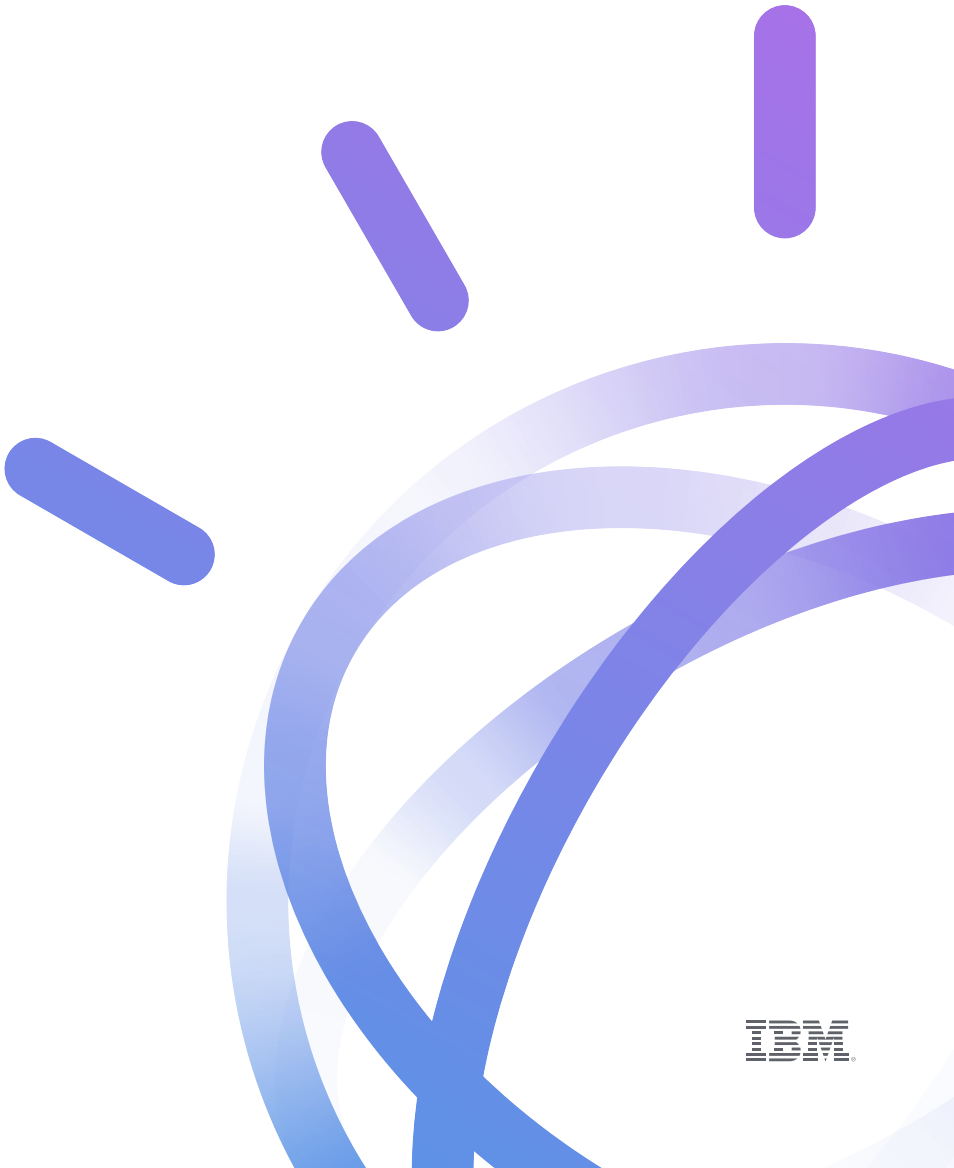
White Paper

# A new era of technology-enabled financial risk management

## Apply emerging technologies to modernize your risk management capabilities and improve outcomes



**Watson Financial Services**

IBM

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## Risk brings rewards

The financial services industry is no stranger to the concept of exponential growth. By investing early in the growth cycle, it’s possible to capture large returns while investing late leads to smaller returns and missed opportunities. Today, the technology infrastructure used by financial institutions is experiencing several threads of exponential growth. It may, therefore, be unsurprising that the same guidance may apply: the firms who fail to invest in these technologies will miss out on the benefits of this exponential growth. Generally speaking, these technology trends allow firms to collect and store increasing amounts of data, easily obtain infrastructure at very low cost, conduct analysis in differentiating and value-adding ways, and deliver new services to internal and external clients. Firms that wait to adopt these technologies may find themselves at a disadvantage, facing pressures from competitors and new entrants to the market.

