



Essays in Financial Economics: Speculation, Liquidity and Rationing

Hye-Jin Cho

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ATTESTATION DE REUSSITE AU DIPLOME

Le Président atteste que

le doctorat en Sciences Economiques

a été décerné à

Madame HYEJIN CHO

née le 5 octobre 1983 à PUSAN (COREE DU SUD)

au titre de l'année universitaire 2018/2019

Discipline : SCIENCES ECONOMIQUES
Titre des travaux : Essays in financial economics: Speculation, liquidity and rationing
Date de soutenance : 10 décembre 2018
Etablissement soutenance : UNIVERSITE PARIS 1 PANTHEON-SORBONNE
Jury : M. FRANCOIS GARDES, Président du jury, PROFESSEUR DES UNIVERSITES
UNIVERSITE PARIS 1 PANTHEON-SORBONNE
M. MARTIN KAAE JENSEN, Rapporteur du jury, PROFESSEUR DES UNIVERSITES
UNIVERSITY OF SURREY
M. EMMANUEL LÉPINETTE, Rapporteur du jury, MAITRE DE CONFERENCE
UNIVERSITE PARIS 9 - DAUPHINE
M. RAPHAEL DOUADY, CHARGE DE RECHERCHE CNRS
CNRS
M. ROGER GUESNERIE, PROFESSEUR EMERITE
COLLEGE DE FRANCE
M. STEFANO MARMI, PROFESSEUR DES UNIVERSITES
Scuola Normale Superiore di Pisa
M. PHILIP PROTTER, PROFESSEUR DES UNIVERSITES
COLUMBIA UNIVERSITY
M. JOSÉ ALEXANDRE SCHEINKMAN, PROFESSEUR DES UNIVERSITES
COLUMBIA UNIVERSITY
Ecole doctorale : Economie Panthéon-Sorbonne
Section CNU : 0500 - Sciences économiques

Fait à Paris le 10 décembre 2018



N° étudiant : 11128642

Pre-Report on Thesis by Doctoral Candidate Mrs Hye-Jin CHO

"Essais en économie financière sur la spéculation, la liquidité et le rationnement " (Short English title: «Essays in Financial Economics»)

25th of November 2018

This thesis spans wide and far, across a large number of different topics, areas and methodologies.

Chapter 1 deals with overconfidence and related bubbles to economic fundamental, and the efficient market hypothesis.

Chapter 2 to looks at regulation in an uncertain environment with credit constraints/rationing and relates this to risk preference.

Chapter 4 is split into three article-length and independent parts, each with a heavy empirical component; the first on systemic risk, the second on the regulation of small sized banks, and the third on quite a different topic, namely Piketty's ideas as expressed, e.g., in his *Capital* monograph.

Chapter 3 considers a Principal-Agent model where the Agent's cost can be high or low (best to think here of a firm and a worker). The principal chooses a contract (payment conditioned on final outcome or output) so as to maximize expected utility. So this is a screening model. The chapter explores relationships between the single-crossing property, Spence-Mirrless condition, and the characteristics of optimal contracts. Section 3.2.3. look as necessary conditions, the first-best, and Principal's "dilemma". 3.2.4. adds sufficiency and by way of both theoretical and graphical arguments, resting in part of

Pick's Theorem, provide characterizations. Section 3.3. goes into Myopic frameworks where renegotiation may be called for. I previously (in my Pre-Defense report) gave a number of suggestions for improvement of this chapter; mostly related to improving the clarity of the description of the model and its relationship with existing literature, as well as a more general recommendation, going a bit more into Pick's theorem and its potential role for this literature.

Considering previous feedback and suggestions, especially my own which centered on Chapter 3 at the Pre-Defense, definite progress has been made, and given my previous suggestions, also satisfactory progress. The structure of the Chapter is very much clearer, as is the model description, etc., etc. This shows maturity of the Candidate. I particularly like the idea of introducing Pick's theorem, this does hold promise. This is an important area of research with implications for a great number of real-world problems, and therefore of potential value for a great number of stake-holders. The general comments to follow next apply of course also to this chapter, in particular, there is a promise of very innovative directions for future work precisely marked out by the ideas presented.

All chapters display highly innovative ways of thinking about problems: truly this Thesis is an expression of new ideas and unconventional approaches. This is laudable and refreshing. And in all cases the topics are extremely interesting. This does make it difficult in some instances to pin-point the exact relationship with existing literature (and, in particular, the precise value added), although again definite progress has been made since the Pre-Defense. When very "out-of-the-box" ideas are put forth, in general, the more different from and the more unconventional the attack on any given problem; the less clear is the incremental value but the more promise there is of a "true break-through".

The Thesis is refreshingly daring in its originality, Mrs Cho does not allow herself to be hemmed in by the tight restrictions of any given "paradigm".

I hereby certify that the dissertation of Mrs Hye-Jin Cho (short title in English: «Essays in Financial Economics») is of a high quality and fulfills the academic standards. I therefore allow the PhD defense to take place by Monday, the 10th of Dec. 2018.



Martin Kaae Jensen, Professor of Economics, University of Surrey, United Kingdom

Rapport sur la thèse de Doctorat de Hye-Jin CHO

"Essais en économie financière sur la spéculation, la liquidité et le rationnement "

Ce mémoire de doctorat est composé d'un nombre significatif d'articles. Il est bien équilibré entre des travaux théoriques et des études empiriques, ce qui est intéressant.

La première partie est consacrée à l'étude de bulles spéculatives qui émergent de divergence de croyances entre deux groupes d'agents (principaux). C'est un sujet clairement intéressant et ambitieux en économie qui n'est pas simple en terme de modélisation. Ce travail mérite d'être développé encore avec plus de formalisme mathématique et en motivant plus clairement le choix des indicateurs (motiver par exemple ϕ dans (5)).

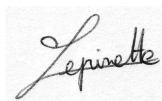
La seconde partie s'intéresse au crédit de rationnement. Il s'agit de l'étude d'un modèle de Holmstrom-Tirole (2013). Comme dans le premier travail, cette étude semble motivée par l'étude des crises financières. Ici l'excès (ou le déficit) de liquidité sont mis en relief avec l'octroi de crédit ou de manière équivalente la prise (ou non) de risque. C'est clairement un sujet d'actualité qui est difficile à traiter. Comme le premier travail, celui-ci est bien documenté. Il devrait être aussi développé en insistant peut-être plus sur la motivation initiale du projet afin de mieux comprendre et motiver le choix et l'usage des indicateurs retenus.

Le chapitre sur la théorie des contrats me parait très intéressante. Il faut cependant formuler plus clairement ce qui est nouveau par rapport à la littérature existante.

La partie empirique poursuit dans le même esprit l'étude de la liquidité, ce qui est essentiel pour la détection des crises financières potentielles. Ce travail est réalisé en s'appuyant sur des exemples concrets : secteur bancaire en Bosnie Herzégovine, la classe des banques de petites tailles (comment les réguler ?) Enfin, des indicateurs de la croissance économique sont étudiés/proposés puis implémentés à partir des données empiriques de la Banque mondiale. C'est clairement une partie très intéressante de la thèse.

En conclusion, ce travail est conséquent et s'attaque à des problèmes très difficiles. Il laisse augurer des nouveaux travaux importants dans le domaine. Je donne donc mon aval pour la soutenance.

Emmanuel Lépinette¹, le 14 Novembre 2018.

A handwritten signature in black ink, reading "Lépinette", written in a cursive style.

1. Ceremade, CNRS 7534, Université Paris-Dauphine, PSL University, Paris, France

Rapport sur la soutenance de la thèse de Madame Hye-Jin Cho : « Essais en économie financière sur la spéculation, la liquidité et le rationnement », Université Paris I Panthéon-Sorbonne, le 10 Décembre 2018 à 10 heures.

La candidate est invitée par le Président du jury à présenter ses travaux. Le document projeté est bien organisé, l'exposé, donné en anglais, fait la synthèse de chaque chapitre.

Emmanuel LEPINETTE, Professeur à l'Université Paris-Dauphine, présente le premier rapport. Un travail important a été fait. Les aspects mathématiques devraient être plus clairement développés. Dans le premier chapitre, en page 21, l'équation (1.5) devrait être mieux justifiée économiquement. Le calcul du paramètre φ de l'équation 1.6 devrait être également précisé. Que signifie dans le Lemme de la page 23 « agents believe » (comportement à définir précisément). La contribution du chapitre 3 devrait être précisée (en particulier par rapport au théorème de Picks).

La candidate précise ces points, en particulier son utilisation du théorème de Picks et la condition particulière qu'elle considère.

Martin Kae JENSEN, Professeur à l'Université du Surrey, donne le second rapport. Il note que des questions très différentes ont été abordées dans la thèse avec des références très diverses. La recommandation générale serait en conséquence d'orienter la présentation de chaque chapitre en fonction du journal auquel il serait proposé, et d'y ajouter une synthèse des méthodes et résultats. Une présentation plus précise devrait être faite : énoncé du théorème, des conditions de sa preuve... Il faudrait également indiquer quel type de situation dans le monde réel correspondrait aux conditions formelles étudiées afin qu'on en comprenne mieux l'intérêt. Chaque théorème utilisé devrait être précisément cité. Dans le chapitre quatrième, jugé intéressant, l'apport de Piketty pourrait être également précisé. Le choix des fonctions de production utilisées dans le dernier chapitre devrait être mieux discuté.

La candidate répond à ces diverses remarques.

Le Professeur José Alexandre SCHEINKMAN, de l'Université Columbia, a été empêché de participer à la soutenance.

Philip PROTTER, Professeur à l'Université Columbia, n'étant pas économiste mais statisticien, a eu du mal à évaluer les contributions précises de la candidate. En page 22, l'équation (1.6) semble inexacte sur le plan mathématique : il conviendrait de mieux expliquer les notations. Le paramètre φ dit être inférieur en valeur absolue à un, ce qui n'est pas discuté. Le statut des différentielles totales de l'équation (1.5) en page 21 n'est pas évident et devrait être clarifié. Les équations (2.1) et (2.2) qui sont invoqués ne sont pas clairement référencées. L'ensemble donc du développement a semblé assez confus et devrait bénéficier d'une relecture

par un spécialiste pour être clarifié. L'estimation de certains paramètres du modèle (λ) semble difficile et devrait être discutée.

La candidate remercie pour ces remarques et fait référence au modèle de Sheinkman pour expliquer ces équations. La signification économique des hypothèses de ce modèle n'est pas facile à donner.

Le Directeur de thèse note que la présentation de ce modèle devrait effectivement être précisée ainsi que les hypothèses alternatives faites sur les différentes contraintes de ce modèle. Il note également que les estimations des paramètres évoqués ont été discutées dans la littérature.

Le professeur *Stefano MARNI*, de l'Ecole Normale Supérieure de Pise, note que la thèse est difficile à comprendre pour lui sur le plan mathématique mais semble contenir des analyses intéressantes. Certains développements sont très difficiles à comprendre. Il faut en améliorer la présentation pour ne pas risquer d'être mal comprise lors de la soumission des articles. Les estimations du chapitre 4.1. doivent être mieux discutées : pourquoi la corrélation est-elle aussi élevée ?

Roger GUESNERIE, Professeur émérite au Collège de France, note qu'une grande variété de sujets a été abordé par la candidate. La formulation de ces divers modèles doit être mieux présentée. Le chapitre 1 traite des bulles sous l'hypothèse d'anticipations rationnelles, Une analyse en temps discret est plus usuelle et pourrait être préférée à la formulation en temps continu. Une clarification des apports au modèle de Sheinkman est également nécessaire, comme c'est aussi le cas, dans le chapitre 2 par rapport au modèle de Holmstrom-Tirole. Dans le chapitre 3, la connexion de ces travaux avec ceux présenté par Araujo-Moreira mérite d'être soigneusement analysée.

La candidate justifie l'analyse en temps continu par la plus grande facilité d'interprétation des hypothèses et conclusions.

François GARDES, Professeur à l'Université Paris I Panthéon Sorbonne, président du jury, discute les estimations du chapitre 4, trop sommaires pour pouvoir être interprétées comme des preuves empiriques. La spécification de ce modèle linéaire devrait également être discutée. Les différents chapitres doivent être ré-écrits en fonction des revues où ces travaux seront soumis.

Raphael DOUADY, Professeur à l'Université Paris I Panthéon Sorbonne, directeur de la thèse, note que la candidate a lu beaucoup de littérature et tenté de connecter tous ces apports, ce qui peut donner l'impression d'une thèse disparate. Sans doute certains chapitres auraient pu être omis pour que la thèse soit mieux concentrée sur les problèmes liés à l'instabilité des marchés.

Les explications fournies par la candidate dans ses résumés et conclusions des chapitres et à la suite des questions posées par le jury, sont parfois difficiles à comprendre. Ceci est certes du à la technicité de certains chapitres. Néanmoins, il est important que la nature des résultats obtenus soit exposée clairement ainsi que la contribution spécifique de la candidate aux diverses analyses. Le jury invite la candidate à améliorer sa capacité à synthétiser les méthodes et les résultats de ses travaux, et à modifier en conséquence son document de thèse en vue des publications.

Après en avoir délibéré, le jury décerne à la candidate le Doctorat en Sciences Economiques de l'Université Paris I Panthéon Sorbonne.

Le Conseil de l'Ecole Doctorale EPS (Economie Panthéon Sorbonne, ED 465) a décidé que les mentions « Honorable – Très honorable – Très Honorable avec les félicitations » ne seront plus attribuées au sein de l'Ecole doctorale pour les thèses soutenues à partir du 1^{er} septembre 2009.

M. JENSEN Marth
LÉPINETTE Lepinette
F. GARDES F. GARDES
Philip Protter P. PROTTER
S. PRABHU S. PRABHU
R. Guernier R. Guernier
R. Dourady R. Dourady



UNIVERSITÉ PARIS I PANTHÉON SORBONNE

ÉCOLE DOCTORALE ED-465

CENTRE D'ÉCONOMIE DE LA SORBONNE

THÈSE

Pour l'obtention du titre de Docteur en économie

Présentée et soutenue publiquement

le 10 décembre 2018 par

Hye-Jin CHO

**Essais en économie financière
sur la spéculation, la liquidité et le rationnement.**

Directeur de thèse: M. Raphael DOUADY, Chercheur CNRS, Université Paris 1

JURY :

Raphael DOUADY

François GARDES

Roger GUESNERIE

Martin Kaae JENSEN

Emmanuel LEPINETTE

Stefano MARMI

José Alexandre SCHEINKMAN

Philip PROTTER

Professeur, Université Paris 1

Professeur, Université Paris 1

Professeur, Collège de France

Professeur, University of Surrey

Professeur, Université de Paris-Dauphine

Professeur, Scuola Normale Superiore di Pisa

Professeur, Columbia University

Professeur, Columbia University

Directeur de thèse

Président

Examineur

Rapporteur

Rapporteur

Examineur

Examineur

Examineur



*Essays in Financial Economics:
Speculation, Liquidity and Rationing*

Hye-Jin Cho

JURY :

Raphael DOUADY	Professor, University of Paris 1	Thesis Supervisor
François GARDES	Professor, University of Paris 1	President
Roger GUESNERIE	Professor, College de France	Examiner
Martin Kaae JENSEN	Professor, University of Surrey	Reporter
Emmanuel LEPINETTE	Professor, University of Paris-Dauphine	Reporter
Stefano MARMI	Professor, Scuola Normale Superiore di Pisa	Examiner
José Alexandre SCHEINKMAN	Professor, Columbia University	Examiner
Philip PROTTER	Professor, Columbia University	Examiner

A thesis will be submitted to the Department of Economics of University of Paris 1
for the degree of Doctor of Economics, Paris, December 10, 2018.

L'Université Paris 1 – Panthéon Sorbonne n'entend donner aucune approbation, ni improbation aux opinions émises dans cette thèse ; elles doivent être considérées comme propres à leur auteur.

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Statement of Conjoint Work

I confirm that Chapter 2 is jointly co-authored with Raphael Douady, all authors contributed equally to the project and Chapter 4-(1) is jointly co-authored with Almir Alihodzic, all authors contributed equally to the project.

Beyond Everything.

Acknowledgement

I met my thesis supervisor, Raphael Douady, by recommendations of two CNRS researchers: Arnaud Renaud and Michel de Lara. When he suggested me for going to Bachelier conference in 2013, now, I am going to Bachelier conference every year. I would say he encouraged me for my PhD studies and I felt pure joy during my PhD studies with him. Thank you, Raphael.

I met the most brilliant person in my life during my PhD studies. Before I met Roger Guesnerie, it made me very excited and expected. The moment with him was sharply cutted in a sensible way. My sense inspired by him was ready to think again for getting an elaborated framework. His comments are durable that it made me think for a day, a month and for a longer period.

I met a very elegant person in my university. Still, I can't believe that I am teaching Economics in French. Of course, french students are good at writing and well prepared for courses. However, if I don't have a help from François Gardes, I couldn't do it. I appreciate with his consistent help for teaching in Microeconomics and organizing the committee as a president. I was very happy for learning his passion and love for his students and I am proud of being one student of them in his warm and intelligent circle. I felt like meeting a person from another space whenever I met Martin Kaae Jensen. It's so so so special. I admire his writing skill structuring technical arguments with detailed economic interpretations. Most of all, I appreciate with his comments on the part which I mostly enjoyed during my PhD studies.

At the last stage right before the defense, most valuable comments are from Emmanuel Lepinette. I puzzle on how I can convince scholars in math finance and Economics at the same time. His comments on line by line and in the overall settings offered me the key. Every invitation by his hosting in Bachelier conferences was the precious experience for me and I thank to Emmanuel for his support.

It was very honorable to be invited by Stefano Marmi in Scuola Normale Superiore di Pisa during my PhD Studies. I looked at the same sky like the one of Galileo Galilei in Pisa and crossed the bridge. In Pisa, the math, science and art go together toward illumination of intelligence.

I got most inspiration for my dissertation from models of José Alexandre Scheinkman. His participation in the jury is much meaningful for me. I do expect my ideas are too much far from his original one. I look forward to attaching my ideas in my favorite models and also, I expect to improve the quality of my research. Thank you.

I appreciate with the participation of Philip Protter. During my PhD studies, his papers and the compilation book with scholars in Paris inspired me in the part of speculation. Thank you, Philip Protter, for your positive reply for the jury of my defense and I will do my best.

I would like to thank to host professors in three mobility. Firstly, in Kobe, I was delightly welcomed by Professor Takashi Kamihigashi with Professor Kenji Sato and Professor John Quah. It was beautiful. Secondly, in Washington.D.C., I could spend the nice time with more than 50 interns and it was such a pleasure to meet competent economist: Dr.Salmon Ferhan, Dr.Appendino, Maximiliano Andres, Dr. Martin, Edouard, Dr. Cerisola, Martin D and Samiei Houssein. Thirdly, in Pisa, with Stefano Marmi, I met his two angelic students - Maddalena Ghio and Matteo Ottaviani. Also, I enjoyed the extra activities with my pingpong club members: Neeraj Mishra, Omer Arif, Ajesh Jacob, Akash Deep Biswas, Renata Cerna, Andreas Minne, Maria Paola, Rashmish Mishra, Vincenzo Verdi, Isha Verma, Abhishek Kumar Lilit Popoyan.

Since I did the master program and the PhD program in the same university, I met good professors and students. I thank to Bich Philippe, Alain Chateaufneuf and Hippolyte d'Albis for the warm decision at my important moment. Mostly thanks to Mouez Fodha of the doctoral school with Loic Sorel, Jean Christophe Fouillé and Natalie Louni for precious supports. Especially, Bertrand Wignolle gave me the heartfelt advice. I was very happy with Joel's family. When I started the PhD, their Ivoire was born. When I was late to finish my work in front of the blackboard, Joel was the most kind person for permitting me enough time for me. It was nice to participate the seminar of Emily Tanimura. I had the nice time with Carmen Camacho, Agustin Pérez-Barahona. Cuong Le Van. I learned mostly from two assistant professors. One of two was Thai Ha Huy for his durability of researches and Jean Francois Caulier - my student said "he is perfect", François said "perfect" of his work and he is perfect for me as well. I enjoyed the course of David Martimort mostly with his humour and his passion. I appreciate with Dominique Guegan, Rania Kaffel, Philippe de Peretti, Christophe Chorro, Marc-Arthur Diaye and Xiangyu Qu. Thanks to François-Gilles Le Theule, Christophe Moussa, Pierre-Charles Pradier, Fahmi Ben Abdelkader and Emmanuel Poulle representing Labex réfi and to Yuri Kabanov, Emmanuel Lepinette, Juan Pablo Ortega and Albert Shiryayev for all valuable memories and inspiration in the Bachelier Colloquium (2014-2018).

I had nice and intelligent fellows in my office. Especially, Lorenzo Bastinello was kind and very popular, Florent Mc Isaac was the youngest and clever one, Viet Cuong with lemon was funny, Paulo Casaca carried Amazon airs and beers to Paris, Stephane Gonzalez had lots of screens. That was the best for a fun to share an office with warm ambiance. I miss the time when we celebrated the birthday together with Lalaina rakotonindrainy, Nikolaos Pnevmatikos, Andreas Karpf, Thais Nunez, Sang Pham, Okay Gunes, Federica

Ceron, Sebastian Cea, Xavier Venel, Cynda Ounaies, Salah Ould Youne, Anil Alpman, Amir Sani, Mustapha Ridaoui, Wael Saker, Emanuele Franceschi, Simon Schopohl and Antonis Staras.

I made the energy for my research by Matteo Iacopini. When I opened the drawer, there were the same ten chocolate tablettes. It was highly selected by Matteo. When my smile faded out as time goes by the end of my PhD studies, my kind neighbor Jean-Christophe Vergnaud and Alessandro Ravina were a good listener. Wish happiness to Kehan Lee and Xiaoying Huang and the plus one. Special thank to Antoine Kornprobst, Clément Goulet, Fatma Rostom. Wish the best dissertation to Alexis Poindron, Maxime Nicolas, Guilherme Pelegrina, Nhung Luu and two Moussa. Bises to Max Lobeck, Daniel Bastidas, Thomas Delcey, Yara Zeineddine, Hélène Benistand, Evgenii Monastyrenko, Anna Petronevich and Bin Wang of Doctorissimes team. Specially thanks again to Bin Wang for a great help right before the pre-defense. Bestly to my wise Korean friend Sang-won Lee. Bises to my old friends, Lenka Wildnerova, Peter Martey Addo, Moutaz Alta, Thu hien Tao, Natalia Gonzalez, Makruhi Sinanyan, Mikel Evans, Sonechka Bu, Hernan Aldrete, Pierre-Alexandre Modart, Elisa Rizzo. Especially, I thank to Alta for showing the sincere effort of many many things from the beginning of my stay in Paris. To my husband, Jean-Pierre Dugeon and my family in my Korea.

The Outline of Thesis

Plan de la thèse

- Cette thèse comporte six articles en anglais.
- Trois chapitres consistent en chaque article théorique et le quatrième chapitre est composé de trois articles empiriques
- La chapitre introductive, écrit en français, met au courant du lecteur avec l'approche, la littérature et les résultats principaux de chaque chapitre.
- Voici le résumé de chaque chapitre et la table des matières suivra.

The outline of thesis

- This thesis contains six articles in English.
- Three chapters consist of each theoretical article and the fourth chapter is composed of three empirical articles.
- The introductory chapter, written in French, acquaints the reader with the approach, literature and main results of each chapter.

In what follows, I begin with the abstract of each chapter and the table of contents.

Abstract

Chapter 1 On Overconfidence, Bubbles and the Stochastic Discount Factor:

The article proposes a model of speculative bubbles with the disagreement between two heterogeneous groups of traders who react to higher expected returns. The example focuses on overpricing of stocks in the bullish market. Attention is directed to how the short-sale constraint is kept until the maturity but smoothed for two groups who hold non-negative payoff portfolios. The smooth condition of short-sale implies that traders perceive the intertemporal composition of risk. Notably, depending on signals how two heterogeneous groups balance conflicting signals they face, intertemporally, the price spiral wavers dynamics of stochastic economies. The result suggests the motivation of risk-adjusting behaviors as overconfidence. The first-best response with overconfidence is related to figure out economic fundamentals. The model in the continuous time goes to smaller lengths as possible to establish the efficient market hypothesis with stochastic discount factors.

JEL classification: D01; D52; D62; D84

pricing kernel, speculation, stochastic discount factor, belief contraction and overconfidence.

Chapter 2 Risk Preference in Reserve Choice and Liquidity Control: In examining prudence of collateral, the argument is how a regulator figures out whether commercial banks want to hold excess liquidity for the precautionary aim or expect to cross the redline before debt overhang. Risky behavior in the fixed-investment scale is representable as inside liquidity in the market. This paper introduces a credit rationing model in uncertainty where the argument of demand deposit and required reserves comes from. As such, the proposed simulation in two villages exemplifies the combination of credit, liquidity, and regulation.

JEL classification: D81; F34; G11; G18

credit rationing, inside liquidity, collateral, liquidity shocks, excess liquidity, risk preference.

Chapter 3 The Order-theoretic Single Crossing Property in a

One-Dimensional Screening Model: We consider a finite one-dimensional screening of choices in monotone comparative statics (MCS). Before revealing the true state of the world, a principal sorts on actions of the agent to cause the social value of production as an informed principal. The model produces a rich order-theoretic single-crossing property according to Pick's theorem pursuing no distortion at the top.

JEL classification: C61; D81; D86

informed principal, principal's dilemma, screening, single-crossing property.

Chapter 4-1 Analysis of Systemic Liquidity Risk for the Banking Sector in

Bosnia Herzegovina (BH): The purpose of this paper is to relate the Danish concept of "balance principle" to test hypotheses of systemic liquidity risk in the banking sector. In the paper, the major econometric method is to gauge the general applicability of theories of liquidity and to test applicable validity of Bosnia Herzegovina(BH). A prime example for this study is taken from the first quarter to the second quarter of 2014. Our intention here is to consider the identification of macroeconomic parameters that positively affect the growth of the banking sector. The parameter liquidity, e.g. liquid assets/total assets, will be observed as a dependent variable, and nonperforming loans/total loans, average profitability on equity capital, noninterest expenses/total revenue, the average required reserve, total loans, the money supply in the wider sense, net capital/risk-weighted assets, and net performing assets/total assets will be used as independent variables. The purpose of the paper is to determine whether there is interdependence in the movement between the independent and dependent variables through a multiple linear regression.

JEL classification: G01; G20; G21

systemic liquidity risk, Danish balance principle, ANOVA test, macroeconomic parameters.

Chapter 4-2 Regulating Small Banks: The motivation of this article is to induce the bank-capital-management solution for small banks categorized in commercial banks and regulation bodies. The goal of the article is intended to mitigate the risk of a banking area and also provide the right incentive for small banks in the macroeconomic framework.

JEL classification: C62; C63; D01; G10; G21

demand deposit, on-balance-sheet risks and off-balance-sheet risks, portfolio composition, minimum equity capital regulation.

Chapter 4-3 A Survey about Piketty's Inequality and the trade condition:

This article presents a methodology designed to facilitate alternative variables measuring economic growth. A capital-labor split of the Cobb-Douglas function is adapted for use in the context of economic growth. A capital/income ratio and two fundamental laws of capitalism originated by Thomas Piketty illustrate capital inequality undervalued with respect to labor inequality. In addition, the article includes export and external debt as strong alternatives. Empirical data of the World Bank are analyzed to demonstrate broad differences in economic sizes. The case analysis on Latin America as an example of a different-sized economy is also discussed.

JEL classification: E01; E22; G00; G01; H63

capital-labor split, factors of production, capital/income ratio, Thomas Piketty, capitalism, economic size, debt sustainability, Latin America, import substitution industrialization (ISI) model, insolvent external debt, openness, external-debt-to-exports ratio.

Contents

Table of contents	5
Table of figures	6
Chapter 0 : Résumé	9
0.0.1 Chapitre 1: Excès de confiance, Bulles et coefficient d'actualisation stochastique	10
0.0.1.1 Approche et littérature	10
0.0.1.2 Principaux Résultats	12
0.0.2 Chapitre 2: Maintenir des réserves pour répondre aux besoins de liquidités	12
0.0.2.1 Approche et littérature	13
0.0.2.2 Principaux Résultats	13
0.0.3 Chapitre 3	14
0.0.4 Chapitre 4	14
0.0.4.1 Chapitre 4-1 L'analyse du Risque de la Liquidité Systémique pour le Secteur Bancaire en Bosnie Herzégovine (BH):	14
0.0.4.2 Chapitre 4-2 Règlement de Petites Banques:	14
0.0.4.3 Chapitre 4-3 La Taille Économique et La Viabilité de la dette contre "L'inégalité des détentions de Capitale à la Piketty":	15
Chapter 1 : On Overconfidence, Bubbles and the Stochastic Discount Factor	16
1.1 Introduction	17
1.1.1 Risk, Shortsales and Two Players	17
1.1.2 Axiomatic Foundations of Speculative Bubbles	18
1.2 The Intertemporal Composition of Risk	18
1.2.1 A Market-related Variation in the Short-run	18
1.2.2 Representing Prices	19
1.2.3 The Displacement with Two Groups' Signals	20
1.2.4 Responses with Overconfidence	21
1.3 The Specification of Bubble Formations	22
1.3.1 The First-Best Response with Overconfidence	23
1.3.2 Two Ways that Speculative Bubbles Burst	24
1.3.3 The Stochastic Discount Factor	25
1.4 Overpricing and Mathematical Inductions	26
1.5 The Scheinkman-Xiong Model	27
1.5.1 The Unique Equilibrium Allocation	28
1.6 Sorting by the Iterated Belief Contraction	30
1.7 Conclusion and Further Discussions	31
1.8 Appendix	35
Chapter 2 : Risk Preference in Reserve Choice and Liquidity Control	40
2.1 Introduction	41

2.2	Excess Liquidity and Global Imbalance	41
2.3	Loan for Investment and an Interest Ceiling	42
2.4	A Model	43
2.4.1	Overnight Loan Investment	47
2.4.2	Compound Concern in Credit Rationing	49
2.4.3	When Beliefs are Formed Enough to Effect on Decision Procedures	51
2.5	Incomplete Structural Representation in Two Villages	52
2.5.1	Selected Liquid Characteristics of Village I and Village II	52
2.5.2	Composition of Liquidity	53
2.5.3	Reserve Choice and Liquidity Control	55
2.5.4	Utility Function in Incomplete Structural Representation	56
2.5.5	Risk Preference in Triangle	58
2.6	Conclusion	59
2.7	Annex	60
2.7.1	A Case Example: Lebanon	60
2.7.2	Jordan and Lebanon in the Middle East and North Africa region (MENA)	61

Chapter 3 : The Order-theoretic Single Crossing Property in a One-Dimensional Screening Model 65

3.1	Introduction	67
3.1.1	Without the Spence Mirrlees Condition	68
3.2	FRAMEWORK	69
3.2.1	The informed principal	69
3.2.2	Monotone comparative statics (MCS)	70
3.2.3	Necessity	70
3.2.3.1	The First-Best Contract and a Principal's Dilemma	70
3.2.3.2	A Principal's Dilemma	71
3.2.4	Sufficiency	73
3.2.4.1	The Sorting Condition	73
3.2.4.2	Pick's Theorem	74
3.3	Re-negotiation for Myopic Decision-Making	76
3.4	Conclusion	80

Chapter 4 : Analysis of Systemic Liquidity Risk and two additional applied works 83

4.1	4.(1) Analysis of Systemic Liquidity Risk for the Banking Sector in Bosnia Herzegovina (BH)	84
4.2	Introduction	84
4.3	Systemic Liquidity Risk as to the Balance Principle	84
4.4	Literature Review	85
4.5	Methodology and the multiple regression model	86
4.6	The Macroprudential Stress Test Beyond The Institutional Environment – Bosnia and Herzegovina (BH)	88
4.6.1	The Result	96
4.7	Conclusion	99
4.8	4.(2) Regulating Small Banks	105

4.9	Introduction	105
4.10	The Macprudential Approach to Financial Regulation Covering on-Balance-Sheet and Off-Balance-Sheet (OBS)	105
4.11	A Model	108
4.11.1	Saving Preference of Consumers	108
4.11.1.1	Selected object	108
4.11.1.2	The objective function	108
4.11.1.3	Constraints	109
4.11.2	Arguments	109
4.11.3	Deposits of Households	110
4.11.4	The Composition of Borrowings for Firms	115
4.11.4.1	Demand Deposit of Bank	118
4.11.5	Federal Reserve Banks and General Equilibrium(GE)	120
4.11.6	General Equilibrium(GE)	120
4.12	Effects of Equity Capital Regulation	121
4.12.1	An additional explanation about the borrowing composition of firms – The portfolio composition effected by the minimum equity capital regulatoin.	121
4.12.2	Previous Deposits Affects Optimized Equity Capital	123
4.12.3	K Index for the Indicator of Risk Taking	125
4.13	Conclusion	126
4.14	4.(3) A Survey about Piketty’s Inequality and the trade condition	131
4.15	Dynamics of the Capital/Income Ratio of Thomas Piketty: $r > g$	132
4.15.1	The First Fundamental Law of Capitalism $\alpha = r \times \beta$	133
4.15.2	The Second Fundamental Law of Capitalism: $\beta = \frac{s}{g}$	134
4.16	Economic Size and Debt Sustainability	135
4.16.1	Export and Debt Sustainability	135
4.17	Debt Management of Latin America	136
4.17.1	Debt-Driven Capital	136
4.17.2	Failure of Debt-Driven Capital	136
4.17.3	Why capital can not be simply explained within gross domestic production (GDP) (Attention to Import substitution industrialization (ISI)	136
4.17.4	More to the immediate point why the GDP is not just the GDP to consider the capital inequality: an example of Export-oriented industrialization (EOI)	137
4.17.5	Insolvent External Debt of Latin America	137
4.17.6	Openness and External Debt to Exports Ratio	138
4.17.7	Risk Management in Major Latin America Countries: (Mexico, Argentina, Brazil, Chile)	138
4.18	Conclusion	140

List of Tables

2.1	A demand deposit (DD) Index and a required reserve (RR) Index	47
2.2	Selected Liquid Characteristics in Village I and Village II.	53
2.3	The Precautionary Level in Liquidity Composition.	54
2.4	The liquidity composition in the Village II and Village I	56
4.1	The empirical balance when the capital of a household economy is concerned.	114
4.2	Effects of increasing the equity at the portfolio composition.	122
4.3	Mean at the portfolio composition.	122
4.4	The risky portfolio composition.	123
4.5	Standard Deviation at the portfolio composition.	123
4.6	Optimized equity capital.	124

List of Figures

2.1	Pledgeable Demand Deposit (DD) and a Positive Wedge $Z_1 - Z_0$ (rent) . .	45
2.2	Excess Demand Deposits (DD) and a Negative Wedge $Z_1 - Z_0$ (rent) . . .	48
2.3	Comparative statics in investment (Negative credit rationing (Left) and positive credit rationing (Right)	50
2.4	A Point-wise risk behavior in incomplete structural triangle	59
2.5	A Component-wise risk behavior in incomplete structural triangle	59
4.1	The Danish Balance Principal Mortgage Model	86
4.2	The Financial Analysis: Solvency vs. Liquidity Ratios	89
4.3	The Regulatory Capital of 13 Eastern European Countries for 2006-2013 .	90
4.4	The tendency of Net Profits and Losses (NPLs) of Eastern European Countries on December 31, 2012	90
4.5	The Value of Assets of Financial Intermediaries in Bosnia Herzegovina (BH) for 2011 - 2013	91
4.6	Performance indicators of the Banking Sector in Bosnia and Herzegovina (BH) for the Quarter 4 of 2013 - Quarter 2 of 2014	92
4.7	The Movement of the capital adequacy ratio and non-performing loans of the banking sector of BH for the period: Q4 2013-Q2 2014	92
4.8	An Analysis of Movement of Macroeconomic Variables for the period: 2007- 2013	93
4.9	Testing the rise in non-performing loans to total loans through the stress test scenarios for the period: 2014 - 2015	95
4.10	Descriptive statistics of the observed banking performance from the Quarter 1 in 2004 to Quarter 2 in 2014	96
4.11	A Regression analysis in Bosnia Herzegovina (BH) for the period: Q1 2004. - Q2 2014	97
4.12	An Analysis of variance in Bosnia Herzegovina (BH) for the period: Q1 2004. - Q2 2014	97
4.13	The matrix of correlation coefficients in Bosnia Herzegovina (BH) for the period: Q1 2004. - Q2 2014	97
4.14	A Regression analysis coefficients in Bosnia Herzegovina (BH) for the period: Q1 2004. - Q2 2014	99
4.15	Assets, Liabilities and equity capital of U.S. commercial banks, Vanhooose (2008)	107
4.16	The balance in Freixas-Rochet (1999)	107
4.17	The Equilibrium in Freixas-Rochet (1999)	121
4.18	Methodology about Factors of Production	132
4.19	Private Capital in Rich Countries, 1970-2010	134
4.20	The External Debt for Latin America	138
4.21	The External Debt to Exports Ratio	139

Chapter 0 :

Résumé

Les essais de cette thèse traitent de problèmes liés aux signaux de spéculation entre deux groupes d'opérateurs, de la liquidité systémique, de l'investissement et du rationnement du crédit. Ils sont divisés en trois, à savoir une étude d'économie financière de la dynamique de ces signaux, puis une étude qui introduit un système de signaux dans un cadre principal-agent, et enfin une étude dynamique précise. En cas de désaccords entre les différents groupes et d'incertitude dans la décision des agents, l'ajustement du risque n'est pas vers des décisions optimales des agents et il en résulte des formes diverses de décisions pour la banque et pour l'investissement. Dans des situations économiques et financières, l'estimation des décideurs, en principe, donnera les moyens de prévenir les crises économiques et contribuera à équilibrer l'économie. Plus particulièrement, les trois situations suivantes seront détaillées: la motivation de l'excès de confiance dans l'investissement, la statique comparative de l'investissement et le crédit des dettes. L'on en déduit les caractéristiques du rationnement à l'équilibre ainsi que certaines implications microéconomiques.

Ce volume comporte quatre chapitres principaux reprenant six articles de recherche développés au cours de cette thèse, complétés par deux chapitres d'introduction et de conclusion. La thématique générale abordée avec ces projets s'articule autour de problématiques théoriques d'économie financière. Toutefois, quatre champs distincts sont successivement étudiés, en cohérence avec l'évolution de mes recherches et de mes centres d'intérêt tout au long de ce cheminement. Le premier article est une contribution à la théorie de la spéculation; le second, coécrit avec Raphael Douady, aborde des questions relatives au rationnement du crédit; le troisième propose une condition de sélection en statique comparative de l'investissement et en théorie des mécanismes d'incitation; enfin, le dernier propose une vue empirique appliquée aux questions de la liquidité systémique, du système de banque et aux Inégalités de détentions de capitale à la Piketty. Les quatre chapitres vont être présentés successivement dans les sections suivantes; sera également détaillée l'articulation entre ces chapitres.

0.0.1 Chapitre 1: Excès de confiance, Bulles et coefficient d'actualisation stochastique

La première approche, qui constitue le premier chapitre de cette thèse, est une contribution à la littérature sur la spéculation. Il a été approuvé par l'IJFS (International Journal of Financial Studies) en 2018. La question principale au cœur de cet article est celle de la possibilité de bulles spéculatives pour des agents rationnels. En fonction du niveau de chaque croyance, la valeur fondamentale des prix des actions sera signalée différemment par le marché.

0.0.1.1 Approche et littérature

La théorie de la spéculation est un champ de la littérature économique et financière traitant des lois de probabilité des fluctuations des prix des valeurs fondamentales que le marché admet à cet instant. M.L. Bachelier (1900) définit la limitation des analyses de la spéculation comme suit:

“La détermination de ces mouvements se subordonne à un nombre infini de facteurs: il est

dès lors impossible d'en espérer la prévision mathématique. Les opinions contradictoires relatives à ces variations se partagent si bien qu'au même instant les acheteurs croient à la hausse et les vendeurs à la baisse."

La tendance de ce champ de recherche est passée des approches quantitatives à des approches qualitatives. Une des grandes conjectures en théorie de la spéculation se rapporte à la corrélation entre la possibilité de bulles et la valeur fondamentale des actifs en fonction du niveau des prix. Cela signifie quantitativement qu'un résultat sera considéré comme une réussite en fonction du nombre de cas des bulles que nous pouvons mettre en évidence dans le système du prix. A titre d'exemple, Cagan (1956) observait sept hyper-inflations.

En revanche, un modèle de court terme, tel que celui de Scheinkman-Xiong (2003) est davantage concentré sur une seule bulle, telle que celle de 3Com à la fin des années 1990. Le modèle de Scheinkman-Xiong (2003) formule des principes de base dans le cadre de dividendes cumulatifs en temps continu qui représentent le volume des échanges dans un environnement avec excès de confiance. Le champ des applications est beaucoup plus restreint que lorsque ces problématiques de bulles résultent de facteurs psychologiques. Par conséquent, et sur le plan pratique, diverses interprétations sont possibles, que ce soit sur le plan économique ou sur le plan financier. Les techniques du calcul des probabilités pourront alors s'appliquer aux mouvements de la dynamique de la Bourse de la même façon qu'une science exacte traditionnelle.

Dans le détail, cette approche repose sur une méthode stochastique qui est développée dans ce chapitre et qui étudie un marché financier où les signaux sont émis par deux groupes distincts. Une étude dynamique précise des signaux spéculatifs des deux groupes est menée à bien. Même si certains des agents savent que leur prédiction diffère de celle d'autres, les contraintes imposées sur leurs comportements les amène "à accepter de n'être pas d'accord" (Carlin-Longstaff-Matoba (2014)).

