

THE OLIVER WYMAN

RISK JOURNAL

PERSPECTIVES ON THE RISKS THAT WILL
DETERMINE YOUR COMPANY'S FUTURE

ABOUT THE COVER

On November 10, 1985, the town of Epecuen, in Argentina, was flooded after water broke through the embankment protecting the town, with water levels eventually reaching 10 meters in height. Three decades later, the water has receded. But Epecuen remains a ghost town. This photo was taken in 2010.

© Dimaberkut | Dreamstime.com - Dead City In Argentina Photo

INTRODUCTION

Organizations are required to respond to an ever-expanding range of interconnected risks in order to remain successful. In today's environment, risk identification and mitigation are essential elements of firms' strategies as they face the challenges of economic volatility, falling commodity prices, rapid technological change, and cyberattacks.

It is our pleasure to share with you the fifth edition of the *Oliver Wyman Risk Journal*. This collection of perspectives represents the latest thinking on risk from across our firm.

I hope you find the *Oliver Wyman Risk Journal* informative and valuable.

Yours sincerely,

A handwritten signature in black ink that reads "Scott McDonald". The signature is written in a cursive, slightly stylized font.

Scott McDonald
President & CEO
Oliver Wyman Group

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VOLUME 5, 2015



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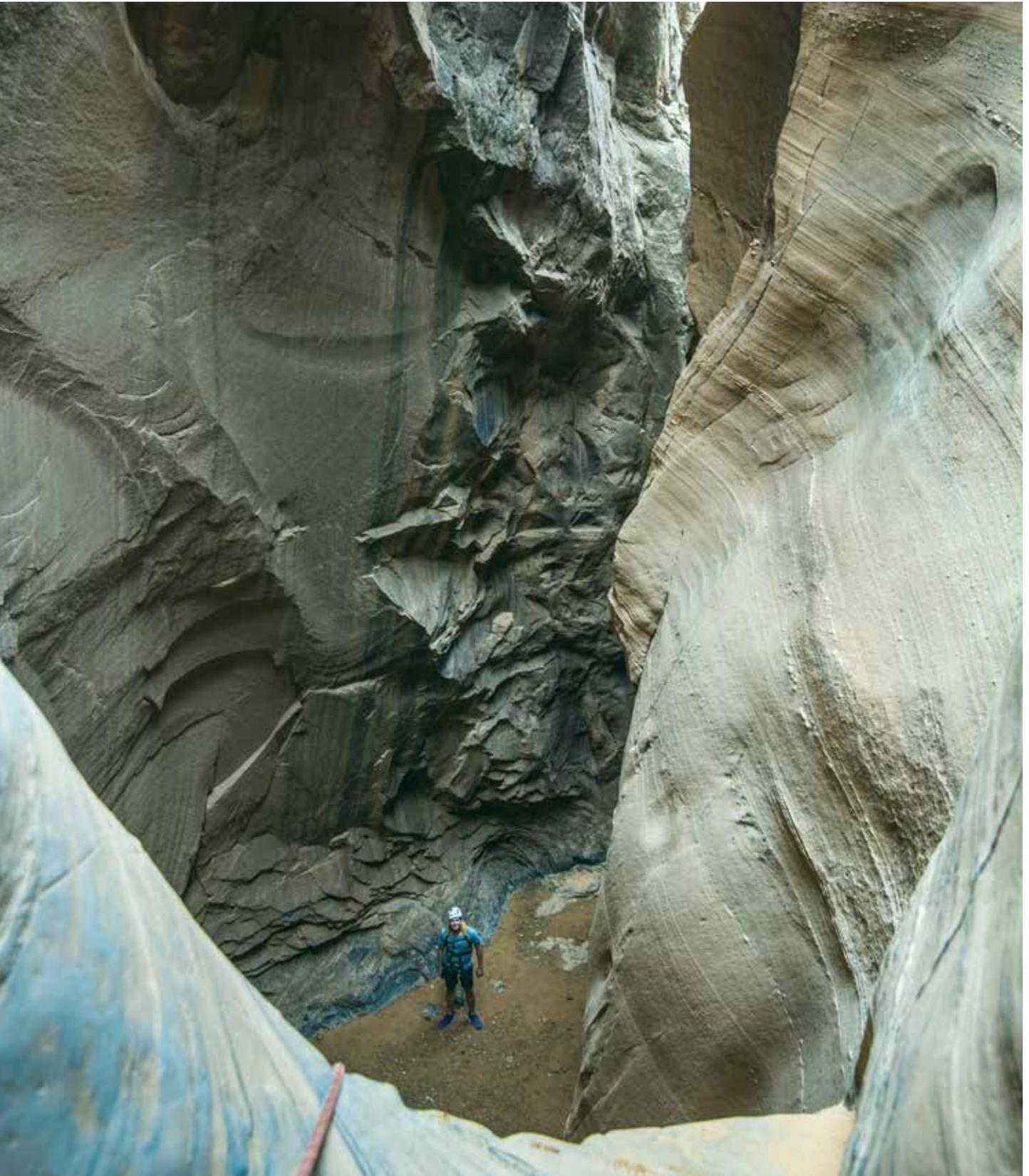
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EMERGING RISKS

The background of the slide is a photograph of a server room. The server racks are arranged in long aisles, and the lighting is a cool, blue-green hue. The perspective is from a low angle, looking down the length of the aisle, creating a sense of depth and scale. The racks are filled with various components, and some lights are visible on the units.

- The Only Way Is Up
- Cyber-Risk Management
- Controlling the Genie of Emerging Technologies





THE ONLY WAY IS UP

WHAT A RISE IN US INTEREST RATES COULD MEAN FOR THE GLOBAL ECONOMY

Barrie Wilkinson

Central banks responded to the financial crisis by slashing interest rates. In August 2007, the United States federal funds rate was 5.25 percent. By December 2008, it had fallen to 0.25 percent. After seven years of sluggish economic recovery, the rate remains stuck there.

As the US economy picked up in 2014, pundits predicted a rate rise in 2015. But these expectations have been confounded by dramatic declines in prices recently across a broad range of commodities and stock indices. Investors fear an accelerated economic slowdown in China and knock-on effects on still-weak US and European economies.

Meanwhile the Federal Reserve has been sending mixed signals about the likely timing and size of rate rises. Many investors fear that a premature or overly large rate rise could be the final nail in the coffin for emerging market economies.

How worried should investors be? In other words, how likely is a material rise in US interest rates and what would it mean for markets?

A BRIEF HISTORY OF US INTEREST RATES

To answer the first part of our question, we need to understand the history of US interest rates and what drives it.

US interest rates have been declining steadily since the early 1980s. (See Exhibit 1.) Inflation is part of the explanation. Before a lender can earn any real interest, the rate on their loan must first compensate them for the erosion of their money's purchasing power when the loan is repaid. As inflation has fallen since the early 1980s, interest rates have automatically fallen with it. Moreover, the real rate of interest (the nominal interest rate minus the rate of inflation), which ultimately influences an individual's propensity to save versus spend, has also fallen.

A rise in US interest rates
could spell crisis for
emerging markets



Why have rates been falling?

Judging by media discussion of interest rates, you might easily believe that real interest rates are entirely at the discretion of central bankers. They aren't. According to Ben Bernanke, "The Fed's ability to affect real rates of return, especially longer-term real rates, is transitory and limited."

In fact, the influence works in the other direction. The Fed aims to set interest at the so-called "equilibrium" rate. This is the rate at which borrowing is not so cheap as to cause "overheating" and consequent inflation, nor so expensive as to stifle spending and cause a recession. What this equilibrium rate is depends on economic circumstances beyond the control of the Fed.

For the past seven years, spending within the economy has been low as a result of high unemployment and the need to pay down debt built up during the pre-crisis boom. This depressed the equilibrium rate and required the Fed to keep rates low. The US now appears to be re-emerging from this slump, pushing up the equilibrium rate. The general consensus is that rates need to rise because the risk of overheating has started to outweigh the risk of an economic contraction.

A BIG RISE?

But by how much will interest rates rise?

The general consensus seems to be "not much." According to such thinking, the Fed will gradually raise the fed funds rate to 2 percent or 3 percent, and even this may prove a brief

peak. Structural changes in the economy, such as an aging population, mean that the equilibrium rate will continue to remain low over the long run, limiting the extent of any upward pressure.

Set against this view, however, is the evidence of history. As the earlier periods of Exhibit 1 show, nominal interest rates can reach extraordinarily high levels and even real rates can be as high as 8 percent.

Of course, the US economy of the postwar period, which saw steadily rising nominal rates, was quite unlike today's economy. The fact that real rates remained low during this period indicates that inflation was the largest driver of these rises. The Fed now has a much clearer policy of managing inflation within a tighter band; and the US is no longer so exposed to external shocks in energy prices, so the threat of spiraling inflation is hopefully limited. The sudden rise in real rates in the 1980s can perhaps be attributed to the baby

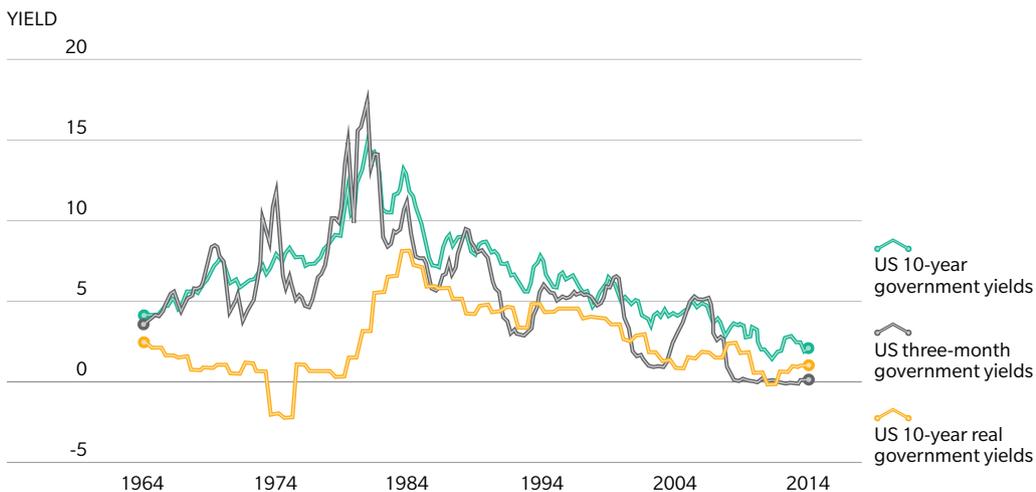
Interest rates need to rise because the risk of overheating has started to outweigh the risk of an economic contraction

boomers of the 1950s and 1960s coming of age in the workforce, combined with the liberalization of the economy during the Reagan era. By contrast, these same baby boomers are now preparing for retirement, causing a drag on the economy and a buildup of the supply of savings that is more likely to keep real rates low.

But this only suggests that if interest rates rise, it is unlikely to be for the same reasons that they rose in these earlier periods. A rise

EXHIBIT 1: DECLINING US BOND YIELDS

TEN-YEAR AND THREE-MONTH US GOVERNMENT BOND YIELDS HAVE BEEN DECLINING SINCE 1984



Source: Oliver Wyman analysis; DG ECFIN AMECO; OECD; Thomson Reuters Datastream

in interest rates could very well happen for some other reason. A profound technological advance might cause an investment boom. Or a dramatic increase in immigration might cause a boom in the housing and education sectors. Or a rise in rates may be inexplicable, because economies are complex open systems and, hence, unpredictable.

When the only way is up, and when history is full of large shifts, risk managers would be prudent to consider much larger rate moves.

What could a significant rate rise mean?

Over the past three years, concerns have been shifting away from the Eurozone peripheral nations, toward the fragility in emerging markets economies. (See Exhibit 2.) At the heart of the problem is the economic slowdown in China and its knock-on effects. The reverberations from China's slowing economy are being felt most acutely in commodities-producing nations such as

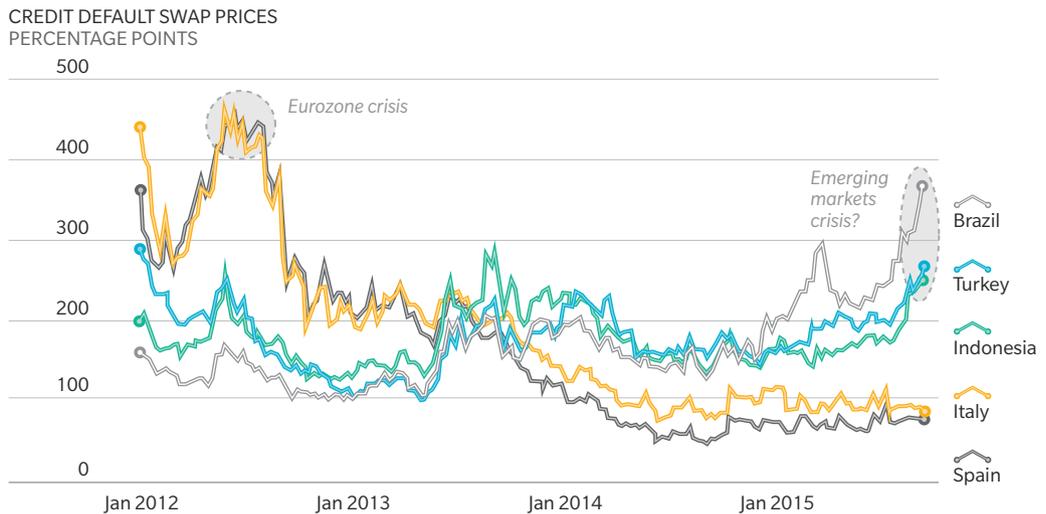
Brazil and Russia, whose economies can be viewed as a leveraged bet on China.

If US rates were to rise significantly, capital would flow out of China and other emerging markets and back into US assets. To protect their currencies from further devaluation, interest rates in emerging markets would have to rise above their equilibrium rates, further stifling already slowing growth. A US interest rate rise is the last thing emerging market economies now need. But that doesn't make it any less likely.

History indicates that the Fed will act solely in the US interest when setting interest rates. The big question is whether the emerging markets crisis will be contained to equity and property markets or whether it will spread into corporate debt markets (noting that many emerging markets corporates have been borrowing in dollars), potentially infecting the banking system and ultimately threatening the solvency of sovereigns.

EXHIBIT 2: GROWING EMERGING-MARKET CONCERNS

EMERGING MARKETS' CREDIT DEFAULT SWAP (CDS) PRICES ARE RISING, WHILE EUROZONE CDS PRICES ARE STABILIZING



Source: Oliver Wyman analysis; Thomson Reuters Datastream



SWINGS AND ROUNDABOUTS

According to proponents of globalization, improved economic prospects in one part of the world should act to benefit the rest of the global economy. However, the business cycles of emerging markets and the developed world are rarely in sync. Arguably the developed world has not benefited a great deal from

the emerging markets growth story since capital has fled the developed world to seek opportunities in the emerging markets. As the US now recovers, the money will flow in the other direction, which spells bad news for emerging markets economies.

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CYBER-RISK MANAGEMENT

WHY HACKERS COULD CAUSE THE NEXT GLOBAL CRISIS

Raj Bector • Claus Herbolzheimer • Sandro Melis • Robert Parisi

In recent months, cyber terrorists have accessed the records of 21.5 million American public service employees, infiltrated the German parliament's network, and blocked a French national television broadcaster's 11 television channels for several hours. Last summer, a malware attack compromised the operations of more than 1,000 energy companies, giving hackers the ability to cripple wind turbines, gas pipelines, and power plants in 84 countries, including the United States, Spain, France, Italy, Germany, Turkey, and Poland at the click of a mouse.

For many years, the world has benefited from information technology advances that have improved the productivity of almost every industry – banking, healthcare, technology, retail, transportation, and energy. But we continue to underestimate the dark side of this equation: Greater dependence on information technology is resulting in an increasing and unprecedented number of cyberattacks.

More than 30 countries – including Germany, Italy, France, the United Kingdom, the United States, Japan, and Canada – have now rolled out cybersecurity strategies. Financial

services regulators in the United Kingdom are working with top banks to improve their cyber-risk management. Germany is weighing a cybersecurity law that will require companies deemed critical to the nation's infrastructure to immediately report cyber incidents to the government. And on June 29, the Latvian Presidency of the Council of the European Union reached an understanding with the European Parliament on the main principles of what could become a unified cybersecurity directive for the European Union designed to protect critical infrastructure.

1,000

The estimated number of energy firms that hackers compromised in a global malware attack in 2014



MOUNTING CYBER THREATS

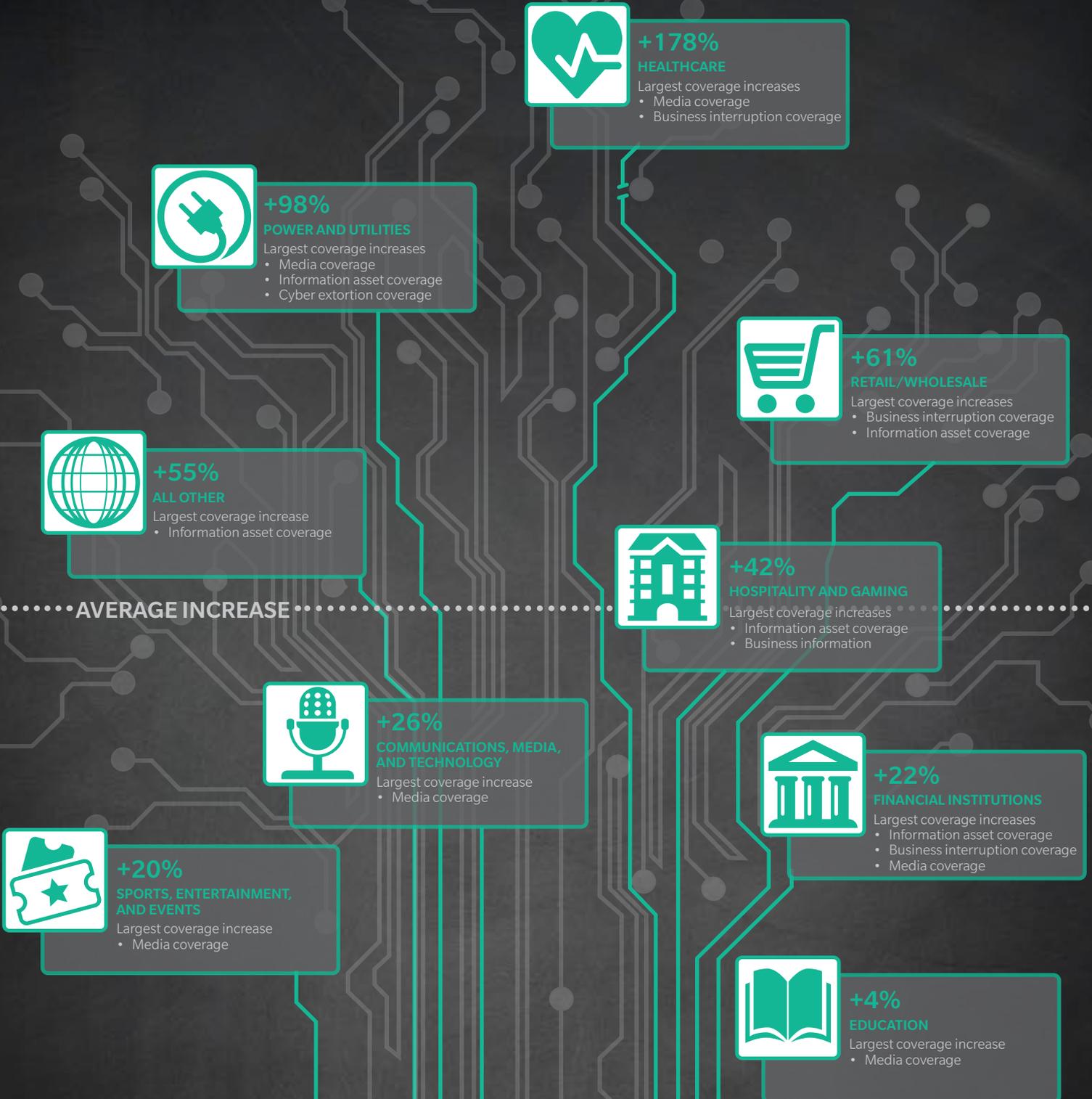
But the searing reality is that both the growing strategic relevance of data and the potential impact of data breaches for companies are outpacing these initiatives. The most recent *Global Risks* report by the World Economic Forum and its partners (including our firm Oliver Wyman) ranks cyberattacks as one of the top 10 risks most likely to cause a global crisis. The World Energy Council, a forum for energy ministers and utilities, considers cyber threats as one of the top five risks to the world's energy infrastructure.

That's because the industrial control systems that support power utilities, oil and gas companies, and refiners are more exposed to external threats now that they increasingly rely

on digital data networks. Digital blockchain collective ledgers of Bitcoin transactions and other new technologies are rapidly multiplying the potential points of intrusion in global banking systems. Manufacturing and machinery industries, too, are entering a new world of cyber product liability and data protection, as they share production facilities and introduce more devices produced elsewhere into their own products. In response, companies with revenues of more than \$1 billion have increased their cyber insurance limits worldwide by 42 percent on average since 2012, according to Marsh Global Analytics estimates. Marsh, like Oliver Wyman, is a division of Marsh & McLennan Companies. Over the same time period, healthcare companies have bought 178 percent more cyber insurance and power and utilities firms have expanded their coverage by 98 percent. (See Exhibit 1.)

