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Monday, December 10, 2018

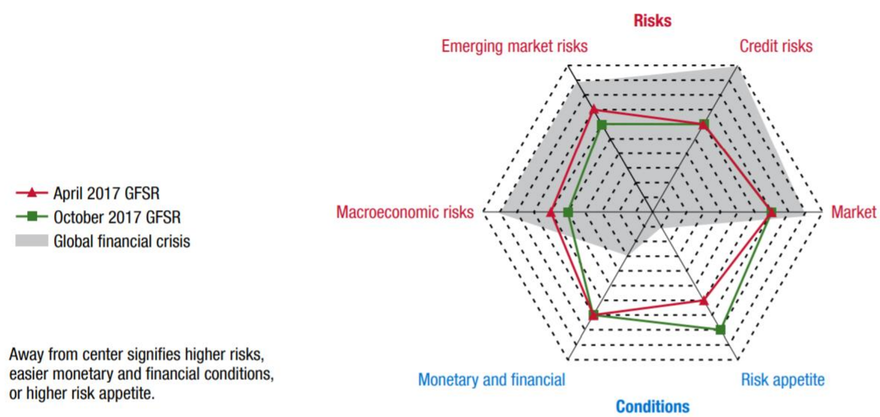
Top 10 risk and compliance management related news stories and world events that (for better or for worse) shaped the week's agenda, and what is next

Dear members and friends,

I have just read for the second time the paper "Global Financial Stability Report October 2017: Is Growth at Risk?", which is available at IMF eLibrary (www. elibrary.imf.org) and the IMF website (www.imf.org).

Figure 1.1. Global Financial Stability Map: Risks and Conditions

Risk appetite has grown markedly as near-term stability risks have declined.



Source: IMF staff estimates.
Note: The shaded region shows the global financial crisis as reflected in the stability map of the April 2009 *Global Financial Stability Rep*

According to the paper, the prolonged search for yield has raised the sensitivity of the financial system to market and liquidity risks, keeping those risks elevated. The widening divergence between economic and financial cycles within and across the major economies is discussed in page 65. Prolonged monetary accommodation — and a continuing need to sustain economic momentum — has contributed to a widening divergence between financial and economic cycles.

Rapid inflation of asset prices has ensued as large output gaps necessitate an unusually protracted period of low interest rates. This asset price growth has been accompanied by gathering strength in credit growth and rising leverage, the combination of which has facilitated strong financial expansion across several economies.

Such financial expansions have generally been accompanied by less remarkable economic recoveries, leading to only slowly dissipating negative output gaps. This divergence creates a challenge for monetary and financial policies to support economic recovery while ensuring that medium-term risks do not build.

Later in the document, we find very interesting information about cyber risks.

According to the paper, cyberthreats to financial institutions are growing, and events in 2016 and 2017 have altered the threat landscape substantially. There has been a sizable increase in the impact and sophistication of financially motivated cyberattacks on financial institutions.

Cyberthreats can be related to financial gain — including malware attacks — or can aim to destroy information technology systems. Some estimates place the economic losses of a hypothetical major global cyberattack as high as $53 billion (Lloyds 2017).

While the magnitude and frequency of attacks have grown, their nature has evolved as perpetrators have adopted operational models that replicate legitimate businesses, such as the use of vertically integrated software packages and cloud-based operations.

This evolution renders the technology both more potent and easier to access. Moreover, because cyberthreats are international and can become systemic, private sector institutions are not well positioned to respond effectively on their own.

A coordinated regulatory approach is needed, which would result in a consistent risk mitigation framework to support financial stability.

The systemic risk ramifications of a cyberattack could be substantial.

There are several channels through which cybersecurity events could threaten financial stability:
(1) data breach,
(2) disruption of business,
(3) integrity attack (modifications to internal data), and
(4) malicious activities (financial gain).

Greater reliance on technology, combined with the interconnection of the global financial system, means that many, if not all, participants in the system are at risk. Banks and financial market infrastructures, in particular, harbor the potential for contagious cyber risk, given their interconnection — so that attacks on individual financial institutions can quickly fan out across national financial systems and beyond.

You *must* read the paper at:
https://www.imf.org/en/Publications/GFSR/Issues/2017/09/27/global-financial-stability-report-october-2017

Welcome to the Top 10 list.

Best Regards,

George Lekatis

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Number 1 (Page 9)

International supervisory community meets to discuss challenges ahead for global bank supervision and regulation

BIS

Some 300 central bankers and banking supervisors representing more than 80 jurisdictions met this week in Abu Dhabi, United Arab Emirates, to discuss a range of policy and supervisory topics.

Events included a meeting of the Basel Committee on Banking Supervision and the 20th International Conference of Banking Supervisors (ICBS).

Number 2 (Page 12)

Looking ahead by looking back

William Coen, Secretary General of the Basel Committee on Banking Supervision, at the 20th International Conference of Banking Supervisors, Abu Dhabi, 28 November 2018.

BIS

"This is the 20th ICBS organised by the Basel Committee. The first one took place on 5-6 July 1979 in London, with over 200 participants from 83 countries.

The structure of the conference was very similar to our conference today, with three topical workshops held during the day along with panel discussions."

Number 3 (Page 19)

Malicious scripts make websites malicious

National Cyber Security Centre
a part of GCHQ

Malicious scripts are pieces of code which can be injected into a website or browser by a nefarious actor to steal sensitive information.

Another company recently admitted to suffering a data breach, with a fake Google script being the apparent cause.

Almost 10,000 people had their personal data compromised with 6,600 having financial data, including CVV number (sometimes called security code, which is found on the back of your card) compromised.

Number 4 (Page 21)

Lasting Impressions: Remarks before the CV Summit—Crypto Valley

Commissioner Hester M. Peirce, Zug, Switzerland (By Video)

"Crypto and blockchain, by facilitating payment and information transfers across the world, allow people to interact with one another without regard to geographic location.

As with any other human undertaking, many crypto projects will fail, but failure is part of the process of refining technology and discovering where and how it can be used to make people's lives better."

Number 5 (Page 26)

Good practices on interdependencies between OES and DSPs

This study is concerned with dependencies and interdependencies among Operators of Essential Services (OES) and Digital Service Providers (DSPs) as defined in the NIS Directive and addresses emerging dependencies and interdependencies across sectors.

The Network and Information Security (NIS) Directive entered into force in 2016, becoming the first piece of European legislation dealing with cybersecurity.

The directive was created with the objective of boosting the overall level of cybersecurity in the European Union.

It does so by increasing the cybersecurity capabilities in the Member States, by enhancing cooperation on cybersecurity among the Member States, and by requiring Operators of Essential Services (OES) and Digital Services Providers (DSPs) to manage their risks.

