More businesses today are riding the Big Data analytics bandwagon with the objectives of converting insights—gleaned from huge piles of data—into genuine business advantage. In the retail banking space, unstructured data collected from a broad range of social media sources has resulted in advanced customer profiling and in-depth analytics that in turn are helping enhance customer loyalty and experiences. However, in capital markets so far, firms have traditionally dealt with structured data sets from limited and pre-defined sources. Big data strategies have now begun to impact a select few areas in capital markets firms over the recent years, including sentiment analysis for trading, risk analytics, and market surveillance. Data management is now a strategic function within most financial institutions, and regulatory, customer and internal drivers have resulted in firms re-evaluating data related to trading, risk management and operations.
Big Data in the Context of Capital Markets

Capital markets areas typically generate large volumes of data—be it through trading, transactions or operations. However, computing efficiencies and cost constraints limited the management of such data in the past. Today, advanced computing powers coupled with new technologies like Hadoop, Spark, and others have made it possible to have integrated views of data. Regulatory changes, advanced trading strategies, tighter risk management and compliance, complex processing and stricter timelines for reporting are fast paving the way for the adoption of Big Data.

Typically, data strategies can be applied to a whole range of functions, ranging from front-office trading to back-office processing, surveillance, reference data and support. Many firms today are focused on data-driven initiatives, and are looking to discover unique ways in which data can address prevailing problems or give them a competitive advantage.

Regulatory mandates demand that firms eliminate silos, and this means combining isolated data sets with heterogeneous assets, products and such. In many ways, such strategies are analytical tasks. Audit trails for data underlying risk analytics or pricing of trades are necessary for investors and regulators. The need for transparency in financial markets means that data must be stored and analyzed in a comprehensive manner, while also keeping costs of managing it low.

Application of Data Analytics in Capital Markets

Big Data projects tend to be implemented in a sporadic manner across capital markets firms. Key areas of focus, keeping in mind the goals of revenue optimization, cost reduction and reporting, are:

- Client Relationship Management
- Market Data
- Risk Management
- Post-trade Processing
- Trading
- Surveillance
- Research

These applications find use in three critical areas - those focused
on revenue generation, those aimed at meeting compliance or risk requirements, and those concentrated on cost reduction and operational efficiency.

**Revenue Optimization**

**Trading Analytics**

A good example of the revenue generating intent of Big Data analytics is in sentiment analysis. A Big Data strategy can be used to gather and process information surrounding specific markets to create a clear understanding of sentiments that drive front-office trading strategies, as well as to determine the valuation of individual securities. Using this information, traders are able to determine whether various market participants and commentators, including those on social networks such as Twitter or blogs, are bullish or bearish and can then formulate investment strategies accordingly. On a microeconomic level, sentiments and news surrounding an individual organization can be incorporated into valuation methodologies to produce a fundamental price for a security. By comparing this to the market value, investors can more effectively gauge whether a security is undervalued or overvalued, thereby highlighting potential opportunities for arbitrage.

Trade analytics includes application in areas such as sentiment analysis, High Frequency Trading (HFT), pre-trade decision making, and transaction cost analysis, among others. Due to a cost-driven trading environment, fund managers and buy-side traders are forced to watch every penny involved in transactions, and therefore the increased demand for computerized algorithms. Demand is not limited to mere post-trade Transaction Cost Analysis (TCA); therefore, pre-trade analytics are being used to cover a range of needs, for example, through the analyses of historical, current price and volume data, clients can determine where and when to send orders or realize lost opportunity costs.

HFT is a branch of algorithm trading wherein order execution is conducted at exceedingly high rates. Here, a burst of small sized orders are sent at very high speed in response to an event. Apart from the built-in memory that is inherent in hardware, it is the algorithm that helps recognize and respond to such nano-second events. With the help of machine learning, historical data is used to find patterns to predict the future, form clusters and perform classification, thereby, identifying particular traits of an event. Proprietary HFT desks try to make profits by acquiring positions that they predict will be profitable based on price movement forecasts. It is the speed coupled with robust and agile data analytics, which provides true competitive advantage in securities trading.

**Research**

Data analytics can aid the research by generating trading signals (Please see Figure 2) using Time Series Analysis and simulations. Sentiment analysis is used to gather and process information surrounding specific markets

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**Figure 2: Application of Big Data in Capital Markets Firms**
APPLICATION OF DATA ANALYTICS IN CAPITAL MARKETS

and stocks to formulate trading strategies, as well as to determine the valuation of individual securities. Using information available on news channels, social networks and websites, it is possible to formulate investment strategies. One can evaluate stock placement by comparing created and existing stock prices, resulting in better buy/sell decisions. Being able to provide high-quality research is a service that has helped reinforce client relationships and generate revenue. By the application of analytics and combining natural language inputs with unstructured data engineering across economic reports, monetary policy changes and political events, organizations are gaining the ability to automate manual knowledge-based work. Questions that would once have taken days to research and study can now be answered and visualized in minutes, providing organizations with an automated quant capability.

Client Relationship Management

A single view of the customer can make an immense difference to customer satisfaction levels, thanks to consolidated, rich, relevant and insightful data. A 360 degree view can be obtained by applying analytical insights to data captured at various touch points in the client management lifecycle. This involves classification of clients into predefined segments and using of predictive data models to evaluate future client behavior. In addition, advanced analytics can be used to identify subsets of clients---those which contribute maximum revenue, those that are not served to their full potential or have a high future potential, or for whom there may be no viable economic case for retention. Analytical data can also identify client behavioral trends such as their propensity to use a particular mode of communication (phone or email rather than post-trade portals) and make last-minute changes to account allocations, thereby, personalizing services and offering dynamic fee packages. Advanced analytics on position and transaction data can identify patterns and trends that inform the next best course of action.

