank</th>
<th>Symbol</th>
<th>2014:H1</th>
<th>2013:H1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SPY</td>
<td>282,274,393</td>
<td>324,179,685</td>
</tr>
<tr>
<td>2</td>
<td>SPX</td>
<td>102,838,314</td>
<td>106,013,756</td>
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<tr>
<td>3</td>
<td>IWM</td>
<td>87,650,888</td>
<td>72,904,773</td>
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<tr>
<td>4</td>
<td>VIX</td>
<td>85,601,020</td>
<td>73,023,288</td>
</tr>
<tr>
<td>5</td>
<td>QQQ</td>
<td>68,008,220</td>
<td>46,747,383</td>
</tr>
<tr>
<td>6</td>
<td>AAPL</td>
<td>63,693,105</td>
<td>72,758,451</td>
</tr>
<tr>
<td>7</td>
<td>FB</td>
<td>49,844,335</td>
<td>30,111,207</td>
</tr>
<tr>
<td>8</td>
<td>EEM</td>
<td>45,018,232</td>
<td>39,661,468</td>
</tr>
<tr>
<td>9</td>
<td>VXX</td>
<td>38,780,641</td>
<td>42,669,246</td>
</tr>
<tr>
<td>10</td>
<td>BAC</td>
<td>37,591,492</td>
<td>49,155,417</td>
</tr>
</tbody>
</table>

Average monthly volumes
In millions of contracts

Source: OCC, TABB Group estimates
...as evidenced by seemingly insatiable demand for direct volatility exposure

- The use of US listed options as part of volatility strategies has grown considerably.
  - Increasing liquidity in listed markets is attracting greater interest
  - OTC volatility products are important but investor preference is shifting toward listed products
  - The two most active volatility options represent $2.1 billion in daily notional value traded
  - High volume days exceeding $5 billion notional traded

![Average monthly volume (millions of contracts)]

Barclays iPath S&P 500 VIX ST Futures ETN (VXX)
- Open interest: 4.2 million contracts
- Average daily trading volume: 312,000
- Average daily notional value traded: $1.2 billion

CBOE Volatility Index® (VIX)
- Open interest: 7.5 million contracts
- Average daily trading volume in 2014: 690,000
- Average daily notional value traded: $937 million

Source: CBOE, OCC, TABB Group estimates
One of the biggest challenges in US options markets is fragmentation of liquidity.

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Market Model</th>
<th>Trading Model</th>
<th>Pricing Model</th>
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</thead>
<tbody>
<tr>
<td>BATS US Options Exchange</td>
<td>Price/time</td>
<td>Electronic</td>
<td>Maker/taker</td>
</tr>
<tr>
<td>BOX OPTIONS EXCHANGE</td>
<td>Price/time</td>
<td>Electronic</td>
<td>Taker/maker &amp; traditional</td>
</tr>
<tr>
<td>CBOE</td>
<td>Pro-rata</td>
<td>Hybrid</td>
<td>Traditional</td>
</tr>
<tr>
<td>CBOE C2</td>
<td>Price/time</td>
<td>Electronic</td>
<td>Maker/taker</td>
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<tr>
<td>ISE</td>
<td>Pro-rata</td>
<td>Electronic</td>
<td>Maker/taker &amp; Traditional</td>
</tr>
<tr>
<td>ISE Gemini</td>
<td>Pro-rata</td>
<td>Electronic</td>
<td>Maker/taker and Traditional</td>
</tr>
<tr>
<td>MIAX Options</td>
<td>Pro-rata</td>
<td>Electronic</td>
<td>Maker/taker &amp; Traditional</td>
</tr>
<tr>
<td>NASDAQ</td>
<td>Price/time</td>
<td>Electronic</td>
<td>Maker/taker</td>
</tr>
<tr>
<td>NASDAQ OMX BX OPTIONS</td>
<td>Price/time</td>
<td>Electronic</td>
<td>Maker/taker &amp; Traditional</td>
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<tr>
<td>NASDAQ OMX PHLX</td>
<td>Pro-rata</td>
<td>Hybrid</td>
<td>Maker/taker &amp; Traditional</td>
</tr>
<tr>
<td>NYSE AMEX OPTIONS</td>
<td>Pro-rata</td>
<td>Hybrid</td>
<td>Traditional</td>
</tr>
<tr>
<td>NYSE ARCA OPTIONS</td>
<td>Price/time</td>
<td>Hybrid</td>
<td>Maker/taker &amp; Traditional</td>
</tr>
</tbody>
</table>