## What you don’t know can hurt you

Technology is evolving at an incredible rate and new solutions appear all the time. For example, over the past five years there has been tremendous growth in the artificial intelligence (AI) used for voice recognition and determining user intent. This technology has driven a corresponding growth in the adoption of smart speakers, such as the Amazon Echo and Google Home, and sales of these devices in the US reached 100 million in 2018. Today financial and other firms are using this technology to deliver new and improved customer digital experiences. But what about other technologies like big data, cloud, Docker and Kubernetes? Can they be applied to core financial functions, such as risk management, trading, settlement, finance and accounting? What about AI for natural language understanding (NLU) and machine learning (ML)? How can they be applied to these same core functions? Financial firms need to invest the time to learn these technologies or risk falling behind competitors. Firms who are faster to recognize the potential applications of these technologies to their core systems will gain a competitive advantage over those firms that move more slowly.

## Challenges create opportunities

Big data, cloud, Docker, Kubernetes and AI all provide multiple opportunities for financial firms to improve core systems. Most firms face similar challenges when looking to redesign these systems on top of new technologies.

These challenges include:

- **Learning curve:** These technologies are new and rapidly evolving. Therefore, there aren't a lot of experts familiar with these technologies. They're often used in open source projects that have been created to solve a problem in another industry, so determining how to use the technologies to improve a financial system is not always apparent. Firms need time to learn these technologies and develop a team of internal experts.
- **System complexity:** Many core financial systems are complex, have dependencies on multiple data sources and are intertwined with other systems. Designing a new architecture requires a deep understanding of the business processes and workflows for the target solution, as well as the dependent data and related systems. Without the ability to evaluate these new technologies in the context of each core system, it's impossible to pick a viable path forward.
- **Migration plan:** Core systems are integral to business operations. Any migration to a new architecture needs to consider business continuity and minimize disruptions. The ideal plan provides a path that rolls out the new architecture in a series of steps. However, sometimes a piecemeal approach isn't possible, and a full replacement is needed. The latter approach requires longer develop timelines and can delay the benefits of the new architecture.

While figuring out how to deal with these challenges can be daunting, it also presents an opportunity for big improvements. Firms who are faster to recognize the potential applications of these technologies will gain a competitive advantage over those that move more slowly. Taking risk management as an example, firms always make trade-offs across multiple dimensions: cost, performance and number of calculations. However, new technologies change the way these trade-offs are evaluated. Solutions using a cloud architecture can deliver hardware savings due to the cloud's pay-as-you-go pricing model where fees are based on consumption. Solutions using a big data architecture can deliver greater performance and resiliency over earlier in-house solutions built using a relational database architecture. Docker and Kubernetes allow clients to manage workloads more efficiently by provisioning and scaling resources on demand. AI can be applied to labor-intensive operations, such as cleaning data to improve data quality at a lower cost. Similar opportunities can be found for other core financial systems, such as trading, settlement, finance and accounting. The challenge—and the opportunity—is there are so many places where these technologies can be applied to drive improvements.

## Data-driven pioneers are tomorrow's leaders

The balance of this white paper delves into the key technologies and various tools IBM has applied to developing solutions for the field of risk management. However, many of these applications are general in nature and can be applied to achieve similar results in other areas. Understanding the technology available to financial institutions today will help financial institutions navigate the uncertain "waters" of the future.

## Big data

Big data technology today has evolved to the point where it can be applied to sophisticated business processes beyond search, social and e-commerce. Often, these applications don't typically qualify as "big" when considering the amount of data involved. Yet big data technology can have a huge impact on "small" data, including improved performance and operating models, and better resiliency. Hence, big data has become an integral element as financial institutions create new architectures for core systems. Using risk management as an example, big data can be used to significantly improve performance by reducing the number of data moves, for example, copies, inserts and extractions. Because risk management systems demand a large range of data from various sources, traditional relational database management systems (RDBMSs) often fall short of delivering the needed performance when calculating analytics on the most granular level. System performance is constrained due to the time required to manage the input data that feeds the analytics and the resulting outputs.

Big data provides an alternative approach to building scalable solutions because the time required to manage the data is reduced. Using big data, calculations are moved to the data instead of moving the data to the calculations, greatly reducing overall run times. Big data also provides resiliency to mission-critical applications because redundancy and fault tolerance are built into the software framework. By design, multiple copies of all file blocks are stored on the file system so, if a disk drive crashes or a node dies, jobs can be simply rerun using another copy of the data.

