



SALZBURG
GLOBAL
SEMINAR

SALZBURG GLOBAL FINANCE FORUM

THE PROMISE AND PERILS OF TECHNOLOGY: ARTIFICIAL INTELLIGENCE, BIG DATA, CYBERCRIME AND FINTECH

SALZBURG GLOBAL SEMINAR IS GRATEFUL TO THE FOLLOWING ORGANIZATIONS FOR THEIR SUPPORT OF THIS PROGRAM:

PARTNERS



JPMORGAN CHASE & CO.



SPONSORS

CLEARY GOTTLIB

Davis Polk



CO-SPONSORS



SALZBURG GLOBAL SEMINAR WOULD LIKE TO THANK ALL PARTICIPANTS FOR DONATING THEIR TIME AND EXPERTISE TO THIS PROGRAM.

SALZBURG
GLOBAL
SEMINAR

SALZBURG GLOBAL
FINANCE FORUM

THE PROMISE AND PERILS OF TECHNOLOGY: ARTIFICIAL INTELLIGENCE, BIG DATA, CYBERCRIME AND FINTECH

JUNE 24 TO 26, 2018

Session 599

RAPPORTEUR

Silke Finken

PROGRAM DIRECTOR

Tatsiana Lintouskaya

PROGRAM ASSOCIATE

Antonio Riolino

CONTRIBUTORS Julia Bunte-Mein and Maryam Ghaddar

EDITOR Louise Hallman

PHOTOS Sandra Birklbauer

COVER IMAGE Markus Spiske

CONTENTS

5 The Promise and Perils of Technology: Artificial Intelligence, Big Data, Cybercrime and Fintech

6 Executive Summary

Technological change and its disruptive impact on society and the financial landscape

Emergence of new data-based business models and ecosystems

Key internal challenges for financial institutions

Activity- and principle-based regulation as the way forward

Conclusion and next steps

11 Opening Remarks from the Program Co-Chairs

José Manuel González-Páramo

J. Christopher Giancarlo

14 Interview

Hal Varian – Data, like oil, needs to be refined in order for it to be useful

16 Program Participants

18 Staff

THE PROMISE AND PERILS OF TECHNOLOGY: ARTIFICIAL INTELLIGENCE, BIG DATA, CYBERCRIME AND FINTECH

The “Fourth Industrial Revolution” is fundamentally changing society, economies and financial markets on a global scale. Significant and often disruptive technological developments such as artificial intelligence (AI), robotics, big data and distributed ledger technologies (DLT) have led to the digitization of assets and information, the emergence of new players, business models and ecosystems, as well as new ways of interaction between individuals and businesses. While these changes potentially increase productivity and growth, they may also trigger new risks for today’s market participants and society.

The eighth program of the *Salzburg Global Finance Forum – The Promise and Perils of Technology: Artificial Intelligence, Big Data, Cybercrime and Fintech* – brought together stakeholders from different financial institutions, regulators and policymakers around the world to discuss:

- How these technological developments are impacting and challenging society and financial markets, what consequences they imply for policy, regulation and practitioners; and
- What measures could be taken to mitigate the potential risks associated with the impending technology-triggered transformations.

This report provides:

- An executive summary of the discussions from the two-day program (June 24 to 26, 2018);
- The opening remarks of the program’s two co-chairs – J. Christopher Giancarlo, chairman of the US Commodity Futures Trading Commission (CFTC) and José Manuel González-Páramo, member of the board of directors and chief officer for global economics, regulation and public affairs at BBVA in Madrid, Spain;
- An interview with the keynote speaker, Hal Varian, the chief economist at Google; and
- A list of all participants in attendance and the *Salzburg Global Finance Forum*’s Advisory Committee.



EXECUTIVE SUMMARY

TECHNOLOGICAL CHANGE AND ITS DISRUPTIVE IMPACT ON SOCIETY AND THE FINANCIAL LANDSCAPE

Technology and its massive adoption are fundamentally changing the way in which individuals and private as well as public institutions interact. Its exponential and hence often disruptive development enables the provision of new products and services as well as the emergence of new business models and ecosystems.

With 2.5 quintillion bytes of data created each day, advances in machine learning and AI, in combination with big data and cloud computing, allow for the collection and exploitation of unprecedented amounts of data, detection of patterns, profiling of consumers and the deduction and automated execution of consequences such as fraud prevention or mass customized services. In connection with the hyper-connectivity arising from an increasing mobile penetration, new levels of customer access and interaction – particularly by third parties – substantially change distribution models, and customer journeys and experiences.

As a result, banks as well as incumbents in other industries are faced with changing consumer needs and expectations. Having grown accustomed to the convenience offered by technology and immediate and individualized interactions with social media, customers increasingly demand 24/7 availability, a seamless experience across customer journeys, and a tailored and compelling consumer experience.

SOCIETAL DISRUPTION

Technological advances also boost productivity, which in turn fosters growth and consequently overall wealth – just as in previous industrial revolutions. While the creation of global trade platforms as well as disintermediating technologies such as blockchain potentially allow increasing financial inclusion especially in emerging economies, the disruptive technological changes also give rise to worries about inequality and growing unemployment due to automation. Estimates range up to 47 percent of total US employment

being in danger of robotization and computerization, with many “white collar” or traditionally middle-class jobs also displaying a high probability of being replaced due to their high degree of routinization.

Increasing automation could also, however, be greatly beneficial – especially for developed countries. A decreasing demand on the labor market due to automation coincides with a prospective decreasing supply in the workforce due to demographic changes. In the short term, automation of jobs might aggravate social tension and societal inequality, potentially even triggering the emergence of a digital divide between different fractions of society, or even geopolitical consequences and massive immigration due to countries having different starting points, education trajectories, infrastructure and demographic developments.

However, in the long term, artificial intelligence has the potential to fundamentally boost global productivity, growth and overall wealth by optimizing asset utilization of capital, counteracting demographic challenges of developed countries, and driving advances in a variety of sciences.