Number 6 (Page 28)

Banking conduct supervision - new challenges 10 years after the financial crisis

Carlos da Silva Costa, Governor of the Bank of Portugal, at the Conference on "Banking Conduct Supervision: new challenges 10 years after the financial crisis", hosted by the Bank of Portugal, Lisbon.

"I want to make three brief points in this opening address:

- The first point is about the growing importance of banking conduct supervision, from the perspective of safeguarding financial stability;

- The second is on the approach followed by Banco de Portugal in this respect;

- And finally a note about the digital challenge."

Number 7 (Page 33)

ESAs propose to amend bilateral margin requirements to assist Brexit preparations for OTC derivative contracts

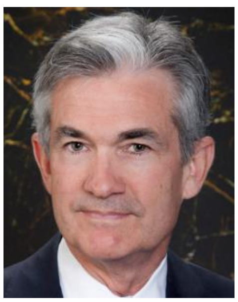
EBA European Banking Authority

The European Banking Authority (EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), together the European Supervisory Authorities (ESA), have published a final report with draft regulatory technical standards (RTS) proposing to amend the Commission Delegated Regulation on the risk mitigation techniques for OTC derivatives not cleared by a CCP (bilateral margin requirements) under the European Market Infrastructure Regulation (EMIR).

Number 8 (Page 36)

The Federal Reserve's framework for monitoring financial stability

Jerome H Powell, Chairman of the Board of Governors of the Federal Reserve System, at the Economic Club of New York, New York York.



"Today marks the publication of the Board of Governors' first Financial Stability Report. Earlier this month, we published our first Supervision and Regulation Report.

Together, these reports contain a wealth of information on our approach to financial stability and to financial regulation more broadly.

By clearly and transparently explaining our policies, we aim to strengthen the foundation of democratic legitimacy that enables the Fed to serve the needs of the American public."

Number 9 (Page 39)

Steering fintech for a prosperous society

Keynote address by His Excellency Dr Mohammad Y Al-Hashel, Governor of the Central Bank of Kuwait, at the Global Informatics Forum, Gulf University for Science and Technology, Kuwait City.

"ladies and Gentlemen, if you are 30 years old or younger, by a show of hands, how many of you have heard that sound before? You may not all be familiar with it but that, about 20 years ago, was the sound of a modem connecting to the internet.

It was the latest technology at that time, and it was the envy of older generations who had never dreamed of seeing such luxuries during their lifetimes."

Number 10 (Page 41)

NIST Evaluation Shows Advance in Face Recognition Software's Capabilities

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Between 2014 and 2018, facial recognition software got 20 times better at searching a database to find a matching photograph, according to the National Institute of Standards and Technology's (NIST) evaluation of 127 software algorithms from 39 different developers—the bulk of the industry.

The findings, together with other data in a NIST report, point to a rapidly advancing marketplace for face-based biometric matching algorithms.

Number I

International supervisory community meets to discuss challenges ahead for global bank supervision and regulation

BIS

Some 300 central bankers and banking supervisors representing more than 80 jurisdictions met this week in Abu Dhabi, United Arab Emirates, to discuss a range of policy and supervisory topics.

Events included a meeting of the Basel Committee on Banking Supervision and the 20th International Conference of Banking Supervisors (ICBS).

At the Basel Committee's meeting on 26-27 November, the Committee:

- agreed to a set of targeted revisions to the market risk framework, which will be submitted to the Basel Committee's governing body, the Group of Central Bank Governors and Heads of Supervision (GHOS). The revised framework seeks to enhance the risk sensitivity of the standardised approach, revise the calibration of certain elements of the framework, and improve certain aspects of the internal models approach. If endorsed by the GHOS, the framework would be published in early 2019;

- agreed to consult on potential enhanced disclosures to reduce bank window-dressing behaviour related to the leverage ratio;

- approved a set of revisions to the Pillar 3 disclosure framework, which will be published in December; and

- reviewed a report setting out the range of bank, regulatory and supervisory cyber-resilience practices across jurisdictions. This report will be published in December.

The Committee discussed its ongoing evaluation of its post-crisis reforms, including the usability of capital buffers; members reaffirmed the usefulness of buffers as a loss-absorbing mechanism.

The Committee took note of the comments received on its discussion paper on the regulatory treatment of sovereign exposures (https://www.bis.org/bcbs/publ/d425.htm).

The Committee also discussed its work programme and strategic priorities for 2019; it expects to publish the work programme in early 2019, following review and endorsement by GHOS.

The Committee agreed to consult next year on a framework which would consolidate the Committee's standards into a single integrated framework.

The ICBS, which was hosted by the Central Bank of the United Arab Emirates, took place on 28-29 November. More details:
https://www.bis.org/bcbs/events/icbs20/programme.htm

As the ICBS coincided with the 10th anniversary of the global financial crisis, delegates discussed the evolution of the regulatory landscape over the past decade and the implications for regulation and supervision.

Discussions at the ICBS included best practices for evaluating the impact of post-crisis reforms, the role of proportionality in the Basel framework, and the importance of implementing the post-crisis reforms in a full, timely and consistent manner.

Looking forward, participants exchanged views on the supervisory challenges following the completion of Basel III, the implications of financial technology for banks and supervisors, and the importance of strengthening operational resilience, including cyber-resilience.

The ICBS included keynote speeches by His Excellency Mubarak Rashed Al Mansoori, Governor of the Central Bank of the United Arab Emirates, William Coen, Secretary General of the Basel Committee on Banking Supervision, and Sir John Vickers, Warden of All Souls College at Oxford University, and panel discussions comprising current and former GHOS members.

William Coen, Secretary General of the Basel Committee on Banking Supervision, thanked the Central Bank of the United Arab Emirates for hosting a successful conference, and said that "it is imperative that we do not forget the lessons of the global financial crisis to prepare ourselves effectively for the challenges and risks that loom ahead."

His Excellency Mubarak Rashed Al Mansoori, Governor of the Central Bank of the United Arab Emirates, said: "It was a great honor to host the International Conference of Banking Supervisors (ICBS) and our esteemed peers and stakeholders from all over the globe this year under the patronage of Deputy Prime Minister of the UAE, H.H. Sheikh Mansour bin Zayed Al Nahyan. The financial sector is evolving at incredible speed, the world's financial markets are more interlinked and co-dependent than ever and new dynamics and risks are emerging every day.

Therefore, fostering coordination and cooperation through global conversations such as ICBS is crucial to ensuring that we all learn from the experience and insights of others, and creating effective regulatory frameworks that take the broader global context into consideration."

Notes

The Basel Committee is the primary global standard setter for the prudential regulation of banks and provides a forum for cooperation on banking supervisory matters.

Its mandate is to strengthen the regulation, supervision and practices of banks worldwide with the purpose of enhancing financial stability.

The ICBS, which has been held every two years since 1979, brings together senior central bankers and bank supervisors from around the world as well as representatives of international financial institutions.