EXHIBIT 1: RISING CYBER RISKS

COMPANIES ARE SPENDING MORE ON CYBER-RISK INSURANCE TO PROTECT THEMSELVES FROM AN INCREASING NUMBER OF CYBERATTACKS



Source: Marsh Global Analytics. Percentage increase in spending by companies with more than \$1 billion in revenues on cyber-risk insurance from 2012 through 2014

Former director of the United States' National Security Agency, General Keith Alexander, has commented that countries need something like an integrated air-defense system for the energy sector to keep up with mounting cyber risks. The same is true for other industries. But recent clashes between the White House and Republicans over the establishment of a new Cyber Threat Intelligence Integration Center demonstrate that marshalling the resources required to protect companies more broadly will take time.

TREATING CYBER RISKS AS OPERATIONAL RISKS

So what else can be done? Above all, companies must treat cyber risks as permanent risks to their entire enterprise and not as isolated "information technology" events. Unlike strategic, operational, and financial risks, cyber risks are often mistakenly treated as lower priority and relegated to the information technology and communications departments.

As a result, the true cyber risk exposure of companies often goes unnoticed by top management and boards of directors, exposing companies to greater risk. Cyber risks are rarely quantified or linked with their potential impact on companies' financials, making it almost impossible to conduct cost-benefit analyses or make strategic choices. Information-technology departments introduce new technical solutions with minimal top-level direction and without any comprehensive understanding of the risk appetite of the organization. Companies adopt case-by-case reactive measures instead of a balanced portfolio of initiatives that involve their entire organization and align with their overall appetite for risk.

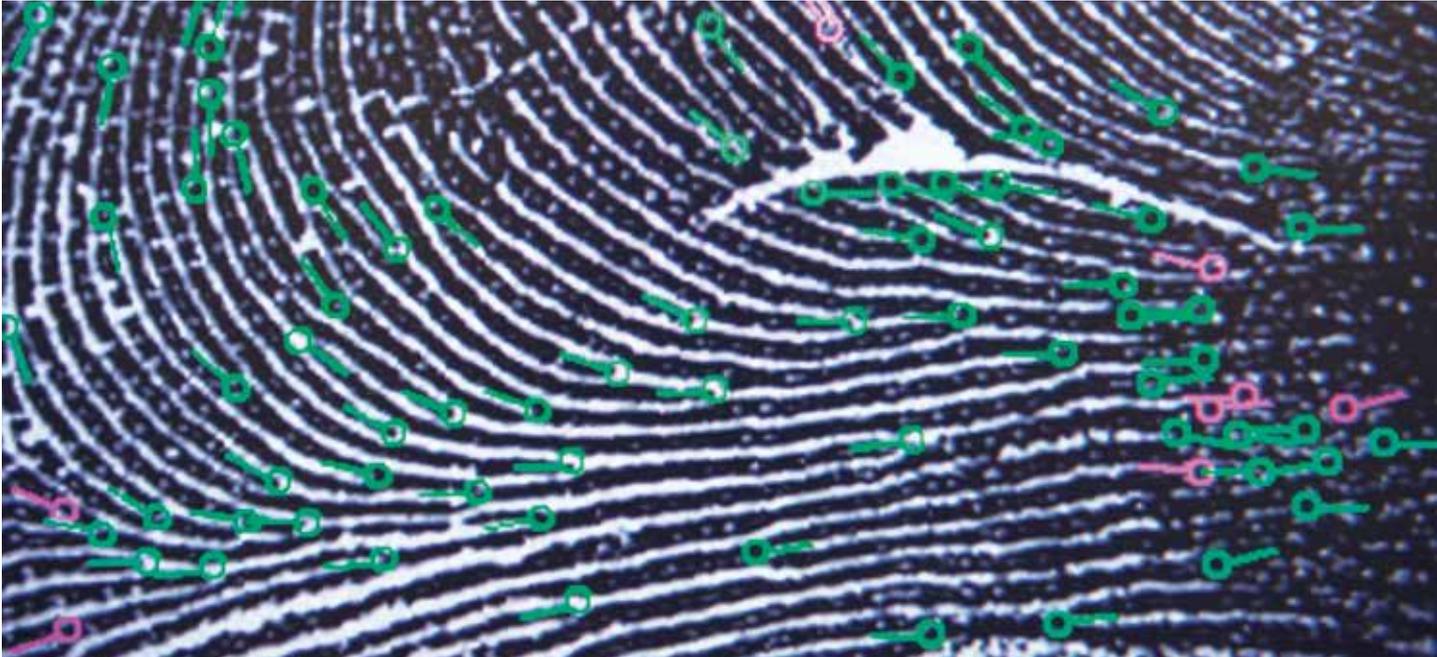
Companies, instead, should set a target level of cybersecurity for critical networks based on their importance to the firm's overall appetite for risk, much as they would with any other operational risk. This should be done quantitatively, perhaps in the form of financial exposure a company is willing to accept. The company should then ensure that controls and processes address gaps that are accordingly prioritized, starting with those that are mission critical. For example, the potential economic loss associated with construction plans for a new, innovative product may be significantly higher than that of an older production line that is about to be retired.

98%

The percentage increase in cyber insurance coverage by power and utilities firms in the past two years

MAKING CYBER-RISK MANAGEMENT SECOND NATURE

Top managers also need to develop a cyber-risk management culture to the point that it becomes second nature. Cyber-risk management goals, such as the protection of important customer data or the prevention of unauthorized access to mission-critical



systems, should be baked into performance targets, incentives, regular reporting, and key executive discussions. When executives evaluate their tolerance for breaches that could impact their company's reputation or violate health, safety, and environment standards, cyber incidents involving their industrial control systems should be front and center.

Otherwise, like other slow-building risks that people take for granted, ignoring the threat of increasing cyberattacks could drop unprepared

companies into the middle of a full-blown crisis. Consider: 81 percent of large businesses in the United Kingdom suffered a cybersecurity breach during the past year and the average cost of breaches has nearly doubled since 2013, according to a recent report produced by the United Kingdom Department for Business Innovation & Skills. This isn't a threat that is going away. Companies need to do the math and truly make cybersecurity a top priority.

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This story first appeared on BRINK.



CONTROLLING THE GENIE OF EMERGING TECHNOLOGIES

SIX STEPS TO MITIGATE RISKS CREATED BY INNOVATION

John Drzik

Innovation is vital to progress. Advances in science, and the new technologies flowing from them, have propelled economic and societal development throughout history. Emerging technologies today have the potential to further increase global prosperity and enable us to tackle major challenges.

But innovation also creates new risks. Understanding the hazards that can stem from new technologies is critical to avoiding potentially catastrophic consequences. The recent wave of cyberattacks exemplifies how new technologies can be exploited for malicious ends and create new global threats. Risk governance needs to keep pace with scientific advances. (See Exhibit 1.)

What is the next technology innovation that could create significant new threats? Synthetic biology and artificial intelligence are two examples of emerging technologies with the potential to deliver enormous benefits but also present significant challenges to government, industry, and society at large.

Take synthetic biology: Creating new organisms from DNA building blocks offers the potential to fight infectious disease, treat neurological disorders, alleviate food security, and expand biofuels. The flipside is that the genetic manipulation of organisms could also result in significant harm, through error or terror. The accidental leakage of synthesized organisms, perhaps in the form of unnatural microbes or plant mutations, could lead to unintended consequences, such as the rise of new diseases or a loss of biodiversity. Bio-terrorism threats could emerge from organized groups or lone individuals in the growing “bio-hacker” community, were they able to access synthetic biology inventions online or spread organisms of their own.

THE DOUBLE-EDGED SWORD OF ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) also presents a double-edged sword. Advances in AI can increase economic productivity, but at the same time, they may also result in large-scale structural unemployment, leading to serious social upheaval. AI developments raise new questions about accountability and liability: Who is to be held accountable for decisions made by self-driving cars, in cases where the choice is between harming a pedestrian versus a passenger? (See “Self-Driving Freight in the Fast Lane,” on page 88.)

We need to set a course for rigorous risk governance of emerging technologies

Similar challenges need to be confronted given the rapid growth of unmanned aircraft systems (or drones). (See “Commercial Drones,” on page 84.) Looking into the future, some have even posited that the achievement of “the Singularity,” the point at which machine brains surpass human intelligence, would present an existential threat to humanity.

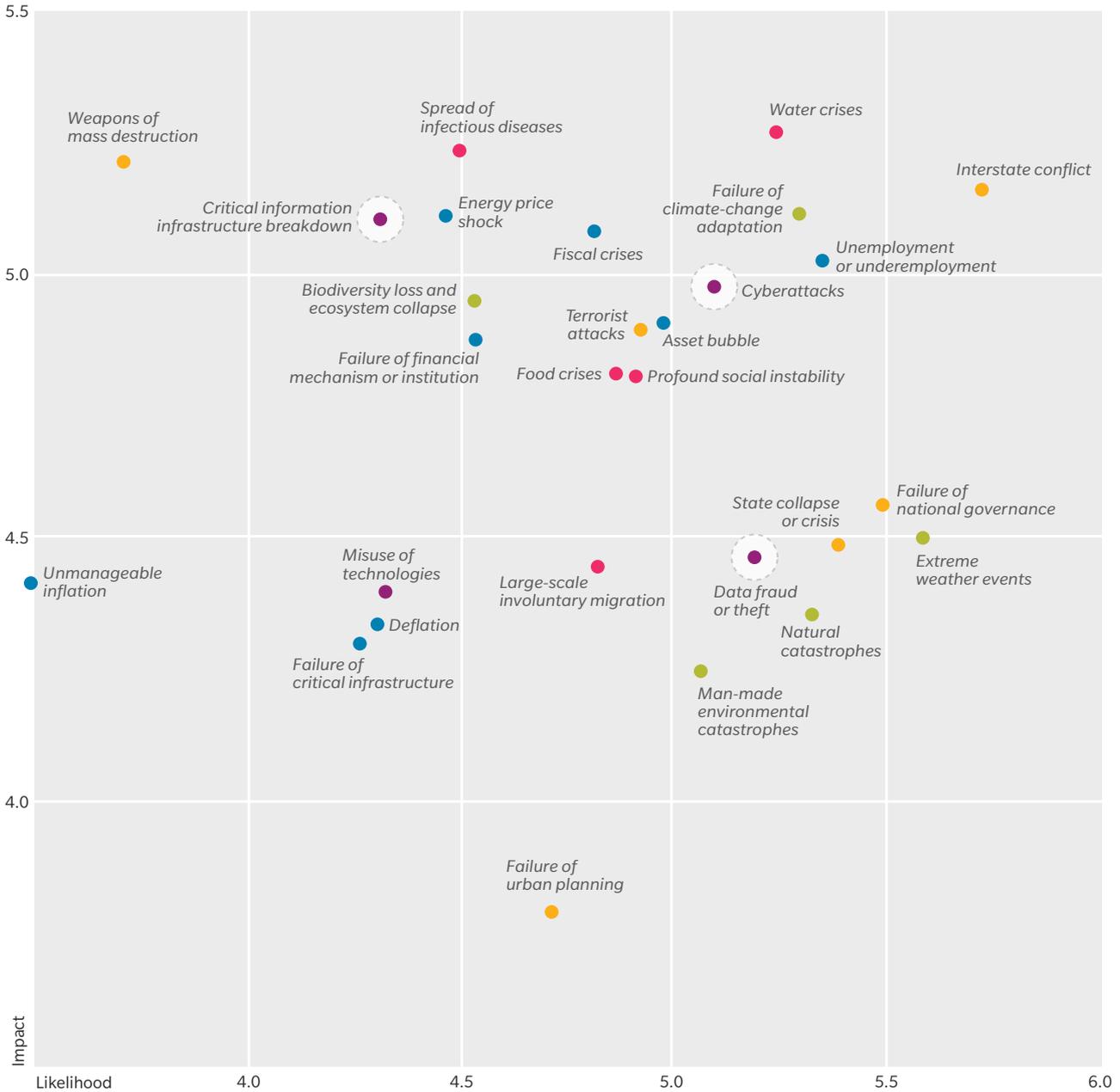
Risk governance for these and other emerging technologies is challenging. Many institutions and communities are engaged in research and development, and the pace of innovation is accelerating. National legal and regulatory frameworks are underdeveloped, so certain topics and techniques escape scrutiny by not

EXHIBIT 1: GLOBAL RISKS LANDSCAPE 2015

THE POTENTIAL IMPACT AND LIKELIHOOD OF GLOBAL RISKS OVER THE NEXT 10 YEARS

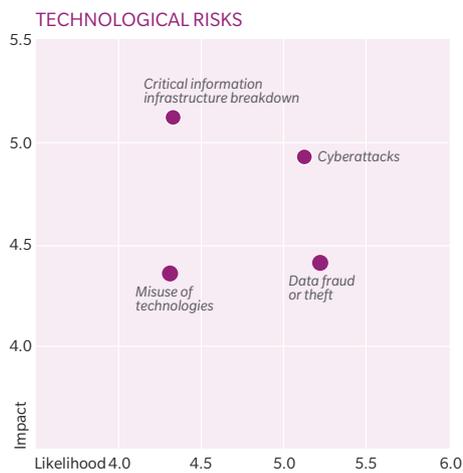
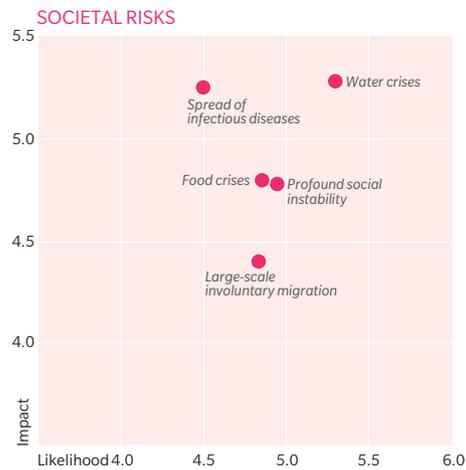
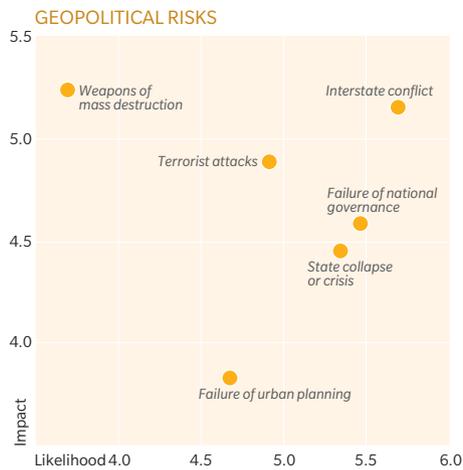
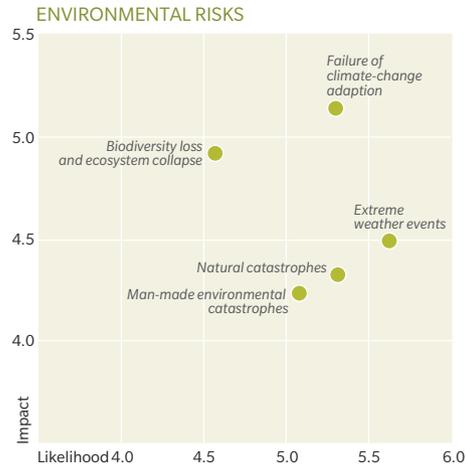
For the *Global Risks 2015* report (published by the World Economic Forum in collaboration with a group of partner organizations, including Marsh & McLennan Companies), 900 risk experts representing business, government, non-governmental organizations, research institutions, and the academic community selected, out of a group of 28 global risks, the ones that will be of greatest concern over the next 10 years. These pages summarize the results.

On the left lies the full gamut of risks. Note that three technological risks – cyberattacks, data fraud or theft, and critical information infrastructure breakdown – are among those considered to be of greatest concern.



Source: *Global Risks 2015*: Tenth edition, World Economic Forum and partners, including Marsh & McLennan Companies. Oliver Wyman is a division of Marsh & McLennan Companies

GLOBAL RISKS BY CATEGORY



- Economic Risks
- Environmental Risks
- Geopolitical Risks
- Societal Risks
- Technological Risks

Source: *Global Risks 2015: Tenth edition*, World Economic Forum and partners, including Marsh & McLennan Companies. Oliver Wyman is a division of Marsh & McLennan Companies



being specified. Institutions that are meant to provide oversight struggle to cope with advances that cross departmental jurisdictions and, short on resources, are often unable to assess risks with the rigor they demand.

At the international level, weaknesses also exist. For example, the Cartagena Protocol on Biosafety provides guidelines on the handling and transportation of living modified organisms, but not their development. The United Nations Convention on Biological Diversity addresses synthetic biology, but the resulting agreement is not legally binding. A current live concern is that large-scale international negotiations such as the Transatlantic Trade and Investment Partnership (TTIP) may inhibit new governance

proposals and influence global norms in pursuit of open markets and more streamlined regulation.

A WAY FORWARD

Is there a way forward, and if so, what is it? Realizing potential benefits from emerging technologies requires a willingness to accept risk. But this risk must also be managed, to avert disasters. Governance and control frameworks need to be reinvigorated, and accountability needs to be clearer. I recommend six actions:

Understanding the hazards that can stem from new technologies is critical

1. As emerging technologies affect more people than just the users of the technology, we need a more energetic dialogue around risk governance priorities that involves a broad range of stakeholders. Innovators, industry more broadly, governments, regulators, and the public must all be consulted to create greater buy-in and better considered regulation.
2. Research related to risk governance needs to be given a higher priority and more funding. Institutions responsible for oversight must have the capacity to explore areas of concern more deeply and to be able to engage effectively with innovators.
3. Broader disclosure standards are crucial to allow deeper risk assessment, determine controls, and build trust. We need to find the right balance between confidentiality and transparency. Intellectual property rights should not be used to restrict access to information needed for appropriate risk regulation. Producers should be more transparent, so that regulators can prepare effective regulation. Regulators should also be transparent, so that developers know as early as possible which kinds of applications will be prohibited.
4. We need to close regulatory gaps in those areas that present the greatest risk, and set out clear compliance and liability expectations. At the same time, regulation should become more adaptable to new developments. Regulatory systems should build in more intelligent decision gateways and evolve in the light of new knowledge or technological advances, which may lower risk in some areas and increase it in others.
5. International discussions between governing institutions need to move beyond principles to more binding protocols. This is critical for preventing the flow of emerging technology risks across borders, which is all too easy in today's global economy.
6. At the same time as we improve regulation, we need to promote a culture of responsibility around innovation – to encourage more self-policing among innovators and de-glamorize hackers. Deep commitment from the sector will help build and maintain a platform of trust vital for achieving the potential of scientific and technological advances.

Innovation must be encouraged, but we need to set a parallel course for rigorous risk governance of emerging technologies. It is much better to confront difficult issues now than endure an incident with disastrous consequences later. As we know all too well, history is littered with risk mitigation measures that proved ineffective because they were put in place too late.

John Drzik is President of Global Risks and Specialties at Marsh. Marsh, like Oliver Wyman, is a division of the Marsh & McLennan Companies, which contributed to the World Economic Forum's *Global Risks 2015* report.

This story is adapted from a version that first appeared on the World Economic Forum's blog.

REVAMPING BUSINESS MODELS

- Beyond the Loss-Leader Strategy
- Insurance Model Under Threat
- The New Balance of Power in Oil
- Making Lemonade from Stress Testing Lemons







BEYOND THE LOSS-LEADER STRATEGY

BUSINESS MODELS BASED
ON CROSS-SUBSIDIZING NO LONGER WORK

Duncan Brewer • George Faigen • Nick Harrison

Many companies selling goods and services to consumers follow a decades-old formula: They offer blockbuster deals on frequently bought products to grab the attention of price-sensitive consumers, and make up for the resulting losses by charging higher prices on other products or services that are purchased less often or are harder to compare. Grocery stores recoup the cost of low prices on milk, bread, and bananas by selling higher-margin items like health and beauty products. Banks offer free current accounts as a way to make more money from loans and insurance. Electronics retailers sell cheap televisions to boost profits from cable, mount, and installation service sales.

This loss-leader strategy has been the bedrock for many successful businesses. However, the business model has developed a fatal flaw: It assumes that consumers primarily purchase from one provider at a time when the Internet has made it much easier for consumers to find individual products at the right price by visiting multiple websites or online aggregators. As a result, more consumers now tease apart their purchases, wrecking the foundation of loss-leader tactics.

There are many well-known instances of businesses in various industries being blindsided by this online threat. Low-cost airlines and online booking aggregators have wreaked havoc with package holiday providers by helping consumers disaggregate their travel purchases. Online retailers are devastating electronics players by forcing them to lower prices not only on headline items but also on high-margin add-on items.

Now, more businesses in other industries have come under attack. In the past four years, more people have started to shop at multiple grocery stores and websites to get the best prices. Amazon and specialists like Wag.com steal away customers by selling high-volume consumer products such as pet food for about a third less than in many

23%

The percentage increase since 2010 of shoppers who visit multiple stores and websites to find the best prices for groceries

grocery stores. Discounters such as Aldi and Lidl push lower-priced foodstuffs. Peer-to-peer lenders undercut retail banks by offering loan and savings products at more attractive rates, leaving banks to sell more of the lower profit, transactional products, such as checking and savings accounts.

In this environment, companies relying on cross-subsidizing inevitably suffer slow but irreversible profitability declines. They must stop such disruptors from cherry-picking their highest-margin products and customers. The traditional loss-leader formula is failing. It must either be forsaken or refined.

A REALISTIC ROUTE TO PROFITABILITY

In order to reduce interdependence between transactions and to stop rivals from taking away high-margin business lines and customers, companies must strengthen their defenses on highly profitable products and customers while cutting the resources they devote to less profitable product segments. They must examine if high prices charged in some areas subsidize other parts of their business, and reduce those subsidies. At the same time, companies need to raise prices for low-value

customers to reduce cross-subsidies, even if it means reducing overall market share.

That’s a tall order. For starters, most companies’ top-level numbers – such as sales volumes and profit margins – do not provide the granularity needed for them to understand if their most profitable products are at risk. Warning signs can be very subtle: A small decline in a highly profitable category could indicate a benign change in consumer behavior – or it can portend a big shift of profitable customers to a competitor.

