

Capital Market Equilibria

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Table of Contents

Prologue

(G. Bamberg and K. Spremann) 1

1. Equilibrium versus Market Imperfections 1

2. Questions and Answers 2

The Hybrid Model and Related Approaches to Capital Market Equilibria

(G. Bamberg) 7

1. Introduction 8

2. Portfolio Models Based on Different Sets of Parameters . . . 10

2.1 One-Parameter Models 10

2.2 Two-Parameter Models: Mean-Semivariance Approach . . . 11

2.3 Other Two-Parameter Approaches 14

2.4 Extensions to Three or More Parameters 16

3. Rationale of the Hybrid Model 17

3.1 Consistency of the Mean-Variance Approach with
Expected Utility and Stochastic Dominance 17

3.2 Explicit Solutions of the Portfolio Problem 21

3.3 Explicit Solutions of the Equilibrium Conditions 27

3.4 Which Mean-Variance Approaches Provide Explicit
Solutions? 30

4. Applications of the Hybrid Model 33

4.1 Consideration of Income Taxation 34

4.2 Heterogeneous Expectations 39

4.3 Restrictions on Short Sales 41

4.4 Some Other Market Imperfections 44

5. Appendix 46

5.1 Proof of Theorem 4 46

5.2 Solution of Partial Differential Equation (31) 48

References 49

Portfolio Decisions and Capital Market Equilibria Under Incomplete Information

(V. Firschau) 55

1. Introduction 55

VIII

2. Risk Situation with Regard to the Prior Parameters: A Two-Level Bayes Approach	59
3. Risk Situation with Regard to the Prior Parameters: Lin's Approach	62
4. Partial Uncertainty with Regard to the Prior Parameters	66
5. Asset Pricing under Uncertainty	72
References	77

Option Valuation: Theory and Empirical Evidence

(R. Geske and S. Trautmann)	79
1. Introduction	80
2. Option Valuation Theory	81
2.1 Preference and Distribution-Free Results	81
2.1.1 Call Options	81
2.1.2 Put Options	83
2.1.3 Relations Between Puts and Calls	85
2.1.4 Additional Arbitrage Restrictions	85
2.2 Distributional Assumptions and Hedging Models	86
2.2.1 Hedge Portfolios	86
2.2.2 The Classical Black-Scholes Model	89
2.2.3 A Brief Description of Other Option Valuation Models	90
2.2.4 Analytic Models For American Calls and Puts	93
2.3 Preference Assumptions and Non-Hedging Models	94
2.4 New Option Instruments	95
2.5 Applications of Option Theory	97
3. Empirical Tests of Option Valuation	97
3.1 Test of Boundary Conditions Among an Individual Equity Option and the Underlying Stock	100
3.2 Test of Boundary Conditions Among Different Equity Options and the Underlying Stock	104
3.3 Tests of Equity Option Pricing Models	107
3.3.1 Results of Robustness Tests	109
3.3.2 Results of Predictability Tests	111
3.3.3 Results of Unbiasedness Tests	113
3.3.4 Results of Hedge Return Behavior Tests	116
3.4 Tests of New Option Instruments	119
3.5 Estimation Problems	121
4. Appendix: Formulae for the Evaluation of European Calls	123
References	127