The conference promotes the discussion of key supervisory issues and fosters the continuing cooperation in the oversight of international banking.

With its wide membership of senior supervisors and policymakers, the ICBS presents a unique opportunity for a broad-based discussion on issues that are timely and relevant to supervisors in advanced and emerging market economies alike.

Number 2

Looking ahead by looking back

William Coen, Secretary General of the Basel Committee on Banking Supervision, at the 20th International Conference of Banking Supervisors, Abu Dhabi, 28 November 2018.

Excellencies,
Governors and Heads of Supervision (past and present),
Sir John Vickers,
Distinguished members of the Basel Committee,
Ladies and gentlemen,

Good morning, sabah al kheir, and welcome to the 20th International Conference of Banking Supervisors (ICBS).

I would like to express my sincere thanks to Governor Mubarak Al Mansoori and the Central Bank of the United Arab Emirates (UAE) for hosting us in this splendid venue.

This is the Year of Zayed, marking 100 years since the birth of Sheikh Zayed bin Sultan Al Nahyan, the first President of the UAE. And this Sunday (2 December 2018) will mark the 47th National Day of the UAE under the theme of "This is Zayed. This is the UAE.".

Sheikh Zayed's long-term vision transformed the UAE into the remarkable and prosperous country that it is today, and I have no doubt that this is only the beginning for this country.

This is the 20th ICBS organised by the Basel Committee. The first one took place on 5-6 July 1979 in London, with over 200 participants from 83 countries.

The structure of the conference was very similar to our conference today, with three topical workshops held during the day along with panel discussions.

Some of the topics discussed at that ICBS included the supervision of international bank lending, banking supervision on a consolidated basis, and the regulation of banks' foreign exchange business.

The Basel Committee chairman at that time, Peter Cooke (Head of Banking Supervision at the Bank of England) opened the conference by setting out his vision for the ICBS.

As he put it, the aim of the ICBS is not "to achieve formal agreement on any issues-there will be no votes, no resolutions-I would hope however that there may emerge a broad-based consensus on a number of issues which will be discussed in the course of the sessions".

Cooke also stressed that the ICBS was an opportunity for the Basel Committee to "have the benefit of the comments of all [participants] who are concerned in the matters it is discussing". This vision continues to hold almost forty years later.

The theme of this year's conference is about looking back in order to look ahead more effectively. This ICBS coincides with the 10-year anniversary of the global financial crisis. So it is an opportune time to look back at what happened over the past 10 years, and what this means for the years ahead.

Looking back: "The enemy is forgetting"

I thought that, in the time that I have today, I would list the Basel Committee's publications over the past 10 years. There are over 350 such publications, so luckily for you, I don't have that much time!

The past decade has certainly been a productive one from the regulatory perspective. Indeed, much has been said about the causes, lessons, and regulatory and supervisory responses to the global financial crisis.

The usual narrative is to go through the various episodes of bank distress and highlight the positive responses by policymakers.

As I have done this myself on several occasions, I do not plan to go through these issues in detail today.

Instead, I would like to highlight a few vignettes from the past decade that illustrate the real costs of the crisis.

Consider first the shipping industry. Maritime transport is the backbone of global trade.

Whether it's through Port Zayed here in Abu Dhabi or the Port of Shanghai, billions of tonnes of goods are shipped each year.

The global financial crisis struck at the heart of this important industry. To give just one example, the Baltic Dry Index - which measures the demand for shipping capacity - reached a record high level in May 2008 before plummeting by 94% in December that year to its lowest level since 1986.

Another casualty of the crisis was the automotive industry. With almost 100 million vehicles produced last year, the industry is another pillar of the global economy.

And yet it was in critical condition following the onset of the global financial crisis.

For example, two of the three biggest US automakers (which collectively employed 1.6 million people at that time) were staring at bankruptcy and liquidation. This prompted an $80 billion bailout by the US government to prevent such an outcome.

What about households' savings? In 2008, money market mutual funds (MMMFs) managed $5 trillion in assets globally. The "breaking of the buck" of the Reserve Primary Fund on 16 September 2008 saw the value of its shares drop from $1 to 97 cents.

Following the announcement, investors withdrew $200 billion from prime MMMFs. But it was not an isolated event. What is perhaps less known is that up to 28 other MMMFs broke the buck in 2008, with one fund losing nearly 10% of its value.

And it was not just the private sector that was painfully exposed to the effects of the crisis. Since 2007, there has been a continuous rise in the global stock of public and private debt, reaching almost 220% of global GDP at the end of last year, with global government debt increasing by more than a third during this period.

This build-up in debt levels reflects in part the sheer scale of government interventions in response to the financial crisis. A recent research paper estimates the direct costs of bailouts from the crisis in the US alone to have been about $500 billion, with a further $400 billion fiscal stimulus package.

Put differently, a crisis that was triggered by unsustainable levels of leverage has resulted in even higher levels of leverage.
Growth in public sector debt has more than replaced the decline in private sector debt.

None of the examples that I have highlighted relate to the distress experienced by banks during the financial crisis. This is deliberate, as our ultimate focus as central bankers and supervisory authorities isn't about a bank failing, but rather the impact of that failure on the real economy and the provision of financial services to households and businesses.

These snapshots, while anecdotal in nature, help to portray the global and multifaceted impact of the financial crisis, which continues to scar us to this day. Recent research by the IMF suggests that output levels remain below pre-crisis trends in more than 60% of economies.

Importantly, this includes advanced and emerging market economies that did not suffer a systemic banking crisis in 2007-08, and painfully illustrates the negative cross-border spillover effects of financial crises.

For example, the UAE was not immune from the effects of the global financial crisis. Dubai World, the investment company behind many of the spectacular projects in Dubai (such as The Palm Islands and The World), faced a debt standstill in November 2009, resulting in a $10 billion aid package from Abu Dhabi.

These effects are seen not just in economic and financial numbers, but in societal patterns at large. Recent research has shown how post-crisis global economic performance has had a significant impact on both migration and fertility rates, with these long-lasting effects yet to be fully felt.

There are now fewer graduates entering the financial sector, with an increasing number opting for what some may view as more socially useful activities!

As former Federal Reserve Board Chairman, Ben Bernanke, said recently, "For those working to keep our financial system resilient, the enemy is forgetting".

As we look forward, we simply cannot afford to forget the devastating impact of financial crises. As memories fade, don't underestimate how difficult it will be to not forget, or to not become complacent. Sooner or later, we will again hear the mantra that "this time it's different".

Looking ahead: mission accomplished?

I hope I have jolted your memory of the impact of the global financial crisis. A key question for us today is whether we have done enough, and what lies ahead in terms of future challenges and risk.

The main elements of the Basel Committee's post-crisis reforms are well known.

These include improving the quality of bank capital, increasing capital requirements, enhancing risk capture and reducing excessive risk-weighted asset variability, constraining leverage by imposing a minimum leverage ratio and incorporating macroprudential and liquidity risk elements into the Basel framework.

