TOULOUSE ECONOMISTS ON

Finance and Macroeconomics

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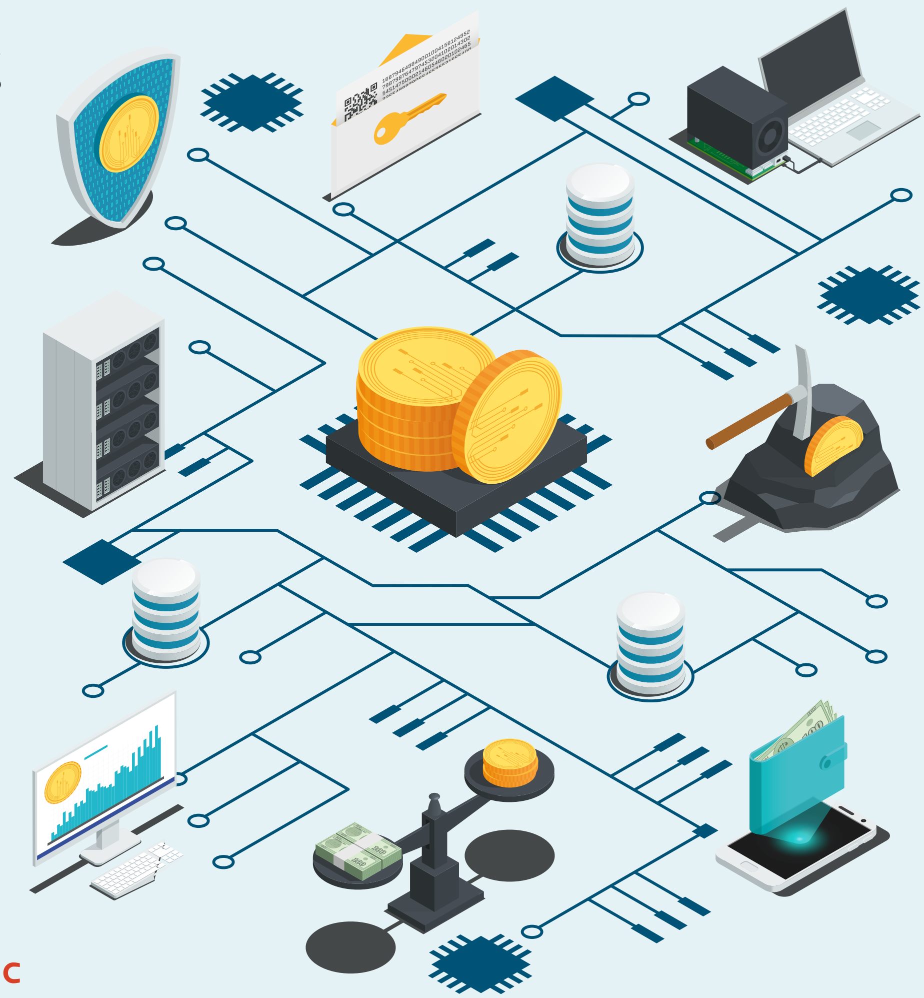


BANQUE DE FRANCE
EUROSYSTÈME

INSTITUT D'ÉCONOMIE INDUSTRIELLE

Toulouse School of Economics

BANKING ON BRILLIANT RESEARCH

FANY DECLERCK - TSE

Fany Declerck *is professor of finance at the Toulouse School of Management and research fellow at TSE, Fany's research studies the microstructure of financial markets using large and high-frequency databases.*

She has held visiting positions at Carnegie Mellon, Banque de France, Berkeley, and Euronext Paris.

She is currently director of the doctoral program in management science and scientific adviser to Autorité des Marchés Financiers.

Since 2007, Banque de France has been able to draw on the skills, knowledge networks and cutting-edge tools of Toulouse economists to address urgent challenges facing the banking and financial sectors. In the following pages, we present evidence of this extraordinarily productive and mutually beneficial collaboration. Here, Fany Declerck (senior TSE researcher) explains this partnership's lasting appeal while representatives from BDF's Financial Stability Department discuss some of the important issues on the road ahead.

How does the partnership work?

FD: Banque de France and TSE aim to strengthen economic research in France and to place themselves at the heart of the debate and at the apex of international economic expertise. For this purpose, Banque de France and TSE have been working together since 2007 in a long-term scientific partnership that involves the exchange of ideas, joint projects and events.

The themes of this partnership focus on the following areas:

- Financial intermediation and the prevention of crises: monetary economics and aggregate liquidity, payment systems, and prudential regulation.
- Macroeconomic analysis of fluctuations and growth, and monetary, budgetary and fiscal policies.
- Market finance and microstructures: market transparency and price formation processes, market and post-market industrial economics.
- Risk and asset prices: formation of financial bubbles, risk aversion, and the assessment and sharing of extreme risk.

The aim is to provide a consistent conceptual framework as well as detailed empirical studies.

Who are the key participants?

FD: This partnership is based on interactions between researchers from the TSE macro and finance groups with Banque de France's Financial Stability and Operations department as well as its Economics and International Relations department. Banque de France has a duty to analyze the functioning of the financial sphere to assess its vulnerabilities and highlight the elements likely to fuel destabilizing developments.

In this capacity, it contributes to the development of international financial standards through its participation in numerous international groups, such as the Basel Committee on Banking Supervision or the Committee on Payments and Market Infrastructures.

The issues raised by this partnership are therefore directly relevant to the French economy.

What are the benefits of the partnership?

FD: Together, we have developed research activities such as an annual international conference and two seminar series. In addition, Banque de France researchers benefit from the support of TSE academic researchers who can accompany them in the publication process.

In November last year, TSE researchers also met with Banque de France's governor, François Villeroy de Galhau, to discuss their research papers.

These regular and long-term exchanges allow Banque de France to enrich its analysis with rigorous theoretical elements but also robust and independent empirical studies. For TSE researchers, these interactions are invaluable as they ensure a much more accurate understanding of the mechanisms at work in banks and the financial markets.

TSE students also benefit from this partnership, as each year Banque de France representatives come to Toulouse to contribute to both basic and more applied courses.

Finally, another central pillar of the partnership since 2012 is the Banque de France-TSE Prize in Monetary Economics and Finance.

What are the challenges for banking in the digital age?

BdF: When Lloyd Blankfein, the CEO of Goldman Sachs, emphasized his openness to investment in cryptocurrencies with the reminder that "folks also were skeptical when paper money displaced gold", at the same time he signaled that banks could become obsolete if they did not adapt to technological progress. Banks are perfectly aware that digitization is vital and a "technology arms race" is currently underway in the banking sphere. Banks partner with fintechs to enhance their customers' experience. They invest in artificial intelligence and machine learning to reduce costs by automating resource-consuming basic activities. They pool together to support blockchain projects meant to solve frictions in various fields such as remittance payments or post market services.

Admittedly a world without banks is not the most probable scenario, but a scenario in which banks become invisible to a large part of their clients should not be discounted. Technological firms, be they start-ups or big "techs" like the GAFAA (Google, Apple, Facebook, Amazon, Alibaba), have the potential to capture B2C relationships, making clients' behavior more volatile and putting at risk traditional banks' business models based on stable deposits.

A decade of regulatory reforms has made banks safer than ever before, but the new "open bank" environment comes with new risks. For instance, one should not forget that HFT can create the illusion of liquidity; crowdfunding and crowdlending have not yet experienced a full credit cycle; and cryptocurrencies are subject to operational and fraud risks, as well as cyberattacks. Against this background, the role of central banks and regulators is to promote activity-based regulations where the same high quality and security standards apply to every financial service, irrespective of its underlying technology, to ensure consumer protection and financial stability.

Which issues need to be tackled by Europe?

BdF: Finalization of the Basel 3 reforms remains a top priority. Ten years after the 2008-2009 financial crisis, it is time to end the regulatory changes which resulted and provide a stable and robust regulatory framework for banks and market participants. Finishing the rules is one thing, but ensuring that they are effectively implemented is just as important. To ensure that Basel 3 will provide all its expected benefits in Europe and worldwide, it will have to be fully and timely implemented by all jurisdictions.

Completing the banking union is also much needed. As the Total Loss Absorbing Capacity (TLAC) defined at international level and the Minimum Requirement for own funds and Eligible Liabilities (MREL) still need to be fully articulated, finalizing the Single Resolution Mechanism (SRM) and implementing the European Deposit Insurance Scheme (EDIS) are important steps to consolidate and strengthen the European banking sector.

