

TOULOUSE ECONOMISTS ON **FINANCE AND BANKING**

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A RARE and beautiful COMBINATION

The Institute of Industrial Economics (IDEI) is a partnership-based research centre which offers businesses and administrations an interface between their activities and the world-class economic research at the Toulouse School of Economics. Since 2007, the French Banking Federation (FBF) has been able to draw on the skills, knowledge networks and cutting-edge tools of TSE researchers 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.

Bruno Biais is a senior researcher at TSE and a key contributor to the FBF partnership. A distinguished academic who has published extensively in the world's foremost economic journals, Biais is an enthusiastic supporter of the IDEI project. "Thanks to the input from our industry partners," he says, "we are able to choose original research topics, on issues that really matter in practice, and we can conduct research based on rich information about how things work in the real world."

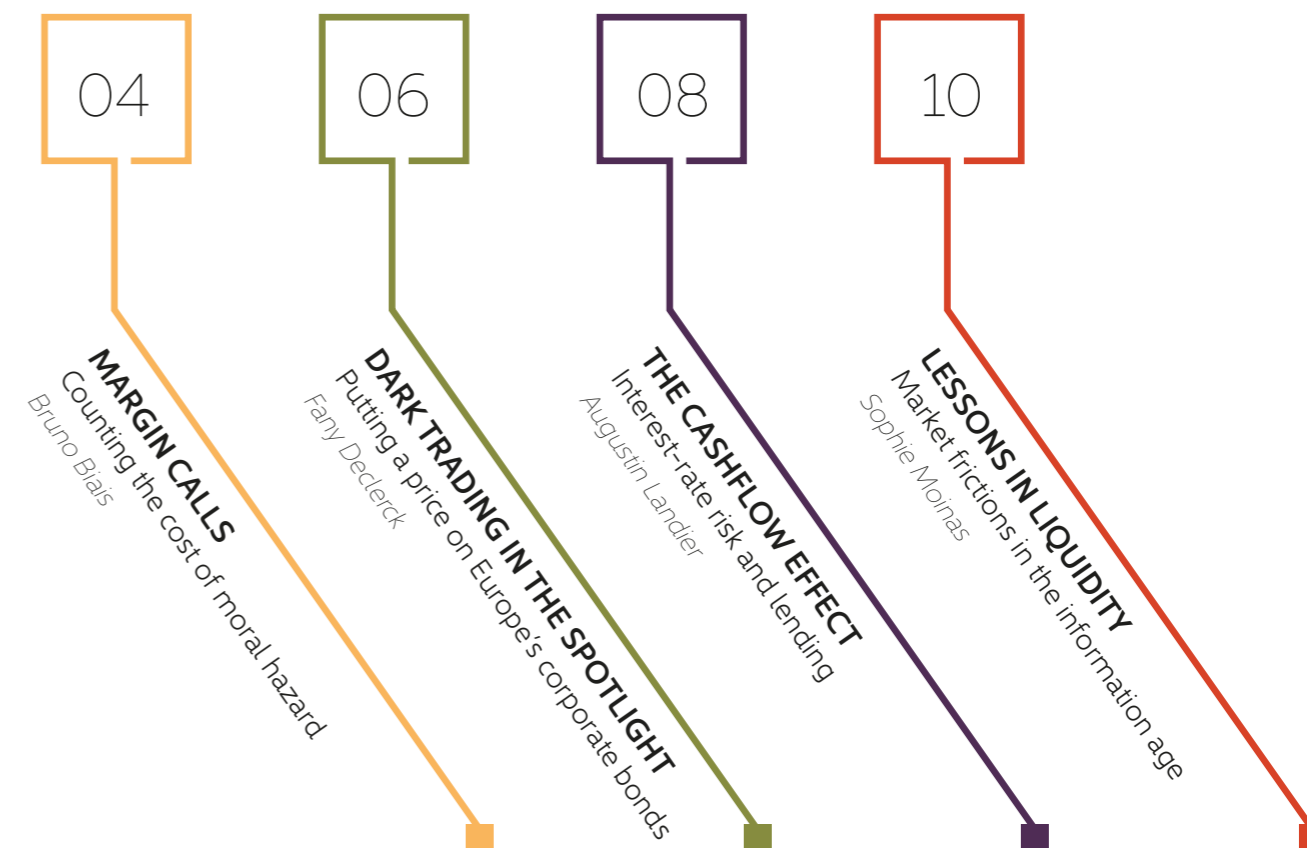
"For example, in 2007 our partners at the FBF suggested we should look into high-frequency trading and clearing systems. These important topics were not on the radar of academic research at the time. In this process, we were able to expose our theoretical analyses to the viewpoint of market participants and regulators, producing high-level research that has been accepted in top academic publications such as the *Journal of Finance*, the *Journal of Financial Economics* and the *Review of Economic Studies*."

