Proving the market observability of derivatives and consensus

Totem Trade Data Services:

Transaction/ quote analytics and reporting for derivatives markets, including Totem consensus scoring and back testing, liquidity reports, analytics, and customized reporting for clients. Use cases include fair value leveling, day 1 P&L review, valuation adjustments, consensus assessment/scoring, concentration risk, liquidity risk, audit, and regulatory review.

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>
> *– GSIB Bank Valuation Controller*

The question: Is consensus pricing reflective of the market?

As global regulatory scrutiny increases on banks, the need to substantiate independent valuation decisions has also grown. Valuation control groups at banks across the globe use the Totem consensus data to independently verify derivative fair values across equities, rates, FX, commodities, and XVA. Totem consensus data provides the average of accepted prices from active market participants that submit their best estimates of mid-market values across liquid and illiquid instruments. Given the nature of derivative markets and the consensus, not all points published are actively trading. So, how do you prove that the consensus accurately reflects the market?

The solution: Compare the consensus to transactions and executable quotes.

We use transactions and market color, such as executable quotes, to back test the consensus to prove that it accurately reflects the market. A large global bank (referred to as the "GSIB Bank") and Totem worked together to create customized back testing logic for each asset class based on available market color and consensus fields.

The Bank applied the following customized back test to S&P Global Market Intelligence Trade Data:

- $x = \dfrac{Trade\ Price - Consensus\ Price}{Consensus\ Standard\ Deviation + Volatility\ of\ Consensus\ Price}$

- If $x > 1$ = Fail or if $x < 1$ = Pass

- Consensus Standard Deviation is the same as published in the results file for the trade date of the trade being tested.

- Volatility of Consensus Price is calculated as the standard deviation of the consensus for the report look-back period (e.g., one month, three months, etc.)

This back testing approach shows the differences between trades and consensus in the context of price volatility and consensus volatility over that period, thereby isolating true variances in volatile markets. From the GSIB Bank's perspective, "Totem's price volatility based back-testing reports help our team operationally in a very significant way."

The GSIB Bank added, "The back testing is essentially a corroboration of the consensus levels, and where we can evidence a high back testing pass-rate percentage, it gives us comfort to disclose those products as Level 2 in the Firm's Fair Value Hierarchy levelling disclosures." In addition, previously the GSIB Bank back tested Totem consensus levels manually using DTCC trade data. One of the valuation controllers at the GSIB Bank remarked that, "this was not only very operationally intensive (meaning we could only run it once every six months) but also given DTCC's data quality issues and lack of non-US institution trading activity, the results were also subpar compared to Totem's new back testing reports that leverage OSTTRA / MarkitServ trade data."

Calculating price volatility and the price volatility score

Table 1 below shows results for the back testing of an instrument over a 19-day period. The instrument consensus price is observed over that period and a price volatility or "PriceVol" is calculated as the standard deviation of the instruments over the observed period. This is additive and considers the volatility in the price of the instrument over the observed period.

Table 1: Price volatility calculation example

Instrument Observed	Price
Day 1	102
Day 2	101
Day 3	102
Day 4	100
Day 5	100
Day 6	101
Day 7	102
Day 8	101
Day 9	102
Day 10	100
Day 11	101
Day 12	102
Day 13	100
Day 14	101
Day 15	100
Day 16	100
Day 17	102
Day 18	101
Day 19	101
Price Volatility - Standard Deviation	**0.7947**

Table 2: Line-by-line score calculation

Example	Consensus Price	Trade Price	Consensus Standard Deviation	Price Volatility	Price Volatility Score
Pass	100	101	1	0.7947	0.56
Fail	105	95	1	0.7947	5.57

Analyzing the results

Applying this logic to trades in each risk bucket over a period allows client firms to see the cumulative pass percentage of each bucket, as well as the ability to simply add testing results across multiple periods. Below is an example result summary for USD Swaptions.

Table 3: USD Swaptions Cumulative Pass Percentage results example

Term	Tenor	Relative Strike	Trades	Dealer to Dealer Trades	Dealer to Client Trades	Vega	Trades Tested	Trades Passed	Pass Percentage
120	120	ATM	82	74	8	417,666,466	82	80	98%
120	120	OTM+	3	3	0	67,041,552	3	3	100%
120	120	OTM-	5	5	0	84,396,876	3	2	67%

The results in Table 3 can be used for multiple valuation controls focused on observability, including fair value leveling, day 1 P&L review, and overall consensus back testing. For example, the GSIB bank that collaborated with Totem to create this logic uses the results to substantiate fair value leveling, explaining that "specifically, we take the raw files and pivot them to reflect the bucketing in our fair value hierarchy levelling process (e.g., < 10y, > 10y) and then take the aggregated back testing pass-rate for that bucket. If the pass-rate is > 50%, we keep that bucket as Level 2. Otherwise, it is flagged for a potential move to Level 3."

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Price volatility based back testing reports are available for several instrument types including swaptions, cap/floors, and equity options. Totem Trade Data Services and the GSIB Bank continue working together to further develop the reports.

Passing the test with regulators and auditors

Over 20 banks globally use S&P Global Market Intelligence Totem Trade Data Services to support consensus back testing, fair value leveling, and other use cases. In addition to SOC1 accreditation, the services have also been reviewed by global regulators, external auditors, and bank valuation committees.

S&P Global Market Intelligence Totem Trade Data Services Overview

	Cross asset coverage	**Interest rates** – yield curve, basis swaps, inflation, cross currency swaps, swaptions, cap/floors
		Equities – vanilla options (indices, stocks, and ETFs), variance swaps
		FX – vanilla options
		Commodities – vanilla options, swaps/forwards (in development)
		Totem Broker Data Services subscriptions are available separately from Fenics, Tradition, Vectalis, and more
	Analytics	**Visualizations**: Implied trade volatility vs. consensus, liquidity heatmaps, historical trading trends, bid/ask spread trends
		Customized reporting: Apply your firm's unique logic to our trade data; use cases include fair value leveling, back testing, risk, and more
	Client specific trade data services	Clients can upload their own trades or quotes for back testing or other analytics
		Common client trade back testing or analytics with OSTTRA / MarkitSERV
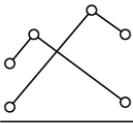
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