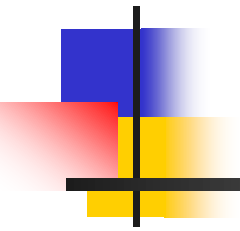
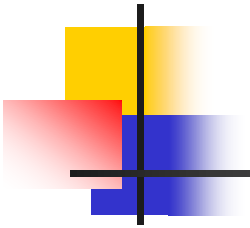


RISK AND REGULATION

From default risk to market risk and regulation: an option approach

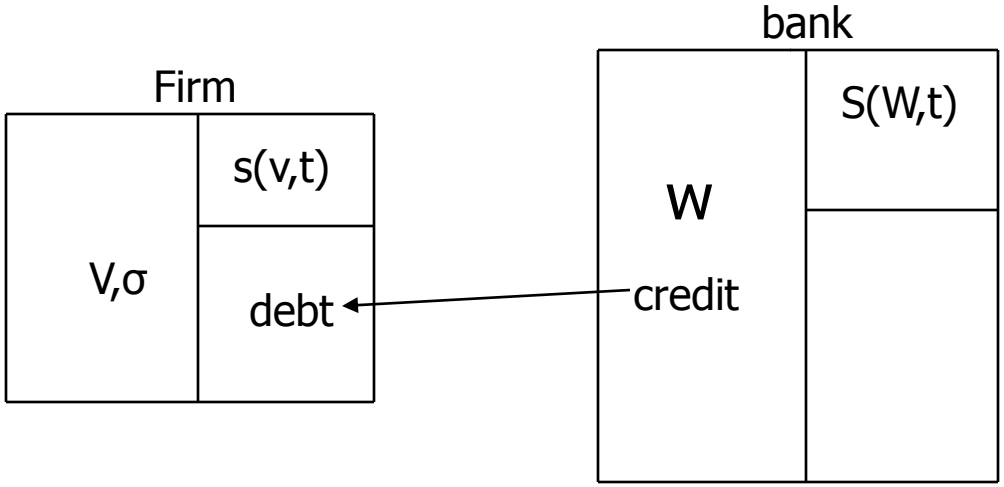


RISK AND REGULATION

- Content
  - From default risk to market risk: some insights
  - The foundations of banking regulations

1-FROM DEFAULT RISK TO MARKET RISK

- Credit and moral hazard problem
  - Consider the credit relationship between a borrower and a bank



1-FROM DEFAULT RISK TO MARKET RISK

- The timing of operations is the following:
  - **First**, the firm gets a loan from the bank
  - **Then**, the firm invests and the business risk of the firm is specified
- Once the firm has obtained the loan, it can invest in a riskier project to maximize the firm's value!
  - Remember that the call's value is increasing, all things equal, in the risk of the underlying asset

1-FROM DEFAULT RISK TO MARKET RISK

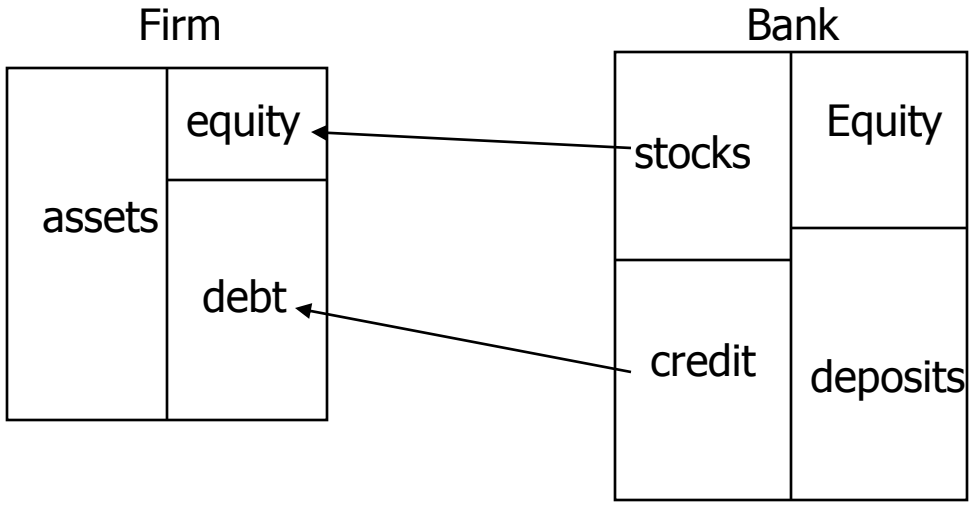
- The asset substitution moral hazard
  - Firm's objectives and decisions
    - Max s(v,t)…
    - …implies max σ!
    - Increases in σ implies a shift in value from the debtholders toward the shareholders
  - Consequences for the bank
    - The bank is exposed to the asset substitution moral hazard which in term decreases the value W of bank's assets
    - W is not maximized and so is not S(W,t)!