La composition inter-temporelle du risque est limitée par les contraintes sur des comportements: bien que les agents aient assez des motivations pour se comporter différemment, les actions des agents sont déterminées par la variation des fondamentaux du marché à la suite de réactions des agents à des événements différents. L'apparence de ces réactions ressemble étroitement à la spéculation.

La vente à découvert contraint a été fondée sur le débat introduit par Meunier (1977). Le désaccord peut porter sur des baisses à la suite des retours attendus limités aux contraintes de vente à découvert (Chen-Hong-Stein '02, Diether-Malloy-Scherbina '02). Si ce n'est pas le cas, cela peut être vice versa (Boehme-Danielsen-Kumar-Sorescu '09 et Avramov-Chordia-Jostova-Philipov '09).

Une idée intéressante a été émise à la suite de Hansen-Jagannathan '97 et Hansen-Scheinkman '09: les fractions lisses de la contrainte de vente à découvert. Dans le détail et pour un horizon éloigné, la contrainte de vente à découvert est maintenue à la fin de la maturité à long terme mais elle permet des changements dans la composition du portefeuille. Ceci implique que des récompenses non-négatives soient conservées mais que les échanges des intermédiaires soient autorisés tout comme la récompense des portefeuilles positifs.

La question abordée par ce chapitre est celle du point où la bulle spéculative finira bien par éclater dans le cadre d'un modèle stochastique en temps continu et en fonction des déplacements des signaux entre les deux groupes.

0.0.1.2 Principaux Résultats

Le modèle montre que l'excès de confiance peut être interprétée comme un indicateur avancé de prévision sur l'émergence de bulles. C'est le cas parce que l'excès de confiance paramètre la stabilité dynamique des deux groupes d'opérateurs sur le marché. La forme la plus faible de ce résultat s'énonce comme la condition de non-arbitrage (NA) autorisant les échanges d'intermédiaires sur le marché. Cela continue d'être le cas si et seulement si l'antécédents des opérateurs diffèrent entre eux. L'excès de confiance produit des désaccords entre les deux groupes. L'accumulation de croyances arrive alors avant le point où commence l'échange. La maximisation d'une utilité subjective après le point d'échange unique prendra la forme d'une unique allocation d'équilibre.

L'argument de base est semblable au travail de Scheinkman-Xiong (2003) selon lequel des croyances hétérogènes produisent un commerce entre deux groupes dans un cadre de temps continu. Après le point d'échange, le modèle a un équilibre unique où la sous-évaluation peut se comprendre comme l'analogie de l'intervalle d'explosion de la bulle spéculative dans le cadre de temps discret. Par conséquent, l'intervalle d'excès de confiance dans le modèle résume les conditions de l'explosion de la bulle spéculative. L'excès de confiance peut s'entendre sur le plan mathématique comme une certaine longueur qui va permettre d'établir une prévision fiable et rigoureuse sur l'apparition des bulles.

Notre caractérisation de l'excès de confiance a été motivée par la perspective quantifier la connexion entre le comportement à court terme et à long terme de deux groupes hétérogènes impliqués dans le même échange. Nous avons étudié l'estimation et l'évaluation des bulles spéculatives. Lorsqu'il s'agit du retour à la valeur moyenne dans l'estimation, la solution stationnaire du mouvement Brownien a mis l'accent sur des comportements continus. D'autre part, les espérances réitérées dans l'intervalle spécifique entre l'opérateur de retour à la moyenne et l'opérateur markovien d'excès de confiance restent sous contrôle.

Ici, dans cet article et entre les deux groupes hétérogènes, le pouvoir dans l'échange est accordé au groupe optimisme ou présomptueux. Le coefficient d'actualisation stochastique donne les informations sur les marches aléatoires selon la tendance des prix fondamentaux et en fonction des valeurs des limites supremums attendues. Les coefficients d'actualisation stochastique connectent la somme d'espérance et l'opérateur décomposant le prix par des loteries par la multiplication. La multiplication des coefficients d'actualisation stochastique et le retour à la moyenne par des opérateurs tarifaires peut être discutée. D'une part, l'espérance conditionnelle d'une estimation fonctionnel augmenté à un pouvoir négatif de développer un grand écart aux plus grands horizons. D'autre part, le taux attendu de longue durée de retours tire la croissance des opérateurs.

0.0.2 Chapitre 2: Maintenir des réserves pour répondre aux besoins de liquidités

Le second chapitre adopte une vue plus large avec le concept du rationnement du crédit. Ce chapitre, qui reprend et étend un document de travail supporté par Ferhan Salman, Maximiliano Andres Appendino, Edouard Martin, Martin D. Cerisola et Hossein S. Samiei lors de mon invitation au FMI (Fonds Monétaire International) en 2016, est devenu un travail joint avec Raphael Douady en 2018. Il cherche à étudier l'échelle fixe de l'investissement et considère la dynamique de réserves et dépôts à vue au sens des excès

de liquidité.

0.0.2.1 Approche et littérature

Le rationnement du crédit s'entend comme le rationnement des excès de liquidité par la préférence pour le risque et selon l'investissement liquide. Cette étude s'adresse à deux questions de recherche: Premièrement, la question est comment on peut ré-identifier en 2016 d'excès de réserves dans la liquidité qui sont apparues après la crise bancaire du début des années 1930 ou encore en 1970. Deuxièmement, il est nécessaire d'offrir une nouvelle technique pour mesurer la préférence pour le risque afin de tester les données croisées entre l'économie et la finance et en appliquant des théories de l'incertitude.

Le but d'un régulateur devient manifeste lorsque la présence de certaines liquidités fait le rationnement du crédit marcher. Il va sans dire qu'un équilibre Nash émerge lorsque (1) aucun rationnement du crédit (l'investissement d'optimum est de premier rang) ne survient ou l'investissement est bas (le cas du premier rang pour tout le monde) (Piketty, 1997), (2) le crédit est rationné (aucun prêt) ou lorsqu'il n'y a pas d'incitations à des prêts excessifs (Stiglitz-Weiss, 1981). Selon toutes apparences, les différents types de rationnement du crédit (le crédit rationné ou le financement suffisant) sont mélangés par le niveau de financement propre au marché. Le niveau approprié du mélange dans les différents types du rationnement du crédit fournira une image du cycle économique dans les imperfections du marché du crédit.

Le modèle est principalement basé sur celui de Holmstrom-Tirole (2013). Par rapport à des joueurs de type entrepreneur chez Holmstrom-Tirole (2013), l'on considère un agent neutre au risque avec une opportunité d'investissement qui lui semble valoir la peine. Les deux conditions nécessaires à un rationnement du crédit (Holmstrom-Tirole, 2013) sont les suivantes:

La première dimension est la valeur présente nette du projet. Une autre dimension est le loyer net dont profitera l'agent après le placement de toute sa valeur nette dans le projet. Tous les projets ayant une valeur présente nette positive seront retenus. Un agent pauvrement doté en capital-pauvre aura toujours des projets avec une valeur présente nette positive qu'il devra rejeter parce que la société dans son ensemble n'a pas assez de la capitale. Les deux motivations d'investissement et de réserves obligatoires se rattachent toutes deux et de façon très nette à la dynamique de la statique comparative. La recherche sur la statique comparative de l'investissement en est cependant toujours à un stade extrêmement préliminaire, comme en atteste le caractère succinct de la littérature sur ce sujet. Elle ira en s'amplifiant en s'intéressant à deux sujets: (1) le montant de l'investissement qui est assuré et (2) la paramétrisation.

0.0.2.2 Principaux Résultats

D'une part, l'excès de liquidité est simplement déduit des réserves obligatoires dans des banques. À propos, si la croissance du rationnement du crédit au niveau de précaution supporte l'écart de réserves obligatoires et de dépôts à vue susceptibles de gage, $RR-DD > 0$.

L'augmentation du fonds de crédit en vue d'investissement est dans l'échelle remplaçante fixe, Réserve (Réserve (R) - des Dépôts à vue (Demand Deposit)). Le plus évident est que la préférence en matière du risque dans le triangle distingue entre le comportement

risqué affectueux à l'intérieur d'un triangle et un comportement de l'aversion au risque à l'origine dans un espace bidimensionnel de la probabilité composée.

Ces résultats de statiques comparatifs dans l'investissement donnent une image claire des critères réglementaires exigés. Particulièrement, Le règlement dur en augmentation du niveau de précaution est impossible à contester avec chaque ensemble de niveau croissant au-dessus de niveau exigé. Par conséquent, le but d'un règlement doux est de vérifier la dynamique de statique comparative pour suffisamment suivre la tendance de ligne directrice, pas une limitation de ligne directrice spécifique d'une quantité. Ce résultat technique indique plusieurs demandes prometteuses pour des questions réglementaires.

0.0.3 Chapitre 3

Nous considérons une sélection unidimensionnel fini de choix dans la statique de comparatif de monotone (MCS). Avant la révélation du vrai état du monde, un principal ne trie sur les actions de l'agent pour causer la valeur sociale de production dans le problème du principal informé. Le modèle produit une propriété seul croissant théorique d'ordre riche selon le théorème de Picks ne poursuivant aucune altération en haut.

0.0.4 Chapitre 4

Le point de vue du quatrième chapitre est composé par trois articles de littérature économique appliqué.

0.0.4.1 Chapitre 4-1 L'analyse du Risque de la Liquidité Systémique pour le Secteur Bancaire en Bosnie Herzégovine (BH):

Le propos de cet article est de relier le concept danois de "principe de l'équilibre" pour tester les hypothèses du risque de la liquidité systémique dans le secteur bancaire. Dans le papier, la méthode économétrique principale doit mesurer l'applicabilité générale des théories de la liquidité et tester la validité de la Bosnie Herzégovine (BH) sur le plan d'une application. L'exemple principal pour cette étude est pris du premier trimestre au deuxième trimestre de 2014. Notre analyse identifie les paramètres macro-économiques qui affectent positivement la croissance du secteur bancaire. Des ratios de liquidité, par exemple Actifs cycliques / Passifs cycliques, seront observés comme une variable dépendante et la proportion de prêts improductifs par rapport au total des prêts, la rentabilité moyenne en fonds propres, les frais autres/ revenu total, les réserves obligatoires, l'emprunt total, la masse monétaire dans le plus large sens, le capital net/des actifs pondérés en fonction des risques et des actifs performants nets/les actifs totaux seront utilisés comme des variables indépendantes. Le but du papier est de déterminer s'il y a l'interdépendance dans le mouvement entre les variables indépendantes et dépendantes par une régression linéaire multiple.

0.0.4.2 Chapitre 4-2 Règlement de Petites Banques:

La motivation de cet article est de susciter la solution capitale bancaire de gestion pour des petites banques catégorisées dans des banques commerciales et des corps réglementaires. Le but de l'article est d'atténuer le risque d'une zone bancaire et de fournir ainsi une

motivation juste pour de petites banques dans un cadre macroéconomique.

0.0.4.3 Chapitre 4-3 La Taille Économique et La Viabilité de la dette contre “L’inégalité des détentions de Capitale à la Piketty”:

Cet article présente une méthodologie conçue pour faciliter des variables alternatives mesurant la croissance économique. Une rupture capital-de-travail de la fonction de Cobb-Douglas est adaptée à l'utilisation dans le contexte de croissance économique

Le ratio de capital/revenu et deux lois fondamentales de capitalisme produit par Thomas Piketty illustre l'inégalité capitale sous-évaluée en ce qui concerne l'inégalité de travail. De plus, l'article inclut la dette d'exportation et externe comme de fortes alternatives. Les données empiriques de la Banque mondiale sont analysées pour démontrer de larges différences de tailles économiques. L'analyse de cas sur l'Amérique Latine comme un exemple d'une économie différente-taille est aussi discutée.

Le ratio de capital/revenu et deux lois fondamentales de capitalisme produisent par Thomas Piketty illustrent la sous-évaluation de l'inégalité du capital par rapport à l'inégalité de travail. De plus, l'article suggère que la dette d'exportation et externe constitueraient des alternatives convaincantes. Les données empiriques de la Banque mondiale sont analysées pour démontrer de larges différences de tailles économiques. L'analyse de cas de l'Amérique Latine fournit un exemple d'une autre taille-économie et est également discutée.

Chapter 1 :

On Overconfidence, Bubbles and the Stochastic Discount Factor

Clearly, two sets of ideas, a trader wants to buy and another trader wants to sell, stand in parallel. It seems plausible, yet it requires further examination on aggregate measures of fundamentals to estimate risks faced by agents.

Speculation is the short-run behavior not to sell in the bullish spot for more returns. Overconfidence of agents has been convincingly generated from heterogeneous beliefs concerning the bullish moment. The information is available to all agents. Those agents are divided into two groups. Each group over-estimates the informativeness of a different signal. Some agents know that their forecasting differs from others but limitation on behaviors lead them to “agree to disagree” (Carlin, Longstaff and Matoba (2014)).

1.1 Introduction

This chapter attempts to identify a continuous-time equilibrium model in which overconfidence generates disagreements among two groups regarding asset fundamentals. By testing the variance of a stationary mean reversion as the overconfidence parameter increases, it simply points out how heterogeneous beliefs of two groups lead to trading. More specifically, those beliefs make clear what follows from overconfidence.

My goal in this chapter is an investigation how market prices can react to the stochastic discount factor when traders have heterogeneous beliefs. This account will offer further evidences of market dynamics for “beating the market”.

In the pages which follows we shall develop such a view based on the intertemporal composition of risk, the operator for the long-run and sorting by the iterated belief contraction. In continuous-time modeling of asset pricing, asset payoffs depend on both the future state and on the date when the payoff is realized. Risk-averse traders adjust the risk across maturities. The perception of the intertemporal composition of risk is crucial to trading because it enabled less risk-averse agents speculate more aggressively for higher returns. However, each agents do not share risks perfectly (Berhardt-Taub (2008)).

1.1.1 Risk, Shortsales and Two Players

Since the intertemporal composition of risk is bounded by limitation on behaviors, even though agents have enough motivations to behave differently, agents are ruled by the fundamental variation of market reactions to different events. Ostensibly, the conceptual overconfidence bears a striking resemblance to speculation. Agents share the same information but each activities are consistently linked to two different signals when it comes to the same output in the same trading.

The short sale constraint has been on the debate from Miller (1977). Disagreement may lead to lower expected returns bounded by short-sale constraints (Chen, Hong and Stein '02, Diether, Malloy and Scherbina '02). Otherwise, it can be vice versa (Boehme, Danielsen, Kumar and Sorescu '09 and Avramov, Chordia, Jostova and Philipov '09). The interesting idea in Hansen-Jagannathan '97, Hansen-Scheinkman '09 is the smooth assumption of the short-sale constraint. In detail of it, in the long horizon, the short-sale constraint is maintained by the end of long-term maturity but it permits the change in the composition of portfolio. It implies that non-negative payoffs are kept but the intermediate trading is permitted as the non-negative portfolio payoffs.

For example, Ellen has an idea for a start-up, worth 100 million dollars if successful, but

requiring 1 million dollars in funding from Frank. They are both risk-neutral. Assume that Ellen and Frank have non-negative payoffs at the end of trading. On the one hand, Ellen thinks the probability of success is 90%. On the other hand, Frank thinks the probability of success is 10%. Despite of his pessimism, Frank is willing to invest. Therefore, fluctuation in relative beliefs generates buying.

Then, two traders have non-negative portfolio payoffs (Ross '78, Harrison-Kreps '79, Kreps '81, Chamberlain-Rothschild '83, Hansen-Richard '87 and Clark '93). Hence, intertemporal payoffs are possibly various.

1.1.2 Axiomatic Foundations of Speculative Bubbles

Market fundamentals rank the price level x_t in a discrete-time framework according to

$$x_t = f_t + aE(x_{t+1} \mid \Omega_t), a \in (0, 1), t \in \mathbb{N}$$

where x_t is the price level, f_t is fundamentals and Ω_t is the information set.

It becomes apparent in three examples suggested by O. Blanchard (1979):

1. Reduced form of a money market equilibrium: x_t is price level and f_t is nominal money (Flood and Garber, 1980),
2. Arbitrage equation: x_t is price of share and f_t is dividends or the dividend rate (Scheinkman and Xiong, 2003),
3. Equilibrium of a material market (for example the gold market): x_t is price and f_t is existing stock (Harrison and Kreps, 1978).

No single answer about the definition of bubbles will suffice but it is highly probable that *bubbles* are price deviations from their fundamentals, similar to Allen and Gorton (1993). Yet it bristles with ambiguity how the price simply goes down when the bubble bursts.

In an attempt to clarify a particular point, one viewpoint might be put any admissible payoff as dividends. The main concept resorts to representative pricing as dividends without an operator in a differential form. Such a technique in a continuous time, there is no significant disparity of the time between the fair value and returns. Since dividends as fundamentals occur at the same time with pricing of an asset, at this point, it solves the time that we do not need to wait for the maturity of total instantaneous returns.

1.2 The Intertemporal Composition of Risk

1.2.1 A Market-related Variation in the Short-run

Continuous paths of fundamentals can be decomposed into three different variations: the variation by shocks and the adjusting variation to shocks and a market-related variation.

The first two components measure the economic fundamental. The last one captures the deviation from the market target of fundamentals.

In conjunction with those fundamentals, the parameter \bar{X} represents an equilibrium. The trajectory of economic fundamentals X_t is a continuous-time Markov process with almost surely continuous sample paths of the equilibrium \bar{X} . The position of a pricing variable is randomly placed by dynamics of other pricing variables.

The concept of shocks allows us to explore the extent to which such a variance may be able to be caused by shocks and adjust itself relevant to economic fundamentals. There are a pair of parameters about shocks. Firstly, the main feature with direct relevance to shocks is locally arranged as the degree of volatility σ caused by shocks. Secondly, much more connected to the global type of fundamental dynamics, λ is the rate by which these shocks dissipate and the variable reverts towards the mean. Besides, the Wiener process dZ_t displays scale invariance to scheme fundamentals, under another name as Pareto. Two tails of all stock market prices with positive and negative variations are market-related variations.

In papers of overconfidence, Sheinkman-Xiong considered the Orstein-Uhlenbeck process of cumulative dividends. $X = (X_t)_{t \geq 0}$ of the stock market assuming that

$$dX_t = \eta - \lambda(X_t - \bar{X})dt + \sigma dZ_t \quad (1.1)$$

where the trend-line parameter η equals zero, $Z = (Z_t)_{t \geq 0}$ is a standard Brownian motion, and the coefficient (λ, σ) can be chosen in observable data and \bar{X} is the long-run mean. $Z = (Z_t)_{t \geq 0}$ in the equation (1) may be substitutable to $Z^\alpha = (Z_t^\alpha)_{t \geq 0}$ in case of the group α and $Z^\beta = (Z_t^\beta)_{t \geq 0}$ in case of the group β . To infer current X and value the asset, agents of group $\alpha(\beta)$ use observations of X and any signal of the group $\alpha(\beta)$, correlated with X ¹.

1.2.2 Representing Prices

The argument goes as follows: cumulative dividends may be represented as fundamentals. Virtually, various interpretations are possible. It may be the existing stock (Harrison-Kreps (1978)) or the logarithm of nominal money (Flood-Garber (1980)). As Cagan (1956) observes in his work of seven hyperinflations, the trend line of the German hyperinflation was not validated during the hyperinflation's final 5 months (July-November 1923). Namely, a big conjecture in theory of bubbles is the possibility of the fundamental value according to the price level p_t as a diffusion such that

$$\frac{dp_t}{p_t} = X_t dt, \quad (1.2)$$

1

$$E(X_t) = \bar{X} + (X_0 - \bar{X})e^{-\lambda t} \rightarrow \bar{X} \text{ as } t \rightarrow \infty,$$

$$V(X_t) = \frac{\sigma^2}{2\lambda}(1 - e^{-2\lambda t}) \rightarrow \frac{\sigma^2}{2\lambda} \text{ as } t \rightarrow \infty.$$

If X is constant as $\lambda \rightarrow \infty$, both (λ, σ) is needed to adjust to vary the degree of mean reversion.

and the long-run mean \bar{X} as the market's target, which is not directly observable to the public. Obviously, the trading volume and the actual amount of fundamentals is placed at the vortex of pricing-leveled bubbles.

A model of Scheinkman-Xiong (2003) (e.g. the 3Com-Palm case in the late 1990s) formulates fundamentals in the continuous-time cumulative-dividend stream featuring the trading volume. The buyer's willingness to pay is a function of the value of the option that he acquires, the payoff from stopping (Stokey, Lucas and Prescott, 1989) is, in turn, related to the value of an option like American options with no maturity. The model concludes high trading volume eventually makes the end of bubbles. The question ultimately hinges on a universality.

The pricing level of fundamentals ought to be obtained by the multiplication by a common factor representing a universality. Without a doubt of difficulty to modelize in the continuous time technically, a market-related variation during small intervals in the continuous time contributes to a more understanding of economic fundamentals. Flood-Garber (1980) mentioned that such direct methods to calculate pricing and a bubble parameter are impossible since market fundamentals are comprised in part of agents' expectations. The argument about the identification problem inspires the expectation model in the continuous time that we cannot miss the description of all small intervals and definately, it devotes an entire picture of fundamentals.

1.2.3 The Displacement with Two Groups' Signals

We begin by describing the general class of a continuous-time equilibrium model and prove the existence of bubbles and bursts. A number of important financial economic models fit into this general framework including the Scheinkman-Xiong model (2003) of overconfidence and the Protter's model (2012) of a fundamental pricing in an incomplete market. In this section, we will use the Scheinkman-Xiong model to illustrate and motivate our assumptions.

The basic setting is the continuous-time economy in a finite-horizon, populated by a continuum of agents $I = [0, 1]$.

There is a single risky asset. The dividend process follows:

$$dD_t = X_t dt + \sigma_D dZ_t^D, \quad (1.3)$$

where σ_D is constant, and Z_t^D is a standard Brownian motion process.

Each agent $i \in [0, 1]$ is subject to either investors α or traders β who make signals either s_α at the confident level or s_β at the overconfident level in trading.

Initial dividends are non-negative, $X_0 = x \geq 0$, and after X hits zero there are two interpretations about the evolution of dividend process. Firstly, the evolution of dividends, dX_t , hits zero and the non-anticipated process dZ_t is the same as zero. The low bound points out the moment of low-dividend or (theoretical) zero-dividend. Secondly, assume that the non-anticipated process dZ_t is the same as zero and signals are shared between the group α and β .

1. zero dividend: $dX_t = dZ_t = 0$ for $t \geq \tau$, τ = the moment of low-dividend or zero-dividend. \Rightarrow (1) overpricing.

2. heterogenous dividends: $dX_t = dZ_t^\alpha = 0$ for $t^\alpha \geq \tau^\alpha$, τ = the moment of homogeneous dividend. \Rightarrow (2) overconfidence.

For the first case, the non-negative dividend is wanted after hitting at zero, even though the information of paid-dividends is not given. The reason is that (random) moments of dividends will be non-negative, not hitting at zero.

For the second case, the certain thing is the dividend process of two groups is hitting at zero which is the same as a homogeneous value. The correlation parameter ϕ with X is expected how two non-anticipated procedures are going to be different and valued as heterogenous dividends.

In defining fundamentals, it may be useful to begin with the suggestion that the price of fundamentals is approximately similar to the cumulative dividends. If we expect the case of overpricing with overconfidence, the initial dividend is exactly same when hitting at zero. Defined by the Fundamentals are:

$$dX_t - \sigma_D dZ_t^D \equiv f_t dt \equiv dS_t^\alpha - \sigma_s dZ_t^\alpha \equiv dS_t^\beta - \sigma_s dZ_t^\beta, \quad (1.4)$$

revoking mutually independent four standard Brownian motions $Z^D, Z^f, Z^\alpha, Z^\beta$ denoted as cumulative dividend process D , fundamental f , signal of group α and signal of group β .

For random variables of dividends given in a observable (λ, σ) , at those moments after hitting at zero, precisely, we don't know whether the dividend process and the signal process how similar they are. Therefore, we need one more variable. The parametric role of overconfidence should be given in detail since we want to put this myopic dividend procedure into the economic framework.

1.2.4 Responses with Overconfidence

According to the parameter of overconfidence, the weightness between dZ_t and dZ_t^α is revealed as below:

$$dX_t = X_t dt + \sigma_s \cdot \phi dZ_t^x + \sigma_s \sqrt{1 - \phi^2} dZ_t^\alpha \quad (1.5)$$

As has been seen in Scheinkman-Xiong (2003), the interval of $0 < \phi < 1$ is the case of overconfidence. What we can look up at the extreme such as two categories $\phi = \{0, 1\}$:

1. $\phi = 1$: if we plug $\phi = 1$ in equation (1.5), we get $X_t dt + \sigma_s \cdot \phi dZ_t^x$ without $\sigma_s \sqrt{1 - \phi^2} dZ_t^\alpha$. It belongs to the case of low-dividend. Remark that overpricing is implied and it maybe in the situation with overconfidence.
2. $\phi = 0$: if we plug $\phi = 0$ in equation (1.5), we get $X_t dt + \sigma_s \sqrt{1 - \phi^2} dZ_t^\alpha$. It belongs to the case of heterogeneous dividend. Remark that one group can be overconfident.

To get to the heart of questions relating to fundamentals, through the re-arrangement of the equation (1.5), we shall see the definition of overconfidence deduced from fundamentals of Scheinkman-Xiong (2003) as below:

(*Overconfidence*) The overconfidence parameter ϕ generates disagreements among two heterogeneous groups regarding asset fundamentals $dS_t^\alpha - \sigma_s dZ_t^\alpha$, the overconfidence of the group α is such that

$$\phi \equiv \frac{dS_t^\alpha - X_t dt - \sigma_s \sqrt{1 - \phi^2} dZ_t^\alpha}{\sigma_s dZ_t}. \quad (1.6)$$

This brings about the comparison between a good- or bad-news public signals and each group α - or β 's private signals. Here, a bad news event can be a new equity issue, as overvaluation and in an opposite way, repurchase can be a good-news event, as undervaluation. Overvaluation implies that traders are overconfident to receive a positive private signal and undervaluation is vice versa.

The market mechanism is simply cycled if the expectation of returns is higher after the stock price goes down. However, Daniel-Hirshleifer (2015) broadly imparted the response of groups with mood of market manipulation. Particularly, in case of undervaluation before repurchase, how the stock is a good investment for long-term shareholders if prices adjust instantaneously (Ikenberry, Lakonishok-Vermaelen (1995)).

It doesn't conclude the key empirical findings that the end of bubbles may be caused by both medium-term price momentum (Jegadeesh-Titman, '93) or long-term reversal (DeBondt-Thaler, '85). Most obviously, responses with overconfidence tell that such signals show the continuation of returns.

(*Universality with Overconfidence*) Agents of group $\alpha(\beta)$ believe that innovations $dZ^\alpha(dZ^\beta)$ in the signal $s^\alpha(s^\beta)$ are correlated with innovations dZ^f in the fundamental process, with $\phi(0 < \phi < 1)$ as the correlation parameter. Non anticipated process is defined by signals of group α such as $dZ_t \equiv dZ_t^\alpha$ heating at $\phi = 0$, going up to $\phi = 1$ making heterogeneous dividends of group α and β , for example, the response function of group α is such that

$$(1 - \sqrt{1 - \phi^2})dZ_t^\alpha \equiv \phi \cdot dZ_t. \quad (1.7)$$

See Appendix.

1.3 The Specification of Bubble Formations

The system with mean reversion and overconfidence displays a comparable argument when mean reversion λ is greater, where the overconfidence parameter at extremes such as the minimum $\phi = 0$ or the maximum $\phi = 1$. In considerable detail, the coefficient λ , rearranged from the equation, is the parameter such as the mean reversion in Scheinkman-Xiong (2003):

$$\lambda = \frac{df_t - \sigma_f dZ_t^f}{-(f_t - \bar{f})dt}, \quad (1.8)$$

where $\lambda \geq 0$.

Significant abnormal returns from trading strategies that buy past winners and sell past losers were realized over the 1965 to 1989 period (Jegadeesh et al, '93). This stochastic stability interests us for two reasons. First, the strategy we examine here

may be compounded excess returns on average which is uniformly realized during the period, and second, responses with overconfidence is not attributed from delayed stock pricing by other factors. The information and those price reactions are formed objectively near the stability.

Consider, for example, overconfident groups' portfolios realize higher returns than others around quarterly-earnings announcements after the initiated date. Those plans about early-stage earnings of trading illustrates how overconfident can reach early earnings than others schematically from the pivot of the stability? In an attempt to clarify a particular point, attention to mean reversion in the interval $\{0, 1\}$ of overconfidence, we construct the dynamic composition of mean reversion λ and the overconfidence parameter ϕ .

(A higher overconfidence) A higher overconfidence ϕ causes an increase in fluctuation of opinions and a slower mean-reversion. See Appendix.

1.3.1 The First-Best Response with Overconfidence

λ is counter-monotonic to ϕ only and only if $\lambda(\phi = 0) > \lambda(\phi = 1)$ when heating at $\phi = 0$ and going up to $\phi = 1$

$$\frac{df_t - \sigma_f \cdot \frac{(1 - \sqrt{1 - \phi^2})}{\phi} \cdot dZ_t^f}{\bar{f}dt - (dS_t^\alpha - \sigma_s dZ_t^\alpha)} \equiv \lambda$$

$$\text{If } \phi = 1, \text{ then } \lambda \equiv \frac{df_t}{\bar{f}dt - (dS_t^\alpha - \sigma_s dZ_t^\alpha)}$$

$$\lambda(\phi = 0) - \lambda(\phi = 1) \equiv \frac{\sigma_f \cdot dZ_t^\alpha}{\bar{f}dt - (dS_t^\alpha - \sigma_s dZ_t^\alpha)}$$

Agents attribute to their own forecast of the current level of fundamentals as larger overconfidence ϕ increases. Have relevance to price spirals (Barberis et al, 2018), arisen from sequences of cash flows, it significantly increases the size of a bubble. Possibly, responses to mean reversion may be the extrapolation (Barberis, 2018)-the formation of expected returns by investors based on past returns. On the other hand, since the extrapolation can be explained without bubbles as well, it is not apparent. Here, the overconfidence parameter calls on an association with the volatility.

The rate of mean reversion Q , which recalls the mean reversion for the overconfidence parameter relevant to the volatility, is newly added in this model. The stationary solution γ is: (*Stationary solution γ*)

$$\gamma \equiv \frac{\sqrt{(Q\lambda + \phi \frac{\sigma_f}{\sigma_s})^2 + (1 - \phi^2)(2\frac{\sigma_f^2}{\sigma_s^2} + \frac{\sigma_f^2}{\sigma_D^2}) - (Q\lambda + \phi \frac{\sigma_f}{\sigma_s})}}{\frac{1}{\sigma_D^2} + \frac{2}{\sigma_s^2}}$$

which is agreed by Rogers-Williams 1987; sec. 6.9, Lipster-Shiryaev 1977; theorem 12.7. The variance of a stationary mean reversion γ combined with Q ; the rate of mean reversion, decreases according to the overconfidence parameter ϕ .

Letting

$$\begin{aligned}\theta(\phi) &= (Q\lambda + \phi\sigma_f/\sigma_s), \\ \Psi(\phi) &= (1 - \phi^2)[(2\sigma_f^2/\sigma_s^2) + \sigma_f^2/\sigma_D^2],\end{aligned}$$

one derives:

$$\begin{aligned}\frac{d\gamma}{d\phi} &= \frac{[(2\theta(\phi)\theta'(\phi) + \theta'(\phi))/[2\sqrt{\theta(\phi)^2 + \Psi(\phi)}] - \theta(\phi)}{1/\sigma_D^2 + 2/\sigma_s^2} \\ &= \frac{[\theta(\phi)/\sqrt{\theta(\phi)^2 + \Psi(\phi)} - 1]\theta'(\phi) + \Psi'(\phi)/2\sqrt{\theta(\phi)^2}}{1/\sigma_D^2 + 2/\sigma_s^2} \\ &\leq 0.\end{aligned}$$

1.3.2 Two Ways that Speculative Bubbles Burst

Remark that the coefficient factor λ is going to 1 implying the stationary solution of Scheinkman-Xiong (2003). By the lemma, overconfidence should be zero where the the coefficient factor λ is one. I shall proceed in the following that the the coefficient factor λ is in the interval between the upperbound and the lower bound of overconfidence. It shows the coefficient factor λ is going to *zero* where the overconfidence is greater than the the coefficient factor λ . As the additional comment, there is no argument in the negative domaine. ξ is assumed to be less than 1. It roles to discount the entire operation of mean-reversion λ . $\xi\lambda$ is ended up to zero.

$$-\sigma/\sigma_s < \xi\lambda < \varpi (= \phi\sigma/\sigma_s). \quad (1.9)$$

If ξ is non-negative and less than 1, then $\frac{d\gamma}{d\lambda} = \frac{\xi}{(\xi\lambda + \varpi)} - \xi < 0$

It's same with $1 < \xi\lambda + \varpi$ and $1 - \phi\sigma_f/\sigma_s < \xi\lambda$

For $\sigma_f > 0, \sigma_s > 0, 0 < (1 - \phi)\sigma_f + \sigma_s$,

$$0 < \sigma_f - \phi\sigma_f + \sigma_s, -\sigma_f < \sigma_s - \phi\sigma_f, -\frac{\sigma_f}{\sigma_s} < \frac{\sigma_s}{\sigma_s} - \phi\frac{\sigma_f}{\sigma_s}$$

$$-\sigma_f/\sigma_s < 1 - \phi\sigma_f/\sigma_s < \xi\lambda$$

It implies that speculative bubbles with overconfidence, making heterogeneous dividends, burst as the mean-reversion is discounted. Compared to the result with mathematical expectation as below, the interpretation about the non-anticipated process is different.

As a criterion of optimal solution with mathematical expectation corresponding to $X_0 = x$, admissible dividend processes $Z = (Z_t)_{t \geq 0}$ can be taken by sup within the corresponding set of the observable data set (λ, σ) .

$$V(x) = \sup E_x \int_0^\infty e^{-\psi t} dZ_t \quad (1.10)$$

with a given rate of discounting $\psi > 0$.

1.3.3 The Stochastic Discount Factor

There is no clue for the existence of the stochastic process X such as X 'existing' up to the first instant of X hitting zero. The reason is that it's assumed that all 'sup's are not taken close to the maximum. If all 'sup's are taken, there are no benefits for arbitrage. Hence, some 'Sup's are not taken in the value of maximum.

Our concern is, by the end, leaning to the verification whether if X is path-connected and continuous, then X is homeomorph to a real interval. Assumed that a stochastic process on a prior admissible set such as dX_t is the major process for measuring fundamentals with the unpredicted process dZ_t .²

$$\text{If } (X_t \equiv Z_t)_{t \geq 0}, \text{ then } V(x) = \frac{1}{\psi}$$

$$\begin{aligned} \int_0^\infty e^{-\psi t} dZ_t &= \int_0^\infty e^{-\psi t} dX_t \\ &= -\frac{1}{\psi} e^{-\psi x} \Big|_0^\infty \\ &= -\frac{1}{\psi} e^{-\psi \cdot \infty} - \left(-\frac{1}{\psi} e^{-\psi \cdot 0}\right) = \frac{1}{\psi} \end{aligned}$$

The optimal solution is possibly constant. Assume that the non anticipated process is revealed such as $X_t \equiv Z_t$. This result suggests that the mathematical expectation is zero which is not related to non-anticipated procedure when speculative bubble bursts. ψ is fixed as the discount factor. Hence, firstly, the stochastic process X is required to be proved for path-connected whenever the trading occurs. Simply, the unique trading for the continuous stochastic process is based. Secondly, dZ_t is unpredicted but exists in the admissible set by the discount factor for the conjecture if X is homeomorphic to a real interval.

Consider a very simplistic example of the price system, where there are two dates of interest, represented by times $t = 0$ (today) and $0 \leq t$ (a continuous-time financial investment horizon). The intermediate trading date at τ is inserted in the time horizon between date zero and date t such as $\tau \leq T$. In the stock market, there is an initial offering asset with a price process \mathcal{F}_0 .

Utility flows:

$$U(\{x_t\}) = E \int_{t=0}^\infty e^{-\psi t} u(x_t) dt \quad (1.11)$$

Since $\frac{u'(x + \Delta x)}{u'(x)}$ is not well-behaved, a stochastic discount factor β_t is defined as an adapted positive process in a time-inconsistent sense.

² $(A \cup B) \cap (A \cup B^c) = A$ (dX_t denoted as A and dZ_t denoted as B). A is fundamental in this logic

The deflating process is

$$E[\beta_t f_t \mid \mathcal{F}_0], \quad (1.12)$$

where β_t is a strictly positive constant and f_t is the payoff at t .

In the condition of *no arbitrage (NA)*, the stochastic discount factor β satisfies

$$\beta_0 = 1. \quad (1.13)$$

Otherwise, β_t is positive with probability 1. In other words, the process $\beta_t f_t$ is a β -martingale.

1.4 Overpricing and Mathematical Inductions

What can be the market fundamental if overpricing occurs? Since the price of only one stock or aggregated sum of stocks do not need to be equal to any market fundamental, we describe a stock market with bubbles defined as overpricing. A speculative bubble exists in the event of large, sustained overpricing of stock and other assets. Since a loss of paper wealth is not necessarily result in changes in the real economy, measured overpricing in a speculative bubble becomes a promising tool to understand financial crises.

Definitely, overpricing is not equivalent to fundamentals if measured by mathematical induction. Concretely, induction is consist of a base and steps to measure fundamentals. Analyzing fundamentals in overpricing is like climbing a big mountain. The induction starts from the initial status and makes steps toward to the top regardless of getting the top. Hence, the maximal value of all economic value does not mean to be in theory of fundamentals.

Needed to be sure it's about non-zero valued fundamental prices, the volatility of a speculative market shows mean-reverting. Going to the average price denoted as mean-reverting is a vital role in this analysis. Suppose to put all related economic variables in one spot of the first-order induction, it makes us confident that it's overpricing affecting to the fundamental value.

Obviously, the second-order induction is about the value in the interval. Distinguishably, in the first-order induction, prior information is observed before the initial time. Compared to the first-order induced mechanism starting from the initial status to the end, the second-order induction is designed for the interval without prior information. We offer a new interpretation of *overconfidence* as a motivation not to participate in economic activities immediately. Risk-averse agents provide a much more rational way of solving the puzzle of externalities. If beliefs of traders are *concordant* (Milgrom and Stokey, 1982), traders agree about how information should be interpreted in the interval. Concordant beliefs arise naturally in statistical problems where there is an unknown parameter about which traders may hold different views.

Let us initiate a discussion of the separation between asset pricing bubbles and speculative bubbles. For example, during the period of German hyperinflation, Flood and Garber (1980) held immense appeal for their hypothesis of no speculative bubbles. However, theoretically, the financial market setting emphasises finite wealth, the finite horizon, and the short-selling behaviour of risk-averse finitely lived agents. Hence, the bubble condition cannot be paralleled with transversality or boundary conditions.

The methodological part of the speculative bubble has come into a debate on the *Markov process* and an *equilibrium*. In a sense of an equilibrium, several traders in tirole (1982) do not willing to sell in a short time and rationally expect bubbles informed by movements of prices. Understanding shorting is the turning point in theory of bubbles. The temptation of shorting is initiated from Azariadis and Guesnerie (1986) animating the detailed technique with the sequentially stable Markov process in accordance with perfect foresight. To conceptualize unstable beliefs, the form of the transition probability matrix are intended to yield a regular stationary sunspot equilibrium (SSE).

The large volume of the frame work is mainly conducted on the first-order induction. The second-order induction is applied in the continuous-time equilibrium model of Scheinkman-Xiong (2003). It embodies overconfidence as the motivation of speculative bubbles. Overconfidence generates disagreements between two groups regarding asset fundamentals.