The IDEI-FBF partnership has made valuable contributions to our understanding of modern banking and finance. Among its key findings, IDEI research has made the case for more transparent financial markets and tighter regulation of high-frequency trading. It has also shown that margin calls and clearing houses can enhance market stability only if they are well designed.

"We try to understand the workings of the financial sector and the interaction of banks, markets, technology and regulators," says Biais. "We seek to understand the impact of frictions - such as market power, asymmetric information and moral hazard - to mitigate their impact and make financial markets more stable and useful for society."

The research team involved in the IDEI-FBF partnership is particularly strong. "The researchers we have in the FBF partnership are highly sought-after at the international level: Augustin Landier is currently visiting Harvard for a year, last year Sophie Moinas was at Wharton, and the year before Fany Declerck was visiting Carnegie Mellon."

Among the defining qualities of TSE researchers is their eagerness to work with others and to discover how



things work in practice. "It's a rare and beautiful combination," says Biais. "For example, Fany has a lot of interactions with Euronext [France's stock exchange] and the AMF [France's financial regulator]. Augustin has a lot of interactions with the European Central Bank. So we are in constant communication with regulators and practitioners. That's really part of our intellectual identity."

These TSE-IDEI networks enrich the ideas exchange between academics and partners. Not only that, says Biais, they also act as a quality guarantee: "The analysis of TSE researchers are validated both by the academic and the practitioners' communities. Interactions with practitioners and regulators ensure our research is relevant. Interaction with academics and the standards imposed by top academic journals ensure our research is rigorous, scientific and unbiased."

The FBF has reaped substantial rewards from TSE's independent, creative thinkers and unrivalled connectivity. "The FBF get access to resources in a completely honest and transparent way," says Biais. "For example, they wanted us to work on high-frequency trading but the banks didn't want to give us the data. Fortunately, the AMF and Euronext were willing to help because of our connections and scientific credibility. We facilitate the flow of data and analysis because we are correctly perceived as not having vested interests. We don't benefit financially from research choices. We don't say things to please the FBF - and they understand this perfectly."

There are plenty of exciting developments to look forward to. In response to FBF's interest in cyberfinance, a new IDEI research project will apply game theory to the study of blockchain. Biais is also studying counterparty credit limits in the foreign exchange market. In response to FBF's interest in cyberfinance, a new IDEI research project will apply game theory to the study of blockchain. Biais is also studying counterparty credit limits in the foreign exchange market. These are just some of the exciting developments to look forward to as the IDEI-FBF partnership applies its inspirational blend of professional expertise, state-of-the-art techniques and academic excellence to the challenges of the 21st century."



BRUNO BIAIS

Professor at TSE, B. Biais is also a senior researcher at Centre for Research in Management (CNRS). His work has been published in *Econometrica*, the *JPE*, the *AER*, the *Review of Economic Studies*, the *Journal of Finance* and the *RFS*. He has taught at HEC, CMU, LBS, Oxford and LSE. He has been a scientific adviser to Euronext and the NYSE. He received the CNRS bronze medal and is a fellow of the Econometric Society. He has been editor of the *Review of Economic Studies* and is co-editor of the *Journal of Finance*.

Research interests

- Market microstructure
- Corporate finance
- Financial contracting
- Political economy
- Psychology and economics
- Experimental economics

MARGIN CALLS

Counting the cost of moral hazard

Derivative trading can help traders share risk. Such gains from trade, however, are jeopardized by counterparty risk. Margin calls can mitigate that risk. In a new article, *'Optimal Margins and Equilibrium Prices'*, Bruno BIAIS, along with Florian Heider and Marie Hoerova, evaluates the costs and benefits of margin deposits, analysing the interactions between risk aversion and moral hazard that generate fire sales, volatility and financial contagion.