These reforms have strengthened the resilience of the banking system.

Since 2011, the leverage ratio of internationally active banks has increased by almost 70%, and now stands at around 6%.

The Common Equity Tier 1 (CET1) risk-weighted ratio has increased by 80%, from around 7% to 13%. Banks now fund themselves with 85% more CET1 capital, and hold 50% more high-quality liquid assets.

But have they gone far enough? This is an important question, 10 years after the start of the crisis. This is why the Committee has put in place a comprehensive work programme to evaluate the effectiveness, interaction and coherence of its reforms.

I cannot do the question justice in my remarks today, but I'll offer the following observations:

- There will be another financial crisis. This is almost a certainty with a fractional reserve banking system that relies on leverage and maturity mismatch. Our job as regulators and supervisors is not to prevent future crises, but to reduce their likelihood, and perhaps more importantly, their impact on the real economy. And whether the next crisis starts from within the banking system, the shadow banking system, central counterparty clearing houses or another part of the financial system, it will affect the banking system in one way or another.

- There will be a "Basel IV" at some point in the future, even if it may not be called as such. There are no shortages of risks looming across the financial system, and we are witnessing financial innovation taking place at a dizzying pace. The regulatory framework needs to adapt to new risks and lessons learned from the crisis. Rest assured: I don't expect Basel IV to happen anytime soon (though some in the industry may think that it already has happened)! But I can say with a fair degree of certainty that the Basel framework in place today will not be the same one in place at the 30th ICBS.

- Despite our collective best efforts in strengthening the regulatory framework, the final Basel III framework represents a consensus among Committee members, which in turn means that it may not necessarily reflect a theoretically "first best" outcome. Put differently, some aspects of the framework, whether the overall calibration or the risk weights for specific asset classes, may be more justifiable from a narrow shorter-term perspective than a longer-term financial stability viewpoint.

Importantly though, the Basel framework includes a number of levers to allow jurisdictions to apply additional safeguards if needed.

First, the framework consists of minimum standards, and jurisdictions are free to, and encouraged to, apply higher standards if warranted for their banking systems. There are many examples of such measures that have been applied across a number of jurisdictions.

Second, an important element of Basel III is its macroprudential framework, which allows for a global coordinated approach for authorities to continuously monitor emerging system-wide risks.

If needed, jurisdictions can respond to such risks by activating or increasing the countercyclical capital buffer, and other Committee jurisdictions are expected to reciprocate such decisions.

We have already seen this framework put into practice, and I encourage all jurisdictions to make use of this tool as the credit cycle evolves.

Third, any known gaps or "second best" outcomes in the minimum requirements (Pillar 1) framework can, and should, be supplemented through robust and rigorous supervision.

This means that supervisors will need to go even further in overseeing banks' activities, changes in business models and emerging risks.

It will inevitably require them to take decisions that may be viewed as unpopular in the short term, but which will help strengthen financial stability over the medium term.

As has often been said - supervisors' value is greatest at a time when they are valued least. And, more than ever, it means that international collaboration among central banks and supervisory authorities is critical.

I will end with one final observation. The global financial crisis raised fundamental questions about ethics, incentives and moral behaviour.

While there have been a set of global and national post-crisis measures related to conduct, accountability and governance, the breach in trust between the banking system and the general public has yet to be restored. Some banks are fond of saying that, 10 years after the crisis, it is time to move on.

And yet, 10 years after the crisis, we continue to see episodes of bank practices that breach any basic ethical and moral principles. I think more may be needed to instil these principles in the financial system and help restore the adage that "my word is my bond".

Conclusion

In conclusion, the Basel Committee's comprehensive post-crisis reforms have undoubtedly enhanced the resilience of the banking system. That increased resilience is there for a reason: there is no shortage of risks in the financial system today, and the likelihood of a future financial crisis occurring only increases with time.

To mitigate the impact and likelihood of future crises, it is imperative that the Committee's reforms be implemented by its members in a full, timely and consistent manner, and that central banks and supervisory authorities remain alert to emerging risks and take additional regulatory and supervisory actions where needed.

And it is important that we keep an open mind as to whether we have gone far enough in strengthening the resilience of the financial system.

As Sheikh Zayed once said, "He who does not know his past cannot make the best of his present and future, for it is from the past that we learn."

We have the opportunity over the next two days to review the lessons from the global financial crisis and prepare ourselves for the years ahead. I wish you an enjoyable and productive conference.

Number 3

Malicious scripts make websites malicious

Malicious scripts are pieces of code which can be injected into a website or browser by a nefarious actor to steal sensitive information.

Another company recently admitted to suffering a data breach, with a fake Google script being the apparent cause.

Almost 10,000 people had their personal data compromised with 6,600 having financial data, including CVV number (sometimes called security code, which is found on the back of your card) compromised.

The most recent breach comes after a number of high profile data breaches this year, such as British Airways and Newegg, in which malicious scripts were used on websites or cloud servers to compromise customer data.

Companies should ensure that their websites are secure, and individuals should ensure that they do not send personal or financial information on illegitimate websites.

The NCSC recommends that all online services undergo regular security reviews – including pentests – and public sector websites can benefit from the NCSC Web Check configuration and vulnerability scanning service.

To learn more:
https://www.ncsc.gov.uk/guidance/penetration-testing

https://www.ncsc.gov.uk/active-cyber-defence

The NCSC has also published seven tips for staying safe online before, during and after bagging Black Friday bargains.

You can also learn more about how to stay safe before, during, and after making online purchases in a new series of podcasts.

To learn more:

https://www.ncsc.gov.uk/blog-post/lets-have-cyber-chat-about-black-friday

https://www.ncsc.gov.uk/cyber-chat

Number 4

Lasting Impressions: Remarks before the CV Summit—Crypto Valley

Commissioner Hester M. Peirce, Zug, Switzerland (By Video)

Greetings to the Crypto Valley Summit from the United States. I am sorry that I cannot be with you in person, but I am honored to be able to address you by video.

In some ways, it is fitting for me to be with you thanks to technology since technology has played such an important role in bringing the world together.

Crypto and blockchain, by facilitating payment and information transfers across the world, allow people to interact with one another without regard to geographic location.

As with any other human undertaking, many crypto projects will fail, but failure is part of the process of refining technology and discovering where and how it can be used to make people's lives better.

Before I go any further, I have to give the standard disclaimer, one that will not come as a shock to you.

What I say represents my own views and not necessarily those of the U.S. Securities and Exchange Commission or my fellow Commissioners.

The first time I was in Switzerland was as an eighteen-year-old. A friend and I were traveling around Europe by train and surviving on a diet consisting primarily of Nutella.

Besides the diet, one of the clearest memories I have of the trip all these years later was the youth hostel in Geneva, which was the most wonderful place we stayed during our entire trip.