But it can be done. Some companies are already improving their ability to identify if high-margin products and customers are at risk. For example, one grocery store quickly discovered a competitor stealing away some of its high-margin razor and blade sales by broadening the scope of its sales analyses to include lower-margin related items. Even though razor sales were sliding, it found that shaving foams and gel sales remained constant – the tell-tale sign of a disruption in progress.

THINK LIKE A DISRUPTOR

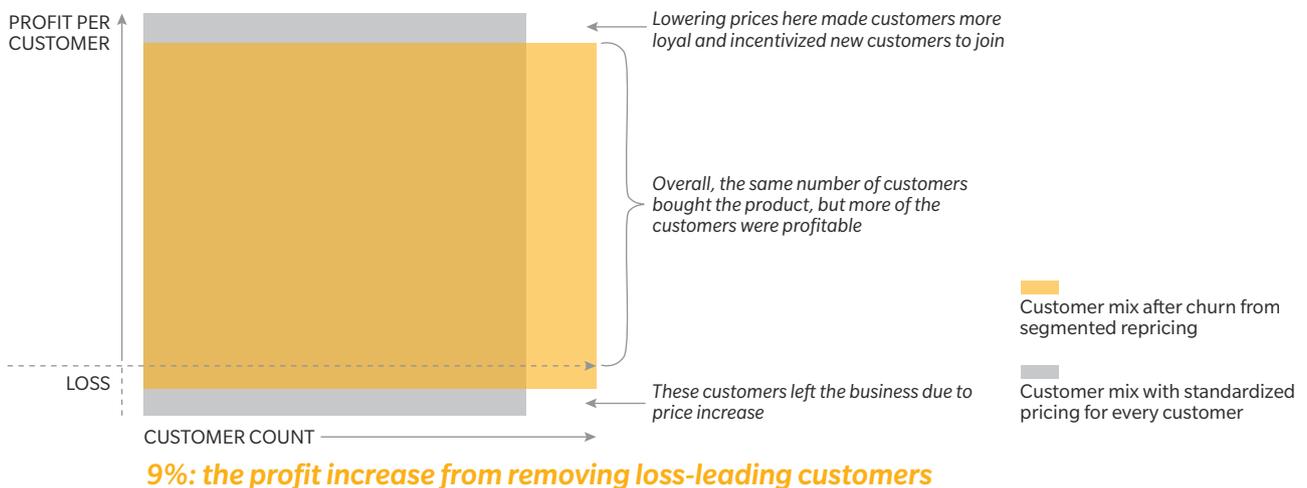
After identifying the problem, companies must assess which products they would target if they were a disruptor with detailed inside knowledge of their core business – and then act quickly to do something about it.

For some businesses, this mindset is already second nature. For example, innovative technology companies will constantly disrupt their own product lifecycles by introducing new products even when their current product line remains profitable. They know that they must disrupt their own sales; otherwise, competitors will do it for them.

Now, other companies are following suit. For example, banks are trying to fend off peer-to-peer lenders by building their own platforms or striking up partnerships – such as Metro Bank’s recent tie-up with the peer-to-peer lender Zopa. Grocery store Tesco offers its own AmazonPrime-style subscription service

EXHIBIT 1: REDUCING LOSS-LEADERS IN A \$1 BILLION SERVICE PROVIDER

HOW A SERVICE PROVIDER REDUCED THE PROPORTION OF UNPROFITABLE CUSTOMERS AND INCREASED AVERAGE PROFITABILITY



Source: Oliver Wyman analysis



called TescoSubscriptions.com, which undercuts prices in its stores on certain high-margin, easy-to-ship items.

At the same time, businesses are de-incentivizing and driving away unprofitable customers. One service company struggling to maintain the margins of its repair and warranty business asked certain customers to pay higher prices after analyses showed that they were likely to cost more than other customers to serve over multiple years. While it made profits from the sales to most of its warranty customers, a few were dragging down margins by requesting more than six repairs per year. The company restored its business profits by tailoring its pricing to reflect each individual's long-term value. Customers with high so-called lifetime values could buy products at lower prices, while those with low customer lifetime values were charged more. The result: The proportion of unprofitable customers was halved and the business' margins improved by over 9 percent. (See Exhibit 1.)

MAKE TOP CUSTOMERS YOUR PRIORITY

Strategies based on cross-subsidizing are unsustainable in a digital, price-sensitive world in which customers pick and choose what they buy and where. New entrants will likely steal away high-margin products and customers, undermining incumbents' business models. To fend off these threats, companies must hone their own best product offers and treat top customers as a high priority.

Cutting prices and offering better services for profitable products and customers can be painful and difficult to justify, especially if a company identifies an online threat in an early, nascent stage. But waiting can be fatal. Reducing profits today can often be the only way to protect a business for tomorrow. In the long run, experience has shown that the value of retaining the best customers can more than offset short-term pain.

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INSURANCE MODEL UNDER THREAT

A FUTURE OF COMPULSORY RISK SHARING?

Fady Khayatt

Insurance is made possible through the pooling of risk. No one knows for certain whether or not they will be in a serious car accident in the coming year. Nor can other drivers predict whether they will have accidents. What can be predicted is that, say, 1 percent of all drivers will be in accidents. If enough drivers contribute 1 percent of the value of their cars into a fund that promises to pay for the replacement of cars written off in those accidents, then the fund will have enough money to pay for all claims on it for a year. By pooling risks, they can be converted into predictable ongoing expenses – insurance premiums, in other words.

Risk pooling is of great economic and social importance. Most valuable activities entail risk, from international trade to building power stations to performing surgery to playing rugby. If people could not insure themselves against the risks involved in such societally beneficial activities, then they would engage in those activities much less frequently and society would be much the poorer.

Yet risk pooling via insurance is under threat, for the apparently perverse reason that insurers are rapidly getting better at measuring risk.

Here's why.

Some insurees are riskier than others. Jack's chance of smashing his car might be twice Jill's. If the insurer cannot identify this difference, it will charge Jack and Jill the same premium. This means Jill pays for more than her share of the risk she contributes to the pool, while Jack pays for less. In other words, Jill's premiums will subsidize Jack's insurance.

If, however, the difference between the risk presented by Jack and by Jill can be determined and quantified, then the cross-subsidy will soon disappear. Even if their insurer were to decide nevertheless to charge Jack and Jill the same premium, Jill will soon be "cherry picked" by

Risk pooling via insurance is under threat, for the apparently perverse reason that insurers are rapidly getting better at measuring risk

a competitor charging low-risk drivers lower premiums. Without Jill's inflated premium available to subsidize Jack's, he will have to bear the full cost of the risk he represents.

MORE ACCURATE RISK MEASUREMENT

Accurate risk measurement thus eliminates cross subsidies. And risk measurement is swiftly becoming more accurate.

Telematics, though hardly new, provides a good example. Devices installed in cars send insurers information about their policyholders' driving behavior and patterns and, thus, their chances of getting into an accident. Safe drivers end up paying lower premiums than risky drivers.

Telematics is but one example of the burgeoning "Internet of things." Homes and commercial assets are increasingly being fitted with sensors that can provide insurers with detailed real-time information about insured objects and their environments.

Nor is this explosion of monitoring and quantification restricted to objects. People are collecting far more data about themselves – for example, about their health – which many are keen to share with insurers in return for lower

premiums. Big Data analysis, by drawing on policyholders' Internet footprints, is able to paint an increasingly accurate picture of their circumstances and behavior.

Insurance pricing that accurately reflects the risk presented by individual policyholders has social benefits. In most cases, it incentivizes people to take actions that reduce risk, provided such actions cost less than what is saved on premiums. And they discourage activities that are not worth the cost when risk is properly accounted for. In other words, accurate risk pricing promotes economic efficiency.

THE DOWNSIDE TO ACCURATE RISK PRICING

But greater accuracy in pricing risk has its downside, too. Some people can find themselves suddenly priced out of an insurance market. Homes in areas that are prone to flooding, for example, may face

premiums so high that they become effectively uninsurable. Or people predisposed to serious diseases may face health insurance premiums they cannot realistically afford.

By making segments of the population effectively uninsurable, accurate risk-based pricing removes the benefit of risk pooling from precisely those who need it most.

How then can affordable insurance be made available to high-risk populations?

One approach that is increasingly being applied to the industry is to force low risk policyholders to subsidize high-risk policyholders. For example, after a spate of floods in England, the government of the United Kingdom will require insurers to provide flood insurance at capped premiums and has established a re-insurance fund (Flood Re) into which all home insurees must make the same contribution, regardless of flood risk. (See Exhibit 1.)

EXHIBIT 1: MOVING TOWARD MANDATORY POOLING

THE INSURANCE INDUSTRY IS MOVING TOWARD MANDATORY POOLING TO COPE WITH THE UNINSURABLE POPULATIONS CREATED BY MORE ACCURATE PRICING. BUT AS THE MANDATORY POOL GROWS, THERE IS LESS PRICE DIFFERENTIATION. HERE'S HOW IT WORKS:

INSURANCE IS MADE POSSIBLE THROUGH RISK POOLING



RISK SEGMENTATION BEGINS



ENFORCED POOLING BEGINS



COMPULSORY RISK SHARING



Some insurees' risks are higher than others, but they have traditionally paid similar premiums.

As insurers have become better at measuring risks, they are charging diverging premiums – creating an “uninsurable” population in the process.

Enforced pooling ensures that affordable insurance can still be provided to “uninsurable” populations, but it requires non-affected insurees to pay a larger premium.

Source: Oliver Wyman analysis



The difficulty with this approach lies in forcing low-risk insurees to remain in the pool. In the case of flooding, the small ratio of high-risk to low-risk homes makes the now transparent cross-subsidy small. However, in other areas, such as health insurance, mandated cross-subsidies may be large enough to drive low-risk insurees out of the pool. ObamaCare deals with this problem by imposing a fine on anyone who refuses to buy health insurance equal to 2 percent of his or her income.

Government policies that require people to buy insurance may look like a boon for the industry. But they could profoundly change the insurance business.

POTENTIAL OUTCOMES

When low-risk insurees are forced into insurance pools with high-risk individuals, their policies receive an implicit government guarantee. If the government makes you buy insurance policies, it must stand behind them. Insurers may end up in the position that banks now find themselves – not proper businesses but quasi-state utilities, where everything is under indirect political control, from risk management to pricing to staff bonuses.

Furthermore, where cross-subsidization is enforced across very large proportions of the population, capabilities in terms of risk selection and pricing that insurers have invested in so heavily become worthless, leaving insurers to compete on service and cost efficiency.

Insurers might argue quite correctly that mandated cross-subsidies place an unfair burden on low-risk insurees. Why should a less affluent woman living in an area not prone to flooding be made to subsidize the insurance of a wealthy man who has built a mansion on a floodplain? Why should a struggling healthy young musician subsidize the health insurance of a retired banker?

Targeted subsidies funded from general taxation might be a fairer way of keeping high-risk people in the pool. And it would allow insurers to remain independent, commercial businesses.

Rapidly rising risk and price differentiation raises a policy issue that must be answered. If insurers cannot come up with a good answer on their own, politicians may come up with a bad one for them.

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THE NEW BALANCE OF POWER IN OIL

FRACKERS ARE CHALLENGING TRADITIONAL SWING PRODUCERS

Bernhard Hartmann • Rob Jessen • Bob Orr
Robert Peterson • Saji Sam

Abdalla Salem el-Badri, secretary general of the Organization of Petroleum Exporting Countries (OPEC), said in April 2015 that the cartel's decision to continue to pump oil in spite of collapsing prices is inflicting pain on United States shale producers. Six months later in its September monthly oil-market report, OPEC wrote: "All eyes are on how quickly US [oil] production falls."

North American oil producers are experiencing widespread pain as a result of rock-bottom oil prices. One after another, US-based independent oil producers such as EOG Resources Inc., Carrizo Oil & Gas Inc., Rosetta Resources (now part of Noble Energy), and Whiting Petroleum Corp. have reported missed-earnings estimates and plans to cut production.

Many may need to contract even further. Banks re-examining their portfolios may charge them higher interest rates if shale producers' credit ratings are downgraded, which will lower their cash flows. In addition, the recent hemorrhaging of talent and

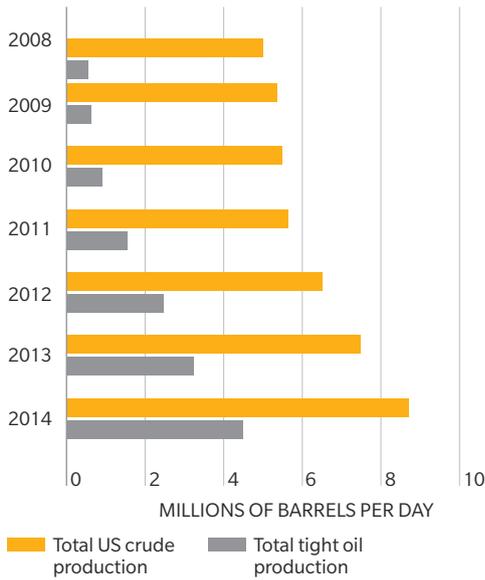
equipment at oil field-services companies could make it more difficult for North American shale producers to "turn on" additional drilling and pressure pumping. Consider: At present, they have only half as many rigs at their disposal as they did in 2014.

But it's way too early to count US-based shale producers out as major players in the oil markets in the future. Rather, what's happening marks an historic shift in the companies acting as market-driven swing producers by reacting swiftly to falling prices.

The gap is closing between the United States' crude oil production and that of the world's other two top producing countries, Russia and Saudi Arabia

EXHIBIT 1: THE DRAMATIC RISE OF AMERICAN OIL

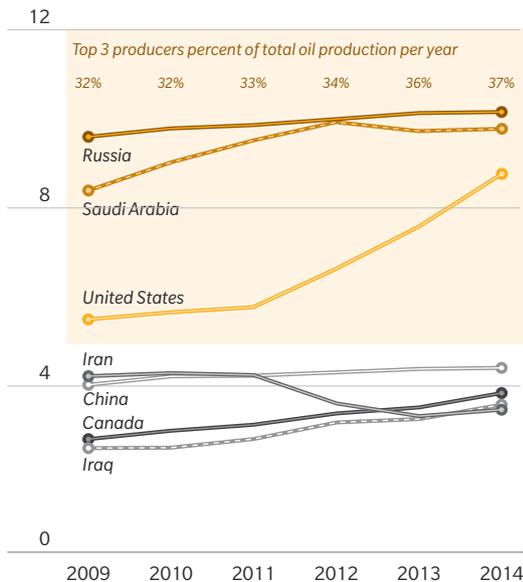
GREATER AMOUNTS OF SHALE OIL ARE BOOSTING CRUDE OIL PRODUCTION IN THE UNITED STATES...



Source: EIA, Oliver Wyman analysis

... PUTTING IT ON PAR WITH THE WORLD'S OTHER TOP PRODUCERS, RUSSIA AND SAUDI ARABIA

MILLIONS OF BARRELS PER DAY



Source: EIA, Oliver Wyman analysis

AN HISTORIC SHIFT

Over the past six years, “tight” oil, also known as shale oil, has soared from about 10 percent of total US crude oil production to approximately 50 percent. That means the US oil industry is producing roughly 4 million more barrels of crude oil every day than it did in 2008, according to the Energy Information Administration (EIA).

As a result, the gap is closing between US crude oil production and the world’s other two top producing countries, Russia and Saudi Arabia. From 2009 to 2014, Russia grew its production from 9.5 million barrels per day to 10.1 million, while Saudi Arabia expanded its production from 8.2 million to 9.7 million barrels per day. Meanwhile, US daily oil production soared by more than 60 percent, from 5.4 million barrels per day to 8.7 million barrels. Together, these three top producers now account for almost 37 percent of the world’s total crude oil production. (See Exhibit 1.)

The EIA expects the new status quo to continue. In the first six months of 2015, US monthly crude oil production ranged from a high in April of 9.6 million barrels per day to 9.3 million barrels per day in June. The agency believes that US production will average 9.2 million barrels per day this year and fall to 8.8 million barrels per day next year, assuming the “lower for longer” pricing environment continues.

STRONGER RESILIENCE

The main reason that shale producers are proving to be resilient is that they have continuously improved their drilling and fracturing technology, increasing their drilling efficiencies and stretching their capital expenditures. Our research shows that over the past three years alone, many American



shale producers have cut their unconventional oil drilling and completion costs by 15 percent to 25 percent on average. In fact, North American shale producers are already working toward reducing their break-even point by as much as half. A lower break-even point could put shale on par with the oil fields of many national oil companies.

Many North American shale producers have also exercised much greater discipline in managing operating expenses, recalibrating oil drilling activity with cash flows and planning for the “lower for longer” oil-pricing environment. Leaders in the industry have developed vast portfolios of operations, which enable them to cut back on drilling in high-cost areas while ramping up their drilling in lower-cost fields. They have also hedged portions of their production at much higher prices so that they can still make a financial profit even when their variable costs exceed the market price.

By contrast, the cost of drilling oil in the Middle East is starting to climb. To maintain or improve production from maturing fields, Middle Eastern national oil companies will need to adopt enhanced recovery methods using more expensive technologies. They also will have to consider tapping into new reservoirs

and fields, many of which are of a lower quality. It will likely cost more to produce a barrel of oil from these sourer, heavier, and tighter supplies.

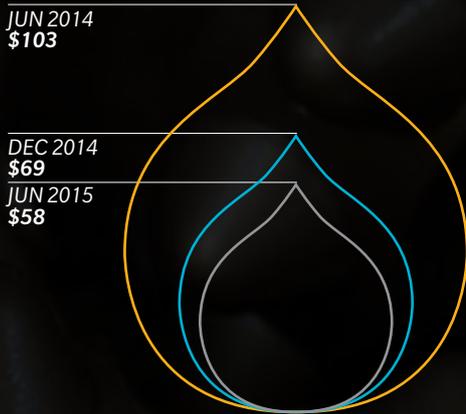
So in effect, as OPEC acts less like a traditional “swing producer,” North American shale producers are stepping into the role. Since 1973, Saudi Arabia and other OPEC members have acted as swing producers by increasing or reducing their oil output to help the global market adjust to shortages or surpluses in supply and volatile prices. North American shale producers are now responding to market supply and price changes.

Although some producers are unable to financially withstand the continued “lower for longer” oil price environment, most unconventional producers are proactively adjusting their production and cost profiles until prices rebound to more desirable levels. By allowing their producing shale fields to deplete naturally and curtailing drilling of new development wells, they are slashing their production in response to oversupply and low prices. But once supply tightens and the price of oil recovers, North American shale producers can quickly ramp up production in a matter of months, rather than years, by deploying currently demobilized rigs in factory-mode drilling.

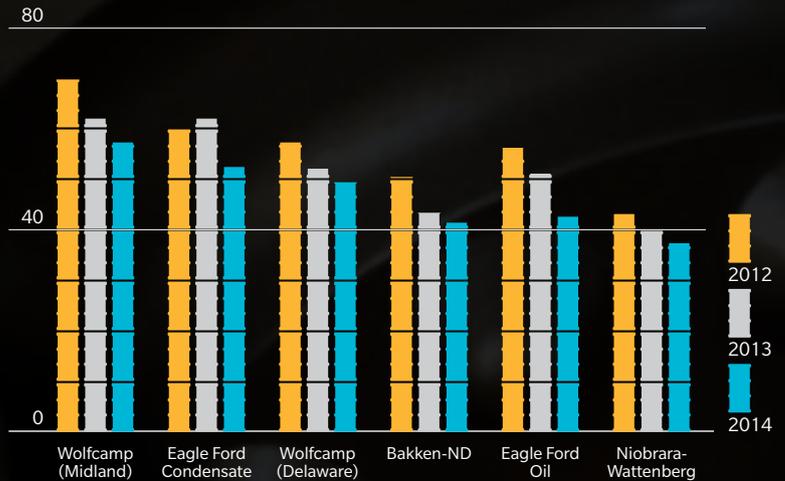
EXHIBIT 2: THE GLOBAL RISE OF SHALE PRODUCTION

NORTH AMERICAN SHALE PRODUCERS ARE BECOMING MORE EFFICIENT...