Brexit brings additional challenges. It calls for the relocation in the EU of some financial market infrastructures and players which are essential to the stability of the EU financial system and markets. Likewise, EU banks will need to restructure their activities as they might not be able to continue providing services in the UK. Ultimately, Brexit creates the opportunity to enhance the provision of financial services within the EU and to bring further consistency to the EU financial supervision architecture.

FINANCIAL STABILITY AT BDF | Anne-Sophie Cavallo, Maëva Chalvet, Nicolas Joly

After four years as respectively banking and insurer examiners for ACPR, the French supervisory authority of banks and insurance companies, Anne-Sophie Cavallo and Maëva Chalvet work in a team of five financial regulation experts in the Financial Stability Department at Banque de France. They are in charge, on a daily basis, of analyzing the impact of regulation on financial institutions and on the overall financial system.

Nicolas Joly *is involved in the supervision of vulnerabilities and macro risks, stemming notably from technological innovations, within the Financial Stability Department. He was previously an ACPR representative, in charge of negotiating the European and international prudential standards for the insurance sector.*

MEET THE TSE RESEARCH TEAM

MARIANNE ANDRIES

An assistant professor in finance, Marianne joined TSE in 2012.

Her areas of interest are asset pricing and behavioral finance theory.

After working as an investment banker, she did her PhD in finance at Chicago University.

She was a visiting researcher at Banque de France in 2016-2017.

BRUNO BIAIS

Professor at TSE (CRM/CNRS), Bruno's work has been published in Econometrica, the JPE, the AER and the RFS. He has been a scientific adviser to Euronext and the NYSE, editor of the Review of Economic Studies and co-editor of the Journal of Finance.

His research interests include market microstructure, corporate finance, financial contracting, political economy, psychology and experimental economics.

MARTIAL DUPAIGNE

Professor at Paul Valéry University in Montpellier, Martial has been closely involved with Toulouse research since 2001.

His research interests include macroeconomics, international economics, applied econometrics, fiscal policy and business cycles.

He earned his PhD from University Paris I.

PATRICK FÈVE

Professor at TSE and UTC, Patrick has also been director of the doctoral school, a research fellow at Banque de France and co-editor of Annals of Economics and Statistics.

His research interests include macroeconomics, international economics and applied econometrics.

He received his PhD at University Paris I.

CHRISTIAN GOLLIER

Alongside Jean Tirole, Christian created TSE and subsequently served as director.

His interests include decision theory under uncertainty, environmental economics, finance, investment, consumption theory, insurance and cost-benefit analysis.

Christian has published over 100 articles in top-tier journals and seven books including The Economics of Risk and Time, winner of the 2001 Paul A Samuelson Award.

ALEXANDER GUEMBEL

Alexander is a professor of finance at the Toulouse School of Management, where he is affiliated with CRM and TSE.

Alexander's research in finance focuses on incentive problems and information aggregation.

He was visiting Professor at London Business School. His work has been published in the Journal of Finance, Review of Economic Studies, European Economic Review and the Journal of the European Economic Association.

CHRISTIAN HELLWIG

Christian is a TSE associate professor with research interests including macroeconomics and global games.

He spent the last two years of his LSE doctorate as a visiting scholar at MIT and taught at UCLA before joining TSE in 2010.

Christian is also managing co-editor of the Review of Economic Studies.

JEAN-CHARLES ROCHET

Jean-Charles is Swiss Finance Institute professor of banking at Zurich University and research associate at IDEI and TSE.

He has published more than 80 articles in international scientific journals and seven books, including Microeconomics of Banking.

His research interests include banking, financial stability, industrial organization of financial markets and contract theory.

ARE BLOCKCHAINS STABLE?

Miners and the coordination game

Bruno Biais
Christophe Bisière
Catherine Casamatta

Blockchain technology is on the verge of being widely adopted by our financial systems, but its intrinsic stability is based more on generally accepted belief than rigorous analysis. In a collective project, TSE researchers Bruno Biais, Christophe Bisière and Catherine Casamatta teamed up with McGill University's Matthieu Bouvard to analyse the stability of blockchain systems using game theory.

Originally designed to validate transactions in the Bitcoin virtual currency network, blockchain technology looks set to revolutionize the financial services industry. Disappearance of obsolete intermediaries, improved security and drastic reduction in financial transaction costs, new innovative applications for companies or individuals: the expected effects are likely to produce a lasting transformation of the financial sector.

Blockchain technology represents a very effective solution to a generic problem: how to maintain a decentralized, shared register when its participants do not necessarily trust each other? In the Bitcoin network, the register contains virtual currency transactions, establishing each participant's assets and ensuring that no one can spend more bitcoins than they possess. In the Ethereum network, these transactions are real computer programs – known as "smart contracts" – that describe the conditions in which transfers between the parties are triggered. They are executed within the blockchain, automatically, irreversibly, and observable by all.

The solution to the problem of the distributed register without the use of a trusted third party, proposed by blockchain technology, is based on a clever combination of known technologies such as cryptographic techniques and original proposals, in particular the protocol allowing participants to agree on the current status of the register.

While the technical properties of the cryptography are well known, those of the distributed consensus protocol are much less so. However, the consequences of a possible breakdown of this consensus cannot be overlooked: if the participants do not agree on the status of the register, several "truths" coexists on transactions and ownership rights. Such instability would be critical for users, who depend on confidence in the system and its ability to maintain consensus.

How does a blockchain work?

In a blockchain network, the flow of transactions to be validated (in other words, to be added to the register) is directed to participants called "miners". Each miner stores these transactions in a block, adds a special transaction corresponding to his or her reward for that block, then tries to validate that block. To do this, he or she must solve a difficult numerical problem, which can only be solved by brute force. The miner then proceeds by trial and error, until he or she finds a solution. The successful miner then disseminates this block and its solution (called "proof of work") within the network.

The other miners check the solution is correct (an easy operation, unlike the search for the solution itself), and mark their acceptance by abandoning their current block and by mining a new block of transactions, attached to this winning "parent" block. The process of searching for and sharing solutions continues, creating a sequence of validated blocks, representing the current state of the register.

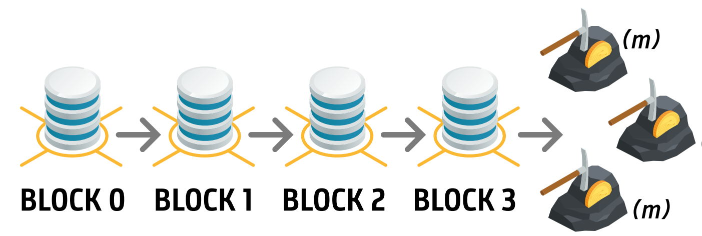


Figure 1: A blockchain, and miners ("m") working together to extend it.

A single string, like that in Figure 1, reflects a perfect consensus among participants: at this point, they all observe the same string and consider it to represent the current state of the register. They therefore all mine on the same parent block (here, block number 3). But an ideal situation such as this is not guaranteed.

One reason for this lies in the physical properties of the network: the winning blocks take time to traverse it. It is therefore possible that two miners who are relatively far apart will validate their blocks at roughly the same time, before receiving the solution from the other. At this point, two visions of the blockchain coexist within the network, with the other miners adopting the perspective of the nearest winning miner, as shown at the top of Figure 2.