One of the major functions of financial markets is to enable participants to share risk. For example, financial institutions can purchase protection in the form of derivatives, such as credit default swaps, to hedge the risk of their assets. The effectiveness of such risk-sharing trades, however, can be significantly reduced by counterparty risk. For example, when Lehman Brothers filed for bankruptcy in September 2008, it froze the positions of more than 900,000 derivative contracts.

Margin deposits mitigate counterparty risk. Accordingly, the response of US and European regulators to the 2008 financial crisis was to encourage the use of margins and centralized clearing in derivative activity. But margin calls can also be destabilizing. If there is a price drop and the margin constraint tightens, the arbitrageur must sell some of his assets. The impact of the ensuing fire sale can spread quickly, depressing prices and tightening constraints for others.

If margin calls can create instability, should regulators intervene? In *'Optimal Margins and Equilibrium Prices'*, Biais, Heider and Hoerova study the interaction between the determination of asset prices by markets and the determination of margins by optimal contracts. The TSE researchers compare the socially optimal allocation to its laissez-faire counterpart, providing important insights for market participants and regulators.

The model: Sharing risk under moral hazard

Biais, Heider and Hoerova's model sets up players as risk-averse hedgers who purchase insurance from risk-neutral investors in a derivative market. Investors have limited liability. They can make insurance payments only when their assets are sufficiently valuable. Hence, there is counterparty risk for the hedgers. To avoid downside risk to their assets and maintain asset value, investors must exert costly effort. The level of such risk-prevention effort is unobservable by other market participants and in combination with limited liability, this generates moral hazard.

After market participants have entered derivative positions, new information about the insured risk is observed, which changes the expected pay-offs of the contracting parties. Bad news creates a debt-overhang problem and reduces investors' incentive to exert risk-prevention effort. The optimal contract relies on margin calls after bad news to cope with moral hazard and reduce counterparty risk.

Analysis: Fanning the fires

The novel contribution of this IDEI research is its analysis of the impact of such contracts on market stability. To fulfil margin calls and deposit cash on a margin account, investors must sell assets. The larger the margin call, the more assets must be sold, and the lower the market clearing price for these assets. This gives rise to fire sales. In a laissez-faire context, market participants purchase too much insurance, and request excessive margins, because they do not consider the costs of their actions for others. The information-constrained utilitarian optimum can be implemented by limits on derivative positions.

Risk aversion increases market instability, so regulatory intervention should be tighter when risk aversion is larger

When the risk aversion of hedgers increases, they become more eager to purchase insurance. This eagerness can be self-defeating. After bad news about the insured risk, they require larger margin calls. This triggers asset sales, which decrease the market clearing price. When hedgers' risk aversion is high, this can give rise to instability in the form of multiple equilibria. In a pessimistic equilibrium hedgers anticipate low prices and request large margins, which, if bad news arrives, trigger large asset sales and low prices. There also exists an optimistic, high-price equilibrium, but even this can be inefficient because of fire sales externalities.

Implications

The researchers' theoretical analysis has several notable implications:

- Hedgers are vulnerable to moral hazard linked to investors. Without moral hazard, hedgers are fully insured by investors. With moral hazard, the market is incomplete and hedgers still bear some risk. As moral hazard rises, risk sharing is more limited, hedgers' valuation of the asset decreases and the risk premium increases.
- Bad news can travel fast. Without moral hazard, the prices of assets held by hedgers and investors are independent. With

moral hazard, they are positively correlated. A bad signal about the hedger's asset triggers a margin call for the investor, which lowers the price of their asset. The larger the variance of the value of hedger's asset, the larger the variance of the value of investor's asset.

- A little more risk aversion can cause a lot more pain. When hedgers are moderately risk-averse, margin calls are small and generate only limited contagion and price drops for the investors' asset. As risk aversion increases, hedgers demand larger margins. A relatively small increase in the risk aversion of hedgers can generate a large drop in investors' asset prices, which can be interpreted as a crash.
- Moral hazard generates volatility. The greater the opacity, complexity and difficulty of risk prevention for investors, the more severe the moral hazard problem, the greater the need for margins, and the greater the fall in prices.

Policy recommendations

Free markets typically produce excessive positions in derivative markets. This is because hedgers are too eager to insure their assets, so investors sell too much insurance. This generates large margins, generating negative externalities.