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Internal IBM tests have shown that the performance of ALM liquidity risk runs can be sped up 20 times by using big data technology, reducing the processing run times from over 4 hours to under 10 minutes.

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IBM has released versions of its asset liability management (ALM) and market risk management solutions on big data. These solutions eliminate the heavy reliance on relational databases for data management, which has dramatically improved runtime performance for these solutions when performing analytics at the most granular level. This performance improvement provides two key business benefits that weren't practiced on earlier architecture: the ability to run all the calculations at the instrument level and the ability to perform multiple intraday calculations.

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**Read the "Think big" white paper to learn how big data will change your approach to financial risk management.**

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## Cloud

The cloud provides a number of generic benefits for running financial workloads. The ability to quickly scale hardware resources up and down enables IT teams to manage compute resources to match business needs. The pay-as-you-go approach allows firms to manage costs by only paying for compute resources when they're being used. Many software providers have released cloud versions of their software, eliminating or greatly reducing the time required to implement solutions. And finally, some cloud software is encapsulated in services, allowing firms to combine multiple services to rapidly create new applications and workflows.

Docker and Kubernetes are two technologies that support moving and managing workloads to the cloud. Docker is an application virtualization technology that provides a portable way to create, deploy and run applications as containers. Kubernetes is an orchestration technology that provides a way to start, stop and manage a set of containers. Used together, these two technologies provide a way to create portable application containers and then manage them across a set of nodes, either in a data center or in the cloud.

The IBM® Cloud™ for Financial Services platform provides APIs that leverage sophisticated risk technology applicable for financial institutions. Using Docker and Kubernetes, these intuitive, cloud-native APIs are offered in a pay-as-you-go model based on how much the tools are used, available in a choice of languages and scalable to meet individual client needs. Red Hat®, an IBM Company, and the world's leading provider of open source cloud software, is a game-changer that can unlock the full value of the cloud for your financial institution. Together, IBM and Red Hat help securely transition virtually any business application to the cloud. This combination of assets enables you to create cloud-native business applications faster and provide greater portability of data across multiple public and private clouds in a security-rich environment.

IBM Financial Risk APIs:

- Provide a curated data repository for reference and time series data
- Compute full revaluation models on financial securities
- Migrate workflows to cloud APIs
- Provide an open architecture for seamless integration
- Enable instant access for immediate deployment

**Infinitely scalable**

Leverage the horizontal scalability of the cloud to compute your large workloads faster and cheaper.

**Pleasantly intuitive**

Access sophisticated models, standardized to best practice, through easy-to-use APIs.

**Primed for innovation**

Try our services at no charge, and see if they're a good fit for your cloud infrastructure of the future.

**Rapidly deployable**

No implementations—simply provision an API key and start using our services.

IBM Financial Risk APIs are easily deployable, scalable and intuitive for users of virtually any background.

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**Learn more about the promise of cloud technology for financial risk management applications. Read the white paper here.**

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## Data aggregation and high-performance analytics

There's no question that financial institutions face a multitude of highly complicated analytical and reporting challenges. One of the biggest challenges is bringing together the data required to drive these analyses and reports. Loading and navigating large volumes of data, generated by multiple systems and stored in numerous locations, is a daunting task. What's more, the computational power needed to churn this data often taxes existing infrastructure beyond its limits. The growing need to analyze and report on the most granular level is stressing current technologies to the brink.

Interestingly, the Basel Committee on Banking Supervision (BCBS) released a report in December of 2017 that found that a key challenge for banks is the lack of "systems needed to efficiently aggregate data from across the banking group for use in stress tests." This finding should come as no surprise. The BCBS 239 principles, which became effective in January 2016, were designed to strengthen banks' risk data aggregation capabilities and internal risk reporting practices. However, another report in March 2017 concluded "while some progress has been made, most G-SIBs have not fully implemented the Principles and the level of compliance with the Principles is unsatisfactory."[1]

> "A key challenge for banks is the lack of systems needed to efficiently aggregate data from across the banking group for use in stress tests."
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> Basel Committee on Banking Supervision (BCBS) report, December 2017

IBM Algo® Workspace Analyzer is a new solution that helps institutions consolidate risk data and analytics from various systems using a different, more efficient approach to risk aggregation than traditional tools. The solution provides easy access to data across an organization because data adapters can be written to read and load data in essentially any format from virtually any system, for example databases, files and so on. Data can be loaded into memory and dispersed across multiple servers that support a massively parallel architecture. The architecture provides near real-time performance for data aggregations, even at the most granular level. The system is extendible, allowing users the ability to create highly customized calculations and efficiently build the complex logic required for new financial regulations and internal management reporting. It's also possible to trigger calculations to run on other systems, retrieve additional data or perform other complex operations. Finally, the solution provides a sandboxing capability that allows user to run tests that change data and calculation logic. The system tracks the changes made in each sandbox and the sandboxes can be shared among users, providing a collaborative working environment.