FINANCIAL DISRUPTION

In the financial landscape, new technologies such as AI and big data provide opportunities for banks to redefine their customer relationships and to create new ways to offer customized problem-solving services and advice to clients. The digital revolution, however, has also lowered the barriers to entry in financial services for new competitors.

In combination with regulatory changes such as the Payment Service Directive (PSD) II, AI facilitates the access of third parties such as fintechs and tech incumbents to banks’ clients, infrastructure and data. As a consequence, established financial institutions face a new level of multi-faceted competition and the emergence of cross-sectoral ecosystems – with players such as GAFA (Google, Apple, Facebook, and Amazon) in the US and Alibaba and WeChat in Asia – increasingly entering traditional financial services.

This is putting pressure on incumbents’ business models. As the trend toward open banking and APIs (application programming interfaces) opens up banks’ infrastructures to allow data to move seamlessly between systems, new technology-enabled platforms emerge with significantly more open, direct access for consumers and new ways of accessing, analyzing and storing data. Neo-banks, crowd-funding, peer-to-peer platforms, aggregators, and digital wallets have all started to unbundle banking by disaggregating the previously completely bank-internal, bank-controlled supply chain layer by layer and occupying and optimizing individual parts of it, leading to a heightened level of disintermediation.

DISCLAIMER

The executive summary reflects the author’s view of the overall discussion during the program and should not be attributed to individual participants.

If banks do not adapt their business models in the face of these developments, they are in danger of becoming commodities and could be further reduced to providing basic infrastructure for third parties to use and to communicate through.

EMERGENCE OF NEW DATA-BASED BUSINESS MODELS AND ECOSYSTEMS

Irrespective of enhanced consumer expectations regarding immediacy and tailored experiences, trust in safeguarding critical financial data remains a key issue for customers and it currently still predominately lies with banking incumbents.

ENSURING TRUST

As the provision of financial services to end customers becomes increasingly based on the value-adding exploitation of data, banks' role as a trusted custodian of clients' financial data can become a competitive edge in staying relevant and retaining the client interface. However, safeguarding and managing clients' data can prove to be a double-edged sword.

In the light of increased openness and access to accounts granted to third party providers under PSD II, banks can no longer afford *not* to intelligently analyze and exploit their clients' data. Failure to do so leaves open the opportunity for third-party payment service providers (TPPs) and potentially tech giants to do it instead. Additionally, aggregators will avail themselves of the data of multiple individual institutions to create and use full financial pictures of private and corporate banking clients, opening systems to third party innovators. These new entrants often have the primary objective to collect and analyze clients' data as the basis for their offerings, and customers often consciously or unconsciously pay with their data for the use of these services or an added convenience.

FOSTERING COLLABORATION

For banks to retain their relevance and position as the customer interface in financial matters, they have to become the trusted gatekeeper of the financial ecosystem. Banks provide an element of trust and authentication, but in terms of service offerings they will increasingly need to collaborate with other providers and institutions to offer the customer the best experience possible. Successful future business models for banks therefore center around analyzing clients' data and behavior in superior ways to anticipate their needs and deliver tailor-made advice and financial (as well as non-financial) services, in collaboration with best-in class partners. As most data – except for the most personal information – is

not owned by any single individual or entity but rather co-created, data-business models and services have to be based on managing data rights and permissions. This in itself can be a valuable service for clients in the form of intelligent electronic identification (e-ID) management.

Adaption to the new competitive environment and world of platforms and ecosystems requires the development of a clear vision and its translation throughout the organization; the skills needed to manage complex ecosystem environments and collaborate with a range of financial and non-financial partners; and a change in mindset and culture towards flatter hierarchies and a more cross-functional, agile and project-based organization.

While technological developments will certainly be disruptive to banks' business and distribution models and change client access and interaction dramatically, core banking services, the efficient management of market and credit risk, and sound consumer and investor protection will nevertheless remain a core value proposition and highly supervised.

Banks that have a comprehensive digitalization strategy and intelligently use technological advances, such as AI and big data, will adapt easily and play a dominant role in financial ecosystems. Others will have to find their niche or become disintermediated and relegated to pure infrastructure providers.

KEY INTERNAL CHALLENGES FOR FINANCIAL INSTITUTIONS

To enable the transformation to data-based business models embedded within financial ecosystems, banks face two critical internal challenges: the acquisition and retention of the right skills and talents as well as the management and mitigation of cybercrime.

TALENT ACQUISITION AND SKILL DEVELOPMENT

Successfully exploiting the advantages of new technologies does not only require greater technical skills but also the broader combination of cognitive, social and interpersonal skills in order to operate in collaborative and agile ways while breaking down the still-existing silos within large financial institutions. As a consequence, the majority of functions will shift from predominately transactional tasks to mainly relational and expertise-based functions.

This change in mindset and skills also applies to the top management and board levels. While the management of classical banking risks, such as market and credit risk, remains



indispensable for financial service incumbents, the competitive edge of institutions aiming to win in the changing landscape will stem from a more balanced combination of bankers and tech-savvy innovators. In a world of disintermediated banking supply chains, the management of ecosystems, networks and data streams, as well as the intelligent exploitation of new technologies, will also increasingly become critical success factors.

In the face of an ongoing war for talent regarding cognitive and technological skills, the new way forward will be not only the ownerships but rather the access to talent. New options will arise through collaboration and talent sharing, be that through the gig-economy with ecosystems of freelance workers, increased collaboration with suppliers and startups, or the “acqui-hiring” of start-up employees and teams. Smaller and mid-sized institutions in particular typically do not have the resources to acquire highly-skilled people and hence have to rely on new models of collaboration.

CYBERCRIME AND RISK MITIGATION

The second major internal challenge is the management and mitigation of cybercrime and the risk thereof, which over the past years has advanced to the top of the risk list of financial service institutions and regulators.

Even though the financial service sector might very well be the best prepared sector against cyberattacks, it is also the most heavily attacked sector and the contagion effects of a large cyberattack could be significant due to the vital importance of payments systems and critical financial market

infrastructure. While minimum standards for all market participants can decrease the probability of successful attacks by strengthening especially the weak links within the financial systems, a targeted attack by a dedicated attacker using state of the art technology will most likely be successful. As a consequence, respond and recover procedures are critical.

