

COLLATERAL AND THE ROLE OF INTERNATIONAL MERCHANT BANKS IN THE SPREAD OF AGGREGATE RISKS

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Non-financial corporations (NFCs) can use a whole range of instruments to collateralise bank loans. A form of systemic risk can arise in this context when the collateral consists of debt instruments issued by international merchant banks (outside collateral) and the assets of those banks simultaneously consist largely of shareholdings in the same set of NFCs. This situation, which is common in the Anglo-Saxon banking world, gives rise to a range of idiosyncratic risks for all the parties involved and also generates aggregate risk. In this article, we investigate the situation where an aggregate economic shock gives rise to increased NFC insolvency rates and where foreclosure on outside collateral by NFC creditors combined with a reduction in the value of shareholdings leads to impairment of merchant bank assets. Contagion risk arises and the sector becomes fragile (has a short distance to default) regardless of competition. This situation creates a high risk of official guarantees being issued for the liabilities of merchant banks. An alternative without the need for public sector involvement is to introduce simple bail-in principles for systemically important merchant banks by replacing debt instruments with contingent convertible debt. This approach is consistent with new regulatory tools requiring banks to hold, in addition to capital, types of liabilities that can be converted into capital when resolution plans are activated. The tools in question are MREL in the EU (defined in the Bank Recovery and Resolution Directive, BRRD) and TLAC in the USA. These regulations may also be useful for containing systemic risk in open economies serviced by big international banks outside host country regulatory control.

1. INTRODUCTION

The research described in this article¹ is concerned with two interconnected problems. The first is **risk concentration** in the global financial system, which is a surprising and unintended consequence of the efforts of borrowers and lenders to diversify their assets and liabilities as much as possible. And the second is **the vulnerability of the international merchant banking sector** as a key intermediary in the diversification process. We begin by describing the mechanism of formation of concentration risk.

Debt instruments as assets of non-financial corporations...

It is an empirical fact that non-financial corporations (and, in a sense, households as well, as far as mortgages and consumer credit are concerned) tend to hold cash and other liquid assets in excess of working capital and other assets immediately linked to their business.² Assets perceived as being safe, liquid and stable in value are naturally preferred. Debt instruments issued by big international financial institutions in the merchant banking sector are generally

considered to satisfy these three criteria.³ Growth in the deposits of non-financial corporations (NFCs) in the Czech Republic and around the world (see Chart 1) is leading to a search for higher yields, which some debt instruments can offer.

...are used as collateral instruments

When an NFC takes a loan, its activity-unrelated assets – including, in our case, debt instruments – usually become part of the collateral (we call them *outside collateral*).

The funds received by merchant banks are invested

The funds merchant banks receive from NFCs are only seemingly diversified in the investment process. Merchant banks ultimately have no choice other than to invest – even if through a chain formed of many links – in the same universe of NFCs whose contributions make up the liability side of the merchant banking sector balance sheet.

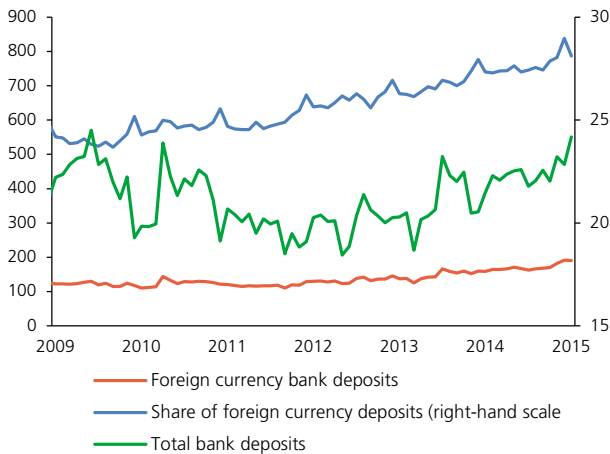
In the event of an aggregate shock coupled with a wave of NFC defaults, contagion occurs...

When an NFC becomes insolvent, the collateral is often sold either directly to its creditors or to the benefit of its creditors. If an aggregate shock hits a significant proportion

¹ A formal description of the model and a detailed discussion of its conclusions are given in Derviz (2014).