It was well-laid out, spotlessly clean, and welcoming. The impression that Switzerland made on my young mind has stuck with me ever since.

The young people of today are on much more remarkable adventures than I was at their age.

With their deep understanding of technology and unbounded imaginations, they are attempting to transform the way so many aspects of our lives work.

Because that impression of the Geneva youth hostel has stuck with me all these years later, I cannot help but wonder what impressions are being seared into the minds of this new generation as they are on their entrepreneurial journey.

Specifically, I wonder what views they are forming of the environment for entrepreneurship in different countries around the world.

Their impressions of Switzerland, which has welcomed new technologies, may be as positive and long-lasting as my own early memories. There is a good reason you are meeting in Crypto Valley.

Will the United States regulatory environment leave a similarly welcoming impression in the minds of today's entrepreneurs?

I am concerned that the answer to that question is no, but there are some reasons to hope for a more positive answer. I will talk briefly about both my reasons for optimism and pessimism.

Let's get the bad stuff out of the way first.

The numerous state and federal regulators in the United States have taken a variety of approaches with respect to cryptocurrency, which makes it difficult for entrepreneurs to know what law will apply to their projects.

This uncertainty is a natural consequence of our diffuse financial regulatory system.

The benefit of such a system is that it allows for experimentation with different regulatory approaches, but the burden of such a system is that operating nationwide often means having to comply with multiple regulatory schemes.

Particularly in a space like crypto, which seeks to bring individuals across far-flung distances into a single market, structuring one's business to avoid a burdensome regulatory regime can in itself be a difficult legal exercise with large penalties for getting it wrong.

Regulators are coming to terms with crypto in different ways and do not always coordinate with one another, so the United States is admittedly sending mixed messages.

For example, our sister regulator, the Commodity Futures Trading Commission, has allowed the development of crypto-derivatives markets, but the SEC so far has not approved any application to list an exchange-traded product based on cryptocurrencies or crypto-derivatives trade on U.S. exchanges.

Each of these exchange-traded products, of course, is considered in light of its own facts and circumstances and the comments we receive, but the themes underlying the rejections so far concern me.

There is a discomfort with the underlying markets in which cryptocurrencies trade, a skepticism of the ability of markets to develop organically outside of a traditionally regulated context, and a lack of appreciation for the investor interest in gaining exposure to digital assets as part of a balanced investment portfolio.

The SEC's reaction to these exchange-traded products is not surprising; regulators have an unfortunate habit of allowing their own conservatism and their legitimate fear that they will be blamed when investments go wrong to curtail investors' options.

I, however, favor an approach that allows investors—informed by good information about the relevant exchange-traded product and encouraged to exercise a healthy dose of skepticism—to choose whether or not to buy the product. I am working on convincing my colleagues.

The SEC, in this area and many others, could do a far better job in providing information to investors.

It has been a real honor for me to be able to talk with entrepreneurs involved in the digital assets space, but doing so also has made me aware of how difficult it is for people who are not used to interacting with the agency to understand what is happening inside our black box.

For example, when it comes to the crypto-exchange-traded product approval process, the fact that these decisions are generally made in the first instance at the staff-level through delegated authority from the

Commission is very confusing. The quick explanation is that there are five of us Commissioners.

We have the final say on enforcement and regulatory decisions by the Commission, but because our jurisdiction is quite large, we allow the staff to make certain routine decisions on our behalf.

Once the staff publishes its decision, if one of the Commissioners or the affected party does not like the decision, it can be reviewed by the Commission.

Another example is our recent decision to suspend trading for ten days in two foreign exchange-listed crypto-based products that were being traded in the United States over-the-counter markets.

The SEC was concerned that there was confusion about just what the products were because they were not being described consistently. Unfortunately, we too confused investors.

We did not make it clear that even after the ten-day suspension was up the products would not automatically resume trading in the way they had prior to the suspension. Before trading as usual could resume, there would have to be a whole new round of paperwork and a new regulatory approval.

We need to do a better job at explaining how and why we make decisions and what those decisions mean to you, the investor.

That brings me to the positive. Last month, the SEC launched its Strategic Hub for Innovation and Financial Technology, which is a virtual forum for thinking through the regulatory challenges associated with developing technologies.

FinHub, as it is known, is just a start, but it does reflect the SEC's interest in being a better source of information for people attempting to understand how to operate legally under a regulatory framework developed over so many decades.

Our use of the securities laws to go after frauds masquerading as crypto-ventures is another positive development.

Resources that would have been contributed by eager investors to these fraudulent projects can instead go to those of you who are seeking to build something with real value to society.

I am hopeful that we can also offer some guidance to help people trying to raise money for legitimate purposes to do so legally. Indeed, some members of Congress have asked us to do just that.

More generally, there is a growing eagerness in regulatory agencies to understand the promise of the new technology.

The SEC recently appointed someone to "coordinate efforts across all SEC Divisions and Offices regarding the application of U.S. securities laws to emerging digital asset technologies and innovations, including Initial Coin Offerings and cryptocurrencies."

The CFTC recently held a two-day FinTech Forum.

The Bureau of Consumer Financial Protection has an active Office of Innovation.

Thank you all for allowing me to join you from afar. I am sorry that I could not be there for this morning's "Initial Coffee Offering" and the fascinating conversations that have undoubtedly followed it.

If you are in Washington, DC, please stop by for a visit. I would be interested in hearing about the exciting work you are doing and how the SEC can make the United States more welcoming for entrepreneurs in crypto and blockchain.

In the meantime, I hope that you have a productive and enjoyable conference.

Number 5

Good practices on interdependencies between OES and DSPs

This study is concerned with dependencies and interdependencies among Operators of Essential Services (OES) and Digital Service Providers (DSPs) as defined in the NIS Directive and addresses emerging dependencies and interdependencies across sectors.

enisa European Union Agency for Network and Information Security

The Network and Information Security (NIS) Directive entered into force in 2016, becoming the first piece of European legislation dealing with cybersecurity.

The directive was created with the objective of boosting the overall level of cybersecurity in the European Union.

It does so by increasing the cybersecurity capabilities in the Member States, by enhancing cooperation on cybersecurity among the Member States, and by requiring Operators of Essential Services (OES) and Digital Services Providers (DSPs) to manage their risks.

In relation to the latter, an important element of the risk to be assessed is the one of the dependencies of the services offered on other services of either OES or DSPs.

