
The Theory of Credit Contracts

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The Theory of Credit Contracts

With a Focus on Group Lending

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Preface

The desire of this monograph is to improve peoples' lives by improving our understanding of credit relationships. In keeping with the Lewinian mantra that there is nothing so practical as good theory¹ it hones the theoretic side of the field, it *improves* and *enriches* the theory of credit contracts.

In part I. *improvement of the existing theory* is achieved by a new approach that carefully decomposes the field into reasonably isolated subproblems which can then be researched quite independently (chapters 2, 3, 4). This unconventional modular approach to the theory of credit contracts is opposed to the rather integral and monolithic research practice that predominates in the literature. It can be seen as a complete restructuring of the theoretic landscape and yields many benefits: It provides a framework to clearly arrange existing knowledge, it enables specialisation and cooperation, and it creates transparency by neatly unravelling the complex interplay between different aspects of lending theory. For instance contract effects and market effects are explicitly separated. In addition to introducing this new modular approach, part I. bestows great care on providing precise definitions of the concepts used in credit contract theory and chapter 5 promotes working towards a standardisation of the field to increase research efficiency.

In part II. enrichment comes about by a whole bunch of *new results*. In order to produce clear-cut conclusions, the structure developed in part I. is applied and the modules are researched individually. In chapter 6 the idea that joint liability mitigates adverse selection is scrutinised and proven wrong in several cases. Chapter 7 provides a very general proof for the risk shift between lender and borrower that is induced by using collateral and it examines the effects of this result on other modules of the theory. Subsequent chapters concentrate on the improvement of repayment games by reinvestigating existing and inventing new payback-enforcement schemes. A special feature is the uniformity of the settings in chapters 10, 11, 12 which makes different payback-enforcement schemes easily comparable and gives practitioners the chance to choose the context dependent best one (see figure 13.2). Chapter 9 introduces a Mathematica-Code that can solve and analyse repayment games automatically. In chapters 10, 11, 12 this tool is put to use, to effectively research many payback-enforcement schemes. In 10 I present a new model that reproduces the perverse effect of joint liability with a minimum of assumptions and

1 See [Wei03, p. 459].

I demonstrate a simple but effective countermeasure, namely adaptive punishment. The applicability of this punishment strategy in the real world is discussed, too. In chapter 11 a new model is introduced which is explicitly tailored to shedding light on the effects of social sanctions – in joint liability contracts with two borrowers and with three borrowers, as well as in individual liability contexts. Finally, chapter 12 reviews the quality of cross-reporting mechanisms presented in the literature and invents a new and better one that features zero equilibrium punishment and only unique equilibria in every possible state of the world. This robustness to different states makes the result independent of the actual probability distribution, thus the application of this mechanism is safe for any real world distribution. As a by-product the model provides a new formal explanation for the trend to keep banking meetings despite the change back to individual liability contracts by microfinance institutions.

Altogether this dissertation features new innovations on several levels. On a conceptual level the modularisation of lending theory, on a formal level the standardisation of lending theory and precise definitions, on a technical level the development of an algorithm to solve repayment games automatically, and with regards to content several new theoretic results on the effects and the performance of various credit contracts. By pointing at numerous open questions and problems, this monograph also motivates future research projects in the field of credit contract theory, in order to extend the boundary of our knowledge even further.

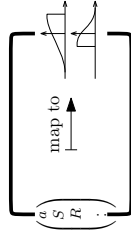
Although it is me who wrote this thesis, it is a whole crowd of people that put me in the position to do that. Most directly my supervisors Prof. Dr. Lutz Arnold and Prof. Dr. Andreas Roeder who I could always turn to with my questions. I was also fortunate to be surrounded by colleagues of great heartiness that often shared their knowledge as trained economists whilst I was working myself into the field (as a trained mathematician). In particular I had long discussions with Marina Markheim, a specialist in Microfinance. Of course, my knowledge and skills have been developed with the assistance of many teachers at school and professors at university and also students asking clever questions in my own lectures. I view this thesis as a culmination of all their efforts and enthusiasm. Finally, I enjoy the company of some close companions who acted as supporters, who cared for me during hardships and who constitute an invaluable wealth. Thank you my friends!

Regensburg, April 2019

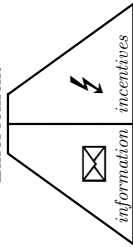
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CONTENT HIGHLIGHTS

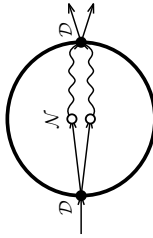
CONTRACT



Enforcement



Uncertainty phase



NEW FRAMEWORK

The field of lending theory structured into layers and modules

```
(* GAME DEFINITION - Individual liability *)
m:=;
(* NUMBER OF PLAYERS *)
n:=2;
(* ACTIONSET for each player *)
act1:= {
  { "RR", "R" },
  { "RR", "R" } };
act2:= { "RR", "R" };
act:=act1@act2;
(* PUNISHMENT FUNCTION, borrower to default, flow *)
punishmentFunction:=actionCombination->{
  playerKey, _ => {
    { "RR", "R" } => { 0, 0 };
    { "RR", "R" } => { 0, 0 };
    ... and here, did not kindly pay (for him *) };
  } };
(* REWARD FUNCTION, lender to borrower flow *)
rewardFunction:= { abilityCombination, actionCombination, playerKey,
  _ => 0 };
(* SANCTIONS FUNCTION, borrower to default, flow *)
sanctionFunction:= { abilityCombination, actionCombination, playerKey,
  _ => 0 };
(* ASSEMBLING PAYOFFLAYERS (start from repayment layer) *)
payoffLayers:= { abilityCombination, actionCombination, playerKey, _ => {
  playerKey, _ => {
    { "RR", "R" } => { 0, 0 };
    { "RR", "R" } => { 0, 0 };
    ... and here, did not kindly pay (for him *) };
  } };
  } };
(* ASSUMPTIONS *)
Assumptions:= {
  R> 0, (* sign gross interest *)
  M> R, (* intensity punishment *)
  interestAssumption:= {
    (* Use ambiguous assumptions like <= *)
  } };

```

NEW TOOL

A new Mathematica-Algorithm to solve and analyse repayment games

Adverse Selection & Joint Liability:
Risk-averse and low income borrowers squeezed out

Risk Shift Effect of Collateral:
Most general proof and possible consequences

Perverse Effect of Joint Liability:
Maximum repayment through adaptive punishment strategy




Mechanics of Social Sanctions:
New cleaner model, motivation & coordination effects, extension to groups of three and individual liability

Cross-Reporting Schemes:
New mechanism featuring zero equilibrium punishment

NEW RESULTS

Collateral risk shift. Adverse selection under J.L. Improved repayment games.

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