



September 14, 2016

## **Virtu Supplemental Information**

### Observations on Third Quarter to-date 2016 Global Market Volumes and Volatility

The purpose of this commentary is to provide regular updates on our views of the market environment relevant to our business.

The volume and volatility environment globally during July and August was severely challenged; in addition to typical seasonality, several global measures represented multi-year lows. In particular, realized volatility in August reached historic lows.

- Global Equities volume and volatility reverted to levels comparable to those observed prior to the U.K. referendum (“Brexit”) on June 23, 2016, and continued throughout most of July and August, with average volumes declining sequentially compared to the second quarter of 2016 as well as the prior year quarter.
- Compared to the third quarter of 2015, U.S. and European volumes were down 19% and 22%, using average daily notional value (“ADNV”) and down 20% in APAC based on Tokyo Stock Exchange average daily volume (“ADV”).
- Compared to the second quarter of 2016, U.S., European and APAC volumes were down 10%, 17% and 7% from already subdued second quarter levels, respectively, calculated on the same basis.
- The ratio of realized volatility of the S&P 500 Index versus expected volatility, as measured by the VIX, continued to slump, declining to 52% for the months of July and August, exacerbating already challenging market conditions. For reference, in the first and second quarters of 2016 realized to implied volatility ratio was 90% and 87%, respectively.
- Additional volatility metrics demonstrate the lack of price movement during the period. For example, during July and August, the average intraday volatility of the S&P 500 Index, EURO STOXX 50 Index, and the Nikkei 225 Index was down 37%, 27%, and 33%, when compared to the second quarter 2016 and down 58%, 30%, and 25% when compared to the third quarter 2015, respectively.
- Global Commodities, as measured by CME and ICE aggregate energy futures contract volumes, were down 4% and 7%, respectively vs. the second quarter of 2016. Various commodity volatility benchmarks are also down vs. the second quarter. CBOE Energy sector volatility, for example, is down 27% and 15% vs. the third quarter of 2015 and the second quarter of 2016, respectively.



## Virtu Financial

- In Global Currencies, ADNV for large spot foreign exchange platforms were down materially in July and August. Compared to the second quarter 2016, third quarter 2016 to date, ADV on Hotspot, Reuters and EBS were down 6%, 12% and 12%, respectively. In August, Hotspot ADV was lower by 14% vs. July and down 20% compared to August 2015. EBS FX volumes were down 18% from July and off 32% from August 2015. Reuters saw a 14% decline from July and a 30% decline from August 2015. CME ADV of FX contracts traded in August was down 13% and 29% vs. July 2016 and August 2015, respectively.

Virtu's results, taken as a whole, reflected the volume and volatility conditions in July and August.

Sources include: Bats Global Markets, Japan Exchange Group (for TSE data and Nikkei Index), Chicago Mercantile Exchange Group, Intercontinental Exchange, Options Clearing Corporation, Chicago Board Options Exchange, Deutsche Borse Eurex, Bloomberg