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**Read the article:** Blazing new analytical paths—Tackling data aggregation for new risk insights.

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## Artificial intelligence and beyond

AI is the face of the future and is changing the way organizations conduct business. In the financial environment, cognitive capabilities can help you act faster and with greater confidence. Natural language processing (NLP) helps you understand patterns and connections in the news and blogs—it even identifies changing sentiments—*before they hit the news*. Cognitive technology can be used to uncover patterns in identifying new stress-testing scenarios—*and faster than ever before*. The potential for AI in financial applications is limitless.

IBM has been on the cutting edge of the cognitive technology revolution from its inception with IBM Watson® AI capabilities. Watson™ augments human intelligence with the ability to reason and learn from data. In addition, IBM Watson Machine Learning (WML) can turn your data into intelligent business applications that you can use with confidence. It uses simpler model creation, improved predictions through continued model retraining and smarter forecasts over time. The result—more accurate, personalized and targeted insights. Watson can help you minimize risk, identify unique market needs and behavioral patterns, optimize resources—and disrupt the disrupters. Plus, it can all be accomplished with greater agility.

When looking specifically at the field of risk management, there are several potential applications for AI that stand out. First of all, ML can be applied to labor-intensive jobs, such as cleaning data to improve data quality. Most financial institutions have people who are dedicated to this task, but scaling operations is expensive. AI provides a way to automate and scale this process. A second potential application is processing unstructured data in the form of written articles and live feeds for interesting news that's related to a portfolio. Natural language processes, combined with sentiment analysis, can help firms take unstructured data and create scenarios that are relevant to one or more investments. Today, this task is typically performed by analysts, but there's a limit to the number of new articles and video streams that a person can process. Again, AI provides a way to automate and scale this process. Finally, chatbots and voicebots can be created to help automate the processes even further. Imagine telling the system to "run a 5 percent S&P down scenario" and then getting a report displayed on your monitor. In this case, AI is being used to change the user experience by changing how users interact with systems.

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**IBM partnered with Chartis to study the role of artificial intelligence in risk and compliance. Read the research report:** AI in RegTech: a quiet upheaval. How advanced technologies are changing the way that financial risk, financial crime risk and GRC are managed.

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## Conclusion

**Ride the new wave in financial risk management**

Although the business requirements facing firms related to financial risk management are increasing, so are the ways to address them. The technology that can be applied to the field of financial risk management is changing extremely rapidly. Attempting to keep abreast of the constantly evolving technologies can be overwhelming, and frankly, intimidating. Big data can dramatically reduce run times by reducing data moves while building in redundancy and fault tolerance at the same time. Intuitive, cloud-native risk technology APIs offer pay-as-you-go models and allow clients to scale hardware resources up and down to meet business demand, as well as quickly build new applications and workflows. Innovative aggregation tools can consolidate risk data from various source systems and provide a flexible way to perform analysis and reporting in near-real time. AI can help incorporate unstructured data into the risk processes, as well as aid in data cleaning. Although it's difficult for financial organizations to keep up with all these technologies on top of regulatory and other business requirements, there's never been a more opportune time to delve into new ways of addressing the future needs of financial risk management.

## Why IBM?

Incorporating decades of IBM risk expertise, best practices and technologies, IBM financial risk offerings provide analytics, workflow efficiencies and insights to decision makers at multiple levels of financial institutions. By enabling more effective risk and reward management, these offerings give decision makers the capabilities they need to help grow and improve profitability, while also continuing to protect the enterprise.

## About IBM Watson Financial Services

IBM is working with organizations across the financial services industry to use IBM Cloud, cognitive, big data, RegTech and blockchain technology to address their business challenges. IBM Watson Financial Services merges the cognitive capabilities of Watson and the expertise of Promontory Financial Group, an IBM company, to help risk and compliance professionals make better-informed decisions to manage risk and compliance processes. These processes range from regulatory change management to specific compliance processes, such as anti-money laundering, know your customer, conduct surveillance and stress testing.

## For more information

To learn more about IBM financial risk solutions, visit ibm.com/RegTech and follow us on Twitter @IBMFintech.

Footnotes

1. “Progress in adopting the Principles for effective risk data aggregation and risk reporting.” Basel Committee on Banking Supervision, March 28, 2017. https://www.bis.org/bcbs/publ/d399.htm



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