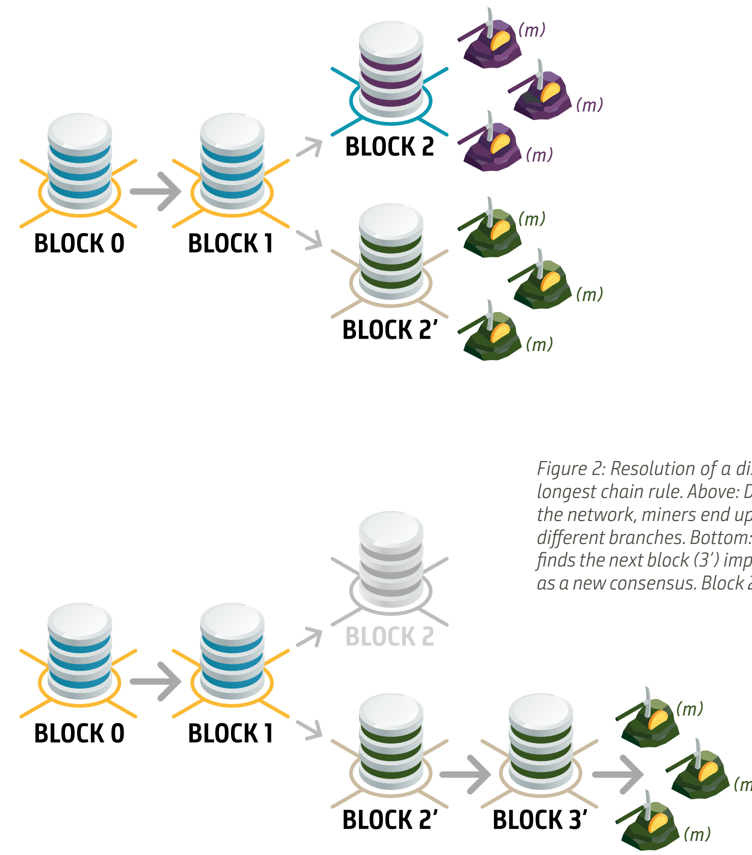


Figure 2: Resolution of a dissensus by the longest chain rule. Above: Due to delays in the network, miners end up mining on two different branches. Bottom: The group that finds the next block (3') imposes its branch as a new consensus. Block 2 is abandoned.

To regain a consensus, miners are supposed to follow a rule that they always mine at the end of the longest chain known to them. Thus, the disagreement mentioned above will naturally disappear when a miner validates and disseminates a new block *(eg Block 3', at the bottom of Figure 2)*, creating a longer chain than other miners, and thus quickly imposing a consensus in line with its vision of the register. A "fork" appeared, but it was very short and only persisted for a brief period.

Another problem is malicious behaviour. A participant who wishes to cancel a transaction in an already mined block – to retrieve already spent virtual currency units - will have to mine a block from a parent block located before the block containing that transaction, and attempt to create a concurrent channel longer than the current string, so that other miners will spontaneously drop the portion of the string containing the transaction. However, the chances of success of a miner, alone on his fork, are slight, unless this miner has considerable computational power. Such success is impossible in mature blockchain networks as rewriting the history of transactions in the blockchain is excessively costly.

A blockchain is a coordination game

Everything seems to indicate that the longest chain rule, combined with the difficulty of the numerical problem to be solved, eliminates the possibility of "serious" *(ie, long and possibly persistent)* forks, thus guaranteeing the stability of the blockchain. The work of Biais and his colleagues consists in evaluating this conjecture from a theoretical point of view, using game theory. They model a blockchain as a game in which rational miners strategically choose the parent block on which to mine. In making his or her decision, a miner anticipates the choices of others. The longest chain rule is a possible strategy, but it is not the only one. For simplicity, the researchers assume that miners instantly observe all transactions and all blocks, and that they are only rewarded in virtual money attached to the blocks they have mined. By eliminating the frictions that caused the instabilities mentioned above, the researchers reinforce their results on the possibility of forks.

In this context, how do miners behave? They are subject to two forces. First, the rewards obtained by mining blocks in a given string will make a miner reluctant to abandon this chain to go mining a possible fork upstream. Indeed, if this fork were to become a new consensus, the rewards associated with blocks now excluded from the register would be worthless. This first force tends to stabilize any situation, whether it has a fork or not. Second, a miner prefers to mine blocks that he anticipates other miners will mine. Indeed, mining alone on one branch, when all the others are working to extend another branch, amounts to using computing power at a pure loss. This second force may favour the appearance of forks, depending on the expectations of the miners.

Significantly, the fact of having started to mine a block is not in itself a reason for a miner to continue. The nature of the numerical problem to be solved means that any attempt to solve it always has the same probability of success, irrespective of the number of attempts already made. This probability depends only on the computational capacity of the miner and the difficulty of the problem, as fixed by the protocol. Since the probability does not depend on the mined block or the blocks that other miners have chosen to mine, there is not a race between miners, in which the first to find the solution gains a reward at the expense of the others.

In this light, the game between miners appears to be a game of coordination, in which anticipation of the behaviour of others plays an essential role.

Consensus and dissensus

In this strategic game, a blockchain configuration is an equilibrium when miners' strategies are coherent, in the sense that no miner, if made aware of the choices made by others, would wish to modify their own choice. At equilibrium, no miner has an interest in changing strategy: in other words, to change the parent block on which he or she is mining.

This first result is reassuring: because a miner who anticipates that other miners will apply the longest chain rule has an interest also following it as well - a single chain, without a fork, is a stable configuration. In addition, this "consensual" configuration is robust in the face of the small deviations expected from the application of the longest chain rule.

As often in coordination games, other equilibria are possible. The top of Figure 3 shows that one can have a stable configuration in which a portion of the chain is collectively abandoned in favour of a branch created upstream. This configuration is suboptimal because the rewards attached to the abandoned blocks are permanently lost. Another, even more negative result of the model is illustrated at the bottom of Figure 3. It is possible to obtain an equilibrium that has a persistent fork, with the miners being distributed on the two branches and continuing to mine them. The dissensus here is complete, and the social value of the blockchain is seriously undermined.

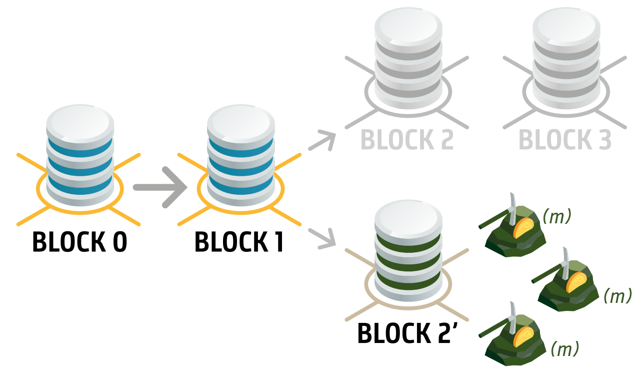
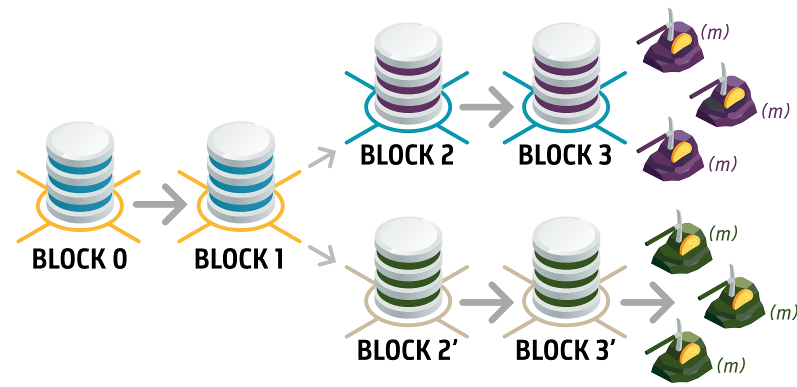


Figure 3: Two suboptimal equilibrium configurations



Summing up

The researchers show that consensus can be achieved within the blockchain, but it is not possible to exclude situations in which temporary or persistent forks appear, even in the absence of malicious miners. Such situations have been observed in the two largest networks based on blockchain, Bitcoin and Ethereum.

For more details, see 'The Blockchain Folk Theorem' a working paper by Bruno Biais, Christophe Bisière, Matthieu Bouvard and Catherine Casamatta

RISK-SHARING OR RISK-TAKING?

Derivatives, margins and central clearing

Bruno Biais
Florian Heider
Marie Hoerova

Can risk-sharing via derivatives perversely lead to risk-taking by financial institutions? How can derivatives activity be made more resilient to risk? In a recent working paper, Bruno Biais, Florian Heider and Marie Hoerova explain how derivatives positions affect risk-taking incentives. They show how margin deposits and clearing arrangements can be designed to mitigate counterparty risk. They provide new empirical predictions about the extent of derivatives activity in a given financial environment and the default risk of institutions selling protection through derivatives.