1.5 The Scheinkman-Xiong Model

This section studies the Scheinkman-Xiong model (Scheinkman and Xiong (2003)) as an example. If agents in group α place more trust in their own signal s^α than the true information, agents are highly confident to undertake some speculative actions with overconfidence ϕ ($0 < \phi < 1$) and signal σ_s is valued with noises dZ_t^α . Hence, we get two process of signals:

$$ds_t^\alpha = X_t dt + \sigma_s \phi dZ_t + \sigma_s \sqrt{1 - \phi^2} dZ_t^\alpha$$

and

$$ds_t^\beta = X_t dt + \sigma_s \phi dZ_t + \sigma_s \sqrt{1 - \phi^2} dZ_t^\beta.$$

By the conditional mean of the beliefs of agents in each group, differences in beliefs are according to:

$$\begin{aligned} g^\alpha &= \hat{X}^\beta - \hat{X}^\alpha, \\ g^\beta &= \hat{X}^\alpha - \hat{X}^\beta, \end{aligned}$$

The evolution of differences in beliefs is:

$$dg^\alpha = -\rho g^\alpha dt + \sigma_g dW_g^\alpha. \quad (1.14)$$

where

$$\begin{aligned} \rho &= \sqrt{\left(\lambda + \phi \frac{\sigma_f}{\sigma_s}\right)^2 + (1 - \phi^2) \sigma_f^2 \left(\frac{2}{\sigma_s^2} + \frac{1}{\sigma_D^2}\right)}, \\ \sigma_g &= \sqrt{2} \phi \sigma \end{aligned}$$

At each t , let $o \in \{\alpha, \beta\}$ denoted as the group of the current owner and \bar{o} as another group. A seller pays the trading cost $c \geq 0$ per unit of the asset sold. p_t is the exercise

price for a unit of the asset. With the short-sale constraint, the exercise price at t is:

$$p_t^o = \max_{\tau \geq 0} E_t^o \left[\int_t^{t+\tau} e^{-r(s-t)} \left[\bar{X} + e^{-r(s-t)} (\hat{X}_t^o - \bar{X}) \right] ds + e^{-r\tau} (p_{t+\tau}^o - c) \right],$$

The equilibrium consists of two parts in the following equation. The first part, $q(g_t^o)$, which depends on the current difference between the beliefs of the other group's agents and the beliefs of the current owner. The second part, except for $q(g_t^o)$, is the expected present value of future dividends from the view of the current owner.

$$\begin{aligned} p_t^o &= p^o(\hat{X}_t^o, g_t^o) \\ &= q(g_t^o) + \frac{\bar{X}}{r} + \frac{\hat{X}_t^o - \bar{X}}{r + \lambda}, \end{aligned}$$

The value of the option $q(x)$ is revealed at the immediate sale in a sense of American option. Each payment and the cost function is formulated as below:

$$V(x) = \sup E_x \sum_{i \geq 0} e^{-\psi T_i} (\zeta_i - c) \geq \frac{x}{r + \lambda} + q(-x) - c \quad (1.15)$$

and

$$\frac{1}{2} \sigma^2 \omega - \rho \cdot x \cdot \omega = r \cdot \omega \quad (1.16)$$

where $0 = T_0 < T_1 < T_2 \dots$ and ζ_0, ζ_1, \dots are non-negative amounts of dividends paid, c is the transaction cost, r is the discount factor and ω is the stochastic discount factor defined by $E^o [e^{-\psi \cdot \kappa |x}] = \omega(x, \kappa, r)$ where the exercise moment is κ and $\omega(\kappa, \kappa, r) = 1$.

In this way, the *bubble* concept relates to the belief difference between the demand price of the current owner (denoted as the group α) and another group (denoted as the group β). The fundamental valuation is along speculative bubbles $b \equiv q(-\kappa)$. It means that the calculation of each exercise moment in speculative bubbles is crucial to find the optimal solution. Remark that the classical approach like Radner-Shepp, \sup is taken over all multivariate point processes $(T_i, \zeta_i)_{i \geq 0}$. However, in Scheinkman-Xiong, the *candidate for an equilibrium* is described with the resale option value. It emphasizes on the selling moment is determined in a predictable way as data given.

1.5.1 The Unique Equilibrium Allocation

This section is motivated for a concept of the candidate for an equilibrium of Scheinkman-Xiong (2003). It's intended for the key from the problem of traders to the economic level. The model has a unique equilibrium, in which all risk-neutral traders maximize subjective expected utility, trading occurs if and only if traders' priors differ.

The set of belief is revealed by willing to trade (Rigotti, Shannon and Strzalecki (2008)) at an act. In addition, the perception of fundamentals of each trader is

characterized by the overconfidence parameter. Since the overconfidence parameter generates disagreements among two heterogeneous groups regarding asset fundamentals, as a result, the benchmark belief according to the maximum of the overconfidence parameter proves the existence of an equilibrium given prior information. By casting the result of an equilibrium in the discrete time with prior information, the gap of the value with and without prior information in the continuous time encapsulates contractions in common beliefs of two groups. What if the price vector is not randomized?

I puzzle on the existence of an unique trading point in the price system. I begin with calling the accumulation factor of Arrow (1959). By the end, for the stochastic discount factor, the price is allocated by lotteries where occasions such as trading happen. Here, the discount factor is the accumulation factor in a sense of allocation in the price system. The price system is the l -tuple $p = (p_1, \dots, p_h, \dots, p_l)$. The value of an action a (arrow, 1959) relative to the price system p is $\sum_{h=1}^l p_h a_h$ where a_h is the accumulation factor. A feasible allocation (x^1, \dots, x^I) induced from $\sum_i x^i \leq \sum_i w^i$ where i are finitely many agents indexed by $i = 1, \dots, I$ and a non-zero price vector $p \in \mathbb{R}_+^S$ are *an equilibrium with inertia* (Rigotti and Shannon, 2005) where S are the possible states of nature indexed by $s = 1, \dots, S$ if

for all i ,

$$x \succ^i x^i \implies p \cdot x > p \cdot w^i \quad (1.17)$$

and endowment $w^i \in R_+^S$ $w^i \in \mathbb{R}_+^S$ is started at date 1 assuming that consumption does not occur at date 0 and the consumption balance left after trading Arrow securities and for all i ,

$$p \cdot x^i = p \cdot w^i,$$

and for each i , either

$$x^i = w^i,$$

or

$$E_{\pi^i} [u^i(x^i)] \geq E_{\pi^i} [u^i(w^i)].$$

where E_{π^i} denotes the expected value with respect to the probability distribution π , each $\pi^i \in \Pi^i$, \exists a closed, convex set Π^i and $u(x)$ denotes the vector $u(x_1), \dots, u(x_S)$.

The interesting part in *an equilibrium with inertia* is the selection of expectation. The entire expectation is not selected for an equilibrium that it contains the unexpected probability. Technically, an equilibrium with trading also says the lotteries about the exercising moment of trading. The economic interpretation is different since *an equilibrium with inertia* has larger pricing information than an equilibrium with trading. However, it's meaning to mention about the *an equilibrium with inertia* with bubbles at the unique trading point because here, overpricing is in the economic level.

Inertia drives an equilibrium in trading only at which is the status quo for all traders so T is the set of agents who are involved in trading in this equilibrium,

$$T = \{i : x^i \neq w^i\}.$$

The number l of commodities is a given positive integer. An action a of an agent is a point of R^l , the commodity space. A price system p is a point of R^l . The value of an action a relative to a price system p is the inner product $p \cdot a$. The equilibrium allocation

(w^1, \dots, w^I) is supported by p as below,

$$p \cdot a \cdot x^i = p \cdot a \cdot w^i,$$

where a is the accumulation factor.

In the first case of $x < \kappa$ where κ is a trading point,

$$p \cdot \psi(-\kappa, x) \cdot x^i = p \cdot \psi(-\kappa, x) \cdot w^i.$$

In the second case of $x \geq \kappa$,

$$p \cdot \psi(r, \lambda, -\kappa, x) \cdot x^i = p \cdot \psi(r, \lambda, -\kappa, x) \cdot w^i.$$

The key point is to explore whether the exercise price occurs at the specific equilibrium who permits trading. The reason is that the total endowment of every player cannot be same with the entire price values because the number of agents are re-updated whether agents are involved in trading or not. To sum it up, regardless of the resale option $\psi(-\kappa, x)$, the trading condition such as $\{x^i \neq w^i \neq \phi\}$ at the *an equilibrium with inertia*. Here, by the standard simplex denoted as Δ is the smallest convex set containing the given vertices in R_+^S . Moreover, given a set Δ , $rint\Delta$ is the relative interior of Δ .

We assume that u^i is strictly concave and a closed, convex set of the probability distribution $\Pi^i \subset rint\Delta$. If (w^1, \dots, w^I) is an equilibrium allocation, then there is the unique equilibrium allocation with inertia at the speculative bubbles when $x < \kappa$.

See Appendix.

1.6 Sorting by the Iterated Belief Contraction

Let's take a close look at the credit expansion. To some extent, the credit expansion is significant subsequent to the credit contraction. When the trader predicts excess returns with the possible over-optimism, risk appetite can explain the negative value of excess returns. Most importantly, the belief contraction should be conditional on the credit expansion taking the same size.

Seen in the observation of Baron-Xiong (2014), three-year cycles in bank credit to GDP ratio in each 23 developed country ³ for 1920-2012, the predicted excess return after the expansion is substantially negative at -23.3% , on the other hand, the return after a credit contraction of the same magnitude is modestly at 4.9% .

This motivation is reflected in the profitable situation denoted as a martingale. A martingale is a sequence of random variables. In the realized sequence, the expectation of the next value is equal to the present observed value. Most obviously, if the trader uses the winning strategy, all prior outcomes may be higher than the current outcome, hence, martingales excludes the possibility of winning strategies based on the information of history.

Given the above observation, it seems plausible, yet it requires a further logic structured when traders perceive fundamentals related to a credit contraction. There is somewhat the

³Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Korea, Malaysia, Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, UK, US.

likelihood, however, that the problem associated with heterogenous beliefs will continue. By and large, the belief contraction is the operation of removing a belief P from a knowledge base K ; the result of this operator is denoted by $K - P$.

$$\begin{aligned}\text{A Knowledge Base } K * P &= (K - \neg P) + P, \\ \text{Belief Contraction } K - P &= K \cap (K * \neg P).\end{aligned}$$

There are five belief revisions: (1) contraction; removing of a belief, (2) expansion; adding of a belief without changing consistency, (3) revision; adding of a belief while maintaining consistency, (4) consolidation; restoring consistency of a set of beliefs and (5) merge; fusioning of two or more sets of beliefs while maintaining consistency.

In the following lemma (2.1), it is highly assumed when traders revise their beliefs by contracting. To put it more concretely, the confident level of traders on the return process is lower than before, the distorted part on fundamentals may be seen as representing risk appetite.

The distorted part ($\neg P$) on fundamentals (F) are perceived larger than the confidence (P) on fundamentals (F) such that $(F \cap \neg P) > (F \cap P)$ where beliefs (P) on the return process has the contraction on fundamentals (F).

See Appendix.

Of special important, the knowledge of prior-outcomes may able to reduce the uncertainty of future outcomes. In (1.6), as long as a higher order perception is the entire portion, the trader figures out the entire knowledge K . Then, removing of beliefs, such as $\neg P$, occurs before forming a belief P . Supposedly, in the circumstance of bubbles, there is the under-estimated removal of beliefs. Then, the trader compares their belief P by the difference between the knowledge K and the biased belief $K * P$ according to imperfect information.

As has been noted earlier, the model is structured on the diminishing motion of heterogeneous beliefs. For example, the expectation is proportional to the square root of the elapsed time. Notably, heterogeneous beliefs on bursts reasonably put more accurately on contracting. Unquestionably, as is explained, the belief removal on fundamentals can be condensed by degeneration of an expectation operator on prior informations.

1.7 Conclusion and Further Discussions

The model shows that overconfidence is construed as a bubble-driven forwardation driver. This occurs because overconfidence parameterizes the stability of two-groups dynamics. This result has the weaker no-arbitrage (NA) condition lending intermediate trading. It proceeds if and only if traders' priors differ. Overconfidence generates disagreements between two groups. Aggregation of beliefs occur before the trading point. Subjective utility maximization after the unique trading point takes up the unique equilibrium allocation.

The basic setting is similar to the work that heterogeneous beliefs generate a trade of two groups in the continuous time framework such as Scheinkman and Xiong (2003). After the trading point, the model has the unique equilibrium at the undervalued exercise price analogous to the interval of the speculative bubble burst in the discrete time framework. Consequently, the overconfident interval in the model sums up the speculative bubble

burst. The mathematical overconfidence goes to some length to establish the bubble-driven forwardation.

Our characterization of the overconfidence is motivated to quantify the connection between the short-run behavior and the long-run one of two heterogenous groups involved in same trading. We studied valuation and pricing in speculative bubbles. When it comes to mean reversion in valuation, the stationary solution in Brownian motion put the link on continuous behaviors. On the other hand, iterated expectations in the specific interval between the mean reversion operator and the overconfidence operator keeping Markov processes under control.

Here, in this article, the trading power is led by the overconfident group among two heterogenous groups. The stochastic discount factor gives information of random walks along the trend line of fundamental prices and upper-bounded expected values. Stochastic discount factors connect the sum of expectation and the operator decomposing the price by lotteries by multiplication. The multiplication of stochastic discount factors and mean-reversion of pricing operators can be argued. For one thing, the conditional expectation of a valuation functional raised to a negative power to develop a large deviation along larger horizons, on the other hand, the long-run expected rate of returns derives the growth of operators.

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1.8 Appendix

[Proof of Lemma 2.1]

$$\begin{aligned}
 1 - \sqrt{1 - \phi^2} &= \phi, \\
 1 - \phi &= \sqrt{1 - \phi^2}, \\
 (1 - \phi)^2 &= 1 - \phi^2, \\
 1 - 2\phi + \phi^2 &= 1 - \phi^2, \\
 2\phi^2 - 2\phi &= 0, \\
 2\phi(\phi - 1) &= 0
 \end{aligned}$$

[Proof of Lemma 3.1] We plug $\lambda = 1, \phi = 0$ into the stationary solution γ

$$\begin{aligned}
 & \frac{\sqrt{1^2 + (\frac{2F}{S} + \frac{F}{D})} - 1}{(\frac{1}{D} + \frac{2}{S})} \\
 &= \frac{\sqrt{1^2 + F(\frac{2}{S} + \frac{1}{D})} - 1}{(\frac{1}{D} + \frac{2}{S})} \\
 & \frac{\sqrt{1^2 + F \times SD} - 1}{SD} > 0
 \end{aligned}
 \tag{1.18}$$

We know that $-1 > 0$ is false, hence, if we know $F \times SD = -1$, it will be also false. It implies $F \times (\frac{1}{D} + \frac{2}{S}) = -1$.

$$\begin{aligned}
 & (\frac{1}{D} + \frac{2}{S}) = -\frac{1}{F}, \\
 & (\frac{1}{D} + \frac{2}{S}) + \frac{1}{F} = 0. \\
 & D \Rightarrow \infty, F \Rightarrow \infty, S \Rightarrow 2 \times \infty
 \end{aligned}
 \tag{1.19}$$

$$D, F = +1 \text{ and } S = -2.$$

$$D, F = -1 \text{ and } S = +2.$$

$$F = 1/2, S = -2 \text{ and } D = \infty$$

$$D = 1/2, S = -1 \text{ and } F = \infty$$

$$F = -1, S = 1 \text{ and } D = -1$$

$$D = -1, S = 1 \text{ and } F = -1$$

(1.20)

[Proof of Lemma 3.7] Letting

$$\begin{aligned} \theta(\lambda) &= A\lambda + \phi\sigma_f/\sigma_s, \\ \gamma &\equiv \sqrt{\theta(\lambda)^2 + \sim} - \theta(\lambda) / \left(\frac{1}{\sigma_D^2} + \frac{2}{\sigma_s^2} \right), \end{aligned}$$

it is derived that:

$$\begin{aligned} \frac{d\gamma}{d\lambda} &= \left[\frac{1/2}{\sqrt{[\theta(\lambda)^2]}} 2\theta'(\lambda) - \theta'(\lambda) \right] / \left(\frac{1}{\sigma_D^2} + \frac{2}{\sigma_s^2} \right) \\ &= \left[\frac{\theta'(\lambda)}{\sqrt{\theta(\lambda)^2}} - \theta'(\lambda) \right] / \left(\frac{1}{\sigma_D^2} + \frac{2}{\sigma_s^2} \right) \\ &= \theta'(\lambda) \left(\frac{1}{\theta(\lambda)} - 1 \right) / \left(\frac{1}{\sigma_D^2} + \frac{2}{\sigma_s^2} \right) \end{aligned}$$

Omitting the constant terms $1/\sigma_D^2 + 2/\sigma_s^2$, the sign of $d\gamma/d\lambda$ is one of

$$A \left(\frac{1}{\theta(\lambda)} - 1 \right).$$

One can remark that

$$\begin{aligned} \theta'(\lambda) &= A \\ &= A \left(\frac{1}{[A\lambda + (\phi\sigma_f/\sigma_s)]} - 1 \right). \end{aligned}$$

If A is a non-negative real number, then

$$\frac{A}{A\lambda + B} - A < 0.$$

If A is infinitesimal, after the mean reversion,

$$A\lambda > A.$$

If $B > A\lambda$, then

$$\frac{A}{2A\lambda} - A < 0,$$

hence $1/A\lambda < 2$ and

$$A/(A\lambda + B) - A < 0.$$

[Proof of Theorem 5.1] Two cases are to be considered in their turn.

1. For $x < k^*$, given the resale option function $\psi(-k, x)$, there exists a unique equilibrium allocation:

$$\begin{aligned} p \cdot \psi(-k, x) \cdot x^i &> p \cdot \psi(-k, x) \cdot w^i, \\ x^i + (1/n)w^i &\succ^i w^i, \\ p \cdot \psi(-k, x) [x^i + (1/n)w^i] &\succ^i p \cdot \psi(-k, x) \cdot w^i, \end{aligned}$$

that implies

$$p \cdot \psi(-k, x) \cdot x^i > p \cdot \psi(-k, x) \cdot w^i$$

Agents are restricted to the traders involved in trading. Hence, $\{x^i \neq w^i \neq \phi\}$. For example, given a set X , $\text{rint}(X)$ denotes the relative interior of X . However

$$\Pi^i \subset \text{rint}(\Delta) = \{\pi \in \Delta : \pi_s > 0, \forall s\}.$$

For a subset C of Δ and $C \subset \Delta$, one obtains

$$\begin{aligned} \text{rint}(C) &= \{q \in C : \text{a neighborhood } V \text{ of } q \text{ in } \mathbb{R}^s \\ &\text{such that } V \cap \text{rint}(\Delta) \subset C\}. \end{aligned}$$

Now suppose that

$$p \cdot \psi(-k, x) \cdot x^i = p \cdot \psi(-k, x) \cdot w^i.$$

Fix $\alpha \in (0, 1)$. Then:

$$\begin{aligned} &p \cdot \psi(-k, x) \cdot w^i \\ &= \alpha p \cdot \psi(-k, x) \cdot w^i - \alpha p \cdot \psi(-k, x) \cdot w^i + p \cdot \psi(-k, x) \cdot w^i \\ &= \alpha p \cdot \psi(-k, x) \cdot w^i + (1 - \alpha) p \cdot \psi(-k, x) \cdot w^i \\ &= \alpha p \cdot \psi(-k, x) \cdot x^i + (1 - \alpha) p \cdot \psi(-k, x) \cdot w^i \\ &= p \cdot [(\alpha \psi(-k, x) x^i + (1 - \alpha) \psi(-k, x) w^i)]. \end{aligned}$$

Whence:

$$E_{\pi^i} [u^i(x^i)] \geq E_{\pi^i} [u^i(w^i)],$$

that in turn implies, from the definition of an equilibrium with inertia:

$$E_{\pi^i} [u^i(\alpha x^i + (1 - \alpha)w^i)] > E_{\pi^i} [w^i], \forall \pi^i \in \Pi^i,$$

that implies, from the strict concavity of u^i ,

$$\begin{aligned} E_{\pi^i} [u^i(\alpha \psi(-k, x)x^i + (1 - \alpha)\psi(-k, x)w^i)] \\ = E_{\pi^i} [\psi(-k, x)w^i], \end{aligned}$$

a contradiction.

2. For $x \geq k^*$, given the resale function

$$p \cdot \psi(r, \lambda, -k, x) \cdot x^i = p \cdot \psi(r, \lambda, -k, x) \cdot w^i,$$

$\psi(r, \lambda, -k, x)$ cannot get value at the origin of the speculative bubble burst $B(= \phi\sigma_f\sigma_s) > A\lambda > -\sigma_f/\sigma_s$, that completes the statement.

[Proof of Theorem 3.1]

β^{LV2} is defined as Q^α for the overconfident group α and Q^β for another group β .

$$g^\beta = Q^\alpha \hat{f}^\alpha - Q^\beta \hat{f}^\beta, g^\alpha = Q^\beta \hat{f}^\beta - Q^\alpha \hat{f}^\alpha = -g^\beta$$

$$ds_t^\beta = Q^\beta f_t dt + \sigma_s dZ_t^f, ds_t^\alpha = Q^\alpha f_t dt + \sigma_s dZ_t^f$$

$$ds_t^\beta - ds_t^\alpha = (Q^\beta - Q^\alpha) f_t dt$$

[Proof of Lemma 6.1]

$$K(knowledge) - P = F(fundamental) - P = F \cap (F * \neg P)$$

$$= F \cap [(F - \neg P) + P] = (F \cap F) - (F \cap \neg P) + (F \cap P) = F - (F \cap \neg P) + (F \cap P).$$

$$F - (F \cap \neg P) + (F \cap P) > 0 \text{ (a set of the belief is a subset of a set of knowledge).}$$

$$F > (F \cap \neg P) - (F \cap P) > 0. \text{ (the assumption of } F > 0 \text{).}$$

$$\text{Hence, } (F \cap \neg P) - (F \cap P) > 0,$$

$$F - (X_t)_{t \geq 0} = F - (F \cap \neg(X_t)_{t \geq 0}) + (F \cap (X_t)_{t \geq 0}) \text{ where } X_t = \mu_t + B_t$$

defined by the Brownian motion: $(B_t)_{t \geq 0}$, and μ_t is not depends on B .

Chapter 2 :

Risk Preference in Reserve Choice and Liquidity Control

Credit rationing is a key to understand credit market imperfection in Economics. The rejection of a credit application by the prospective lender leads a market to be imperfect to offer enough credit to every agent. Consequently, lenders, borrowers and related parties are involved in non-price rationing. As a result, the loanable situation becomes highly negotiable associated with the interest rate than with the risk-free interest rate. For that reason, commercial bankers try to bargain a sufficient loan up to an economic level. Imperfect competition seems reasonable to assume risk appetite on the credit market by central bankers. Some borrowers cannot get a loan associated with the interest rate that others do. Subsequently, lenders should pay attention on borrowers' leaves, reduction of imbalance and liquidity buffer than default according to financial stability.

2.1 Introduction

The goal of a regulator becomes apparent that some liquidity makes credit rationing work. It goes without saying the Nash equilibrium in (1) no credit rationing (the first-best optimum investment) or low investment (the first-best case for everybody) (Piketty, 1997), (2) credit rationing (no loans for everybody) or no incentive for more excessive loans (Stiglitz-Weiss, 1981). Apparently, types of credit rationing (credit rationed or sufficient funding) are mixed by the funding level in the market. The proper level of a mixture in types of credit rationing implies an economic cyclical picture in credit market imperfections.

In the long run, can borrowers leave the credit market? Banks' loan portfolio composition doesn't mean termination of credit market imperfections. The pros and cons to change asset allocation is provided by numerous stylized facts about asset purchases and freshly created reserves. For example, since 2009, the Bank of Thailand has been charged with maintaining inflation between 0.5% and 3.0%. To keep market interest rates meeting to a policy rate, the central bank issues own securities to absorb excess liquidity in the market. A side impact can be losses as a result of low returns on the foreign exchange assets it holds. By means of this composition related to loan competition, when it comes to lenders' dominance, bargaining discriminates monopolists. On the other hand, borrowers' dominance discriminates monopsonists. Clearly, incomplete dominance as a co-existing bilateral monopoly cannot stop bargaining between lenders and borrowers. This approach is broadly relevant to the mixed funding level as a whole. The concept of some liquidity at least allows us to explore the extent to which credit rationed may be able to reproduce sufficient funding and balance itself in the market.

2.2 Excess Liquidity and Global Imbalance

Excess liquidity can be one candidate for drivers to react to structured investment vehicles. Reserves in commercial banks of countries are not inflationary potential holdings. To be exact, this decision procedure is non-price rationing. Holding reserves means a contraction in the supply of credit among commercial banks because of a poorly developed interbank market.

The sound effect of loan claims is achieved by global imbalance ¹. The global imbalance as cross-country differences in saving and investment patterns is pervasive and thought provoking, giving good reasons to advocate reduction of imbalance. To be sure, there have been studies posing this problem, but the question has also been raised as to whether domestic and international distortions can be a key cause of imbalance regardless of economic development levels and financial externalities. To put it bluntly, highly negotiable credit situation discourages a demand of credit. According to externality, supply-side shocks react to the stream on a demand over time.

2.3 Loan for Investment and an Interest Ceiling

An individual's problem is that if the individual borrows the amount B , and an interest ceiling is \hat{r} , then we say individual defaults on his loan if the return R plus the collateral C is insufficient to pay back the promised amount,

$$C + R \leq \underbrace{B(1 + \hat{r})}_{\text{loan for investment}} \quad (2.1)$$

It is an interesting phenomenon that, when discovering commercial banks as borrowers from central banks, distinguishing a liquid asset and liquidity is ambiguous. To reach a fuller understanding of liquidity, a further point is needed to look more closely at the precautionary level and an excessive level of liquidity. To highlight the importance of precautionary balances in commercial banks, a liquid asset can be melted to make liquidity.

From this ambiguity on liquidity to define loan for investment, several further limitations of present regulation should be addressed. Firstly, even though minimum equity regulation lays the foundation of financial regulation in banking, it's vital to claim given amount of equity, the upper boundary is:

$$\frac{\partial E(U_L)}{\partial L} = 0 \quad (2.2a)$$

$$\frac{\partial E(U_B)}{\partial L} = 0 \quad (2.2b)$$

where L is loan for investment and B is the borrowing amount. Calculating the upper boundary can be biased when it comes to measure an interest ceiling. Secondly, if we assume that loan is exercised by a contract, then according to the termination of loan contract, the loan size is discontinuous. Thirdly, there are a variety of institutional constraints that we do not know the internal situation to induce or terminate loan contracts.

It will be assumed that investment and consumption decisions are made according to an optimal program from the point of a regulator about the aggregation valued by outcomes of a representative consumer or entrepreneurs, loan players (commercial banks) and a representative central bank. In an immediate sense, credit rationing is related to lenders' credit limits that borrowers cannot make more loans beyond the red line defined by regulators such as central banks and the government. However, seen from another point of view, it reveals the optimal level that lenders cannot deny an advantage of higher

¹Blanchard's account (2007)

interest. Borrowers' liquidity hinges on liquid assets constructed by credit rationing. From these focal points at hand, it wouldn't be oversight that we should draw a point about a regulator's concerns and an interest ceiling. The argument about an interest ceiling can be briefly stated as follows:

- (1) The rate of wealth transfer from the lender to the borrower (Kala rabinovitch, 1978),
- (2) An instrument for an economic cycle such that if an interest ceiling is sufficiently high, then it discourages demand and conserve their assets up to demand equivalent to zero (Jaffee-Modigliani, 1969),
- (3) Excess demand causing higher interest ceiling \hat{r} (Jaffee-Russell, 1976),
- (4) Bank optimal rate when $f(\hat{r}, R)$ is concave (Stiglitz-Weiss, 1981).

Briefly, we can extend a problem of two groups (Stiglitz-Weiss, 1981) from the individual's problem. Firstly, the net return to the borrower $\pi(R, \hat{r})$ can be written as

$$\pi(R, \hat{r}) = \max(R - (1 + \hat{r})B, -C). \quad (2.3a)$$

The return to the bank can be written as

$$\rho(R, \hat{r}) = \min(R + C; B(1 + \hat{r})). \quad (2.3b)$$

That is, the borrower must pay back either the promised amount or the maximum he can pay back $(R + C)$ about loan for investment B with loan interest rate \hat{r} . With one single exception that the collateral C is not charged for repayment of loan if the situation is solvent that everybody desires. This assumption requires the perfect manipulation of loan interest margin \hat{r} as an instrument related to the collateral which cannot be circulated in the financial autarky. Seen from one-person's problem and a two-group problem, in a nutshell, the same problem setting is reiterated with same variables. We cannot, therefore, avoid the claim that what if borrowing amount according to ceiling interest such as $B\hat{r}$ is not predictably revealed to a regulator.

2.4 A Model

The premise which underpins a good deal of my subsequent argument is to take a panoramic view of investment within fixed investment scale:

$$\begin{cases} Z_1 > I > Z_0 > 0, \\ A \geq \bar{A} \equiv I - Z_0 > 0, \\ Z_1 - Z_0 > 0. \end{cases} \quad (2.4)$$

We assume that agents consider initial investment I satisfies the fixed investment scale, $Z_1 > I > Z_0 > 0$. Most investors can have pleageable investment Z_0 .

A model considers a risk-neutral agent ² with an investment opportunity that is worth Z_1 to him. It is not self-financing in case of a positive net present value, $Z_1 > I$, because most investors can get a pledgeable Z_0 so the risk-taking agent should pay shortfall $I - Z_0 > 0$ converting the market value of their other existing assets.

²entrepreneur in Holmstrom-Tirole, 2013

The portfolio can go forward if and only if the pledgeable income exceed the portfolio's net financing, $I - \bar{A}$, that is when

$$A \geq \bar{A} \equiv I - Z_0 > 0. \quad (2.5)$$

Let A be the maximum amount of capital that the agent can commit to the project either personally or through the commercial bank. The lower bound \bar{A} on the amount of assets that the commercial bank or the agent needs to have in order to attract external funds. A commercial bank with less capital than \bar{A} will be credit rationed. $A > I$ is in the situation that no external funds are needed. Two necessary conditions for credit rationing (Holmstrom-Tirole, 2013) are:

1. a positive rent $Z_1 - Z_0 > 0$. If $Z_1 = Z_0$, then all projects with positive net present value ($Z_1 > I$) are also self-financing ($Z_0 > I$) and hence it can move forward.
2. the agent is capital poor in case of $A < (Z_1 - Z_0)$, the agent has enough capital up front to pay for ex post rents earned and therefore all projects with positive net present value can go forward.

Remark that “capital poor” is in case of $A < (Z_1 - Z_0) \equiv$

$$1 < \frac{(Z_1 - Z_0)}{A}, \quad (2.6)$$

where A is defined as the maximum in capital in a sense of a portfolio and $(Z_1 - Z_0)$ is a positive rent.

This relation is portrayed in detail of contractual information rent.

$$Z_1 - I \geq (Z_1 - Z_0) - A. \quad (2.7)$$

The left-hand side is the net present value of the project. The right-hand side is the net rent enjoyed by the agent after investing all of his net worth into the project. If the right-hand side is negative, all projects with a positive net present value can proceed.

A capital poor agent will always have projects with a positive net present value that it has to be rejected because the firm does not have enough capital. Both motivations of investment and required reserves bear a striking resemblance to dynamics of comparative statics. Research on investment in comparative statics is still in its early stage, as the brevity of the bibliography attests. It may heighten by filling with two aspects: (1) insured amount and (2) parameterization.

Disputably, the investment is not prominent in satisfaction. As is well known, it is assumed that more consumption is always better for the consumer in the sense of increasing his or her utility. However, it is not a same token for investment. Investors demand high-yielding investments to increase utility. The point is that a regulator cannot go to some lengths to establish the utility of investment before revealing the profit. Taking up this issue, insured investment amount can partake of investment in comparative statics.

In applying insured investment to move toward statics, nonpledgeability is closely fetched for being moved of insured investment. Here by, required reserves have a positive precautionary value but it is not *independent liquidity*. Capital adequacy can require illiquidity more than demand deposit. The shortfall, difference between demand deposit

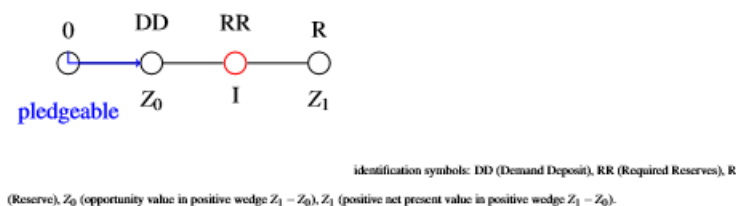


Figure 2.1: Pledgeable Demand Deposit (DD) and a Positive Wedge $Z_1 - Z_0$ (rent)

and required reserves, must be secured by deposit insurance to prevent the bank run (or covered by claims on the market value of domestic assets in commercial banks). Such an intuition offers how we can figure a commercial bank's a fixed reserve scale from an individual problem.

Taking into account the fixed investment scale from Z_0 to Z_1 , it can be extended to the scale from Demand Deposit (DD) to Reserves (R):

It bases categories on the juxtaposition of a series of contrasts of exogenous constraints on payouts and another one based on *endogenous* constraints. Here, for example, exogenous liquidity backs up the amount relevant to a precautionary aim as a maximized whole that only the central bank can enjoy, such as the potentiality of lending on a future loan project or increased loan position status. In the second category, compulsive hoarding should be feasible to pay out projects having profitability. It reduces excess of central banks and the reduced portion is distributed to consumers and producers by commercial banks.

Seen from this point of view, required reserves are tantamount to insured investment as being fixed but also casting itself in the role of nonpledgeability in case of bankruptcy. Consider a commercial bank with precautionary reserves which is bigger than demand deposit claimed by depositors in commercial banks. Our starting point for the certain investment scale of a commercial bank is:

$$R > RR > DD > 0. \quad (2.8)$$

There are various reasons why commercial banks cannot have larger demand deposits than reserves, that is, why there is a *positive wedge* (commercial banks' *precautionary reserves*), $R - DD > 0$. By borrowing the concept of optimal rent, $Z_1 - Z_0 > 0$ which can be an interval to sustain the trajectory of investment, we can put explanation into two general categories: one based on *exogenous* constraints on required reserves and another one based on *endogenous* constraints. The prime example of exogenous constraints is the cost of insurance on deposits that commercial banks should pay, such as certain amount of demand deposits per household should be secured by insurance. Likewise, accumulation of reserves is potential strength to prevent solvency risk by showing the high level of solvency. A related intangible benefit is derived from risk aversion when it comes to continue on-going banking business. As will become obvious from the continued discussion, the uncertain investment scale is:

$$DD > R. \quad (2.9)$$

However, depositors do not value precautionary reserves. It might be in a sense of financial

regulation. There is possibility that banks drive risk-taking business, such as asset-liability mismatch that a bank might borrow money by issuing floating interest rate bonds, but lend money with fixed-rate collateral. If interest rates rise, the bank must increase the interest rate paid to its bondholders, even though accrued interest on its collateral has not increased. If source of liquidity in liabilities is riskier than one in assets, evidently, demand deposit is excessive than reserves. For these reasons, this study does attempt to interpret demand deposit as a medium to identify a commercial bank's problem from an individual's problem. Therefore, viewed in this light, loan for investment is itself a scaled assembly of prudential collateral, risk neutral interest rate margin and demand deposit hedging in uncertainty.

In what follows, the question about meaning of excess reserves ultimately hinges on the shift from risk aversion, $R > RR > DD > 0$ to risk taking, $DD > R$.

By applying this challenging conceptual approach to the subject, Saxegaard (2006) illustrates about holdings of precautionary (\leftrightarrow inflationary potential) reserves in the country having a contraction in the supply of credit by banks because of poorly developed interbank market.

More to the immediate point, excess liquidity ³ is equated to the quantity of reserves deposited in the central bank by commercial banks plus cash in vaults in excess of the required statutory level. Hence, increasing deposits in the private sector stimulates commercial banks to hold excess liquidity in a sense of insuring themselves against shortfalls in liquidity defined as: ⁴

$$Excess\ Liquidity(EL) = Excess\ Cash + Excess\ Reserves(ER). \quad (2.10)$$

In the light of above equations, excess liquidity (EL) is holding-loss reserves which should be liquid to maximize satisfactions of consumers and profits of producers. We've assumed monetary status of consolidated commercial banks (except for a central bank) in three assumptions. Firstly, consolidated commercial banks hold excess reserves which are not inserted into required reserves. Secondly, a reserve requirement can be between 1% and 10%. Thirdly, the borrowed money is deposited into a checking account at another bank that is not any of the previous banks. Within precautionary reserves such as Reserves (R) > Demand Deposit (DD), the problem is the fixed-scale of Reserves (R) and Demand Deposit (DD) as below:

$$RR = m \times DD \quad [1\%, 10\%]. \quad (2.11)$$

Considered in this framework, the argument on the investment scale should be newly defined above 10%. Liquidity creation has two sides of a coin about riskiness. It can be argued for liquidity creating riskless and causing the problem in risky asset markets (Gorton and Pennacchi, 1990). Otherwise, borrowing and lending are permitted but constrained (Kehoe and Levine, 2001).

Because of non pledgeability of required reserves (RR) in case of bankruptcy, pledgeable demand deposits (DD) can be marked by $RR - DD > 0$, required reserves (RR) will be required for strict positive net present value in banks. Let A be excess liquidity of capital

³(Saxegaard, 2006)

⁴this equation is defined in the case of Sub-Saharan Africa on a quarterly basis of IMF data from the first quarter in 1990 to the fourth quarter in 2004

at the vortex of precautionary aim.

$$A \geq \bar{A} \equiv RR - DD > 0. \quad (2.12)$$

The lower bound \bar{A} on liabilities and equities of banks invites a reading on several levels of understanding. The negative effect of the lower bound \bar{A} is achieved by increasing of demand deposits (DD) comparably than required reserves (RR), $DD > RR$. Commercial banks need to extend their deposit level paralleled to demand deposits (DD). On the other hand, central banks decide a reserve requirement for commercial banks. Admittedly, the lower bound \bar{A} is *credit-rationed*. That is to say, credit rationing (Jaffee-Modigliani, 1969) is excess demand for commercial loans at the ruling commercial loan rate. Just as certain stability can be indexed by enough reserves, so does a sudden reserve shortage reflect uncertain demand deposits.

As following, using two different indices stands to reason that for certain outcome in a demand deposit (DD) index, how far demand deposits are bigger than reserves, for uncertain outcome, within the scale of demand deposits, where reserves are located. Otherwise, for certain outcome in a required reserve (RR) index, how far reserves are bigger than required reserves, for uncertain outcome, within the scale of reserves, where required reserves are located.

	certain outcome	uncertain outcome
DD index	$\frac{DD - R}{R}$	$\frac{DD - R}{DD}$
DD (Demand Deposits)	R (Reserves)	
RR index	$\frac{R - RR}{RR}$	$\frac{R - RR}{R}$
RR (Required Reserves)		

Tables 2.1: A demand deposit (DD) Index and a required reserve (RR) Index

2.4.1 Overnight Loan Investment

For example, demand deposits of commercial banks contain loans, excess reserves and required reserves. excess reserves can pay demand deposits incurred by loans. The composition of excess reserves and loans can be arranged. All in all, central banks have commercial bank reserves as liabilities. In some specific cases, required reserve rate is the percentage of deposit in demand deposits. At all events, the amount of reserves should cover demand deposits according to credit rationing. A commercial bank is an *overnight interbank interest player* in a case of

$$A < R - DD. \quad (2.13)$$

Why would a commercial bank hold excess reserves at the central bank? The motivation to hold excess reserves has relevance to make more networks between small banks and a big bank. For example, a small bank Tiny has lent more money than they intended

$$0 \longrightarrow RR \xrightarrow{\rho_1} R(Z_1) \xrightarrow{\rho_0} DD(Z_0)$$

Figure 2.2: Excess Demand Deposits (DD) and a Negative Wedge $Z_1 - Z_0$ (rent)

so some of expected incoming funds did not arrive timely. A small bank *Tiny* faces the problematic situation of liquidity shortage to meet a reserve requirement which are supposed to be sent to the central bank. On the other hand, a big bank *Too Big Too Fail* has excess cash. A big bank *Too Big Too Fail* is supposed to lend to a small bank *Tiny*. An announcement “I lend you” by a big bank *Too Big Too Fail* executes an overnight wire so a small bank *Tiny* can meet reserve requirement at the end of day. Indeed, this overnight wire isn’t a wire of cash between banks. It is a wire of cash reserved in a central bank paralleled to loans of a small bank *Tiny*. Consequently, commercial banks’ excess reserves are involved in reserves of central banks. Generally speaking, bank size is maintained. For a small bank *Tiny*, a change of excess reserves in the composition of a balance sheet is less risky when it is involved in reserves of central banks.

In spite of rearrangement of on-balance sheet factors, excess liquidity has a positive value than the low bound \bar{A} because excess liquidity contains cash vaults and ATMs beyond excess reserves.

$$R - RR \geq R - RR - A, \quad (2.14)$$

In spite of easy deduction with excess liquidity A , being able to transfer cash payoffs does not imply that utility is transferable: wealthy and poor players may derive a different utility from the same amount of money. If capital is credit rationed at the low bound \bar{A} , the utility payoff U of banks shows satisfaction about funding value to hold excess liquidity A depending upon utility jumps at $A = \bar{A}$.

$$U = \begin{cases} A + R - RR, & \text{if } A \geq \bar{A} , \\ A, & \text{if } A < \bar{A} . \end{cases} \quad (2.15)$$

To put it differently, the difference between excess liquidity A and the low bound \bar{A} implies the tolerance level of excess cash. The candidate to achieve the low bound \bar{A} ($=RR - DD$) can be proper amount of cash holdings. Because required reserves are various, I am puzzling on the important scale between *precautionary reserves* and the decision to hold excess funds for hedging liquidity confronting risky situation like wars and terrors which is different at each country. In case of only A left in the payoff utility if $A < \bar{A}$, that is $DD - RR > 0$, banks want to bet more on *hazardous liquidity* A . Simultaneously, the risk-averse bank turns into the risk-taking investment plan.

The moral hazard problem occurs when the poor status of borrowing banks is neglected by lending banks. Let $A \equiv DD - RR > 0$ be the scale of the *hazardous liquidity*, let ρ_0 be the total expected return of pledgeable $DD - R$, and ρ_1 the return of excess $R - RR$, both measured per unit invested.

identification symbols: RR (Required Reserves), R (Reserves), DD (Demand Deposits)

Thus, A results in a total payoff $(\rho_0 + \rho_1) \times A$ of which ρ_0 can be pledged to outside

investors. The residual $\rho_0 \times A$ is the minimum rent of overnight investment plan to the bank.

$$\begin{cases} \rho_1 &= p_H \times R, \\ \rho_0 &= p_H \times (R - \frac{B}{\rho_0}), \end{cases} \quad (2.16a)$$

where p_H is denoted as the probability of success, B as the return of a bad plan and R as return.