- To correct this market failure, regulators could set aggregate position limits for investors. If better capitalized investors have smaller moral hazard problems, such regulatory constraints should be more stringent for those who are poorly capitalized.
- Position limits (or margin caps) can also reduce market instability, if regulators or central banks impose the right constraints to rule out inefficient prices.
- Risk aversion increases market instability, so regulatory intervention should be tighter when risk aversion is larger. This goes against received wisdom that macro-prudential regulation should be countercyclical.

Summing up

Biais, Heider and Hoerova offer a valuable framework for analysing how moral hazard limits risk sharing, which in turn affects asset pricing. Central to their analysis is the interaction between optimal contracting and equilibrium pricing.

Key findings:

- Moral hazard increases risk premiums and generates endogenous contagion, especially when risk aversion is high.
- Margin calls, although individually optimal, can be destabilizing. Because of the negative effects on others, there is a gap between market equilibrium and utilitarian optimum.
- To bridge that gap, regulators can limit positions, especially for poorly capitalized institutions.



FANY DECLERCK

DARK TRADING IN THE SPOTLIGHT

Putting a price on Europe's corporate bonds

Professor of finance at the IAE Toulouse School of Management, F. Declerck is also a research fellow at TSE. She is currently a visiting professor at Carnegie Mellon University. She has also held visiting positions at Banque de France, Berkeley University, and Euronext Paris. She has published in the Journal of Financial Markets and the Journal of Banking and Finance. She received a CNRS international mobility grant in 2014, a Europlace Institute of Finance research prize in 2013, and a four-year grant from the French ministry of research in 2007. From 2006 to 2009 she was a scientific adviser to the French ministry of education and research.

Research interests

- Market microstructure
- Financial frictions
- Limit order market
- OTC markets
- Insider trading
- Financial analysts

Bonds underpin the foundations of our economies. In their eye-opening study, *'Liquidity, Competition and Price Discovery in the European Corporate Bond Market'*, Fany DECLERCK and Bruno Biais shed light on the hidden mechanics of European finance, with implications for our understanding of markets around the world. Do corporate bonds convey adequate information? Are markets liquid enough to avoid excessive costs for issuing firms?

New IDEI research offers timely insights into Europe's fiercely competitive bond market, which is even larger than its stock market. Using state-of-the-art microeconomic techniques, Biais and Declerck's work on corporate bonds is an incisive foray into this relatively unexplored area and a

touchstone for evaluating recent research in the US. The corporate bond market differs markedly from the government bond market, in ways that impact its liquidity and efficiency. It involves a large number of diverse issuers, some rather small, infrequently tapping the market, often for non-standard bonds. Recent empirical estimates of the bid-ask spread for US corporate bonds tend to be larger than those obtained from the stock market. This is surprising, since bonds are less risky than stocks, and spreads increase with risk. To understand such phenomena, Biais and Declerck show that comparison with the UK and eurozone markets can be particularly instructive.

First, consider transparency. In the US, in 2002, TRACE regulation imposed post-trade transparency which has significantly reduced bid-ask spreads. In contrast, there is no post-trade transparency in Europe. So this IDEI research offers an opportunity to compare liquidity in opaque and transparent markets.

Second, consider the competition between liquidity suppliers. In the US, a relatively small number of very large banks dominate the market. In the UK, because sterling-denominated bonds attract mostly British market participants, the number of investors and liquidity suppliers is also limited. In the eurozone, however, the big international players join national champions from across the region so there are typically around 20 active dealers for each bond.

Results

TRADING ACTIVITY

On average, Biais and Declerck find that euro-denominated corporate bonds trade four times a day while sterling bonds trade 1.5 times a day. Studies of the US market find an average number of between 1.1 and 1.9 trades per day. These results suggest that eurozone trading frequency is significantly larger. Still, eurozone trading frequencies are low, relative to the stock market.

This reflects several institutional features of bond markets (see panel, 'Differences with stocks').

As expected, both for euros and sterling, trades are more frequent for bonds with larger issue size. Sterling bonds tend to have lower issue size and also trade less frequently. Bonds with maturity equal to five or 10 years are relatively more frequently traded, perhaps because they are viewed as benchmarks.