SPOT WTI CRUDE OIL PRICE

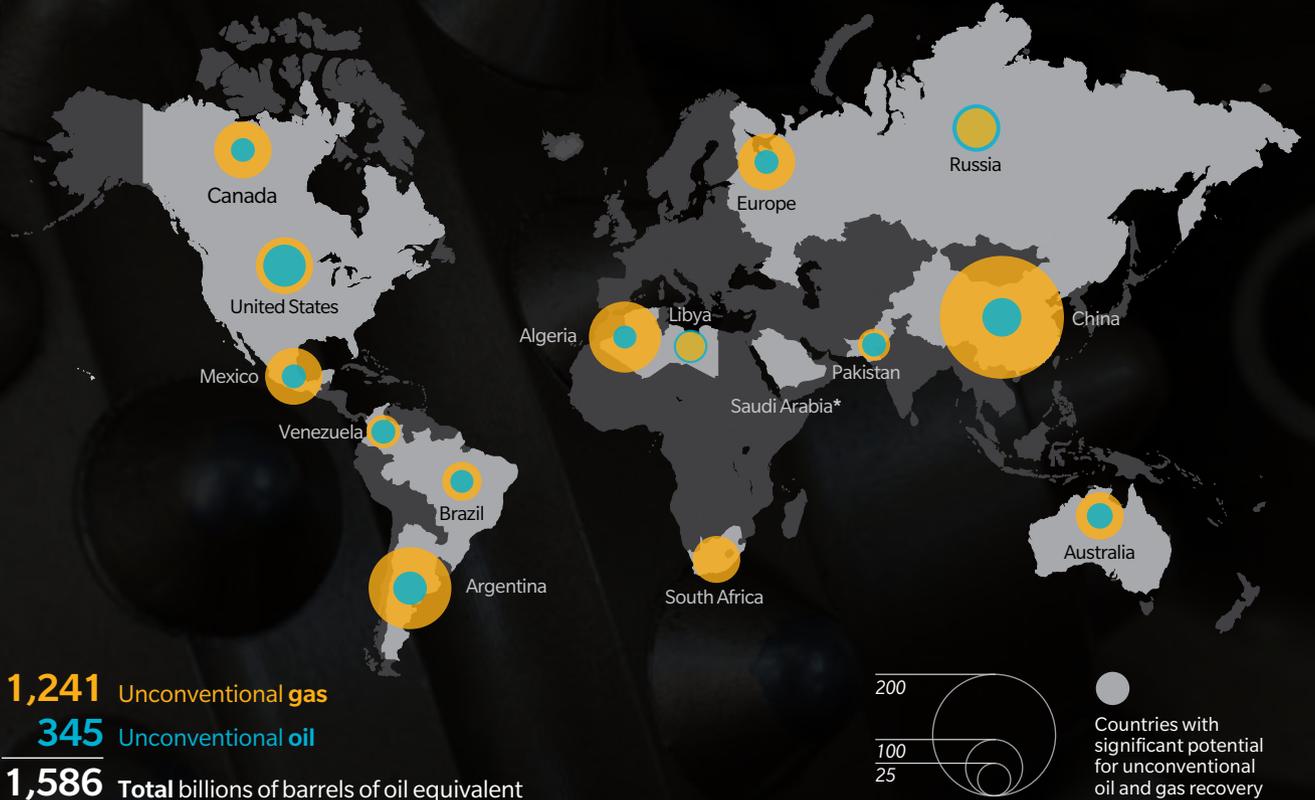


US SHALE BREAK-EVEN COSTS, \$ PER BARREL OF OIL EQUIVALENT



... SERVING AS A BLUEPRINT FOR MORE POTENTIAL SHALE PRODUCTION WORLDWIDE

TECHNICALLY RECOVERABLE UNCONVENTIONAL OIL AND GAS RESOURCES IN BILLIONS OF BARRELS OF OIL EQUIVALENT, 2013



Sources: EIA, NDIC, IEA, ConocoPhillips investor presentation, Oliver Wyman analysis

*The Kingdom of Saudi Arabia has more than 6 trillion cubic square feet of unconventional oil and gas resources, according to oil field service companies operating there.

EXPANDING RANKS

Within the next decade, more unconventional oil and gas producers may also join existing players' ranks. Shortages in rapidly growing regions such as Asia and Africa are likely to be further exacerbated by a rising number of countries taking unilateral action to cope with local scarcities. And the US has shown one relatively inexpensive and fast way for countries to seek energy independence is by exploiting their own unconventional oil and gas resources.

Until now, the US has dominated the unconventional oil and gas market in large part because its players have better access to cheap capital, stronger mineral rights laws, availability of water for fracking, and an entrepreneurial, market-driven supply-chain ecosystem. So far, no other country has been able to replicate these conditions successfully. But in time, countries such as Argentina, Russia, and China could figure out how to improve their environments for unconventional oil and gas drilling – potentially resulting in more regionalized oil markets in the long term. The estimated 156 billion barrels of oil equivalent unconventional resources in the US are only a small fraction of the approximately 1.6 trillion barrels of unconventional oil and gas that exist worldwide. (See Exhibit 2.)

So what steps should governments, national oil companies, and oil majors take to stay ahead of these shifts? Most are tightening their belts to survive currently low oil prices by eliminating less valuable capital expenditures, renegotiating supplier contracts, and

reconsidering stock buybacks and dividend payouts, which have exceeded the oil majors' cash flows in recent years. Some are also opportunistically revamping their portfolios of businesses, workforces, supply chains, and risk management practices.

BECOMING NIMBLE

While these are practical short-term steps, the answer to sustaining in a lower oil price environment is to be nimble, flexible, and efficient in responding to supply-demand dynamics. To come out on top, governments and companies should take advantage of market distress while they can by rebalancing their resources to better meet shifting domestic and overseas demand and supply dynamics before the economic cycle reverses.

Governments in the Middle East, especially, should learn from the processes, organization, supply chains, and other capabilities developed by North American shale players. They need to improve their ability to deploy capital in initiatives that will maximize their localization by creating more jobs, while expanding their range of substitutes for energy imports and potential exports. They should pick up the acreage, technology, talent, and capabilities they need to compete in an oil market made up of many more nimble shale producers.

Frackers are showing that a new, more market-driven, invisible hand is not influencing oil prices but, rather, being driven by them.

Bernhard Hartmann is a Dubai-based partner, **Rob Jessen** is a Houston-based partner, **Bob Orr** is a Houston-based partner, **Robert Peterson** is a Houston-based partner, and **Saji Sam** is a Dubai-based partner in Oliver Wyman's Energy practice.



MAKING LEMONADE FROM STRESS TESTING LEMONS

THE BRIGHTER SIDE OF THE BANKS' COMPREHENSIVE CAPITAL ASSESSMENT AND REVIEW PROGRAM

Michael Duane • Til Schuermann

Executive dining rooms and cafeterias at banks across the United States are all abuzz with talk about the cost and burden of post-crisis regulatory demands. But few regulations have left a more sour taste than the Federal Reserve's demanding Comprehensive Capital Assessment and Review (CCAR) program – or stress testing, as it's more commonly called.

JPMorgan Chase's Chief Executive Officer Jamie Dimon, in his 2014 letter to shareholders, noted more than 500 bank professionals (and thousands of additional contributors) were dedicated to the 2014 submission, which was more than 5,000 pages long. The following year, those numbers ballooned to more than 950 people, and the submission exceeded 20,000 pages. Citigroup, in its third quarter 2014 earnings call, informed investors that it was spending an incremental \$150 million to \$175 million on improving its capital planning capabilities in 2014 alone.

Is this money spent just for regulatory compliance? Yes, satisfying the regulations is necessary, but surely one can make good economic and profitable use of the machinery and processes that have been laboriously built up. How can banks use stress testing for offense rather than just for defense and compliance?

To make progress in thinking creatively about the stress testing and the CCAR machine, a very short overview is in order. Each year, the largest banks have to go through a capital planning exercise. Will the proposed capital plan, which is closely tied to the firm's strategic

Banks should and can use stress testing for offense rather than just for defense



plan (more on that later), survive some really stressful economic and market conditions? If yes, and if the Federal Reserve feels comfortable with the associated risk and capital management, as well as many other processes, then the bank passes the test – and the capital plan, which may contain dividend increases, share-repurchase programs, and even the possibility of inorganic growth, as for example through an acquisition, is approved, or in the tortured language of the Federal Reserve, “not objected to.”

To pull this off, banks have built modeling machinery, which allows them to forecast bank financials – balance sheet and income statement, regulatory ratios – under a range of stressful economic environments. No small feat!

RIGOROUS BUDGETING

The careful reader will likely have noticed that, if you can forecast bank financials under stressful conditions, then surely you can forecast them in expected or baseline conditions. Indeed, banks do just that because they are required also to submit baseline projections to their supervisors – in other words, what the banks actually expect to happen.

Indeed, this is not a new exercise, and it is something corporations have done throughout their existence: It’s called a budget, but it is unlike any budget ever generated in the past. It is far more rigorous, supported with empirical analysis, and, importantly, helps separate the return that comes from the economy and the market, and the return that is delivered by the

bank's management. Any asset manager of course will recognize this exercise immediately: It is the process of separating "beta" (what the market gives you) from "alpha" (what you can deliver above and beyond the market).

Banks are abandoning their old budgeting process and are using the baseline CCAR projection by adapting it to their budget for the next year. However, one shouldn't slavishly adopt the model output; in fact, there may be very good reasons to deviate, deliberately, from a model's best estimate of, say, revenue growth, given expected economic and market conditions. Senior management may wish to set some stretch goals to encourage prudent growth relative to what would happen organically. This is not wishful thinking. As a senior client told us recently, CCAR-based budgeting "simply works better."

DECONSTRUCTING ALPHA

An actual client experience brings home this idea. As part of vetting CCAR results, one business unit was proposing, for its budget, 5 percent growth over the coming year. But the CCAR model's baseline projection was just 3 percent. This raised some questions among the executives, including the chief executive officer: How was the business proposing to generate the additional 2 percent, the "alpha", that the economy was not projected to deliver for the company? Would it be through more aggressive pricing, stronger sales (achieved perhaps by lowering risk limits), or more effective customer retention?

This question triggered a rather spirited debate. After the meeting, members of the team told us that such a robust and disciplined discussion on growth targets would not have been possible even a year earlier.

Come year-end performance evaluation, and compensation discussions, a natural question to ask is: How did you do relative to budget, relative to those stretch goals? One of the hardest problems in performance evaluation is in separating skill from luck. In our client example, if the business unit delivered 7 percent instead of the promised 5 percent growth, was that because of creativity, ingenuity, and grit – or did the economy just turn out better than what had been expected at the time the budget was generated? The CCAR machine can help to answer this question.

STRATEGIC PLANNING

If CCAR can help with budgeting and performance, it's not a big leap to consider how it can improve strategic planning. In which areas should the bank seek growth, where should it shrink, and where might inorganic growth be called for? Moreover, how do these ideas play out in the firm's financials – earnings and balance sheet – and what are the economic conditions that would need to transpire for the strategic plan to work well, just squeak by, or actually fail?

If CCAR can help with budgeting and performance, it's not a big leap to consider how it can improve strategic planning

In fact, the real benefit of stress testing and CCAR – although still untapped and unrecognized – arguably may lie in its potential for facilitating a more rigorous, robust, and credible strategic planning process.

The regulator has a narrow interest: Is there sufficient capital and capital generation capacity to support this strategic plan, even if the economy were to go south? Senior management, the board, and shareholders, on the other hand, have much broader interests: They care about the upside along with the downside. The CCAR machine can help with both: It can warn about the downside risks and inform about the upside potential.

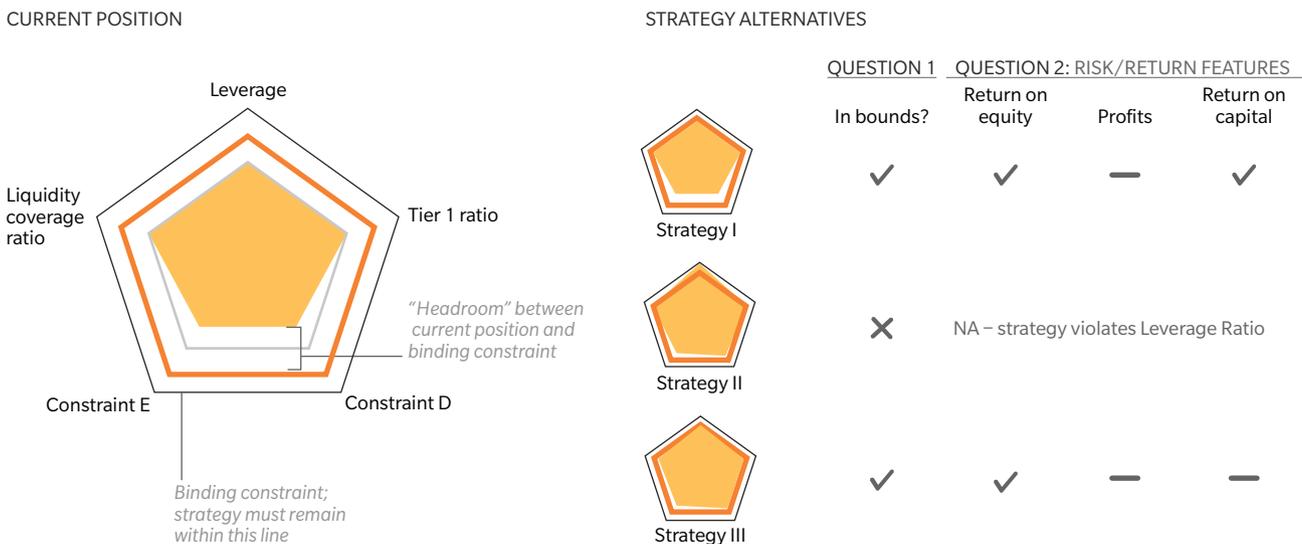
Thanks to CCAR, that strategic planning machinery has now been built! And it can be put to good use answering a number of strategic questions. As an example, consider

the following: where should the bank invest its next marginal dollar of assets? As constraints on a bank – imposed both internally by, for example, the firm’s risk appetite, and by supervisors – increase in both number and complexity, this question becomes more difficult to answer.

Take the stylized example in Exhibit 1: A bank has a number of constraints intended to measure its financial strength that it must respect – leverage, a risk-based Tier 1 capital ratio (capital over risk-weighted as opposed to unweighted assets like the leverage ratio), liquidity – but it has some headroom with which to maneuver. The bank may consider several strategies to take advantage of this headroom, but one strategy may push against one constraint, say leverage, while another may get the bank close to a different constraint, say liquidity. The first question to answer is whether the bank can stay within

EXHIBIT 1: STRESS TESTING STRATEGIES

BANK’S COMPREHENSIVE CAPITAL ASSESSMENT AND REVIEWS HELP SET STRATEGIES BY STRESS TESTING ALTERNATIVES



Source: Oliver Wyman analysis



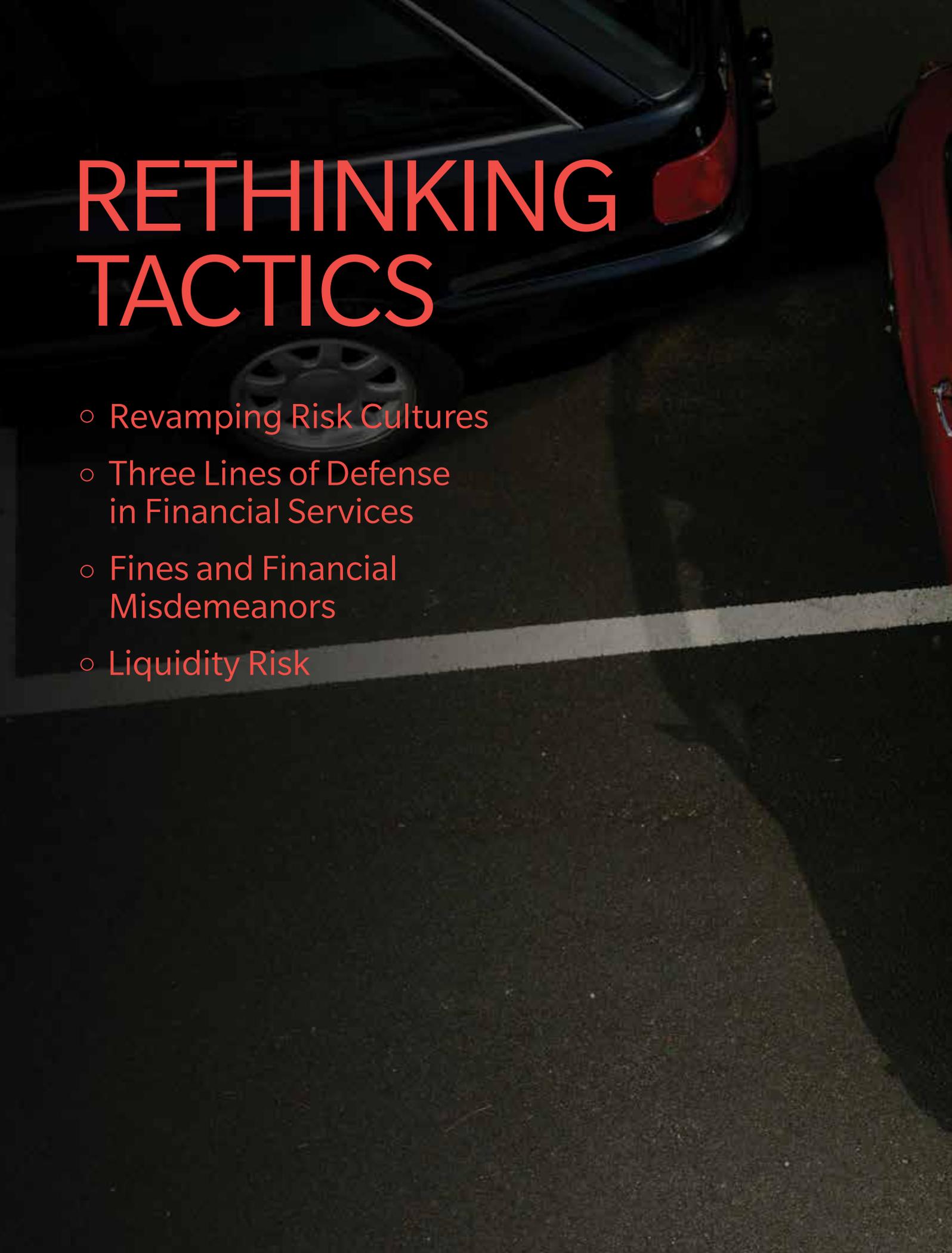
its constraints, by passing CCAR, for example, while remaining within its own risk tolerances, across each of the possible strategies.

Here, the ability of the CCAR/strategic planning machine to capture downside risks is key. Strategy II fails this test (via a leverage ratio breach) and must be discarded. For strategies that pass this first test, the next question is one of classic risk/return optimization. Here, the ability of the CCAR machine to capture baseline expectations and upside potential is

highlighted. Among the remaining strategies, the CCAR machine can be used to pick the strategy offering the best return: Strategy I.

This is just one of the lemonade recipes we have been exploring with our clients. There are many more, equally promising, recipes. They are moving from the test kitchen to the main dining room, and the taste is getting sweeter by the day.

Michael Duane and **Til Schuermann** are both New York-based partners in Oliver Wyman's Financial Services practice. **Schuermann** is a former senior vice president at the Federal Reserve Bank of New York.



RETHINKING TACTICS

- Revamping Risk Cultures
- Three Lines of Defense in Financial Services
- Fines and Financial Misdemeanors
- Liquidity Risk





REVAMPING RISK CULTURES

IT'S TIME FOR COMPANIES TO FOCUS MORE ON BEHAVIORAL BLIND SPOTS

Bill Heath • Kevan Jones • Sir Hector Sants • Richard Smith-Bingham

One employee treats a client poorly. Another allows key equipment to rust. A third witnesses poor conduct by colleagues yet does nothing. A leader makes a snap decision without thought.

Taken separately, each one of these actions may seem trivial. But together, they add up to one of the main reasons why the many initiatives undertaken by companies over the past five years to strengthen their risk cultures continue to fall short: Too few firms give behavior the attention it deserves.

Companies have invested significant time and effort into implementing structural changes designed to prevent a repeat of past egregious risk management lapses that have cost them hundreds of billions of dollars in fines and litigation costs. (See “Fines and Financial Misdemeanors,” on page 58.) Many have strengthened their enterprise risk management frameworks by carefully defining and communicating their risk appetite, clarifying accountabilities and responsibilities for risk taking and risk management, and sharpening operational rules and procedures. They have reinforced

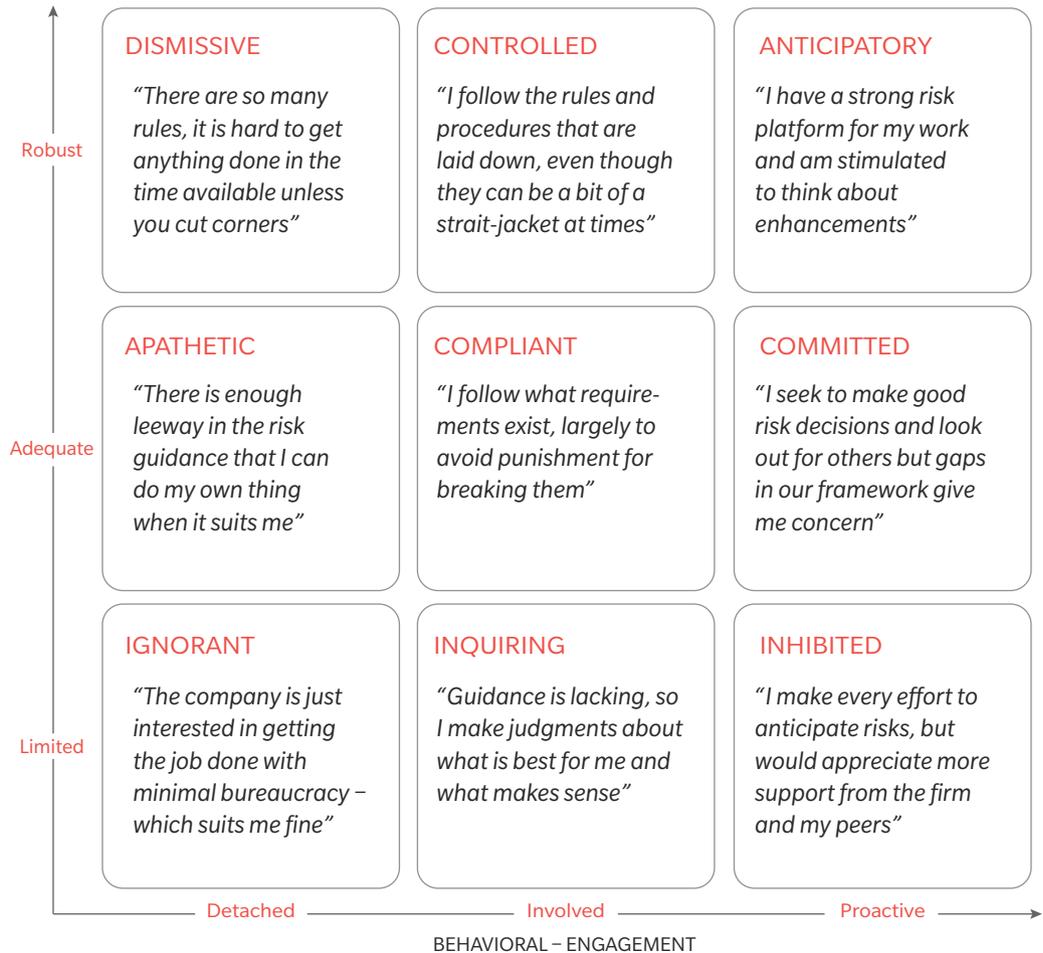
their so-called three lines of defense, enhanced their reporting capabilities, and taken steps to better embed risk management in performance compensation. (See “Three Lines of Defense in Financial Services,” on page 54.)