The rational bank expects the return from overnight investment plan. Hence, we get:

$$0 < \rho_1 < 1 < \rho_0. \quad (2.16b)$$

Consequently, the bank has the minimum illiquidity ratio:

$$1 - \rho_1, \quad (2.16c)$$

Maximum betting level for excess liquidity investment plan is:

$$\frac{A \equiv DD - RR}{1 - \rho_1}. \quad (2.16d)$$

and gross payoff is:

$$U^g = \frac{(\rho_0 - \rho_1) \times A}{1 - \rho_1} = \mu A, \quad (2.16e)$$

where

$$\mu \equiv \frac{\rho_0 - \rho_1}{1 - \rho_1} \quad (2.16f)$$

2.4.2 Compound Concern in Credit Rationing

Assumed that required reserves are monotonically increasing. Merit discussion focuses on similar monotonic increasing nonlinear line of endogenous variables. A further point needs to be made with fixed scaled shocks impacting on the trend line of guided criteria. We shall check whether endogenous variables are comparably statics following the guided trendline with shocks or not. I begin with two properties:

$$\begin{cases} \text{counter-monotonicity} : 1 < |\rho| \\ \text{comparability} : \rho < \rho_1 \end{cases} \quad (2.17)$$

Let X (= Demand deposits) be partially ordered sets. x is comparably static in partially ordered sets T of parameter t (= shocks) by a function $f : X \times T \rightarrow \mathbb{R}$. If for all $x' > x^*$: whenever $f(x', t^*) \geq (>)f(x^*, t^*)$, then

$$f(x', t') \geq (>)f(x^*, t'), \quad (2.18)$$

for all $t' > t^*$. Simply put with counter-monotonicity and comparability as below:

$$\overbrace{0 < \rho_1} < \overbrace{1 < \rho_0 < |\rho|}. \quad (2.19)$$

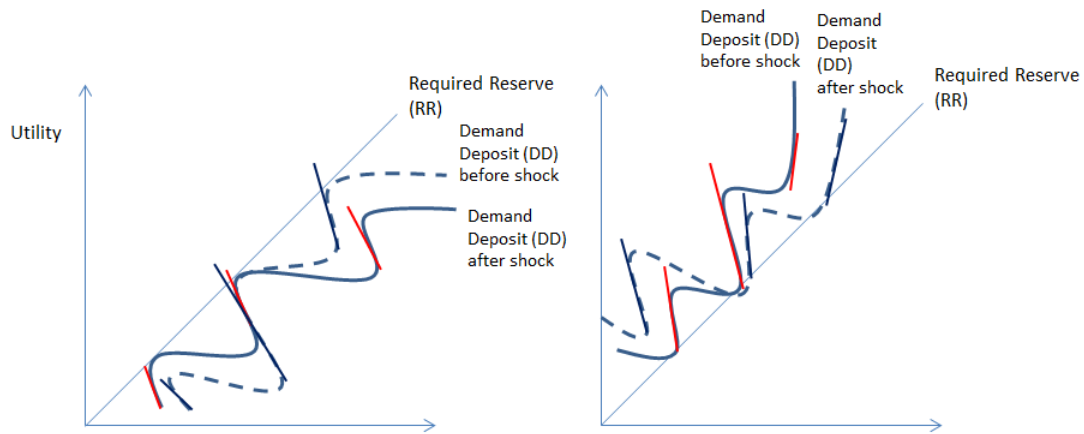


Figure 2.3: Comparative statics in investment (Negative credit rationing (Left) and positive credit rationing (Right) ⁵

The order-theoretic single crossing property of Milgrom and Shannon (1994) in the theory of comparative statics is useful for verifying when the required level in regulation is monotonically increasing. Hereby, endogenous variables are demand deposits and an exogenous parameter is shock as below:

DEFINITION (single crossing property) Let endogenous X (demand deposits) and parameter T (shock) be partially ordered sets. A function $f : X \times T \rightarrow \mathbb{R}$ is said to satisfy the single crossing property in $(x; t)$ if for all $x' > x^*$: whenever $f(x', t^*) \geq (>) f(x^*, t^*)$, then $f(x', t') \geq (>) f(x^*, t')$ for all $t' > t^*$.

Clearly, the slope which has the flow and following the trendline of guided amount is not moving upward entirely:

Comparative statics in investment is the comparison of two different pledgeable portfolios, before and after a change of an exogenous shock within fixed scale by credit rationing in a sense of liquidity and illiquidity:

$$\underbrace{1 + \rho}_{\text{illiquidity to support } \rho_1} < \rho_1. \quad (2.20)$$

Here by, credit rationing is specified in the gap between insured amount and parameterized amount: pledgeable demand deposits and required reserves. Excess liquidity composed by excess reserves is a kind of a shock. The exogenous shock is measured by demand deposit index and required reserve index obtained by credit rationing.

To reach an easier understanding of credit rationing, assume that required reserves (RR) of a bank is monotonically increasing. Certainly, the aim of soft regulation is to check comparatively statics to sufficiently follow the trend of guideline, not a limitation of specific guideline about an amount. The credit scale contains the counter-monotonic part

restricted by redlining between Reserves (R) and Demand Deposits (DD).

$$\left\{ \begin{array}{l} 0 \rightarrow \rho_1 \rightarrow \rho_0 \\ 0 \rightarrow Z_0 \rightarrow Z_1 \\ \underbrace{RR \xrightarrow{\text{moving point}} R \xrightarrow{\text{redlining}} DD}_{\text{credit scale}} \end{array} \right. \quad (2.21)$$

Therefore, when we check the change when the slope is increasing, the change before shock and one with shock increase. However, the change is not beyond the required reserve line. Change is comparably statics but it shows increasing is vigorously continuous along monotonic increasing of criteria for regulation. There remains a range of problems to be tackled because shocks in investment have comparatively statics so it can be nonlinear motions but the lending contract has the fixed term which can be seen in the linear approximation.

2.4.3 When Beliefs are Formed Enough to Effect on Decision Procedures

Remark that each borrower (it can be a country) has the incomplete structural representation:

$$U = \begin{cases} A + R - RR, & \text{if } A \geq \bar{A} , \\ A, & \text{if } A < \bar{A} . \end{cases} \quad (2.22)$$

The preference structure becomes the choice structure when a loaner can answer “Yes” or “no” for the loan request of each borrower. My puzzle is moving on a measure of a consequence of different borrowers having different probabilities of repaying their loan. Apparently, preferences can only depend on the consequences (c_1, c_2, \dots, c_n) . Degenerated lotteries are also equivalent. Compound lotteries $(L_1, \dots, L_k; a_1, \dots, a_k)$ ⁶ is the risk alternative that yields the simple lottery l_k with probability a_k for $k = 1, \dots, K$, given K simple lotteries $l_k = (p_1^k, \dots, p_N^k)$, $k = 1, \dots, K$ and probabilities $a_k \geq 0$ with $\sum_k a_k = 1$. Here by, summation of equivalent lotteries $\sum_k a_k$ should be 1.

It might be useful to explore on methodology part about utility function in incomplete structural representation. For example, in a model of multi-valued prediction (Jovanovic, 1989, discrete form game) u is latent variable, θ is a parameter in the payoff matrix, S is the set of (pure) strategies, and $G(u | \theta)$ is the set of Nash equilibrium (pure) strategy profiles for given u and θ . Then, this issue can be enlarged to question about solutions for multiple equilibria: sub-correspondence, rationalizability, samples converge (ergodicity) or classical central limit theorems. Still, a crescendo of this methodological puzzling is why θ is given at the beginning.

For the issue of utility function in incomplete structural representation, initially I begin with decisions when the number of possible outcomes or “states” is finite. A regulator (decision maker) then indicates the choice structure θ to each state. Let L_θ be the consequence in complete structure θ . Also, let $1_\theta(L)$ be the indicator that the individual

⁶MWG, session 6B

assigns to this complete structure θ :

$$\begin{cases} \exists l_\theta(L) \rightarrow \theta, \text{ where } 1_\theta : L \rightarrow \{0, 1\} \text{ as,} \\ 1_\theta(L) := 1, & \text{if } L \in \theta, \\ = 0, & \text{if } L \notin \theta. \end{cases} \quad (2.23)$$

Then the uncertain outcome or “prospect” is the $2 \times \theta$ vector:

$$(L_\theta; 1_\theta(L)) = ((L_1, \dots, L_\theta); (1_\theta(L), \dots, 1_\theta(L))). \quad (2.24)$$

Under the axiom of choice (if you have one side of a pair of shoes, your choice on another side of a pair is obvious in the binary choice) on two uncertain outcomes, there exists a continuous utility function $U(L_\theta; 1_\theta(L))$ over prospects.

2.5 Incomplete Structural Representation in Two Villages

2.5.1 Selected Liquid Characteristics of Village I and Village II

Having outlined the institutional context dealing with different countries, the discussion now turns to the real economy. The most required question is if there is a certain international institution, how we can decide either yes or no about the liquidity funding in the financial regulation. In order to provide a framework for more detailed consideration of credit rationing, it will be helpful to compare two villages. There is a marked contrast between a village I holding small reserves (reserve ratio 7%) and a village II holding excess reserves (reserve ratio 30%). To a great extent, within the outside liquidity system, both village I and village II are conceived of excess liquidity (2427, 14550): \equiv currency issued (2027, 400, current USD, million) + excess reserves (400, 14150, current USD, million).

For one thing, excess reserves (14,150) and reserve money (15,000) in Village II is higher than in Village I (400, 2610). It can be puzzled if domestic credit to private sector by banks to GDP in Village II is higher than Village I. It bears the imprint of importance to make an attention on two criteria to understand excess liquidity: $R < DD$ or $DD < R$. This may in part be due to pledgeability of demand deposits, illiquidity of reserves and more liquidity of demand deposits are emphasized by contrasting two different liquidities. The comparison is partially developed in creditability judged by expectation of investors.

(Current USD, million)	Village I	Village II
Outside Liquidity in domestic currency, liabilities		
currency issued	2,027	400
required reserves	183	450
excess reserves	400	14,150
reserve money	2,610	15,000
demand deposits, commercial banks	3,400	1,000
excess liquidity	R < DD	DD < R
Inside Liquidity		
overnight deposit window rate	2.75	2.75
credit rationed A	-790	11,972
domestic credit to private sector by banks to GDP (%)	70	99.2
net commercial bank lending and other private credits	250	-43

Tables 2.2: Selected Liquid Characteristics in Village I and Village II.

Insofar as credit rationing going to two different lengths is concerned: insured and parametrized in the optimum, an endogenous liquidity model still calls attention to the central problem as to satisfy the goal of investors by insured and parameterized comparative statics of optimal investment values.

The question has been raised in comparative statics as to whether investors increase the amount of investment or not. Our concern is not with the increase of broad investment amount which can be credited but with insured and parametrized amount getting to the optimal value.

A richer analysis of the interdependence between excess liquidity and credit rationing components in the spread between pledgeable and unpledgeable amount for different countries can be carried out by considering the government policy rule changing the mix of assets held by the private sector through open market operations (Kiyotaki-Moore, 2012).

For example, a look at functioning of the economy by the central bank's balance sheet, Garreth (2015) argues on impact of central bank collateral choices in Bank of England caused by the Asset Purchase Facility (APF) reaching 375 billion by late 2012.

There can be little doubt that offset in the same composition is always possible in the changeable composition. The change of positioning in the same frame figurative as the change of a composition carries articulation of flows. By the way, this framework requires heavy emphasis on the proof that the value of investment has single-valued because the value can be representable in the balance sheet. The puzzle on offset among different values obtained by credit rationing sets the tone for investment having multi-dimensional valued regardless of on-balancesheet factors and off-balancesheet factors.

2.5.2 Composition of Liquidity

At the heart of credit rationing lies the conception of the liquidity composition. In relation to what I have previously said that Village I and Village II are having excess liquidity as far as excess cash and excess reserves concerned. In detail, even though the measurement of excess cash is not easy, Village I are having excess reserves than required reserves ($400 > 183$). Likewise, Village II are having excess reserves than required reserves

as well as Village I ($14150 > 450$). By the way, a closer look at the composition with credit rationing, demand deposits - required reserves ($-790, 11972$) gives a different answer.

Village and Liquidity Composition	Credit Rationing, I : $-(DD-R)$ II: $RR-DD$	Certainty, excess liquidity I: $(R-RR) \div R$ II: $(R-RR) \div RR$	Precautionary Level	Uncertainty, inside liquidity I: $(DD-R) \div DD$ II: $(DD-R) \div R$
Village	Village I, II	Village I, II	Village I, II	Village I , II
currency issued	2027, 400			
required reserves	183, 450			
reserve ratio	7% , 30%			
excess reserves				400, 14150
reserve money				2610, 15000
demand deposits	3400 , 1000			
credit rationing	-790 , 11972			
$(R-RR) \div RR$		93 % , 233 %		
Level Index			-7 % , 133 %	
$(DD-R) \div R$				23%, -93 %

Tables 2.3: The Precautionary Level in Liquidity Composition.

identification symbols: DD (Demand Deposits), R (Reserves), RR (Required Reserves)

Seen in the perspective of an asset-liability match, demand deposits exerted a strong influence on reserves. It is not seem to rash to suggest required reserves as a percentage of net demand deposits held in commercial banks by customer. Demand deposits against reserves is total demand deposits less “due from” (Allen, 1956). No single explanation can account for the single driver to describe the change of reserves with credit and demand deposits. However, Several assumptions are worth to be mentioned for the sake of financial regulation.

It is not unreasonable to postulate that credit rationing is differently interpreted as a transaction holding a liability (Henderson, 1960), reserve credit (Allen, 1956) and a monetary instrument (Siegel, 1981). It can be a transaction (Henderson, 1960) for a borrower occupied by the federal funds absorption ratio of a financial liability defined as the amount of federal funds which directly and indirectly support a one-dollar public holding of the liability. As a matter of the fact, a country bank allows a reserve city bank with different reserve requirements by shifting interbank deposits depending upon reserve credit (Allen, 1956) because total reserves is not changed and only distribution among banks by shifts in interbank balances. Additionally, as a monetary instrument, optimal reserve requirement on demand deposits (Siegel, 1981) controls the value of monetary aggregates.

As a closer look at the composition of Village Liquidity, credit rationing of Village I ($R < DD = -790$) is negative and on the other hand, Village II ($R > DD = 11972$) is positive. It indeed may be said with safety that motivation to hold liabilities excessively is purely surplus reserves in 1930 without any economic purpose caused by lack of good loan opportunities. After crisis 2007, good loan opportunities hinges on a series of remedies in a bad economic situation up to one country and more.

Passively accumulated excess liquidity is not merely explained by the conservative banking

system. At the same time, as a meaning of proper loan commitment, it is no less dubious to connect that the bank behavior in the uncertain situation should be viewed with reservation. It is no wonder the motif to hold excess liquidity is good reason to show credit facility to induce good loan opportunities and obtain safer investment return by overnight interest. This motivation requires a quite logical explanation with small sample of reserves in a vulnerable economy.

2.5.3 Reserve Choice and Liquidity Control

A reserve requirement (or liquidity ratio) varies. As well as investment, the minimum value of reserves is set through the composition of demand deposits and currency. Even though monetary policy works by varying the quantity of money using the reserve requirement and it can become positive as an instrument to make the balance of an economy, some countries having a zero reserve requirement, for example in Canada, the UK, New Zealand, Australia, Sweden and Hongkong, cannot be explained by the monetary policy implication as a whole. Furthermore, since quantitative easing began in 2008 in United States, an enormous amount of excess reserves exists, in this perspective, a reserve requirement is not merely monetary outcome but it appears likely to us that it's ongoing nature in the investment scale. After financial crisis in 2007 up to now in 2017, the motif to change the reserve choice doesn't bear a striking resemblance.

As a first step, the total reserve ratio has strong overtones of non-required reserve holdings. Two different reserve requirements 30% in Village II and 7% in Village I bear uniformed non-required reserve holdings during simulated 10 years as of $70\% = 100\% - 30\%$ in Village II and $93\% = 100\% - 7\%$ in Village I. The comparison of only different reserve requirements may not offer the clearest proof for precautionary holding of excess reserves. The methodology to measure a reserve requirement in Eurozone is more complex in comparative politics terms after Eurozone cuts as of 1% in 2012 from 2%. Given the fact that almost all financial requirement on reserves in Eurozone countries are uniformly implemented by the same redlining. This shouldn't hardly be surprising in the constraint of each country's loan accessibility.

However, it is still expected to be effective as a policy instrument. For example, China cuts bank reserves as of 17.00 % again to counter slowdown as of 29 February 2016.

Village II									
YEAR	R	DD	30 % RR	RR/DD	R-RR	(R-RR) ÷ R	(R-RR) ÷ RR	(DD-R) ÷ R	
1	15000	1000	4500	450 %, certain	10500	70 %	233 %	-93 %	
2	15000	1100	4500	409 %, certain	10500	70 %	233 %	-93 %	
3	15000	1200	4500	375 %, certain	10500	70 %	233 %	-92 %	
4	15000	1300	4500	346 %, certain	10500	70 %	233 %	-91 %	
5	15000	1400	4500	321 %, certain	10500	70 %	233 %	-91 %	
6	15000	1500	4500	300 %, certain	10500	70 %	233 %	-90 %	
7	15000	1600	4500	281 %, certain	10500	70 %	233 %	-89 %	
8	15000	1700	4500	265 %, certain	10500	70 %	233 %	-89 %	
9	15000	1800	4500	250 %, certain	10500	70 %	233 %	-88 %	
10	15000	1900	4500	237 %, certain	10500	70 %	233 %	-87 %	

Village I									
YEAR	R	DD	7 % RR	RR/DD	R-RR	(R-RR) ÷ R	(R-RR) ÷ RR	(DD-R) ÷ DD	
1	2610	3400	183	5 %, uncertain	2427	93 %	1329 %	23 %	
2	2650	3500	186	5 %, uncertain	2465	93 %	1329 %	24 %	
3	2690	3600	188	5%, uncertain	2502	93 %	1329 %	25 %	
4	2730	3700	191	5%, uncertain	2539	93 %	1329 %	26 %	
5	2770	3800	194	5%, uncertain	2576	93 %	1329 %	27 %	
6	2810	3900	197	5%, uncertain	2613	93 %	1329 %	28 %	
7	2850	4000	200	5%, uncertain	2651	93 %	1329 %	29 %	
8	2890	4100	202	5%, uncertain	2688	93 %	1329 %	30 %	
9	2930	4200	205	5%, uncertain	2725	93 %	1329 %	30 %	
10	2970	4300	208	5%, uncertain	2762	93 %	1329 %	31 %	

Tables 2.4: The liquidity composition in the Village II and Village I

identification symbols: DD (Demand Deposits), RR (Required Reserves), R (Reserves), EL (Excess Liquidity)

On the surface, excess reserve can be a result from a policy. A closer look at the structure as below gives an enforced answer to solve this problem about absence of comparable redlining in financial regulation.

Something similar may be observed in the total reserve ratio defined as required reserves plus non-required reserves to demand deposit, $\frac{RR + (R - RR)}{DD}$. It carries the total reserve ratio omitted the analysis of required reserve ratio. Even if the attention on “RR/DD” is regulated at same lower rate as of 5%, how we can interpret the ratio of $(DD - R) \div DD$ varies. I lay heavy alert that this reserve ratio analysis should not be partial only by the reserve ratio. which is not representing the risky behavior. In brief, what we get from this table is, in Village II, the ratio “RR/DD” fulfills a pledgeable reserve level which has negative in $(DD - R) \div R$. On the contrary in Village I, even though non-required reserve ratio such as $(R - RR) \div R$ is stabilized as of 93%, the investment scale such as $(DD - RR) \div DD$ increases.

2.5.4 Utility Function in Incomplete Structural Representation

Given a structural parameter $\theta \in \Theta$ and the realization $u \in U$ of an unobservable random variable, the model predicts a nonsingleton set, denoted $G(u \mid \theta)$, of values for the outcome

variable, that is $G(u \mid \theta)$ is a subset of the (finite) outcome space S . The question (Epstein-Kaido-Seo, 2016) is on how the realized outcome s is selected from $G(u \mid \theta)$. Obviously, the object of interest is θ .

Considering the set of all lotteries or prospects over the fixed outcome levels $L_1 < L_2 < L_3$, which can be represented by the set of all choice structure triples of the form $\Theta = (\theta_1, \theta_2, \theta_3)$, we can represent these lotteries by the points in the unit triangle in the (θ_1, θ_3) plane. Since upward movements in the triangle increase θ_3 , the risky movements are all northwest movements. For $\theta_3 > 1$, it's possible but we assume there is limit of cognition as of $0 < \theta_3 \leq 1$ by a regulator. The value is revealed when preference structure u is corresponding θ -parametric choice structure Θ :

$$G(u \mid \theta_1 + \theta_3) \in \Delta(S), G(u \mid \theta_2) \notin \Delta(S). \quad (2.25a)$$

Let's say we assume that we have three points (lotteries, probabilities). If a lottery is utility-representable, a lottery is θ -parametric structural which is complete in the choice structure.

$$\mathcal{P}_\theta = \left\{ P \in \Delta(S^\infty) : P = \int_{U^\infty} P_{u^\infty} dm_\theta^\infty(u^\infty) \right\}. \quad (2.25b)$$

If the preference of a lottery is not revealed in the θ -parametric structure, we get certain decision procedure which is not interesting for a rational agent who is affording to get risk-taking outcome:

$$\mathcal{P}_{\theta^c} = 0. \quad (2.25c)$$

$G(u \mid \theta_1 + \theta_3) \in \Delta(S)$, $G(u \mid \theta_2) \notin \Delta(S)$ in the case of certain second outcome. Again, there is possibility of $G(u \mid \theta_3) \notin \Delta(S)$ in the extreme case of risky preference on uncertain third outcome.

Compound convergences in this model is assume that u^∞ jointly follows a parametric compound convergence m_θ^∞ , the i.i.d. product of the compound convergence

$$m_{\theta_1+\theta_3} \equiv \left\{ \frac{Z_1^1 - Z_0^3}{A^1}, \frac{Z_1^1 - Z_0^3}{A^3} \right\} \in \Delta, \quad (2.25d)$$

defined as “redlining in credit rationing” on U . For sure, an initial clue to this framework is that markets play allocations. The redlined group of borrowers who cannot obtain credit with a given supply of loanable funds are observed separately. Of special interest is that we can discuss global imbalance in a more convincing way than the financial autarky which is restricted in the scope of balance of savings and investment automatically represented as the supply and demand of loanable funds.

lotteries are degenerated at the same portion in a von Neumann-Morgenstern utility function. Simply from this viewpoint, preferences can only depend on the consequences (c_1, c_2, \dots, c_n) and their respective probabilities (p_1, p_2, \dots, p_n) . A utility function $F(c_1, c_2, \dots, c_n; p_1, p_2, \dots, p_n)$ (by attaching numbers to indifference curves, where a curve corresponding to a higher level of preference gets a bigger number) pictorized in the indifference map as below:

$$EU(L) = p_1 u(c_1) + p_2 u(c_2) + \dots + p_n u(c_n), \quad (2.26a)$$

where $F(=\text{constant})$ exists by the indifference map consisted by contours. To facilitate the previous argument, the incomplete structural utility representation is here by:

$$EU(L) = 1_\theta \cdot G(u \mid (\theta_1 + \theta_3)) + 1_{\bar{\theta}} \cdot G(u \mid \theta_2). \quad (2.26b)$$

My aim is to add a new perspective to a case of continuum project. This framework shows nonmonotonicity of expectation in a framework of an incomplete risk-taking behavior. It provides an overview of convergence of risk-taking behavior than the solution of average riskiness by mean return reverting by loan interest in a sense of mean preserving spreads.

2.5.5 Risk Preference in Triangle

In the decision theory, a decision maker must select one alternative. The alternative can be act, course of action, strategy and so on. Whatever it is, one alternative is selected from a recognized set of decision alternatives. In case of a regulator, especially in financial regulation, decision can be done from a recognized set, however it can be done from a non-recognized set. Every year, a regulator can start his decision conditional to similar preference structure but decision is limited within cash-equivalent redlining.

Consider the simplest situation with three-outcomes. If one is certain, a regulator doesn't need to grasp that problem. Always there are two outcomes in his hand that he need to decide by a binary decision.

A regulator can control the interest rate at the omniscient-director point of view and also, he can offer the loan opportunities to agents, loan players and a representative central bank. However, his power is not directly inserted in the model. When the agent and a regulator have the same preference axiom, the agent only can see his concern between uncertain prospects f and g . On the other hand, a regulator might have more contingent preference ⁷ with the cash equivalents C_f and C_g such as:

$$C_f \sim f \succ g \sim C_g \succ C_f \quad (2.27)$$

The redlining C_G for regulation can be laid between C_g and C_f . The difference between C_G and C_f is revealed by a regulator such as:

$$C_G < C_f \quad (2.28)$$

For example, let's come back to the problem of Village I. An agent can have more contingent preference that Demand Deposits are bigger than Reserves such as $C_g \succ C_f$. By a regulator, Reserves should be preferred to Demand Deposits such as $f > g$.

Let's say realized outcome $\theta_1 = \frac{C_f - C_G}{C_f}$ and $\theta_3 = \frac{C_g - C_G}{C_g}$ selected from a regulator's decision structure $G(u \mid \theta)$. Graphically, we can illustrate the northwest movement in the unit triangle in the (π_1, π_3) plane. Two prospects over the cash-equivalents $(\theta_1 = \frac{C_f - C_G}{C_f}, \theta_3 = \frac{C_g - C_G}{C_g})$ are revealed by each probability, $\pi_1 = 1, \pi_3 = 1$. This movement is stochastically dominant than the problem of Village II having a bet the origin point in the (π_1, π_3) plane representing the probability = 0 since this choice

⁷This is deeply inspired by one agent's problem (Kopylov, 2016)

Figure 2.4: A Point-wise risk behavior in incomplete structural triangle

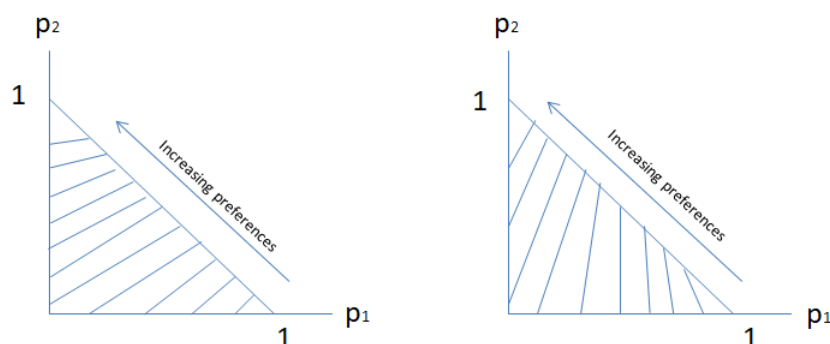


Figure 2.5: A Component-wise risk behavior in incomplete structural triangle

structure revealed by certain outcome secured by pledgeability doesn't require the decision procedure.

To illustrate the preferred indifference curves, the slope in the (π_1, π_3) diagram is parallel to the indifference curve by a financial regulation concerning credit rationing. This implies that in order to know a risky behavior over the entire triangle and beyond the triangle, it suffices to know one point which is moving toward the northwest direction.

Briefly, we can figure out the increasing preference by the movement of the slope of indifference curves in Machina (1987) which is the component-wise consequence. Matching the iso-expected value lines to indifference curves by contingent preference defined by a regulator, risky behaviors are observed in the point-wise consequence.

2.6 Conclusion

Credit rationing is rationing of excess liquidity by risk preference on comparable statics of liquid investment. This study addressed two research questions: Firstly, the key question is how a subject of excess reserves in excess liquidity after the banking crisis of the early 1930s or 1970 can be re-identified in 2016. And secondly, it's necessary to offer new technique to measure risk preference for testing the cross-sectional data between economics and finance by applying theories about uncertainty. For one thing, *Excess liquidity* has simply deduced itself from required reserves in banks. By the way, if *Increasing credit rationing* at the precautionary level stand out from the gap of required reserves and pledgeable demand deposits, $RR - DD > 0$. Not the least of these is its mixture of styles, increasing credit rationing at the aim of investment is within fixed reserve scale, Reserves (R) - Demand Deposits (DD). Most obviously, *risk preference* in the triangle distinguishes between risky loving behavior inside of a triangle and risk aversion behavior at the origin. As has been noted earlier, comparative statics in investment is a richly detailed study of the nature of monotonic required regulation criteria. Especially important is hard regulation on increasing the precautionary level is impossible to quibble with increasing every level set above required level. Consequently,

the aim of soft regulation is to check comparative statics to sufficiently follow the trend of guideline, not a limitation of specific guideline about an amount. This technical result points to several promising applications for qualitative regulatory issues.

2.7 Annex

2.7.1 A Case Example: Lebanon

6.3. Village II (Lebanon)

identification symbols: DD (Demand Deposit), RR (Required Reserves), R (Reserve), EL=Excess Liquidity			
Year	DD-R/R	R-RR/RR, Precautionary Reserves	RR/DD, RR index (1-11th)
1993	-70%	233%,certain outcome	98%,10th(below 100%)
1994	-82%	233%,certain outcome	166,11th
1995	-85%	233%,certain outcome	204,11th
1996	-87%	233%,certain outcome	226,11th
1997	-89%	233%,certain outcome	267,11th
1998	-88%	233%,certain outcome	253,11th
1999	-87%	233%,certain outcome	237,11th
2000	-88%	233%,certain outcome	248,11th
2001	-92%	233%,certain outcome	354,11th
2002	-91%	233%,certain outcome	323,11th
2003	-95%	233%,certain outcome	661,11th
2004	-95%	233%,certain outcome	641,11th
2005	-96%	233%,certain outcome	678,11th
2006	-95%	233%,certain outcome	603,11th
2007	-95%	233%,certain outcome	554,11th
2008	-95%	233%,certain outcome	566,11th
2009	-95%	233%,certain outcome	663,11th
2010	-95%	233%,certain outcome	618,11th
2011	-96%	233%,certain outcome	667,11th
2012	-95%	233%,certain outcome	624,11th
2013	-95%	233%,certain outcome	593,11th
2014	-95%	233%,certain outcome	629,11th
2015	-95%	233%,certain outcome	650,11th

2.7.2 Jordan and Lebanon in the Middle East and North Africa region (MENA)



	Village I	Village II
Population (total)	7,416,083	5,612,096
GDP (millions, Current USD)	3,587	4,573
GDP per capita (Current USD)	4,830	8,148
commercial bank branches per 100,000 adults	19.85	29.84
Domestic credit to private sector (% of GDP)	70	103
Bank nonperforming loans to gross loans (%)	5.6	4
Bank capital to asset (%)	12	8

(Current USD, million)	Village I	Village II
Outside Liquidity in domestic currency, liabilities		
currency issued	5,886	400
required reserve	2,053	19,200
excess reserve	1,981	44,400
reserve money	9,920	64,000
demand deposit, commercial banks	12,684	3,028
excess liquidity	R < DD	DD < R
Inside Liquidity		
overnight deposit window rate	2.75	2.75
credit rationed A	-10,631	60,972
domestic credit to private sector by banks to GDP (%)	70	99.2
net commercial bank lending and other private credits	250	-43

Table 3. Selected Liquid Characteristics in 2014 ⁵

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Chapter 3 :

The Order-theoretic Single Crossing Property in a One-Dimensional Screening Model

Building off of Edlin and Shannon (1998), this note addresses monotone comparative statics (MCS), one of order-theoretical methods for the set of optimal choices. Supposed that the choice evaluates people's own preferences in a decision situation, it can be alternatives, consequences, commodity bundles, cash flows, system, allocations, inventory policies and strategies. In reality, it's not easy to reveal money values of those choices at every situation. An ordinal optimal choice rule does not rely on cardinal information about "intensity" of preference aggregation. For example, if there are two different outcomes in two different states, after parameters change, then there exist two newly ranked outcomes which are not same in two different states.

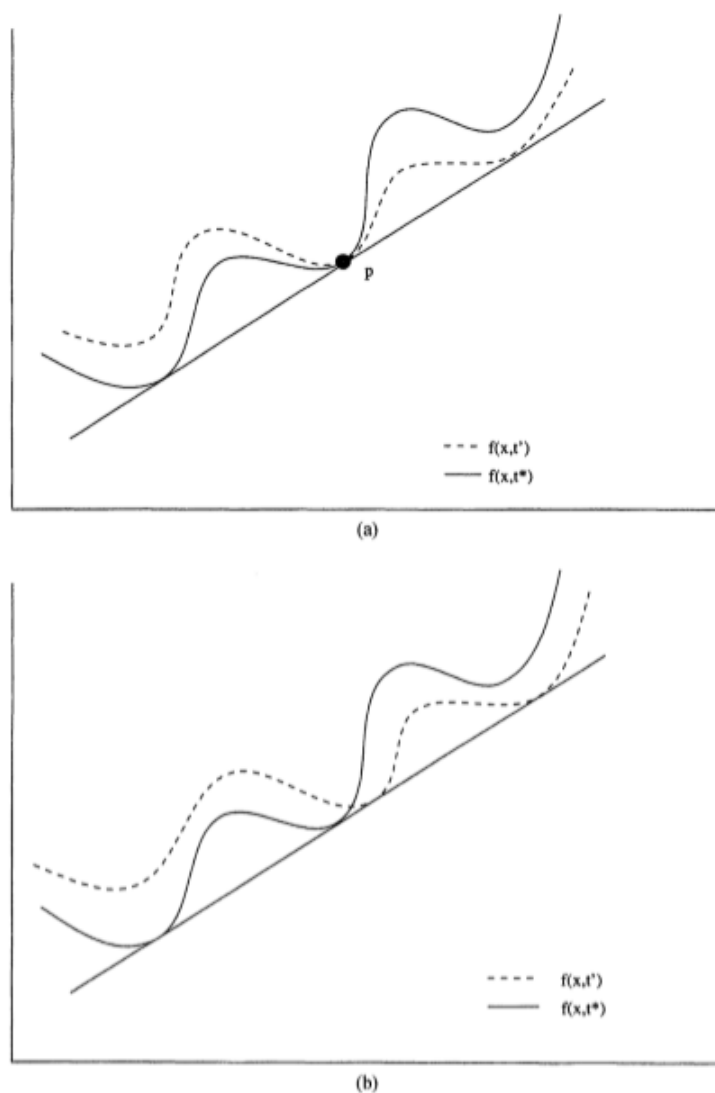
We imagine agents of two types-high and low, involved in an optimal contract, and one principal. The behavior of agents is considered by the principal within the implementable contract.

Since the principal does not know the true state of the world, he relies on actions of agents to cause the social value of production. Leaving aside the information parameter, the principal categorizes multi-dimensional action variables according to two types; an efficient type or an inefficient type. The aggregation of a one-dimensional (money) transfer is significant for the budget planning of the principal and the principal needs not offer agents a differentiable choice set, hence, we understand that separating behaviors cannot be inferred than pooling behaviors. By the way, technically, for some selections remaining constant over some ranges of parameters, we take the claim that the strict single crossing property is weaker than the strict Spence Mirrlees condition. Hence, in a 2-dimensional graph, the choice path, which is optimally selected in the X-axis, matches with each optimal equilibrium value in the Y-axis. After checking the increase of optimal selections before and after parameters change, then, the principal can ensure his decision of incentives is going in a right way.

We follow Edlin and Shannon (1998), who identified constant selections over some ranges of parameters in a 2-dimensional graph. For the first, an illustrative example, in the following figure 1, shows that strict comparative statics result from the strict Spence Mirrlees condition. If the strict single crossing property holds, every selection from the set of maximizers is non-decreasing. Nonetheless, some selections will be constant at points where the strict Spence Mirrlees condition fails. Note that the conjecture for the class of differentiable functions, the strict single crossing property implies that the strict Spence Mirrlees condition holds almost everywhere.

Edlin and Shannon's the second criterion is about differentiable separating equilibria. In pooling equilibria, it may be optimal to offer only one bundle when both types' indifference curves are tangent to the iso-profit set at the same point. This simultaneous tangency is possible, and may in fact be common, even though the strict single crossing property holds. In separating equilibria, the optimal contract involves selling higher quality to the high type than to the low type when the strict Spence Mirrlees condition holds, because the high type's an indifference curve is steeper than the low type's one at each point.

Edlin and Shannon's the main result is twofold. Level sets are path-connected by the strict single crossing property in the broad sense, and a monotonicity condition of the optimal contract is not conditional on a differentiable choice set of separating equilibria.



[Figure 1. Edlin-Shannon (1998)]

3.1 Introduction

To see that some selections are constant, consider one point p in figure 1a. We may focus on the property of the constant sign at the point p in the $[(x, f(x, t))] \equiv x^*(\theta)$ plane. We assume that the principal is able to determine the set of availability, e.g. add up different quantities in a contract or notice the same value of different choices to attain the equilibrium price. Graphically, we may illustrate the property of the constant sign where the choice x fulfills the monotonicity of quantities. Away from the initial value for the bounded variation, we can represent the interval having non-decreasing upward movements in values. It means in order to know the single crossing property in the increasing interval of $[(x, f(x, t^*))]$, it suffices to know the increase of $[(x, f(x, t'))]$ in figure 1a and 1b. By the way, it violates the Spence Mirrlees condition at the point p in figure 1a since the slope of each function is constant.

In theory of incentives, the principal wants to sign a contract with the agent. At the same time, for completion of a contract, the principal should understand how a menu of

contracts is incentive feasible to the agent. Therefore, the order-theoretic single crossing property of Milgrom and Shannon (1994), which can guarantee the existence of optimal choice order, is attractive to be true for the principal. If each local optimum moves up in preferences ordered by the agent, the principal can make the incentive as a dominated strategy for the agent. Each local optimum is path connected to preference-ordering.

The principal cannot be freely deviated from the first-best contract. However, if there is possibility of contract renegotiation for the implementation of a contract, since the principal tries to make a contract with the agent, hence the interest of the principal is how each local optimum increases in changes of parameters. Potentially, the global optimum decreases in changes of parameters.

In the other way, the agent wants to join in this contract as long as the monotonicity of quantities is fulfilled. Any pair of outputs satisfies implementation where the choice rule of the agent satisfies the monotonicity. In fact, the best response of the agent against the principal is constructed as complete information by implementation. Therefore, a change in preferences of the agent cannot destroy the equilibrium as long as the monotonicity constraint is fulfilled.

3.1.1 Without the Spence Mirrlees Condition

The Spence-Mirrlees condition is the sorting condition to check the marginal rate of substitution of the agent which is everywhere higher than another's one. That is, at any point in the function of quantities and types, the indifference curve for an agent with a higher parameter value has a greater slope. The condition can be traced back at least to Mirrlees (1971) or Spence (1974), the "differential" technology has been smoothed by Araujo and Moreira (2010). Actually, when it comes to say "without the Spence Mirrlees condition", the argument is not merely meant to differentiability of the objective function. It's a very complex issue related to the continuity of its derivative with respect to the parameter-types.

Before the parametrization, optimal multiple choices $\{x\}$ are ordered by the preference of a truth-telling agent. By the strong set order, we can order comparable elements and choices can be the optimal selection s finding the minimum before the parametrization and the maximum after the parametrization. Monotone comparative statics consider conditions under which the set of optimal selections s is done by $\operatorname{argmax}_{x \in X} f(x, t)$. That is, from the element to the selection by a function, it's subtle to say when multi-dimensional choices are to a one-dimensional solution.

Of course, we can squeeze to make the upper boundary-"upper envelope" $\sup_{x \in X} f(x, t)$ of the functions $f(x, t)$. However fundamentally, from the choice set to the selection, it's useful to say that the agent needs only one selection. Then, from selections to the optimal value, the principal who doesn't know about the type but he needs to know choices of the agent to figure out his preference ordering. Remark that the Spence Mirrlees condition can ensure the function is differentiable almost everywhere and can be represented as an integral of its derivative. Smoothly in an integral, the attempt by Araujo and Moreira (2010) is to permit marginal increases weighted by the density of pooling types i.e., when $\underline{t} = \bar{t} = t^p$, $\underline{q} = \bar{q} = q^p$.¹ Resumably, incentive constraints are

¹Technically, the admissible perturbation when the optimal choice is continuous and strictly monotonic at types, taking the Gateaux differential at 0 in the direction of the derivative.

trivially satisfied but participation constraints matter in bunching and pooling contracts. Hence, such as the Myerson-Satterthwaite multilateral bargaining model, the existence of a desirable mechanism depending upon relative sizes of the number of sellers and buyers is studied in Williams (table 1, p.170, 1999).

For example, we can see the global necessary incentive compatibility condition, so called as the U-shaped Curve (UC) solution, in following three situations: where contracts target that each type coincides, where the shadow value is positive with the binded non-local incentive constraint and where there are fewer and fewer higher types and therefore the distortion at the top vanishes.

The paper is organized as follows. Section 2 defines the informed principal and shows a principal's dilemma. The section 3 shows examples. The last section provides the case of re-negotiation for far-sight and myopic decision-making.

3.2 FRAMEWORK

3.2.1 The informed principal

Consider the problem of an informed principal:

$$\max_{\{(\underline{V}, \underline{q}); (\bar{V}, \bar{q})\}} v \cdot \underline{V} + (1 - v) \cdot \bar{V} \quad (3.1)$$

with agents' types $\{\theta, \bar{\theta}\} \equiv \{\text{high type, low type}\}$ allocated to v and $1 - v$ respectively in a sense of the von Neumann Morgenstern utility function and a principal's a utility function V subject to incentive constraints and participation constraints.