The researchers also find that AAA and BBB-rated bonds trade more frequently than those rated AA and A. This reflects two countervailing effects: first, a high rating can increase liquidity by reducing adverse selection; second, news is more frequent for riskier bonds, and investors react to news by trading.

MARKET POWER

The number of market makers participating in at least one trade per year is above 25 for euro-denominated bonds and more than 15 for sterling. Using regression analysis, Biais and Declerck look at bonds for which the market share of the most active dealers was above 40%. For a bond price of €100, market power raises the effective spread by 5.6 cents in 2003, .45 cents in 2004 and 1.63 cents in 2005.

The market share of the five most active dealers in euro-denominated bonds is around 40%, while it takes only three or four dealers to cover 40% of the sterling market. So there is more competition between liquidity suppliers in the eurozone market, but even here the largest dealers are likely to enjoy some market power.

EUROPEAN LIQUIDITY

Bid-ask spreads in the European corporate bond market decrease with issue size and increase with maturity, default risk and dealer market power. Biais and Declerck find that effective spreads ranged in 2005 from 0.12% for small trades to 0.08% for large ones, and in 2003 from 0.22% to 0.12%.

Reasonably tight euro spreads are consistent with the presence of a large pool of potential buyers and sellers, attracting relatively competitive dealer liquidity. In contrast, effective spreads are larger in the sterling market, where relatively few investors are active. This causes low natural liquidity, attracts a limited number of market makers and leads to relatively large transaction costs.

Spreads in the euro-denominated corporate bond market are also lower than those of the more transparent US market. Together with the finding that Europe has higher trading frequencies, these results suggest its market is relatively liquid. This is likely to reflect the integration of eurozone financial markets, which has increased the number of potential investors and dealers.

INFORMATION DELAYS

Biais and Declerck reveal that the information content of trades - in other words, the increase or decrease in value of a bond after a purchase or sale - accounts for a significant fraction of the spread, especially for bonds with greater default risk. For a

Differences with stocks

The bond market has important institutional differences from the stock market, which tend to reduce its liquidity.

- The redemption date and relative safety of bonds payoffs tend to attract a specific type of investor, such as pension funds and insurance companies who follow buy-and-hold strategies.
- At least in Europe, it's difficult and costly to short sell bonds.
- Stock market activity is concentrated in a relatively small number of securities, which trade very frequently each day. In the bond market, capitalization and trading are spread across thousands of securities, so it can be difficult to identify a counterpart.

euro-denominated BBB bond priced at €100, after a purchase the midquote rises on average by 5 cents in 2003, 3 cents in 2004 and 1 cent in 2005. For a sterling-denominated bond priced at £100, the increase is on average equal to 6 pence in 2003, 2004 and 2005. Higher information content for sterling trades could reflect less publicly available information.

Quite remarkably, the IDEI researchers find that it takes at least five trading days for the information content of a trade to be fully reflected in market pricing. Since there is no post-trade transparency on the day of the trade, only the dealer and his customer are informed of it.

Summing up

Biais and Declerck's research offers a first study of the microstructure of Europe's corporate bond market. As predicted by theory, bid-ask spreads increase with inventory bearing costs. They also decrease with trade and issue size.

Key findings:

- Transactions costs in European corporate bond markets increase with dealers' market power.
- Effective spreads are tighter and liquidity supply is more competitive for euro bonds than for sterling bonds.
- Euro-denominated bond spreads compare favourably to their TRACE-transparent US counterparts. This suggests that financial and monetary integration has spurred participation and competition, resulting in greater liquidity.
- It takes at least a week for the entire market to learn the information content of trades. Such a long delay is likely due to the lack of post-trade transparency in Europe.



AUGUSTIN LANDIER

Professor of economics at TSE, A. Landier is currently on sabbatical leave at Harvard University. He has taught at New York University, the University of Chicago and was a resident scholar at the IMF. He was a member of the Council of Economic Analysis from 2010 to 2012. He is also a columnist with Les Echos. His book, *La Société Translucide*, won the Turgot prize in 2011. His work has been published in *Journal of Financial Economics*, the *Review of Finance*, the *AER*, *Economic Policy*, the *Review of Economic Studies*, the *Journal of Finance* and the *RFS*. He was a director of Old Lane (Citi Alternative Investments) and founding partner of Ada Investment Management.