Dealing with cybersecurity also requires a different skill set and technological comprehension that is currently still often underrepresented at the top management level of traditional banks and regulators. Boards need to be educated and armed to fulfill their governance obligations and to ask the right strategic and operational questions to understand how well their institutions are prepared to withstand an attack, how quickly and well they may respond and recover, and whether they are able to meet the relevant standards and regulatory requirements.

Collaboration at the sector level is critical to understand systemic impacts, stress test playbooks and response procedures, share information on attack origins with the relevant authorities, and ensure the continuity of necessary financial flows in the times of attacks. Operational collaboration beyond pure information sharing in the form of joint risk identification as well as a more open bi-directional data sharing between banks and regulators would be valuable next steps. In this context, the inclusion of adjacent partners such as telecommunication providers who could proactively block banks from attacks through preventative actions on the network layer would also be beneficial to ensure the safety and soundness of the financial systems and infrastructure.

HARMONIZATION OF NEW REGULATIONS

An additional major challenge for multinational institutions is the implementation of national and regional regulations across a global infrastructure. A harmonized or common framework would be highly beneficial, especially with borders between sectors and countries being blurred in the digital world while authorities and their respective legislations remain local or regional. A candidate blueprint could be the National Institute of Standards and Technology's (NIST) Cybersecurity Framework as it encompasses not only risk management framework components but also tests components that are important to evaluate the quality of the execution of controls.

ACTIVITY- AND PRINCIPLE-BASED REGULATION AS THE WAY FORWARD

The emergence of new players and business models in the financial landscape also creates new challenges for policymakers and regulators. In the past, regulation was often anchored around trusted core intermediaries like banks. New technologies such as cryptocurrencies and blockchain disintermediate these intermediaries and raise the question who to regulate now.

CHANGES IN REGULATION

Due to the much wider diversification of financial business models, the higher degree of modularity and the increased disintermediation of the value chain, parts of – or even entire – financial activities will increasingly be provided by suppliers, fintechs or new players, such as tech incumbents or large online retailers, which may currently not be in the regulated space and where an indirect supervision through the supervised party may not be sufficient. One approach, especially in the case of cryptocurrencies, could be to regulate the connection points between the virtual currency world and the real world.

Risks will also move increasingly in and around networks and ecosystems and be potentially less attributable to single entities. Previously, technological innovations were mainly developed in-house at large financial institutions at the top of the pyramid and diffused into the market after passing through the regulatory framework. Now, however, this pyramid has inverted with many small entities developing financial and technological innovations in open form and in varying collaborations. In this context, *activity*-based regulation of services becomes more important than *entity*-based regulation to ensure that regulatory and supervisory

systems remain relevant for financial services that are being increasingly provided by ecosystems and platforms of financial and non-financial players.

Regulation should, in addition, be technologically-neutral and principle-based given the increasing pace of new technological developments. The overarching paradigm should be: same business, same risk, same rules. It is therefore crucial to understand which participants own which financial positions and where risk is concentrated, as well as what potential risk may emerge from new technological developments and business models. Close cooperation between market and prudential supervisors together with protection agencies and competition authorities is vital to avoid activities falling between the supervisory cracks.

At the bottom line, it will be a case-by-case assessment by the respective regulators as to whether new technologies will require new regulatory regimes such as in the case of crowdfunding or whether solutions to cover emerging risks could be developed within existing regimes. For some phenomena such as cryptocurrencies and Initial Coin Offerings (ICOs), the first step to be taken is the development of a common understanding across regulators and attempts to ensure convergence on various positions and approaches. Again, one suggestion is to use an activity-based approach and regulate them according to business models and use payments, investments or financing tools rather than abstract products that may serve multiple heterogeneous purposes.

CHANGES TO REGULATORS

Regulators themselves are currently also striving to transform into 21st century digital regulators by rapidly trying to understand new technological developments and adopting them in their policy setting, while maintaining the balance between consumer and investor protection on one hand and fostering financial innovation on the other. They are also becoming more evidence-based by applying appropriate cognitive abilities to the vast available amounts of data.

Similar to the financial incumbents, the build-up of the necessary analytical and cognitive skills within regulators poses a significant challenge. While in some areas regulation has already become much more data-intensive and advanced algorithms are used for example to detect market abuse, in other areas detailed real-time data is not yet available or regulators simply lack the capacity to analyze the data appropriately to see the interconnection of various markets. Feedback mechanisms also have to become faster to clearly show market participants that the data collected is being used for policymaking and supervision. To have efficient and integrated markets, information exchange also needs to take place across borders,

which is still severely restrained by the regional diversification of authorities and data localization laws.

Regarding AI, a further concern is the need to build up the necessary capacities on a large scale to overcome the “black box syndrome” and to understand the logic and the functioning behind the algorithms used and to limit the potential for arbitrariness and discrimination. This also leads to the question of potential ethical limitations in the use of technologies and data analytics, which, due to the very fragmented consumer protection regulation and a lack of a social contract outside of traditional banks, requires a much more intensive exchange between regulators, governments and innovators.

CONCLUSION AND NEXT STEPS

The rapid and often disruptive development of technological advances – from AI and robotics to big data and distributed ledger technologies – is fundamentally changing the financial landscape by altering the interaction between customers and providers of financial services, lowering the barriers for new entrants, and enabling the emergence of new business models and ecosystems.

Banks have to adapt to the new competitive environment by becoming trusted custodians of clients’ financial data while at the same time intelligently analyzing clients’ data and behavior to anticipate needs and deliver tailor-made solution by collaborating with financial as well as non-financial partners.

Key internal challenges are the acquisition of talents to achieve the perfect combination of core banking skills with tech-savvy innovative capabilities, as well as the mitigation and management of cyber risk.

The emergence of new players and business models, as well as an increased disintermediation of the value chain of financial institutions, also creates new challenges for policymakers and regulators.

