



Collateral Composition, Diversification Risk, and Systemically Important Merchant Banks

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Research Open Day
Czech National Bank

12 May 2014

Motivation

- Debt crises are, essentially, crises of collateral markets
- From an individual borrower perspective, it may be advantageous to offer collateral other than one's own productive assets and output (i.e. *diversify collateral*)
- One can only diversify through a limited number of intermediaries (“merchant banks“)
- What happens with the balance sheet of the merchant bank sector? (“*Who diversifies the diversifiers*“)

What is wrong with default?

In theory:

- Default can be rationally expected and priced
- Default can be endogenously chosen by optimizing borrowers (lenders, too)
- Under AI, rational default is, actually, the *raison d'être* of, not an obstacle to, debt contracts (CSV theory)

In practice:

- There is a destruction of value (mainly HC) under default
- Legal costs are poorly controllable

Consequences:

- One includes collateral in debt contracts
- One needs a theory of both default costs and collateral markets

Our model tries to show how the two are connected

Literature

- Collateral prices and binding LTV constraints: Morris and Shin (2004), Brunnermeier and Pedersen (2009), Geanakoplos (2010)
- Collateral unrelated to own productive capital: Kiyotaki-Moore (1997) {as opposed to collateral identical with the productive assets of the firm: the Black-Scholes-Merton model}
- Liquid assets on firms' balance sheets : Woodford (1990), Bacchetta and Benhima (2010)
- "The other side" of the collateral market (merchant banks): Craig (2002)
- Probabilistic limits to diversification: Ibragimov et al. (2011)
- The present model of production economy with leveraged firms: Derviz (2012)