In many cases, these structural remedies create a false sense of security, in part because most are not accompanied by an interest in understanding why people act the way they do. The behavioral dimension of a risk culture is often more difficult to detect and address than blatant misconduct. A trickle of low-level transgressions and oversights can erode a firm’s value over time – and can also help to serve as an early warning for more serious and significant incidents. That’s why, for example, firms in high-hazard industries track first-aid cases at their facilities: They know that the manifestation of low-level injuries is symptomatic of actions that could result in a fatality. At the same time, they need to be mindful that focusing on slips, trips, and falls does not blind them to different types of cultural challenges that may lead to catastrophic incidents.

EXHIBIT 1: RISK CULTURE AND PERSONNEL BEHAVIOR

COMPANIES CAN APPLY DIFFERENT APPROACHES TO STRENGTHENING RISK CULTURE. THE DIAGRAM BELOW INDICATES WHAT PERSONNEL BEHAVIOR MIGHT LOOK LIKE DEPENDING ON WHICH TYPES OF INITIATIVE ARE PRIORITIZED.

STRUCTURAL – GOVERNANCE



Source: Marsh & McLennan Companies

The structural aspect of building a strong risk culture is, for the most part, defensive in nature, seeking to place constraints on poor practices, decisions, and activities. The behavioral dimension, on the other hand, primarily focuses on influencing and promoting good practices, decisions, and deeds. It relates more to maintaining, or in some cases regaining, a “social license” through the disposition of individual personnel; the respect they have for

colleagues, customers, and suppliers; and their level of commitment to the risk agenda and the values of the firm. (See Exhibit 1.)

OVERCOMING BIASES

Sustained behavioral change requires influencing people both rationally and emotionally, formally and informally, consciously and subconsciously. Personnel

must be guided and supported to act in an appropriate manner, rather than being tasked to do so. They must feel like they are choosing to behave in the right way for the right reasons.

Neuroscience has shown that changing or developing a behavior is different from learning or doing a task. The part of the brain where new behaviors are learned and embedded is rarely engaged when someone is given an instruction or offered short-term incentives.

To address the behavioral neural networks where beliefs and habits reside and to “rewire” them, individuals and teams must be taken on a journey led by their company’s board of directors and top management. Studies show that employees take cues from their leaders and immediate supervisors to determine whether a commitment to a shift in conduct is real or merely rhetoric. If the board and senior executives hope to motivate their staff and employees to undertake the journey, they first must make strengthening the risk culture a personal goal of their own. They must embody the desired risk culture through their own actions. Their passion for change must be both visible and felt, with meaningful consequences for both right and wrong behaviors.

Leaders must also be aware that changing actions and the associated culture is a long-term endeavor. Boards and management teams must not only own the firm’s risk culture, but also must monitor its impact on a regular basis. Progress can easily be undermined. A set of posters announcing a new corporate culture does nothing to persuade people the effort is real. And six-months’ work can be destroyed with a single poorly phrased communication from leadership.

TAPPING INTO PERSONAL MOTIVATION

Leaders that are successful in this endeavor are able to tap into two powerful factors: personal motivation and iterative learning. In regard to the first one, management can ensure that risk issues resonate deeply with staff by appealing to their commitment to the firm’s success, the impact on customers, the implications for their career, and the power of their own agency.

At a high level, employees must understand how their individual activities link to the strategy of the firm and its long-term success – and ultimately to their own individual rewards. Then they must be given objectives consistent with the broader purpose and set of desired actions, so that assessment of their performance relative to expectations, either positive or negative, can be attributed to outcomes.

Few firms give behavior the attention it deserves

This is often easier said than done, as it can be difficult to predict the impact of initiatives. For instance, after a fatality on the United Kingdom’s North Sea, it became apparent that conducting “temporary” maintenance on one oil rig had become permanent. When asked why, staff said they thought their leaders wanted them to reduce costs, irrespective of risk, despite countless presentations from leaders highlighting how safety should come first. In another instance, an energy supplier inadvertently demoralized its



employees and did little to raise its standards when it benchmarked its safety record against its competitors. But when the company introduced an internal competition between its own facilities, employees were motivated to improve risk practices and become “safety champions.”

Understanding what drives behaviors is more complex than one would think. Psychologists have proven that there are many cognitive biases hard-wired into the human mind. The most commonly cited is “normalization.” This term refers either to situations when unacceptable risk-taking becomes accepted as the norm due to the lack of incidents or to a readiness to accept accidents as a matter of course and an inherent cost of doing business.

Organizations with stronger risk cultures develop practices that enable employees to become aware of and overcome these biases. For instance, it is now common for engineers in high-hazard industries to brainstorm all potential risks and outcomes every three to five years to test that current processes are still adequate. Other industries, such as healthcare,

have started to collect performance data to identify where decisions are being repeatedly made as a result of certain cognitive biases.

LINKING PROMOTION AND PAY TO BEHAVIOR

One way to underscore the link between a strong risk culture and the firm’s long-term success and individual compensation is for management teams and staff to integrate cultural and value evaluations into year-end performance appraisals. These components should consistently and significantly affect remuneration and advancement – even at a senior level. For example, some banks have begun to adjust their executive team’s compensation by 50 percent based on the bank’s financial performance and 50 percent based on assessments of tangible improvements to its culture, as defined in terms of desired conduct and values. Some energy firms recognize and reward employees for adopting a sound risk-management practice pioneered by someone in another division.

Firms must also reward behaviors that are positive and are beyond the minimum threshold set by their internal code of conduct, as part of staff development and promotion decisions. Companies should go out of their way to celebrate individuals who escalate potential issues, support colleagues who clearly put the company ahead of themselves, perform outstanding client or community work, or demonstrate internal leadership on diversity or inclusion initiatives. At the same time, recruitment processes should be recalibrated to support these values and “cultural fit.”

By celebrating those who exhibit the desired values, while also having effective sanctions for bad behaviors, leaders can encourage employees to escalate difficult issues, which is essential for companies seeking to embed desired behaviors on a sustained basis. For example, some energy firms publicly honor and reward employees who stand up for safety against the odds. Without such public acknowledgement, employees may be afraid of the consequences and prefer to engage in “willful blindness.” But care needs to be taken that the financial incentive is not so big that it tempts personnel to “rig” feedback.

ITERATIVE LEARNING

It is also important for leaders to encourage individuals to experiment with new behaviors and repeat them until they become second nature. Companies need to be creative about engagement opportunities – developing learning loops to nurture new actions, blending formal training with informal

nudges, and paying attention to such details as discussion formats, vocabulary choices, and even office design.

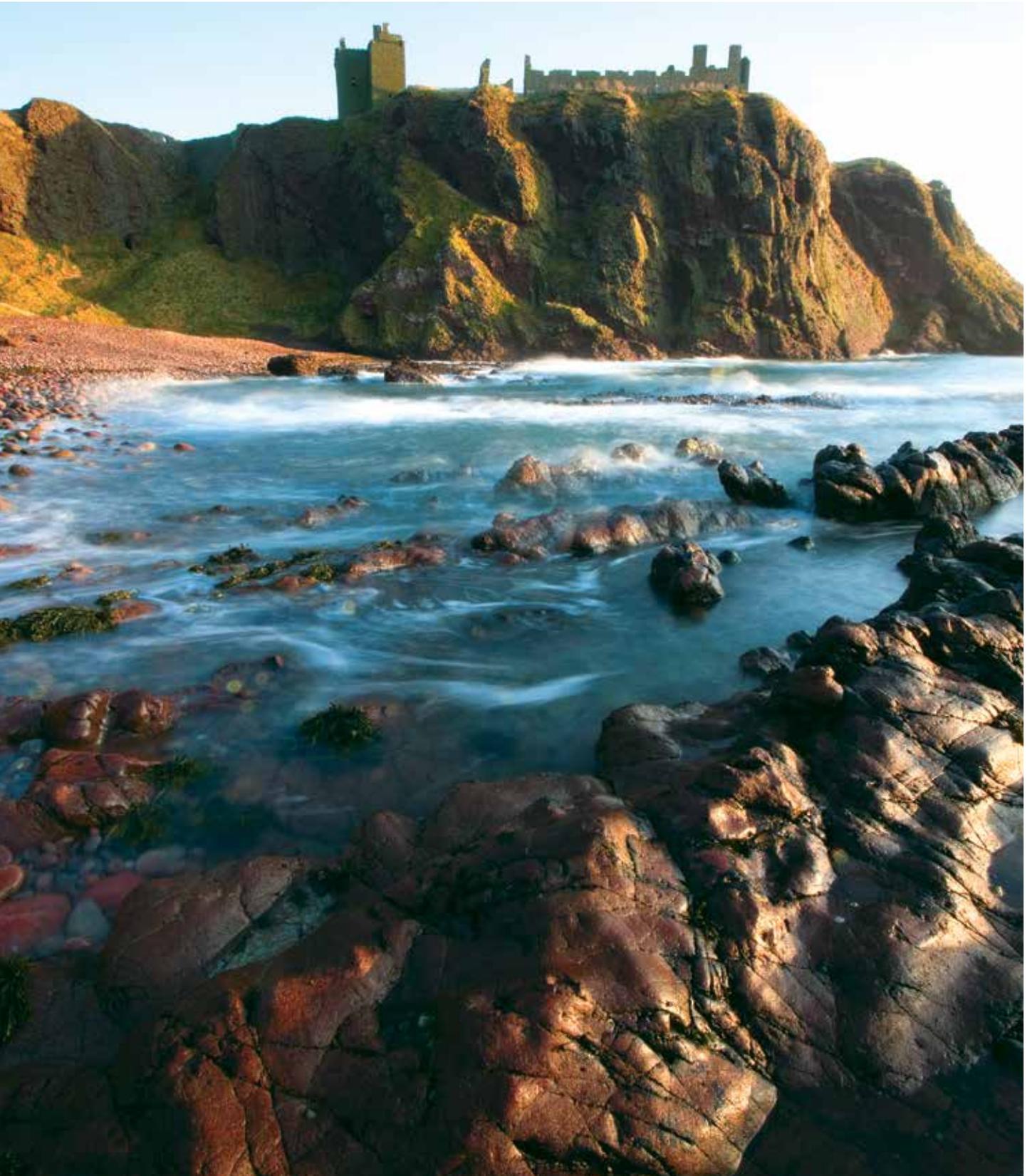
Initiatives should not only embrace experimentation, but also be regularly repeated and new behaviors periodically discussed over a number of months. For example, one bank that set out to tackle inconsistent training and development messages systematically inserted values and examples of appropriate conduct into all of its training and development processes.

At the end of the day, the art of molding desired actions requires making subconscious decisions conscious and then engraining new practices into subconscious behaviors again. Initiatives that simply focus on the conscious brain and overt, rational decision making will fall short of their goals, as will efforts that assume behavioral adjustments follow from a single intervention. Instead, a firm’s risk culture must be continually reviewed and improved, as it is constantly evolving and influenced by leaders and events.

SEEING WHAT’S COMING

By allowing behavioral blind spots to flourish, companies permit their risks to remain invisible. No one wants to hurtle straight towards a full-blown crisis because they didn’t see it coming. Making behavior an integral part of risk culture should be at the top of every company’s “fix-it” list.

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THREE LINES OF DEFENSE IN FINANCIAL SERVICES

FIVE SIGNS THAT YOUR FIRM IS LIVING A LIE – AND WHAT TO DO ABOUT THEM

Mark Abrahamson • Michelle Daisley • Sean McGuire • George Netherton

Ask any bank or insurance company today about how they organize themselves to manage the risks they face and you will undoubtedly hear about their “three lines of defense”: risk taking, risk oversight, and risk assurance. Broadly, the first line is made up of the risk takers – who must own and track the risks they generate. The second line is an independent body within the organization that sets risk-taking limits and ensures that all risks are being appropriately managed. The third line audits and verifies the efforts of the other two to ensure that nothing falls through the cracks. (See Exhibit 1.)

This conceptual framework has governed the industry’s approach to risk management for some time, but few financial services firms are really “walking the walk” when it comes to putting this into practice. In the summer of 2013, the United Kingdom’s Parliamentary Committee on Banking Standards lambasted British financial services firms for paying lip service to the framework: “Responsibilities have been blurred, accountability diluted, and officers in risk, compliance, and internal audit have lacked the status to challenge front-line

staff effectively.” More recently, the Basel Committee on Banking Supervision revised its principles for banks in part to “strengthen the guidance on risk governance, including the risk management roles played by business units, risk management teams, and internal audit and control functions (the three lines of defense), as well as underline the importance of a sound risk culture to drive risk management within a bank.”

The fundamental foundations of the model are sound: They are designed to offset asymmetric information, incentives, and natural optimism. And certainly, empowering professional pessimists to give voice to the “glass half empty” view of the world is sensible governance. But use of the model to deliver effective risk management requires a level of specificity and thoroughness that, to date, has largely been lacking from the industry. As a concept, the three lines of defense may be comforting. But without concrete follow-through by senior managers and boards, they can only provide a false – and perilous – sense of security.

LIVING A LIE

There are five common signs that a financial institution might be purportedly “adopting” the three lines of defense, yet might not be living the three lines of defense in practice, in the sense of consistent and rigorous implementation – in other words, living a lie. This exposes the business to bad outcomes: off-strategy losses, groupthink, overconfidence, onerous control costs, or key judgments left unchallenged. These problems often come about because the business, risk, and audit functions have failed to jointly agree on risk ownership and activities in a holistic and comprehensive way, and senior management has failed to retain a sufficient level of granularity to be confident the model is genuinely being implemented.

The first of these signs is a “theater of the abstract.” Institutions adopt the model, but fail to build out a list of risk activities and translate them into appropriate policies, process changes, and job descriptions. Worrying words might be: “It’s more of a high-level construct here” and “our processes are about people making the right decision – not what hat they wear.”

Another sign of a fundamental problem is not knowing whose line it is – that is, not clearly separating out roles to avoid underlapping and overlapping. “We cover all three lines of defense” is not what you want to hear from any team in the organization. Allocating multiple lines to one person or group, or creating “safety blanket” teams to satisfy regulators, completely undermines the model.

A third indicator is that only the easy questions about risk are getting answered. “The model doesn’t fit the reality of some parts of the business” is a clear warning sign. The firm may be failing to assign explicit responsibility for sensitive topics or grey areas, or to account for new and emerging risks, such as cybersecurity.

Just like contempt, familiarity can also breed complacency: “It’s been like this for years, everyone knows their role.” A strong and up-to-date risk management system requires regular updating to counter drift and ensure that all risks are accounted for.

Or worse, there can be a glaring gap between what executive teams assume the lines of

EXHIBIT 1: THE “THREE LINES OF DEFENSE” FOR FINANCIAL SERVICES

THE THREE LINES OF DEFENSE FRAMEWORK HAS LONG GOVERNED THE FINANCIAL SERVICES INDUSTRY BUT HAS RARELY DELIVERED EFFECTIVE RISK MANAGEMENT



1. ACCOUNTABILITY
People who benefit from taking risks should be accountable for those risks



2. INDEPENDENT CHALLENGE
Given asymmetric incentives, short-termism, and the natural optimism of risk takers, an independent control function is required to ensure risks are identified, controlled, and managed within appropriate boundaries



3. ASSURANCE AND REVIEW
Independent assurance that the risk taker and risk controller interaction is working

Source: Oliver Wyman analysis

defense teams are focusing on and what is actually happening, in part due to broad mandates. Unless key tasks are explicitly owned by a team, second line resources may remain overwhelmingly devoted to regulatory compliance and risk modeling. Words a senior manager never wants to hear, but often does, are: “We’re not sure if that is a first or second line responsibility.”

As a concept, the three lines may be comforting. But without concrete follow-through, it can only provide a false sense of security

BUILDING A DEFENSE THAT WORKS

If a financial-services firm is exhibiting one or more of these signs, it may be time for an intervention at the C-suite or board level. Poor risk management is expensive, inefficient, and dangerous: Redundancy of roles and processes cost money and add to red tape, without delivering better outcomes. Decision making slows when mandates are unclear and people lose confidence in the model. Finally, the board and regulators may unwittingly believe that the firm has comprehensive, independent, and expert independent challenge when it doesn’t – a state of affairs that will quickly come to light in the event of a business or market failure.

Of course, the three lines of defense are intended as a framework, one that must be tailored for each firm’s unique circumstances and business model. But there are some commonalities to its effective use. Critically, the second line – independent oversight – must ensure both top-down and bottom-up risk capture: It owns the risk identification process – including external and emerging risks – and reports on risks to the board and senior management. But it also should

be charged with ensuring that senior management and board discussions on risk at the strategic level are occurring regularly, with outcomes incorporated into risk parameters, to create an effective feedback loop. Equally, it’s important that the third line, assurance, goes beyond simply auditing the other two lines on a stand-alone basis, and takes responsibility for ensuring the relationship between the two is neither too close nor too distant.

Beyond this, clear documentation and communication, fully embedding the model, regular testing and refreshment, and evidence of independent debate and challenge are necessary to make risk management a living, breathing part of the organization.

With sufficient clarity of thinking, management drive, and determined execution, the three lines of defense can be transformed from “words to live by” to a functional bulwark that can protect the business in good times and in bad. But to be truly effective, the model needs to evolve as the business evolves.

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FINES AND FINANCIAL MISDEMEANORS

FINANCIAL CRIME IS
THE NEW MATERIAL RISK FOR BANKS

Dominik Kaefer

Over the past year, regulators in the United States, United Kingdom, and the European Union have hit banks with more than \$9 billion in fines for having rigged the London Interbank Offered Rate, better known as Libor. Libor – a critically important interest rate, upon which trillions of dollars in financial contracts rest – is used by banks as the benchmark for setting rates on consumer and corporate loans. In April, Deutsche Bank alone was fined \$2.1 billion by US financial watchdogs and \$348 million by the Financial Conduct Authority in the UK to settle charges that it allegedly participated in manipulating Libor, while the other banks involved in the scheme each paid more than a billion dollars in fines.

But the Libor case is only one in what seems to be a spate of financial misdemeanors. In a separate action, BNP Paribas agreed in June 2014 to pay nearly \$9 billion and plead guilty for having violated US sanctions rules against Cuba, Iran, and Sudan. In November 2013, JPMorgan Chase paid \$13 billion to settle various charges concerning mortgage securities that it had sold prior to the financial crisis, the largest fine ever paid by a US corporation. Before that, HSBC was fined \$1.9 billion in December 2012 following a US Senate investigation into the role it played in laundering money of drug dealers and “rogue nations.”

Multibillion-dollar fines for alleged respectively committed financial crimes have become a new material financial risk for financial firms. In just five years, such fines have grown from being so miniscule in relation to banking industry profits that they were treated effectively as being nil, to totalling almost \$58 billion in 2014. The average fine has increased seventy-fold in the past six years, rocketing from \$22 million in 2008 to nearly \$1.6 billion in 2014.

But the true cost of an adverse finding from legal or banking authorities goes far beyond the specific fine imposed. The real harm lies in the almost incalculable damage that has been done to the bank’s reputation. Banks face the risk that customers and counterparties will lose confidence in the bank’s sustainable performance, pushing up the cost of capital. And investors fear that the fines are actually harbingers of bad news to come and that the bank is likely to suffer future unexpected losses, thus adding to negative market reactions.

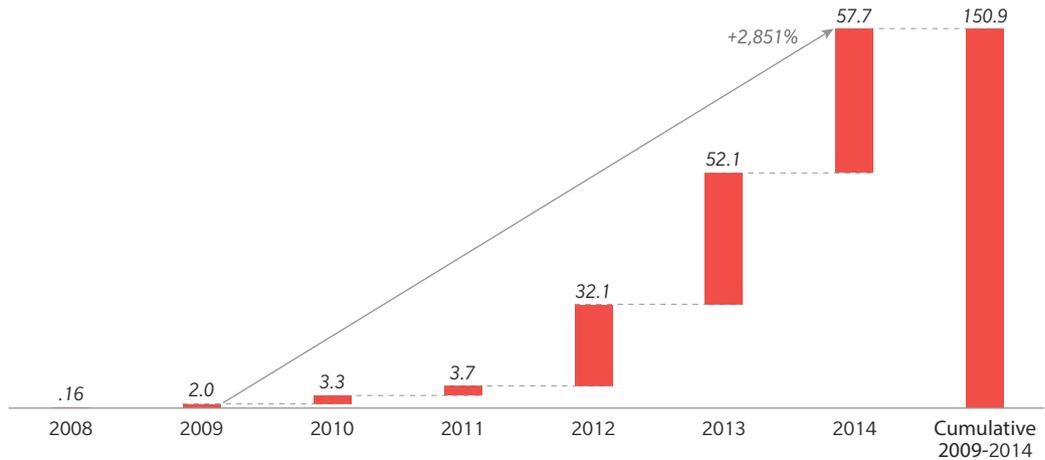
Many commentators attribute these larger fines to deteriorating ethics among bankers. But the real change, in fact, has not come from bankers. Instead, the true transformation can be traced to those whose role it is to regulate the financial services industry. Until recently, bankers were subject to little scrutiny. In fact, it may be that for all we know, bankers in the 1970s were just as inclined to misrepresent risks and conspire to manipulate market prices. Certainly, offshore banking and account secrecy, which have recently been condemned for facilitating tax evasion and money laundering, are nothing new.