Reporting Requirements

External Surveillance

Though regulators across the world have agreed on the key areas of regulatory design that need reforming, it varies from region to region. Prominent regulations that have an impact in two regions have been the Dodd-Frank Act, Basel III, MiFID II, Solvency II, FINRA Guidelines, FATCA, EMIR, UCITS IV and the FRS9 Standard. Large capital market firms with a cross-border presence face a series of regulations which can be categorized by country, region, international standards and product line regulation. For example, capital market firms in the USA are affected by the Dodd-Frank Act, FINRA guidelines (specific to securities), the Volcker rule and the Consolidated Audit Trail (CAT), and those in Europe by EMIR and MiFID II.

Big data is gaining a strong hold due to the increased scrutiny of data quality in regulatory and ad-hoc market reporting and the need for speed and accuracy. As trading increases and regulators demand tighter scrutiny, the volume of data being created also rises dramatically. Multiple siloed systems can create contradictions and inaccuracies, further complicating reporting tasks and increasing the cost and timelines involved in generating consolidated regulatory compliance reports. The Dodd Frank regulation requires trade reconstruction reporting for regulatory investigations within a 72-hour period, and this data may be residing in unstructured formats such as voice or text, making Big Data analytics a must. In short, with Big Data analytics, financial institutions are better able to meet compliance requirements, be it in the form of managing unstructured data contained within mails via text mining for surveillance, or the cross-referencing of internal data sets.

Internal Surveillance

Internal surveillance is performed in areas related to fraud and AML/KYC, market and credit risks, unauthorized trading, employee surveillance, and in continuously monitoring asset performance in businesses that are delivering a higher risk adjusted return on capital investment. This can help evaluate the potential risks and internal and external factors which have an impact on an investment. Data analytics can accurately identify risks and exposure across a trade life cycle and the organization.

Trade surveillance uses pattern based analytics to identify front running and insider trading by gleaning information from various data sources and feeds. Similarly, Anti-Money Laundering and fraud detection can be dealt with models based on pattern identification. Credit scoring, which is a statistical method for evaluating risk of a loan applicant, is another area where Big Data analytics is being applied. As a wide range of information can be generated, multiple variables
can be integrated into more traditional credit rating models to identify hidden patterns that can lead to better and more accurate predictive abilities regarding creditworthiness.

**Cost Reduction**

**Risk recognition**

Cost rationalization can occur when fraud and risks are detected in a timely manner. Big Data analytics enables firms to overlay existing information such as client transactions with data gathered from unstructured and semi-structured sources to deliver deeper insights into fraud. Moreover, it is essential for these firms to define a standard for ‘normal’, so that they can easily flag anomalous behaviour; although, the entire Big Data set is necessary to be able to do this. For example, some irregular activity can be identified by studying a few weeks of transactions, but with the majority of the cases, coherent patterns emerge from mining months or years of data, making the ability of Big Data to handle large volumes and datasets vital.

Cyber security is another area that can be strengthened by the application of data analytics, by classifying intrusions using data mining and neural network approaches.

**Post-trade Processing**

Predictive analytics in post-trade processing can help with pre-emptive actions to prevent settlement failures, reducing opportunity costs associated with settlement delays. Analytics-driven failed settlement identification and mitigation can reduce Basel III capital provisions for operational risk. This in turn can reduce interest rate charges on regulatory capital provisions. Similarly, back-office operational costs can be reduced by identifying patterns, or manual jobs that can be automated; so also, by predicting volumes of trade and trend analyses—all leading to more efficient operations, better resource planning and customer service.

**Market Data Management**

Data storage for historical trading, internal data management and overall control of reference data are all big tasks in financial services. Inconsistent, incomplete or inaccurate reference data can deter the Straight-Through-Processing rate and create lags in transaction settlement. A large portion of a trade record is composed of reference data, and a significant amount of transaction breaks are caused by...
its poor quality. The cost to repair trades and incorrect mismatching are significant, which increases as errors pass through front- to middle- to back-office systems. Organizations have to merge historic and new data to generate insights about delivering better and more cost-effective solutions. Effective reference data management paves the way for developing “golden copies,” or single versions of the truth, thus doing away with inconsistent data. It improves the quality and accuracy of data and reduces the need for manual intervention. Consistent data when sent to business units in an organization, can offer a complete and correct picture of financial instruments and their entities.

There are many more areas in which analytics can help, and they are:

- Data quality discovery and profiling - Real-time monitoring and analyses for possible errors from upstream systems
- Data quality management, to continuously maintain the trustworthiness and standards of data
- Data management cycles, where advanced analytics can generate insights in running core operations, for example, in backtracking of costs incurred due to the use of ‘bad’ data

Conclusion

Growing complexity in the marketplace and the persistent need to comply with a swathe of regulations, is making it necessary for financial institutions to invest in Big Data analytics. The significant role it plays in generating revenue, augmenting the effectiveness of front-office sales and client retention doesn’t require further argument. When implemented in its entirety, Big Data can help institutions go beyond improving risk management, reporting compliance, and operational efficiency, but also in devising better pre-and post-trading methodologies. In short, we believe that there is absolutely no doubt that a revolution in this field is fast imminent.

References