² This phenomenon was first investigated in literature drawing on data from the USA (Woodford, 1990). Analyses based on the European experience now exist as well (Bacchetta and Benhima, 2014).

³ Investment banking in the narrower sense practically ceased to exist as a separate sector after the collapse of Lehman Brothers. However, the business these banks used to conduct is still carried on, albeit by differently organised entities. We will refer to them as merchant banks.

CHART 1
BANK DEPOSITS OF NFCs
 (deposits in CZK billions, share in %)


Source: ČNB

of NFCs in the economy, the amount of foreclosure on such collateral can be considerable. When outside collateral is sold, instruments which are otherwise unconnected with the debtor per se are exposed to selling pressure on the secondary market and the individual debt instruments securing NFCs' diversified exposures turn into a concentrated direct exposure to the final debtor – the merchant bank. The equity and debt securities issued by NFCs simultaneously fall in value. This reduces the value of merchant banks' assets and gives rise to contagion.

...and spreads to commercial banks

To finance their business activities, however, NFCs take loans from commercial banks. These loans are secured, among other things, by debt instruments issued by merchant banks (outside collateral). Such loans are exposed to both specific and aggregate default risks. The nature of the trilateral commercial bank-NFC-merchant bank relationship tends to be such that commercial banks hold claims with higher seniority (debt instruments) while merchant banks hold claims with lower seniority (equity instruments). What is more, the outside collateral used in the insolvency process is in our case made up largely of merchant bank debt instruments. In these circumstances, the consolidated merchant banking sector balance sheet is exposed to greater stress than the corporate sector balance sheet in the event of a negative shock to the real economy. As a result, the distance to default is also shorter for merchant banks than for NFCs.

The failure of a big merchant bank triggers a systemic liquidity crisis...

The main problem of default in the case of a big merchant bank is the associated shock wave of systemic illiquidity. In purely accounting terms, the merchant bank's loss resulting from an aggregate downturn in the production sector may be negligible. However, as every observer of a financial firm resolution knows, the process is lengthy, subject to arbitrary legal tangles, and with an uncertain completion horizon. In the meantime, all the debt instruments the merchant bank issued (and sold to agents demanding diversified outside collateral) is affected by a substantial illiquidity discount. This negatively affects the value of outside collateral, which has been acquired by more and more agents. Those agents move closer to default, and a vicious circle emerges in the financial and non-financial sectors simultaneously.⁴

...to which governments normally react by issuing guarantees for banks' liabilities...

Not surprisingly, therefore, many governments respond to the first signs of stress in systemically important financial institutions by resorting to some sort of guarantee for the commercial and merchant bank liabilities under their jurisdiction. This is what happened in the USA in 2008 and in several European countries, among them Ireland, in the autumn of the same year. Such a guarantee naturally represents a potential burden on public finances, so the price of maintaining liquidity in the financial system may be too high for a government with an already precarious sovereign debt position.

...thus giving rise to a need for a solution that does not burden public finances

There is therefore a need for alternative policies that will contain spates of illiquidity caused by default instead of shifting them from sector to sector around the economy like a hot potato.

A banking union has been established at EU level in response to the financial crisis. The union rests on three main pillars: (i) a single regulatory and supervisory mechanism, (ii) a single bank recovery and resolution mechanism and (iii) a deposit guarantee scheme. The key feature of the second pillar is that it involves certain categories of creditors in the recapitalisation process in order to increase banks' loss absorption capacity. This is

⁴ There is an extensive literature on negative financial externalities and vicious circles, especially in the wake of the recent financial crisis (see, for example, Mendoza and Quadrini, 2010).

known as “bail-in”. The bail-in rules define the general characteristics of debt instruments issued by banks which can be converted into capital in the event of bank distress, thereby turning creditors into shareholders (“eligible liabilities”). The European framework is known by the abbreviation MREL (“minimum requirements for own funds and eligible liabilities”) and its US counterpart by TLAC (“total loss absorbing capacity”).

