Uncertainty and Financial Fragility

Devrim Yavuz

PhD in Economics

University of Exeter

March 2011

Uncertainty and Financial Fragility

1 Volume

Submitted by Devrim Yavuz to the University of Exeter as thesis for the degree of Doctor of Philosophy in Economics, September 2010.

This thesis is available for Library use on understanding that it is copyright material and that no quotation from the thesis may be published without proper acknowledgement.

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

....(signature)

Abstract

My thesis analyzes various types of uncertainties and their effects on financial fragility in the context of information asymmetries and bank-run models. When various generations of currency crisis are considered, it is observed that the financial system and fragilities associated with it plays a critical role in more recent crisis episodes. Therefore, focusing on the financial system can possibly lead to a better understanding of how and why these crises took place. The analysis presented here aims to provide some new insights about this topic. In the first chapter, I tried to analyze how public borrowing can affect financial fragility when how a private bank finances its lending to the government is private information. I built a simple theoretical model where the government basically borrows from a commercial bank. The objective of the government is to realize borrowing at the lowest possible cost but at the same time it cares about the financial stability. The risk-averse commercial bank, on the other hand, maximizes utility by allocating the financing of its lending among a safe and a risky loan where the amount it uses from the safe source considered to be a measure of financial stability. Moral hazard arises as the amount of safe loan used is not observable to the government. Under the assumption that the risk premium is decreasing in income, I show, when the government is not able push the rate down below a certain level, it can trade a rise in borrowing costs with some financial stability. In other words, although pushing the rate down is good both for borrowing costs and financial stability, under asymmetric information, it may be optimal to design a contract with a reward scheme and accept a higher cost for borrowing for a relatively more reliable financial system. This chapter contributes to the literature by identifying a potential moral hazard problem in the process of public borrowing and displays how it can lead to a higher than optimal level of financial fragility when the economic policy gets obsessed with lowering the borrowing costs. The analysis provided is also interesting as it displays an unusual case where the borrower rather than the lender faces issues resulting from asymmetric information. In the second chapter, a bank-run model used to analyze effects of uncertainty on financial fragility in terms of maturity mismatch. I use

an extended version of the well-known Diamond and Dybvig model by introducing short term borrowing where the future cost of borrowing is unknown. This creates an additional source of maturity mismatch and the demand deposit contracts are now vulnerable to both depositor and lender panics. The key is when the borrowing and investment decisions are made the total cost of borrowing is unknown but the deposit contract can be written contingent on this cost. This creates different consumption paths for patient and impatient agents and they bear different degrees of interest rate risk. The characterization of the contract shows interest risk is mainly borne by early consumers particularly for higher roll over costs. In times of crisis the most liquid funds are the ones that are used first and hence consumers who need urgent liquidity suffers most. The main contribution of this part is that, it combines a bank run model with aggregate uncertainty with short-term borrowing. It also sheds some light on the dynamics of financial problems in developing countries. The last chapter analyzes risk sharing under private banking. Once again a version of Diamond and Dybvig framework is used. Instead of assuming a banking structure where consumers form a union to achieve optimal risk sharing, I consider a private bank that maximizes profits. I analyze the deposit contract under different assumptions about how the bank and the depositors consider the probability of a bank run. The original Diamond and Dybvig model, implicitly assumes the probability of a bank-run is sufficiently small to ensure participation. With a private bank, I allow partial participation and optimizing depositors automatically establish individual rationality. This leads to a supply of deposits (or demand for risk sharing function) which varies along with the payments offered in the contract. Therefore, the bank faces a trade-off between the rates it offer and the amount of deposits it can attract. This basically leads a new set of equilibrium contracts to come out which are not possible under standard risk sharing. Depending on the risk averseness of the consumers these alternative contracts produce different levels of financial fragility. This last chapter contributes to the literature by considering the possible risk sharing contracts under a profit maximizing monopolistic commercial bank. It also briefly discusses how this may affect financial fragility.