By contrast, regulators have clearly responded to the widespread criticism and perception that the financial crisis was a failure of banking supervision by becoming much tougher on the banks they supervise. They are demanding unprecedented levels of disclosure and are applying massive fines when wrongdoing is discovered. The notion of wrongdoing has even been extended to include poor risk management. When JPMorgan Chase lost \$6 billion in the London derivatives market, the bank’s woes were compounded by fines imposed by US and UK authorities of about \$1 billion for poor risk oversight.

EXHIBIT 1: THE FINANCIAL CRIME WAVE

BANKS' FINANCIAL FINES ARE SKYROCKETING, INCREASING CUMULATIVELY BY NEARLY 3,000 PERCENT OVER THE PAST FIVE YEARS

\$ BILLIONS



Source: FT Research, Oliver Wyman analysis

MANAGING THE SHIFT FROM VICTIM TO ALLEGED PERPETRATOR

In this new environment of intense scrutiny and massive fines, banks must take a more rigorous approach to managing the risk of financial crime – not the risk of being a victim of crime but the risk of being a perpetrator or accomplice.

To date, managing financial crime risk has often been treated as a simple matter of mechanically complying with “know-your-customer” and anti-money laundering regulations. The inadequacy of this approach is now clear. Apart from the HSBC scandal, the big fines of recent years have concerned conduct outside the scope of these regulations.

Besides money laundering, senior bankers must make sure their institutions are not involved in tax evasion, bribery, corruption,

or terrorism financing. They must also be sure that they abide by sanctions and embargoes and not participate in market abuse. Moreover, banks must not only be law-abiding, they must also be virtuous, given the extension under the UK’s Financial Conduct Authority of the regulator’s power to evaluate a bank’s “culture” and impose penalties on it.

Clearly, part of the answer towards putting an end to the banks’ misdemeanors lies in fostering a cultural change. Banks must use recruitment, promotion, training, and financial incentives to encourage a high standard of business ethics. Not only will such measures reduce the chances of wrongdoing, but they are also likely to reduce the severity of penalties when such offenses occur. The standard management response to a scandal – that the malfeasance was a “rogue event” and not symptomatic of a corrupt culture – will be more believable if banks take these measures.

EFFECTIVE CULTURAL CHANGE

Such cultural change programs are already underway at many banks. To gain greater traction, however, those efforts must be backed by stronger internal scrutiny of staff and client conduct. This self-imposed scrutiny does more than just discipline staff. It helps to ensure that senior managers are ahead of the media and their regulators and that they are initiating action. If a senior manager is surprised by what external investigations uncover, that can only confirm suspicions that he has lost control.

The first step to achieving effective cultural change is figuring out where to look for problems. For this purpose, banking supervisors often recruit ex-bankers to help them understand how bankers behave. In a variation on this “poacher turned gamekeeper” tactic, banks are now recruiting ex-supervisors to help locate the behaviors that concern the authorities.

Banks must then be able to detect misconduct by their staff or clients. To this end, banks are moving beyond traditional risk management and into the kind of techniques more commonly associated with spy agencies such as the CIA and MI5. They are using advanced analysis of transaction patterns, communications, and social networks to identify potentially criminal or unethical behavior. And they are being more vigilant about analyzing geopolitical risks and the individuals with whom the bank is associated. If the bank’s chief executive officer is going to have lunch with a political or business bigwig, then the bank needs to know who that person really is and what risks he may carry with him.

Banks are also increasing their financial crime risk-fighting resources. In 2009, they spent roughly \$4 billion on relevant externally-supplied software and services. In 2014, that figure jumped 60 percent, to \$6.5 billion. While that may be a significant increase, it is not nearly as great as the 3,000 percent increase in the fines for financial crime incurred over the same period. (See Exhibit 1.)

VIRTUE’S REWARD

Virtue is its own reward, according to Cicero. That may well be true. But even if it isn’t, when the public, the press, politicians, and supervisors assume that banks are up to no good and are keen to punish them, virtue has another important bonus: It enables banks to remain in business. If the banks hope to be profitable, they had better learn to also be good.

70x

The number of times that the average fine for banks soared from 2008 to 2014

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Dominik Kaefer is a Frankfurt-based principal in Oliver Wyman’s Financial Services practice.



LIQUIDITY RISK

UNCOVERING THE HIDDEN
CAUSE OF CORPORATE SHOCKS

Alexander Franke • Ernst Frankl • Adam Perkins

International conflicts, an uncertain global economy, and volatile stock prices are prompting management teams to examine whether they would fare better in a liquidity crunch today than they did when the financial crisis struck seven years ago. Unfortunately, the answer to that question is unclear. On the positive side, banks and non-financial companies have both been shoring up capital reserves, partly in response to new regulations.

But unlike banks, which have been forced by regulators to make strengthening their liquidity risk management capabilities a top priority, many businesses have not improved their ability to analyze and mitigate funding shortfalls. A study by the United Kingdom's Financial Conduct Authority released in September found that most commodity traders do *"not include stress testing and scenario analysis in their assessments of liquidity risk."* This could result *"in large financial pressures and liquidity risks in the event of stressed market conditions,"* according to the report. Our research shows that liquidity-risk management may be an even lower priority for many non-financial services companies. In our view: too low.

In a recent Oliver Wyman survey, we asked commodity-driven industrial conglomerates and asset-backed traders about four critical liquidity-risk-management best practices: comprehensive assessments of sources and uses of liquidity; robust risk and reserve calculations; thorough stress testing; and integrated risk and finance evaluations. We found that only some players are following best practices in terms of liquidity-risk assessment and provision planning, such as taking a wide range of risk factors into consideration and conducting extensive stress testing. But even then, these practices are only being applied in isolated cases. Not one company

Businesses do not have an accurate understanding of the extent to which their organizations remain at risk of funding shortfalls

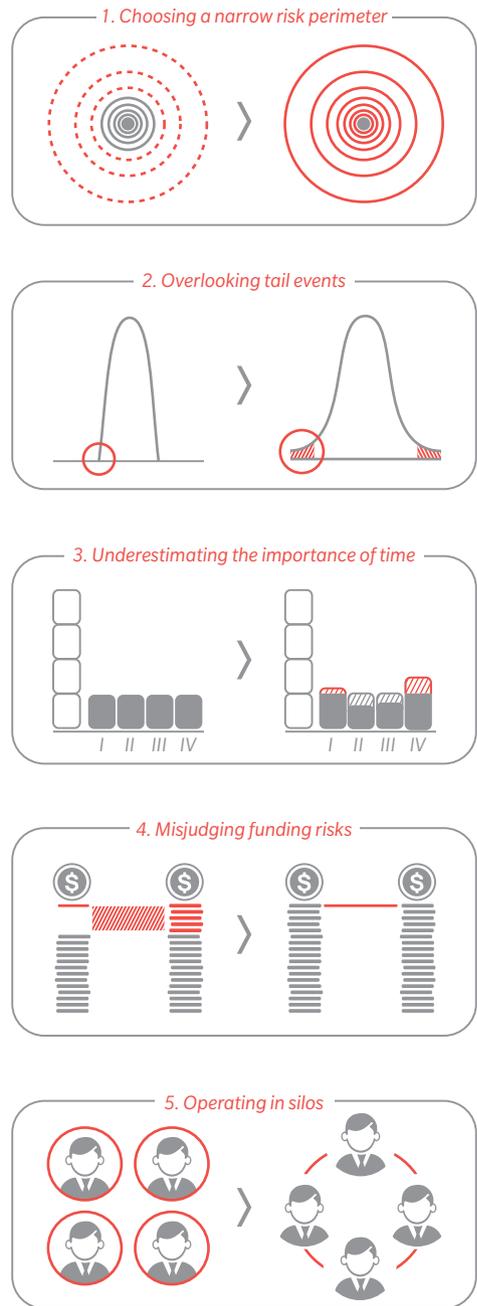
is consistently following best practices for liquidity-risk management across all four dimensions.

Instead, most respondents report that they have only basic liquidity-risk management practices in place. For example, many companies just examine how market price movements will force them to seek more funding. Or they fail to seek the views of both their treasury and risk divisions when stress testing their potential access to funding. (See Exhibit 1.)

There is more work to be done: One of the main reasons that liquidity risk remains a low priority for many organizations is that they do not have a robust enough understanding of how much their organization is at risk of a funding shortfall – or they underestimate the steps required to close the gap. The financial crisis has taught us that liquidity risks are the greatest risks of all in terms of bankrupting a company. But they are difficult to foresee without careful forethought and preparation. That's because they usually occur when risks correlate, overlap, or combine to result in a full-blown crisis. To meet this challenge, liquidity-risk management must be a comprehensive attempt to predict the impact of a perfect storm.

EXHIBIT 1: THE FIVE COMMON MISTAKES IN LIQUIDITY RISK MANAGEMENT

PRACTICES THAT SHOULD BE AVOIDED TO PREVENT A FUNDING SHORTFALL



Source: Oliver Wyman analysis

FIVE COMMON MISTAKES

To take advantage of all that we have learned from the financial crisis and avoid repeating history, companies will need to avoid the five most common mistakes in liquidity risk management:

1. Choosing a narrow risk perimeter. As we learned from the financial crisis, companies can suffer from a shortfall of financial resources when a risk event suddenly creates an unexpected need for funding or when external sources for funding suddenly become unavailable, or both. Generally, companies must be prepared for three types of risk events – market, credit, and operational – which could happen simultaneously. Examining all three types of risks also can help organizations to avoid double counting available reserves.

Unfortunately, most businesses tend to focus solely on market risks that could cause their cost of funding to spike or trigger margin calls from derivative contracts. Few companies regularly evaluate the potential impact of credit risks produced by delays in payments or cancelled deliveries of products that have already been paid for. Or they fail to examine the potential impact of operational interruptions that could require funds or harm a company’s ability to generate cash.

2. Overlooking tail events. The second most common mistake is that companies rarely analyze what could happen if a risk event occurs that is outside of their regularly considered range of possibilities. Most businesses examine if they have sufficient financial strength to weather an event that has somewhere between a 1 percent to 5 percent chance of occurring. But few conduct stress tests and scenario analyses to understand the potential impact of

so-called “tail” events that are outside a company’s regularly considered risk purview.

Or they analyze tail events in a mechanical way. They don’t bring into consideration the views of external experts or even tap all of the business intelligence that may exist within their own organization’s four walls.

3. **Underestimating the importance of time.**

Another frequent error is that companies fail to consider how their exposures change over time. Most calculate their potential liquidity shortage over one quarter and then apply those requirements over a year’s time. Or they ignore this step entirely. As a result, they fail to take into account how much their liquidity requirements could rise when their company pays dividends, for example. Or conversely, businesses may be unaware that they will need fewer reserves at other points in the year.

For example, the European Union voted in January 2013 against a plan to support the European Trading Scheme (ETS) for carbon and auction off yet more carbon credits. If the announcement had come several weeks later, it could have resulted in a full-blown liquidity crisis for many traders. As it was, after the announcement, carbon prices went into free-fall, dropping by 40 percent, and triggering hundreds of millions of dollars in margin calls on hedges. Traders were only able to meet their commitments by borrowing in the short term from their dividend reserves. Had the dividends already been paid and those reserves been depleted, many traders would not have been able to weather the shift as easily.

4. **Misjudging funding risks.** Trying to understand the risks associated with the uses of liquidity is a common process for risk managers. But issues such as the availability of funding and the associated

risks come less easily to them. As a result, few companies regularly assess the potential funding and liquidity problems that could result if lenders shut down credit facilities or if corporate treasuries cut funding for subsidiaries.

But paying greater attention to potential funding shortfalls caused by unexpected moves by counterparties is becoming critical. Banks and investors are increasingly worried about high debt levels and weak earnings in the current uncertain economic environment. In fact, some prominent independent traders have already begun to report that counterparties are starting to trim their credit lines.

5. **Operating in silos.** Intuitively, it may seem obvious that liquidity risk is too interconnected, complex, and potentially fatal to be analyzed by a single division. Yet seven years after the financial crisis, many companies still assign the responsibility of monitoring liquidity risk either to the risk division, since it is closely tied to market and credit risk, or to their treasury, since liquidity risk relates to working-capital management and funding. Firms often assign tasks such as calculating liquidity risks, setting liquidity reserve requirements, and determining funding requirements and provisions to a single division or spread out the work across segregated teams in silos that don’t communicate with each other.

This failure to collaborate causes significant gaps in companies’ liquidity-risk analyses. Perspectives from a company’s treasury department are critical to determining cash allocation and funding. But these insights fall short of identifying a firm’s actual liquidity risk without the risk division’s view on potential fluctuations in cash inflows and outflows and the financial planning division’s assessment of the firm’s future minimum liquidity requirements.

A MULTIDISCIPLINARY APPROACH

So what can be done? Ultimately, companies’ chief financial officers and chief risk officers need to work together to ensure that their risk, treasury, and financial planning divisions are interacting with each other to assess the company’s liquidity requirements, potentially as part of their annual planning and budgeting process. By taking advantage of the expertise that exists across the company, they can be sure they are considering all potential risks to funding.

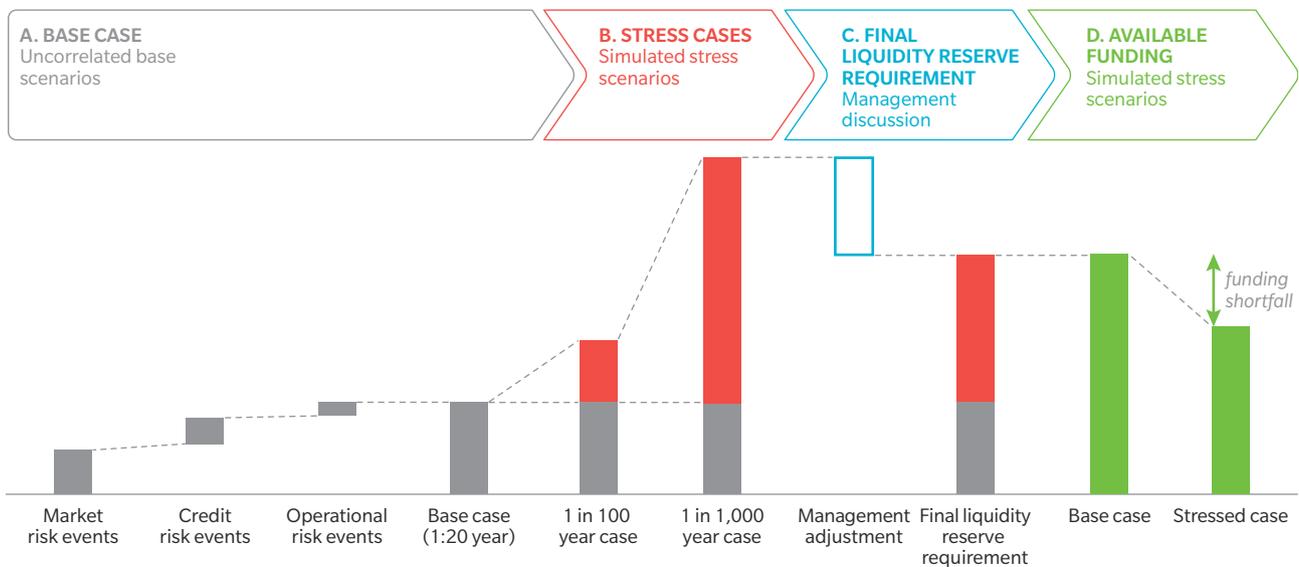
Leaders in this area include in their multidisciplinary analyses improbable and unforeseen events. They compile an exhaustive risk register across divisions, which include assessments of different types of liquidity risks,

and then assess their likelihood, impact, and potential interplay with other risks. (See Exhibit 2). Then they evaluate what the company’s liquidity requirement will be when major liquidity risk events occur that could happen once in 20 years, once in 100 years, or once in 1,000 years. These individual reserves are then aggregated to give the total base and stressed liquidity requirement.

The company’s top management team can then adjust the company’s final reserve requirement based on the company’s risk appetite and its willingness to pay for cash reserves or unused credit lines. By matching the requirements for “business as usual” against a stressed funding scenario, the management team can gain a more accurate picture of how large a funding shortfall should be addressed.

EXHIBIT 2: FORECASTING FUNDING SHORTFALLS

COMPANIES MUST ADOPT A MULTIDISCIPLINARY APPROACH TO IDENTIFY THE FULL EXTENT OF THEIR FUNDING SHORTFALL



Source: Oliver Wyman Analysis



ADDRESSING FUNDING SHORTFALLS

Once companies grasp the full extent of their potential funding gap, they can create a strategy for changing the way they address potential shortfalls in financial resources and incorporate these shifts into their overall strategy for managing risks. But developing such an integrated approach can only happen if companies attempt to bring the limits associated with their reserve calculations in line with their changing appetite for risk and overall funding plans.

Companies must examine a wide range of scenarios to determine both the cost of different sources of funding and the likelihood

of their access to financial resources. For example, companies should be prepared for separate divisions to draw down on reserves at the same time and examine how internal transfer prices and competition for funding could affect funding availability.

Finally, a company's chief risk officer must work with its chief financial officer to calculate and monitor the firm's financial resources. They must form teams responsible for liquidity risks in their risk, financial planning, and treasury divisions. Otherwise, corporations will not just remain vulnerable to the next financial virus, they may even exacerbate it, fulfilling the words of Spanish-born philosopher George Santayana that "those who do not remember the past are condemned to repeat it."

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REDEFINING INDUSTRIES



- A Bankless Future?
- The Industrialization of Commodity Trading
- Commercial Drones
- Self-Driving Freight in the Fast Lane





A BANKLESS FUTURE?

BRACING FOR THE UNBUNDLING OF BANKS

Barrie Wilkinson

It is the year 2115 and my great-grandson, Barrie Wilkinson IV, walks into a real estate agent's booth on New York City's Upper West Side.

Barrie: "I'm looking for a one-bedroom apartment. Do you have anything for \$20 million or less?"

Real estate agent: "You are in luck, sir. Such a property came on the market today."

Barrie: "Can I take a look?"

Real estate agent: "Of course. Put on these i-goggles and I'll take you on a virtual tour."

Five minutes later...

Barrie: "It looks great. I'll take it."

Real estate agent: "Wonderful! I'll just need you to sign the contract and confirm means of payment."

Barrie lifts his arm and starts speaking to his Apple Watch: "Update on my financial situation, please."

Watch: "I'm opening your Amazon money manager account. You have \$3 million in liquid bonds and \$4.5 million in your equity portfolio."

Barrie: "Liquidate my bond portfolio and set aside funds for a deposit on the house."

Watch: "Transaction complete."

Barrie: "Now I need a mortgage for \$17 million."

Watch: "Your Experian credit rating has expired. Would you like me to get it renewed?"

Barrie: "Yes. And share all available information so I get the best possible rating."

Watch: "Done. You have received a B2 rating. You now need to upload the information on the property and legal documents. You have received five mortgage offers. How should I rank them?"

Barrie: "By price please, and filter for offers that cannot deliver the funds today."

Watch: "The best offer is from Vodafone Finance at 2 percent for a 30-year fixed-rate mortgage. Would you like to proceed?"

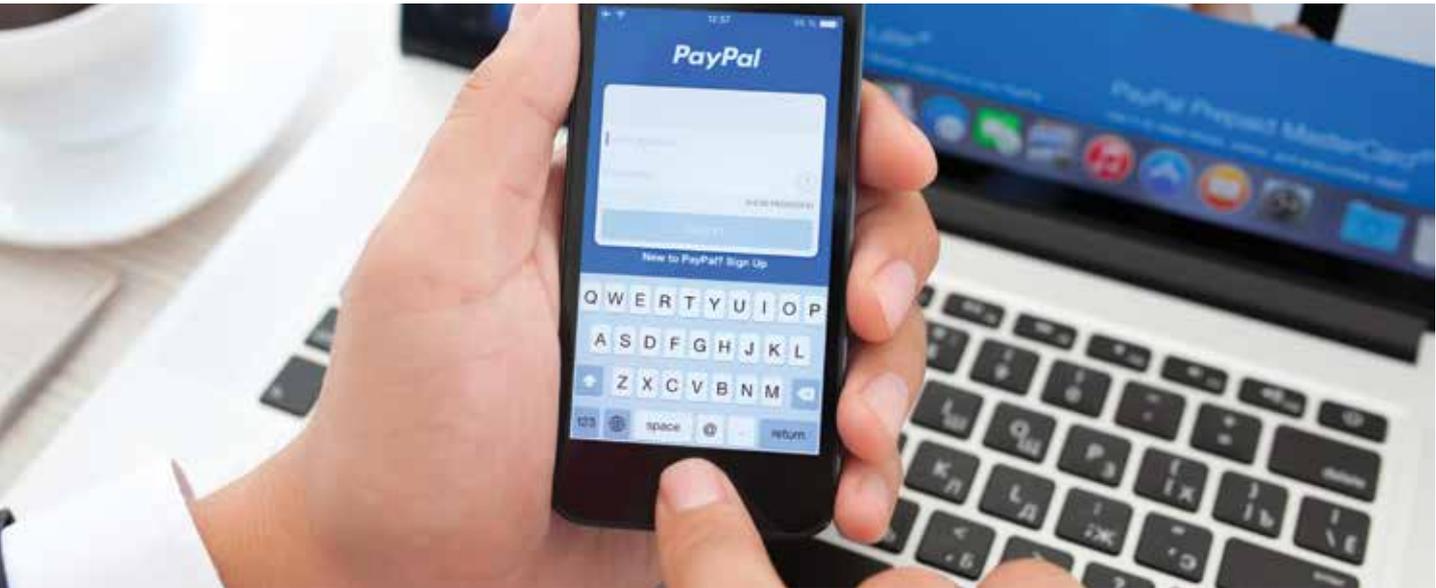
Barrie: "Yes, that sounds great."