Source: Exchanges, TABB Group
Market makers are integral to liquidity in US options markets; several hundred firms quote two-sided markets across all options.

Trading in US Options Markets by Type of Account

<table>
<thead>
<tr>
<th>Year</th>
<th>Retail</th>
<th>Institutional</th>
<th>Market maker</th>
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</thead>
<tbody>
<tr>
<td>2010</td>
<td>22%</td>
<td>30%</td>
<td>45%</td>
</tr>
<tr>
<td>2011</td>
<td>20%</td>
<td>32%</td>
<td>47%</td>
</tr>
<tr>
<td>2012</td>
<td>22%</td>
<td>30%</td>
<td>48%</td>
</tr>
<tr>
<td>2013</td>
<td>24%</td>
<td>28%</td>
<td>48%</td>
</tr>
<tr>
<td>2014</td>
<td>24%</td>
<td>30%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Source: TABB Group estimates, OCC
European demand for US Listed Options
TABB published its second report on European trading of US options in March 2014, following up on its original 2011 research.

- The interviews for the 2014 report included 31 participants from Europe and the US.
- The sample included broker-dealers, market makers, retail brokers, data providers, EMS providers, US options exchanges, hedge funds and asset managers.
- Respondents included firms based in the US, UK and continental Europe.
- The majority of interviews were conducted with individuals in the UK and continental Europe, representing 61% of the total with individuals in the US accounting for the remaining 39%.

**Respondent Profiles**

- **6%** US
- **39%** Europe
- **26%** US
- **53%** Europe
- **17%** US
- **11%** Europe
- **17%** US
- **10%** Europe
- **13%** US
- **10%** Europe

**Regional Segmentation**

- **58%** US
- **17%** US
- **17%** US
- **8%** US
- **26%** Europe
- **53%** Europe
- **11%** Europe
- **10%** Europe

**Source:** European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
European investors accounted for an estimated 9% of total US listed options trading volume in 2013

- Hedge funds domiciled in Europe represent the largest source of demand for US listed options.
  - Demand has declined since 2011 as the focus of strategies has shifted away from the US.
  - Lower correlation has hit flows.
- Private wealth accounts are a growing source of order flow.
  - High levels of US equity exposure have risen in value.
  - Focus on overwriting and risk management has led to rising activity.
- Proprietary accounts and sell-side desks remain active users but are shifting activity to the US.
  - Need to access local expertise and operate during US hours drives decision to establish US presence.
- Traditional asset managers represent a small but growing proportion of activity.
  - Increasing adoption amid greater focus on reducing risk and improving returns.
  - Deep liquidity is a powerful factor driving demand.
- Other investor segments including retail and corporations represent a small amount of activity.
  - Retail brokers have identified and are targeting growing demand from active traders.
  - Challenged to shift demand away from local instruments.

Proportion of US Listed Options Order Flow Executed in Europe

- Hedge funds domiciled in Europe represent the largest source of demand, accounting for 58% in 2011 and 55% in 2014.
- Private wealth management accounts for 18% in 2011 and 21% in 2014.
- Proprietary accounts represent 15% in 2011 and 14% in 2014.
- Investment managers account for 5% in 2011 and 6% in 2014.
- Other segments, including retail and corporations, represent a small amount of activity, with 4% in both 2011 and 2014.

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
Their presence is also apparent when the UK is on holiday, with US volumes seeing sharp declines when UK markets are closed.