The principal, being informed of the agents's ex-post type, offers the contract at the ex-ante stage. We ignore the principal's ex-ante participation constraint because the principal has all the bargaining power at the ex-ante stage when the contract is offered. Let's compare with the second-best case. This case is that the principal is ready to accept some distortions away from efficiency in order to decrease agent's information rent. This comparison makes us puzzled on the weak nature of the contract game. It's mainly depending upon the complete information. The principal wish to offer the contract. However, the measurement of decisions is uniformed about the agent's utility function. We cannot do the chess game if the principal is supposed to offer the contract to the agent. Here, we try to understand the innate weak point as a decision maker in the complete information of the contract.

$$v \cdot (S(\underline{q}) - \underline{\theta}\underline{q}) + (1 - v) \cdot (S(\bar{q}) - \bar{\theta}\bar{q}) - (v \cdot \underline{U} + (1 - v) \cdot \bar{U}) \quad (3.2)$$

where the agent's utility function \underline{U} and \bar{U} is concerned. Note that an allocation space is feasible such that $\{(q, t) : q \in \mathcal{R}_+, t \in \mathcal{R}\}$ and the quantity produced is $S(q)$ for the principal and the transfer t is rewarded to the agent.

The **cost function**, $C(q, \theta)$ of an efficient agent (θ) (resp. $\bar{\theta}$) is consisted of a variable cost $\underline{\theta}q$ (resp. $\bar{\theta}x$) and a fixed cost F : $C(q, \underline{\theta}) = \underline{\theta}q + F$. If these quantities satisfy a **monotonicity constraint**, $\underline{q} \geq \bar{q}$, then any pair of outputs (\underline{q}, \bar{q}) is **implementable**. Briefly, an action profile $q(\theta)$ is implementable via transfer $t(\theta)$.

t=0	t=1	t=2
Principal offers a contract	Agent accepts or refuses the contract	Principal discovers his type

Figure. Timing of Ex Ante Contracting with an informed Principal.

3.2.2 Monotone comparative statics (MCS)

A one-dimensional decision of a consumer or a firm (the principal) who wants to delegate to an agent the production of x units of a good. Hence, the principal should convince by himself about his choices. Assumed that $V(x)$ is a function of the principal from a lattice X into a partially ordered set Y , then $V(x)$ is **quasi-supermodular** if, for all x' and x'' in X , $V(x' \wedge x'') \preceq V(x')$ implies $V(x'') \preceq V(x' \vee x'')$ and $V(x' \wedge x'') \prec V(x')$ implies $V(x'') \prec V(x' \vee x'')$. It's evidently that the principal does the right decision for increasing the value from his optimal choices.

Monotone comparative statics consider a selection s in the set of optimal solutions as $\operatorname{argmax}_{x \in X} V(x, \theta)$. If X , Θ , and Y are partially ordered sets and $V(x, \theta)$ is a function from a subset S of $V : X \times \Theta \rightarrow \mathcal{R}$, then,

$$\operatorname{argmax}_{x \in X} V(x; \theta) \quad (3.3)$$

Compared to the critical value, argmaximized values are focused on choices. The optimized value is given and choices which can get to the optimum are ordered. Those orders are verified by the **single crossing property** in (x, θ) on S if, for all x' and x'' in X and θ' and θ'' in Θ with $x' \prec x''$, $\theta' \prec \theta''$, and $\{x', x''\} \times \{\theta', \theta''\}$ being a subset of S ,

$$V(x', \theta') \preceq V(x'', \theta') \text{ implies } V(x', \theta'') \preceq V(x'', \theta'') \quad (3.4)$$

and $V(x', \theta') \prec V(x'', \theta') \text{ implies } V(x', \theta'') \prec V(x'', \theta'')$.

The family of functions of $\{V(\cdot, \theta)\}_{\theta \in \Theta}$ obeys **single crossing differences** if for all $\theta'' > \theta'$, the function $\delta(\theta) = V(x''; \theta) - V(x'; \theta)$ is a single crossing function. The family of functions of $\{V(\cdot, \theta)\}_{\theta \in \Theta}$ obeys **increasing differences** if for all $x'' > x'$, the function $\delta(\theta) = V(x''; \theta) - V(x'; \theta)$ is an increasing function.

3.2.3 Necessity

3.2.3.1 The First-Best Contract and a Principal's Dilemma

Rather than insisting on the first-best production level \bar{q}^* for an inefficient type, the principal prefers to decrease \bar{q} by an amount dq . By doing so, the utility function of the principal shapes as the quadratic form since the function is inverse to the agent's one. The increasing difference $\bar{V} - \underline{V}$ of the von Neumann Morgenstern (NM) utility function of the principal is constant as x increases even though the increasing difference $\bar{U} - \underline{U}$ of the utility function of the agent increases as x increases.

$S(q) = -(|S''| x^2/2) + \mu x$ for some μ large enough with respect to $\bar{\theta}$ so that outputs are always positive. $|S''|$ denotes the absolute value of the second derivative of the surplus function. This number is constant (Martimort, 1999) for a quadratic surplus function and is constant when $\Delta\theta$ is small enough.

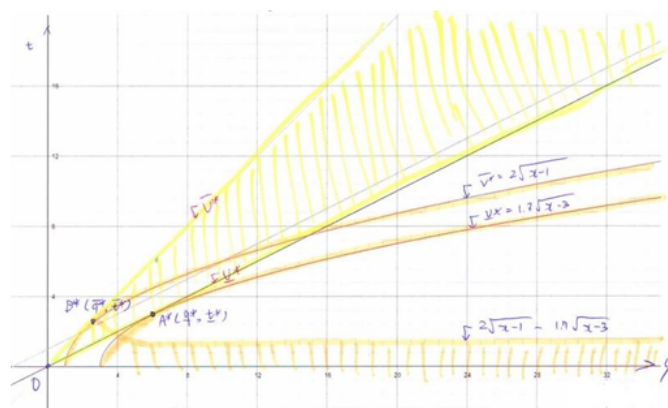


Figure 2-1. The First-Best Contract

We can puzzle on the optimal limitation that the principal can maintain his risk-averse preference up to the certain level of the first-best contract.

3.2.3.2 A Principal's Dilemma

The expected efficiency of allocation $v(S(\underline{x}) - \theta \underline{x}) + (1 - v)(S(\bar{x}) - \theta \bar{x})$ is greater than the expected information rent $v\underline{U} + (1 - v)\bar{U}$ in the objective function of the principal.

Since the principal must offer any menu of contracts $\{(\underline{t}, \underline{x}); (\bar{t}, \bar{x})\}$ before knowing which types of agents, the principal should be ready to accept some distortions away from efficiency in order to decrease the information rent of the agent.

In Figure 2-2, the graph of $\frac{\bar{U} + \underline{U}}{\bar{V} + \underline{V}}$ is changed from concave-down with decreasing slope to concave-up as long as $\bar{U} + \underline{U}$ increases. Remark that $\bar{U} = \bar{t} - \theta \bar{x}$, $\underline{U} = \underline{t} - \theta \underline{x}$ and $V(x, \theta) = S(x) - t, t = \theta x$.

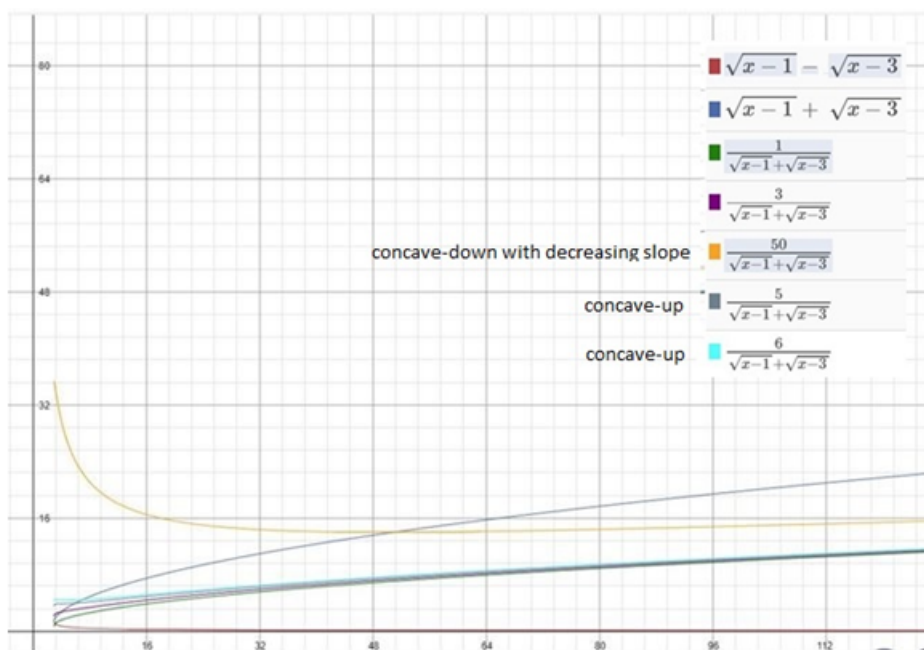


Figure 2-2. Concave-up and concave-down of the principal

If the utility function of a principal \bar{V} (resp. \underline{V}) is the square-root equation, it implies that the graph is vertical-stretched by α (resp. α') and horizontal-stretched by β (resp. β'), e.g. $\bar{V} = |\alpha| \sqrt{x - \beta}$ (resp. $\underline{V} = |\alpha'| \sqrt{x - \beta'}$) where $|\alpha| > |\alpha'|$ and $\beta < \beta'$, each level of utilities of agents \bar{U} and \underline{U} are not defined as the same function shape above the maximum value of

$$\max_x f\left(\frac{\bar{U} + \underline{U}}{|\alpha| \sqrt{x - \beta} + |\alpha'| \sqrt{x - \beta'}}\right) \quad (3.5)$$

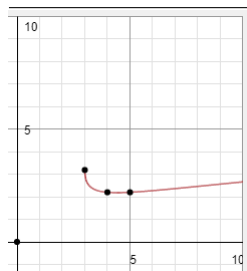
on the points x .

Assumed that $\bar{V} = 2\sqrt{x - 1}$, $\underline{V} = 1.7\sqrt{x - 3}$ and respectively, $\bar{U} = x$ and $\underline{U} = \frac{1}{2}x$. By the effective frontier of the utility function, $\bar{U} + \underline{U}$ is greater than $\bar{V} + \underline{V}$. $x + \frac{1}{2}x \geq |\alpha| \sqrt{x - \beta} + |\alpha'| \sqrt{x - \beta'} \approx |c| (\sqrt{x - \beta} + \sqrt{x - \beta'})$. Hence, we get $\frac{x + \frac{1}{2}x}{\sqrt{x - 1} + \sqrt{x - 3}} \geq |c|$

² The minimum value of $\frac{x + \frac{1}{2}x}{\sqrt{x - 1} + \sqrt{x - 3}} \approx 2.196$ is defined whenever β, β' are non-negative, hereby where $x \geq 3$.

For $0 < |c| < 1$, $|c| \leq [\min_x f = 2.196, \max_x f = 3.182]$. For $1 < |c|$, the utility function \underline{U} and \bar{U} are not defined where the vertical stretch is denoted as $\max_x f \approx 3.182 < |c|$.

x	y $\equiv \frac{x + \frac{1}{2}x}{\sqrt{x - 1} + \sqrt{x - 3}}$
0	0
3	3.182
4	2.196
5	2.197



It implies it might be possible to have new arguments on the SMC violation in one-dimensional screening problems (Laffont-Guesnerie 1984, Araujo-Moreira 2009) where the utility function of the agent does not satisfy the SMC. The SMC is to convince implementable contracts only using local incentive compatibility (IC) constraints. If the SMC is violated the local IC constraints are no longer sufficient for implementability. Classically, two types taking same decisions must get the same marginal tariff which leads to the same marginal utility of decision (Theorem 1, Araujo-Moreira 2009). Hereby, the graph of the utility function of the principal is derived from the optimality of the

²The closed space $cl\left(\frac{U(t)}{V(t)}\right) = \left\{\frac{U(t)}{V(t)} \mid \frac{U(t)}{V(t)} \cdot \lambda \geq c\right\}$ optimized by the boundary operator ∂ such that $\partial\left(\frac{U(t)}{V(t)}\right) = \left\{\frac{U(t)}{V(t)} \mid \frac{U(t)}{V(t)} \cdot \lambda = c\right\}$ for some nonzero $\lambda \in \mathbb{R}^+$ and some constant c . Applied from cardinal polyhedral type spaces of G.Carroll (p.679, 2012).

utility function of the agent. This is realistic to be seen in the two-person game when it comes to the principal being a Stackelberg leader.

Although the unlimited backing from the principal actually makes the contract unrealistic, it is not essential for making the point: agreeing to limit the contract for implementability.

3.2.4 Sufficiency

3.2.4.1 The Sorting Condition

Preferences of the agent depend upon multidimensional action variables, the information parameter and the one-dimensional money transfer [Guesnerie-Laffont (1984)]. Otherwise, the principal's preferences can be indifferent to transfers if the principal is only concerned with the level of the action variable. For the connection between the agent and the principal, there is a one-dimensional parameter θ which is known to the agent but unobservable to the principal. However, preferences of the principal are of two possible types, both of them. Let's say an action profile $x(\theta)$ is implementable via transfer $t(\theta)$, then we need to make a focus on the ordinal version of complementarity between x and t . To check the implementability of a piece-wise C^1 one-dimensional action profile, we can assume the utility function of the agent satisfies (M), (D), (CS+) [resp.(CS-)] and (B)³ [Corollary 2.1. of Guesnerie-Laffont (1984)] if and only if:

$$\frac{dx}{d\theta} \geq 0 \quad (3.6)$$

(resp. ≤ 0) a.e. Further, this conjecture should be tested with the monotonicity and the differentiability of the function. It's not simple to extend the result to multi-dimensional actions. Most of all, If $x(\theta)$ has a finite number of increasing portions, then any constant piece in $x(\theta)$ must join two different increasing pieces. By the way, unlike with those increasing differences, there is no sense of a comparatively greater additional preference in the sorting condition.

The sorting condition is: *the (partial derivative) constant sign, the single-crossing condition or the Spence–Mirrlees condition*. That is, if it is (strictly) preferable to have more of the first component given a particular level for the second component, then it would still be (strictly) preferable to have more of the first component given a greater level for the second component.

To ensure the sufficient implementability, there are two assumptions. One is the sorting condition and another is a rate of growth of MRS.

Firstly, the sorting condition means the utility function of the principal is of such a shape that the utility function of the agent is increasing in a parameter constraint. Let X and Θ be partially ordered sets. The utility function of the principal $V : X \times \Theta \rightarrow \mathbb{R}$ is said to satisfy the *single crossing property* in $(x; \theta)$ if for all $x' > x^*$:

1. whenever $V(x', \theta^*) \geq V(x^*, \theta^*)$, then $V(x', \theta') \geq V(x^*, \theta')$ for all $\theta' > \theta^*$; and
2. whenever $V(x', \theta^*) > V(x^*, \theta^*)$, then $V(x', \theta') > V(x^*, \theta')$ for all $\theta' > \theta^*$.

The function is said to satisfy the strict single crossing property in $(x; \theta)$ if for all $x' > x^*$,

³(M) is denoted as the monotonicity, (D) denoted as the differentiability, (CS+) denoted as the constant sign and (B) denoted as the boundary

whenever $V(x', \theta^*) \geq V(x^*, x^*)$, then $V(x', \theta') > V(x^*, \theta')$ for all $x' > x^*$.

In other way, given a function $V : R^2 \times \Theta \rightarrow R$ which is C^1 , we say that $V(x_1, x_2, \theta)$ satisfies the strict Spence Mirrlees condition if: $\frac{\partial V}{\partial x_1} / \left| \frac{\partial V}{\partial x_2} \right|$ is increasing in θ , and $\frac{\partial V}{\partial x_2} \neq 0$ and has the same sign for every (x_1, x_2, θ) . Let $V : Q \times \Theta \rightarrow \mathbb{R}$ be continuously differentiable, where $Q \subset \mathbb{R}^2$. Then V is said to satisfy the (strict) Spence Mirrlees condition if $V_x / |V_y|$ is (increasing) nondecreasing in θ , and $V_y \neq 0$ and has the same sign for every (x, y, θ) .

This will be soon discussed in a technical condition bounding the rate of growth of the MRS.

3.2.4.2 Pick's Theorem

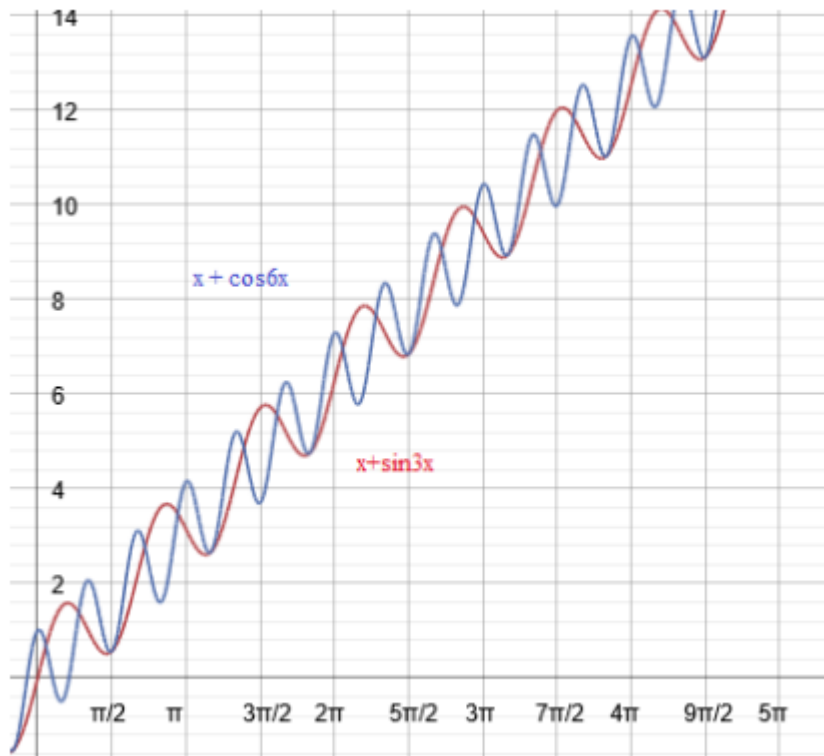
Pick's theorem provides a simple formula for calculating the area \mathcal{A} of the polygon in the interval of increasing differences (decreasing differences). It is constructed on a grid of equal-distanced points (i.e., points with integer coordinates) such that all the polygon's vertices are grid points in the interval. Here, the polygon in Pick's theorem is defined in the closed area made of two curves:

The area \mathcal{A} is composed of the number i of lattice points in the interior located in the polygon and the number b of lattice points on the boundary placed on the polygon's parameter such that

$$\mathcal{A} = i + \frac{b}{2} - 1. \quad (3.7)$$

All existing proofs of Pick's Theorem depend on the decomposition from the primitive polygon. By the n -decomposition from the primitive polygon, those lattice polygons with $\frac{1}{n}$ interior lattice points and $\frac{1}{n}$ boundary lattice points (vertices). Here, the interval established by the definition of increasing differences (resp. decreasing differences) decomposes the polygon into the positive area or the negative area. Even though x -coordinates and y -coordinates are both of them positive, the number of increasing points is easily calculated by excluding the number of lattice points belong to decreasing differences.

To generate optimal selection s , we posit the following examples of lattice decomposition with the principal's utility function $V(x, \theta)$. In figure 3-1, let X and Θ are partially ordered sets. For the optimal selection s , in the plane $[x, V(x, \theta)]$, there are two functions: $x + \sin 3x$ and $x + \cos 6x$ before and after a parameter changes.



[Figure 3-1. non-monotonic, partially non-decreasing]

For $i = 17, b = 56, \mathcal{A} = 44, \mathcal{A}' = 8$

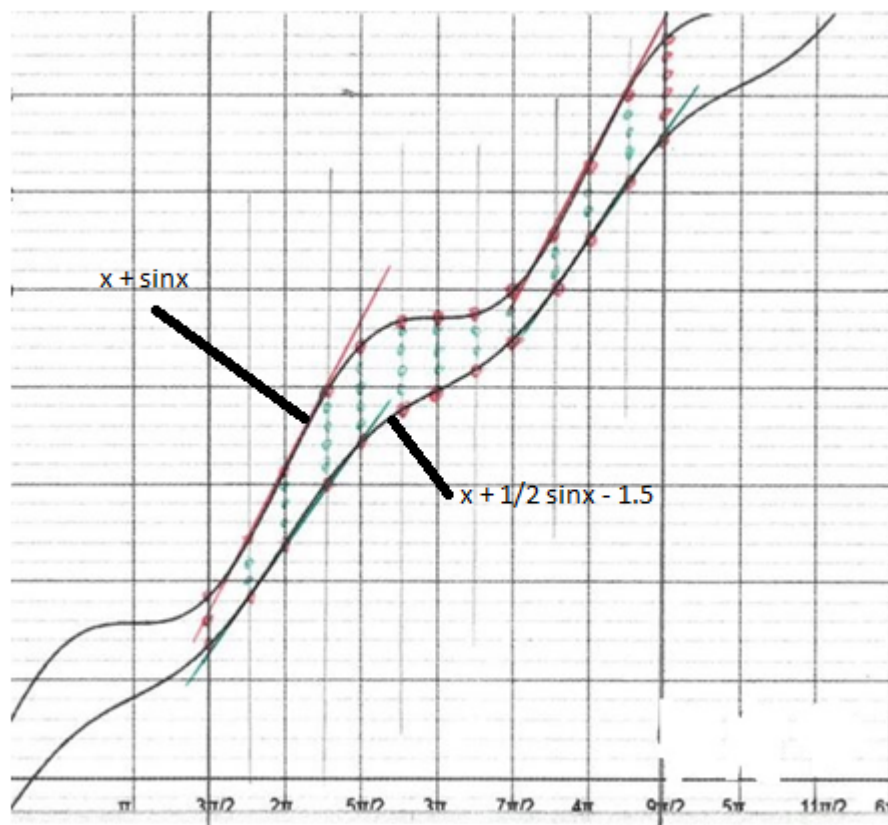
We would expect the principal's utility function has the increasing difference $\mathcal{A} = 44$ and the decreasing difference $\mathcal{A}' = 8$ by Pick's Theorem in which interval is arbitrary designed. It represents the non-typical function which is not monotonic, not entirely increasing: (a) $V(x, \theta)$ is non-monotonic, partially non-decreasing.

(b) The strict Spence Mirrlees condition fails at p ; and

(c) The number of interior points $i = 17$, the number of boundary points $b = 56$.

The increasing area is calculated: $\mathcal{A} - \mathcal{A}' = 44 - 8 = 36$. It continues to satisfy that $V(x, \theta)$ is non-decreasing in (x, θ) .

In figure 3-2, it would come as no surprise that the increasing difference extracted from the decreasing difference is significant in which following case it violates the strict single crossing property.



[Figure 3-2. non-monotonic, entirely non-decreasing]

For $i = 31, b = 31, \mathcal{A} = 45.5, \mathcal{A}' = 0$

Before checking the monotonicity (M), the differentiability (D) and constant signs (CS+, CS-), the increasing area is calculated: $\mathcal{A} = 45.5 - \mathcal{A}' = 45.5$. For the optimal selection s , in the plane $[x, V(x, \theta)]$, there are two functions: $x + \sin x$ and $x + \frac{1}{2} \sin x - 1.5$ before and after a parameter changes.

- (a) $V(x, \theta)$ is non-monotonic, entirely non-decreasing.
- (b) The strict single crossing property fails; and
- (c) The strict Spence Mirrlees condition holds.

Also, it continues to satisfy that $V(x, \theta)$ is non-decreasing in (x, θ) . Needless to say about the boundary condition (B) and marginal rate of substitution (MRS), in fact, two examples as above are examples of non-decreasing function of optimal selections.

3.3 Re-negotiation for Myopic Decision-Making

This section considers a class of principal-agent problems which have the following features.

- (1) There is the Ratchet effect because the principal wants to maintain the result of local increasing differences to the result of global increasing differences.
- (2) Re-negotiation is possible when it comes to the short-run result. For the short-run result, the principal roles as a Stackelberg leader of the two-person game in the local

increasing differences.

(3) The agent reacts within the positive interval of efficiency, $\Delta\theta = \bar{\theta} - \underline{\theta} > 0$. On the other hand, the concern of the principal is the global increasing differences in the finite contract period.

When the principal makes the far-sighted decision and the agent depends on the long-run result. Global increasing differences are defined as below:

(global increasing differences) The area \mathcal{A} is fat if global increasing differences (\mathcal{A}) are larger than global decreasing differences (\mathcal{A}') such that $\mathcal{A} - \mathcal{A}' > 0$. Specifically, when the principal makes the decision in a core decision set and the agent depends on the short-run result, the agent has the tendency to re-negotiate with the short-term contract. For the aim of a principal, the completion of the contract is significant. The first move of the principal can be argued.

(local increasing differences) The area \mathcal{A} is sponged if local increasing differences (\mathcal{A}) are larger than local decreasing differences (\mathcal{A}') such that $\mathcal{A} - \mathcal{A}' > 0$. The principal made the order of his preference and he has the motivation for the first-move on incentives when the decomposition of the local increasing difference by the interval order doesn't match with the decomposition from the primitive polygon.

(Fatty Sponge Max Condition): The principal should do the first-move to reveal the incentive because the gap between the far-sighted decision and core decision should be negotiated where $0 \geq \frac{i - i'}{b - b'} > -\frac{1}{2}$. Assumed that the principal recognizes the local increasing difference by the decomposition from the primitive polygon without time allocation. By Pick's theorem, the difference between increasing differences and decreasing differences is positive, $A - A' = i + \frac{b}{2} - 1 - (i' + \frac{b}{2} - 1) = (i - i') + (\frac{b - b'}{2}) > 0$, hence,

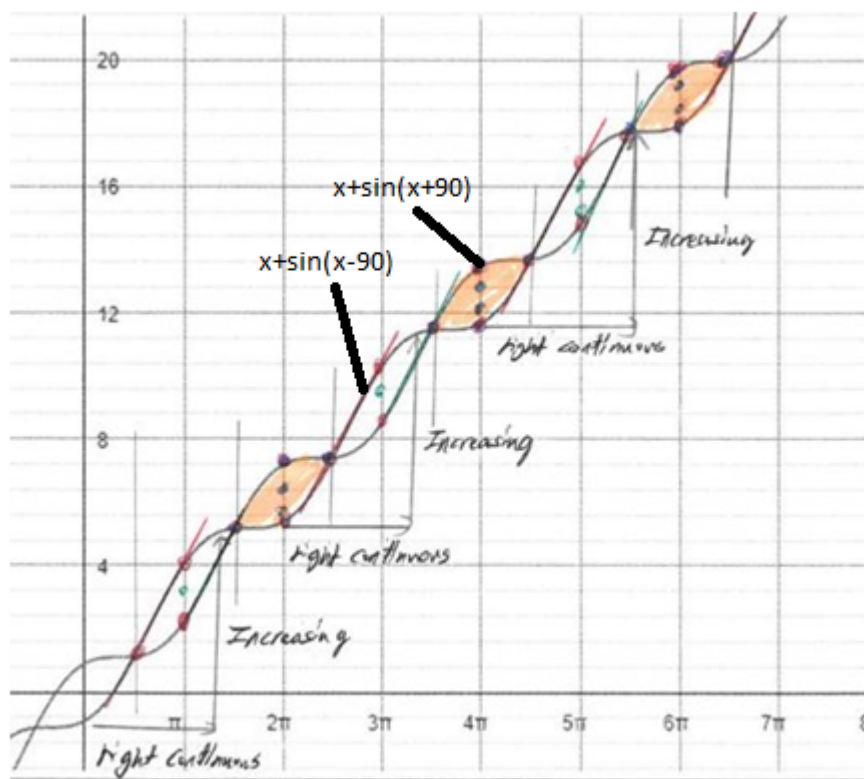
we get $\frac{i - i'}{b - b'} > -\frac{1}{2}$. By the comparison with the interval order, $i - i' > 0, b - b' > 0$, there is a recognition gap when the principal decomposes from the primitive polygon and not in the interval order such as $0 \geq \frac{i - i'}{b - b'} > -\frac{1}{2}$.

The principal decides recursively where the boundary is fatty, $b > b'$. Durably, checking $i > i'$ is sponged from the bottom of $i = i'$.

Theorem. (Agent's the best-response set): the acceptance of an incentive optimized with a constraint of fatty sponge max condition.

In figure 4-1, we shall see the monotonic case of the entirely non-decreasing function which has the repetitive interval. For the optimal selection s , in the plane $[x, V(x, \theta)]$, there are two functions: $x + \sin(x + 90)$ and $x + \sin(x - 90)$ before and after a parameter changes.

- (a) $V(x, \theta)$ is monotonic, entirely non-decreasing].
- (b) The strict single crossing property holds; and
- (c) The strict Spence Mirrlees condition holds.

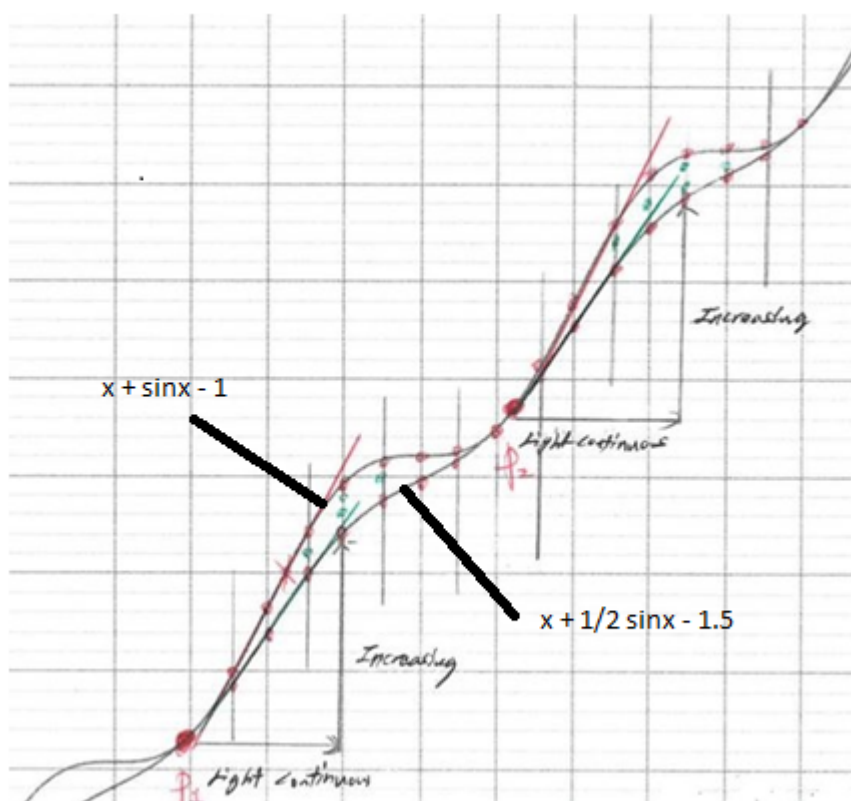


[Figure 4-1. Monotonic, entirely non-decreasing]

For $i = 10, b = 19, \mathcal{A} = 18.5, \mathcal{A}' = -1$

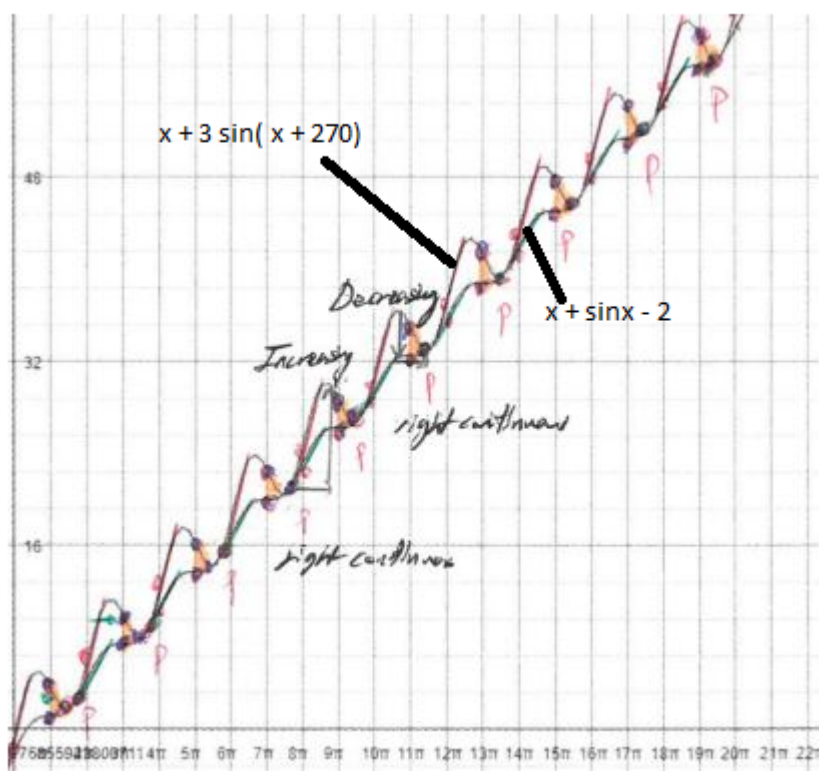
In figure 4-2, we shall see the monotonic case of the entirely non-decreasing function which has the recursive interval. For the optimal selection s , in the plane $[x, V(x, \theta)]$, there are two functions: $x + \sin x - 1$ and $x + \frac{1}{2} \sin x - 1.5$ before and after a parameter changes.

- (a) $V(x, \theta)$ is monotonic, entirely non-decreasing.
- (b) The strict single crossing property holds; and
- (c) The strict Spence Mirrlees condition fails at p_1, p_2 .



[Figure 4-2. Monotonic, entirely non-decreasing]
For $i = 9, b = 30, \mathcal{A} = 25, \mathcal{A}' = 0$

In figure 4-3, we shall see the non-monotonic case of the partially non-decreasing function. Negative and positive areas are closely offset. For the optimal selection s , in the plane $[x, V(x, \theta)]$, there are two functions: $x + 3\sin(x + 270)$ and $x + \sin x - 2$ before and after a parameter changes.



[Figure 4-3. Non-monotonic, partially non-decreasing]

For $i = 1, b = 39, \mathcal{A} = 19.5, \mathcal{A}' = 14$

- (a) $V(x, \theta)$ is non-monotonic, partially non-decreasing.
- (b) The strict single crossing property holds; and
- (c) The strict Spence Mirrlees condition fails at p .

3.4 Conclusion

These are significant differences of research questions in theory of contract between 1980 and 2018. In 1980, enough had been said to demonstrate how many contracts firms can print them out. The reason is the number of contracts is equivalent to the number of firms which is direct to devote to economic growth. In 2018, there has been quite a bit of recent scholarly effort aiming to understand an informed principal with complete information. In this study, the mechanism with an informed principal is based on three concerns: a principal's dilemma, a sorting condition and a re-negotiation. All settings are centralized around how the principal can solve the situation when the complete information in the contract doesn't work. Those odd patterns are measured by order-theoretical method such as Pick's theorem.

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Chapter 4 :

Analysis of Systemic Liquidity Risk and two additional applied works

4.1 4.(1) Analysis of Systemic Liquidity Risk for the Banking Sector in Bosnia Herzegovina (BH)

The danish balance principle mortgage model is intended to maintain the mortgage market stability in Denmark over the last two centuries (IMF, 2011). The balance principle in this case ensures interest rate matching, duration/liquidity matching and currency matching by maintaining the purchase of bonds and cash flows with bond investors and securing loans and installment fees of real properties with borrowers.

Under the strict balance principle, each new mortgage loan is in principle funded by the issuance of new mortgage bonds of equal size and identical cash flow and maturity characteristics. For example, the 30-year, fixed rate, callable annuity loan funded by a pass-through callable mortgage bond gives plausible explanation for the balance principle application. Proceeds from the sale of the bonds are passed to the borrower to purchase the real property and the interest and principal payments are passed to the investors holding the mortgage bonds.

4.2 Introduction

Clearly, in the paper, the balance principle touches upon the theme of correlation of profitability index and debt ratio analysis by the ANOVA test on Bosnia Herzegovina (BH). The balance principle framework means that assets are supported by profits and liabilities are operated by loans accounts for liquidity of on-balance sheet factors. In addition, the fundamental idea underlying the liquidity of on-balance sheet factors is exploring the systemic liquidity risk because the debt with collaterals gives reliable explanations for off-balance sheet factors.

Even if we limit our analysis to a simple economy setting with on-balance sheet factors, the method of an operational goal and financial stability would have at least three important effects that should be taken into account:

(1) The effect on timing and sequential causality of crisis; (2) The effect on counterproductivity of banks and their borrowers; and (3) The effect on institutional deficiencies.

The following first chapter will review professional tools indicating the timing and sequential causality of crisis management. Representative methods are the Internal Capital Adequacy Assessment Process (ICAAP) and the Supervisory Review and Evaluation Process (SREP). The preventive method to the crisis situation can provide the sequential process to defend a financial crisis.

4.3 Systemic Liquidity Risk as to the Balance Principle

The present financial economic research question emerged from the question: “*What is systemic liquidity risk?*” It’s hard to give convincing answers to this question. Previous financial studies suggest a bar between two waves of debit and credit in the balance sheet

and liquidity is usually described with respect to this framework. *Liquidity* provides the rapid circulation between two waves of debit and credit in the balance sheet. In addition, *systemic liquidity risk* has convincingly argued by on-balance sheet factors and off-balance sheet factors in the economy with financial related parties and non-financial related parties.

This paper calls attention to the central problem of systemic liquidity risk as to the balance principle. Indeed, the systemic risk issue argues persuasive evidence of solutions beyond on-balance sheet factors. Still, the paper makes an attempt to answer the on-balance sheet factors.

Assets of banks are loans. Evidently, if the bank can borrow much more money, the profit of a bank goes up. Hence, the sharp power game between the regulatory bodies and banks has been existed. The liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) are fortified leverage concepts in the third Basel accord (BASEL III). Asset price appreciation is required to be more than the cost of borrowing in these concepts.

The counterproductivity of banks and their borrowers will be detected in the second chapter.

In the last session, the macroprudential stress test aimed to simulate the regulative situation. Regulatory actions to ensure the financial stability and risk taking try to do the work beyond the institutional constraints. One strong centralized body exist in finance. The core of finance is voluntary investment and thus, it cannot be controlled by one strong body. We will test the significance of observed financial variables in the model, where the null hypothesis is the reason why the independent variables do not significantly affect the dependent.

In this context, it is stated that the observed independent variables have the greatest impact on the growth or decline of the liquidity for the banking sector in Bosnia and herzegovina.

4.4 Literature Review

Overall liquidity risk management is intended to aim at market stability rather than efficient operation. However, traditionally, liquidity functions have supported the stable capital structure of banks. The premise which underpins a good deal of my subsequent argument is dependency of deposits within the scope of liquidity motion. To facilitate understanding of motion of deposits and loans, it seems necessary to examine the balance sheet principle for the going concern of the banking entities.

Specially, in a risky situation, the bank can not meet the debt obligation of loans under constrained condition. In this case, it may better for the bank to seek marketable assets to build a better investment portfolio with stable debt condition to arbitrage the profitable investment. It is highly probable that the required amount of liquid and marketable investments depend on the stability of its deposit structure related with the credit portfolio growth. On the other hand, if the majority of the portfolio consists of a large volume of long-term loans and stable deposits, it evidently offers a greater liquidity position for commercial banks. (Greuning, Bratanovic (2006). Testing of liquidity risk can be implemented through Monte Carlo simulation, which allows the distribution of liquidity, as well as the probability of insolvency for each scenario under consideration.

Liquidity risk is divided into two types: funding liquidity risk (cash flow risk), and market

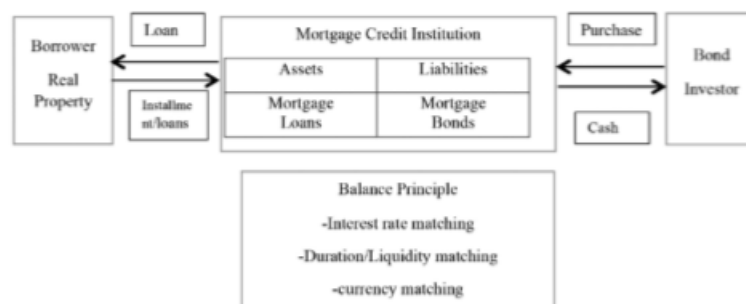


Figure 4.1: The Danish Balance Principal Mortgage Model Source: IMF (2011), Global Financial Report: Durable Financial Stability, p.118.

liquidity (asset/product risk). Accepted at face value and taken in literal expression itself, funding liquidity risk is the problem of funding (liability of traders), and market liquidity is the problem of the market (of assets). A close look at the Brunnermeier-Pedersen model (2008) reveals that market liquidity declines as fundamental volatility increases, which is consistent with the empirical findings of Benston and Hagerman (1974) and Amihud (2002). Diamond and Dybvig (1983), argue that financial crisis occurs if there is a lack of short-term liquidity. Burnside et al. (2001) view government guarantees as actual causes of financial crisis. These authors claim that the lack of private hedging of exchange rate risk by firms and banks led to financial crisis in Asia. According to Goodhart et al. (2006), bank liquidity is approximated based on the model of microeconomic basis, where the test endogenous reactions of banks and liquidity is projected on the basis of the credit supply.