Derivatives activity has grown strongly over the past 15 years. For example, the face value of credit default swaps (CDS), which are bilateral over-the-counter contracts used to insure credit risk, increased from around $180 billion in 1998 to more than $60 trillion by mid-2008. But the insurance provided by derivatives is effective only if counterparties can honor their contractual obligations. When Lehman Brothers filed for bankruptcy, it froze the positions of more than 900,000 derivative contracts (about 5% of all derivative transactions globally).

Building the model

The TSE and ECB researchers' model features risk-averse protection buyers who want to insure against a common exposure to risk. These buyers contact risk-neutral protection sellers whose assets can be risky, but who are not directly exposed to the risk that the buyers want to insure. Because of limited liability, protection sellers can make insurance payments only if their assets are sufficiently valuable. The value of a protection seller's assets is affected by her actions. Specifically, the model assumes protection sellers can prevent downside risk, and hence maintain a sufficient value for their assets, by exerting costly effort such as scrutiny of potential investments. Alternatively, protection sellers can "shirk" the cost of scrutiny by relying on external, ready-made credit ratings or simple backward-looking measures of risk. A failure of protection sellers to exert the risk-prevention effort (which the researchers call "risk-taking") leads to counterparty risk for protection buyers.

Since financial institutions' balance sheets and activities are opaque and complex, risk-taking is difficult to observe and detect for outsiders. This creates a moral-hazard problem for protection sellers, the key friction in the model.

Risk-sharing may breed risk-taking

The model builds on two important characteristics of derivatives activity:

1 / During the life of a derivative contract, new information about the value of the underlying asset becomes available. Such news affects the expected pay-offs of the contracting parties: it makes the derivative position an asset for one party and a liability for the other.

2 / Derivative exposures, and hence the associated potential liabilities, can be large. According to the US Treasury, total credit exposure from derivatives reached more than $1.5 trillion in 2008. The total credit exposure of the top five financial institutions was up to 10 times larger than their risk-based capital.

One of the researchers' key insights is that a large derivative exposure undermines a protection seller's incentives to exert the risk-prevention effort when news makes the derivative position an expected liability. In that case, the seller bears the full cost of the risk-prevention effort while the benefit of this effort partly accrues to the counterparty in the form of payments from the derivative contract. This is reminiscent of the problem of debt overhang (Myers, 1977) but there is an important difference. In this analysis, the liability arises endogenously in the context of an optimal contract and only materializes when negative news occurs.

The optimal contract takes one of two forms, depending on the severity of the moral hazard problem. Either the contract maintains protection sellers' risk-prevention incentives, at the cost of less ex ante risk-sharing for protection buyers, or it promises more risk-sharing but gives up on risk-prevention incentives, which creates counterparty risk for protection buyers. Thus, Biais and his colleagues show how the risk-sharing potential from derivatives contracts is limited by the potential or the actual presence of endogenous counterparty risk.

Margin calls and central clearing

The main focus of their paper is to characterize the optimal design of margin calls and central clearing, two institutional arrangements that aim to mitigate counterparty risk in derivatives. Both margins and central clearing received much attention in the regulatory overhaul of financial markets in the aftermath of the financial crisis. The Dodd-Frank Wall Street Reform Act in the US and the European Market Infrastructure Regulation both require certain derivative trades to occur via central clearing platforms (CCPs).

The researchers' model features a CCP that interposes between protection buyers and sellers. In a bilateral contract, each protection buyer is exposed to the counterparty risk of his own protection seller. The CCP instead pools the resources from all protection sellers. Any losses from the default of individual sellers are therefore shared across all protection buyers.

The CCP is also in charge of implementing margin calls. The party subject to a margin call must hand over control of assets to the CCP, "ring-fencing" them from moral hazard. With fewer assets, the cost of risk-prevention effort is lower, which improves risk-prevention incentives. But the loss of control goes hand-in-hand with a loss of income. Safe assets on a margin account earn a lower return than risky assets left on financial institutions' balance sheets. Margins will therefore be used only when the ring-fencing benefit outweighs the cost: for example, when the moral hazard problem is severe; or when the opportunity cost of depositing assets in the margin account is not too large.

Policy implications

The researchers' analysis implies that margins can be an attractive substitute to equity capital. Ring-fenced from moral hazard, assets can support larger liabilities. Consequently, margins allow protection sellers to engage in incentive-compatible derivative trading with less equity. An advantage of margins is their contingent nature. They are called only when individual derivative positions deteriorate.

This mechanism design approach clarifies how two important reform proposals to make derivative markets more resilient, namely margins and central clearing, interact and need to be designed together. While central clearing allows mutualizing counterparty risk, margins provide incentives to avoid counterparty risk. Without margins, CCPs would bear too much risk and without a CCP, contracting parties would have to put up higher margins. And it is the CCP who must design and mandate the margin calls. Otherwise, there would be free-riding on the insurance it offers.

Biais and his colleagues also identify a channel through which derivatives activity can propagate risk. Without moral hazard, they assume for simplicity that the pay-offs from protection-seller assets and protection-buyer assets are independent. In contrast, with moral hazard, bad news about protection-buyer assets can increase the likelihood of low pay-offs from protection-seller assets, because bad news undermines protection sellers' risk-prevention incentives. Moral hazard in derivatives activity can therefore generate contagion between two, otherwise unrelated, asset classes.

For example, before the recent crisis commercial banks frequently reduced their capital requirements by purchasing derivatives. A bank exposed to sub-prime mortgages could purchase CDS on mortgages and save on regulatory capital. Conditional on the drop in real-estate prices, those CDS contracts became expected liabilities for those institutions that sold them, typically investment banks. The researchers' model predicts that financial institutions with larger short CDS positions exposed their balance sheets more to downside risks as bad news about the housing market emerged. This creates correlation between mortgage values and the values of financial institutions' assets without direct exposure to mortgage default. By contrast, those same institutions would not have increased their risk exposure after good news about the housing market. Importantly, in the researchers' model the exposure to downside risk is not the consequence of mistakes or incompetence. It is a calculated choice of trading-off ex ante risk-sharing and downside risk exposure after bad news.

Empirical implications

Biais and his colleagues' model generates new testable implications:

1 / Derivatives contracts that offer ample insurance but increase exposure to counterparty risk are more likely to be underwritten in a "benign" macroeconomic and financial environment.

2 / The relation between derivatives exposures and the pledgeability of a financial institution's assets is U-shaped. Financial institutions with an intermediate level of risk-management efficiency choose small derivatives exposures while financial institutions on the other two sides of efficiency spectrum choose large exposures.

3 / Optimal margins are higher when ***i)*** risk-free rates are high compared to the return on productive investment opportunities, and ***ii)*** risk-management costs increase strongly with the amount of assets under management.

Margins can be interpreted as a form of collateral. Collateral is usually analyzed in models in which agents borrow to finance investments. This research offers the first analysis of the incentive role of collateral in derivatives trading. This new context brings about new features that set margins apart from standard collateral. Standard collateral, say a house that backs up a mortgage, is transferred from the borrower to the creditor after decisions have been taken and pay-offs are realized, for example, when the borrower defaults. By contrast, margin calls in this analysis, as in derivatives markets, occur before contracts mature; in other words, before final pay-offs are realized, and, importantly, before effort and risk-taking decisions are made.

Future research

The researchers explain how derivatives activity, through its effect on incentives, can generate contagion between asset classes whose risk is independent in the absence of incentive problems. This novel form of contagion adds to the literature on shock propagation, which emphasizes interregional financial connections, information contagion and fire sales.

Biais and his colleagues' emphasis on the positive consequence of margins contrasts with the result that margins can be destabilizing, as shown by Gromb and Vayanos (2002) and Brunnermeier and Pedersen (2009). These other studies take margin constraints as given and, for these margins, derive equilibrium prices. Greater margins force intermediaries to sell more after bad shocks, which pushes prices down and can generate spirals. In contrast, Biais and his team endogenize margins, but take as given the value of assets a protection seller deposits on a margin account. They suggest that future research could combine the two approaches and study how endogenous margins could destabilize equilibrium prices. Such research in the context of derivatives and margins would complement Acharya and Viswanathan's (2011) analysis of fire-sale price externalities in the context of borrowers de-levering by selling assets.