Activity- and principle-based regulation appears to be the most suitable approach forward to balance consumer and investor protection on one hand and the facilitation of financial innovation on the other, and to provide a technology-neutral level playing field for incumbents and new entrants.

The deliberations of the 2018 program of the *Salzburg Global Finance Forum* revealed that entirely new concepts of finance and money are being formed as a result of burgeoning technology. The financial services industry will continue to face major shifts driven by technological upheaval, the changing global economy landscape, and socio-political uncertainties. Both the industry and policymakers will need to grapple with the opportunities and challenges these shifts pose and discover the ways of channeling powerful forces of technology in a positive way.

The Forum’s future programs will continue looking into the future of finance and exploring future global challenges and opportunities and their likely effect on societies and economies.



OPENING REMARKS FROM THE PROGRAM CO-CHAIRS

JOSÉ MANUEL GONZÁLEZ-PÁRAMO

– MEMBER OF THE BOARD OF DIRECTORS
AND CHIEF OFFICER FOR GLOBAL ECONOMICS,
REGULATION AND PUBLIC AFFAIRS,
BBVA, MADRID, SPAIN



Let me say at the outset that I am very thankful for the opportunity to be here and to co-chair with Chris [Giancarlo] at this very interesting seminar session on *The Promise and Perils of Technology, AI, Big Data, Cybercrime, and Fintech* – quite an array of issues.

Currently, we are immersed in a revolution, that is very obvious to all. Revolution means a threat to some, but opportunities to some others, or maybe to most – which is my belief. During these three days, we are going to analyze and debate how these technological changes are impacting and challenging the society, the economy, and the financial industry. And secondly, what measures should be taken by both the private and the public sector in order to reduce or mitigate the potential risks associated with this revolution.

For this purpose, let me add a bit of color to what was said by Stephen [Salzer, Salzburg Global President]. This first day, starting with the speech by Hal Varian and then followed by the fireside conversation, we will start by analyzing social and economic impacts of the transformation in the revolution of the economy and society. The economy and society change continuously. The difference between revolutions and periods of stability is precisely the speed at which change takes place. During normal times it is incremental, but in times of revolution, those changes become disruptive. And we believe that we are at such a moment now. Massive adoption of digital technologies, no matter the fact that most of them were invented in the last century, now are compounding themselves thanks particularly to the hyper-connectivity that mobile devices permit and the exploitation of this information.

There are three driving forces that explain this revolution.

First of all, the eruption of these technologies, and their hyper-connectivity associated to mobile, is generating data in amounts that were beyond our imagination even three, four, five years ago. This huge amount of data can be exploited now in very clever ways using data science in particular and building towards artificial intelligence devices that permit, together with machine learning and other techniques, to tailor-make services or offers to clients. So profiling our consumers is better than it ever was before. If you put this together with new infrastructures such as cloud computing (which is changing the way not just of storing but also of computing data) and the blockchain, you easily understand what these new technologies mean; they are exponential in the way that they impact society.

Second, we have a new type of consumer in front of us. The internet has defined the standards of consumer experience that clients are now demanding. They are connected – or want to be connected – 24/7, through many devices with seamless experiences... They want immediacy, they want their problems to be solved, they want tailor-made offers to them, and on top of all of this, they require trust. So the key to success for incumbents is keeping the trust in what they already have, which is their relationships with clients. Trust means, in the case of financial institutions, not just preserving money and assets, but also protecting data and using data only in the way they are authorized explicitly by their clients.

Finally, new business models have emerged. They do not have legacies associated to old tech, regulation, or to the labor force. New competitors are disrupting the market of incumbents. I'm speaking not only about new start-ups, but also about big-techs or ecosystems characterized by three features: they develop network effects, they are a portal to other markets, and they generate and exploit huge amounts of data.

So, what's going to happen is the big question.

There are techno-pessimists that emphasize the negative impact of this in terms of inequality at least in the short term, as well as issues of growth, productivity, ethics, privacy and freedom. These are elements that worry many, but there is another attitude towards these visible changes which is techno-optimism. I have to say from the outset that I am with this approach. In the short term, there will be tension and creative destruction, but in the medium to long term, technologies will significantly increase productivity and boost growth. If we take any lessons from the previous industrial revolutions that we have seen in history, of course, policies could do a lot in order to minimize the cost associated with transition, but also there is much that companies can do to help their employees in the transition.

On the second day, the impact of the digital transformation in the financial sector and the answers provided by regulators will be the focus of our discussion. From the point of view of incumbents, new technologies are providing new opportunities to redefine customer relations, and the starting point of incumbents is one of great advantage because incumbents have the balance sheet and they have the clients. It is about keeping that, and possibly increasing the competitive edge, using technologies to their advantage. What a client wants is not a mortgage – she wants a house, so you have to facilitate acquiring that house. Customers don't mingle with the details of the market. This is about making simple connections, helping them to decide. It is about advisory, it is about using modern technologies to make this possible.

There are new ways to support customers, to increase their assets, to protect their money, and to make the data work harder for them. Of course, there is an issue of speed, because the impact of this kind of revolution has to do with speed. The first industrial revolution lasted about 60 years. Many say that this revolution is going to last half of this duration, which means that the tensions created will be felt perhaps more acutely. In order to survive and to succeed in this very challenging environment, incumbents need to develop a vision. The vision is partly about who are your competitors. If you identify them right, you have half the way done. But together with that you need the capacity in terms of technology and finance in order to make investments and recruitment that is needed and also changing the talent and culture within the organization.

There is an external driver of speed of transformation, which has to do with the role of regulators and supervisors. Tomorrow we will see to what extent regulators and supervisors could help in this transition or may act as breaks in the process of re-invention of finance.

On the final day, we will focus on the new risks posed by this economy: privacy, cyber-threat, financial crimes. Since data is the most valuable asset, protecting it is of the essence... Fighting against cyberterrorism and preventing consumer exploitation by the misuse of the data are very important. All of us have in mind recent cases of cyberattacks at the global level and also misuse of data associated to one of the big platforms.