The instruments that meet the definition of eligible liabilities include subordinated debt, long-term deposits of institutional investors and contingent convertible instruments. The interest returns on such instruments reflect their higher level of risk. Banks’ liability structures meet the requirements to varying extents, but the vast majority of banks will have to boost their eligible or loss-absorbing liabilities. This provides an investment opportunity for well-capitalised, highly liquid non-bank institutions willing to take on the risks of such instruments.

2. WITHDRAWAL FROM OBLIGATIONS, BORROWER DEFAULT AND INTERMEDIARY DEFAULT

The first objective of the research described in this article is **to model the mechanisms whereby the set of collateral referred to here as outside collateral contributes to the accumulation of systemic risk in merchant banks**. The second objective is **to compare several alternative regulatory approaches from the perspective of the costs of combating systemic risk in the model environment**.

Our model of the mechanisms of the contribution of outside collateral to the creation of systemic risk...

If it is to serve the above purposes, the chosen model must incorporate the motivation of economically active agents to borrow. Otherwise, any problems associated first with taking a loan and then with servicing it would have the nature of an unsystematic deviation from rational behaviour, which in fact does not require any loans. We therefore consider a rational producer which, as a starting condition, has limited funds of its own, while the prevailing market input prices (wages and rental of necessary physical capital) point to a substantially higher optimal investment level. This implies a natural demand for more investor capital in the form of shareholdings or credit.

...uses the standard model of a production economy...

The standard model of a production economy with a Cobb-Douglas production function and parameter values (for the capital share, the labour share, consumer time preferences,

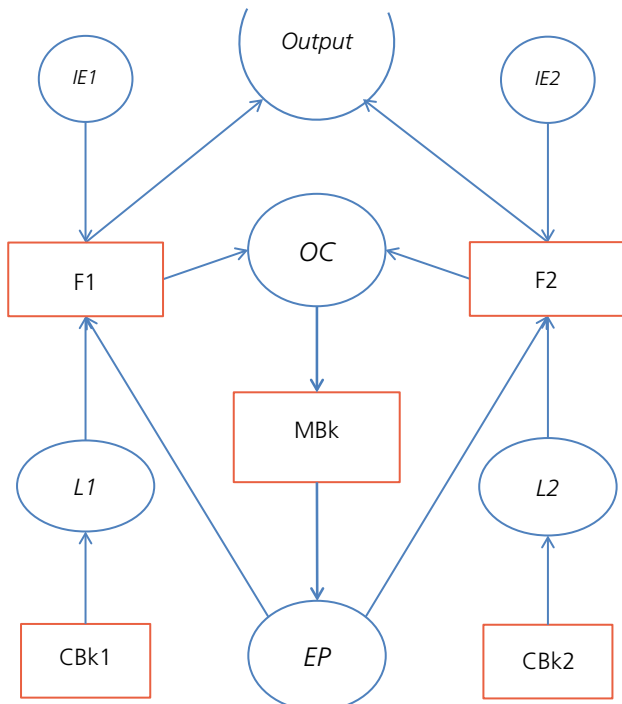
the benchmark risk-free interest rate, etc.) gives rise to an equilibrium that assumes a non-zero NFC debt level. Thus far, however, the main features of this model are well known from standard microeconomics textbooks. The innovations in our model have to do with the choice of collateral for corporate debt.

The theoretical literature on loans at risk of default tends to identify loan collateral with the value of the NFC’s assets, i.e. with the sum of the present value of output and physical capital at the end of the production cycle when the debt is repaid in part or in full. In the relevant models, a firm that is unable to repay must hand over its output and physical capital to its creditors, thereby partially satisfying their claims. Business practice, as we know, is rather different, as the debtor usually owns other assets in addition to those linked with its own productive activity. Even the assets we call outside collateral go to the creditors in the event of insolvency. We go one step further and ask what additional assets are used as collateral. To better formalise the relevant issues, we now define the set of agents represented in the model.

...but extends the standard set of agents to include secondary equity market investors...