Summing up

Derivatives activity, motivated by risk-sharing, can breed risk-taking. Bad news about the risk of the asset underlying the derivative increases the expected liability of a protection seller and undermines their risk-prevention incentives. This limits risk-sharing, and may create endogenous counterparty risk and contagion from news about the hedged risk to the balance sheet of protection sellers. Margin calls after bad news can improve protection sellers' incentives and enhance the ability to share risk. Central clearing can provide insurance against counterparty risk but must be designed to preserve risk-prevention incentives.

For more details, see 'Risk-sharing or risk-taking? Counterparty risk, incentives and margins', a working paper by Bruno Biais, Florian Heider and Marie Hoerova

NEED FOR SPEED

Can regulators catch up with fast traders?

Fany Declerck

On today's financial markets every nanosecond counts, increasing the chance of an 'arms race' as traders, venues or investors compete to be the fastest. Here, TSE professor Fany Declerck reviews the economic literature on high-frequency trading and the huge challenges it has created for the financial industry, regulators and researchers.

Market microstructure focuses entirely on how to acquire and shoot out information. In the old days of the Chicago Board of Trade, traders wore platform shoes to see and be seen above the flailing arms on the trading floor. Female traders were admitted in 1969 because other traders seemed to better hear their higher pitched voices. Since then, mathematical and technological advances have totally reshaped the industry.

A crucial ingredient in this process has been telecommunications innovation. In the early 1840s, information took two weeks to travel from Wall Street to Chicago. Today, companies like Anova are installing laser networks between stock exchanges to gain a few nanoseconds in speed over the current microwave and fibre optic links. Trading firms can also pay to place their servers inside the exchange's data centre, a practice known as colocation.

Biais and Foucault (2014) define high frequency trading (HFT), or fast traders (HFTs), as follows: "HFTs strive to minimise so-called latencies: essentially the time it takes for them to receive messages from trading platforms, process this information, and react to it by sending back new orders based on this information."

Today, investors must collect and process large amounts of quotes and machine readable news, often from several markets. HFT's main characteristics are: i) high rates of intraday messages; ii) submission of numerous orders that are cancelled shortly after submission; iii) small trade size; iv) ending the day in as flat a position as possible (that is, not carrying significant, unhedged positions overnight).

Overinvestment

Stock exchanges need to invest in cutting-edge fast technologies if they want to attract order flow and charge higher fees. Competition among venues increases trading volumes and efficiency, but entry and fragmentation can be too high, and investment in speed can be excessive. To improve their monitoring capacity, trading speed competition can also occur between liquidity providers and liquidity consumers, leading to socially wasteful investments.

A model developed by Biais et al (2015) demonstrates that, in general, the socially optimal level of investment in HFT technology is not zero. HFT technology improves social welfare, and helps trading firms deal with market fragmentation. However, as trading firms do not consider the negative externality of fast access to market quotes, an arms race ensues in which institutions overinvest in HFT technology.

Richborough (Kent, United Kingdom) is a recent example of such huge investment. To be sure that even the Earth's curvature would not impede its ability to transmit data to continental Europe, Vigilant Global tried to erect a 324 metre mast, 12 metres higher than the Eiffel Tower. Ash Parish Council voted unanimously against the project, but New Line Networks is now planning to build its own mast in the same town.

Adverse selection

Foucault et al (2016) study a dynamic model which shows that if fast speculators can trade on advance and informative private information about both long run and short term value, they will trade first on what moves prices in the short run, then on the long term information, even if those two pieces of information are conflicting. This helps us to understand round trip trades by HFTs over milliseconds and nanoseconds.

Aït Sahalia and Saglam (2014) use a dynamic framework to show higher profits, higher liquidity provision and higher cancellation rates in normal market conditions for a monopolistic HFT market maker. Their model also predicts that liquidity supply decreases when price volatility increases. When competition is introduced, liquidity consumers are better off.

Trading on news

Based on Foucault et al (2016), we know that fast speculators trade aggressively on their short term information and more passively on their long term information. This implies that fast traders can cause adverse selection against slower traders. It also suggests fast trades contribute to price discovery: they are more informative about short term price variations and less informative about long term variations; overall the price discovery process is unaffected.

In today's market, information is easily, directly and electronically available to all investors, but it is still costly. Static models predict that, with more information, the price discovery process should be better. Paying attention to and extracting a more precise signal from news is nonetheless time consuming.

Dugast and Foucault (2016) show that the reduction in the cost of accessing data can impair long run asset price informativeness. In their dynamic model, raw data is a noisy signal and processed data has the noise removed. Investors face a delay and a higher cost for processed data. If the cost of raw data declines, more investors trade on it, improving short run price discovery. If raw data is a poor signal, it generates mispricings, then profit opportunities for trading with processed data. In contrast, if the raw signal is sufficiently reliable it can crowd out demand for processed data and the final price will not fully reveal the asset value. Fast traders are, of course, likely to use raw data.

Market quality

HFT can lead to an arms race, with measured liquidity as the unintended victim. However, most evidence suggests that HFT has led to improvements in liquidity and price discovery. Following the introduction of autoquote to the NYSE in 2003, Hendershott et al (2011) observe a decline in effective spreads and in the adverse selection cost (only) for large cap stocks. Quotes become more informative and the liquidity supply works better. Brogaard et al (2014) indicate that HFTs increase asset price informativeness: by being able to forecast very short run price changes, they contribute to market stability. Moreover, HFTs do not exit the market at time of market stress.

Boehmer et al (2015) find that HFT firms do not destabilise stock exchanges, in line with Hasbrouck and Saar (2013). Using similar Canadian data, Brogaard et al (2015) establish that HFT limit orders are more informative and almost twice as prevalent as non HFT limit orders.

Negative externalities

High trading speed may reduce frictions and trading costs, but it may also generate negative externalities. In 2012, the Nasdaq OMX Stockholm equity market offered each trading firm the option to pay an extra fee to boost its trading speed. Brogaard et al (2016) show that this option, mainly chosen by fast market makers, is associated with improved liquidity via a reduction in the inventory bearing risk, and that the improvements benefit both fast and slow traders. Their data indicate that orders submitted by HFTs reflect advance information, consistent with a higher adverse selection cost for slower traders.

Similarly, Menkveld and Zoican (2015) show that the new trading system introduced in 2010 at Nasdaq OMX, while lowering the exchange latency, also increases spreads via higher adverse selection against slower traders. Thus, an increased speed can reduce market liquidity. Weller (2016) also finds a negative link between HFTs and the informativeness of prices about future earnings.

Using a unique data set from Euronext and the AMF (the French financial markets authority), Biais et al (2016) find that

proprietary traders, be they fast or slow, provide liquidity with contrarian marketable orders, thus helping the market absorb shocks, even during crises, and earn profits by doing so. Moreover, fast traders provide liquidity by leaving limit orders in the book. Yet, only proprietary traders can do so without making losses. This suggests that technology is not sufficient to overcome adverse selection; monitoring incentives are also needed.

Institutional investors

A common concern about the impact of HFT is the sharp drop in the number of shares available in limit order books and in accompanying trade sizes. As a result, institutional investors with large orders need to use a "slice and dice" trading strategy. We also know from the empirical literature that fast traders are more skilled in market monitoring and can forecast very short-term price changes. Institutional traders may have to deal with detection risk by HFTs and institutional investors have expressed concerns about trading costs. In fact, Anand et al (2012) have captured a 33% increase in US equity markets from 2005 to 2010 for institutional investors.

The empirical analysis of Van Kervel and Menkveld (2016) finds that during the first hour following an institutional order execution, HFTs act as market makers, but then flip for multi hour executions, increasing trading costs for the institutional trader. HFTs cannot detect institutional orders immediately, but as soon as they do they "back run" on those orders.

Korajczyk and Murphy (2015) find that HFTs provide, on average, far more liquidity to large institutional size parent orders than designated market makers (DMMs). For the largest institutional size orders, HFTs provide less liquidity while DMMs increase their liquidity provision.

Policy implications

The secrecy of HFT firms and their algorithms has led regulators to propose market microstructure updates to slow down trading, such as minimum quote lives, scheduled periodic auctions and taxation. The results of Pagnotta and Philippon (2015) are consistent with regulations that push for more competition and fragmentation.

Biais et al (2015) shed light on three regulator interventions: a ban on fast trading, the coexistence of slow and fast markets, and a Pigovian tax on HFT technology. Only the latter enables a socially optimal level of investment in HFT technology.