The challenges for companies, the challenges for governments, the challenges for individuals in order to behave in the cleverest way, in order to protect ourselves against these risks, will be the focus of the third day. Education, business attitudes, standards, regulation, coordination authorities across the world will be touched upon.

In conclusion, I am confident that this seminar will contribute to better understanding finance in this changing world. We have the opportunity for in-depth conversation, to build an open and inclusive financial system and set the agenda for the future.

Thank you very much again for inviting me to co-chair this seminar.

J. CHRISTOPHER GIANCARLO

– CHAIRMAN,
US COMMODITY FUTURES TRADING COMMISSION,
WASHINGTON, DC, USA



Good afternoon. It is a pleasure to greet all of you here at historic Schloss Leopoldskron in beautiful Salzburg. Welcome to the 2018 *Salzburg Global Finance Forum on The Promise and Perils of Technology: Artificial Intelligence, Big Data, Cybercrime and Fintech*. It is going to be a terrific program. I look forward to being with you over the next 38 hours.

This year we celebrate two anniversaries. The first was the creation of the Salzburg Global Seminar in 1947 by three Harvard students: one Austrian and two Americans. Like many, they were concerned about the war-time destruction of the European economy and society. They were alarmed at the predations of Stalinism in post-war central Europe. Europe had barely escaped one tyranny and now was facing another. The Harvard students sought to launch a “Marshall Plan of the Mind” to promote the values of free enterprise and liberal democracy. Miraculously, Max Reinhardt's widow gifted them the use of Schloss Leopoldskron with its own illustrious history as a prewar center of culture and its location secure in the American zone of occupied Austria. Thus, Salzburg Global Seminar was born.

The second anniversary is of the creation in 1948 of the world's first stored program computer, the “Manchester Baby.” It was designed as a test platform for the first true random-access computer memory. The Baby had been constructed in a separate building at the University of Manchester and

housed in a room that was roughly the same size as Parker Hall, the room in which much of today's Salzburg Global Seminar takes place.

Clearly, so much has changed in the 70 years since these two events – so much change in the course of one human lifetime. The post- world war chaos, gave way to the Cold War, then the “new world order” and now, perhaps, a return to global threats and multi-polarism. Meanwhile, the average contemporary smart phone now has 500 million times the storage capacity of the Manchester Baby and the average modern laptop computer has 30 million times the processing speed. Today's digital technology puts us on the verge of what many are calling the fourth industrial revolution, a melding of science and technology with human life and society.

Yet, the more politics evolve and technology advances, the more essential it is for people of goodwill to come together to explore different perspectives and search for common ground. And, as the world's wealthiest nation, America still had a role to play in supporting such efforts, as it did at the beginning of this one here in Salzburg. For that reason, I am honored to symbolize American commitment to international forums such as this through my service as co-chair of this program.

I am also here in my official capacity as Chairman of the US Commodity Futures Trading Commission (CFTC), the world's oldest and most experienced regulator of derivatives trading markets. Not only do we oversee the world's largest futures markets, we are also the world's only derivatives-specific, national regulatory body.

At the CFTC, we see emerging financial technology as not only a great challenge, but also a great opportunity. Our policy response might be summarized in “five As”:

- Adapt Rapidly
- Adopt Widely
- Analyze Deeply
- Administer Principally
- Advocate Rarely

These responses are simple in concept. Adapting rapidly means keeping pace and not falling behind technological evolution. Adopting widely means seeking to utilize new technology advances in the course of regulatory activity. Analyzing deeply means increasingly effective big data collection and analysis. Administer principally means staying true to the CFTC's long-standing practice of principles-based regulation, especially in a time of rapid technological transformation. Perhaps most importantly, advocating rarely means avoiding any temptation to champion any particular form of technology, market structure or innovation over any other, but to allow market forces and technical innovation to evolve organically.

Let me review our two-day program. It begins this afternoon with a great address by Hal Varian, Google's chief economist, followed by dinner and then a fireside chat about the impact of technology on economics and society. Monday will have a series of well-arranged panels, including a discussion of the impact of digital technology on financial services, the challenges it presents for public policy. Then, after lunch, some break out groups will consider individual technological areas. Following our gala dinner on Monday, there will be an engaging debate on the proposition that “technology is tearing trust apart.” Then, on Tuesday morning, we will have a final panel, followed by reports of the break out groups and my closing remarks.

Undoubtedly, our conversations over the next few days will identify a range of concerns over the future of financial markets as well as human society. It may even cause us to consider the future of human nature. This would be for the good. In prior times of rapid technological change – the first three industrial revolutions – the technological innovators were often not the ones concerned with social impact. Meanwhile, the social reformers were often not the technologists. That was unfortunate.

The opportunity for today's leaders in the current industrial revolution, such as those gathered here together, is to be both prophets of change and protectors of the human condition. As program co-chair, I challenge you to take time in your deliberations over the next 48 hours to consider the impact of emerging technology, not just on financial markets, but on humanity itself.

The first Salzburg Global Seminar [program] took place in a rapidly changing Europe, with a devastating war behind it, threats on its flanks and the computer age on its horizon. The Seminar's essential purpose was then to champion the cause of economic liberty and human dignity against tyranny and oppression.

Seventy years later, Salzburg Global Seminar again takes place amidst a changing and turbulent world with a new technological revolution underway. Let us put our minds to work, as our predecessors did seventy years ago, to consider how best to enhance the human spirit amidst the perils and promises of an ever changing world and ever constant technological transformation.

DISCLAIMER

These remarks have been edited for clarity, post-delivery, by both speakers.

INTERVIEW

HAL VARIAN – DATA, LIKE OIL, NEEDS TO BE REFINED IN ORDER FOR IT TO BE USEFUL

Chief economist at Google explains what he believes the Fourth Industrial Revolution will look like and the effects of big data and robotics on education, labor, research, and demographics

For decades, science fiction films and books have foretold of a future where robots dominate the world, where human action becomes obsolete, and subsequently, human intelligence dwindles into oblivion. Hal Varian, the chief economist at Google, is of a different mindset. He believes technology will set its own course.