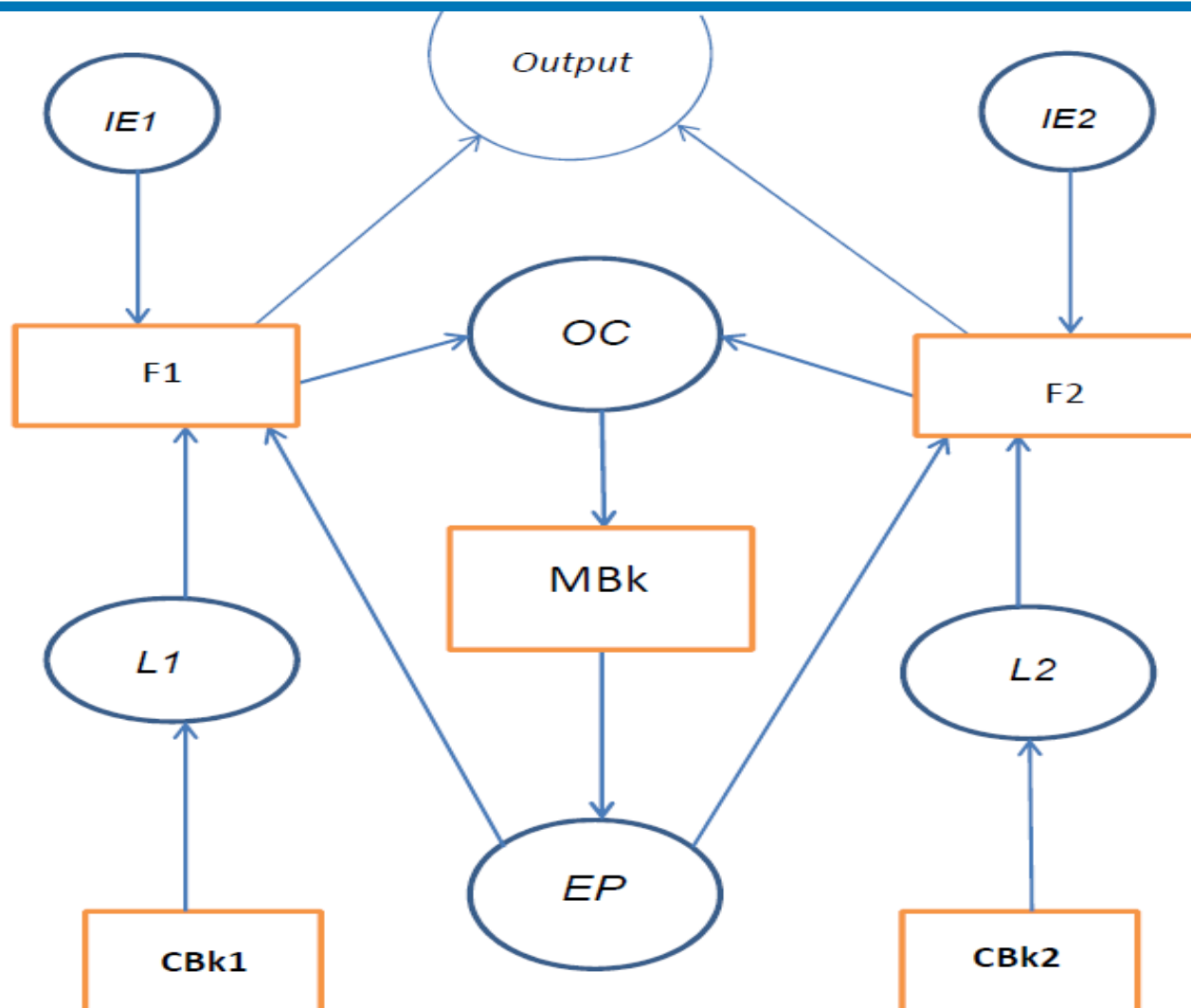
Genesis of the problem

- Firms would like to diversify assets
- It is too costly for most firms to engage in active asset trade of their own, *ergo* they need an asset manager
- Investment/merchant banking services are required, but their industry tends to become highly concentrated
- Merchant banks themselves would like to diversify, but their investment opportunity sets are (small) finite
- They end up investing in the same/similar company universe as the one which funds them
- Merchant banks cannot fully exploit their market power: low deposit rates would make the collateral they provide less valuable, adversely affecting their own equity holdings
- Hence merchant bank sector is fragile, even more so than the corporate one

Elements of the model

- Two periods
- Firms with production functions: $Af(k, m) = ALk^\alpha m^{1-\alpha}$
- A – systemic productivity component,
- L – firm-specific productivity component
- Capital transformation function: $t(k) = \delta + \tau(k)$
- τ – inverse of capital installation costs
- Physical capital financed by both equity and debt
- One commercial bank (business lender) for each firm, risk-neutral
- One merchant bank (invests in equity partnerships), risk-neutral

Investment and payments



Collateral diversification

Funds raised by equity and debt issuance are split between physical capital intended for own production and outside assets (debt/deposit/bond claims on the merchant bank):

$$q+b=k+v$$

Merchant bank balance sheet:

$$\sum_l q_l^p + q^0 = \sum_l v_l$$

q_l^p - equity partnership size in firm l , q^0 - other assets,
 v_l - deposit of firm l (its outside collateral)

Equilibrium (attributes)

- The symmetric case considered here: 2 identical firms, common productivity shock
- Simultaneous clearing of two markets: for commercial loans and equity partnerships
- Extension: secondary market for small-size shareholders
- Three regulatory arrangements concerning the merchant bank liabilities
 - 100 per cent official deposit guarantee
 - Admissible liabilities in equity form only
 - Admissible liabilities in CoCo bond form only (conversion into common stock if dividend/interest revenues insufficient to pay out deposits)

Equilibrium (taxonomy)

- E1 (baseline) $k=b-b^m+q-v$, $q=q^h+q^p$, $q^p=v$
- E2 (restricted) $k = b - b^m + q - \bar{v}$, $q=q^h+q^p$,
 $2q^p = 2\bar{v} + q^o$
- E3 (outside equity, incomplete)
 $k=b-b^m+q-v$, $q=q^h+q^e+q^p$, $q^p=v$
- E4 (outside equity, complete) $k=b-b^m+q$, $q=q^h+q^e$,
 $q^p=v$

Table 1 Economic fundamentals in a symmetric equilibrium with fully guaranteed deposits in the merchant bank

ν :	0	0.1	0.404991
Lending rate	0.0757712	0.0732556	0.069355
Physical capital	13.6654	13.7408	13.656000
Total equity capital	2.7	2.8	3.104991
Average gross output	17.1668	17.2473	17.156800
Working capital loans	2.55836	2.51444	2.408040
Total loans	13.5394	13.5711	13.379800
Debt service	14.56529659	14.5652591	14.30776
Survival probability, firm	0.901305	0.928249	0.981900
Default threshold, firm	0.319907	0.272727	0.143834
Expected dividend	2.64068	2.81098	3.277320
Expected merchant bank profit	0	-0.00921571	0.00445542
Default threshold, merchant bank	0.98492915	0.98295585	0.623454
LGD of merchant bank	0	5.00129	27.3482