- Easter Monday (4/1/13): -16%
- Early May (5/6/13): +29%
- Summer (8/26/13): +45%
- Boxing Day (12/26/13): -16%

Daily trading volume in millions of contracts.
Demand from investors is directly correlated to US equity AuM; 2013 levels in favored hedge fund and high net worth locations

- Geo-political uncertainty is driving flows back to the US
- Exposure to dollar-denominated assets will climb as investors execute a flight to safety
- Volatility product adoption will increase as investors seek uncorrelated hedges

**Value of US Equity Holdings by Country**

- **Europe Total:** $2.2 trillion

**European Purchases of US Equity Securities**

- 2010: $55 billion
- 2011: -$32 billion
- 2012: $73 billion
- 2013: $7 billion
- 2014:H1: $15 billion

*Source: US Treasury Department*
Deep liquidity, transparency and electronic access support growing demand

What are the biggest changes in US options trading activity originating from Europe?

- Growing demand: 54%
- More electronic trading: 38%
- Volatility focus: 29%
- ETF demand: 25%
- Focus on Europe: 17%
- Greater understanding: 17%
- Refined strategies: 17%
- Best execution focus: 17%
- Focus on pricing: 13%
- More listed products: 13%
- Lower commissions: 13%

- Brokers report rising demand for US listed options.
- Electronic access growing in importance.
- Strong growth and future demand forecast for hedging with ETF and volatility products.
- Countering demand is the de-emphasis on US exposure from macro strategies as European equity markets recover.

Source: TABB Group Interviews

How has demand for US options products changed since 2011?

- Increased 93%
- Decreased 7%

Response percentages are calculated as a percentage of total responses for each question.

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
European investors are becoming more sophisticated in how they use options; directional and volatility strategies are growing

- European institutional investors are expanding the diversity of options strategies.
  - Asset managers and pension funds using more options in directional and hedging strategies.
  - Private wealth managers implementing more sophisticated strategies.
- There is rising interest from European retail investors to trade US options.
  - Retail brokers improving electronic access to meet rising client interest.
  - Transparency and ease of access driving demand
- Volatility strategies using US listed options and futures products are becoming more popular.
  - Regulation forcing investors to use listed rather than OTC products.
- Hedging strategies continue to focus on ETF and sector index products.
  - Sector hedging strategies rely on liquid products to ensure ability to exit a position.
- Declining correlation is raising investor focus on single stock options.
  - Directional strategies focusing on corporate actions.
  - Short term expirations a popular tool.

What types of strategies are European investors employing with US equity options?

- **Directional/Hedging**: 71%
- **Volatility**: 62%
- **Premium/Overwriting**: 41%

Source: TABB Group Interviews

“Correlations between indices and single names were fairly high and that is changing, with more focus on single stock options especially around earnings.”

- US Broker

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
ETF options have become more important in hedging strategies; but declining correlation is shifting focus to single stock options.

- In 2011, European investors were just beginning to see opportunities in ETF products.
- ETF growth potential remains bright.
- Sector-specific hedging strategies driving adoption.
- Volatility exposure is becoming a larger focus.
- Clients are leveraging technology to support multi-asset trading strategies.
- Falling correlations will favor use of single stock options.

**What Types of Options Are Currently Being Traded?**

<table>
<thead>
<tr>
<th>Type</th>
<th>2011</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single stock</td>
<td>39%</td>
<td>65%</td>
</tr>
<tr>
<td>ETF</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>Index</td>
<td>91%</td>
<td>90%</td>
</tr>
</tbody>
</table>

**Where Do You See the Greatest Growth Potential?**

<table>
<thead>
<tr>
<th>Type</th>
<th>2011</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETF</td>
<td>50%</td>
<td>31%</td>
</tr>
<tr>
<td>Volatility products</td>
<td>38%</td>
<td>56%</td>
</tr>
<tr>
<td>Weekly expirations</td>
<td>38%</td>
<td>50%</td>
</tr>
<tr>
<td>Index</td>
<td>25%</td>
<td>37%</td>
</tr>
<tr>
<td>Single stock</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
European investors use the phone to trade larger orders; adoption of electronic trading channels for smaller orders is growing