“My theory is,” he jested, “we want to make sure robots think humans are cute - kind of like doggies and puppies and kitty cats... because if they think we’re cute, then they’ll take care of us.”

Varian, who attended this year’s program of the Salzburg Global Finance Forum on the recommendation of a friend, has worked at Google since 2002 on algorithm designs for auctioning and marketing systems, as well as policy-related issues, like privacy and intellectual property.

During the Finance Forum, he presented a keynote speech on the economics of artificial intelligence (AI). More specifically, he explained the economic implications of data on education, the workforce, research and development, and demographics. Varian later elaborated on this point, saying data needed to be turned into information, knowledge, and action to be coined as meaningful.

“I think there’s a mystical belief in the power of data,” he said. “Data is like oil in one respect... namely, it needs to be refined in order to be useful. So the data itself is not the important components, the know-how to refine it into something that’s useful. It’s the same [when] we talk about oil or data – it’s just the raw material, it’s not the finished product.”

When it comes to considering what the Fourth Industrial Revolution will look like, it’s easy to fall into the trap of fearing the unknown. The societal response to this radical revolution, whether it concerns technology, big data, or mass industrial change, is one massive question mark. Varian suggested past industrial revolutions occurred gradually, and then all at



once, adding there were challenges and risks involved but then also a plethora of opportunities. He suggested it will be similar this time around.

“In Silicon Valley, they always say you overestimate what can be done in a year; you underestimate what can be done in ten years. So a lot of technology that looks so exciting and so obvious today will probably take many years to deploy... The mobile phone has come up as an example. The first working mobile phone was in 1970; the first commercial version was in 1980 – it cost over a thousand dollars, it weighed several [kilograms], it was the size of a brick. So, that technology took... more than a decade to really disseminate in a meaningful way.”

The chief economist offered another example that cropped up several times over the course of the Finance Forum: autonomous vehicles. For years, companies worldwide have been endeavoring to circulate driverless cars more widely. It is, as Varian underlined, “a trillion-dollar industry” that works on a mobile and a technological level, but human error and human behavior have thus far been too strong a poison against its operational and marketing advancement.

Preserving the human spirit in the face of such technological developments is essential to maintaining the situation in the future. “Demography is destiny,” Varian said. He described a concept of “Bots & Tots,” which essentially pins automation against procreation. Whereas age distribution is indicated through demographics, technology is not as widely understood.

“We don’t really know where we’ll go, even in three [or] five years; it’s hard to forecast what will happen in that time period. But, based on the estimates that I’ve developed using the demographic data and various forecasts of the technology data, it looks like the demographic data is the bigger effect, at least for the next ten or 15 years.”

Regarding education and labor, he said, “We are a long

way away from truly intelligent robots, but at the same time... we've seen tremendous advances in just the last five years about tasks that were thought to be extremely difficult, like image recognition and automatic translation and voice transcription... I think that within the next two years, your mobile phone will be able to translate in real time... that doesn't mean that translators would entirely disappear because there are still cases where the translator might need to know special vocabulary, technical work, physics, chemistry, mathematics, or specific literary skills."

So how do we prepare for this new industrial revolution adequately and in a purposeful way? With the Finance Forum taking place directly after the Salzburg Global Board of Directors Gala Weekend titled *Who's Afraid of Artificial Intelligence?*, Varian offered his input on the topic, stressing both the benefits and dangers of these changes.

"You certainly shouldn't be blasé," he noted. "You should recognize that every technology can be misused... There are tremendous possibilities for improvement in how people live, but they also can be used as weapons, and that's not even thinking about the technological advancements. That's simply taking ordinary devices that you would use every day – a car, a truck, a drone perhaps."

His time at Schloss Leopoldskron provided Varian with the opportunity to exchange ideas and viewpoints with others in the field of economics and finance. "You learn things here," he concluded. "Having these meetings... plus government meetings, plus institutional meetings, that's what makes the world go round."

If Varian could leave his fellow participants with one piece of wisdom, what would that be?

"Keep an open mind."



PROGRAM PARTICIPANTS

CO-CHAIRS

J. Christopher Giancarlo,
Chairman, US Commodity
Futures Trading Commission
(CFTC), Washington DC, USA

José Manuel González-Páramo,
Executive Member of the Board,
BBVA, Madrid, Spain

RAPPORTEUR

Silke Finken,
Professor of International
Management, International
School of Management,
Munich, Germany

PARTICIPANTS*

Cyrus Ardalan,
Non-Executive Director and
Chairman, Citigroup Global
Markets Ltd., London, UK

Martin Arrowsmith,
Senior Manager, Bank of England,
London, UK

Greg Baer,
President, The Clearinghouse
Association, New York, USA

Apurv Bagri,
Deputy Chairman, Dubai Financial
Services Authority, Dubai, United
Arab Emirates

Rico Bauch,
Deputy Head Foreign Currency
& Gold Transaction, Deutsche
Bundesbank, Frankfurt am Main,
Germany

Denis Beau,
First Deputy Governor, Banque de
France, Paris, France

Byron Boston,
CEO, President and Co-Chief
Investment Officer, Dynex Capital,
Inc., Henrico, USA

Josh Bottomley,
Global Head of Digital, Data &
Development, HSBC, London, UK

Henry Bowen,
Head of Finance for the Digital
Team, HSBC, London, UK

Maarten Bras,
Policy Officer, De Nederlandsche
Bank, Amsterdam, Netherlands

Jacques Bughin,
Director and Senior Partner,
McKinsey & Company, Brussels,
Belgium

Phyllis Caldwell,
Chair, Board of Directors,
Ocwen Financial Corporation,
Washington DC, USA

José Manuel Campa,
Global Head of Regulatory Affairs,
Santander, Boadilla del Monte -
Madrid, Spain

Filip Caron,
Senior Analyst, National Bank of
Belgium, Brussels, Belgium

Bradley James Carr,
Senior Director, Institute
of International Finance,
Washington DC, USA

Katherine M. Carroll,
Partner, Cleary Gottlieb Steen &
Hamilton LLP, Washington DC,
USA