Research interests

- Corporate finance and governance
- Asset management
- Organizations
- Behavioural economics

THE CASHFLOW EFFECT

Interest-rate risk and lending

Monetary policy has been shown to influence the real economy through various channels, including the supply of credit. In an illuminating new study, *'Banks' Exposure to Interest Rate Risk and the Transmission of Monetary Policy'*, Augustin LANDIER, along with David Sraer and David Thesmar, explores a novel 'cashflow' channel in which interest-rate risk affects lending, with crucial implications for our understanding of public finance and banking.

Policy makers adjust short-term interest rates, such as the federal funds rate, in a bid to manage our economies by directly influencing the cost of capital. But such actions produce indirect effects. The latest IDEI research on a large panel of US banks by Landier, Sraer and Thesmar provides evidence for a novel channel of monetary policy transmission. They find that banks are typically exposed to interest-rate risk and this amplifies the effects of short-term rate changes, affecting banks' cashflow and lending.

This study is particularly relevant to understand why the current "low rate" environment negatively impacts bank profits. When a bank borrows short term, but lends long term at fixed rates, any increase in the short rate reduces its cashflows. Since issuing equity is expensive, the bank has to reduce lending to prevent leverage from rising. This channel rests on three elements:

- Commercial banks tend to operate with constant leverage targets.
- Banks are exposed to interest-rate risk.
- There is a failure of the Modigliani-Miller proposition, which holds that the value of a company is unaffected by the way it is financed. This failure prevents banks from issuing equity easily in the short run.

The income gap

A central goal of this paper is to document, empirically, the exposure of banks to interest-rate risk. Using US bank holding company data – available quarterly from 1986 to 2011 – the researchers measure the "income gap" of each bank, as the difference in value

between the bank's assets and liabilities that re-price or mature within a year. To focus on significant entities, they restrict the sample to banks with more than \$1bn of total assets.

The average income gap is 13.5% of total assets, but the researchers find substantial variation. Banks' income gap is typically positive, which means that their assets are more sensitive to interest rates than their liabilities. However, some banks appear to have a much larger exposure to interest-rate risk than others: many of the banks have almost no income gap; while for highly exposed banks the average gap is 25% of total assets. There is also a substantial decrease in the average gap over time, from as much as 22% in 1993 to 5% in 2009.

Interest risk and cashflows

The paper reports evidence that banks do not fully hedge their interest-rate risk. Swaps are the most prevalent form of hedge, accounting for about 18% of the average bank's total assets. However, once a handful of large outliers are removed, the average amount is only 4% of total assets, smaller than the average income gap. Meanwhile, 40% of the banks have no derivative exposure.

The data unfortunately provides only notional exposures that may conceal offsetting positions. To deal with this, the researchers look directly at the sensitivity of banks' revenue to interest rates and find it is closely related to the measured income gap. A 1-point (ppt) increase in the federal funds rate induces a bank with a high-income gap to increase its quarterly earnings by about 0.02% of total assets, relative to a bank with a low-income gap. This can be compared to a quarterly return on assets of 0.20% in the sample.

Overall, these results indicate that interest-rate hedging is a minor force for most banks, and even most large banks. Their evidence suggests that banks keep most interest-rate risk exposure related to lending, perhaps because hedging is too costly.

Impact on lending

Since interest-rate risk affects banks' cashflows, it should also affect lending by banks which are financially constrained. When rates increase, banks that have little debt capacity and no liquid assets have no option but to scale down lending.

The paper finds that the income gap strongly predicts how bank lending reacts to interest-rate movements. A 1-point increase in the federal funds rate leads a bank with a high-income gap to increase its quarterly lending by about 0.4 ppt more than a bank

with a low-income gap. This is to be compared to quarterly loan growth in the data of 1.8%.

This result stands up to various consistency checks, including controls for other factors, such as leverage, bank size and asset liquidity. The effect is larger for smaller banks, consistent with the idea that smaller banks are more financially constrained. Similarly, the effect is more pronounced for banks with no hedging on their balance sheet. A possible explanation for the results is that well-managed banks adapt their income gap to anticipate short-rate movements. The results, however, stand up to further tests for different measures of expected short rates.

Summing up

The researchers' sample consists of quarterly data on US bank holding companies from 1986 to 2011. Landier, Sraer and Thesmar measure the sensitivity of bank profits to short interest shocks through the income gap, defined as the difference between assets and liabilities that mature in less than one year.