Aït Sahalia and Saglam (2014) also consider three potential policies: a transaction tax, minimum waiting times before limit orders can be cancelled, and a tax on limit-order cancellations. The first does not improve the liquidity supply; the other two improve liquidity provision at times of low volatility, but impair it during high volatility.

Regulators are also seeking to reconstruct the sequence of events across linked markets via a master clock, to detect predatory or illegal trading behaviour. However, as the arms race between HFT firms has almost reached the physical limits set by the speed of light, it is impossible to precisely sequence such trades. Instead of trying to implement a speed bump, regulators could speed up access to protect large orders and avoid disclosing information to HFTs.

Meanwhile, several firms are developing high tech surveillance techniques to supply traders with non public information. Genscape, Remote Sensing Metrics LLC and DigitalGlobe are at the vanguard of a growing industry that uses a patented private network of in the field monitors, maritime freight tracking, infrared diagnostics, electromagnetic frequency monitors, high-resolution aerial photography and near earth satellite imagery.

Summing up

Driven by electronic trading, market fragmentation, IT improvements and regulatory enforcement, HFT is a new entrant in stock exchanges. It appears to produce greater price efficiency and market liquidity, but the evidence is more mixed regarding negative externalities such as adverse selection and arms races. Trading on advance information is nonetheless significant. Finally, the "slice and dice" trading strategy implemented by institutional investors does not seem fully appropriate to avoid the risk of detection by fast traders.

BEYOND THE CURVE

Tax, revenue and public debt

Patrick Fève
Julien Matheron
Jean-Guillaume Sahuc

Which tax rate produces the highest fiscal revenue? The Laffer curve generally depicts an 'inverted U'-shaped graph starting at 0% tax with zero revenue, rising to the maximum revenue at an intermediate tax rate, before returning to zero revenue at 100% tax. Together with Julien Matheron and Jean-Guillaume Sahuc from Banque de France, TSE's Patrick Fève has examined this crucial relationship in the context of liquidity-constrained agents and incomplete financial markets. After six years' work, their paper will soon be published in the prestigious Journal of the European Economic Association. It shows that the shape of the famous curve depends on whether debt or transfers are adjusted to balance the government budget constraint.

Against a backdrop of fiscal consolidation in developed countries, the Laffer Curve has recently received considerable attention and has proven to be a useful tool to quantify the available fiscal space. Using a neoclassical growth model with incomplete markets and heterogeneous, liquidity-constrained agents (hereafter, IM), Fève and his co-researchers find there is no sense in which one can define a Laffer curve abstracting from whether debt or transfers are chosen to balance the government budget constraint. This is because the interest rate itself is not invariant to debt and transfers, contrary to what happens in a representative agent (RA) setup.

Conditional curves

To address this issue, they develop the concept of conditional Laffer curves. Holding public debt constant, they vary transfers and adjust one tax rate accordingly. This yields a relation linking fiscal revenues to the tax rate conditional on transfers. By holding transfers constant and varying debt, they can similarly define a Laffer curve conditional on public debt. In an RA setup, the two conditional Laffer curves coincide, which is the mere reflection of the irrelevance of public debt and transfers for the equilibrium allocation and price system. In an IM setup, however, the picture changes dramatically.

The horizontal 'S'

Although the Laffer curve conditional on transfers has the traditional inverted-U shape, its counterpart conditional on debt looks like a horizontal 'S'. In this case, there can be one, two, or three tax rates compatible with a given level of fiscal revenues. The regular part of this curve (the part that indeed looks like an inverted 'U') is associated with positive government debt, whereas the odd part (the part that makes the curve look like a horizontal 'S') is associated with negative debt levels.

To understand this odd shape, consider a situation such that the debt-output ratio becomes negative, say, because the government is now accumulating assets. There are two effects at work here. Obviously, if government wealth increases, the fiscal burden declines, calling for a lower tax rate to balance the budget constraint. This is the standard force present in an RA framework. However, in an IM context, there is another force at work: The interest rate decreases when government wealth increases. Other things equal, this reduces government revenues, calling for higher taxes. For sufficiently negative government debt, the second force dominates, leading to the oddly shaped Laffer curve conditional on debt.

Negative debt

In practice, the key question is whether the odd portion of the Laffer curve conditional on debt is relevant from an empirical point of view or a mere theoretical curiosity.

Defining debt as government liabilities net of financial assets and using a long data set featuring all the G7 countries, based on Piketty and Zucman (2014), Fève and his colleagues find occurrences of negative public debt for Japan, Germany, and the United Kingdom. One can alternatively define public debt as government liabilities net of nonfinancial assets (eg administrative buildings, subsoil, and intangibles such as artistic originals). This alternative definition is somewhat contentious because the national accounts assume a zero net return on nonfinancial assets. However, it provides a rough assessment of government net wealth. Under this definition, negative public debt is pervasive. Fève et al conclude from both perspectives that the odd part of the Laffer curve conditional on debt is not a theoretical curiosity.

Public debt dynamics

Negative public debt plays a central role when analyzing Laffer curves. It is thus important to show that the possibility of negative public debt is empirically relevant.

Fève, Matheron and Sahuc use the data on the government balance sheet constructed by Piketty and Zucman (2014) to obtain two measures of public debt.

See Figures 1 and 2 on pages 19 and 20

The model

To explore these issues, the researchers consider a prototypical neoclassical model along the lines of Aiyagari and McGrattan (1998) and Flodén (2001). In this economy, households are subject to persistent, uninsurable, idiosyncratic productivity shocks and face a borrowing constraint. The model includes distortionary taxes on labor, capital, and consumption. These taxes are used to finance a constant share of government consumption in output, lump-sum transfers, and interest repayments on accumulated debt. Although the model is very simple and essentially qualitative, Fève and his team strive to take it seriously to the data, calibrated to the US economy and matching key moments of earning and wealth distributions. They then study the steady-state conditional Laffer curves associated with each of the three taxes considered.

Key results

1 / *When transfers are varied, the Laffer curves in the IM economy look broadly like their RA counterparts. In the researchers' benchmark calibration, the revenue-maximizing labor income tax rate hardly differs from its RA counterpart. They reach similar conclusions when considering capital income and consumption taxes.*

2 / *When debt is varied instead of transfers, the regular part of the Laffer curve is similar to its RA counterpart. However, whenever debt is negative, the two curves differ sharply, confirming the insight drawn from the above discussion.*

A corollary of the results is that the Laffer curves (conditional on transfers) are not invariant to the level of public indebtedness. This is potentially very important in the current context of high public debt-output ratios in the United States and other advanced economies. It turns out that the Laffer curves are only mildly affected by the debt-output ratio, provided that the latter is positive. However, for negative levels of public debt, the researchers find that the Laffer curve associated with capital income taxes can be higher than its benchmark counterpart.

The results are robust to a series of model perturbations, such as lower labor supply elasticities, lower shares of government spending, alternative calibration targets for the debt-output ratio, alternative utility functions, and alternative processes for individual productivity.

Summing up

To inspect how allowing for liquidity-constrained agents and incomplete financial markets impacts the shape of the Laffer curve, Fève and his co-researchers use a neoclassical growth model. They pay particular attention to whether debt or transfers are adjusted to balance the government budget constraint as taxes are varied. In a RA framework, this does not matter, whereas opting to adjust debt rather than transfers is important in an IM setup.

They find that the properties of the Laffer curve depend on whether it is conditional on debt or conditional on transfers. When they consider Laffer curves conditional on transfers, the results in an IM economy closely resemble their RA analogs. However, when they consider Laffer curves conditional on debt, they obtain a dramatically different picture. Now, the Laffer curves on labor and capital income taxes resemble horizontal 'S's, meaning that there can be up to three tax rates associated with the same level of fiscal revenues.