Table 2 Economic fundamentals in the presence of secondary equity market

q^h :	1.0286351	2	2	2	
v :	0	1	1.06316	3.06023	
	<i>Minimal q^h for which equity finance suffices</i>		<i>$v=q^p$, i.e. no outside equity needed</i>	<i>$v=q$, max allowed</i>	
Lending rate	0.0675991	0.0683201	0.0683651	0.069773404	
Physical capital	13.7016000	13.551	13.5417	13.2554	
Total equity capital	3.0679157	3.06337	3.06316	3.06023	
Average gross output	17.2055000	17.0446	17.0347	16.7286	
Working capital loans	2.3910200	2.38065	2.38001	2.36008	
Total loans	13.0247000	13.8683	13.9217	15.6155	
Debt service	13.9051580	14.8157836	14.873458	16.705047	
Survival probability, firm	0.9835150	0.982852	0.98281	0.981516	
Default threshold, firm	0.1379920	0.140426	0.140576	0.145183	
Expected dividend	3.3029400	3.28166	3.28035	3.23994	
Merchant bank profit		0.04251625	0.04444839	0.01849962	
Secondary equity market financing	Complete	Complete	Incomplete (q^p-v)	Complete	Incomplete (q^p-v)
q^e	2.0392800	1.06337	0.0633700	1.06316	0
p	2.0392800	2.33000	2.63417	2.32895	2.65199
x^e	1	0.456384	0.0240583	0.456497	0

Table 3 Economic fundamentals when merchant bank debt is convertible into equity

$q^h=2.7$	<i>Merchant bank deposits officially guaranteed</i>	<i>Merchant bank liabilities in equity form only</i>	<i>Merchant bank deposits converted into equity when insolvent</i>
$v:$	0.404991	0.402676	0.598661
Lending rate	0.069355	0.069351	0.0697665
Physical capital	13.656000	13.6569	13.5779
Total equity capital	3.104991	3.102676	3.298661
Average gross output	17.156800	17.1577	17.0733
Working capital loans	2.408040	2.40809	2.40342
Total loans	13.379800	13.3807	13.2969
Debt service	14.30776	14.308665	14.224578
Survival probability, firm	0.981900	0.981904	0.981523
Default threshold, firm	0.143834	0.14382	0.145161
Expected dividend	3.277320	3.27744	3.26608
Expected merchant bank profit	0.00445542	0	0.117892
Merchant bank profit under unit TFP	0.00366253	0	0.00498064
Default threshold, merchant bank	0.623454	0	0.546639
Expected revenue on diversified collateral	0.42746826	0.425357475	0.414181
LGD of the merchant bank	27.3482	0	0

Discussion I: expected results

- Collateral diversification lowers interest rates and raises DD of non-financial borrowers
- More equity capital diverted towards financial collateral (marginally) reduces investment and output
- Subjectively, incumbent shareholders (and managers) of the firms are against new stock issues, but may have no choice if the foundation capital is low: there may be no credit in equilibrium for undercapitalized firms
- Subjectively, firm managers are even against collateral diversification (they see the need to borrow more and a downward pressure on dividends, but do not internalize the additional equity capital supply); that is why the decision to diversify is usually taken by the shareholders

Discussion II: results known in other contexts

- Retail equity investors cannot provide all the necessary equity financing due to an informational disadvantage (CSV effect)
- The party most interested in the existence of outside (diversified) collateral is the myopic commercial bank
- Real fundamentals change very little under contract modifications intended to cover only rare adverse events
- Non-core liabilities of the financial sector and false (i.e. risk-enhancing) asset diversification by the non-financial sector are complements; these are two sides of the economy-wide leverage risk

Discussion III: (relatively) unexpected results

- If the merchant bank deposits are officially guaranteed, then its loss given default is of the same order as the aggregate output
- The merchant bank balance sheet is fragile: it needs optimal capital structure of firms in its equity portfolio to compensate for high expected LGD due to leverage
- Merchant bank fragility is not a consequence of competition, but of its middle role in diversification process
- Merchant bank expected profit is higher under the CoCo regime than under the deposit guarantee regime (there is some overinvestment under guarantees)

Conclusions

- Leverage stemming from collateral diversification is chosen voluntarily by the non-financial private sector since, under scarce equity, its presence both provides better managerial incentives and improves welfare
- The leverage may be the only way to allow production financing as secondary stock market participation is limited by information barriers faced by small shareholders
- Since the merchant bank sector which provides leverage is intrinsically fragile, potential costs of official guarantees to it will always be high
- Instead of trying to transfer losses from sector to sector (“hot potato” approach), one should try to channel them back to their originators
- The CoCo bond restriction on the merchant bank liabilities, as explored by the present model, is able to relocate *systemic corporate losses* back to the originating sector
- In addition, the CoCos mechanism replaces legal costs of an *insolvent* SIFI resolution by protection costs of shareholder rights in a *surviving* SIFI – both a cheaper and a politically more viable solution

Thank you for your attention

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