Key findings:

- Banks retain significant exposure to interest-rate risk.
- The income gap strongly predicts how bank profits will react to future movements in interest rates.
- Banks' exposure to interest-rate risk has implications for the transmission of monetary policy. When the US Federal Reserve increases short rates, this affects banks' cashflows and hence their lending policy. The income gap's impact on the sensitivity of lending to changes in interest rates is stronger and more consistent than previously identified factors, such as leverage, bank size or even asset liquidity.
- The researchers' evidence suggests their main channel is a cashflow effect, as opposed to a collateral channel: interest rates affect lending because they affect cashflows, not because they affect the market value of equity.
- These results suggest that the allocation of interest-rate exposure across agents (banks, households, firms, government) may explain how an economy responds to monetary policy. In particular, the role of interest-rate risk is crucial to our understanding of the transmission of monetary policy and its redistributive effects.

“ The role of interest-rate risk is crucial to our understanding of the transmission of monetary policy and its redistributive effects ”



SOPHIE MOINAS

Professor of finance at the IAE Toulouse School of Management, S. Moinas is also a member of TSE and the Centre for Research in Management (CNRS). She received the PhD Thesis Award from the French Finance Association and Euronext in 2006, the De La Vega Prize 2013 from the Federation of European Stock Exchanges, and the Award for Best Young Researcher in Finance from the Europlace Institute of Finance (EIF) in 2015. She obtained EIF research grants in 2009 and 2010, and a junior research grant from the ANR for 2009-2014. Her work has been published in the Southern Economic Journal, Finance, Econometrica, the Journal of Financial Economics and the RFS.

Research interests

- Market microstructure
- High-frequency trading
- Experimental finance
- Behavioural finance

LESSONS IN LIQUIDITY

Market frictions in the information age

In today's financial markets, where every nanosecond counts, it's hard to keep up with the pace of change. In a timely new study, *'Who supplies liquidity, how and when?'*, Sophie MOINAS, Bruno Biais and Fany Declerck, study the behaviour of high-frequency traders and brokers of French stocks. Their findings provide fresh insights into the challenges of information asymmetry and the crucial role of proprietary traders in supplying liquidity, even during financial crisis.

In perfect markets, buyers and sellers immediately find each other and reap gains from trade at frictionless prices. In the real world, despite the breakneck speed of technological advances, market frictions are still an

obstacle to such welfare improvements. As part of their ambitious and ongoing investigations, researchers Moinas, Biais and Declerck, analyse the developments that have revolutionised modern markets and the liquidity that oils their complex mechanisms.

Market frictions can be reduced by intermediaries, who provide liquidity to impatient sellers by purchasing their assets and holding inventories until final buyers are found. These services are likely to be provided by those with the best network links and search ability. The agents best placed to offer liquidity are also likely to be those best able to carry the risk of an unbalanced inventory, and are the least constrained by position limits set by regulators. Because the inventory-bearing capacity of market makers is limited, however, liquidity shocks have a transient impact on prices - there are "limits to arbitrage", and liquidity supply is profitable.

Another market friction is adverse selection, which occurs when trading parties have different information. This can magnify the price impact of trades and even lead to market breakdown. Adverse selection leads market makers to post relatively high ask prices, and relatively low bid prices. Efficiency suggests that the intermediaries should be those agents best able to mitigate adverse selection. Such ability could reflect better market-monitoring technology, enabling intermediaries to cancel their orders before being picked off. However, this could worsen the adverse selection problem for other investors with less effective monitoring. Adverse selection for these investors could be further amplified if intermediaries took advantage of their timely market information to hit stale quotes themselves.

Since the beginning of the century, three developments have changed the economics of liquidity supply and financial trading:

- Equity markets have converged towards an electronic limit order book structure, in which many different financial institutions can provide liquidity by leaving limit orders in the book.
- Low-latency technologies are making it easier, at a cost, to monitor and react rapidly to market movements.

- Regulatory reforms before the crisis contributed to the fragmentation of markets and the development of high-frequency trading, while reforms since the crisis have made proprietary trading more costly and complex for investment banks.