The baseline model, depicted in Figure 1, features firm owners (incumbent controlling shareholders), firm managers, commercial banks lending to those firms and also big merchant banks purchasing shareholdings in firms and selling their liabilities to firms in the form of fixed-income certificates of deposit (CDs). The extended model additionally includes secondary equity market investors buying freely tradable shares in the above firms. We assume that there is a large number of firms and a limited number of both commercial and merchant banks. In the case of commercial banks we use this assumption because lenders, which enjoy some market power over borrowers, are also sensitive to information on borrowers’ expected performance when it comes to setting interest rates. In the model, therefore, interest rates respond to firms’ capital structure and productivity, in line with empirical evidence (see, for example, Chan and Kanatas, 1985, and Strahan and Cebenoyan, 2004). If, by contrast, the model – ignoring the real world evidence – assumed fully competitive behaviour of commercial banks (as is often assumed in the theoretical literature), the relevant properties of borrowers would not be sufficiently taken into account and would have no way of influencing the outcome. Furthermore, it is logical to assume that merchant banks are much larger than NFCs, given that we want to analyse the strategic shareholdings of those banks in firms. This contrasts with

FIGURE 1
STRUCTURE OF THE MODEL



Notes: Agents, shown as rectangles, are F1 and F2 – two firms in need of financing; CBk1 and CBk2 – commercial banks, lend to F1 and F2; MBk – merchant bank, sells its certificates of deposit to F1 and F2, buys strategic equity partnerships in F1 and F2. Goods and assets, shown as ellipses, are Output, produced by F1 and F2; L1 and L2 – loans granted by commercial bank CBk1 to F1 and by CBk2 to F2; IE1 and IE2 – initial capital of F1 and F2; EP – equity partnerships in F1 and F2 acquired by the merchant bank; OC – outside collateral instruments (either officially guaranteed or convertible) purchased by F1 and F2 from MBk.

minor shareholders, who with their small shareholdings have no influence in decision-making.

...and adds the innovation of outside collateral...

Our model therefore contains one key innovation: the NFC's decision to buy assets in the form of merchant bank CDs and use them as collateral on a loan from a commercial bank. It finances this purchase by selling a sufficient number of new shares on the market, which are likewise bought by merchant banks. In the baseline setup the merchant bank balance sheet is simple, consisting of shareholdings in firms on the asset side and CDs on the liability side. The formal reason why firm shareholders decide to expand their set of investment opportunities in this way instead of investing more funds in the production process is that the existence of an intermediary in the shape of a merchant bank ultimately allows them to realise this expansion, albeit at the cost of transferring a fraction of their dividend income to other agents, but with a simultaneous reduction in the subjective default probability thanks to risk diversification. For the incumbent NFC shareholders, the resulting effect

turns out to be positive (this issue is discussed further in the next section). The aggregate effect is additional leverage on top of that stemming from borrowing from commercial banks.

We should emphasise that the transaction framework described above is typical of highly developed and sophisticated financial markets containing well-capitalised, highly liquid NFCs. Use of this framework allows them to optimise their financial asset yields, financing costs and ownership structures. In the Czech case, this setup may open to criticism from the prudential perspective. However, we need to realise that large and economically strong financial and industrial conglomerates are being formed in the Central Europe region and that those conglomerates are able to use a similar transaction framework in the European economic area and create the kind of aggregate risks described above. In addition, general growth in bank deposits of NFCs in the Czech Republic (see Chart 1), coupled with insufficient investment opportunities in the real economy in the current low interest rate environment, may make new forms of investment more appealing to NFCs.

...which generates new elements when a contracting party defaults on a debt instrument

At the core of this modelling exercise is the definition of what happens in the event of withdrawal from a debt obligation. In the case of NFCs as debtors the mechanism is entirely standard and is equivalent to the procedure for limited liability companies: the firm surrenders its output, physical capital and outside collateral to the lending bank, and the shareholders get nothing. Merchant bank default is less easy to describe. Withdrawal from obligations for one merchant bank debt instrument logically triggers a shock wave of illiquidity across all other similar instruments. This affects all holders of debt instruments issued by the merchant bank, i.e. in our model all NFCs that use such instruments as outside collateral on their own debt. Among other things, this implies a fall in recovery rates across the economy. If this potential outcome is rationally foreseen, commercial banks should naturally respond by tightening their credit conditions, i.e. by increasing the "haircut" on outside collateral. This, however, can cause other NFCs unable to meet the tighter credit conditions to run into solvency problems. This gives rise to a vicious circle of insolvency well known from the recent global crisis and from its most significant predecessor, the Great Depression of the 1930s. The model uses a logical shortcut in that it defines merchant banks as a set of identical agents and describes only one representative of that set. Consequently,

it abstracts from the situation where merchant banks hold part of the debts of other merchant banks, which makes the merchant banking sector even more fragile. This implies that the crisis effects we describe here could be even more dramatic if we generalised the model to inhomogeneous, interconnected merchant banks.