According to Adrian et al. (2008), banks will actively respond to any development of the prices of financial assets in the financial market, in order to stabilize its financial leverage and harmonize the financial regulations in force. According to Brunnermeier et al. (2009), behavior liquidity of banks in a financial crisis and tension, i.e. in the case of increasing impact of the crisis relationship between funding liquidity and market liquidity, is stronger in terms of the formation of the spiral of liquidity or spreading financial contagion.

4.5 Methodology and the multiple regression model

Given a goal of stability, there is one further argument of cashflows. The cashflow is saturated with expectations of inflows and outflows as given maturity. The temporary cash shortage is prominent in the liquidity problem. It appears likely to us that the liquidity management is the need for net financing. There is somewhat the likelihood of qualified liquidity management of commercial banks; however, there is the prediction problem of expected liquidity associated with contingent liabilities. For example, legal clauses of credit and guarantees stimulates huge cash outflows that do not depend on financial conditions of some banks. That's why significant cash outflows caused by insolvency and bankruptcy situations suddenly occurs in the economic depression and financial crisis.

Something that holds the various elements of a complicated structure together is

an economically and financially integrated solution. For example, Denmark has a sophisticated housing finance system with a unique arrangement of asset-liability matching that has helped maintain mortgage market stability over the last two centuries. The system relies on mortgage financing via covered bonds. It underwent a regulatory overhaul in 2007 following the adoption by the European Union of the Capital Requirements Directive a year earlier.

The mortgage loan casts itself in the role of small margin and long-term investment. Mortgage banks take the credit risk and market risk including prepayment risk is passed on to the bond investors.

In Denmark, under the strict balance principle, each new mortgage loan is in principle funded by the issuance of new mortgage bonds of equal size and identical cash flow and maturity characteristics.

The analysis of systemic liquidity risk between Economics and Finance has been identified as the most complex aspect of regulation. The dual role of assets and liabilities with the balance principle kept by the going concern with the accounting perspective takes on a much easier role.

Asset Liquidity is defined as a quick validated certain asset liquidation with minimum losses. The dimensions of Asset Liquidity are *time* and *Liquidity value*. In pricing model, market illiquidity is measured by an illiquidity premium. the pricing model introduces an additional variable for the market illiquidity, which can be interpreted as the premium required by investors as compensation for any transaction costs or uncertainty. The present value of market illiquidity can be expressed by the following equation (Schmaltz, 2009: 16-17):

$$L_t^a = \sum_{j=t+1}^T \frac{CF_s^a}{(1 + r_f(t, j) + c^a(t, j) + \delta^a(t, j))^s} \quad (4.1)$$

Where:

CF_s^a : Future Cash Flow, asset a ;

L_t^a : Liquidation Value, asset a ;

$r_f(t, j)$: Risk free interest rate;

$c^a(t, j)$: Credit Risk Premium, asset a ;

$\delta^a(t, j)$: Illiquidity Premium, asset a ;

$\delta^a(t, j) \geq 0$

The liquidation value of assets a at time t is denoted L_t^a . It presents the sum of all future cash flows discounted at the risk-free rate $r_f(t_1, t_2)$ and the premium for potential future illiquidity $\delta^a(t_1, t_2)$. Also, market liquidity is measured by delta, where delta is an illiquidity premium. The present value PV_t^a can be expressed as the market value of perfect liquid assets:

$$PV_t^a = L_t^a(\delta^a = 0) \quad (4.2)$$

In liquidity management, asset liquidity is measured by haircuts denoted as HC , as below:

$$PV_t = HC \times PV_t^a + (1 - HC) \times PV_t^b \quad (4.3)$$

where:

PV : The present value;

HC: Haircut.

The present value can be decomposed into a fraction that can and a fraction that cannot be recovered in liquidation. Haircuts can take values from 0 to 1. As well as delta the haircuts are illiquidity measures as they take values for less liquid and zero for perfectly liquid assets. Asset liquidity depends on the institutional setup, for example, marketable assets have a higher liquidity than non-marketable assets. On the other hand, financial assets are marketable if they are produced on a primary market and not by an intermediary.

For instance, an investor who buys a stock on 50% margin will lose 40% of his money if the stock declines 20% (Bodie et al., 2008). Thus, both liquidity ratios and solvency ratios provides considerable insight into the status of entities. To measure liquidity risk, essential to the notion of liquidity ratios is the comparison with the solvency ratios as shown in Table 1.

The regression model is an equation with a finite number of parameters and variables. Depending on whether a model comprised only one or more variables, there is a simple and multiple linear regression models respectively. In addition to a dependent variable and one or more independent variables, each regression models contains a random variables. A simple linear regression model expresses a relationship between the two parameters as follows:

$$Y_i = \alpha + \beta X_i + \varepsilon_i, i = 1, 2, \dots, n, \quad (4.4)$$

where:

Y : dependent variable,

α and β : unknown parameters that need estimate, and

ε_i : stochastic variable (error distances)

Unlike the simple regression model, the multiple linear regression model is different in that it comprises two or more independent variables.

$$Y_i = \alpha + \beta_1 X_{i,1} + \beta_2 X_{i,2} + \dots + \beta_i X_{i,j} + \dots + \beta_k X_{i,k} + \varepsilon_i, i = 1, 2, \dots, n \quad (4.5)$$

Specifically, this model consists of one dependent variable Y , and K independent variables, which are referred to as: $X_{i,j} = 1, 2, \dots, K$. This study used a multiple linear regression model, which assesses the nature and strength of a bond between a dependent variable and K independent variables marked with $X_{i,j} = 1, 2, \dots, K$.

4.6 The Macprudential Stress Test Beyond The Institutional Environment – Bosnia and Herzegovia (BH)

As some banks are differently defined risk-weighted assets according to their internal models and the differences in the local rules of European Unions (EU) member states, there is a risk that the current amount of capital will not be sufficient in terms of meeting regulatory requirements. Otherwise, there is a trend of deterioration in the credit quality of the portfolio where there is an increase in the share of non-performing loans (NPLs) to

Liquidity Ratios	Current ratio	$= \text{Current assets} / \text{Current liabilities}$ The current ratio measures a company's ability to pay off its current liabilities (payable within one year) with its current assets such as cash, accounts receivable and inventories. The higher the ratio, the better the company's liquidity position
	Quick ratio	$= (\text{Current assets} - \text{Inventories}) / \text{Current liability}$ $= (\text{Cash and equivalents} + \text{Marketable securities} + \text{Accounts receivable}) / \text{Current liabilities}$ The quick ratio measures a company's ability to meet its short-term obligations with its most liquid assets, and therefore it excludes inventories from its current assets. It is also known as the acid-test ratio.
	Days Sales Outstanding (DSO)	$= (\text{Accounts receivable} / \text{Total credit sales}) \times \text{Number of days in sales}$ DSO refers to the average number of days it takes a company to collect payment after it makes a sale. A higher DSO means that a company is taking unduly long to collect payment and is tying up capital in receivables. DSOs are calculated quarterly or annually.
Liquidity Index	LI	$LI = \sum_{i=1}^N W_i (P/P^*)$ Where: W_i stands for the percentage of each section of assets in the bank's portfolio, P stands for the price of assets in case of a sudden sales and P^* stands for real market price of assets. The bigger the difference in price, logically the lower the liquidity of the concerned financial institution (bank). Liquidity index (LI) measures the size of a bank's possible loss caused by a final sale of assets, compared to the normal market price of those assets.
Liquidity at Risk	LaR	$= \text{Probability of reaching a certain Liquidity level (pL)} - \text{Cash flow at Risk (CaR)}$ <ul style="list-style-type: none"> • Withdrawal of deposits by X % • Inability to refinance all funds • Inability to refinance X % of money/commercial papers • One-day drop by X% in the main index of shares • Substantial change of interest rates • Restrictions related to convertibility of currency on the emerging markets • Crisis on the emerging markets • Loss in respect of loans • Business risk • Ad hoc analysis of special events This method is used to determine the value of cash flows related to various balance sheet and off-balance sheet positions of a bank.
Solvency Ratios	Debt to equity	$= \text{Total debt} / \text{Total equity}$ This ratio indicates the degree of financial leverage being used by the business and includes both short-term and long-term debt. A rising debt-to-equity ratio implies higher interest expenses, and beyond a certain point it may affect a company's credit rating, making it more expensive to raise more debt.
	Debt to assets	$= \text{Total debt} / \text{Total assets}$ Another leverage measure, this ratio measures the percentage of a company's assets that have been financed with debt (short-term and long-term). A higher ratio indicates a greater degree of leverage, and consequently, financial risk.
	Interest coverage ratio	$= \text{Operating income (or Earnings before interest and taxes (EBIT))} / \text{Interest expense}$ This ratio measures the company's ability to meet the interest expense on its debt with its operating income, which is equivalent to its earnings before interest and taxes (EBIT). The higher the ratio, the better the company's ability to cover its interest expense.

Figure 4.2: The Financial Analysis: Solvency vs. Liquidity Ratios.¹

Country	2006	2007	2008	2009	2010	2011	2012	2013	Index (2013/2006)	Average
Romania	18.1	13.8	13.8	14.7	15.0	13.4	14.6	13.9	76.79%	17.1
Montenegro	21.3	17.1	15.0	15.8	15.9	16.5	16.5	14.7	69.014%	17.1
Poland	13.2	12.0	11.2	13.3	13.9	13.1	14.8	15.2	115.15%	17.1
Turkey	21.9	18.9	18.0	20.6	19.0	16.5	17.9	15.7	71.69%	17.1
Bulgaria	14.5	13.8	14.9	17.0	17.5	17.5	16.5	16.6	114.48%	17.1
Macedonia	18.3	17.0	16.2	16.4	16.1	16.8	17.1	16.8	91.80%	17.1
Hungary	11.0	10.4	12.3	13.9	13.9	14.2	15.9	16.9	153.64%	17.1
Bosnia and Herzegovina	17.7	17.1	16.3	16.1	16.2	17.2	17.0	17.0	96.04%	17.1
Lithuania	10.2	11.1	11.8	14.6	14.6	17.4	15.2	17.4	170.59%	17.1
Albania	18.1	17.1	17.2	16.2	15.4	15.6	15.6	17.9	98.89%	17.1
Latvia	10.8	10.9	12.9	14.2	15.6	14.0	16.7	18.1	167.59%	17.1
Croatia	14.0	16.3	15.1	16.4	18.8	19.2	20.5	20.9	149.28%	17.1
Serbia	24.7	27.9	21.9	21.4	19.9	19.1	19.9	20.9	84.61%	17.1

Figure 4.3: The Regulatory Capital of 13 Eastern European Countries for 2006-2013 (in %)²

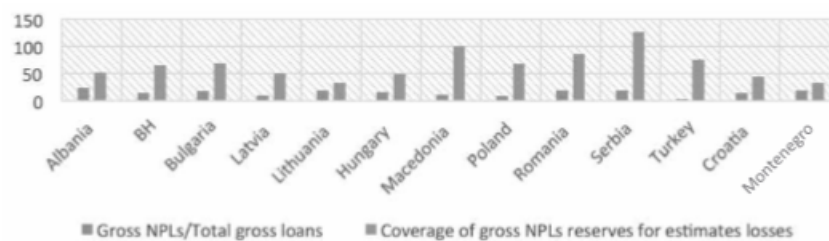


Figure 4.4: The tendency of Net Profits and Losses (NPLs) of Eastern European Countries on December 31, 2012 (in %).³

total loans. The following is the capital adequacy ratio for banks in the euro zone from 2006 to 2013 as follows.

As shown, on the basis of Net profits and losses (NPLs), the Republic of Serbia is above the regional average (6,80 times) excepted for Turkey, which apparently seems to be the best coverage (27,85 times) because it fulfills minimum of the gross Net Profits and Losses (NPLs) to total gross loans, as well as Macedonia (9,52 times) and Poland (7,67 times). In order to maintain financial stability and pursue interests of depositors and other creditors of the National bank of Serbia (NBS), the IFRS (International Financial Reporting Standards) requires the establishment of regulatory provisions that at the end of 2013 accounted for about 50,9 % of Net Profits and Losses (NPLs) where the loan loss covered on-balance and off-balance sheet losses amounting to about 117.9 % of the loans. The share of domestic banks in total assets of Bosnia and Herzegovina (BH) is very negligible. Table 4.(4) illustrates the structure of assets of financial intermediaries in Bosnia and Herzegovina (BH) for the period of 2011 – 2013.

The most important and most developed financial market in Bosnia and Herzegovina (BH) is certainly the banking market. Table 4.(3) makes clear that commercial banks have a predominant share of total assets of the business, which amounted to 86.1% in 2011 and reached 87.4% in 2013. The second large portion in the amount of total assets

Financial intermediaries	2011		2012		2013	
	Value	Participation (%)	Value	Participation (%)	Value	Participation (%)
Banks	10 734	86.1	10 832	86.3	11 262	87.4
Leasing companies	392	3.1	366	2.9	305	2.4
Microcredit organizations	379	3.1	345	2.8	341	2.6
Mutual funds	414	3.3	407	3.2	390	3.0
Insurance and reinsurance	550	4.4	600	4.8	586	4.5
Total	12 469	100	12 550	100	12 884	100

Figure 4.5: The Value of Assets of Financial Intermediaries in Bosnia Herzegovina (BH) for 2011 - 2013 (in mil. EUR)⁴

certainly insurance companies and reinsurance companies, with a relatively small portion of 4.4% in 2011 and 4.5% in 2013 (The Central Bank of Bosnia and Herzegovina-CBBH, 2014).

Contraction of the non-banking sector resulted from low purchase power of the populations, weak economic activity, political circumstances and the previously accumulated risks, particularly in the segment of leasing companies and the microcredit sector. Underdevelopment of the capital market, slow transformation of closed investment funds and high fees of companies that manage investment funds reduced the value of domestic investment funds. Due to prominent legal uncertainty and segmentation, the domestic capital market is not sufficiently attractive to foreign investors. (The Central Bank of Bosnia and Herzegovina - CBBH, 2014).

The dominant presence of foreign banking groups in Bosnia and Herzegovina (BH) causes the indirect transfer problems from the eurozone banking system to the banking sector of Bosnia and Herzegovina (BH). The liquidity position at the end of 2012 continued to be fragile. Risks of investing in the real sector in comparison to the amount of money of banking groups have created a kind of cash drag, or liquidity, which in the short term cannot qualify to cover the costs. As a result of the given situation, banks partly compensated for large decreases of foreign liabilities by the increase of deposits of domestic sectors of 2.6%. Investors in government bonds and treasury bills were mainly domestic banks. Banks in Bosnia and Herzegovina (BH) have surplus funds invested in securities due to the lack of quality projects and other better opportunities for potential investments. The main objective of investing in domestic banks was primarily the preservation of the net interest margin, i.e. achieving high yields on securities.

Given the data of the council for Ministers Directorate for Economic Planning, Economic Trends, Bosnia and Herzegovina (2013), the banking sector in Bosnia and Herzegovina (BH) after three years has generated a negative financial result. The growth in non-interest expenses or provisions for general credit risk and potential credit risk was influenced by a negative result at the end of 2013. If the value of the indicator ROA is less than 0.5%, the bank's profitability is considered to be bad. If it is between 0.5% and 1%, then we can say it is about average profitability, and if the value of the ROA indicator ranges between 1% and 2%, we are certainly talking about very profitability financial institutions.

In the table as below, it is quite clear that the indicator of the profitability of the banking sector of BH recorded a negative value of 0.20% in the last quarter of 2013. In the second

Parameters of the Banking sector	Period		Index (Q2 2014/Q4 2013)
	Q4/2013	Q2/2014	
Return on average assets	-0.20	0.5	250.0%
Liquid assets/Total assets	26.4	24.7	93.56%
Liquid assets/Current financial liabilities	46.2	43.4	93.94%

Figure 4.6: Performance indicators of the Banking Sector in Bosnia and Herzegovina (BH) for the Quarter 4 of 2013 - Quarter 2 of 2014 (in %) ⁵

Years/ Quarter	Q4 2012	Q1 2013	Q2 2013	Q3 2013	Q4 2013	Q1 2014	Q2 2014
Capital adequacy	17.0	17.2	17.2	17.0	17.8	17.3	17.3
Non-performing loans/total loans	13.5	13.8	14.3	14.9	15.1	14.9	15.5

Figure 4.7: The Movement of the capital adequacy ratio and non-performing loans of the banking sector of BH for the period: Q4 2013-Q2 2014 (in %).

quarter of 2014 a slight increase was recorded in the value of 0.5%.

Weak lending activity reflects the weak demand on the one hand, and the rigidity of banks on the other hand. In a time of weak domestic demand, the demand for credit is stagnant or declining. Also, due to the unstable economic growth and development, it is difficult to determine the risk assessment of bank lending, which leads to weak loan supply.

As can be noted from the table 4.(4) in terms of liquidity indicators, there was a slight decline at the Central bank in Bosnia and Herzegovina (BH) (2013). Unlike other indicators where positive developments are deemed desirable, the overly high level of the liquidity indicator, especially under the current macroeconomic conditions, often indicates unwillingness of banks to finance the domestic economy and households. Banks in BH efficiently managed their liquidity, which is shown by the data that liquid assets accounted for 26.4% of the banking sector as sets at the end of 2013, and that 46.2% of short-term liabilities of BH banks were covered by liquid assets.

The banking sector in Bosnia and Herzegovina is stable with regard to liquidity excepted for a few banks that displayed significant weaknesses in their business operations. At the system level, the BH banking sector is still adequately capitalised. Also, in the table 4.(5), it's quite clear that the average capital adequacy of the baniking sector of the BH from quarter 4 in 2013 to quarter 2 in 2014 was recorded (17.26%), which led to the conclusion that the banking sector is well capitalized and able to maintain a high rate of capitalization above the statutory minimum of 12%. Also, it can be noted in the third quarter of 2013, in the increasing rate of non-performing loans, there is a slight decline in the rate of capital adequacy. Higher rates of non-performing loans are related to reduced domestic demand and high unemployment.

On the other hand, the high rate of credit risk can cause losses of banks due to significantly incapacitated enterprise borrowers to properly fulfill thier obligations.

The banking sector in Bosnia Herzegovina (BH) in 2013 is construed as stable. Generally, the banking sector in Bosnia Herzegovina (BH) is adequately capitalized. The main risk

Indicators	2007	2008	2009	2010	2011	2012	2013
Real GDP (growth rate)	6.0	5.6	-2.7	0.8	1.0	-1.2	1.6
Average Annual Growth Rate of CPI	1.5	7.4	-0.4	2.1	3.7	2.0	-0.1
Broad Money - M2 (as a percentage of GDP)	54.2	49.8	52.3	54.8	55.9	57.9	61.6
The growth rate of loans in the financial sector	28.83	22.43	-3.17	3.51	5.28	4.12	2.94
The growth rate of deposit in the financial sector	37.93	-1.75	1.83	3.62	3.70	2.57	6.93
The growth rate of foreign direct investment	200.61	-48.55	-73.68	70.39	16.50	-23.54	-21.81
Growth of commercial bank assets	32.80	7.83	-0.61	0.75	3.90	1.95	5.02

Figure 4.8: An Analysis of Movement of Macroeconomic Variables for the period: 2007-2013 (in %).

of the banking sector in Bosnia Herzegovina (BH) is the tendency of further growth in non-performing loans. Thus, the increased level of systemic risk in the banking sector in Bosnia Herzegovina (BH) is the result of high level of non-performing loans and the lack of an appropriate solution for this problem.

The global economic crisis has highlighted the fact that the rapid credit growth in the countries of Southeastern Europe had an impact on the increase in non-performing loans to total loan portfolio and increased credit losses. Based on macroeconomic assumptions, Central Bank of Bosnia Herzegovina (BH) has implemented top-down stress tests as shown in Table 4.(6).

In the table below, from the data of the Central Bank of Bosnia and Herzegovina - CBBH, it is quite clear that the highest value of economic activity as measured by the gross domestic product was recorded in 2007 (6%). On the other hand, the lowest value was recorded in 2009 (-2.7%). Crisis effects did not become effective in full capacity until the end of 2008, as the activities continued to take place by inertia of previously arranged agreements. Towards the end of the year, only export indicated that the crisis was being accelerated and expanded to BH, while other economic indicators were still the lowest at the level from 2007. At the end of the year, the banking sector suffered a strong shock due to withdrawal of a portion of the deposits and the deteriorated conditions for foreign borrowing, which then had an impact on the reduction of availability of credit, as well as a slowdown of personal consumption and investment. In general, the domestic economy still relied on domestic consumption and investments. After several years of economic expansion and relatively high growth rates, in 2009, the domestic economy experienced a marked contraction caused by the global recession. The domestic economy entered this crisis with a serious fiscal deficit and a very sensitive external position of the country, as well as an unfinished transition process. The three main channels of transmission of the crisis for all emerging market countries were a sudden drop in capital inflows, a reduction of the external demand for their exports, and a decrease in metal prices. Investments fell off considerably due to much lower capital inflows, so, for instance, a 39 percent reduction in imports of capital products was recorded, while the domestic production of capital products was lower by 18 percent.

Positive economic trends and gradual recovery from 2011 and beginning of 2012 suddenly stopped during 2012. In the first half of the year, there was still a momentum in the activities, followed by stagnation and slow-down, which was mainly caused by

the recession trends in the euro area and our region. Recession in the euro area has lasted for six successive quarters, and in our economy, the situation particularly became complicated when the circumstances in German economy became worse. The main effects of economic stagnation in the euro area, on the local economy were reflected in the decrease of external demand for our exports and insufficient capital inflows. All this brought about recession trends and it is estimated that the real decline of the GDP in 2012 was (-0.5%), and that negative risks were realized to a high extent, which were not so visible in the beginning of 2012.

When measured by the value of the nominal GDP and growth of the real GDP of International Monetary Fund (IMF), there was a slight recovery in economic activity in the country in 2013. Despite the nominal annual growth, economic activity in the country in the periods after 2008 is quite weak, and could adversely affect the trend of long-term potential growth of the country. Experts from the International Monetary Funds predict that the continuous growth of foreign direct investment (FDI) in Bosnia and Herzegovina (BH) for the period: 2014 – 2018., will amount from 320 million to 360 million.

The high value of the consumer price index was recorded in 2008 (7,4%), while on the other hand, the lowest value was recorded in 2009 and 2013 respectively (-0,4% and -0,1%). The slowdown trend in inflation has been present since the early 2011, and continued in 2013, with the deflationary pressures emerging in the second half of the year. Annual inflation, measured by the consumer price index (CPI) in 2013 was -0,1%. At the end of 2013, inflation rate of – 1,2% was recorded. Deflation in 2013 is a result of a continuing trend in the decrease of food and oil prices on the global markets. Long-term inflationary trend in data of the Central Bank of Bosnia and Herzegovina (CBBH) measured by core inflation, is almost zero.

The amount of money in circulation in terms of the currency board arrangement is conditioned by the amount of funds in the reserve account with the Central Bank of Bosnia and Herzegovina - CBBH and it consists of cash in bank vaults and cash out of banks, that is, the amount of money circulating in the economy. While cash in vaults of banks in recent years has generally had an uniform trend with a pronounced seasonal character, its constant growth has been recorded in 2013. Growth in savings in the banks contributed to the evident results in macroeconomic stabilization due to the introduction of the currency board in 1997, contributing to a significant stabilization of prices.

The growth rate of loan amounting to 2,94% at the end of 2013 was largely caused by refinancing, which involved extension of clients' repayment periods by banks and provision of additional loans for continuation of clients' business operations. More prominent orientation of the BH banking sector to the government sector is possible in the period ahead, due to budget needs linked with financing of existing budget deficits. The reliance of the BH banking system on foreign sources was one of most significant risks that the domestic financial system was exposed to, despite all positive effects of funding from abroad. The increase in resident deposits buffered the effects of deleverage of banks owned by foreign banking groups and contributed to maintaining financial stability of the CBBH.

Foreign direct investment in the absence of the dynamics of domestic investment remain the only real source of stronger economic growth in Bosnia and Herzegovina. In the table 4.(7), it's quite clear that foreign direct investment in the reporting period had a very volatile movement, which, in our opinion, can be much more volatile in the future.

Indicators	Baseline scenario		Extreme scenario	
	2014	2015	2014	2015
Shock A – Slowdown in economic activity				
Increasing the ratio of NPLs to total loans	1.0%	0.0%	5.0%	4.0%
Shock B – Increase in interest rates				
Increasing the ratio of NPLs to total loans	0.0%	0.0%	0.0%	0.5%
The capital adequacy ratio	18.0%	18.3%	16.1%	15.0%
The number of banks that need recapitalization	5	6	7	10

Figure 4.9: Testing the rise in non-performing loans to total loans through the stress test scenarios for the period: 2014 – 2015

This empirical study refers to the analysis of the total liquidity of the banking sector in Bosnia and Herzegovina (BH) for the period from Q1 2004 to Q2 2014. The data used for this study are the official data (statistical analysis) of the Central Bank of Bosnia and Herzegovina. This study used a multiple linear regression model which assesses the nature and strength of the bond between a dependent variable, and K independent variables that are marked with $X_{i,j} = 1, 2, \dots, K$. Therefore, in this study, parameter liquidity - liquid assets/total assets (LA/TA) of the banking sector in BH is used as dependent variable and the following ones as independent variables: NPLs/total loans (NPLs/TL) average profitability on equity capital (APEC), non-interest expenses/total revenue (NIE /TR), the average required reserve (ARR), total loans (TL), the money supply in the wider sense (M2), net capital/risk weighted assets (NC/RWA) and NPAs/Total assets (NPA/TA). the regression model in this study is presented as follows:

$$LA/TA = \alpha + \beta_1 \times (NPLs/TL) + \beta_2 \times (APEC) + \beta_3 \times (NIE/TR) + \beta_4 \times (ARR) + \beta_5 \times (TL) + \beta_6 \times (M2) + \beta_7 \times (NC/RWA) + \beta_8 \times (NPAs/TA) + \varepsilon_i \quad (4.6)$$

The representativeness of the model will be calculated based on the coefficient of correlation (r), coefficient of determination (R^2) and adjusted co-efficient of determination (\bar{R}^2). There is also an analysis of variance (ANOVA), which will test the significance of observed financial variables in the model, where the null hypothesis is the reason why the independent variables do not significantly affect the dependent:

$$H_0 \dots \beta_1 = 0$$

$$H_0 \dots \beta_1 \neq 0$$

Table 4.(8) illustrates the descriptive statistics of explanatory variables:

The table below illustrates the descriptive statistics of explanatory. It is clearly seen that the highest volatility is measured by the standard deviation observed in the total loans of 3.801% and the money supply in the broader sense of 3.084%. Credit growth in Bosnia and Herzegovina at the end of 2013 was approximately 3,4% and it is mainly related to refinancing of existing bank clients. The growth of non-performing loans, increased risk aversion and tighter requirements for the granting of weak domestic demand influenced the design of lending activity to businesses. In Bosnia and Herzegovina (BH) in 2013, of

Management Domain	Dependent and independent variables of the model	Index	Mean	Std. Deviation	N
Liquidity	Liquid assets/total assets	LA/TA	30.97	4.73	42
Debt Quality	NPLs/total loans	NPLs/TL	7.97	4.26	42
Profitability	Average profitability on equity capital	APEC	3.19	3.07	42
Profitability	Non-interest expenses/total revenue	NIE/TR	89.27	7.98	42
Reserve	Average required reserve	ARR	1.535E3	654.66	42
Liquidity	Total loans	TL	1.232E4	3,801.82	42
Money Supply	M2	M2	1.185E4	3,083.73	42
Capital	Net capital/risk weighted assets	NC/RWA	16.95	1.088	42
Asset Quality	NPAs/total assets	NPAs/TA	5.67	3.48	42

Figure 4.10: Descriptive statistics of the observed banking performance from the Quarter 1 in 2004 to Quarter 2 in 2014.)

total loans to enterprises, 60% were related to short-term loans. Thus, this data suggests a problem of liquidity of companies, and as a consequence of increasing the number of blocked accounts of companies in Bosnia and Herzegovina (BH) and the increasing amount of uncollectible receivables from companies that are bridging these borrowings (The Central Bank of Bosnia and Herzegovina (2013).

4.6.1 The Result

Results obtained by regression analysis indicate that the coefficient of correlation is $r = 0.99$, indicating that there is a strong correlation between the dependent variable, i.e. (liquidity - Liquid Assets)/Total Assets (LA/TA), and independent variables: Net Profits and Losses (NPLs)/Total Loans (NPLs/TL), Average Profitability on Equity Capital (APEC), Non-Interest Expenses /Total Revenue (NIE/TR), the Average Required Reserve (ARR), Total Loans (TL), the Money Supply in the wider sense (M2), Net Capital / Risk Weighted Assets (NC/RWA) and Non-Performing Assets (NPAs) / Total assets (NPA/TA). The coefficient of determination is $R^2 = 97\%$, and the adjusted coefficient of determination is $\bar{R}^2 = 0.97$. The data shows that this model describes 97% of variations with [U+202F]independent variables which makes the model relatively representative. The significant test also indicates that there is a significant influence on certain independent variables on the dependent variable. The testing of the null hypothesis indicates that there is significant influence of certain independent variables at a significance level of $\alpha = 1\%$, and that the empirical F- ratio is 163, 29.

As for this study, the value of the empirical F- ratio (163, 29) is greater than the theoretical value of F- ratio (3,09) for the 8-degree of freedom in the numerator and 34 in the denominator. Thus, we can conclude to reject the null hypothesis that the independent variables have a significant impact on the dependent variable. Darbin-Watson statistics show high correlation with respect to the value of approximately over 1.

The coefficient of correlation can take values from -1 to $+1$. Thus, the resulting ratio shows the strength of two observed parameters. A zero value indicates that there is no correlation, the value of 1,0 indicates the correlation between complete and connected, while the value of -1,0 indicates the correlation between complete and negative. From the above table it is evident that most explanatory variables are slightly negatively correlated each other, and on the other hand, a number of observed variables have a

Regression Statistics	
Multiple R	0.988
R Square	0.975
Adjusted R Square	0.969
Std. Error of the Estimate	0.828
Durbin - Watson	1.592

Figure 4.11: A Regression analysis between the following parameters: Liquid Assets / Total Assets (LA/TA), Net Profits and Losses (NPLs) / Total Loans (NPLs/TL), Average Profitability on Equity Capital (APEC), Non-Interest Expenses / Total Revenue (NIE/TR), the Average Required Reserve (ARR), Total Loans (TL), Money Supply in the wider sense (M2), Net Capital / Risk Weighted Assets (NC/RWA), Non-Performing Assets (NPAs) / Total Assets (NPLs/TA) in Bosnia Herzegovina (BH) for the period: Q1 2004. – Q2 2014.

ANOVA	Df	SS	MS	F	Significance F
Regression	8	896.48	112.06	163.29	0.01
Residual	34	22.65	0.69	-	-
Total	42	919.13	-	-	-

Figure 4.12: An Analysis of variance between the following parameters: Liquid Assets / Total Assets (LA/TA), Net Profits and Losses (NPLs) / Total Loans (NPLs/TL), Average Profitability on Equity Capital (APEC), Non-Interest Expenses / Total Revenue (NIE/TR), the Average Required Reserve (ARR), Total Loans (TL), Money Supply in the wider sense (M2), , Net Capital / Risk Weighted Assets (NC/RWA), Non-Performing Asset /Total Assets (NPAs/TA) in Bosnia Herzegovina (BH) for the period: Q1 2004. – Q2 2014.

	LA/TA	NPLs/TL	APEC	NIE/TR	ARP	TL	M2	NC/RWA	NPAs/TA
LA/TA	1.000	-0.824	0.362	-0.004	0.144	-0.838	0.820	0.320	-0.854
NPLs/TL	-0.824	1.000	-0.256	-0.072	-0.463	0.576	0.643	0.015	0.996
APEC	0.362	-0.256	1.000	-0.724	0.049	-0.309	-0.255	0.253	-0.234
NIE/TR	-0.004	-0.072	-0.724	1.000	0.058	0.065	0.006	-0.275	-0.108
ARP	0.144	-0.463	0.049	0.058	1.000	0.339	0.312	-0.647	-0.409
TL	-0.838	0.576	-0.309	0.065	0.339	1.000	0.984	-0.651	0.626
M2	0.820	0.643	-0.255	0.006	0.312	0.984	1.000	-0.599	0.690
NC/RWA	0.320	0.015	0.253	-0.275	-0.647	-0.651	-0.599	1.000	-0.170
NPAs/TA	-0.854	0.996	-0.234	-0.108	-0.409	0.626	0.690	-0.017	1.000

Figure 4.13: The matrix of correlation coefficients between the parameters of: Liquid Assets / Total Assets (LA/TA), Net Profits and Losses (NPLs) / Total Loans (NPLs/TL), Average Profitability on Equity Capital (APEC), Non-Interest Expenses / Total Revenue (NIE/TR), the Average Required Reserve (ARR), Total Loans (TL), Money Supply in the wider sense (M2), , Net Capital / Risk Weighted Assets (NC/RWA), Non-Performing Asset /Total Assets (NPAs/TA) in Bosnia Herzegovina (BH) for the period: Q1 2004. – Q2 2014.

positive correlation. Since the object of analysis is about the impact of independent variables on the dependent variable, i.e. the ratio of liquid assets to total assets (liquidity of the banking system in Bosnia and Herzegovina) it can be seen that the strongest positive correlation was observed between the ratio of liquid assets / total assets and money supply in the wider sense of the word, i.e. parameter - M2 (0,820).

In fact, this correlation is completely logical and reasonable because of the increase of parameter M2 leading to an increase of liquidity in the banking system. Also, the indicators of liquid assets / total assets and the value of average profitability on equity capital were recorded as the positive correlation (0,362), and between the indicators of net capital / risk-weighted assets (0,320). The greatest value of the capital adequacy ratio for the analyzed period was recorded in 2004 (20,1%), the lowest reached in the last quarter of 2008 (15,0%) and the mean value of 16,95%, which suggests that the banking system in Bosnia Herzegovina (BH) is well capitalized and is able to maintain a constant high rate of capitalization and well above the legal minimum of 12%, which reflects positively on the overall liquidity of the banking sector. Also, the average reserve requirement has had a positive causality of the observed variable ratio (0,144).

Theoretically, the amount of required reserves directly affect the value of bank resources. The height of required reserves directly influences the values of resources. With the higher reserve requirement of banking resources are typically more expensive, because the reserve requirement are the funds on which the yield is small. (Kozaric, Kovacevic (2007). Required reserves are the only monetary policy instrument operationally available to the CBBH to implement the economic policy goals.

Therefore, the strongest negative correlation was noted between observed indicators of liquidity as the dependent variable and independent variables in the model, such as indicators of non-performing assets to total assets (-0,854), followed by total loans (-0,838) and non-performing loans to total loans (-0,824). The movement of non-performing assets, or bad loans, have an impact on liquidity. Thus, the high liquidity leads to low profitability and vice versa, lower liquidity leads to higher profitability (K. Kosmidou (2008).

In the first quarter of 2014, most financings of the Central Bank of Bosnia and Herzegovina (CBBH) are related to short-term loans where the rate of growth on a quarterly level was 3% for short-term loans and 0,1% for long-term loans to private and public non-financial companies. Thus, the data indicates increased repayment of maturing obligations and forecasts new loans used to restructure existing loans.

From above tables, we can explore the indicator of liquidity in the banking sector of Bosnia Herzegovina (BH) i.e. the ratio of Liquid Assets and Total Assets (LA/TA) presents the strongest positive correlation to the Money Supply in the wider sense (M2) (1,97). As previously noted, the correlation coefficient was observed the same trend in the movement, which is quite reasonable because the increase in the money supply in the financial system leads to an increase of liquidity.

A potential indicator of liquidity is assumed as the Net Capital / Risk-Weighted Assets (NC/RWA) (0,10). The increase in risk-weighted assets while increasing non-performing loans and provisions shows that the actual credit growth to some extent offset with the negative effect of additional provisions for non-performing bank claims. The growth of capitalization in the banking sector and the growth of risk-weighted assets induces that the banking sector achieved a certain financial stability at the end of 2013.

On the other side of the most pronounced negative correlation was recorded between

Model	Unstan- dardized Coeffi- cients B	Std. Error	Stan- dar- dized Coeffi- cients Beta	t	Sig	95% Con- fidence Inter- val for B Lower Bound	Upper Bound	Zero order	Corre- lations Partial	Part
(Constant)	23.29	5.96	-	3.91	0.001	11.17	35.41	-	-	-
NPLs/TL	2.51	0.73	-2.26	3.45	0.002	1.03	3.98	-0.82	0.51	0.09
APEC	0.07	0.07	0.04	0.92	0.36	-0.08	0.22	0.36	0.16	0.01
NIE/TR	-0.01	0.03	-0.01	-0.21	0.83	-0.07	0.05	-0.01	-0.04	-0.01
ARP	6.43	0.01	0.01	0.11	0.92	-0.01	0.01	0.14	0.02	0.01
TL	-0.01	0.01	-2.01	-8.68	0.01	-0.01	-0.01	-0.84	-0.83	-0.24
M2	0.01	0.01	1.97	7.18	0.01	0.01	0.01	0.01	-0.82	0.78
NC/RWA	0.44	0.24	0.10	1.80	0.08	-0.06	0.93	0.32	0.30	0.05
NPA's/TA	-4.34	0.93	-3.19	-4.67	0.01	-6.23	-2.45	-0.85	-0.63	-0.13

Figure 4.14: A Regression analysis coefficients between the following parameters: LA/TA, NPLs/TL, APEC, NIE/TR, ARP, TL, M2, NC/RWA, NPAs/TA in Bosnia Herzegovina (BH) for the period: Q1 2004. – Q2 2014.

the ratio of Net Assets to Total Assets (NA/TA) and the ratio of Liquid Assets and Total Assets (LA/TA) (-3,19). This relation is quite logical, because with the increase in non-performing assets and loans comes to falling liquidity. Non-performing loans are the largest source of risk of the Bosnia Herzegovina (BH) banking sector. At the end of 2013, non-performing loans accounted to 15,12% of all loans in the balance sheets of commercial banks in Bosnia Herzegovina (BH). Despite of the fact, the banking sector in Bosnia Herzegovina (BH) has a lower level of participation of non-performing loans to total loans compared to some countries in the region, non-performing loans are one of the biggest risks the stability of the financial system.

The second considerable amount of negative correlation is Non-Performing Loans / Total Loans - NPLs / TL and Liquid Assets / Total Assets - LA / TA (-2,26). To last in the competition for the negative correlation between the variables are the total loans - TL as an independent variable and liquid assets / total assets - LA /TA as the dependent variable in the model (-2,01). As we know the risk of insolvency is the inability of the banking sector to meet maturing obligations, which may eventually lead to a loss in business. It is well known that high liquidity leads to low profitability, and vice versa lower liquidity and higher ratio of loans to deposits leads to greater profitability. Thus, this negative correlation is understandable and logical consequence because the increase in the rate of credit on condition that leads to deterioration of the quality of the loan portfolio at the same time comes a decrease liquidity.

4.7 Conclusion

This paper analyzes the determinants of the liquidity of the banking sector in Bosnia Herzegovina (BH) in the period between Q1 2004 and Q2 2014, using multiple linear regression models. In the quantitative analysis, we assume liquid assets / total assets of the banking sector in Bosnia Herzegovina (BH) (LA/TA) is used as dependent variable, and the following ones as independent variables: NPLs / total loans (NPLs / TL) average

profitability on equity capital (APEC), non-interest expenses / total revenue (NIE / TR), the average required reserve (ARR), total loans (TL), the money supply in the wider sense (M2), net capital / risk weighted assets (NC / RWA) and NPAs / Total assets (NPA/ TA). The null hypothesis was rejected because it was not shown that the independent variables affect the dependent variable. The liquidity of the banking sector in Bosnia Herzegovina (BH) was generally satisfactory. The basic liquidity indicators such as total assets and liquid assets to short-term liabilities, with the slight increase in value compared to the previous year. As the trend of increasing other indicators of financial health of the banking sector Bosnia Herzegovina (BH) positive effects, too high level of liquidity especially in unfavorable macroeconomic environment initiates the conclusion that banks are simply unwilling to finance the Bosnia Herzegovina (BH) economy and population. Willingness of large European banking group to lend to the domestic economy and household sector will largely determine further development of BH banking system, and the way of resolving the issue of non-performing loans and measures that will be taken by relevant domestic institutions will play an important role. Other risk in BH banking sector arise from the credit risk. Future research on this topic can be expanded depending on the availability of the database, so that the use of more appropriate explanatory variables for a longer period of time can get even better analysis.

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4.(2) Regulating small banks

4.8 4.(2) Regulating Small Banks

In Europe, after the Basel 1 (1988) accord, the banking supervision Accords in Basel, Switzerland, Basel 2 (1999) and Basel 3 (2010) have been evolved. The issuer, the Basel Committee on Banking Supervision (BCBS), advised about credit risk (1988.07) at the Basel 1 and amended about market risk (1996.01) with the Basel 1 Amendment. In the revised framework of the Basel 2, operational risk (2004.06) was introduced and enhanced at the Basel 3 (2010.12). In this overall perspective, these Basel Capital Rules have been enhanced up to the Basel 3. For example, the scope of operational risk is enlarged. This requires some reasonable motivation since banks face the situation to manage the cost to follow banking capital regulation rules. Of particular significance is that the government needs to regulate banks to prevent panic from the systemic banking crisis.