Watch: "I can confirm that the mortgage funds have been transferred to a custodial account awaiting confirmation of receipt of the property deeds."

Real estate agent: "I just need a fingerprint signature on the contracts, and I'll release the deeds."

Barrie presses his finger on the screen of his watch.

Real estate agent: "Excellent. Here are the keys to your new home. Congratulations."



Denys Prykhodov / Shutterstock.com

UNBUNDLING BANKS

While it may seem unlikely, the scenario above is already possible using technology currently in existence. Most readers will be struck by how quick and hassle-free buying a house could technically become. But bankers should be struck by something else: Namely, the absence of any party in the story that resembles the banks of today. Each activity involved in the financing of Barrie IV's house purchase is performed by a separate firm. When his great-grandfather recently bought a house, they were all performed by one bank.

Fintech firms are already using advanced information technology to compete with banks in various parts of their "value chain." Thus far, the competition has been restricted mainly to the payments space, but they are moving into other areas. Investors are enthusiastic about their prospects.

Tens of thousands of bank employees spend their days concerned with credit risk, market risk, cybersecurity, and a plethora of other menaces. Yet these threats are trivial compared to the prospect of being rendered irrelevant by technology.

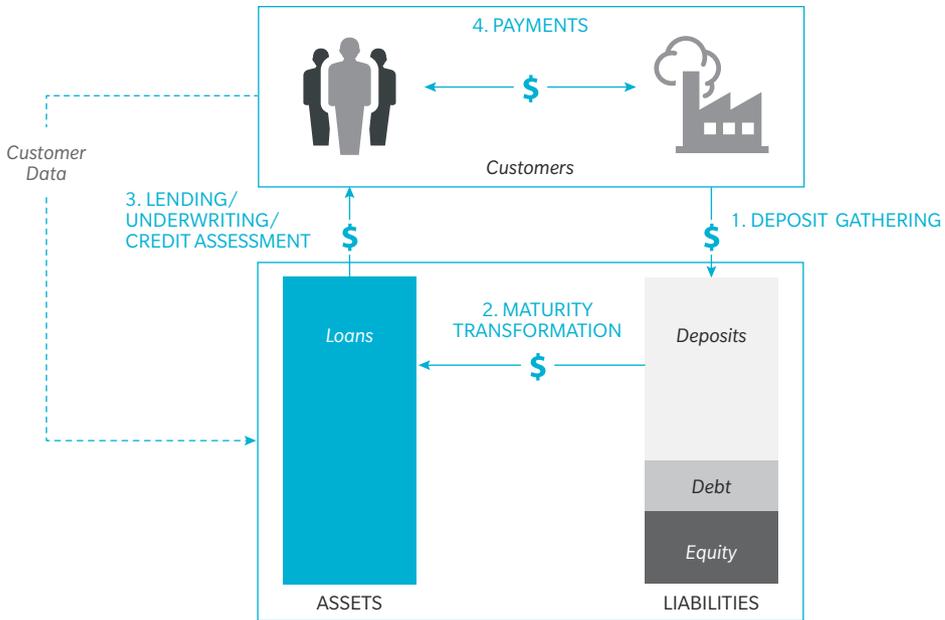
Is the multi-function, one-stop-shop banking model doomed?

To answer the question, we need to look at what banks do. Is there any function performed by banks that couldn't be done better by stand-alone competitors using new technology? Or is there some advantage in combining these activities within a single firm?

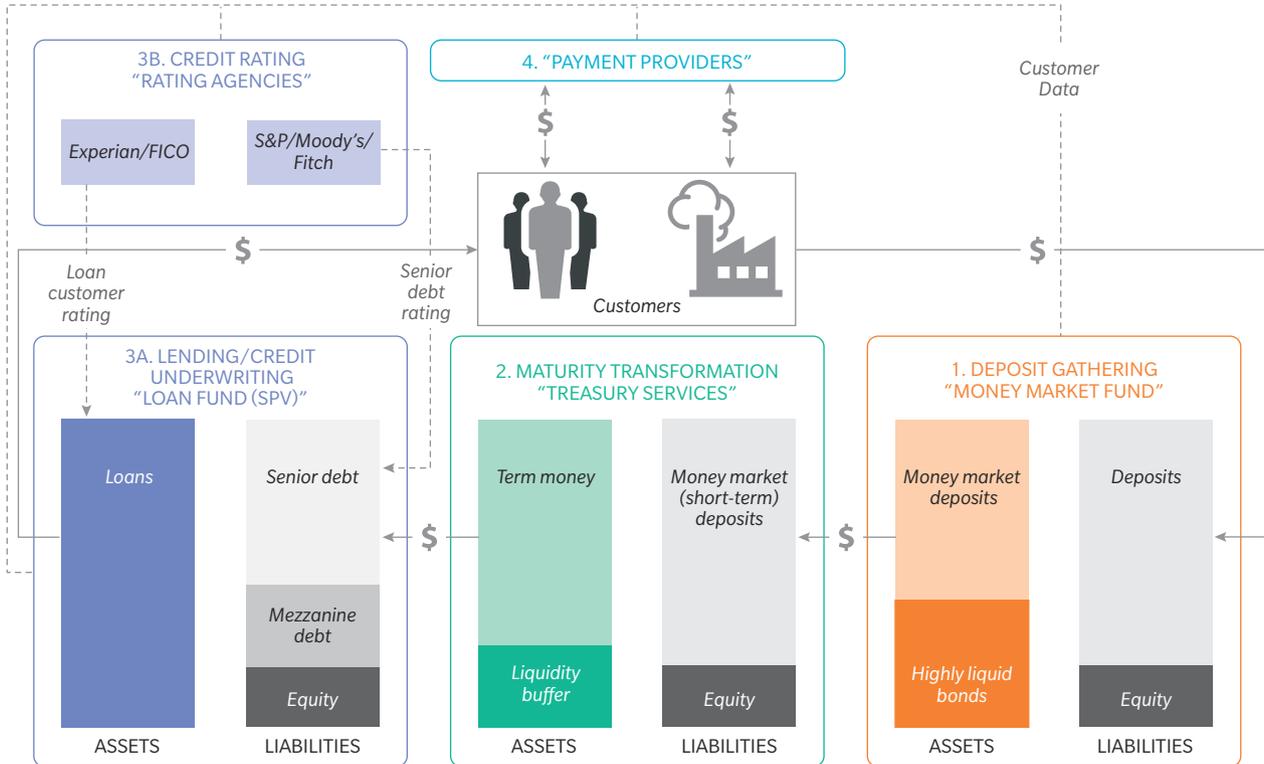
Banks need to adopt much of the technology used by their upstart competitors

EXHIBIT 1: UNBUNDLING BANKS

TRADITIONAL BANK (ONE-STOP-SHOP FOR ALL BANKING SERVICES)



AFTER UNBUNDLING



– \$ – Money flow - - - - Information flow

Source: Oliver Wyman Analysis

THE RISE OF PURE-PLAY PROVIDERS

Banking involves four basic activities: deposit taking, maturity transformation (using short-term liabilities to fund long-term assets), lending (including credit assessment), and the provision of payments. These activities have traditionally been bundled together in a single firm. But they need not be. Each function could instead be performed by pure-play providers. (See Exhibit 1.)

Some such pure-play firms already exist. Non-bank payments providers, such as PayPal, are familiar and growing in number. In an unbundled world, they could extend their activities to include direct debits, standing orders, and other payments still dominated by banks.

Today's money market funds resemble the pure deposit takers. Though they must invest to pay interest to their depositors, they greatly reduce the risk of doing so by buying only high-rated, liquid securities in an unlevered model.

Banks will continue to lose big chunks of what they do now

Loan funds and securitization vehicles already resemble pure-play lenders. They fund their lending by issuing securities backed by the loan assets. In a mirror image of money market funds, they reduce the liability side of their business to a formality. And, of

course, stand-alone credit assessors, such as Experian and Moody's, have been around for decades.

The notable exception is maturity transformation. No firm provides maturity transformation as a stand-alone service, taking the short-term assets of investors and providing lenders with long-term funding.

How come?

MITIGATING DEPOSITOR RISKS

In his seminal 1937 paper "The Nature of the Firm," British Nobel Prize-winning economist Ronald Coase argued that the scope of a firm's activities is determined by transaction costs. A firm will buy from an external supplier unless transaction costs make it cheaper to do things in-house. These transaction costs arise mainly from contractual uncertainty and the difficulty of getting information.

Standardized contracts in financial markets (most notably, for exchange-traded securities) and advances in information technology have dramatically reduced market and transaction costs. So we should not be surprised by the emerging unbundling of banks.

But what about maturity transformation? Why haven't external providers emerged when the transactions required have also become cheaper?

The answer is government policy.

Maturity transformation creates a risk for depositors. If too many depositors ask for their money at once, the bank (or an alternate provider) may not be able to hand it over because it cannot liquidate its long-term assets. To protect depositors from this risk, and the economy from the systemic risk created by bank runs, governments now



guarantee retail bank deposits. Emergency access to central bank support also helps banks to mitigate the risk of a run on wholesale deposits. These mechanisms effectively, if unintentionally, subsidize the short-term borrowing performed by deposit-taking institutions. Unsubsidized pure-play providers cannot compete.

Of course, governments attempt to reduce the extent of this subsidy by requiring deposit takers to hold liquid assets sufficient to prevent the need to call upon these mechanisms. But the non-existence of pure-play providers suggests that this is insufficient to eliminate the subsidy.

REVAMPING BANKS

So long as these implicit subsidies are worth more than the burden of liquidity and capital rules, banks are unlikely to completely unbundle in the way envisaged above. But they will continue to lose big chunks of what they now do. And in response, they will find themselves adopting much of the technology of their upstart competitors.

There will probably still be banks around when my great-grandson begins to look for a London residence, but they will not exist in the same form that we know them today. And, as Barrie IV will testify, banking will be better than we now know it, whoever supplies it.

Barrie Wilkinson is a London-based partner and co-head of Oliver Wyman's Finance & Risk practice in Europe, Middle East, and Africa.



THE INDUSTRIALIZATION OF COMMODITY TRADING

WHAT ASSET-BACKED TRADERS' STRONG RESULTS MEAN FOR THE FUTURE OF INDEPENDENT TRADERS

Alexander Franke • Ernst Frankl • Christian Lins • Adam Perkins
Roland Rechtsteiner • Graham Sharp

One after another, the commodity trading industry's traditionally leading independent traders have been increasingly stagnating as the prices of everything from copper to crude oil remain stuck at rock-bottom levels. By contrast, the world's slow-moving top asset-backed trading giants are announcing rock-solid results.

Has the commodity trading industry been turned on its head? No, but the turnabout shows that it's obeying a new set of rules – a seeming contradiction that only makes sense in light of an ongoing transformation of nonconformist commodity trading into a mature industry. The strong trading results of longstanding oil majors and other asset-backed traders provide a glimpse into the potential of strategies that will work in the future. The commodity traders that have come closest to achieving established, institutionalized global machines designed to generate earnings reliably in spite of market conditions are now at the head of the pack.

The trailblazers in the commodity world, in short, are industrializing. Oversupplied markets, rising customer expectations, and higher costs resulting from tighter governance, reporting, and asset management requirements are fracturing the principles of commodity trading that once ruled the industry. Among the casualties: Superstar commodity-trading individuals accustomed to operating solo. The new rules require more than ingenuity, agility, and speed. They call for systematically achieving superstar results by transforming market and competitor intelligence gathered from personal networks into tradable institutional knowledge, offering structured customer solutions, and monetizing “optionality” – defined as the options available to run, manage, and extract the most value from their portfolios globally. Leading players are metamorphosing into light-footed, one-stop shops able to finance, store, transport, refine, and distribute commodities globally with machine-like efficiency, avoiding operational or financial strain.

INSTITUTIONALIZING OPERATIONS

For now, major energy companies and other asset-backed traders are the furthest along this path. For example, in the first three months of 2015, BP's profit fell only 20 percent compared to the same period in the previous year, even though crude oil prices were cut in half. Similarly, the trading arms of Total and Shell helped to support their overall group results by taking advantage of favorable forward market conditions and storage capacity along their logistics chains. As a group, top-tier asset-backed traders have been growing their gross margins more than three times as fast as independent traders since the financial crisis. The top five asset-backed trading giants have bounced back strongly from the crisis, growing their gross margins as a group by more than

15 percent every year ever since 2010. By contrast, the gross margins of the top five independent traders have expanded annually by only 5 percent. (See Exhibit 1.)

As a result, tightly run, independent traders are, in a rare shift of industry dynamics, following the example of asset-backed traders, rather than the other way around. Independent traders are striving to institutionalize their operations without sacrificing their nimbleness and entrepreneurial drive. To that end, they are introducing middle-management positions to break down the organization's dependence on a handful of key individuals in order to gather and act quickly on market intelligence from anywhere in the world.

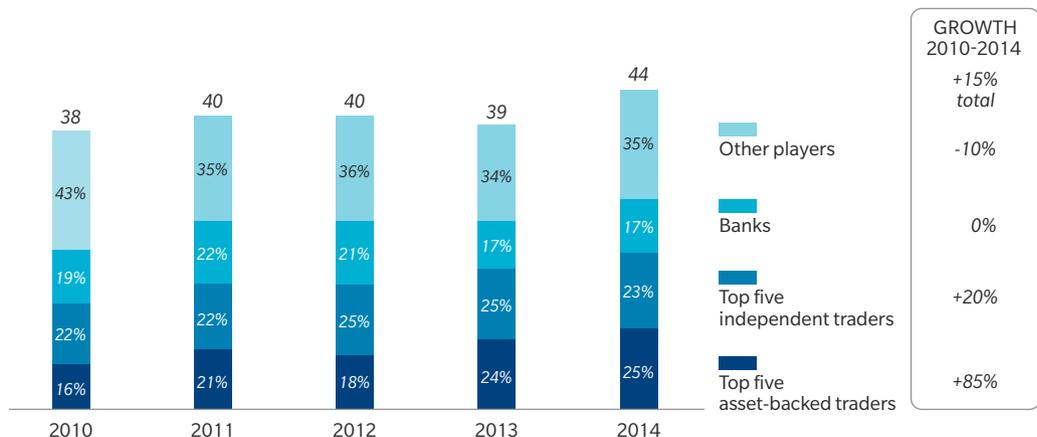
At the same time, they are shifting towards a more rules-based, management-run model, with explicitly defined delegations of authority

EXHIBIT 1: THE COMMODITY TRADING GAP

TOP ASSET-BACKED TRADERS WITH MORE INSTITUTIONALIZED OPERATIONS HAVE GAINED SIGNIFICANT MARKET SHARE AFTER THE FINANCIAL CRISIS COMPARED TO THEIR INDEPENDENT TRADING PEERS

COMMODITY TRADING POST FINANCIAL CRISIS GROSS MARGINS OVERALL AND BY PLAYER

US\$ BILLIONS
MARKET SHARES IN PERCENT



Note: Top five = five largest players in 2014
Source: Oliver Wyman analysis

and institutionalized processes around investment decision making and capital allocation. Many are also building out their corporate functions, such as corporate finance, strategy, and external communications. They are even involving their compliance and legal departments more in complex issues such as customer relationships. Some are going as far as to outsource and offshore routine administrative work and to publish comprehensive annual reports.

Of course, no single playbook works for every player. Established commodity producers and other asset-backed traders are presently demonstrating greater resilience to difficult market conditions by centralizing supply and trading operations to optimize the returns from their massive global portfolios of production, processing, logistics, and retail assets, as we predicted in “The Dawn of a New Order in Commodity Trading” Acts II and III, which appeared in the *Oliver Wyman Risk Journal* in 2013 and 2014.

At the other end of the spectrum, many top independent traders are developing standardized tool kits to invest along their logistics chains in storage terminals, transportation, domestic distribution, and retail chains with a broad network of customers and partners. In recent months, Castleton Commodities International, backed by private investment vehicles and family trusts, bought Morgan Stanley’s oil business for an estimated \$1 billion. Through subsidiaries, Vitol and Trafigura partnered with private equity and sovereign funds to expand into retail fuel distribution networks and gain control over transportation and storage assets. A Japanese trading firm joined with three Japanese oil-refining companies to form a new liquefied petroleum gas trader called Gyxis.

3x

How much faster top-tier asset-backed traders have been growing their gross margins compared with independent traders over the past five years

For most companies, the commodity-trading makeover underway requires attaining significant scale and sophistication, while not jeopardizing flexibility. Traders scramble to develop scope through capital-efficient partnerships and contracts and then seek to differentiate their services to avoid becoming commoditized themselves.

That’s why commodity traders with a narrow commodity or regional footprint are rapidly expanding and forging closer relationships with customers. For instance, more midsize players active in trading only a few commodities are developing comprehensive, global cross-commodity portfolios and are broadening their offerings to counterparties in order to form longer-term relationships. A new wave of petrochemical companies is also building out trading capabilities in related commodities or service offerings.

RAISING THE BAR

For companies struggling to adapt, the industry's coming of age is problematic. Consider: The revenues from investment banks' commodity trading operations, many of which were forced to sell their physical assets and were ultimately sold off, have stagnated over the past five years. Most niche players lacking scale and sophistication have shrunk. For example, commodity hedge funds primarily betting on price directions without assets suffered massive capital outflows over the period.

Independent traders are suddenly imitating asset-backed traders, rather than the other way around

In general, the industry's greater scale and sophistication raises the bar, both for those existing traders seeking to grow and for those companies considering entering commodity trading. New entrants' resolve is being tested as never before, especially as commodity prices remain flat in the near term.

Successful strategists are designing large systems and industrialized platforms that can maintain the high degree of entrepreneurship and individual talent required for them to act swiftly on monetizing opportunities. Hence the question becomes: Will independent traders industrialize to the degree required to continue to take on established top-tier asset-backed traders as they have done in the past? And if independent commodity traders improve their

resilience, will asset-backed traders be able to go on building out their capabilities and gaining market share at the same pace?

To be sure, while the current industry shift underway is significant, independent commodity traders have a solid track record of being able to not just meet, but also to exceed the industry's challenges. Still, the answer depends on whether players can recognize – and pull – the three key levers that have led to the exceptional growth and profitability of top-tier asset-backed traders in recent years. Those organizations approaching the large-scale change underway as three simultaneous and parallel challenges – the industrialization of processes, the monetization of interconnected analytics, and the mass-customization of customer solutions through partnerships – have a greater chance of succeeding in this undertaking.

1. **Industrializing processes.** One of the biggest challenges for commodity traders is that the pace at which they have amassed massive global portfolios of commodities and logistics and retail operations in recent years has outpaced the investment in processes that are needed to monetize their potential effectively. This is especially true for independent traders that have historically had an appetite for more complex deals, which require extensive oversight by their own staff and as a result cannot be easily integrated into a standardized trading workflow.

Consequently, the more commodity traders attempt to be all things to all clients, the more their costs rise – often faster than their revenues. Commodity traders are trading a much broader range of commodities with more numerous counterparties, handling more complex logistics chains, managing more multifaceted financial and operational risks, and delivering commodities to wholesale and retail customers in smaller lot sizes around the world.



To avoid this outcome, major energy companies have been refining their ability to incorporate their longstanding operational expertise into their trading divisions' cultures. They are standardizing, automating, and outsourcing processes. They are breaking down barriers between logistics operations and their supply and trading divisions in order to improve operational stability and efficiency. At the same time, they are standardizing and outsourcing finance, risk reporting, and post-trade handling matters.

Taken together as a whole, these efforts are having a significant impact. One leading asset-backed player, for example, was able to reduce the ratio of costs to trading income by more than 10 percentage points simply by standardizing and outsourcing more work.

2. Monetizing interconnected analytics.

Leading asset-backed traders are also developing a competitive edge in terms of automating the collection and analysis of their market intelligence in order to optimize the value captured from existing strategies and to develop entirely new opportunities. Traditionally, commodity traders have gathered market intelligence from personal networks of buyers, sellers, shippers, and agents with little formalized assessment and tracking. Centrally controlled fundamental market analytics have been critical, but these have often struggled to support fast-paced day-to-day front-office decisions.

But that's beginning to change.

Leading traders are breaking down their organization's heavy dependence on a handful of key individuals for critical decision making across global systems based on market intelligence.



They are strengthening their market, weather, and competitive intelligence-gathering capabilities by upgrading their systems to process the Big Data that exists across their massive operations. They are adopting remote-sensing technologies such as satellites and ground-based sensors to gather quasi-real-time market intelligence on waterborne vessels and pipeline flows, as well as the state of refineries, stockpiles, and tank farms worldwide.

By connecting their proprietary intelligence on flows, the condition of their assets, and competitor behavior with new technology-backed market and competitor intelligence, leading traders are able to improve the precision of their trading strategies, as well as identify new opportunities. To be sure, intelligence gathered by individuals will always be hugely important to the commodity trading industry. But the new front line for competition between commodity traders is shifting toward inferring meaningful

intelligence in a timely manner from a combination of proprietary intelligence and ground or remote sensing data from other sources. This can be achieved with so-called “smart machine” algorithms that learn to derive signals to trade by identifying patterns and anomalies.

3. Developing equity-based opportunities.

Top asset-backed traders are also beginning to play catch-up with leading independent commodity traders by successfully building out their business development and origination capabilities. In the past, top asset-backed traders have been slower than independent traders such as Vitol and Trafigura to strike capital-efficient partnerships in order to expand their capabilities and market access. That’s in large part because they didn’t have to. Most oil majors and other large commodity producers were already operating in most of the key markets and were able to mobilize resources globally more easily because of their already existent vast global production and processing networks.

But recently, asset-backed players have been entering partnerships in new markets to exploit profitable niches and emerging markets, especially in the Eastern Hemisphere. For example, Shell has been involved in a number of successful collaborations with logistics-services provider Royal Vopak N.V. related to infrastructure investments. BP is joining forces with Sinopec to gain access to the Chinese bunker fuel market. European utility traders are also considering Asian partnerships in order to expand and better optimize their global fuel and freight books.