3. INVESTMENT OF LIQUIDITY AND OUTSIDE COLLATERAL

The model we describe is a general equilibrium model, i.e. it assumes that several markets clear simultaneously. In this case we are concerned with the NFC credit market, the NFC equity market and the market for merchant bank CDs used as outside collateral. In the model, the supply of new shares and bank loans is endogenous, while changes in the supply of outside collateral form the basis for comparative-statics experiments. The reason for opting for exogeneity of the amount of eligible outside collateral is that although it is logical to enquire into the optimal amount of outside collateral, different agents turn out to have different interpretations of optimality.

The incentive to hold outside collateral varies across transaction agents...

For example, an NFC manager who is remunerated in proportion to the dividend paid but holds no sway over the level of equity (and thus takes it as given) has no interest in holding outside collateral. From his perspective, the introduction of outside collateral would lead primarily to higher debt levels and hence to a lower expected dividend, as liquidity is being invested elsewhere than in the project he manages. The optimal level of physical capital must therefore be financed additionally. Second-order effects such as a slightly lower default probability are not strong enough to reverse this negative preference.

...shareholders...

The NFC's controlling shareholders, by contrast, welcome the introduction of outside collateral, as they see a generally rising level of equity capital and less dependence on bank loans, and hence a lower default probability and a prospect of a lower loan interest rate. From the perspective of such shareholders, the expected dividend is conversely higher in the case of outside collateral.

...lending banks...

The opinion of the lending bank depends on whether its perception of reality is closer to the myopic view of the firm manager (with whom it negotiates the loan) or to the more sophisticated view of the NFC's owners. In the myopic case,

the commercial bank can be expected to encourage the use of outside collateral, as it will boost loan demand and improve its bargaining position and will also increase the recovery rate in the event of default (as the value of the outside collateral is not tied to the performance of the NFC). By contrast, a bank with a broader macroeconomic view may not encourage the expansion of outside collateral so much if it is aware of the aggregate effect of a fall in interest rates and in the amount of debt service.

...regulators...

The regulator's view will also evidently depend on whether it pursues predominantly microprudential or macroprudential objectives. The microprudential perspective has much in common with the view of a commercial bank that adopts the firm manager's myopic view, as it puts the emphasis on the lower default probability and generally higher investment and output for a typical loan. By contrast, the macroprudential perspective must take into account the total loss given default at a time of negative aggregate shocks. With mass use of outside collateral, this loss is amplified by the spread of systemic risk across markets (the main theme of this article).

...and we therefore seek the natural level of outside collateral...

Given all that, it is difficult to clearly define the natural level of outside collateral for the general equilibrium calculation in this model. It is often necessary to compare the results for the full range of conceivable values. This is what we do in our research. We examine three particularly important benchmark levels: besides the zero initial level of outside collateral we seek, first, the endogenously determined optimal level of outside collateral from the perspective of the NFC's final majority shareholder (i.e. including the representative of the merchant bank that owns the equity share which the firm sold to finance the purchase of outside collateral) and, second, the maximum – and also endogenous – level of outside collateral in the case where the collateral is financed by the NFC's entire equity capital (original and new, as supplied by the merchant bank) and investment in production is financed solely by bank credit. We assume for simplicity that the NFC is not allowed to increase the level of outside collateral above the last-mentioned limit, i.e. it cannot part-finance it with bank credit.