4.9 Introduction

Much interest has been aroused in cascading failure of bank run prevention. For example, Friedman and Schwartz(1963) observe large costs imposed on the economy of United States caused by bank runs in the 1930s. Upon on much more recent data, in systemically important banking crises of the world from 1970 to 2007, the average net recapitalization cost to the government was 6 % of GDP (Gross Domestic product). Fiscal costs associated with crisis management were averaged 13 % for GDP (16 % of GDP if expense recoveries are ignored), and economic output losses were averaged about 20 % of GDP during the first four years of the crisis. Otherwise, if the government decides to adopt the Basel capital regulation framework, the adoption cost will influence the economy of countries. Either households or banks, related parties to economy should pay for the Basel capital regulation as the preventive method in the banking business cycle. An OECD (The Organisation for Economic Cooperation and Development) study released on 17 February 2011, estimated that the medium-term impact of the Basel III implementation on GDP growth would be in the range of 0.05 % to 0.15 % per year. Economic output would be mainly affected by increase in banks' lending spreads, as banks pass a rise in bank funding costs, due to higher capital requirements, to their customers. Therefore, the situation is that banks are struggling to manage the regulation cost and the government wants to defend about nationwide contagion of other banks.

4.10 The Macroprudential Approach to Financial Regulation Covering on-Balance-Sheet and Off-Balance-Sheet (OBS)

Insofar as systemic risk is concerned, risks that firms, households and reserve banks and commercial banks face are highly linked to each other. Seen from this point of view, the banking industry and the monetary policy have particular relevance to systemic risk. Undoubtedly, it goes without saying that financial contagion problems through international banks should be measured in the manner of systemic risk management. With the macroprudential approach, it is highly probable that systemic risk is explained by the

static model of the general equilibrium. Because on-balance-sheet and off-balance-sheet (OBS) risks are structurally segmented annually or periodically by financial statements containing the balancesheet. Even though domino effects or contagions can be understood as movements having the future tendency to figure out solutions toward the future, scope of regulation should be articulated by categorization of on-balance-sheet and off-balance-sheet (OBS) risks in the static model. Thus, the macroprudential approach to financial regulation covering on-balance-sheet and off-balance-sheet (OBS) risks is intimately linked with the general equilibrium(GE) approach.

On-balance-sheet risks are presented in a fourfold manner and are divided into credit risk, market risk, liquidity risk and systemic risk. Assets of banks have credit risk and market risk. Credit risk is the risk that a borrower will default on any type of debt by failing to make required payments. Market risk is the risk of losses in positions arising from movements in market prices. In case of liquidity risk, there are two major situations. One is emergency capacity of banks. When an illiquidity event takes place, an affected bank typically must borrow funds at interest rates exceeding those paid by other institutions. Another is about the stability of the banking system in case of inducing a large number of depositors to seek withdrawals. I would say liquidity risk in regard of demand deposit is on-the-balance-sheet risks of banks. Credit, market and liquidity risk are portrayed in considerable individual details but systemic risk is negative externality or adverse spillover effect stemming from transaction in which they were not participants. Distinguished from credit risk containing sovereign risk (government risk), counterparty risk (unincorporated entities' risks exposed to financial risk, usually referring to governments, national banks), systemic risk is the risk of collapse of an entire financial system or the entire market, as opposed to risk associated with any individual entity, group or component of a system. George G. Kaufman and Kenneth E. Scott (2003) define "systemic risk" in imprecise terms as below:

"Systemic risk refers to the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components, and is evidenced by comovements (correlations) among most or all the parts."

Darryll Hendricks (2009), who is a practitioner, suggests a more theoretical definition from sciences in which the term originated:

"A systemic risk is the risk of a phase transition from one equilibrium to another, much less optimal equilibrium, characterized by multiple self-reinforcing feedback mechanisms making it difficult to reverse."

Banks engage in a number of activities that yield income, entail expenses and manage risks from on-balance-sheet risks to off-balance-sheet risks. Depending on bank characteristics, Banks extend loan commitments, security loans and trade derivative securities. Through extended loan commitments, the borrower has a guarantee of credit at a given interest rate whenever desired during the specific period.

The bank receives interest income on the portion of the credit line that the borrower draws upon, and the bank receives non-interest income on the unused portion. Whereas a loan commitment obligates a bank to bring a loan onto its balance sheet upon customers' requests, securitization permits a bank to remove loans from a balance sheet. Trading derivative securities also proved to be significant source of revenues. This claim is supported by the survey of David Van Hoose (2010), by the end of 2008, United States banks held a notional amount of derivatives totally more than 190 trillion dollar, of which about 150 trillion dollar of derivatives' exposure was comprised of interest rate contracts.

Asset category	\$ Billions	%
Commercial and industrial loans	1,197.9	12.3
Consumer loans	847.4	9.0
Real estate loans	3,573.9	36.7
Interbank loans	364.6	3.6
Other loans	269.0	2.7
Total loans	6,252.8	64.3
Securities	2,017.7	20.7
Cash assets	247.1	2.5
Other assets	1,220.4	12.5
Total assets	9,738.0	100.0

(Source: Board of Governors of the Federal Reserve System, August 2008)

Category	\$ Billions	%
Transactions deposits	579.1	6.0
Large time deposits	1,016.4	10.4
Savings and Small Time Deposits	4,171.6	42.8
Total deposits	5,767.1	59.2
Borrowings	1,744.8	17.9
Other liabilities	1,051.4	10.8
Total liabilities	8,563.3	87.9
Equity capital	1,174.7	12.1
Total liabilities and equity capital	9,738.0	100.0

(Source: Board of Governors of the Federal Reserve System, August 2008)

Figure 4.15: Assets, Liabilities and equity capital of U.S. commercial banks, Vanhoose (2008).

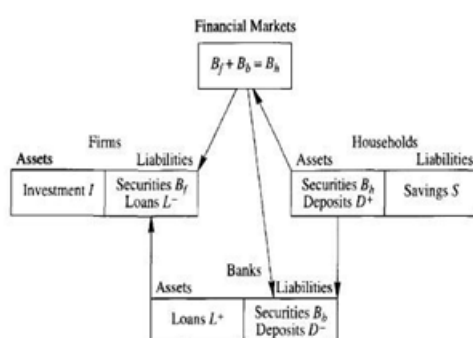


Figure 4.16: The balance in Freixas-Rochet (1999).

In relation to what I have previously said, the general equilibrium (GE) approach is useful to understand the overall mechanism of financial transaction and economic policy. The opposite mechanism of assets and liabilities on bank characteristic in the table 2.(1), is different from usual balance sheets of firms. That is, banks regardless of central banks or commercial banks have characteristic that loans are assets of banks and deposits are liabilities.

All of these figures are emphasized by capital circulation of the Freixas-Rochet model (1999) in the figure 2.(3). In conjunction with the Freixas-Rochet model, the equilibrium is detected with the general equilibrium approach with direct relevance to circulation of securities and stability of deposits. In the paper, the general equilibrium approach is upgraded with an adroit mixture of the balance sheet concept evaluating the value of economic entities and the income statement concept considering the profit to support the existence of financial entities.

4.11 A Model

4.11.1 Saving Preference of Consumers

A microeconomic theory of banks had not been existed before the microeconomic foundation related to banks in the early 1970s. I would suggest add a banking sector at the Arrow general equilibrium model (1953) under the complete financial market assumption. The main purpose of the model has been to explore solutions about the problem of households, firms, banks and regulation bodies.

The two-period model ($t = 0, 1, 2$) with a unique physical good initially owned by consumers in the economy in which a continuum of ex-ante identical agents is each endowed with one unit of goods at the period $t = 0$, and this good is to be consumed at each period of $t = 1$ and $t = 2$. The consumer chooses her consumption profile (C_1, C_2) and the allocation of her savings S between bank deposits D_h and securities $\sum_{s \in \Omega} P_s B_s^h$, in a way that maximize her utility function μ under her budget constraints:

$$\begin{aligned} & \text{Max } \mu(C_1, C_2), \\ & C_1 + \sum_{s \in \Omega} P_s B_s^h + D_h + S_h - \sum_{s \in \Omega} P_s B_s^h - D_h = W_1. \\ & C_2 = \Pi_f + \Pi_b + (1+r)\sum_{s \in \Omega} P_s B_s^h + (1+r_D)D_h + (1+r_h)S_h - (1+r)\sum_{s \in \Omega} P_s B_s^h - (1+r_D)D_h. \end{aligned}$$

where W_1 is denoted as her initial endowment of the consumption good, $\Pi_f + \Pi_b$ as respectively profits of the firm and of the bank (distributed to the consumer-stockholder at $t = 2$), B^h as securities, D^h as bank deposits and S_h as savings.

r, r_D, r_h are interest rates paid by securities, deposits and savings. For each future state of the world s ($s \in \omega$) one can determine the price P_s the contingent claim that pays one unit of accounts in state s and nothing otherwise.

The consumer has a well-defined set of desires (“preference”), which can be represented by a numerical utility function. In addition, we assume that the consumer chooses optimally, in the sense that they choose the option with the highest utility of those available to them. It implies that a consumer is solving an optimization problem. An optimization problem has three key components.

4.11.1.1 Selected object

The consumer chooses her consumption profile (C_1, C_2) and allocation of her savings S_h between bank deposits D_h and securities B^h . If real assets $S_h - \sum_{s \in \Omega} P_s B_s^h - D_h$ is non-negative, it implies real assets are sufficient to support the household economy.

4.11.1.2 The objective function

The consumer maximizes her utility function μ . μ is assumed to be increasing and concave. Notice that preferences are contingent states and do not fit the standard Von Neumann-Morgenstern representation. Incompleteness of preference becomes apparent that decision makers cannot make a decision in the ambiguous situation. However, even though one individual or one factor doesn't decide, the regulator decides the policy with a foretaste of what is to come after annual closing accounts.

4.11.1.3 Constraints

1. Cash-in-advance: $0 < D_h \leq W_1$, The paper will be based on the Cash-in-advance constraint. This approach that was introduced by Clower (1967) is the requirement that each consumer or firm must have sufficient available cash before they can buy goods.
2. The Price of security under Uncertainty: $\sum_{s \in \Omega} P_s B_s^h$ (resp. $\sum_{s \in \Omega} P_s B_s^f, \sum_{s \in \Omega} P_s B_s^b$) implies the price of securities by the absence of arbitrage opportunities. A bank issues (or buys) a security h (intepreted as a deposit or a loan) characterized by the array B_s^h ($s \in \Omega$) (resp. B_s^f, B_s^b) of each payoff in all future states of world ω .
3. An interior Solution: The consumer's program (P_h) has an interior solution only when interest rates are equal: $r = r_D$.
4. The Preference of Savings: In the Arrow-Debreu model, money is redundant in the market. Households are indifferent about the composition of savings. In the paper, the household has preference to increase the budget to collect savings S_h and affected by risk levels of securities, deposits and real assets. Savings S_h is the sum of Securities $\sum_{s \in \Omega} P_s B_s^h$, Deposits D_h and Real Assets $S_h - (\sum_{s \in \Omega} P_s B_s^h + D_h)$.

4.11.2 Arguments

There are concerns about savings that are substituted into consumption by the household like Covas-Fujuta (2010). Diaz (2005) adds no capital requirement at basics to reduce consumption and increase savings by the household. Haslag (2001) assumed that return to money is positively related to the money growth rate that is a random variable, gross real returns to savings are random. His realized gross real return to savings indicates that the gross real return to savings is a weighted sum of capital and fiat money (which derives its value from government regulation or law, so called as 'fiat currency'). The weight is the share of agent's asset.

In the Waller model (2004), Savings are very passively selected by the household depending upon decisions at the previous period. Middle-aged agents have already earned their wage income, as the wage during period t was determined by the previous period's interest rates (a level of the capital stock). Also, they have already decided how much to consume and save (since savings are a fixed fraction of wage income), but they have not yet decided how to allocate their savings between capital and fiat currency. What these middle aged agents want at this point is just the highest possible interest rate between period t and $t + 1$, so that they can obtain the best possible return on their savings and can thus consume as much as possible during their period of old age. In the third period of life, retired agents consume their savings and exit the model.

Practically, Christensen-Meh-Moran (2011, Bank of Canada) mentioned, at the timing of events, households deposit savings at banks that use these funds as well as their own net worth to finance the entrepreneur's projects. In the investment frame, exiting (failing to

return from the project) agents sell their capital for consumption goods and surviving agents buy this capital as part of their consumption-savings decision.

However, in reality, even though the agent has a house, they need to spend expenditure for renting, maintenance and extension of houses. Savings and real asset portion are large enough to make the loan from banks. It is hard to explain price fluctuation of houses and savings on the economy by depending upon the interest rate of capital stock and deposit, or perfect substitution of consumption. For households, the preference of savings is the matter about existence of household economy making future benefits and directly affecting to the welfare of any individual.

House-price appreciation by the model of Goodhart-Kashrap-Tsomocos (2012) is impressive. Reducing deposit defaults induces more savings circulated by the bank and less self-insurance and by the end, the reduction in self-insurance reduces the number of houses for sale in a good state, which means that house-price appreciation in the boom is higher than otherwise. Most of all, the market incompleteness with deadweight costs of default distorts the housing market. Wealthy agents endowed with houses make their saving decisions accounting for the possibility that deposits will not be fully repaid.

When default penalties for banks are low, then households internalize risks putting less wealth into the banking system and hold more in the form of houses. This choice increases the supply of houses that is available in boom, which lowers house prices and raise welfare for agents entering the housing market at that time. To insure that house price reduction in the bad state of the world, households P and F are also presumed to have lower wealth. Likewise, the non-bank is endowed with lower capital in period 1 as well as in the bad state of the world. This model describes the house bubble phenomenon interestingly.

In the model of Lucas (1995), to support the incompleteness of markets, he pointed out savings that the young split their savings between bank deposits, which promise a fixed nominal return, and a bank equity, which yields an uncertain real dividend. In addition, because a constant fraction of initial wealth is saved, there is no distortion due to fixed nominal interest payments on deposits. Hence regardless of deposits, the bank equity is related to the real effect of monetary policy.

In the paper, at the framework of securities, deposits and real assets with savings, firstly, the relation between savings and real assets (especially houses) can be much more attached. Secondly, deposits included in the total saving amount which are escaped from the one-sided thinking that deposits are equal to savings and can be perfectly substituted to consumption. Thirdly, Securities at uncertainty are affecting to the investment portfolio of households. These dynamics are explained by the following academical detail.

4.11.3 Deposits of Households

Households choose $(C_1, C_2, S_1, S_2, R_1)$ taking prices (W_1, W_2) as given. Formally, if we consider the 4-factor model containing banks, because banks have the special financial structure having deposits as liabilities and loans as assets, we need to have the different mindset from generally accepted accounting principles about debit and credit accounts. The general equilibrium(GE) diagram is similar with the balance sheet. Distinguishably, the money flow in the paper starts at the bank transaction which is “deposits and borrowings” as liabilities and “claims to corporate” as assets.

Then, deposits of household are the amount to be accumulated in banks. Conveniently, riskier investments than deposits for household are categorized as securities.

Savings are moving in the real household economy by capital circulation of securities, deposits and real assets. In addition, the welfare of each household is moving from dynamics of accumulated savings. In the overlapping generation model, wealth is always given and manages the household economy easily by each generation. In reality, one who didn't get a house as a legacy, she should spend quite a long time to have a house or rent a house.

Attention about fundamental wealth related to non-working capital of a household economy should be emphasized. If the consumer spends his income entirely, the total amount W_1 may be spent totally and can be bounded. In this manner, the household always has their fundamental welfare to manage the household economy and consumption can be naturally deduced from the framework of household economy. That is, W_1 is the budget constraint and the market information is incomplete so we cannot deduce the real variable of consumption in reality. W_1 and incompleting market information are not enough to deduce the real variable of consumption. In terms of the working capital, we are not so surprised to know that capital has various liquidities.

For example, a household wants to spend money on a daily basis but should reduce the amount of money by spending it to have fundamental living basis like houses. In the paper, the financial budget constraint is bounded within the W_1 except for S_1 because S_1 is the summation of securities, deposits and real assets. These are vital factors to operate household economy related to financial markets. The working capital concept at the household economy is evoked within the general equilibrium in the paper. In the perspective that the industrial characteristics of banks mainly operated by capital, it makes sense to us that consideration about the household economy should be balanced with the working capital concept of banks.

Then, why we need to define return R_1 in this model? Simply, we think of three variables of W for endowment, S for savings and C for consumption. We assume that the concept of the golden-rule saving rate in Chapter 1 of Barro and Sala-i-Martin, n denotes for the constant exogenous population growth rate, and d is for the constant exogenous rate of depreciation of capital. We know the house saving rate is 5% (usually 2 – 11%, OECD, Economic Outlook n.91, June 2012). The amount of savings in the economy should grow as population grows. To support this insured saving amount caused by population growth, the return should be enough to make profits to cover the insurance expense in the economy with the general equilibrium(GE) perspective. Then, we can assume the worst scenario like a bank-run case. Even though the fix amount of saving deposits is secured, the loss amount induced from total savings by the end - insured savings will go to the consumption part. In this overall perspective of an equilibrium, insuring savings of households seems plausible to support the economy of households, yet it requires further understanding about the profitable dynamic mechanism to operate the economic cycle. I would say the original form is mainly based on the BCR general equilibrium model diagram presenting as the balancesheet format as it can be because on-balance-sheet factors are reflected by two regards - the money flow perspective(profit) and the economic status perspective(net present value).

The original form (savings containing real assets)

$$\begin{aligned} & \text{Max } \mu(C_1, C_2), \\ & C_1 + \sum_{s \in \Omega} P_s B_h + D_h + S_h - \sum_{s \in \Omega} P_s B_h - D_h = W_1, \\ & C_2 = \Pi_f + \Pi_b + (1+r) \sum_{s \in \Omega} P_s B_h + (1+r_D) D^h + (1+r_h) S_h - (1+r) \sum_{s \in \Omega} P_s B_s^h - (1+r_D) D^h. \end{aligned}$$

The simplified form for calculation (savings containing real assets)

$$\begin{aligned} & \text{Max } \mu(C_1, C_2), \\ & C_1 = W_1 - S_1, \\ & C_2 = R_1 + W_2 - (1+r) S_1 - S_2. \end{aligned}$$

We have the first order condition of consumption at period 1 and 2 as below:

$$\begin{aligned} \frac{\partial L}{\partial C_1} &= \mu'(C_1, C_2) - \lambda = 0, \\ \frac{\partial L}{\partial C_2} &= \mu'(C_1, C_2) - \lambda = 0. \end{aligned}$$

We know the Lagrange multiplier is 0 as $\lambda = 0$, by $\frac{\partial L}{\partial S_1}$, the first order condition of savings at period 1 and by $\frac{\partial L}{\partial R_1}$, the first order condition of return from initial investment.

In addition, we get $\lambda(1+r_1) = 0$ by $\frac{\partial L}{\partial S_1}$, the first order condition of savings at period 1. Therefore, what is get from checking the first order condition of household problem is that households consume today or tomorrow regardless of a banking money flow and it is not affected by the return of initial savings. $\mu'(C_1, C_2) = 0$ denotes as time indifference about consumption preference. Households operate the household economy related to banks regardless of consumption for today or tomorrow. We conclude consumption choice is not affected by return of initial savings r_1 at the frame of banking money flow related to household.

The house expense portion in deposits held with MFIs (Monetary Financial Institutions) is the asset that can induce the future benefit and considered as priority to invest for a long time. For example, among loans to households of MFIs (5231 billion euros), loans for house purchase are 74%, 3858.1 billion euros in 2013. Note that we focus on the money transaction started from the bank balance sheet, in the concept of savings, House fee is deduced from $S_h - \sum_{s \in \Omega} P_s B_s^h - D_h$ Where h is the period of household.

If we suppose the house fee is not contained in savings, the simplified form is as below:

The simplified form for calculation (savings without real assets)

$$\begin{aligned} & \text{Max } \mu(C_1, C_2) = 0, \\ & C_1 + \sum_{1 \in \Omega} P_1 B_1^h + D_1 = W_1, \\ & R_1 + C_2 + (1+r) \sum_{1 \in \Omega} P_1 B_1^h + (1+r_1) D^1 - (1+r) - \sum_{2 \in \Omega} P_2 B_2^h - D_2 = W_2, \\ & \text{Also, } C_1 = (W_1 - S_1) + (S_1 - \sum_{1 \in \Omega} P_1 B_1^h + D_1). \end{aligned}$$

The first-order condition

$$\begin{aligned}
\frac{\partial L}{\partial C_1} &= \mu'(C_1, C_2) - \lambda = 0, \\
\frac{\partial L}{\partial C_2} &= \mu'(C_1, C_2) - \lambda = 0, \\
\frac{\partial L}{\partial D_1} \lambda &= 0, \\
\frac{\partial L}{\partial D_1} - \lambda(1 + r_1) &= 0, \\
\frac{\partial L}{\partial D_2} \lambda &= 0, \mu'(C_1, C_2) = 0, \\
\frac{\partial L}{\partial \Sigma_{1 \in \Omega} P_1 B_1^h} - \lambda(1 + r_1) &= 0, \\
\frac{\partial L}{\partial \Sigma_{1 \in \Omega} P_1 B_1^h} \times \lambda &= 0, \\
\frac{\partial L}{\partial r_1} &= \lambda \times (\Sigma_{1 \in \Omega} P_1 B_1^h + D_1) = 0.
\end{aligned}$$

In conclusion, $\mu'(C_1, C_2) = 0$ (time indifference about consumption preference) is the same condition regardless of real assets whether it is contained in savings or not.

Consumption choice is not affected by the interest rate r_1 for initial savings (same condition regardless of real assets whether is contained in savings or not) and summation of securities and deposits $\Sigma_{1 \in \Omega} P_1 B_1^h + D_1$. Evidently, this condition appears in this banking model when we ignore real assets which is most stable in the household economy and can be interpreted as the big portion expense and the intangible asset producing future benefits. Therefore, with the condition that real assets are contained in savings, we can explain the house economy affected by the proportion of securities and deposits.

First intention to choose the general equilibrium model in the paper is to offer understandable method to the academic field and professional field. In the practice, the reserve bank has many methods and even they want more methods together in the weighted way. As I can do, I am intending to use real variables than random variables and a lot of Lagrange methods which is very general way to use the general equilibrium. The saving composition matter is more specifically supported by the following empirical data.

The deposit amount traded is different depending upon factor composition of economic models. For example, the European Central Bank announces the Euro areas' deposit amounts for the 4th quarter in 2013 in the Euro areas. Gross saving amount of households is 2521.3 billion euros (growth rate:2.4). Deposits by non-financial corporations are 1870.7 billion euros (growth rate:6.7). Deposits by Insurance corporations and pension funds (financial intermediaries) are 653.2 billion euros (growth rate:-5.3). Deposits by other financial intermediaries are 1854.1 billion euros (growth rate:-3.1). Deposits by government are 440.8 billion euros (growth rate:-1.8). Deposits by non-euro area residents are 2522.9 billion euros (growth rate:-11.2). Therefore, without consideration about deposits by non-financial corporations (1870.7), the comparison between deposits by household (2521.3) and deposits by financial intermediaries (653.2+1854.1=2507.3) is naive explanation.

Loans for house purchase is 3858.1 billion euros (growth rate:0.7). It is Long-term liability affecting the existence of household economy. In addition, the total (7341.7) of deposits by insurance corporations, pension funds (653.2, -5.3), other financial intermediaries (1854.1,

-3.1), non-financial corporations (1870.7), government (440.8), non-euro area residents (2522.9) are. Also, total (7752.2) of deposits by household (2521.3, 2.4) and Loans for house purchase (3858.1, 0.7) and other loans (796.7, -1.6), consumer credit (576.1, -3.0) are.

	(billion euros, growth rate)
Loans for house purchase (3858.1, 0.7)	insurance corporations and pension funds (653.2, -5.3)
other loans (796.7, -1.6)	other financial intermediaries (1854.1, -3.1)
consumer credit (576.1, -3.0)	non-financial corporations are (1870.7, 6.7)
	government (440.8, -1.8)
	non-euro area residents (2522.9, -11.2)
	total 7752.2

Tables 4.1: The empirical balance when the capital of a household economy is concerned.

(Ref: European Central Bank, the 4th quarter in 2013)

Savings S_h are the sum of Securities $\sum_{s \in \Omega} P_s B_s^h$, Deposits D_h , Real assets $S_h - \sum_{s \in \Omega} P_s B_s^h - D_h$. Households try to control the balance of assets and liabilities because in the situation of uncertainty, to maintain enough Deposits D_h for the economic existence of households, households need to invest on securities as of $\sum_{s \in \Omega} P_s B_s^h$ posed on uncertainty conditions. Mainly, real assets imply the budget for houses which can afford to manage the residence and invested real assets. For example, if the household has an apartment and there is the redundancy after spending the investment on securities and deposits, it can be the maintenance fee for house decoration or big furniture purchases. The importance of portion for houses is considerable. Otherwise, if real assets are negative, hence, savings of households are less than the amount of securities and deposits. Even though, the amount of operation in the household is enough with securities and deposits. In the conservatism on the house budget, we can consider the effect on housing. In the paper, Houses of households is considered as future economic assets that support each member of households to make productions.

Through the general equilibrium approach, the link from the bank problem to the household problem is naturally connected. Also, the following technical finding by usage of same accounts at the household problem induces direction of regulation on banks like the portfolio analysis and initial GDP consideration. The following are technical findings with saving preference.

Suppose that $\exists s \in \{G, B\}$, G=Good, B=Bad. In the case 1, risk aversion is as below: (resp. risk-taking case)

$$\Omega = \{G, B\},$$

$$C_1 + \sum_{s \in \Omega} P_s B_{s=B} B_{s=B^h} + D^h + S_h - \sum_{s \in \Omega} P_s B_{s=G} B_{s=G^h} - D^h = W_1$$

In this case, portfolio analysis should be detected by regulation because the situation can be changed depending on the status.

In the second case, incompleteness preference can be considered.

$\Omega = \{G, B, \text{no choice}\}$, no choice can be selected by Choquet expectation

$$CEv(\mu(x)) = \min_{\Pi \in \text{core}(v)} E_{\Pi}(\mu(x))$$

where $\text{core}(v) = \Pi\{\Delta S : \Pi(A) \geq v(A) \text{ for all } A \subseteq S\}$. $C_1 + 0 + D^h + S_h - 0 - D^h = W_1$

and D^h offset, hence $C_1 + \frac{C_2}{1 + r_h} = W$.

Initial GDP is caused by partition of initial endowment that is the combination of a consumption set. Hence, regulation direction is originated from initial GDP in this case.

4.11.4 The Composition of Borrowings for Firms

The firm chooses its investment level I and its financing (through Real Assets $\sum_{s \in \Omega} P_s B_s^h + D_h$, Liabilities to banks $\sum_{s \in \Omega} P_s B_s^h + D_h - L_{fr}$ (or Liabilities to central banks L_{fr}) in a way that maximizes its profit:

$$\text{Max } \Pi_f(P_f)$$

$$\Pi_f = f(I) + r_f(\sum_{s \in \Omega} P_s B_s^h + D_h) - r_L^{\text{bank}}(D_h + \sum_{s \in \Omega} P_s B_s^h - L_{fr}) - r_L^{\text{fr}} L_{fr}$$

$$I = S_h = D_h + \sum_{s \in \Omega} P_s B_s^h$$

Where f denotes the production function of the representative firm. r_f is the premium of firm's real assets. r_L^{bank} , r_L^{fr} are interest rates on bank loans and federal reserve bank loan. D_h denotes for bank deposits. B_h denotes for securities. Especially B_{fr} denotes for securities of federal reserve banks. L_{fr} are loans claimed by the firm to the federal reserve bank. For each future state of the world s ($s \in \omega$), one can determine the price P_s of the contingent claim that pays one unit of accounts in a state s and nothing otherwise. I is the investment level and S_h denotes for savings.

Interior Solution: P_f has an interior solution only when: $r_f = r_L^{\text{bank}} = r_L^{\text{fr}}$

The Modigliani-Miller(MM) theorem projects a theme of a theorem on capital structure. The basic theorem states that, under a certain market price process (the classical random work) and an efficient market, in the absence of taxes, bankruptcy costs, agency costs and asymmetric information, the value of a firm is unaffected by how that firm is financed. Firms are indifferent about the composition of borrowings. Given the proposition II of the Modigliani-Miller (MM) theorem, a higher debt-to-equity ratio leads to a higher required return on equity because of the higher risk involved for equity-holders in a company with debt. $r_E = r_0 + \frac{D}{E}(r_0 - r_D)$ where r_E is the required rate of return on equity or cost of equity, r_0 is the company unlevered cost of capital (ie. Assume no leverage, r_D is the required rate of return on borrowings or cost of debt and $\frac{D}{E}$ is the debt-to-equity ratio

under two assumptions: (1) no transaction costs exist. (2) individuals and corporations borrow at same rates. However, on the surface, given same ratios of $\frac{D}{E}$, two different sized banks are distortly interpreted. Even though this proposition is induced in the absence of the bankruptcy costs, merges of banks like “too big to fail”, so called “the size game among big banks”, are considerable. Thus, it is certainly worth inquiring $D + E$ behind it's dynamics of $\frac{D}{E}$.

The model provides a key with which to unlock riddles of firms' borrowing compositions. The borrowing composition of firms imparted dynamics with the preference to maintain Real Assets $\sum_{s \in \Omega} P_s B_s^h + D_h$. Regardless of an equilibrium, firms prefer to loan from central banks (so called as bonds) than commercial banks. Among D_h and $\sum_{s \in \Omega} P_s B_s^h$, Firms prefer to have D_h because of financial stability and preference about certainty. The model reflects the tendency of banks toward the big size with Real Assets. In the economic existence respect of banks, banks have responsibility to operate the dynamics of the debt-to-equity ratio $\frac{D}{E}$ and maintain the economic entity of Real Assets $D + E$ in the economy of countries.

Given the firm's problem, we have ambiguity about change of firms because of investments or loan status. Precise explanation about the relation with commercial banks and central banks should be offered. In the general equilibrium(GE), firms choose labor cost and manage the capital for production or business process but labor effect is hard to be clarified with certain connection of commercial banks and federal banks. Hence, the transaction like loan movements (i.e. liabilities to banks, liabilities to central banks, investments) can be selected to explain in this paper. Additionally, Investments is regarded as Real assets to support existence of business entities.

It implies firms want to acquire investment budget to maintain real assets that can be requisite for existence of firms. Therefore, by having borrowing preference to have much more stability between liabilities to banks and central banks (so called as bonds), firms pursue to obtain stability to acquire the investment up to the stability of Investments which can be equal to Real Assets. Thus, we can explain dynamics of investments and loans with the firm's property.

There are many arguments to explain the ambiguity of firms with informational asymmetry, shock absorbed by effective capitals, securities, technical shocks, and interest rates on loans and borrowing constraints.

Boyd-Chang-Smith (2004) points out two informational asymmetry problems of firms: The moral hazard problem arises because any borrower's project choice is not observable. Also, the costly state verification (CSV) problem arises because, for either type of projects, the return of investments cannot be freely observed by any agent other than the project owner.

In the Nelson-Pinter (2012) model, at the production function of Cobb-Douglas in a standard form, there is a shock variable to the quality of physical capitals. When we face the unanticipated exogenous declines in the productive capacity of physical capitals, available “effective capitals” for use in the production is diminished. This intends to consider the effect on banks since banks hold claims on physical capitals directly on their balance sheets, this will be loss for banks, which must be absorbed or passed on to outside creditors.

In the Dewatripont-tirole (2012) model, he argues that securities are characterized not

only by income rights but also by control rights. Optimal corporate choices are time-inconsistent. Investors in control of corporate choices must face an incentive that differs from firm-value maximization. A banking manager has no financial resources to cover an investment cost and turns to investors for financing. The capital structure - that is, the allocation among investors of contingent cash-flow and control rights - is designed at this financial stage. Covas Fujita (2010) mentioned that the technology shock is distributed as standard normal distribution. Labor and capital rental markets are assumed to be competitive.

Diaz (2005) thinks that since interest rates on loans are greater or equal than the discount rate, firms prefer to use internal sources (i.e. cash flows) rather than external financing. In addition, he induces that capital depreciation is paid out of firm's cash flow and net investment is entirely financed with debting. In the model of Nuno-Thomas (2013), they assumed that the firm can only borrow from banks located on the same island.

In the static model of general equilibrium(GE), if we know the GDP endowment as the exogenous factor, we can calculate more at the firm's problem. Indeed, the analysis about GDP like Consumption to GDP, Government Expenditure to GDP, Fixed Capital Formation to GDP, Export to GDP, Net Export to GDP, Money to GDP except for inflation rate and nominal interest rate are used with the general equilibrium(GE) approach.

The effort to figure out ambiguity of firms and overall perspective analysis display a coherent structural and compositional understanding. Then, how we can measure the firm's productivity relating to the banking area in general equilibrium(GE)? The classical viewpoint that there are three basic factors of production, (land, labor and capital) at the production function. Total-factor productivity (TFP) is different from the traditional calculation measured by inputs of labor and capital. The TFP calculation is measured as a Solow residual affecting in total output and not caused by inputs. The equation $Y = A \times K^\alpha \times L^\beta$ in Cobb-Douglas form represents total output (Y) as a function of total-factor productivity (A), capital input (K), labor input (L), and two inputs' respective shares of output (α and β are the capital input share of contribution for K and L respectively). The problem is that units of A do not admit a simple economic interpretation. We have two ways to calculate TFP (Chen, 2011). Firstly, we obtain the TFP measurement by estimating a production function. Secondly, we establish a model to find the determinant of TFP and uncover whether financial factors exert any effects on TFP. Materials and energy are secondary factors because they are from land, labor and capital.

It can be puzzled whether duplicated or missed amounts are existed in the general equilibrium(GE). The equity portion as capitals is in the liabilities of firms and the wage portion as expense is in the eliminated account of firms. With this production function measure, we are talking about the exact asset amount of firms that is the part of equity at the same time. Let's go back to the definition of the production function. Factors of production are inputs to the production process. Finished goods are the output and the relationship of input and output is the production function. The important point is that we cannot exaggerate too much about money. Indeed, the classical viewpoint is that money is not contained in capital because it is not directly produce any good so it is hard to be related to consumptions of goods at the problem of household.

In the paper, firstly, we are focusing on "capital" including the "financial capital." Financial capital is raised to operate and expand a business and it is net worth (assets

minus liabilities) including money borrowed from others. Originally, “Capital” means goods that can help produce other goods in the future, the result of investment. Considering a labor is not realistic because the number of employees at the firm is hard to be considered at the banking problem. Already we consider equity (asset-liability) is the result after considering labor cost. Redundant firm size variables can evoke the biased information if we pursue obtain the general equilibrium(GE) in this model. It’s true that wage is the large portion of input at the firm and should be considered distinguishly. However, for the special industry like banking, we need to clarify needed variables to figure out the problem in the academic field for future and in the realistic world for present. If we contain banks and federal banks in the banking model, we add the real asset variable. It implies the capital concept is naturally inducing the working capital concept. Adding the shock variable to the quality of physical capital (Nelson-Pinter 2012, Gertler-Karadi 2011, Gertler-Kiyotaki 2010) is hard to be measured and needed to be predicted with a lot of unexpected uncertain situation.

Also, the conservative business cycle is deduced. If we assume that multiplier μ exists, $\mu(D_h + B_h) > D_h + B_h - L^{fr} > L^{fr}$. This assumption exactly reflects the preference of safer capital type like real assets > a government bond (lower interest rate on a bond than a loan) > a loan.

4.11.4.1 Demand Deposit of Bank

Scope of Small Banks: Domestically chartered commercial banks, country branches and agencies of foreign banks, Edge Act corporation.

The bank chooses its supply of loans to firms $D_h + B_{fr} + L_{fr}$, its demand for deposits D_h , and the borrowing $B_{fr} - L_{fr}$ in a way that maximized its profit:

$$\begin{aligned} & \text{Max } \Pi_b(P_b), \\ \Pi_b &= r_L^{Bank}(D_h + \sum_{s \in \Omega} P_s B_s^h - L_{fr}) - r_L^{fr}(\sum_{s \in \Omega} P_s B_s^{fr} - L_{fr}) - r^D D^h. \end{aligned}$$

where r_L^{Bank} , r_L^{fr} are interest rates on bank loans and federal reserve bank loan. D_h denotes for bank deposits. R_D is the interest rate paid by deposits. B_s^h denotes for securities. Especially B_s^{fr} denotes for securities of federal reserve banks. L^{fr} are loans claimed by the firm to the federal reserve bank.

The bank maximizes the profit by choosing its supply of loans L^+ , its demand for deposits D^- and the issuance $\sum_{s \in \Omega} P_s B_s^b$:

$$\begin{aligned} & \text{Max } \Pi_b(P_b) \\ \Pi_b &= r_L L^+ + r \sum_{s \in \Omega} P_s B_s^b - r^D D^- L^+ = \sum_{s \in \Omega} P_s B_s^b + D^- \end{aligned}$$

The part of banks’ problem provides a context which capital circulation within banks is required by other main factors of economy. The problem of banks is presented without equities of banks in fairly balanced debits and credits of banks. This main issue has been to handle the demand deposit in the banking area and it related to the money supply closely. In the data of Board of Governors of the Federal Reserve System, demand deposit and money stock data have been collected from Demand Deposit, Currency and Related items (J.3, Semi monthly) in 1960 to Money Stock Measures in 2012.

Under the fractional reserve banking, deposit is important indicator for economy because

of money multiplier effect. In the formula of $\text{moneysupply} = \text{currency} + \text{deposits}$, demand deposit which has highest liquidity among deposits on the balance sheet of banks is directly related to the M1 of central banks. Diamond and Dybvig model (1983) explains why bank runs occur at an undesirable equilibrium and why banks issue demand deposits that are more liquid than their assets by providing better risk sharing among people who need to consume at different random times. The key to describe the rationality both for the existence of banks and for their vulnerability to runs is the illiquidity of assets, especially by the demand deposit. His conclusion on the bank runs as better indicator of economic distress than money supply is too quick because there is the duplicated section of deposits and money supply. A bank run is the sudden withdrawal of deposits of just one bank and money supply contains the currency section.

In case of bank runs, the government of country should prepare the recovery solution for economy. Regularly, given information about money supply, the government can figure out about both moving of currency and deposits. Krugman (2006) points this out that deposits are usually considered part of the narrowly defined money supply, as they can be used, via checks and drafts, and a means of payment for goods and services and to settle debts. The money supply of a country is usually held to consist of currency plus demand deposits. In most countries, demand deposits account for a majority of the money supply. To explain the correlation between deposit (demand deposit) and money supply, bank runs can be interpreted as the sudden constraint of deposit and money supply. We research on indicators of economic crisis so economic crisis is not the indicator to analyse the status of economy.

Gorton and Pennacchi (1990) assume that the uniqueness of demand deposits roles as a desirable medium of exchange so the existence of demand for privately produced riskless trading securities induces issuing demand deposits by banks. Actually, under the fractional reserve banking, a bank deposit is not a bailment that implies physical possession of personal property. It moves safely upon the banking revenue process. Firstly, the property of a customer was deposited. In turn, the customer receives an asset called the deposit account. Finally, the deposit account is the liability of the bank on its balance sheet. On the balance sheet of Liabilities of all commercial banks in the United States (2014.01), 70% is the deposit account. The circulation of deposits is important in economy. David Vanhoose (2010) categories the deposit into three sections like transaction deposit, large-denomination time deposit, saving deposits and small-denomination time deposits, at the United States commercial bank liability and equity capital. Transaction deposit contains non-interest-bearing demand deposits. Transaction deposit is 6% among total liabilities and equity capital of bank balance sheet.

Dewatripont-Tirole (2012) points out that deposit insurance is the prevention of banks' runs following the Diamond-Dybvig (1983).

In the model of Boyd-Chang-Smith (2004), even though project return is safe because of a large number of borrowers, he assumes possibility for banks to fail.

Regardless of a single borrower and aggregate of borrower, potential bankers can suggest needless to operate the bank.

In the model of Covas-Fujita (2010), the bank can raise funds through either deposits or equity so holding equity involves the equity issuance cost. Diaz model (2005) also try to select the considerable sources. For example, firms' only source of financing is bank lending the bank can claim the full amount of firm's cash flow. The equity of banks moves under the upper limit of dividends (under the hypothesis that the bank can turn equity

into dividends with restriction) because of the balance-sheet constraint.

Goodhart-Kashrap-Tsomocos (2012) mentioned shadow banking. The securitized loans, called mortgage backed securities (MBS) can be sold to the non-bank and the non-bank will finance the purchase with a repo loan from the bank (that will have the MBS as collateral).

4.11.5 Federal Reserve Banks and General Equilibrium(GE)

The Federal Reserve Bank chooses its investment level I and its financing (through real assets $D_h + \sum_{s \in \Omega} P_s B_s^h$, Liabilities to bank $D_h + \sum_{s \in \Omega} P_s B_s^h - L^{fr}$ (or Liabilities to central bank L_{fr}) in a way that maximizes its profit:

$$\text{Max } \Pi_b(P_b),$$

$$\Pi_f = f(I) + r_f(D_h + \sum_{s \in \Omega} P_s B_s^h) - r_L^{Bank}(D_h + \sum_{s \in \Omega} P_s B_s^{fr} - L_{fr}) - r_L^{fr} L_{fr}.$$

$$I = S_h$$

where f denotes the production function of the representative firm. r_f is the premium of firm's real assets. r_L^{Bank} , r_L^{fr} are interest rates on bank loans and federal reserve bank loans. D_h denotes for bank deposits. B^h denotes for securities. Especially B^{fr} denotes for securities of federalreserve banks. L_{fr} are loans claimed by the firm to the federal reserve bank. For each future state of the world s ($s \in \omega$), one can determine the price P_s of the contingent claim in state s and nothing otherwise. I is the investment level and S_h denotes for savings.