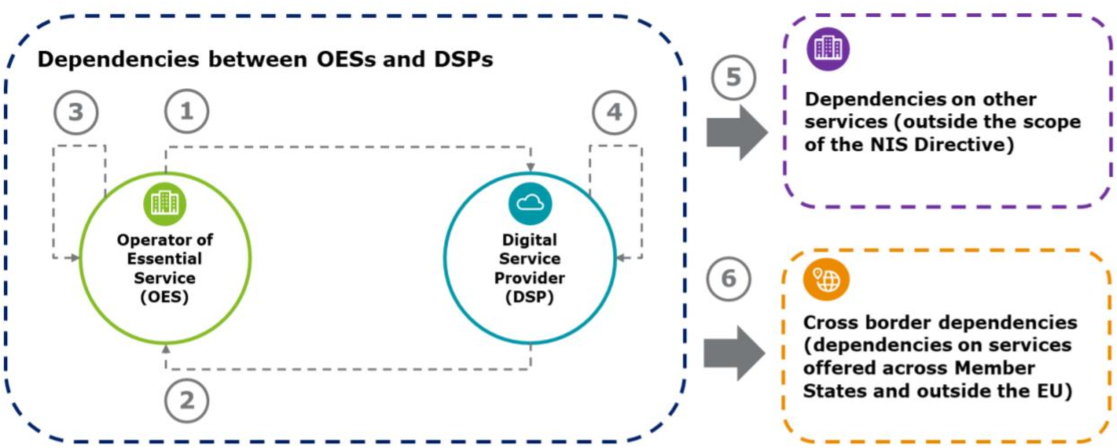


Figure 1 Dependencies (and Interdependencies) among OES and DSPs

These dependencies might be of either national or cross-border nature.

A glance at the interdependency landscape reveals a number of emerging interdependencies between OES/DSPs at both system and service level.

There is an increasing number of cybersecurity incidents that, due to these interdependencies, either propagated across organisations, often across borders, or had a cascading effect at the level of essential services.

Yet, despite the clear need to address interdependencies as part of their overall cybersecurity risk management, organisations and National Competent Authorities (NCAs) face difficulties due to the lack of suitable methods, tools, available data and expertise.

In order for OES, DSPs and National Competent Authorities (NCAs) to effectively identify and assess interdependencies, a framework based on a 4-phase approach appears to be a suitable way forward.

Existing methods, tools and good practices for interdependencies can easily be mapped to these 4 phases based on the respective individual or sectorial specificities and needs.

The development of indicators for the interdependencies' assessment, which are mapped to well-known and widely used industry standards and frameworks would also constitute a practical approach.

To read the paper:
https://www.enisa.europa.eu/publications/good-practices-on-interdependencies-between-oes-and-dsps

Number 6

Banking conduct supervision - new challenges 10 years after the financial crisis

Carlos da Silva Costa, Governor of the Bank of Portugal, at the Conference on "Banking Conduct Supervision: new challenges 10 years after the financial crisis", hosted by the Bank of Portugal, Lisbon.

Good morning and welcome,

It is with particular satisfaction that Banco de Portugal is hosting this Conference, 10 years after the Bank was given a far-reaching mandate in banking conduct supervision.

The importance given to supervising the conduct of banking institutions in their relationships with customers and depositors is still relatively recent, although we now know that it is a fundamental duty to ensure the confidence of bank customers, and subsequently safeguard the stability of the financial system.

I want to make three brief points in this opening address:

- The first point is about the growing importance of banking conduct supervision, from the perspective of safeguarding financial stability;

- The second is on the approach followed by Banco de Portugal in this respect;

- And finally a note about the digital challenge.

Importance and evolution of banking conduct supervision

The international financial crisis reinforced the perception that the relationship between bank customers and credit institutions tends to be asymmetrical and the uninformed behaviour of bank customers generates risks to the financial system.

This risk is greater:

(i) the lower customers' financial literacy is, in terms of having specific skills and the knowledge required to make financial decisions tailored to risk, and

(ii) the lower customers' financial skills are, in terms of their capacity to manage day-to-day expenses and anticipate and prevent the risk of future financial expenses or burdens.

As a consequence, it has become clear that financial literacy and skills are a requirement for financial stability.

Sound or sustainable financial decisions made by each individual functioning in a given economic and financial space - especially bank customers - are key to financial stability.

However, they are not enough in themselves, as economic agents do not consider and therefore do not incorporate the externalities that derive from their decisions or actions, particularly the systemic risk.

This observation is especially important when the market is euphoric, as is the case with the residential real estate and mortgage markets.

The intensity and propagation of distorted expectations of asset price increases are greater the lower the financial literacy and experience of a particular population.

This means that an improvement in financial education contributes to financial stability but does not prevent negative externalities which threaten the stability of the financial system.

Measures are also needed to tackle negative systemic developments resulting from the interaction of individual decisions even when well-founded - measures which aim to mitigate negative systemic effects on the stability of financial institutions.

Such measures would be incumbent upon the financial literacy and skills of the economic agents and, in particular, their ability to interpret the signs that result from the intervention of the prudential authorities.

As a rule, a reduced capacity to interpret this intervention creates a greater risk of a bubble developing in the market and as a consequence determines a need for more interventionist prudential measures on the credit granting side or on the savings application side, to guarantee financial stability.

Financial literacy and education are therefore key for financial stability and for the nature of conduct and macroprudential supervision policies.

In short, to safeguard financial stability, it is not enough to monitor individual choices or to regulate the conduct of banking institutions with their customers.

It is also necessary to monitor the system as a whole, to mitigate the negative externalities of individual actions, as well as the supervision of each financial institution to ensure its financial strength, in particular its capacity to absorb the risks resulting from the application of the resources entrusted to it.

The relevance of financial literacy and education has increased even more with the globalisation of markets and growing sophistication of products. Widespread access to banking products and services that are ever more diverse and complex and the emergence of new sales channels have all brought new risk sources.

We have therefore seen, at international level, the progressive strengthening of the framework of rights granted to banking customers, a broadening of areas of intervention for conduct supervision and more intrusive action by the supervisors.

The objective is to encourage the adaptation of products and services to the characteristics and needs of customers and prevent conflicts between the interests of customers and institutions.

Financial information and education for banking customers has also come to be seen as a structural dimension of banking conduct supervision, complementary to regulation and oversight.

More informed customers and with a greater ability to understand the characteristics of banking products and services are generally more attentive and demanding.

They are also better prepared to choose banking products and services more suited to their financial situation, needs and risk profile, thus contributing to the efficient operation of the market and to safeguard financial stability.

Banco de Portugal's conduct supervision strategy

Banco de Portugal began exercising its conduct supervision mandate at the outbreak of the international financial crisis.

We have adopted a strategy based on three fundamental vectors of action since the beginning, which are mirrored in the themes of this conference's panels:

(i) Firstly, Banco de Portugal's strategy is based on the development of a regulatory framework that covers and regulates the conditions to market the products and services of retail banks;

(ii) Secondly, Banco de Portugal is responsible for compliance with the regulatory framework applicable to the relationships between credit institutions and their customers through effective oversight and sanctions procedures;

(iii) And finally, but no less important, we have, since the beginning, worked hard to inform and educate banking customers.