Table 1 provides a qualitative overview of what happens to the general equilibrium in this model in the case of a permitted gradual expansion of outside collateral. To derive the optimal level of outside collateral from the public

TABLE 1
AGGREGATE EQUILIBRIUM IMPACT OF THE USE OF OUTSIDE COLLATERAL ON SELECTED MACROECONOMIC FUNDAMENTALS

Variable	Share of outside collateral in total NFC loan collateral	
	Rise to optimal level from firm shareholders' perspective	Further rise (to total equity capital level)
Lending rate	<i>moderate fall</i>	<i>slight fall</i>
Physical capital	<i>slight rise</i>	<i>slight fall</i>
Output	<i>slight rise</i>	<i>slight fall</i>
Total loans	<i>moderate rise</i>	<i>moderate fall</i>
Debt service	<i>moderate fall</i>	<i>moderate fall</i>
Dividends	<i>rise</i>	<i>moderate rise</i>
Probability of default, non-financial corporation	<i>fall</i>	<i>fall</i>
Probability of default, merchant bank	<i>fall</i>	<i>fall</i>
Merchant bank profit	<i>moderate fall</i>	<i>moderate rise</i>
Guarantees for merchant bank liabilities given default	<i>rise</i>	<i>sharp rise</i>

Source: ČNB

welfare perspective we would first need to define the relevant welfare function. We therefore leave this for future research.

...which significantly affects the merchant bank's solvency in the event of an aggregate shock...

A key question associated with the role of merchant banks as intermediaries between NFCs demanding high-quality collateral and other NFCs offering their shares on the market is how claims are settled when, due to an aggregate shock, the real sector is not earning enough and therefore paying low dividends. In this situation, a merchant bank that holds shares in firms is also not earning enough. It cannot reduce its fixed-income payments on CDs without declaring insolvency. A very important fact is that the merchant bank cannot set a low level of CD interest in advance in order to create a buffer for weak cash flow situations, because at low interest rates its CDs are not attractive to NFCs seeking alternative investments suitable for use as outside collateral. For this reason, in the model there is a floor for CD interest rates compatible with the existence of general equilibrium. As a result, even if it were a monopolist in its market, the merchant bank cannot fully exercise its market power and

set interest rates low enough to protect itself adequately against the risk of low dividend income. It is more fragile than firms in the non-financial sector: there is a whole range of aggregate productivity values at which NFCs survive and repay their debts to commercial banks while merchant banks end up making a loss.

...and leads in the extreme case to outside collateral holders suffering losses if the government fails to issue guarantees

The question of who will bear the loss is linked with the legal status of merchant bank liabilities and has to be addressed outside the formal model described here. In the case of private owners of merchant bank debt instruments, the merchant bank must withdraw from all its obligations simultaneously in the event of default. This causes distress to all holders of its CDs (outside collateral), i.e. the entire non-financial sector in our model. A serious problem is that this happens regardless of the absolute size of the merchant bank loss. With the exception of extreme falls in aggregate productivity, a CD guarantee fund financed by corporate taxes would be able to cover this merchant bank loss. This is the model equivalent of what happened in many economies during the recent crisis, when governments issued guarantees for the liabilities of systemically important banks in the belief that any actual payments from the budget, i.e. from taxes, would amount to only a fraction of the formally guaranteed asset value.

The push to reduce official guarantees is giving rise to bail-in alternatives

However, even the potential burden on public finances was usually so large that it was necessary to consider bail-in alternatives, i.e. involving creditors in rescuing the bank. The most common bail-in mechanism involves the use of convertible, or contingent convertible, debt in the bank's balance sheet. "Contingent" means that conversion occurs only when predefined conditions linked with a deterioration in the financial institution's condition have been met. This approach now has a regulatory framework laid down in the EU Bank Recovery and Resolution Directive (BRRD, MREL) and in the TLAC instrument in the USA. The bank can of course hold convertible debt instruments in excess of the regulatory requirements, but may face a whole range of legal obstacles to converting them.