- Large institutional investors generally execute by phone to access capital and get market color.
  - Small transactions are transitioning to low touch.
- Financial Information eXchange (FIX) connections are being adopted broadly to meet compliance burdens.
  - Best execution documentation for high touch trades driving demand.
- Direct market access (DMA) support for options is not a focus; regional diversity and number of accounts dilutes direct efforts.
  - Cost to promote platforms is prohibitive.
  - Incremental upside for front-end vendors is low due to lack of existing trading constituency.
  - Brokers and data vendor efforts are more successful due to sales presence and client relationships.
- Smaller funds are embracing electronic tools to execute smaller orders.
  - Workflow efficiencies and lower commissions are driving adoption.

What order channels do European investors use to access US options markets?

- 2014: 86% High touch, 14% Low touch
- 2010: 90% High touch, 10% Low touch
- US: 32% High touch, 68% Low touch

“European clients are using low touch channels to trade. They are becoming more comfortable trading electronically in US markets.”
-US Broker

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
Lack of understanding of US market structure and trading protocols create barriers for European institutional investors

- Understanding of US options market structure has improved in recent years but the fragmented exchange landscape is confusing.
- Investors are using more complex strategies and testing low touch order channels.
- Complex exchange pricing schema inhibits low touch electronic trading for less sophisticated investors.
- Inexperienced users look to brokers to support operational complexities that differ from European markets.
- Lack of block crossing capabilities fosters use of broker capital.
- Inability to delta hedge as part of execution incurs leg risk for clients trading high touch.
- Dedicated technology to support options trading is not broadly available.
- Large firms with multi-asset capabilities will invest if magnitude of activity supports need.
- Smaller firms do not have technological resources to support efficient access.

“One thing we can do significantly better is to educate European accounts on market structure and the amount of liquidity that is available in US markets.”
- US Broker

What is the biggest challenge facing buy side accounts trading US options?

- **Market structure**: 58%
- **Different trading protocol**: 33%
- **Lack of crossing facility**: 25%
- **Market access**: 17%

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
Comparing market structures

- Trading preferences of European institutional investors favor trading upstairs.
- European block crossing mechanisms favor upstairs trading.
- Investors are comfortable trading in OTC markets.
- Lower cost and easier trading.
- Regulatory pressure to move OTC trading into central clearing mechanisms will drive listed adoption.
- Financial crisis of 2008 caused investors to reevaluate credit of counterparties.
- Financial stability has caused credit fears to recede.
- Limited liquidity in listed products forces investors to use brokers to provide liquidity.
- Vertical clearing models inhibit liquidity.
- Market structure deters quoting.

### Proportion of Notional Trading Value

<table>
<thead>
<tr>
<th>Europe</th>
<th>US</th>
<th>OTC</th>
<th>Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>22%</td>
<td>8%</td>
<td>58%</td>
<td>36%</td>
</tr>
</tbody>
</table>

Source: Bank for International Settlements
European market’s limited listed liquidity and preferred trading procedures encourage use of European OTC instruments

- Trading preferences of European institutional investors favor trading upstairs
  - European block crossing mechanisms favor upstairs trading
  - Investors are comfortable trading in OTC markets
  - Lower cost and easier trading
- Regulatory pressure to move OTC trading into central clearing mechanisms will drive listed adoption.
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  - Financial stability has caused credit fears to recede
  - Limited liquidity in listed products forces investors to use brokers to provide liquidity
    - Vertical clearing models inhibit liquidity
    - Market structure deters quoting

Source: Bank for International Settlements
Vertical clearing infrastructure at European options exchanges raises the cost of trading and creates isolated pools of liquidity.

- European equity options trading is fragmented by country and clearing facility.
- Lack of fungibility among clearing houses inhibits market growth and liquidity creation.
- Fragmented clearing structure impedes capital allocation and reduces margin efficiencies.