Examples of this are the Bank Customer Website, launched in 2008 and completely renewed in 2017, and the National Plan for Financial Education, promoted with the other financial sector supervisors and which is supported by a large network of partners.

Digital challenges

I will end my address, as I couldn't refrain from doing, with a reference to the challenges the conduct supervisor faces due to the progressive digitalisation of the channels used in the sale of financial products and services.

The digital environment encourages the emergence of innovative products and services and new suppliers, with business models that are sometimes disruptive in comparison to traditional banking.

Furthermore, the dematerialisation associated with using digital channels facilitates the sale of products and the provision of cross-border banking services.

Regulators and conduct supervisors must therefore take on an active role in the digital ecosystem, catalysing the benefits and safeguarding against risks that may emerge.

Regulation and supervision should not impede innovation but they should ensure that the bank customer is protected, regardless of the channel used to carry out banking transactions.

The conduct supervisor must therefore:

- Closely accompany the technological innovation process in the retail banking markets;

- Reflect on the suitability of the existing regulatory framework;

- Develop new oversight tools and surveillance strategies to ensure that the regulatory framework is suitably complied with, that conditions for all operators are equitable and that banking customers are protected.

Promoting the financial literacy of bank customers is also of particular importance. That is why the development of digital financial information and education initiatives is one of our top priorities.

So I invite you to get to know the campaign recently launched by Banco de Portugal on social networks and on the Bank Customer Website to promote the security of young people who use digital channels.

Thank you all and I hope that this Conference is beneficial to all those present.

Number 7

ESAs propose to amend bilateral margin requirements to assist Brexit preparations for OTC derivative contracts

The European Banking Authority (EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), together the European Supervisory Authorities (ESA), have published a final report with draft regulatory technical standards (RTS) proposing to amend the Commission Delegated Regulation on the risk mitigation techniques for OTC derivatives not cleared by a CCP (bilateral margin requirements) under the European Market Infrastructure Regulation (EMIR).

The draft RTS propose, in the context of the United Kingdom's (UK) withdrawal from the European Union (EU), to introduce a limited exemption in order to facilitate the novation of certain OTC derivative contracts to EU counterparties during a specific time-window.

The amendments would only apply if the UK leaves the EU without the conclusion of a withdrawal agreement – a no deal scenario.

The draft RTS complement the similar proposal published by ESMA on 8 November 1 with respect to the clearing obligation.

In the context of the on-going withdrawal negotiations between the EU and the UK, and to address the situation where a UK counterparty may no longer be able to provide certain services across the EU, counterparties in the EU may want to novate their OTC derivative contracts by replacing the UK counterparty with an EU counterparty.

However, by doing this, they may trigger the clearing obligation or the bilateral margin requirements for these contracts, therefore facing costs that were not accounted for when the contract was originally entered into.

Limited exemption from the bilateral margin requirements to facilitate novations

The draft RTS allows UK counterparties to be replaced with EU ones without triggering the new procedures defined in the bilateral margin RTS.

This limited exemption would ensure a level playing field between EU counterparties and the preservation of the regulatory and economic conditions under which the contracts where originally entered into.

Its scope, time and intent are aligned with the draft RTS regarding the clearing obligation that ESMA published on 8 November.

The window for the novation of OTC derivative contracts which fall under the scope of this amending regulation and the one published by ESMA would be open for twelve months following the withdrawal of the UK from the EU.

Counterparties can however start repapering their contracts ahead of the application date, making the novation conditional upon a no-deal Brexit, given the conditional application date of these two amending regulations.

Participants Brexit preparations

The ESAs and other EU authorities and institutions have been clear on the importance for market participants to be prepared for Brexit, including the possibility of a no-deal scenario.

These draft RTS provide regulatory solutions to support counterparties' Brexit preparations and to maintain a level playing field between EU counterparties, while addressing potential risks to orderly markets and financial stability.

As regards non-centrally cleared OTC derivative contracts, these two measures will be the only regulatory measures the ESAs intend to propose to help address the legal uncertainty raised by the withdrawal of the UK from the EU and to ensure a level-playing field between EU counterparties.

Counterparties should start negotiating as soon as possible the novations of their transactions which are in the scope of these amending regulations, given the twelve month timeframe to benefit from it.

Next steps

The draft RTS have been submitted to the European Commission for endorsement, and they are subject to the scrutiny of the European Parliament and of the Council.

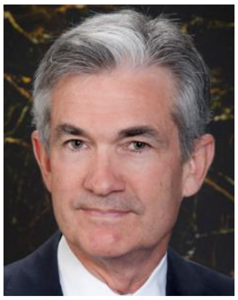
To read more:
https://eiopa.europa.eu/Publications/Reports/ESAs%202018%2025%20-

%20Final%20Report%20-%20Bilateral%20margining%20%28novation%29.pdf

Number 8

The Federal Reserve's framework for monitoring financial stability

Jerome H Powell, Chairman of the Board of Governors of the Federal Reserve System, at the Economic Club of New York, New York York.



It is a pleasure to be back at the Economic Club of New York. I will begin by briefly reviewing the outlook for the economy, and then turn to a discussion of financial stability.

My main subject today will be the profound transformation since the Global Financial Crisis in the Federal Reserve's approach to monitoring and addressing financial stability.

Today marks the publication of the Board of Governors' first Financial Stability Report.

Earlier this month, we published our first Supervision and Regulation Report.

Together, these reports contain a wealth of information on our approach to financial stability and to financial regulation more broadly.

By clearly and transparently explaining our policies, we aim to strengthen the foundation of democratic legitimacy that enables the Fed to serve the needs of the American public.

Outlook and Monetary Policy

Congress assigned the Federal Reserve the job of promoting maximum employment and price stability.

I am pleased to say that our economy is now close to both of those objectives.

The unemployment rate is 3.7 percent, a 49-year low, and many other measures of labor market strength are at or near historic bests.

Inflation is near our 2 percent target.

The economy is growing at an annual rate of about 3 percent, well above most estimates of its longer-run trend.

For seven years during the crisis and its painful aftermath, the Federal Open Market Committee (FOMC) kept our policy interest rate unprecedentedly low--in fact, near zero--to support the economy as it struggled to recover.

The health of the economy gradually but steadily improved, and about three years ago the FOMC judged that the interests of households and businesses, of savers and borrowers, were no longer best served by such extraordinarily low rates.

We therefore began to raise our policy rate gradually toward levels that are more normal in a healthy economy.

Interest rates are still low by historical standards, and they remain just below the broad range of estimates of the level that would be neutral for the economy--that is, neither speeding up nor slowing down growth.

My FOMC colleagues and I, as well as many private-sector economists, are forecasting continued solid growth, low unemployment, and inflation near 2 percent.

There is a great deal to like about this outlook.

But we know that things often turn out to be quite different from even the most careful forecasts.