4. CONTINGENT CONVERTIBLE DEBT AS A WEAPON AGAINST SYSTEMIC RISK

Contingent convertible debt was discussed as a financial stability instrument long before the recent global crisis

TABLE 2
IMPACT ON SELECTED MACROECONOMIC FUNDAMENTALS OF THE CANCELLATION OF GUARANTEES AND THE TRANSFORMATION OF MERCHANT BANK LIABILITIES TO CONTINGENT CONVERTIBLE BONDS

Variable	Introduction of CoCo bonds instead of official guarantees
Lending rate	<i>moderate rise</i>
Physical capital	<i>slight fall</i>
Output	<i>slight fall</i>
Total loans	<i>slight fall</i>
Debt service	<i>slight fall</i>
Dividends	<i>slight fall</i>
Probability of default, non-financial corporation	<i>slight rise</i>
Probability of default, merchant bank	<i>eliminated</i>
Merchant bank profit	<i>moderate rise</i>
Guarantees for merchant bank liabilities given default	<i>eliminated</i>

Source: ČNB

flared up (see, for example, Flannery, 2005, and other references therein). Until recently, however, the emphasis in the literature was placed on containing moral hazard in banks: the threat of a decline in the price of convertible debt on the secondary market should deter banks' managers and controlling shareholders from engaging in excessively risky behaviour (Calomiris and Herring, 2012). Our research sets out to extend this view by incorporating channels of risk transmission in the event of negative aggregate shocks. In our model, therefore, there is a risk of failure of a systemically important financial intermediary and of related financial contagion regardless of whether or not moral hazard is present.

CoCos as an alternative to official guarantees...

A large number of proposed alternatives to official guarantees apply the concept of contingent capital or contingent convertible (CoCo) debt. In financial practice, CoCo bonds are converted into equity under predefined conditions tied to the issuer's accounts, the market value of selected assets of the issuer, a downgrading of the issuer's rating or a minimum level of capital. The simplicity of our model means that it is enough for these instruments to behave as standard bonds when the issuer is able to repay but to be converted into equity when it becomes insolvent. The research described here demonstrates how an economy might work if NFCs have diversified outside collateral in the form of merchant bank CoCos. For this purpose, we conduct experiments with the general equilibrium model

described above in which a typical merchant bank has assets composed of shareholdings in NFCs and liabilities in the form of CoCos held by the same NFCs.

...change the behaviour of transaction agents and the values of macroeconomic fundamentals...

In the model, if the merchant bank's corporate dividend income is lower than the liabilities arising from its CDs, the CD owners are paid an aliquot share of the dividends of firms (which in this situation are understandably low) instead of fixed interest and principal. The loss arising in the NFC sector is thus dissolved in the sector itself and is not transferred to public budgets or to the investment and commercial banking sector. The key to determining the costs and benefits of this set-up is to work out how the agents' behaviour changes compared to the official guarantees case and how the values of macroeconomic fundamentals change in the new general equilibrium. We need to check whether leaving the additional risk in the private non-banking sector leads to an excessive fall in economic activity with knock-on effects on public welfare. Calculations conducted in our model indicate that the costs of this type are far smaller than the benefits in the form of elimination of the potential fiscal burden, which, moreover, would be payable when the economy is in recession.

...indicating a net benefit of using CoCos...

The impacts on individual economic fundamentals are summarised in Table 2, in which the benchmark aggregate level of outside collateral is the level that would be chosen by the NFCs' majority shareholders. The adverse effect on the usual macroeconomic aggregates (national income, investment, lending, interest rates etc.) of switching from official guarantees for merchant bank liabilities to a system of liabilities of the same banks operating in the CoCo regime turns out to be relatively small, even though the total amount of loans in the real economy is higher in the guarantee regime. In return, the exposure of public budgets to risks associated with guarantees in the event of adverse macroeconomic developments is completely eliminated. The effect is even stronger when one considers the amount of impaired assets whose CoCo guarantee may become payable even in the event of only a slight breach of the merchant banking sector's aggregate solvency threshold. In our model this comes out at around 50% of GDP.⁵

⁵ This specific figure for payable guarantees stems from extreme simplification of many aspects of reality, most notably the commercial banking sector's balance sheet structure. It should therefore be treated with caution.

...and the prospect of development of the CoCo market

As banks are required to hold similar instruments for crisis resolution purposes (MREL and TLAC), a large CoCo market can be expected to develop. Given their relatively high rates of return, CoCos may also be a very attractive investment for NFCs with strong liquidity and capital positions. At the same time, however, they may give rise to a new kind of aggregate risk and probably also a different attitude of commercial banks to this type of outside collateral. This may lead to larger haircuts or conditional acceptance of collateral depending on the evolution of the indicator that activates conversion to capital. This type of risk needs further research and the model may have to be extended to include it in the future.