1-FROM DEFAULT RISK TO MARKET RISK

- The asset substitution moral hazard
  - What can the bank do to prevent such an opportunistic behavior?
    - Tactical answers
      - To include covenants in loan credits
      - To lend with short term maturity to force the borrower to renegociate periodically the credit
      - To transfer the loan application to the leasing subsidiary of the bank
    - Strategic answer:the bank can substitute in its balance-sheet some market risk to the initial credit risk

1-FROM DEFAULT RISK TO MARKET RISK

- Consider now the double relationship between a bank and a firm



1-FROM DEFAULT RISK TO MARKET RISK

- If the firm maximizes the value of equity, it maximizes also the value of stocks in the bank's balance sheet
- Including stocks in its balance-sheet increases the risk of the bank's assets and also the value of bank's equity (remember that the value of a call is increasing in the risk of the underlying asset)

1-FROM DEFAULT RISK TO MARKET RISK

- An example
  - Suppose that a bank has the choice between two strategies
    - A)investing 10000 in credits such that:
      - 10000 → 12000 (+20%, p=1/2)
      - 10000 → 9000 (-10%, p=1/2)
    - B)investing 5000 in credits with the same return and 5000 in risky stocks
      - 5000 → 6000 (+20%, p=1/2)
      - 5000 → 4500 (-10%, p=1/2)
      - 5000 → 6500 (+30%, p=1/2)
      - 5000 → 3500 (-30%, p=1/2)

1-FROM DEFAULT RISK TO MARKET RISK

- Suppose that credit risk and market risk are independant, which strategy should the bank choose if it is financed with deposits (payment 10000 in 1 period)?
  - A)equity gets 2000 (p=1/2) and 0 otherwise
  - B)equity gets 2500 (p=1/2) and 0 otherwise
- Note that strategy B is socially more inefficient than A (riskier and less profitable); nevertheless, bank's shareholders will choose strategy B

2-THE FOUNDATIONS OF BANKING REGULATIONS

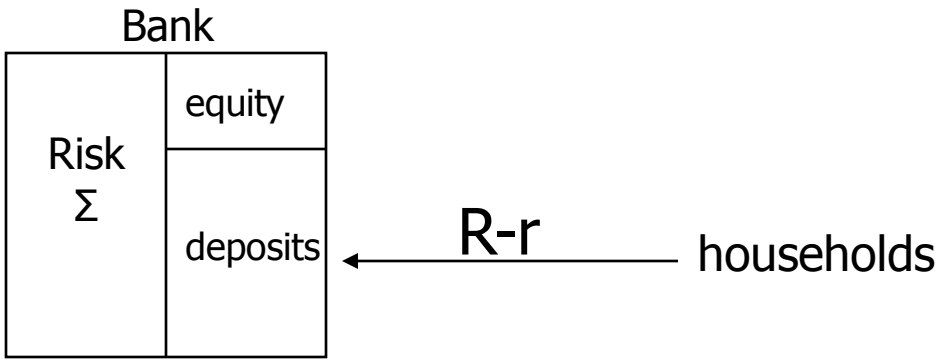
- In part 1, we concluded that banks have incentives to include some market risk along with credit risk in their balance-sheets
- What are the consequences in terms of financial stability and bank fragility?

2-THE FOUNDATIONS OF BANKING REGULATIONS

- The case of private banks
  - Rational shareholders have strong incentives to increase the risk of bank's assets
  - Such behavior will induce wealth transfer from deposit holders toward bank's shareholders
  - In turn, deposit holders have also incentives to withdraw their deposits if the bank's assets are too risky

2-THE FOUNDATIONS OF BANKING REGULATIONS

- How to prevent unexpected withdrawals?
  - Following Merton (1974), we can conclude that deposits withdrawals are directly linked to the households expected risk premium



2-THE FOUNDATIONS OF BANKING REGULATIONS

- How to prevent unexpected withdrawals?
  - Suppose that the maximum risk premium that households can bear is m
  - A regulation must respect the following condition:
    - R-r<m
    - With R-r=-(1/t)[Log(N(d_2)+N(-d_1)/d)]
    - With t, d_1, d_2 and d are relatives to the bank characteristics

2-THE FOUNDATIONS OF BANKING REGULATIONS

- Remember that R-r is increasing in Σ and d; R-r=f(Σ, d)
  - A higher Σ implies a lower leverage d and consequently higher equities
  - A lower Σ authorizes a higher leverage d and consequently lower equities
  - Every bank regulation must link assets risk Σ and leverage d

2-THE FOUNDATIONS OF BANKING REGULATIONS

- Remarks
  - Notice that d is the apparent leverage
    - d=D.exp(-rt)/V
  - *All things equal (!)*, a lower V should induce a reinforcement in bank regulation
  - Σ is the risk of a portfolio; when computing it, don't forget the correlations between individual risks

SUMMARY

- Option pricing theory offers a rational conceptual framework for evaluating corporate liabilities and credit risk premium
- The default risk premium is increasing in the business risk and the leverage
- In the credit relationship, the bank is exposed to the asset substitution moral hazard
- The bank has strong incentives to include some market risk along with credit risk in its balance-sheet
- Such risk-taking bank behavior needs appropriate regulation

SUMMARY

- Regulations must consider together the assets' risk and bank leverage; these principles can legitimate Cooke and Mac Donough regulation

REFERENCES

- Black, F., and Scholes, M., (1973), « The pricing of options and corporate liabilities », Journal of Political Economy, May-june, 637-659.
- Merton, R., (1974), « On the pricing of corporate debt: the risk structure of interest rates », Journal of Finance, May, 449-470.