Amelie Champsaur,
Partner, Cleary Gottlieb Steen &
Hamilton LLP, Paris, France

Anthony Charrie,
Principal, Oliver Wyman, London,
UK

Joanna Cound,
Head of Public Policy, EMEA,
Blackrock, London, UK

Sherard Cowper-Coles,
Group Head of Public Affairs,
HSBC Holdings plc, London, UK

Andreas Dombret,
Member of the Board, Bank
of International Settlements,
Frankfurt, Germany

Saeb Eigner,
Chairman, Dubai Financial
Services Authority, Dubai, United
Arab Emirates

Douglas Elliott,
Partner, Oliver Wyman, New York,
NY, USA

Charles C. Gray,
Special Counsel, Sullivan &
Cromwel LLP, New York, USA

Aleksi Grym,
Head of Digitalisation, Bank of
Finland, Helsinki, Finland

* positions correct at time of session
— June 2018)

ADVISORY COMMITTEE

Sandra O'Connor
(Chair of the Advisory Committee)
Chief Regulatory Affairs Officer, JPMorgan
Chase & Co, New York, NY, USA

Lorenzo Bini Smaghi
Chairman of the Board, Société Générale,
Paris, France

Andreas Dombret
Member of the Board of the Bank of
International Settlements; former Member
of the Board Deutsche Bundesbank
(2010–2018), Frankfurt, Germany

Douglas Flint
Former Chairman,
HSBC Bank Plc,
London, UK

Patrick Kenadjian
Senior Counsel,
Davis Polk & Wardwell London LLP,
London, UK

Michael Krimminger
Partner,
Cleary Gottlieb Steen & Hamilton LLP,
Washington DC, USA

Sylvie Matherat
Chief Regulatory Officer,
Member of the Management Board,
Deutsche Bank AG, Frankfurt, Germany

Annette Nazareth
Partner, Davis and Polk, LLP;
former Commissioner of the US Securities
and Exchange Commission,
Washington DC, USA

David Wright
Chair, EUROFI, Paris, partner at Flint-
Global, London, UK; former Secretary
General, IOSCO, Madrid, Spain

Roland Günther,
Vice President, Deutsche Bank,
London, UK

Udo Helmbrecht,
Executive Director, European
Network and Information Security
Agency (ENISA), Crete, Greece

Tom Huertas,
Partner, Ernst & Young LLP,
London, UK

Mark James,
Partner, Oliver Wyman, London,
UK

Patrick Kenadjian,
Senior Counsel, Davis Polk &
Wardwell London LLP, London, UK

Peter Kerstens,
Advisor on financial technology
and cybersecurity, European
Commission, Brussels, Belgium

Charly Kleissner,
Impact Investor, USA/Austria

Michael Krimminger,
Partner, Cleary Gottlieb Steen &
Hamilton LLP, Washington DC,
USA

Jiri Krol,
Deputy CEO, Head of Government
& Regulatory Affairs, The
Alternative Investment
Management Association (AIMA),
London, UK

Ulrich Krueger,
Head of Section, Deutsche
Bundesbank, Frankfurt, Germany

Christopher Lee,
Independent Board Director,
Matthews Asia Funds, Redwood
City, CA, USA

Rebecca Lentchner,
Head of Government Relations
APAC, BNY Mellon, Hong Kong,
China, Hong Kong SAR

Alastair Lukies,
Chairman, Innovate Finance,
London, UK

Steven Maijoor,
Chair, European Securities and
Market Authority (ESMA), Paris,
France

B. Thomas Mansbach,
Principal, Russin & Vecchi LLP,
International Legal Counselors,
Washington, DC, USA

Sylvie Matherat,
Chief Regulatory Officer, Deutsche
Bank AG, Frankfurt am Main,
Germany

Cheri McGuire,
Group Chief Information Security
Officer, Standard Chartered Bank,
London, UK

Marcello Miccoli,
Economist, Bank of Italy, Rome,
Italy

Wim Mijs,
Chief Executive, European
Banking Federation, Brussels,
Belgium

Martin Moloney,
Special Advisor, Risk &
Regulation, Central Bank of
Ireland, Dublin, Ireland

Bailey Morris-Eck,
Trustee, American Fund, USA

Annette Nazareth,
Partner, Davis Polk & Wardwell
LLP, Washington DC, USA

Bogdan Nedelcu,
IT Security Officer, National Bank
of Romania, Bucharest, Romania

Sandra O'Connor,
Chief Regulatory Affairs Officer,
JPMorgan Chase, New York, USA

Noémie Papp,
Head of Digital & Retail, European
Banking Federation (EBF),
Brussels, Belgium

Gregory Rattray,
Managing Director, Global Cyber
Partnerships & Government
Strategy, JPMorgan Chase,
New York, NY, USA

Geert Roosen,
Senior Equity Research Analyst,
Alliance Bernstein, London, UK

Sushil Saluja,
Senior Managing Director,
Accenture, London, UK

Michael Sholem,
European Counsel, Davis Polk &
Wardwell London LLP, London, UK

Slaven Smojver,
Advisor, Croatian National Bank
(CNB), Zagreb, Croatia

Dominik Treeck,
Partner, Oliver Wyman,
Washington DC, USA

Nathalie Tuxen,
Head of Payments Systems,
Danmarks Nationalbank,
Copenhagen, Denmark

Andres Unger,
Partner, BearingPoint, Vienna,
Austria

Hal Varian,
Chief Economist, Google;
Professor, University of California-
Berkeley, Berkeley, USA

Beat Weber,
Economist, European Affairs
and International Financial
Organizations, Oesterreichische
Nationalbank, Vienna, Austria

Laurence White,
Member of Secretariat,
Financial Stability Board, Basel,
Switzerland