An interior Solution: P_f has an interior solution only when: $r_f = r_L^{Bank} = r_L^{fr}$

4.11.6 General Equilibrium(GE)

General equilibrium(GE) is characterized by a vector of interest rates (r , r_D , r_h , r_f , r_L^{Bank} , r_L^{fr}) and three vectors of demand and supply levels (C_1 , C_2 , $\sum_{s \in \Omega} P_s B_s^h$, D^h) for the consumer, (I , $\sum_{s \in \Omega} P_s B_s^h$, D^h , L_{fr}) for the firm, (L_{fr} , $\sum_{s \in \Omega} P_s B_s^h$, D_h , $\sum_{s \in \Omega} P_s B_s^{fr}$) for the bank and (D_h , $\sum_{s \in \Omega} P_s B_s^h$, L_{fr}) for federal reserve banks.

Each agent behaves optimally. (i.e., his or her decisions solve P_h , P_f or P_b respectively.

Each market clearing

$$I = S \text{ (Good market)}$$

$$D_h \text{ (Firm)} - D_h \text{ (Firm)} + D_h \text{ (Household)} - D_h \text{ (Household)} + D_h \text{ (Bank)} - D_h \text{ (Bank)}$$

$$(Deposit \text{ market})$$

$$L_{fr} \text{ (Firm)} - L_{fr} \text{ (Firm)} - L_{fr} \text{ (Bank)} + L_{fr} \text{ (Firm)} + L_{fr} \text{ (FR:Federal Reserve Banks)} -$$

$$L_{fr} \text{ (FR)} \text{ (Credit Market)}$$

$$B_s^h \text{ (Firm)} - B_s^h \text{ (Firm)} + B_s^h \text{ (Household)} - B_s^h \text{ (Household)} + B_s^{fr} \text{ (Bank)} - B_s^{fr} \text{ (Bank)}$$

$$+ B_s^{fr} \text{ (FR)} - B_s^{fr} \text{ (FB)} \text{ (Financial market)}$$

It is clear in this model that the only possible equilibrium is such that all interest rates are equal: $r = r_L = r_D$.

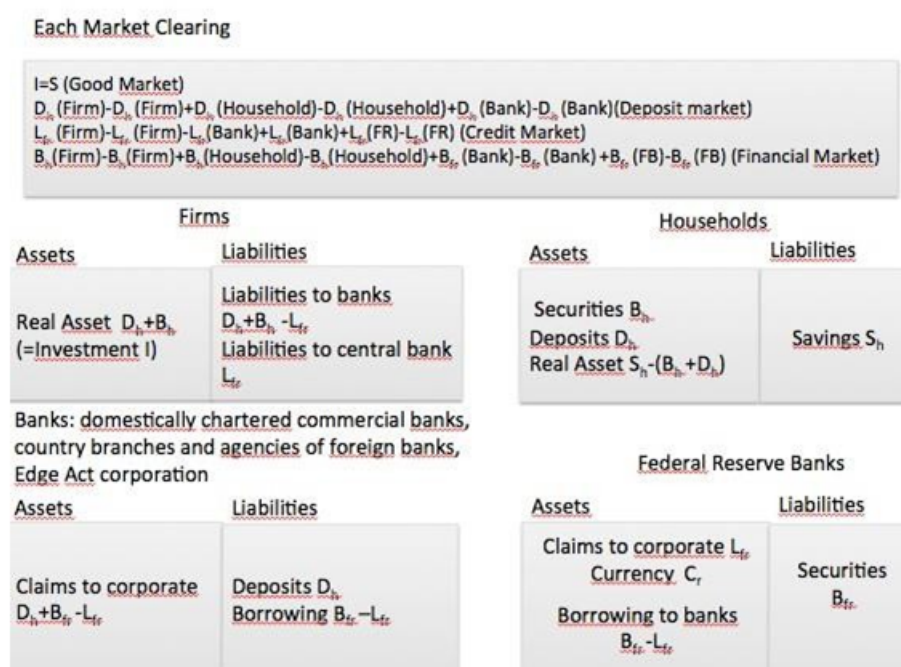


Figure 4.17: The Equilibrium in Freixas-Rochet (1999).

If firms and households have unrestricted access to perfect financial markets, then at the competitive equilibrium, banks make zero profit. Additionally, the size and composition of balance sheet (banks) have no impact on other economic agents.

(result) Cho (2014)

If some accumulated variables are not negative, for example, components of Investment I , Savings S_h , L_{fr} are not negative, there is the equilibrium in the economy and the existence of each factors like firms, Households, Banks, Federal Reserve Banks is fulfilled. The size of banks is affecting on each agent because equity capitals depend on previous deposits (additional explanation in Part IV, 7). Depending the change of bank size influencing on total deposits D_h , the liability of firms is affected by liabilities to banks $D_h + \sum_{s \in \Omega} P_s B_s^{fr} - L_{fr}$, deposits of household D_h and real assets of households and firms. This is supported by the following process of equity capital multiplication.

4.12 Effects of Equity Capital Regulation

4.12.1 An additional explanation about the borrowing composition of firms – The portfolio composition effected by the minimum equity capital regulatoion.

In the model of Kahane (1977), the minimum capital requirement causes an unintended result: rather than improved the intermediary's condition, it increases its probability of ruin. He checks this calculation with the ruin constraint and given standard deviation of rate of return at the portfolio composition of liability, stock and bonds.

In this paper, with the portfolio of risky portfolio and stable portfolio, explanation will be easier to be understood why minimum equity regulation induces for banks to operate riskier portfolio. In addition, it intends to reduce procyclicality (to the financial shocks) and promote the countercyclical buffer.

If we assume that the bank manages a risky portfolio with an expected rate of return of 17 % and a standard deviation of 27 %. The expected rate of return on equity is 7 % and even though, there is pressure to raise the required equity every period, liability is same for each period. The bank tries to meet the bank capital condition regulated by financial intermediaries so the bank should operate much more riskier portfolio comparing to the previous period as following:

Period	Required Equity, Liability	Portfolio composition
		(risky portfolio, stable portfolio)
1	12(12%), 88(88%)	(-61.6%, 161.6%)
2	13(13%), 88(87.12%)	(-61%, 161 %)
3	14(14%), 88(86.72%)	(-60.4 %, 160.4 %)

Tables 4.2: Effects of increasing the equity at the portfolio composition.

To calculate the portfolio composition, we calculate the expected value to the mean:

Mean	
$0.12 \times \frac{12}{100} \times 0.07 + 0.88 \times 0$	$= 0.0084$
$0.1287 \times \frac{13}{101} \times 0.07 + 0.8712 \times 0$	$= 0.0090$
$0.1372 \times \frac{14}{102} \times 0.07 + 0.8672 \times 0$	$= 0.0096$

Tables 4.3: Mean at the portfolio composition.

Suppose that the bank decides to invest in the portfolio having a proportion Y of the total investment budget so that the overall portfolio will have an expected rate of return as above. We know an expected rate of return of a risky portfolio R_p is 17 % and an expected rate of return of a stable portfolio is 7 %:

$R_f + (R_p - R_f) \times Y$	Proportion Y
$0.07 + 0.1 \times Y = 0.0084$	-0.616
$0.07 + 0.1 \times Y = 0.0090$	-0.61
$0.07 + 0.1 \times Y = 0.0096$	-0.604

Tables 4.4: The risky portfolio composition.

Thus, in order to obtain a mean return of 0.84 %, 0.90 % , 0.96 %, the bank must invest -61.6 % , -61 % , -60.4 % of total funds in the risky portfolio and 161.6 % , 161 % , 160.4 % in stable portfolio.

Standard deviation increases.

Standard Deviation	
0.12×0.27	$= 0.0324$
0.13×0.27	$= 0.0351$
0.14×0.27	$= 0.0378$

Tables 4.5: Standard Deviation at the portfolio composition.

4.12.2 Previous Deposits Affects Optimized Equity Capital

n	Deposits	Borrowings	OptimizedEquityCapital
$n = 0$	$D_0 = 1$	-	-
$n = 1$	$D_1 = (1 - \beta - K)$	$B_1 = (1 - \beta)$	$OEC_1 = K$
$n = 2$	$D_2 = (1 - \beta - K)^2$	$B_2 = (1 - \beta)(1 - \beta - K)$	$OEC_2 = K(1 - \beta - K)$
$n = 3$	$D_3 = (1 - \beta - K)^3$	$B_3 = (1 - \beta)(1 - \beta - K)^2$	$OEC_3 = K(1 - \beta - K)^2$
...
$n = k$	$D_k = (1 - \beta - K)^k$	$B_k = (1 - \beta)(1 - \beta - K)^{k-1}$	$OEC_k = K(1 - \beta - K)^{k-1}$
...
$n \rightarrow \infty$	$D_\infty = 0$	$B_\infty = 0$	$OEC_\infty = 0$
	total deposits	total borrowings	total optimized equity capital
	$D = \frac{1}{K + \beta}$	$B = \frac{1 - \beta}{K + \beta}$	$OEC = \frac{K}{K + \beta}$

Tables 4.6: Optimized equity capital.

Assumed that β = restriction of borrowing, then, Borrowings can be executed between Deposit 1 and Restriction β

$$\text{Balance sheet equality constraint: } D_n = B_n - OEC_n$$

Hart and Jaffee (1974) analyzed properties of the feasible and efficient set with the assumption that the initial equity capital is zero (i.e. $K = 0$). However, it is possible that the intermediary's equity is zero in the substantial degree of leverage (high liabilities to equity ratios denoted as $(\frac{EquityCapital}{D_h + B_{fr} + L_{fr}})$). Then, we should assume that the equity is negligible.

In the paper as the same as KAHANE (1977), we assume the equity is positive ($K > 0$) so that the opportunity set does not pass through the origin (i.e. the vector of Deposit D , Borrowing B , Optimized Equity Capital = 0 give an infeasible solution). Then, the theoretical superior limit for deposits is defined by the following:

$$\text{Deposits} = \sum_{n=0}^{\infty} (1 - K - \beta) = \frac{1}{K + \beta}$$

Theoretically, the superior limit for the equity capital by the firm is defined as below:

$$\text{OptimizedEquityCapital} = K \times \text{Deposit} = \frac{K}{K + \beta}$$

And the theoretical superior limit for total borrowings in banks is defined as below:

$$\text{Borrowings} = (1 - \beta) \times \text{Deposits} = \frac{1 - \beta}{K + \beta}$$

The process of the geometric series can be represented, where Borrowings at stage k are a function of deposits at the precedent stage. Optimized Equity Capital at stage k is a function of the deposits at the precedent stage:

$$OEC_k = K \times D_{k-1}$$

Hence, if the optimized equity capital depends on the initial deposit and the terminal condition of bank is liquidation of bank deposits,

(Result) hence, Optimized Equity Capital depends on the previous deposit. In addition, deposit insurance cost also increases because deposit insurance depends on the number of households.

Deposits at stage k are the difference between additional borrowings and the optimized equity capital relative to the same stage: $D_k = B_k - OEC_k$.

In the model of Gorton-Winton (1995), bank size is given. In the theorem of Modigliani-Miller, the size and composition of banks' balance sheets have no impact on other agents. However, as population grows, insured deposits will increase. Then, the bank size should grow. Therefore, the growth of bank size should be discussed with the new measurement such as a new indicator.

4.12.3 K Index for the Indicator of Risk Taking

Remark that the equity capital ratio with respect to total liabilities and equity capital is denoted as $\frac{\text{EquityCapital}}{D_h + B_{fr} + L_{fr}}$ for $K \in (0, 1)$, the borrowing (from federal banks) ratio as

$$\frac{B_{fr} - L_{fr}}{D_h + B_{fr} + L_{fr}} \text{ for } \beta \in (0, 1).$$

Suppose the demand for funds is unlimited, by summing up two quantities, the theoretical equity capital multiplier is defined as:

$$k = \frac{\text{Deposits} + \text{OptimizedEquityCapital}}{\text{Borrowings} + \text{OptimizedEquityCapital}} = \frac{1 + K}{K + \beta}$$

where the equity capital ratio with respect to total liabilities and equity capital is denoted as $\frac{\text{EquityCapital}}{D_h + B_{fr} + L_{fr}}$.

k is the index to decline to increase the risk at the portfolio of commercial banks. The deposit is fixed at total 1 and borrowings have the constraint cannot be negative value beyond the minimum borrowings β .

For example, if deposit=1, the minimum of required equity = 10%, borrowings =0.3. Then, we get the k index as below:

$$\frac{1 + 0.1}{0.3 + 0.1} = \frac{1.1}{0.4} = 2.75$$

If the minimum of required equity is raised from 10% to 15%, k index was as below:

$$\frac{1 + 0.15}{0.3 + 0.15} = \frac{1.15}{0.45} = 2.55.$$

To increase the k index, the bank should increase the deposit beyond the initial deposit level (1 in this simulation) or allocate the borrowing portfolio.

4.13 Conclusion

The minimum capital requirement is a necessary condition for banking sector stability to raise the quality, consistency and transparency of the capital base. However, it has friction with the portfolio management. By using effects of increasing the equity at the portfolio composition, reducing procyclicality (to the financial shocks) and promoting the countercyclical buffer are pursued.

In the Basel 3 system, the risk coverage framework intends to capture all material risks by using counterparty credit risk formula weighted on the external rating of the counter party. Exposure measures contain on-balance sheet, repurchase agreements and securities finance, derivatives and off-balance sheet (OBS) items. In the paper, rather than enlarging the risk contagion, related factors and risk affection scope are detected without overstatement by using the general equilibrium(GE) model and deposit affection to the optimized equity capital. Deposits are in the large portion at the household, firm and banks. To explain risk coverage, by proving correlation of optimized equity capital upon the previous deposit level, the paper aims to ensure that banking-sector-capital requirements take account of the macro-financial environment in which each substantial economic entity operates.

Basel 3 introduced a minimum leverage ratio. The leverage ratio was calculated by dividing Tier1 capital by the bank's average total consolidated assets. In the paper, k index is suggested as the indicator of risk taking. Within the liability, three major fractions like deposits, borrowings and optimized equity capital are considered as the complementary of minimum capital requirement. Assets of commercial banks are mainly consisted with loans and securities. Because the optimized equity capital grows and deposits is restricted by change. Borrowings that are the difference between asset and deposit+equity capital should be checked whether borrowings cover the optimized equity by k index or not.

The combination of portfolio composition test, deposit-equity optimization and k index enables bounding the bank capital regulation problems.

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4.(3) A Survey about Piketty's Inequality and the trade condition

4.14 4.(3) A Survey about Piketty's Inequality and the trade condition

Questions about stability of the capital-labor split

“in the 2000s several official reports published by the Organization for Economic Cooperation and Development (OECD) and the International Monetary Fund (IMF) took note of the phenomenon (a sign that the question was being taken seriously). The novelty of this study is that it is to my knowledge *the first attempt to place the question of the capital-labor split and the recent increase of capital's share of national income* in a broader historical context by focusing on the evolution of the capital/income ratio from the eighteenth century until now. ”

Ref: Thomas Piketty (2014) Capital in the Twenty-First Century

Until when, can we use the Cobb-Douglas function with the mindset to believe the stability of the Capital-Labor split? A rational answer with alternative solutions should be pursued to this question. At the first step, we may comment on weakness of this method.

Firstly, the Solow residual which is a number describing empirical productivity growth in an economy from year to year and decade to decade is hard to be calculated because of it's "residual" which is the part of growth that cannot be explained through capital accumulation or the accumulation of other traditional factors, such as land or labor.

The equation in Cobb-Douglas form is: $Y = AK^\alpha L^\beta$ where total output Y is as a function of total-factor productivity A , Capital input K , Labor input L and two input's respective shares of output. (α and β are the capital input share of contribution for K and L respectively)

Even though Robert Solow defined rising productivity as rising output with constant capital and labor input perfectly, he left undefined part as the Solow residual. The problem is that Solow residual has pro-cyclicality. Traditionally, total output is measured by inputs of labor and capital. TFP (TFP) called multi-factor productivity (MFP) accounting for all inputs cannot be measured directly and accounts for effects in total output not caused by inputs. Indeed, there are two sided directions to analyze the economy.

Especially, Multifactor Productivity (MFP) is measured as below:

$$MFP_i = Y_i - \varphi_i \quad (4.7)$$

where Y_i denotes actual output and φ_i denotes predicted output

$$\text{Log}_e(Y) = \alpha_0 + \beta_I \text{Log}_e(K_i) + \Upsilon_I \text{Log}_e(L_i) \quad (4.8)$$

so we get, $MFP = \Delta(\ln f)/\Delta t = \Delta(\ln Y)/\Delta t - s_L \times \Delta(\ln L)/\Delta t - s_K \times \Delta(\ln K)/\Delta t$ where f is the global production function: Y is output, t is time, s_L is the share of input costs attributable to labor expenses, s_K is the share of input costs attributable to capital expenses, L is a dollar quantity of labor, K is a dollar quantity of capital, M is a dollar quantity of materials, S is a dollar quantity of (business) services, E is energy or exergy (available energy), only used in some models.

Secondly, like Total Factor Productivity (TFP), Growth accounting exercises are open to the Cambridge Critique. The aggregation problem is the major part of this debate. The

Inputs: Three Factors of Production
Classical economics Adam Smith, David Ricardo: Labor, Capital Stock, Land (Natural Resource)
Marxism Labor, The subject of labor, The instruments of labor
Neoclassical microeconomics different format: Capital, Fixed Capital, Working Capital, Financial Capital, Technological progress
+add: Entrepreneurs (Frank Knight), Human Capital, Intellectual Capital, Social Capital (Pierre Bourdieu), Natural resources (Ayres-Warr), Energy
Output: Finished Goods (National Income)
Factor Payments: Rent, Wage, Interest, Profit

Figure 4.18: The Methodology about Factors of Production

style that the representative agent solves the decision problem in the function assuming the entire economy cannot be from the debate about the collection problem of different inputs, sudden shocks, rate of profit and a large number of heterogeneous workplaces. Hence, some economists believe that the method and its results are invalid. Otherwise, we can indirectly establish the model to find determinants of TFP. Neoclassical economics started with the classical factors of production of land, labor and capital. Further distinctions from classical and neoclassical microeconomics include capital-the result of investment, fixed capital, working capital, financial capital and technological progress. Additionally, entrepreneurship, human capital, intellectual capital, social capital, natural resources and energy can be considered.

So we need to think “Weightness” on Labor, Capital and other factors at the next step. I agree with the opinion of Thomas Piketty that structure of inequality with respect to both labor and capital has actually changed since the ninetieth century.

“To what extent are inequalities of income from labor moderate, reasonable, or even no longer an issue today? It is true that inequalities with respect to labor are always much smaller than inequalities with respect to capital. It would be quite wrong, however, to neglect them, first because income from labor generally accounts for two-thirds to three-quarters of national income, and second because there are quite substantial differences between countries in the distribution of income from labor, which suggests that public policies and national differences can have major consequences for these inequalities and for the living conditions of large numbers of people.” Ref: Thomas Piketty (2014).

4.15 Dynamics of the Capital/Income Ratio of Thomas Piketty: $r > g$

“... If, moreover, the rate of return on capital remains significantly above the growth rate for an extended period of time (which is more likely when the growth rate is low, though not automatic), then the risk of divergence in the distribution of wealth is very high...”

“... This fundamental inequality, which I will write as $r > g$ (where r stands for the average annual rate of return on capital, including profits, dividends, interest, rents, and other income from capital, expressed as a percentage of its total value, and g stands for the rate of growth of the economy, that is, the annual increase in income or output), will play a crucial role in this book. In a sense, it sums up the overall logic of my conclusions....”

Ref: Thomas Piketty (2014) Capital in the Twenty-First Century

Thomas Piketty put emphasis on capital inequality. This is the similar viewpoint of boom and burst. Boom and burst are periods of a severe business cycle over time. Several economic indicators are denoted as sustained increases followed by a sharp and rapid contraction. Times of increased business and investment have collapsed leaving widespread poverty such as the depression of 1837 and 1857 in the United States. For example, in the early 1800s in Ohio people were buying land on credit to sell at twice the price but land became too expensive to buy. At the same time, wheat prices became too low to transport wheat to market. Wheat was 1.50 dollars per bushel in 1816[U+202F]; by 1821, 20 cents. The automaker Paul Hoffman said “we can not live with a crash with 26 depressions over 100 years including the burst of the 1930s. ”

The dynamics of the capital/income ratio adds a new perspective to the debate on capital and wealth Previous study provides an overview of economic development. The direction of economic growth rate should increase to the top. However, the new viewpoint offers an alternative framework to demonstrate how the society actually move. It examines different meanings of changes and directions with regard of economic growth. The attempt to be escaped by the required bilateral choice between capital and labor reilluminates on alternative factors to research economic growth.

4.15.1 The First Fundamental Law of Capitalism $\alpha = r \times \beta$

With the aid of exploration of capital induced from national income, the first law of capitalism attempts to show visible motion of dynamics. It requires the fully-fledged account of global data because the formula produces the global interpretation without constraints. In the left side of formula, α can be added and in the right side of formula, $r \times \beta$ can be added. Hence, broader context with global empirical data is somewhat limited.

“In order to illustrate the difference between short-term and long-term movements of the capital/income ratio, it is useful to examine the annual changes observed in the wealthiest countries between 1970 and 2010, a period for which we have reliable and homogeneous data for a large number of countries. To begin, here is a look at the ratio of private capital to national income, whose evolution is shown in Figure 5.3 for the eight richest countries in the world, in order of decreasing GDP: the United States, Japan, Germany, France, Britain, Italy, Canada, and Australia.” Figure 5.3 (figure 1 in the paper as below) displays annual series and shows that the capital/income ratio in all countries *varied constantly in the very short run.* ”

“... can now present the first fundamental law of capitalism, which links the capital stock to the flow of income from capital. The capital/income ratio β is related in a simple way to the share of income from capital in national income, denoted α . The formula is $\alpha = r \times \beta$, where r is *the rate of return on capital.* ...” Ref: Thomas Piketty (2014)

The first law of capitalism offers a subjective view of capital to focus on deviation of bilateral choice between capital and labor. Further evidence of the authenticity of the texts is needed.

In the figure 1 (as below), the slope is upward in the end. It implies interpretation whether the long-run or short-run economy is possible. However, depending on the date of the World Bank as below, it's impossible to explain about capital formation except for data

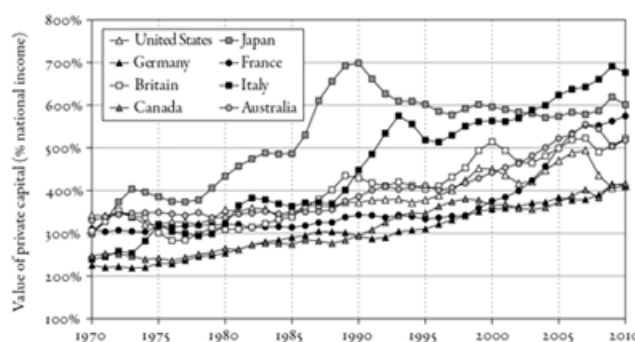


Figure 4.19: Private Capital in Rich Countries, 1970-2010

of China. China has the highest gross capital formation (% of gross domestic production (GDP)) from 2004 to 2013. Indeed, this level is higher than the world's one. France, Germany, United States and Japan's graphs are similar except for China's one.

Ref: piketty.pse.ens.fr/capital21c

In the figure 2 (as below), gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

The first law of capitalism gives fresh impetus to emphasize the role of capital to promote economic growth. It should be elaborated to describe the main features of dynamics related to global data for the possibility of wide cross-country comparison.

4.15.2 The Second Fundamental Law of Capitalism: $\beta = \frac{s}{g}$

"...In the long run, the capital/income ratio β is related in a simple and transparent way to the savings rate s and the growth rate g according to the following formula: $\beta = \frac{s}{g}$"

Ref: Thomas Piketty (2014) Capital in the Twenty-First Century.

Gauging the general applicability related to the income rate to the growth rate is investigated by similarity between each gross domestic production (GDP) motion of different countries and world average motion.

As below, there are graphs of correlation between countries' gross domestic production (GDP) growths and the world's one. China has very different shapes of correlation with respect to the world's one from other's. This example is to test the hypothesis of the second law of capitalism. With the panoramic viewpoint of figure 3, the

argument is evidently to make explicit cross-sectional data of different countries and thus contrast various interpretations upon which to different approaches to the contemporary management of past built environments are based.

Gross domestic production (GDP) growth graphs of United Kingdom, United States, France, Germany, Japan, Ireland, Italy, Portugal and Spain have similar upward tendencies. China's one looks like South Korea, Mexico, Argentina, Brazil and Chile.

In addition, in the long run, can the capital/income ratio β be reflected by the volatility of the savings rate s and the growth rate g ? Within the context not to divide into countries depending on their economic sizes, then, we face aggregation problem. This brief empirical test here is intended to provoke the case that outstanding values than averaged value in the long run can exist. The second law of capitalism encapsulates the capital concern in general. However, it initiates a discussion of the stabilization of dynamics and boundary of optimal values by the end. Hence, in this paper, I will endeavor to explore new variables which can affect the left side and right side in the law of capitalism by absorption.

4.16 Economic Size and Debt Sustainability

4.16.1 Export and Debt Sustainability

In case of debt sustainability, the debt to export criterion should be considered with the size of countries (Roubini, N. 2001). Suppose you have two countries, A and B are identical. Their GDP is 100 each, their external debt is 50 each and their export is 20 each. Then, the debt to GDP ratio is 50% for each and the debt to export ratio is 250% each. Assumed that, at this ratio, both countries are solvent. Now take two countries and merge them. Total GDP will be 200, total debt will be 100 and total exports will be 20. Roubini, N. (2001) mentioned this is because exports among each other are now inter-regional rather than internationally tradable. At this point, the economic problem might be put with trade in a sense of the full context of framework considering the economic size;

By the end of this case, the combined $A + B$ economy has a debt to GDP ratio that is still 50% but now the debt to export ratio is 500%, a figure concludes on a pessimistic note. In the light of the debt to export criterion, two economies are solvent if they are considered as two. On the contrary, they are insolvent if they are combined. This suggest that the debt to export ratio may be a faulty measure for solvency of larger countries; it suffices to say that "large" implies intra-regional rather than internationally tradable. Significantly, smaller countries with similar fundamental condition would look solvent just because their export to GDP ratio is higher than larger ones.

To put it more concretely, a small and opened economy, like Argentina, is usually more opener than a larger economy. It is lower probable to say that the big economy, like Brazil, low export to GDP ratio undoubtedly reflect currency overvaluation, high degrees of trade protection and other policy restrictions to openness rather than the structure on the whole one about lower openness. By the same token, the economy having a large debt to export ratio needs openness to service its external debt. For example, if export ratios are low, even a large real depreciation may not improve exports and trade balance

enought to reduce a resource (trade balance) gap necessary to prevent insolvency so the degree of openness (export to GDP ratio) within countries or beyond countries does affect country's ability to service its debt.

4.17 Debt Management of Latin America

4.17.1 Debt-Driven Capital

In the 1960s and 1970s many Latin American countries, notably Brazil, Argentina, and Mexico, borrowed huge sums of money from international creditors for industrialization; especially infrastructure programs. After 1973, private banks had an influx of funds from oil-rich countries and believed that sovereign debt was a safe investment. Between 1975 and 1982, Latin American debt to commercial banks increased at a cumulative annual rate of 20.4 percent. This heightened borrowing led Latin America to quadruple its external debt from 75 billion in 1975 to more than 315 billion in 1983, or 50 percent of the region's gross domestic product (GDP). Debt service (interest payments and the repayment of principal) grew even faster, reaching 66 billion in 1982, up from 12 billion in 1975.

4.17.2 Failure of Debt-Driven Capital

As interest rates increased in the United States of America and in Europe in 1979, debt payments also increased, making it harder for borrowing countries to pay back their debts. Deterioration in the exchange rate with the US dollar meant that Latin American governments ended up owing tremendous quantities of their national currencies, as well as losing purchasing power. The contraction of world trade in 1981 caused the prices of primary resources (Latin America's largest export) to fall.

Argentina has until midnight on July 30, 2014 to avoid going into default for the eight time in its history. Most creditors exchanged their defaulted debt for new securities in two restructurings in 2005 and 2010 but a few creditors led by a hedge fund called NML Capital scooped up the cheap defaulted debt in order to chase payment of full principal plus interest. If argentina defaults, its outstanding debt under foreign law amounts will be 29 billion.

4.17.3 Why capital can not be simply explained within gross domestic production (GDP) (Attention to Import substitution industrialization (ISI))

Import substitution industrialization (ISI) is a trade and economic policy that advocates replacing foreign imports with domestic production. ISI policies were enacted by countries within the Global South with the intention of producing development and self-sufficiency through the creation of an internal market. ISI works by having the state lead economic development through nationalization, subsidization of vital industries (including agriculture, power generation, etc.), increased taxation, and highly protectionist trade policies. Import substitution industrialization was gradually abandoned by developing countries in the 1980s and 1990s due to structural indebtedness from ISI related policies on the insistence of the IMF and World Bank through their structural adjustment programs

of market-driven liberalization aimed at the Global South.

ISI was most successful in countries with large populations and income levels which allowed for the consumption of locally produced products. Latin American countries such as Argentina, Brazil, Mexico, and (to a lesser extent) Chile, Uruguay and Venezuela, had the most success with ISI. This is so because while the investment to produce cheap consumer products may pay off in a small consumer market, the same cannot be said for capital intensive industries, such as automobiles and heavy machinery, which depend on larger consumer markets to survive. Thus, smaller and poorer countries, such as Ecuador, Honduras, and the Dominican Republic, could implement ISI only to a limited extent. Peru implemented ISI in 1961, and the policy lasted through to the end of the decade in some form.

By the early 1960s, domestic industry supplied 95% of Mexico's and 98% of Brazil's consumer goods. Between 1950 and 1980, Latin America's industrial output went up six times, keeping well ahead of population growth. Infant mortality fell from 107 per 1,000 live births in 1960 to 69 per 1,000 in 1980 and life expectancy rose from 52 to 64 years. In the mid 1950s, Latin America's economies were growing faster than those of the industrialized West.

4.17.4 More to the immediate point why the GDP is not just the GDP to consider the capital inequality: an example of Export-oriented industrialization (EOI)

Export-oriented industrialization (EOI) sometimes called export substitution industrialization (ESI), export led industrialization (ELI) or export-led growth is a trade and economic policy aiming to speed up the industrialization process of a country by exporting goods for which the nation has a comparative advantage.

From the Great Depression to the years after World War II, under-developed and developing countries started to have the hard time economically. During this time, many foreign markets were closed and the danger of trading and shipping in war-time waters drove many of these countries to look for another solution to development. The initial solution to this dilemma was called import substitution industrialization.

Both Latin American and Asian countries used this strategy at first. However, during the 1950s and 1960s the Asian countries, like Taiwan and South Korea, started focusing their development outward, resulting in an export-led growth strategy. Many of the Latin American countries continued with import substitution industrialization, just expanding its scope. Some have pointed out that because of the success of the Asian countries, especially Taiwan and South Korea, export-led growth should be considered the best strategy to promote development.

4.17.5 Insolvent External Debt of Latin America

Since the 1980 several countries in the region have experienced a surge in economic development and have initiated debt management programs in addition to debt relief and debt rescheduling programs agreed to by their international creditors. The following is a list of external debt for Latin America based on a 2012 report by The World Factbook.

Rank	Country – Entity	External Debt (million US\$)	Date of information
26	Brazil	405,300	31 December 2012.
35	Argentina	130,200	31 December 2012.
40	Mexico	125,700	31 December 2012.
45	Chile	102,100	31 December 2012.
49	Colombia	73,410	31 December 2012.
51	Venezuela	63,740	31 December 2012.
63	Peru	4,200	31 December 2012.
77	Cuba	22,160	31 December 2012.
78	Ecuador	20,030	31 December 2012.
81	Dominican Republic	16,580	31 December 2012.
82	Guatemala	16,170	31 December 2012.
83	Uruguay	15,900	31 December 2012.
85	Panama	14,200	31 December 2012.
86	El Salvador	12,840	31 December 2012.
88	Costa Rica	12,040	31 December 2012.
112	Nicaragua	5,228	31 December 2012.
114	Honduras	4,884	31 December 2012.
123	Bolivia	4,200	31 December 2012.
139	Paraguay	2,245	31 December 2012.

Figure 4.20: The External Debt for Latin America

4.17.6 Openness and External Debt to Exports Ratio

Debt burden indicators include the (a) Debt to gross domestic production (GDP) ratio, (b) External debt to exports ratio, (c) Government debt to current fiscal revenue ratio etc. This set of indicators also covers the structure of the outstanding debt including the (d) Share of foreign debt, (e) Short-term debt, and (f) Concessional debt in the total debt stock.

The ratio of gross external debt to exports provides a quick indicator of the capability of an economy to repay external debt with enhanced revenue from sales to foreign countries. A ratio below 1 suggests that debt can be repaid rapidly, theoretically in less than one year. Conversely, the higher the ratio, the lower the country's capability to finance the debt with revenue from exports.

Having discussed the capital inequality issue, attention to the export variable and need of comprehensive ratio analysis[U+202F]: debt to export ratio and capital to income ratio, we will now proceed to investigate the risk management status of Latin America.

4.17.7 Risk Management in Major Latin America Countries: (Mexico, Argentina, Brazil, Chile)

Among Latin America, the adoption of solvency II which is EU directive - codifies and harmonizes the EU insurance regulation primary concerning the amount of capital that EU insurance companies must hold to reduce the risk of insolvency- is realistic in Mexico. In the second half of 2008, the Mexican regulator (Comisión Nacional de Seguros y Fianzas, or CNSF) shared with the Mexican association of insurance companies (Asociación Mexicana de Instituciones de Seguros, or AMIS) a draft of a project of insurance law

Country - Entity (million\$)	external debt	exports	Ratio (External debt/Exports)
Brazil	405,300	242,000	1.674793388
Argentina	130,200	85,360	1.525304592
Mexico	125,700	370,900	0.338905365
Chile	102,100	83,660	1.220415969
Colombia	73,410	59,960	1.224316211
Venezuela	63,740	96,900	0.657791538
Peru	4,200	47,380	0.088644998
Cuba	22,160	5,600	3.957142857
Ecuador	20,030	23,770	0.842658814
Dominican Republic	16,580	9,467	1.751346784
Guatemala	16,170	9,864	1.639294404
Uruguay	15,900	9,812	1.620464737
Panama	14,200	17,970	0.790205899
El Salvador	12,840	5,804	2.212267402
Costa Rica	12,040	11,470	1.049694856
Nicaragua	5,228	4,160	1.256730769
Honduras	4,884	6,946	0.703138497
Bolivia	4,200	11,770	0.356839422
Paraguay	2,245	4,700	0.477659574

Figure 4.21: The External Debt to Exports Ratio

(the proposed law) in which a Solvency II-type regime was incorporated. The draft considered an initial date for this proposed law of January 2012. Since that time (end of 2008) through 2009 and the beginning of 2010, the proposed law was discussed and reviewed between CNSF and AMIS. The actual initial date is January 2014. However, the proposed law did not approved by the Mexican Congress.

If the strong solvency regulation is existed like Argentina, the conflict of two regulations between local solvency regulation and international one should be considered for the stable adoption. The current framework does not seem to indicate that an extended application of the Solvency II methodology will be feasible in the near future, except for the offices and branches of European-based insurance companies.

The regulatory agency, SSN (Superintendencia de Seguros de la Nación) only mentioned the adoption of Solvency II without clear criteria. Acutally, the insurance industry is tightly regulated in Argentina. SSN resolutions cover most aspects of insurance company activity, including unearned premiums and methods of mathematical reserve valuation. The agency establishes minimum valuation methods arising from formulas used to value out-of-court, mediation and lawsuit payables, as well as incurred but not reported (IBNR) claims reserves. Most insurance companies use these mechanisms to value their payables. As of 30 June 2011 (last fiscal year-end), all insurance companies in the market calculated their capital to be credited based on the issued premiums indicator. Of 155 insurers, only 4 carried minimum capital deficit as of this date. In recent months, the SSN announced the launch of a strategic plan of insurance, inviting all industry participants to bring their vision to define the insurance policy to be used during the period 2012–2020.

The existence of many solvency regulations can be analyzed with the conflict inside rules in Brazil so the Own Risk and Solvency Assessment (ORSA) is needed to integrate them. Brazil has adopted international regulations at each pillar. For Pillar I, the adoption of International Financial Reporting Standards (IFRS) as Brazilian generally accepted accounting principles (GAAP) in 2010. Detailed monthly reporting requirements of individual policy and claims data for the Insurance Supervisory Authority (Superintendência de Seguros Privados, SUSEP) were introduced in 2004 at the level of Pillar II. In 2004, the Supervisory Authority introduced the requirement that each insurance company should produce an annual actuarial valuation report proper to Pillar III.

In Chile, a new law that would require insurance companies to withhold risk-based capital was sent to Congress for approval on 30 September 2011. The methodology for calculating risk-based capital in Chile has yet to be made public. It is expected that the Chilean regulator will publish a consultative white paper with details around the calculation of risk-based capital in the third quarter of 2012. The SVS (Superintendencia de Valores y Seguros) has demonstrated interest in performing the first Quantitative Impact Study (QIS) by the end of 2012.

4.18 Conclusion

A capital-labor split of Cobb-Douglas function which continues to be widely used by economists, has little empirical support. Even though neo-classical economists have proposed mathematical and theoretical realisms of economic growth by using the function, it was never empirically validated as the appropriate model for economic growth. Indeed,

Thomas Piketty, a French economist, brought up this debated topic about capital inequality in his book, *Capital in the Twenty-First Century* in 2014.

I agree with him in that there is the structure of inequality with respect to both labor and capital actually changed since the nineteenth century of the chapter: Beyond Cobb-Douglas "The Question of the Stability of the Capital-Labor Split. Some research questions like "Did the Increase of inequality cause the financial crisis?", "The illusion of marginal productivity", "The Question of Time Preference" and "Is there an equilibrium distribution?" are fresh and fancy to break old fixed ideas.

I feel the solution is weak to support his brilliant idea enough. At the part4, the talk is suddenly changed to tax and pension (PAYGOs) without connection with previous capital inequality. Tax issues on Capital and Chinese millionaires are far from the real data of capital formation because it is very high value in China. We cannot see any empirical data of China's one in his book even though the major capital part is by China. It seems hard to accept a solution of redistribution by immigration and an opinion about the central bank just as a loan deal before redistribution of wealth.

In the article, the most recent data shows that export and external debt may be correlated to explain economy growth. In the paper, Latin America history pervades the claim that capital within GDP of Thomas Piketty should be enhanced by conceptual capital related to debt and export beyond GDP. In addition, to point out miscalculation of ratio analysis depending on economic size, the example by Roubini, N. (2001) is demonstrated. To conclude, through the case analysis of Latin America, in detail, economic size and debt sustainability as economic growth indicators are emphasized by empirical data.

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**Essais en économie financière
sur la spéculation, la liquidité et le rationnement.**

Résumé : Cette thèse comporte six articles répartis en quatre chapitres. Les trois premiers chapitres sont constitués chacun d'un article théorique alors que le quatrième chapitre est composé de trois articles empiriques. Le premier chapitre envisage un cadre avec deux catégories d'agents, l'un souhaitant vendre alors que l'autre souhaite acheter. Sont analysés les problèmes liés aux signaux spéculatifs et est également estimé le risque auquel sont confrontés les opérateurs en excès de confiance. Le second chapitre étudie le rationnement du crédit et met en évidence une situation où la prise de décision est associée à une échelle fixe dans l'investissement. Le troisième chapitre aborde la théorie des mécanismes d'incitation et met en évidence une condition de tri en théorie des incitations. Le principal est confronté à un dilemme car il ne peut pas maintenir un risque identique lors de l'analyse de la statique comparative de l'investissement. Le quatrième chapitre est segmenté en trois articles empiriques, à savoir une étude de la liquidité systémique de l'investissement, la régulation des banques de petite dimension, et, enfin, le lien entre la taille des économies, la viabilité de la dette et les inégalités de détention de capital à la Piketty.

Mots-clefs : Spéculation. Liquidité. Rationnement. Economie Financière.

**Essays in Financial Economics:
Speculation, Liquidity and Rationing**

Abstract: This thesis contains six articles gathered in four chapters. The three first chapters each consist of a theoretical article while the fourth chapter is composed of three empirical articles. The first chapter addresses a framework where a trader wants to buy while another trader wants to sell, these two traders standing in parallel. It seems plausible, yet it requires further examination on aggregate measures of fundamentals, to estimate the risks faced by overconfident agents. The second chapter is devoted to the analysis of credit rationing and illustrates a situation requiring decision-making measured by some fixed scale in investment. In the third chapter, the model shows a sorting condition in the theory of incentives, the principal having the dilemma that he cannot maintain risk preference according to the comparative statics of investment. In the fourth chapter, three empirical articles are presented : the first relates to systematic liquidity in the investment, the second the regulation of small banks and the third analyzes economic size and the viability of the debt while providing an articulation with the capital inequality emphasized by Piketty.

Keywords: Speculation. Liquidity. Rationing. Financial Economics.