For more details, see 'The Horizontally S-Shaped Laffer Curve' by Patrick Fève, Julien Matheron and Jean-Guillaume Sahuc

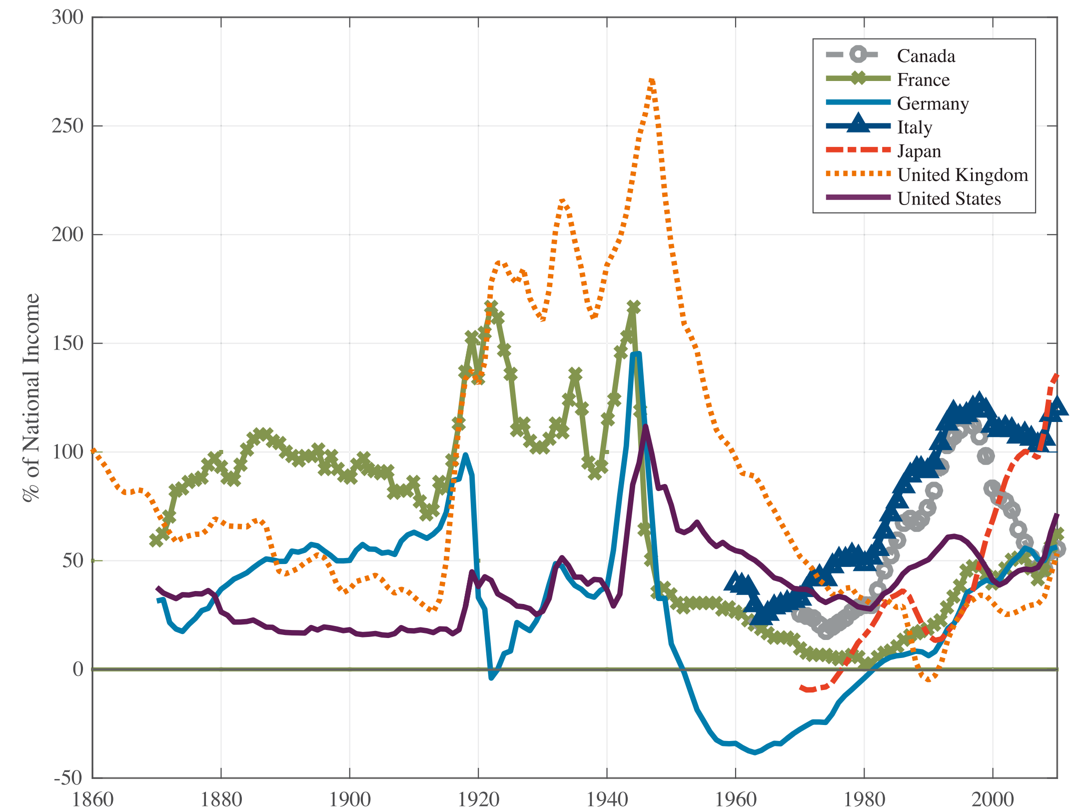


Figure 1 - Public debt (without accounting for nonfinancial assets

Figure 1 *reports the first debt definition, the difference between government liabilities and financial assets. The figure shows that in all the countries considered, large fluctuations in public debt are mainly associated with major historical events.*

After borrowing to pay for the Civil War, the US reduced its debt by half in the wake of World War I. Subsequently, the debt-to-national-income ratio fluctuated around 40% until World War II, which caused its debt to exceed one year of national income. The postwar US economy grew, and the debt-to-income ratio declined until the mid-1970s when it reached 30%. In the early 1980s, defense spending and tax cuts led to ballooning debt. Before the Great Recession, the ratio was below 50%, but stimulus packages have led to an upward trend.

Since the 1970s, starting from a negative level, Japan's net debt has increased steadily. Over the 1990s and 2000s, Japan experienced no increase in nominal income, so the debt-to-income ratio has continuously increased. Japan has been unable to inflate its way out of debt, and has made tiny interest payments to bondholders.

Following the Napoleonic wars, the UK implemented a long and drastic austerity plan such that the debt represented 26% of national income in 1913. At the end of World War I, the ratio was 180% and remained virtually unchanged until World War II, which pushed debt up to 270%. Unlike other European countries, the UK refused to pursue inflationary default so postwar debt only declined very gradually. From the early 1980s until 2008 (with the notable exception of 1990, where debt was negative), UK public debt hovered around 30%.

During the 19th century, France experienced rising deficits, and its debt reached 100% of national income by 1890. Despite inflation during World War I, the debt-to-income ratio rose to over 170% by the early 1920s. By the beginning of World War II, the ratio had decreased to 100% but shot to over 160% in 1944. France then inflated its way out of debt by imposing heavy losses on bondholders. The debt-to-income ratio decreased toward zero until the end of the 1970s and has continually increased since.

Germany inflated its way out of its World War I debts through hyperinflation, wiping out bondholder wealth. In 1948, Germany used a currency conversion to significantly reduce its debt obligations. Importantly, German public debt was negative for roughly 30 years, from the early 1950s to 1980.

Italy also inflated its way out of debt after World War II. However, in stark contrast with France, Italy consistently ran budget deficits after World War II. In the mid-1990s, it reformed its public finances to prevent additional increases in the debt-to-income ratio. During this period, Italy benefited from lower interest rates.

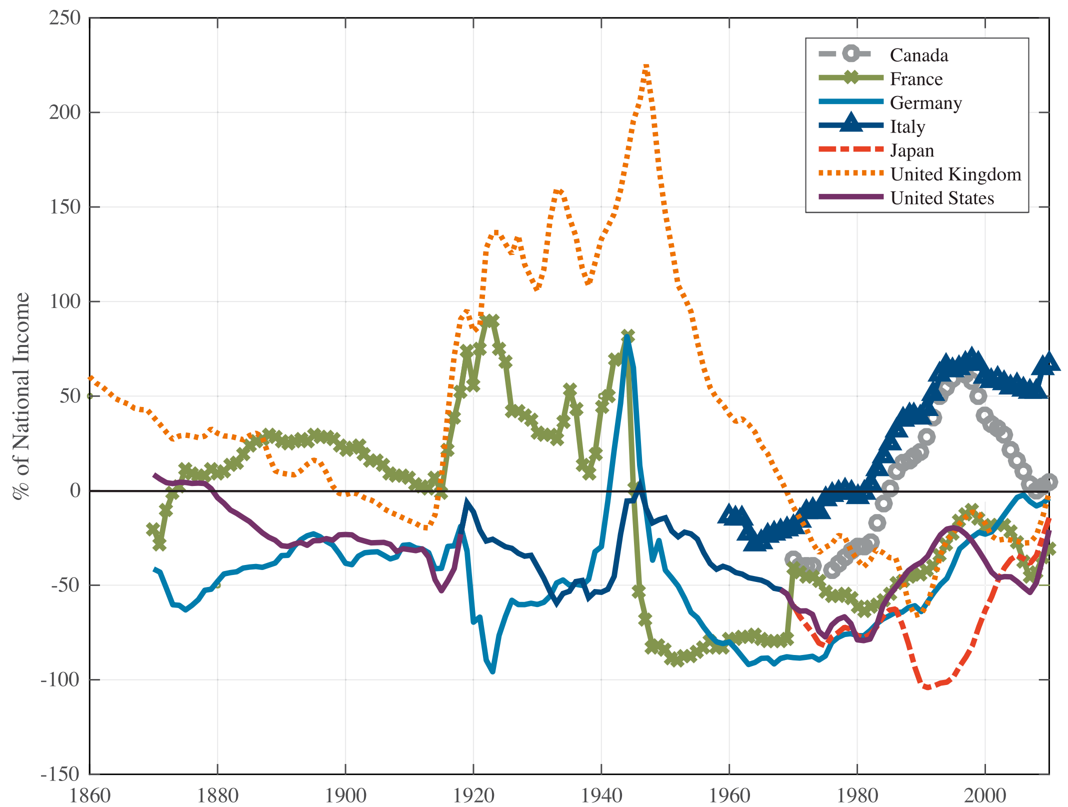
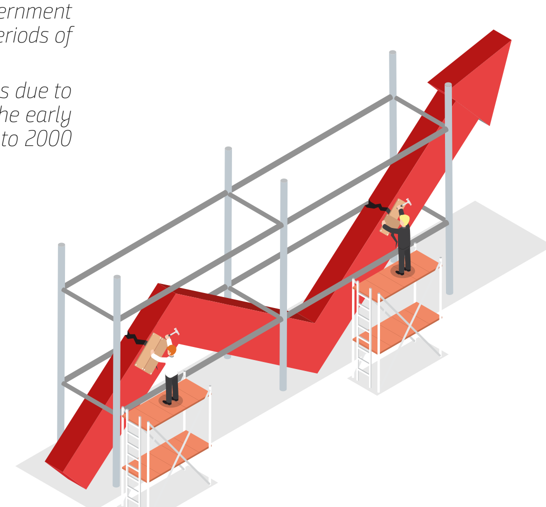


Figure 2 - Public debt (including nonfinancial assets)

Figure 2 *reports the second debt definition, which accounts for government nonfinancial assets. Although substantial efforts have been made to improve measurement, Fève and his co-researchers urge caution, especially with cross-country comparisons.*

They note three important empirical features. First, nonfinancial assets greatly exceed financial assets. Second, in all countries (except Japan), ratios of nonfinancial assets to national income exhibit remarkable stability. Consequently, the second indicator is roughly a downward shift of the first indicator. Third, nonfinancial assets are of the same order of magnitude as government liabilities. For most countries, regimes of positive debts have been followed by long periods of negative debts.