5. CONCLUSION

Two questions often arise in connection with the activity of merchant banks not only as issuers of liquid instruments used as outside collateral, but also as sources of additional financing for firms. The first relates directly to the construction of CoCos: Why not choose a more radical option and limit all permitted merchant bank liabilities to equity instruments, i.e. instruments that unconditionally link payments to investors to the institution's earnings?

According to current knowledge, the answer is no on both the purely practical level and the theoretical level. On the practical level, this solution would involve excessive administrative intervention in the operation of an entire significant sector of the economy, and such intervention would not be easy to justify on legal grounds. In addition, it would involve an attempt to drastically regulate international institutions that are capable of circumventing the restrictions of individual jurisdictions. Isolated economic considerations are not enough to justify imposing one specific market behaviour on a large number of significant economic agents. The costly state verification (CSV) literature (see Townsend, 1979) likewise tells us that such regulations would most probably go against the natural interests of both the owners of the institutions involved and their investment partners. The CSV theory demonstrates that when the issuer of liabilities has better information on its performance than the buyer, a debt instrument featuring contingent convertibility into capital if the issuer defaults is often the only contract that both parties are willing to accept. A classic equity contract is less advantageous for the buyer because the buyer must bear the costs of checking the true income of the issuer under all circumstances,

whereas it pays the buyer to do so at most in cases where the issuer is insolvent.

The second question concerns the substitutability of the merchant banking sector by other institutions, for instance in the form of a standard equity market. Our model answers this question by allowing for generalisation in the shape of a secondary corporate equity market for small investors. Here, it turns out that in general equilibrium, small shareholders – who, in contrast to merchant banks acquiring large shareholdings, cannot see the influence of their stakes on the NFC's capital structure and behaviour – do not buy enough equities and do not pay enough for them to ensure optimal financing. This is a variation on the aforementioned theme of Townsend's CSV effect. Virtually all the performance parameters of a firm with a suboptimal capital structure are worse than those of a firm with a large owner capable of appreciating relevant changes in the marginal product of capital. The result indicates that an agent playing a role similar to that of the merchant bank in our model is in all probability the natural evolutionary outcome in a standard production economy. It therefore makes sense to analyse the impact of its activity on various aspects of the economy, including systemic risk.

We should stress that the use of contingent convertible bonds and similar instruments meeting the MREL and TLAC requirements on the liability side of the merchant bank balance sheet is not a miracle cure that will eradicate default and insolvency risk from the global financial system once and for all. This risk will not disappear. However, the vulnerability of merchant banks to aggregate risks associated with the use of original debt instruments as outside collateral by NFCs will be greatly reduced, and a significant channel of potential contagion to other market segments in the event of aggregate shocks will be closed.

The loss arising from weak performance of a systemically important group of economic agents will be allocated only subsequently to the results of those investors who, instead of investing directly in those agents, opted to deposit their funds with merchant banks with a vague idea of achieving greater diversification and lower risk. Those investments will ultimately resemble equities despite the investors' originally different intentions. However, such equity characteristics will only manifest themselves in situations where default has to be declared on fixed-income instruments. In all other (more favourable) scenarios, merchant bank liabilities retain a resemblance to bonds. The main financial stability benefit of contingent convertibility is that it limits the number of

cases where it is necessary to declare default on the fixed-income instrument.

However, the potential development of a large market in such instruments and of their use as outside collateral gives rise to a host of new aggregate risks in the event of economic shocks. These risks should be the subject of further research.

The advantages of the bail-in principles described in this article are perhaps most pronounced in small open economies, which cannot react very effectively on the regulatory level to investment decisions by international financial groups with large merchant banking operations. In the CoCo liability system, the government's role in the resolution of insolvent banks is transformed from that of provider of official guarantees to potential upholder of the shareholder rights of creditors from its own country in a going concern when the new owners are limited in exercising their shareholder rights. This is far simpler and cheaper than asserting creditor rights before a court in another country in the case of a bankrupt institution.

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