Contents

1 Introduction **1**

1.1 Currency Crisis and Financial Stability 3

1.2 A Review of Turkish Economic Structure 10

1.3 Financial Fragility Prior to the Crisis 20

1.3.1 Financial Fragility and the Stabilization Program 24

1.3.2 Heterogeneity of Banking Sector 27

2 Public Borrowing and Financial Fragility **31**

2.1 Introduction 31

2.2 Theoretical Background 32

2.3 The Model 39

2.3.1 A Simple Model of Public Borrowing 39

2.3.2 Moral Hazard 46

2.4 Conclusion 55

3 Interest Rate Risk and Financial Fragility **58**

3.1 Introduction 58

3.2 D&D Model, Aggregate Uncertainty and Short-term Borrowing . . . 60

3.3 The Model 62

3.3.1 Basic Framework 62

3.3.2 Demand Deposits and Bank-runs 67

3.3.3 Uncertainty and Interest Rate Risk 68

3.3.4 Date zero problem 82
3.3.5 Characterization of the Optimal Contract and Financial Fragility 93
3.4 Conclusion 95

4 Risk Sharing with Private Banking **99**
4.1 Introduction 99
4.2 Extensions to the D&D Model 102
4.3 The Model 109
4.3.1 The Degree of Risk Sharing: Complete versus Incomplete Insurance 124
4.4 Conclusion 128

5 Conclusion **132**

A Interest Rate Risk and Financial Fragility **138**
A.1 $s - b > 0$ 138
A.1.1 Region A: 138
A.1.2 Region B: 139
A.1.3 Region C: 141
A.1.4 Region D: 143
A.1.5 Region E: 146
A.1.6 Region F: 147
A.1.7 Region G: 148
A.2 $s - b < 0$ 150
A.2.1 Region H: 150
A.2.2 Region I: 152
A.2.3 Region J: 155
A.2.4 Region K: 157
A.2.5 Region L: 158

List of Tables

1.2.1 Financing the public sector deficit (percent of GNP) 16

1.3.1 FX Denominated assets and liabilities 22

1.3.2 Assets and Liabilities 23

1.3.3 Demirbank vs Others 29

3.3.1 Sample Solution 93

List of Figures

1.2.1 PSBR and Domestic Debt Stock 11
1.2.2 Domestic Debt Instruments 12
1.2.3 Commercial Banks Asset Composition 16
1.3.1 FX short positions 22

2.3.1 The Probabilities and Possible Payoffs for the Commercial Bank . . . 48

3.3.1 Timeline of the events 69
3.3.2 Early and late consumption when $s-b>0$ 81
3.3.3 Liquidation behavior (Common when $s-b>0$ and $s-b<0$) 82
3.3.4 Payback behavior when $s-b>0$ 83
3.3.5 Early and late consumption when $s-b<0$ 84
3.3.6 Payback behavior when $s-b<0$ 85
3.3.7 Regions for s-b>0 86
3.3.8 Utility for Region A 88
3.3.9 Maximum Utility for $s-b>0$ 89
3.3.10 Regions for s-b<0 90
3.3.11 r_3 and r_4 for $s-b<0$ 91
3.3.12 Maximum Utility for $s-b<0$ 92
3.3.13 Optimal Contract 94
3.3.14 Financial Fragility 96
3.4.1 Optimal Contract versus Autarky 97

4.2.1 D&D Basic in Extensive Form 105
4.3.1 Demand for Risk Sharing 114

4.3.2 Effect of a change in p on D 115

4.3.3 The feasible region for a risk sharing equilibrium 121

4.3.4 Demand for risk sharing 127

4.3.5 Optimal c under complete insurance 127

Acknowledgements

I would like to express my deepest appreciation to my supervisors Surajeet Chakravarty and Tatiana Kirsanova being to me invaluable mentors as well as excellent teachers. I am deeply indebted to them for their guidance and help through my PhD studies. In numerous occasions, they showed their most encouraging support. I would like to thank Professor Gareth Myles and Professor Gulcin Ozkan for the valuable discussion and their comments during the viva.

The support and friendship of many staff members and my fellow research students at the University of Exeter were certainly unforgettable. The completion of the work described in this thesis would not been possible without the scholarship offered by the Central Bank of the Republic of Turkey.

My parents, Mr Fevzi Yavuz and Mrs Ayten Yavuz, my brother, Ulas Yavuz and his family supported my dreams and efforts during many difficult moments. Mr Abdullah Kuzu and Mrs Ayse Kuzu are like a second family for me now and they helped me on numerous occasions.

Finally, I would like to thank my wife, Arzu Yavuz, for her unconditional support for everything.