Other traders are also entering deals backed by third-party master agreements with banking, logistics, project development, and engineering partners. They have discovered that these partnerships serve a dual purpose. They help their companies to avoid becoming slow and rigid in their quest for stability. At the same time, traders pick up clear guidance on complementary commodity classes, potential acquisition targets, and preferable deal structures.

BREAKING FROM THE PACK

The commodity-trading industry began as a fragmented band of individuals stepping in to smooth out global supply and demand imbalances and information asymmetries. But that's not where it will end. To remain front-runners, commodity traders must

industrialize in order to become nimble, global one-stop-shops for multiple commodities, in addition to providing for their financing, risk management, and logistics.

To do so, in the next five years, commodity traders will morph into organizations with all of the benefits and challenges of other mature industries. Like automakers, manufacturers, and financial-services firms before them, as commodity traders' business models become increasingly homogeneous, they will be under even more intense pressure to distinguish themselves from the pack.

This is a tall order for an industry made up of creative and nimble customers and key trading talent unaccustomed to more institutionalized cultures. Sluggish commodity markets and slipping trading margins could threaten traditional compensation structures and levels.

Nevertheless, leading independent traders must learn from asset-backed traders in order to grow and become more resilient. If the past is an indicator for the future, independent players will find nimble and swift ways to adapt and lead again. Conversely, asset-backed traders will need to continue to push the envelope in professionalizing the industry and strive to be more agile by exploring new, innovative ways to inexpensively optimize all of the options available in their massive global operations. No one can afford to sit still.

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COMMERCIAL DRONES

THE UNITED STATES MUST SPEED UP
GLOBALLY COMPETITIVE REGULATIONS

Georges Aoude • Peter Fuchs • Geoff Murray

By 2035, the number of unmanned aerial vehicles in operation in the United States is expected to surpass the number of manned aircraft in operation. The US commercial drone market could easily be worth \$5 billion, according to the Volpe National Transportation Systems Center, and the global commercial market may be several times greater.

Although the use of drones is relatively novel in the US, that is not the case with other developed countries. In Japan, for example, farmers have been using drones for decades to inspect crops. In Canada, police use drones for search-and-rescue operations. In the United Kingdom, drones are used for commercial photography. Yet in the US, such activities have been relatively rare because the Federal Aviation Administration (FAA) considers commercial drone usage illegal without special permission.

This past February, the FAA finally proposed regulations for commercial drones. Once the rules are finalized, the hope is that within a couple of years the US will be on par with many other countries. Already, the FAA has begun granting more exemptions for commercial drones, as well as blanket waivers for certain operators. (See Exhibit 1.) The US needs to continue to close its gap with other nations, or it risks leaving billions of dollars in economic growth on the table as drone service providers and customers take their business elsewhere.

TAKING THE LEAD

It is not too late for the US to take the lead. With more reasonable and globally competitive regulations, the US could still become a front-runner in this fast-changing, growing industry. The FAA is moving in the right direction by beginning to base rules on the actual risk that small, unmanned aircraft pose to the public. But the administration

2035

The year that unmanned aerial vehicles in operation in the United States should surpass the number of manned aircraft

must go further. It's important for the FAA to develop the risk-based foundation for drone regulations – not just for the purpose of unleashing the US market but to guide that more heavily fraught regulatory issue: privacy.

The rationale for the distinction between recreational and commercial drone activities mirrors the manned aircraft world, where commercial pilots are responsible for transporting large numbers of passengers safely in large aircraft and are held to the highest level of experience and training. Recreational pilots are held to a lower standard in terms of experience because of the lesser potential for harm to life and damage to property. However, there is little difference whether smaller drones are used for commercial or recreational purposes, as the risks they pose are similar. In both cases, the drones are unmanned, and the risk of damage to people, property, or manned aircraft is low.

After struggling with this and other issues, the FAA found that the manned aircraft framework cannot be readily applied to commercial drones. For example, the agency dropped the idea of requiring drone operators to hold pilot licenses.

This is the same lesson that regulators in other countries have learned. The technology is moving too quickly; the field to be regulated is too new. Lower risk activities must be permitted sooner rather than later; incremental regulations must be released when ready, and then improved, so that the technology can be introduced safely as soon as is practical.

Many countries distinguish instead between heavier drones (typically, those weighing more than 55 pounds) and lighter drones. The smallest drones, weighing less than 4.4 pounds, are treated differently in some countries because they pose a much lower safety risk than larger drones. Most commercial drones weigh far less than 55 pounds and operate below commercial airspace.

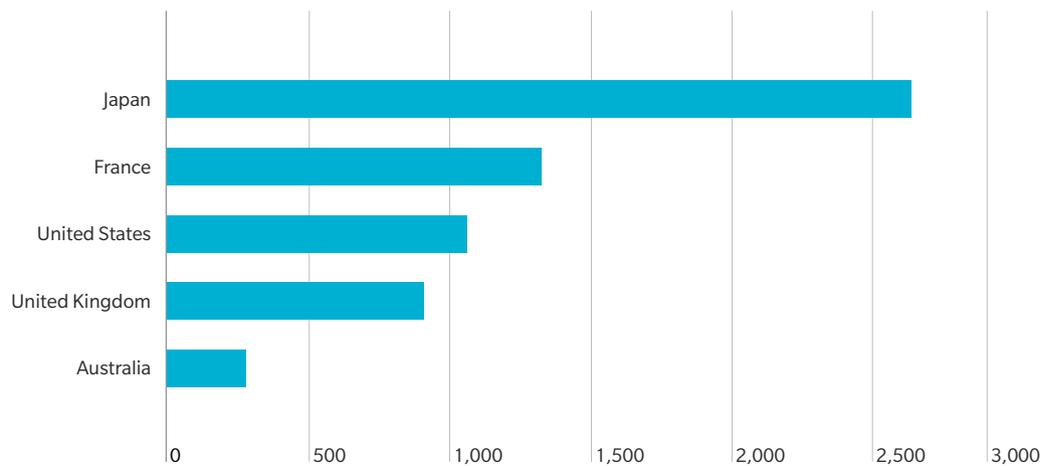
IMPROVED RISK ANALYSIS

Still, the process is far from perfect, as a recent spate of near misses with unauthorized drones in US airspace shows. Regulators' use of risk-based language is not always accompanied by a serious risk analysis and ranking of different types of drone operations. For example, how can the FAA justify stricter safety requirements for commercial drones than for recreational drones, when both involve exactly the same operations, unless the answer is simply that the law requires it?

The technology poses other conundrums for regulators to assess risk. For example, drones rely on shared, non-secure radio frequencies, and the radio link between the drone and its ground-based operator can be interrupted. Regulators worry about what could happen in the event of an interruption. Some drone manufacturers are addressing this issue by programming their drones to hover while waiting for the link to be re-established and to return to home base after a set period if a secure link is not re-established. Regulators and manufacturers continue to study solutions to the lost link issue.

EXHIBIT 1: GLOBAL COMMERCIAL DRONES: THE RACE IS ON

THE NUMBER OF REGISTERED COMMERCIAL DRONE OPERATORS IS RAPIDLY INCREASING WORLDWIDE



Source: Government data through August, Oliver Wyman analysis

The proposed FAA regulations conclude that even the smallest, lightest drones, those under 4.4 pounds, traveling beyond the line of sight of the operator (which would likely be the case in commercial operations) entail greater risk than heavier drones within the line of sight. But what is the true safety risk profile of different alternative operations under consideration? This rule would leave some highly anticipated activities, like package delivery, out of bounds.

DEVELOPING A TIERED SYSTEM

With a few modifications, the current airspace and regulatory structure may easily lend itself to drone operations. For example, current uncontrolled airspace could be approved for beyond-line-of-sight operations, while controlled airspace would be reserved to line-of-sight operations. Similarly, current regulations defining type of operation, including visual and instrument flight rules, could be applied to define when drone operations may and may not occur. And the current civil definition of flight operations, from light sport aircraft to commercial airline operations, lends itself to a tiered system of qualifications, regulations, and acceptable risks.

It is difficult to put a price tag on the lost opportunities in the US market resulting from regulatory constraints. However, the Association for Unmanned Vehicle Systems International estimates that each year of delay has a \$10 billion economic impact for the US. We expect that once the FAA issues reasonable

regulations, the US drone service providers will quickly catch up to their foreign competitors. Still, the first movers in other countries could achieve important short-term gains. At a minimum, they gain time to develop their brands in the market.

To catch up with the global drone industry, US regulators must stick to their plan of incremental rule updates that are risk-based and closely track industry developments.

This groundwork will be important as drone use becomes more widespread globally, and the public begins to call for strict privacy parameters. Typically, activities with lower safety risks, such as precision agriculture, oil and gas exploration, and wildlife conservation, have lower privacy risks because they are conducted in remote areas. The most sensitive concern is that people will use drones for surveillance or to fly over private property and transmit images. Privacy concerns will probably prove more difficult to manage than safety, and already some local authorities are issuing their own rules. Some privacy issues will certainly be covered by existing law, but there may be loopholes that regulators must catch as drones take to the skies.

US regulators should embark on a plan to catch up to global standards for prudent, risk-based regulations that meet these challenges. By doing so, the FAA can enable the safe deployment of new unmanned vehicles in the US without forcing the private sector to pay a steep price for its late start.

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This story first appeared on Forbes.com.



SELF-DRIVING FREIGHT IN THE FAST LANE

DRIVERLESS VEHICLES ARE ABOUT TO REWRITE
THE RULES FOR TRANSPORTING NOT JUST PASSENGERS,
BUT FREIGHT, TOO

Jason Kuehn • Juergen Reiner

Driverless cars, which are in development by Google, Tesla, Apple, and a slew of automakers, are expected to revolutionize personal transport in the next decade. Soon, driver-free trucks and locomotives will become a new economic imperative for freight railroads and motor carriers, as well.

Specialized automated trucks are already in use at off-road and remote locations, such as mines in Australia and Chile, military bases, and container terminals. On-road, they are being tested in the United States and Europe by Freightliner/Daimler, Volvo, and Peterbilt. Driverless trucks on open roads will face the same challenges as driverless cars, although trucks' added size and weight are likely to generate even greater public-safety concerns.

Trains are easier to run in an automated manner, as they use fixed guideways and do not have to deal with unpredictable traffic. Indeed, a number of short-haul mining operations in North America have used automated trains since the 1960s. Today, some 48 city metro systems worldwide are automated, as are dozens of airport shuttle and people-mover systems. In the second half of 2015, mining company Rio Tinto is expected to start up the world's first long-distance driverless freight rail service, with 42 trains operating over 1,000 miles of track in Western Australia.

So the question is not whether the technology is feasible for self-driving trains and trucks, but what the impact will be once it becomes more widely adopted. Research and development is much further along in the automation of trucking than in freight rail, in large part because trucking is more labor intensive and the economic benefits of automation greater. The compelling economics of autonomous trucking may change the transportation landscape so radically, however, that railroads

240,000

The anticipated shortfall of truck drivers in the United States by 2023

will have no choice but to respond in kind. To manage this transition safely, all parts of society – government, the private sector, and the public – will need to work in concert, with freight railroads and motor carriers leading the way.

ECONOMIC IMPACT OF AUTOMATION

A major benefit of driverless trucking would be its impact on the current and projected shortage of long-distance drivers in the United States and Europe. An aging population, lower wages (in the US, truck drivers earn only about half of what train crews do), tighter hours of service rules, and a younger generation less willing to spend long periods of time away from home mean that the US is short as many as 35,000 drivers – and could be short 240,000 by 2023, according to the American Trucking Association. Some 40 percent of truck drivers in Germany will retire over the next decade, as reported by the *Wall Street Journal*, which could lead to a shortfall of 250,000 drivers. Driverless trucks would reduce the demand for long-distance drivers; most remaining drivers could then be utilized for more complex local

pickup and delivery operations, which would solve many of the lifestyle issues faced by truck drivers.

Driverless trucks would yield other economic benefits as well: Today, trucks sit idle when drivers are in mandatory rest periods; autonomous trucks could be kept moving. This change alone could reduce driver costs by up to two-thirds and increase equipment utilization by one-third. Having trucks travel together in a closely spaced “platoon” with a driver only in the lead vehicle could cut fuel consumption by up to 10 percent. Accident rates could drop by up to 70 percent, resulting in lower casualty claims and likely lower insurance rates, especially if truck-dedicated lanes become a reality. Furthermore, it’s estimated that operating driverless vehicles with closer spacing and at more consistent speeds over long distances could increase highway capacity by 200 percent or more.

While railroads currently are able to fill most of their train crew jobs due to higher pay levels versus trucking, the lifestyle similarities between train crews and truck drivers suggest that a shortage of train crew personnel may not be too far away. Automation of locomotives would decouple work from the actual movement of trains, enabling operating support jobs to be converted to regular shift

assignments at fixed geographic locations and improving the appeal of railroading to employees who want more consistent schedules and to work near home.

At the same time, railroads could reduce their labor costs and boost their network capacity by running driverless trains. Asset utilization, service levels, and reliability also could improve, as they could operate more frequent, shorter trains at no cost disadvantage versus current operations – although such a change will require double-tracking the core network to enable trains to move in both directions at once in order to gain the “conveyor belt” benefits of automation. Such changes are likely to become necessary if driverless trucks reduce motor carrier costs enough to make them competitive with rail over longer distances. Otherwise, railroads could face a loss of market share that would be difficult to make up.

GOING DRIVERLESS: WHAT WILL IT TAKE?

Many of the technological building blocks for driverless trains already exist (or are being implemented) in the US and Europe: remote control systems, onboard computers that enforce speed limits and regulate movement, and software that optimizes train operation and fuel consumption.

The critical barrier at present to driverless trains is the issue of protection of the right-of-way, as trains do not have the means to detect and avoid obstacles in their paths. To overcome that impediment, several different strategies in tandem will be needed: Grade crossings may require upgrades or real-time monitoring systems to ensure the “box” within the gated area remains unobstructed. Automobile drivers will need to be more alert around crossings; in the US, for example, the Federal Railroad

250,000

The anticipated shortfall of truck drivers in Germany by 2025



Administration has partnered with Google to add all grade crossings to Google Maps. When the software is used for turn-by-turn navigation, it will warn drivers when they are approaching crossings.

With the implementation of positive train control (PTC), freight trains will be able to send their locations via satellite to an accessible database, much like the many transit systems that already offer tracking apps. It's not hard to envision a future of mobile phones lighting up and beeping loudly to warn drivers and pedestrians of an oncoming train in their vicinity, reducing the likelihood of accidents. (All this would require is that the phone's location tracking system be turned on and that it be running in the background.)

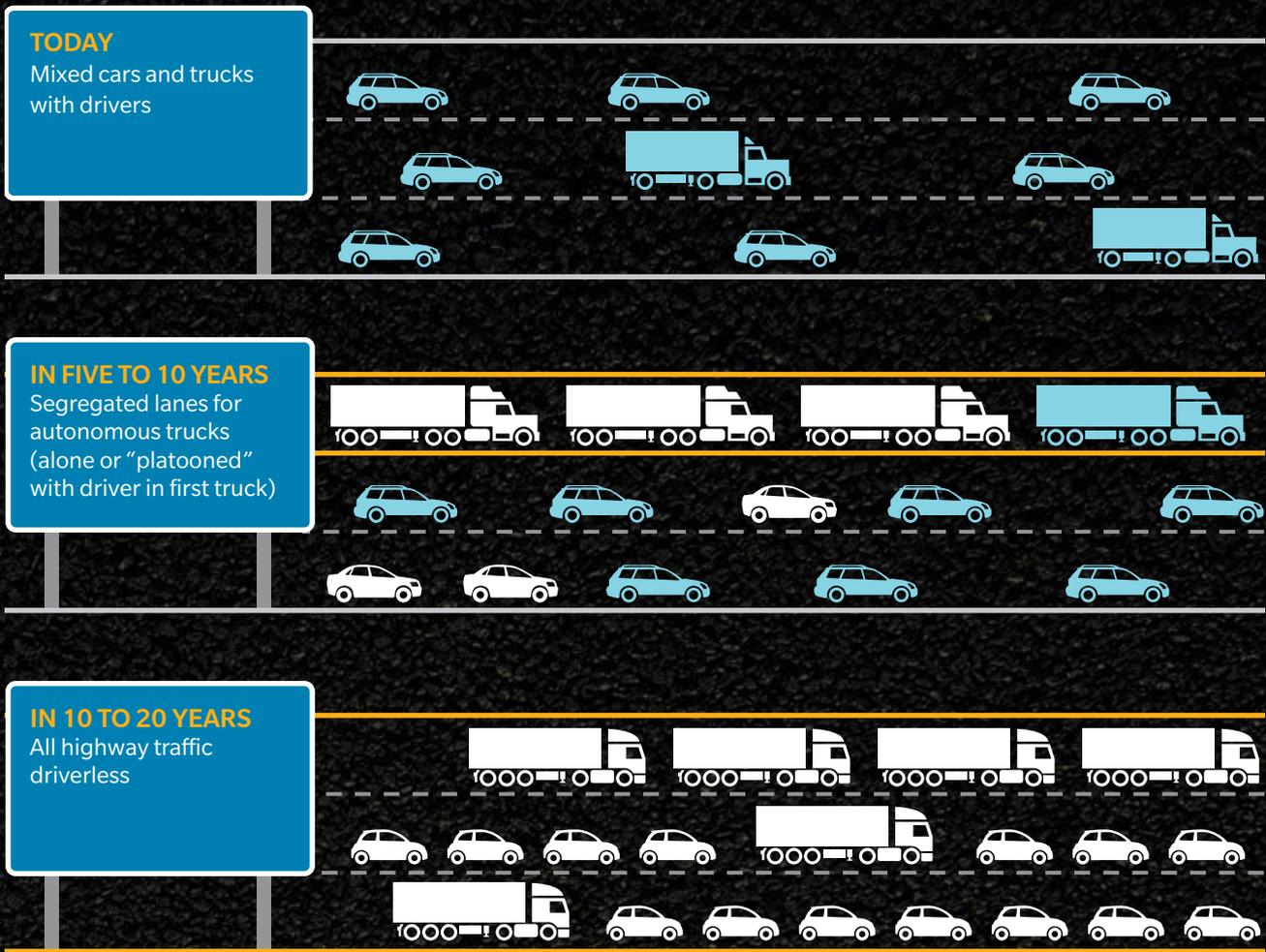
Of course, no rail corridor can be completely sealed off, which means trains will need obstacle detection and avoidance systems. Autonomous cars, for example, will use light detection and remote sensing technology, linked to the braking and steering systems, to avoid obstacles. The major challenge for an automated train will be determining what the obstacle in its path is and whether to brake for it – since sudden deceleration can create a risk of derailment. Is it a car that can't get out of the way – or a deer that can?

For autonomous trucks, the challenge is somewhat different, and likely greater, given that trucks operate on open roads with full public access. Many experts believe that gaining acceptance for driverless trucks will mean restricting them initially to dedicated

EXHIBIT 1: HIGHWAY TO THE FUTURE: DRIVERLESS ROADS

HOW HIGHWAYS COULD EVOLVE IN RESPONSE TO DRIVER-FREE VEHICLES

As driverless trucks come online in the next five to 10 years, they may initially be required to operate in segregated lanes. But once the practice becomes widespread, highways may be restricted to autonomous vehicles. While this transition is fraught with risk, it could yield substantial benefits.



- Top Five Benefits of implementation**
- Solve long-haul driver shortage
 - Increase highway/rail capacity
 - Reduce costs and increase asset utilization
 - Reduce accidents and claims
 - Reduce fuel consumption

- Top Five Risks of implementation**
- Public perception of safety risks
 - Significant funding requirements
 - Some technology is still in development
 - Need for regulatory change
 - Labor union resistance

■ Indicates driver
■ Indicates driverless
 Autonomous traffic lanes

Source: Oliver Wyman analysis



Steve Lagreca / Shutterstock.com

and segregated highway truck lanes. (See Exhibit 1.) In theory, building such lanes could be funded by instituting tolls. And while converting some lanes to autonomous-only vehicles would likely add to highway capacity (and thus cut congestion), this could be a political non-starter unless there are at least two lanes in each direction (or more, in heavily congested urban areas) available for conventional driving.

A reverse solution has been suggested to restrict conventional vehicles instead to special toll lanes, as they take up more capacity and are projected to have higher accident rates than autonomous vehicles. This might be an incentive for the more efficient solution; however, it is unlikely to gain public or political goodwill until autonomous vehicles become more widespread.

AUTONOMY: THE NEXT COMPETITIVE EDGE

The technology for driverless trucks and trains will largely be in place over the next three to five years, and the economic imperative will only escalate. Driverless trucking faces more hurdles, but has more to gain in terms of solving long-term industry structural problems. Railroads could face regulatory and labor union issues, but automation would be easier to implement from a technology standpoint. Most critically, failure by the railroads to move quickly enough could lead to an erosion of their traffic base, as driverless trucking would enable motor carriers to challenge railroads across a much wider swath of their market.

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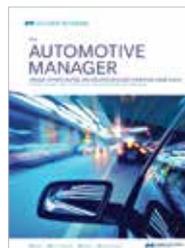
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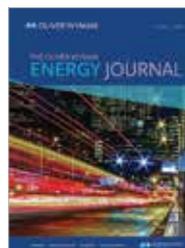
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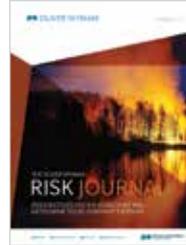
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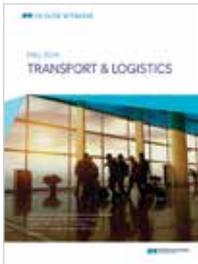
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