The period 1950-1980 displays strikingly large negative debt-to-national-income ratios due to large public assets and low debt levels. The ratios were between 50% and 100% in the early 1980s for France, Germany, the UK, and the US. However, ratios increased from 1990 to 2000 and were close to zero in 2010.



WE MUST ATTRACT THE BEST ECONOMISTS

Photo: Banque de France

Interview with Anne Le Lorier,
First Deputy Governor, Banque de France

Banque de France honours researchers who have helped to develop our understanding of monetary and financial economics. The bank has been a partner of the Jacques Laffont-TSE Foundation since its creation in 2007. France's central bank, which is itself more than 200 years old, plays a major role in supporting research and teaching in economics.

What were the reasons behind this partnership between Banque de France and TSE?

The desire to strengthen economic research in France in order to share our expertise internationally, expertise which has been acknowledged at the highest level by Jean Tirole's Nobel Prize. We are very proud! Our aim is to be a centre of excellence in a league table still today dominated by the big American universities. We stand alongside TSE to foster high-level research, carried out by expert teams made up of researchers from France but also from the very best universities abroad. We must do all that we can to attract the best economists and to face the double challenge of keeping our most brilliant people while attracting foreign talent.

What are the mutual benefits of the partnership?

For TSE, I suppose that the advantage is having access to the world of central banking, its challenges and issues. For us, this partnership has led to tangible results. The first is the scientific supervision of research projects set up by our 'Banque de France Monetary and Financial Studies Department' with the TSE team, notably Thomas Chaney, Patrick Fève, Christian Hellwig, Augustin Landier, Franck Portier and Jean Tirole. Three of whom actually left the United States to join TSE at the beginning of our partnership. Meetings take place over 12 days in the year, through two or three workshops.

The partnership also means that we organise research seminars at the forefront of monetary macroeconomics through our Studies and International Relations Department, with the participation of Franck Portier. There are also around 10 workshops on financial stability, organised by the Financial Stability Department in coordination with Augustin Landier.

Then, of course, there are one or two scientific conferences per year, regular visits from members of TSE for scientific coaching on research carried out at Banque de France and the writing of articles to enrich our reflection or our publications ("Revue de la Stabilité Financière").

What issues should the partnership concentrate on?

We have identified a series of priority themes for the coming years. This partnership is focused on four of them: the study of the size and structure of financial intermediation in Europe and crisis prevention (monetary economics and aggregate liquidity, payment systems, prudential regulation); market transparency and the process of price formation in a low-interest-rate environment, industrial economics of markets and of the post-market; contagion mechanisms in a heterogeneous system; and finally, the decoupling of economic cycles, the effects of low inflation.

THE BDF-TSE PRIZES

In 2012, Banque de France and TSE launched a series of prizes for academic researchers who have improved our understanding of monetary economics and finance. The aim of the awards is to foster conceptual progress toward the design and implementation of improved policies by central banks.

Presented by François Villeroy de Galhau, Governor of Banque de France, at a special event in Paris in November, the senior prize carries a cash award of €30,000.

Laureates of the junior prize will spend time as a visiting scientist at Banque de France. The junior prizes, presented by TSE chairman Jean Tirole, carry a cash award of €15,000 plus travel and living expenses.

Receiving an important prize such as this one is obviously a great honor.

It also makes you think that you may have had some influence both on the research of others, and on the decisions of policy makers.

Such external validation is always comforting.

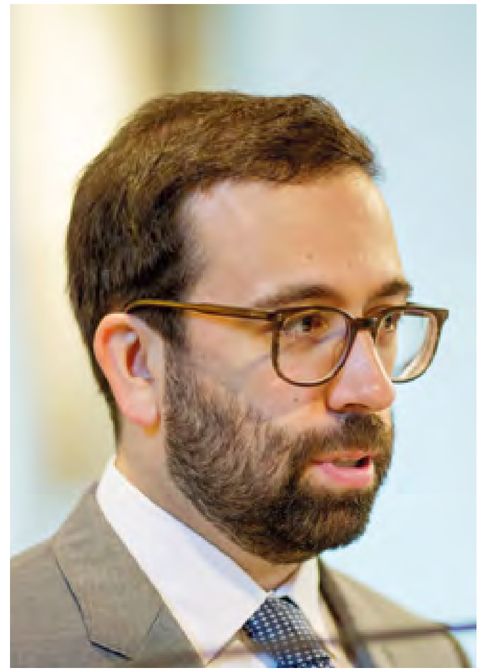
Photo: Marvin Joseph/The Washington Post

Olivier Blanchard Senior Prize

A citizen of France, Olivier Blanchard has spent his professional life in the United States. After obtaining his PhD in economics at MIT in 1977, he taught at Harvard, returning to MIT in 1982. He was chairman of the economics department from 1998 to 2003. In 2008, he took a leave of absence to be economic counselor and director of research at the IMF. In 2015, he joined the Peterson Institute for International economics as the first C. Fred Bergsten Senior Fellow. He remains Robert M. Solow Professor of economics emeritus at MIT.

As a macroeconomist, he has worked on a wide range of issues, including monetary and fiscal policy, speculative bubbles, the labor market and the determinants of unemployment, transition in former communist countries, and the forces behind the recent global financial crisis. He is the author of many books and articles, including two textbooks on macroeconomics.

He is a past editor of the Quarterly Journal of Economics and the NBER Macroeconomics Annual and founding editor of American Economic Journal: Macroeconomics. He is a fellow and past council member of the Econometric Society, president-elect of the American Economic Association, and a member of the American Academy of Sciences. He is an officer of the Legion d'Honneur.



Ricardo Reis

Junior Prize for a researcher affiliated with a European-based institution

"It is an honor to be in the company of such a distinguished list of past winners of this prize, and to be on stage this year with Amir Sufi and Olivier Blanchard, from whose work I have learned much over the years. The collaboration between BdF and the TSE in awarding this prize captures the close connection between research in academia and in central banks that I have also strived to achieve in my career."

Ricardo Reis is the AW Phillips Professor of Economics at LSE. He is a consultant to central banks around the world, and is the editor of the Journal of Monetary Economics. Recent honors include the 2016 Bernacer prize for European economist under the age of 40 with outstanding contributions to macroeconomics and finance.

Ricardo's research contributions are the study of sticky information and rational inattention, inflation dynamics and measurement, capital misallocation and the European slump, the role of reserves on quantitative easing and central bank solvency, and the operation of automatic fiscal stabilizers.

His public service includes a weekly column for the Portuguese press, and developing European Safe Bonds (ESBies). He held previous positions at Columbia and Princeton.

Amir Sufi

Junior Prize for a researcher affiliated with an institution based outside Europe

"It is an honor to receive the Banque de France - TSE Prize in Monetary Economics and Finance. I am humbled to be included in the illustrious group of academics that have received it before me."

Amir Sufi is the Bruce Lindsay Professor of Economics and Public Policy at Chicago Booth School of Business. He is also a research associate at the National Bureau of Economic Research. He serves as an associate editor for the American Economic Review, the Journal of Finance, and the Quarterly Journal of Economics. Amir was awarded the 2017 Fischer Black Prize by the American Finance Association, given biennially to the top financial economics scholar under the age of 40.

Amir's research focuses on finance and macroeconomics. His research on household debt and the economy forms the basis of his book co-authored with Atif Mian: House of Debt: How They (and You) Caused the Great Recession and How We Can Prevent It from Happening Again, published by University of Chicago Press in 2014.

TOULOUSE ECONOMISTS ON

Finance and Macroeconomics

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“Banque de France and TSE: at the heart of the debate and at the apex of international economic expertise”

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