Peter Wilson-Smith,
Founder and CEO, Meritus
Consultants, London, UK

Claudia Wöhle,
Professor, Paris Lodron-
Universität Salzburg, Salzburg,
Austria

David Wright,
Chairman, EUROFI, London, UK

Mark Yallop,
Chair, FICC Markets Standards
Board (FMSB), London, UK

STAFF

Stephen L. Salyer,
President and Chief Executive
Officer

Benjamin W. Glahn,
Vice President – Business &
Operations

Clare Shine,
Vice President & Chief Program
Officer

Tatsiana Lintouskaya,
Program Director

Antonio Riolino,
Program Associate

Ian Brown,
European Development Director

Andrew Ho,
US Development Director

Louise Hallman,
Strategic Communications
Manager

Alexandria Cole,
Library Intern

Jinny Do,
Communications Intern

Maryam Ghaddar,
Communications Intern

Yurah Hong,
Development & Program Intern

Su A Lee,
Program Intern

Mohamed Sidibay,
Development Intern

STAFF

SENIOR MANAGEMENT

Stephen L. Salyer,
*President and Chief Executive
Officer*

Benjamin W. Glahn,
*Vice President, Development &
Operations*

Clare Shine,
*Vice President and Chief
Program Officer*

Daniel Szelényi,
*General Manager –
Hotel Schloss Leopoldskron*

Pia C. Valdivia,
*Vice President and Chief
Financial Officer*

PROGRAM AND ADMINISTRATIVE STAFF & CONSULTANTS

Thomas Biebl,
*Director, Marketing &
Communication*

Ian Brown,
European Development Director

Allison Cowie,
Davidson Impact Fellow

Michelle Dai Zotti,
Development Manager

Jennifer Dunn,
Program Development Assistant

Charles Ehrlich,
Program Director

Marty Gecek,
*Chair – Salzburg Seminar
American Studies Association
(SSASA)*

Michaela Goldman,
Internship Program Manager

Barbara Grodecka-Poprawska,
Program Associate

Louise Hallman,
*Strategic Communications
Manager*

Jan Heinecke,
Fellowship Manager

Andrew Ho,
US Development Director

Faye Hobson,
Program Associate

Dani Karnoff,
*Development Manager –
Campaign & Individual Giving*

Astrid Koblmüller,
Health Program Manager

Brigitte Kraibacher,
Admissions Assistant

Tatsiana Lintouskaya,
Program Director

John Lotherington,
Program Director

Brenna McGaha,
*Director of Finance and
Administration – US*

Paul Mihailidis,
*Program Director –
Salzburg Academy on Media and
Global Change*

Klaus Mueller,
*Chair – Salzburg Global
LGBT Forum*

Beth Pertiller,
Director of Operations

Bernadette Prasser,
Admissions and Program Officer

Michaela Radanovic,
Controller Finance

Dominic Regester,
Program Director

Ursula Reichl,
*Assistant Director Finance,
Salzburg*

Manuela Resch-Trampitsch,
Director Finance, Salzburg

Antonio Riolino,
Program Associate

Carina Rögl,
Accounts Assistant, Salzburg

Susanna Seidl-Fox,
*Program Director –
Culture and the Arts*

Sarah Sexton,
Communications Manager

Alexis Stangarone,
*Special Assistant, Office of the
President*

Oscar Tollast,
Communication Associate

Jenny L. Williams,
*Director, Campaign and
Individual Giving*

HOTEL SCHLOSS LEOPOLDSKRON MANAGEMENT

Richard Aigner,
Hotel Operations Manager

Thomas Bodnariuk,
Executive Chef

Raffat Falk,
Banquets Manager

Karin Maurer,
Revenue Manager

Karin Pfeifenberger,
Sales and Marketing Manager

Matthias Rinnerthaler,
Maintenance Supervisor

Marisa Todorovic,
Executive Housekeeper

INTERNS*

Eve Allums,
Global Citizenship Alliance

Alexandria Cole,
Library

Jinny Do,
Communications

Maryam Ghaddar,
Communications

Yurah Hong,
Program

Sua Lee,
Development & Program

Mohamed Sidibay,
Development (Salzburg)

Buer (Hermione) Su,
Development (Washington, DC)

REPORT AUTHOR

Silke Finken is a professor at the International School of Management. Her research areas are innovation management, financial services, fintech and blockchain as well as strategic management. Previously she was a senior vice president operations and services at DZ BANK AG, responsible for strategic projects and regulatory affair as well as the head of the innovation and consulting management for transaction banking. Before joining DZ BANK AG, Dr. Finken was a project manager at Bain & Company's financial service practice. She holds a PhD in Finance from Frankfurt University. Dr. Finken is a Fellow of several Salzburg Global Seminar programs.

CONTRIBUTORS

Julia Bunte-Mein, *Program Intern*

Maryam Ghaddar, *Communications Intern*

For more information contact:

Tatsiana Lintouskaya,
Program Director
tlintouskaya@SalzburgGlobal.org

Antonio Riolino,
Program Associate
ariolino@SalzburgGlobal.org

Louise Hallman,
Strategic Communications Manager
lhallman@SalzburgGlobal.org

For more information visit:

Series SalzburgGlobal.org/go/finance

Program SalzburgGlobal.org/go/599

* at time of program —
(June 2018)

SALZBURG GLOBAL SEMINAR

Salzburg Global Seminar is an independent non-profit organization founded in 1947 to challenge current and future leaders to shape a better world. Our multi-year program series aim to bridge divides, expand collaboration and transform systems.

Salzburg Global convenes outstanding talent across generations, cultures and sectors to inspire new thinking and action, and to connect local innovators with global resources. We foster lasting networks and partnerships for creative, just and sustainable change.

Over 36,000 Fellows from more than 170 countries have come together through our work, with many rising to senior leadership positions. Our historic home at Schloss Leopoldskron in Salzburg, Austria – now also an award-winning hotel – allows us to welcome all participants in conditions of trust and openness.

SALZBURG GLOBAL FINANCE FORUM

The *Salzburg Global Finance Forum* tackles issues critical to the future of financial markets and global economic growth and stability. Created in 2011, its annual meeting facilitates candid in-depth analysis of strategic challenges and emerging risks by senior and rising leaders from financial services firms, supervisory and regulatory authorities, and professional service providers.

For more info. please visit:
www.SalzburgGlobal.org