Equity Options Trading Volume by Selected Exchanges 2014:H1
(Millions of contracts)

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Country/Region</th>
<th>Clearinghouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eurex</td>
<td>Germany</td>
<td>Eurex Clearing</td>
</tr>
<tr>
<td>NYSE Liffe</td>
<td>UK</td>
<td>ICE Clear Europe</td>
</tr>
<tr>
<td>OMX Exchanges</td>
<td>Nordic/Baltic</td>
<td>NASDAQ OMX Clearing</td>
</tr>
<tr>
<td>Meff Renta Variable</td>
<td>Spain</td>
<td>BME Clearing</td>
</tr>
<tr>
<td>Italian Derivatives Market</td>
<td>Italy</td>
<td>Cassa di Compensazione e Garanzia</td>
</tr>
<tr>
<td>Turquoise Derivatives</td>
<td>United Kingdom</td>
<td>LCH Clearnet</td>
</tr>
<tr>
<td>TOM, The Order Machine</td>
<td>Holland</td>
<td>Holland Clearing House</td>
</tr>
<tr>
<td>Oslo Stock Exchange</td>
<td>Norway</td>
<td>Oslo Clearing, LCH Clearnet</td>
</tr>
<tr>
<td>Warsaw Stock Exchange</td>
<td>Poland</td>
<td>KDPW_CCP Clearing House</td>
</tr>
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<td>Athens Derivatives Exchange</td>
<td>Greece</td>
<td>Athex Clear</td>
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<td>Wiener Bourse</td>
<td>Austria</td>
<td>CCP Austria</td>
</tr>
<tr>
<td>Budapest Stock Exchange</td>
<td>Hungary</td>
<td>Hungary Central Clearing House and Depository</td>
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<td>US Options Markets</td>
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<td>Eurex</td>
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<td>Oslo Stock Exchange</td>
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<td>0.1</td>
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<tr>
<td>Wiener Bourse</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Futures Industry Association, Exchanges
US options trading is fragmented but the horizontal clearing structure provides margin efficiencies and concentrated liquidity.

- Institutional Investors
- Retail Investors
- Broker-Dealer OCC Clearing Member
- Automated Market Makers
- Floor-based Market Makers
- Voice Instant Message FIX Electronic DMA
- Clearing Through OCC

- US broker-dealers spend significant resources on technology to support access to all exchanges.
- Smart order routing allows brokers to achieve best execution for clients.
- Burden of exchange fee complexity is managed by brokers.
- Horizontal clearing allows investors to direct order flow to exchanges with most advantageous trading model.
  - Order flow is primarily directed at available liquidity.
  - Low latency strategies prefer price/time priority exchanges.
  - More passive retail flow generally routed to pro-rata exchanges.

Source: European Trading of US Listed Equity Options 2014: Shifting Demand in a Changing Market Landscape
Key takeaways
Key takeaways

- US listed volume remains stable, an uptick in volatility will see volume surge
  - Geopolitical tensions, shifts in Federal Reserve policies and economic weakness means increases in volatility are a foregone conclusion
  - Foreign demand to manage exposures will continue to grow

- TABB estimates 9% of US listed options trading originates from Europe
  - European investors use US options to hedge exposures, with significant interest in index and ETF products in times of market volatility
  - Investors are attracted to the strong market structure, deep liquidity and transparency.

- European hedge funds and private wealth accounts are most active
  - Hedge funds account for 55% of total order flow, with private wealth managers at 21%
  - Rising US equity assets under management increase demand
  - Proprietary trading firms are reducing activity, accounting for 14% of the total, while investment managers accounting for 6% of total.

- European investor strategies are becoming more diverse and sophisticated with an increased focus on volatility strategies.
  - Institutional investors are becoming more sophisticated in how they use US listed options, with multi-legged strategies becoming increasingly common.
  - Low touch trading will continue to gain in importance, especially for smaller-sized orders originating from the retail and private wealth community.
Panel
Q&A Session
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