The dataset

To investigate the impact of these developments, the researchers analysed a time-stamped record of all orders and trades in French stocks on Euronext during 2010. The sample period brackets the Greek crisis of the summer of 2010, enabling comparison of "normal" and crisis times. This data allows the researchers to identify whether the intermediaries in the sample are:

- 'fast' or 'slow' traders, based on the maximum number of messages per second they can exchange with the market;
- proprietary traders using their own account, or brokers trading on behalf of customers, or a mix of both.

Because of its huge size and technical characteristics, this dataset is difficult to handle. At this stage, they have analysed 23 French stocks, including 10 large caps, 9 mid caps, and 4 small caps. The size of the corresponding data exceeds 7 tera-octets.

Results

LIQUIDITY SUPPLY

The researchers find that proprietary traders, whether fast or slow, tend to buy after price declines, and sell after price increases. This contrarian strategy contrasts with the "momentum trading" of other traders, who tend to buy after price rises and sell after price declines. With more "skin in the game", proprietary traders are better able to carry inventory risk than other traders. This might be because they commit their own capital, rather than trading on other people's behalf. It could also reflect better incentive contracts. Either way, they are well placed to offer liquidity.

Interestingly, the contrarian strategies of proprietary traders were particularly prevalent for small stocks, and during the Greek crisis. They are not "fair weather" liquidity suppliers, disappearing in a crisis. Moreover, their contrarian strategies are profitable. This suggests they are able to identify when transient price pressure, possibly reflecting liquidity shocks, has driven prices away from equilibrium. By absorbing selling or buying pressure, proprietary traders tend to stabilize the market.

ADVERSE SELECTION

Surprisingly, the researchers find that the informational content of marketable orders (i.e., the orders that hit the existing limit orders and execute immediately) does not significantly differ across members' categories. In particular, fast traders' marketable orders don't seem to be more informed than those of slower traders. For limit orders which are not immediately executed, however, the adverse selection costs are low for fast proprietary traders and high for fast brokers. This

suggests that technology, in itself, is not enough to mitigate adverse selection: traders need incentives to use the technology efficiently.

While slow proprietary traders supply liquidity mainly by placing contrarian marketable orders, fast proprietary traders also supply liquidity by placing non-immediately executed limit orders. This second type of liquidity supply, however, becomes much less prevalent after the crisis.

Policy implications

The empirical findings of this IDEI research suggest that current regulatory reforms may have unintended negative consequences:

- Under reforms introduced by the EU in response to the 2008 financial crisis, trading venues will be required to cap the ratio of the number of messages to the number of trades by participant. This may be counterproductive, as fast proprietary traders rely on numerous cancellations and updates to reduce the adverse selection cost incurred by their limit orders left in the book. A cap on messages could thus deter the provision of liquidity. This could be particularly harmful at times of market stress, when the need to modify and cancel orders is acute.

- In this context, market liquidity might also be reduced by new regulations that make proprietary trading more difficult and costly for banks.

Summing up

Using a unique new dataset of orders and trades in French stocks, this ambitious IDEI research project is able to identify high-frequency traders based on direct information about their technological investment.

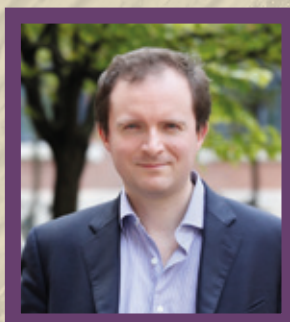
Key findings:

- Proprietary traders, whether fast or slow, earn profits by buying after price drops and selling after price increases. These contrarian strategies help the market absorb liquidity shocks and converge on efficient pricing, even during crisis.
- While slow proprietary traders supply liquidity mainly by placing marketable orders, fast proprietary traders also supply liquidity by leaving limit orders in the book. This second type of liquidity supply declined after the Greek crisis.
- Fast traders don't seem to be more informed than slow traders. Proprietary traders are apparently able to place profitable contrarian orders because they are trading on their own account rather than due to their ability to react quickly to market events.
- Technology is not enough to overcome adverse selection; monitoring incentives are also needed.

Technology, in itself, is not enough to mitigate adverse selection: traders need incentives to use the technology efficiently

TOULOUSE ECONOMISTS ON **FINANCE AND BANKING**

SEPTEMBER 2016



“ Thanks to
input from
our industry
partners, we can
conduct original
research, based
on real-world
information, on
issues that really
matter ”

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