For this reason, sound policymaking is as much about managing risks as it is about responding to the baseline forecast.

Our gradual pace of raising interest rates has been an exercise in balancing risks.

We know that moving too fast would risk shortening the expansion.
We also know that moving too slowly--keeping interest rates too low for too long--could risk other distortions in the form of higher inflation or destabilizing financial imbalances.

Our path of gradual increases has been designed to balance these two risks, both of which we must take seriously.

We also know that the economic effects of our gradual rate increases are uncertain, and may take a year or more to be fully realized.

While FOMC participants' projections are based on our best assessments of the outlook, there is no preset policy path.

We will be paying very close attention to what incoming economic and financial data are telling us.

As always, our decisions on monetary policy will be designed to keep the economy on track in light of the changing outlook for jobs and inflation.

To read more:
https://www.bis.org/review/r181129a.pdf

Number 9

Steering fintech for a prosperous society

Keynote address by His Excellency Dr Mohammad Y Al-Hashel, Governor of the Central Bank of Kuwait, at the Global Informatics Forum, Gulf University for Science and Technology, Kuwait City.

Ladies and Gentlemen, if you are 30 years old or younger, by a show of hands, how many of you have heard that sound before?

You may not all be familiar with it but that, about 20 years ago, was the sound of a modem connecting to the internet.

It was the latest technology at that time, and it was the envy of older generations who had never dreamed of seeing such luxuries during their lifetimes.

This was the sound of the world of connectivity that was about to be unleashed. Let us consider how far we have come.

Back then, the fastest home connection time was 56 kilobits per second. At that speed, a 10 megabyte image would take around 25 minutes to download. Today, it would take seconds.

Such a slow connection now would be completely unacceptable to all of you, even on your phones, let alone your computers and tabletsi .

The world today is very different from what it was just two decades ago.

The technological revolution has enabled us to communicate, socialize, shop, keep up with the news, and perform any number of other tasks simply and conveniently from the palms of our hands.

It is by now inconceivable to imagine an isolated world stripped of its smart phones, high-speed internet, social media, or even food delivery apps.

Yet, it is a false notion to see technology as the sole driver of change when it can be argued that it is, in fact, propelled more by society's insatiable thirst for everfaster access to information and entertainment and empowerment.

There is no sign of the revolution in digital technology slowing down. If anything, the technology is evolving and being adopted at an increasingly amazing pace.

Economists have labeled this the Fourth Industrial Revolution.

They believe the latest digital technology is transforming the economic landscape just as dramatically as the steam engine, internal combustion engine and microchip did before, but this time at an exponential rate.

It is plain to see that the world is not only changing, but is also being disrupted by technology infused with humanity.

Seemingly every sector of the economy – whether healthcare, transportation, hospitality, retail or manufacturing – is being utterly transformed.

So, what about financial services? What will the future look like for this industry? How will these changes affect our life? What role should the regulators play in the technological revolution? And the role of other stakeholders?

These questions will be the subject of my keynote address today: existing trends in financial technology, opportunities and risks, and the Central Bank's steering role as facilitator and enabler. It must always be remembered that people are at the center of all we do.

So in light of the many changes that financial technology is bringing and the possibility that we are drifting into uncharted territory, all stakeholders, including the Central Bank, must ensure that this transformation is aligned with our ultimate objective, which is to ensure inclusive and sustainable prosperity.

This means helping to build a brighter and safer future for all of society.

And we believe that one vital step towards achieving this objective is embracing technological innovation while steering clear of, or at least mitigating, risks to consumers, the economy and broader society.

To read more: https://www.bis.org/review/r181130f.pdf

Number 10

NIST Evaluation Shows Advance in Face Recognition Software's Capabilities

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Between 2014 and 2018, facial recognition software got 20 times better at searching a database to find a matching photograph, according to the National Institute of Standards and Technology's (NIST) evaluation of 127 software algorithms from 39 different developers—the bulk of the industry.

The findings, together with other data in a NIST report, point to a rapidly advancing marketplace for face-based biometric matching algorithms.

The new publication, NIST Interagency Report (NISTIR) 8238, Ongoing Facial Recognition Vendor Test (FRVT), updates the agency's previous evaluations of facial recognition software, 2010's NISTIR 7709 and 2014's NISTIR 8009.

To learn more you may visit:
https://nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.8238.pdf

Comparing the reports indicates that the field of developers has grown and that, broadly speaking, facial recognition software is improving at an increasing rate.

The test—performed in the 2010, 2014 and 2018 evaluations—judged how well an algorithm could match a person's photo with a different one of the same person stored in a large database.

This type of "one to many" search is often employed to check for a person who might be applying for a visa or driver's license under a name different than their own.

The team found that just 0.2 percent of searches failed this year, compared with a 4 percent failure rate in 2014 and 5 percent in 2010.

Failure means that when an image of a person's face is submitted to the recognition software, it fails to return the matching face image that resides in the database.

All of the top-performing algorithms from the latest round make use of machine-learning software architectures called convolutional neural networks.

According to NIST's Patrick Grother, one of the report's authors, the rapid advance of machine-learning tools has effectively revolutionized the industry.

"The implication that error rates have fallen this far is that end users will need to update their technology," said Grother, a NIST computer scientist.

"The test shows a wholesale uptake by the industry of convolutional neural networks, which didn't exist five years ago. About 25 developers have algorithms that outperform the most accurate one we reported in 2014."

But prospective users should beware: The new algorithms do not all perform the same, and the best algorithms are far ahead of the pack.

"There remains a very wide spread of capability across the industry," Grother said. "This implies you need to properly consider accuracy when you're selecting new-generation software."

The NIST evaluation team used a database of 26.6 million photos to test software submitted by companies and one university team.

The participants did not have access to the database, which NIST kept sequestered from the developers.

The NIST report includes results for the effects of aging on faces, scalability to large databases, the identification of twins, and the use of poor quality images.

NIST's report identifies the submissions by name and presents them in ranked tables.

The main ranked list reflects how often an algorithm put the correct result of the "one to many" search at the top of the list of possible identities, a metric called the rank one recognition rate.

However, the report also considers variations such as how the algorithms performed when misidentifications, called false positives, must be minimized.

Other algorithms sometimes outperformed the best performing algorithm when these variant factors took priority.

The work was partly supported by the Department of Homeland Security Science and Technology Directorate.

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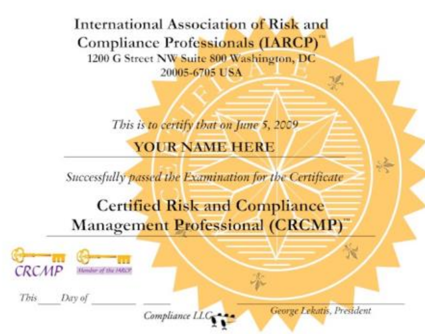

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