The Value of Security Agreements

(B. Rudolph)	135
1. A Survey of Credit Support Decision Models	136
1.1 Credit Decisions in a Restricted Capital Market	136
1.2 Market Uncertainty	136
1.3 Credit Support Decisions with Event Uncertainty	138
2. Neoclassical Theory and Secured Debt	138
2.1 The Basic Approach	138
2.2 Secured Debt and Capital Market Equilibrium	139
2.3 Collateral Policy and Non-Market-Value Debt Claims	141
3. The Theory of Credit Support Decisions in the Light of the Economics of Information	143
3.1 Collaterals as a Tool to Limit the Creditability Risk	143
3.2 Contemporaneous Examination of Credit Standing Risk and Credit Reliability Risk	145
3.2.1 Changing the Dividend Policy	146
3.2.2 Changing the Credit Policy	147
3.2.3 Changing the Investment Policy	148
4. A Scheme of Credit Contract Covenants	149
4.1 Credit Contract Covenants	149
4.2 Covenants Referring Indirectly to Means of Payment	150
4.2.1 Special Obligations of the Debtors	150
4.2.2 Special Rights of the Creditors	151
4.3 Claims of Creditors which Refer to Means of Payment	152
5. The Efficiency of Securing Debt	153
6. Appendix: Secured Debt and Uncertainty	154
6.1 The Firm's Position	154
6.2 Derivation of the Value of Secured Debt	156
6.3 Market Value of the Debt in Dependence of its Collateral Policy	157
6.4 The Maximization of the Market Value with Total Collateral Policy	158
References	160

Asset Pricing in a Small Economy:**A Test of the Omitted Assets Model**

(E. S. Schwartz and M. Brennan)	163
1. Introduction	164
2. Portfolio Based Tests of Efficiency	167
3. Omitted Assets	169
3.1 The Model	169
3.2 Integrated and Segmented Capital Markets	171

4. The Data	173
5. Efficiency of the Canadian Market Index	174
5.1 Beta Estimation under Thin Trading	174
5.2 Preliminary Estimates	175
5.3 Maximum Likelihood Estimation	178
6. Tests of the Omitted Assets Hypothesis	181
Appendix: Iterative Maximum Likelihood Procedure	186
References	187
The Simple Analytics of Arbitrage	
(K. Spremann)	189
1. General Equilibrium, Modern Finance, and Arbitrage Theory	189
1.1 General Equilibrium	189
1.2 Modern Finance	190
1.3 Arbitrage	192
2. An Example, its Generalization, and the Question	193
2.1 A Portfolio of Savings Bonds and Term Deposits	193
2.2 Is a Free Lunch Possible?	194
2.3 Events and Futures	195
2.4 The Question: Should the Original Portfolio be Revised?	198
3. Arbitrage versus Equilibrium	199
3.1 Some Borrowing from Production Theory	199
3.2 Either Arbitrage is Possible or Equilibrium Prices Exist	200
3.3 The Lemma of MINKOWSKI-FARKAS as Mathematical Background	200
3.4 The Derivation of an Issue Price	201
3.5 Summing up the Results	203
4. Derivative Contracts in Complete Capital Markets	204
4.1 Complete Capital Market	204
4.2 One-Period Option Pricing	204
References	206
About Contributors	209
Author Index	213
Subject Index	219

The Value of Security Agreements

Bernd Rudolph

Summary: The purpose of this paper is to examine security agreements in the light of some well known models of financial theory. In section 1 a survey of common credit support decision models is given and the role of collateralization is examined in the context of these models. Section 2 seeks to prove that the neoclassical theory of finance fails to explain the empirical evidence of security agreements in credit-contracts. Section 3 examines a rather new approach and it is shown on the basis of this approach that security agreements can be interpreted in a rather satisfactorily manner. Collaterals and credit covenants are realized as instruments of influencing the trustworthiness of the borrower. In sections 4 and 5 finally several types of credit contract covenants are structured and discussed with respect to their practical efficiency. In the appendix some main results of the neoclassical approach are proved in a more general way.

Table of Contents:

1. A Survey of Credit Support Decision Models	136
1.1 Credit Decisions in a Restricted Capital Market	136
1.2 Market Uncertainty	136
1.3 Credit Support Decisions with Event Uncertainty	138
2. Neoclassical Theory and Secured Debt	138
2.1 The Basic Approach	138
2.2 Secured Debt and Capital Market Equilibrium	139
2.3 Collateral Policy and Non-Market-Value Debt Claims	141
3. The Theory of Credit Support Decisions in the Light of the Economics of Information	143
3.1 Collaterals as a Tool to Limit the Creditability Risk	143
3.2 Contemporaneous Examination of Credit Standing Risk and Credit Reliability Risk	145
3.2.1 Changing the Dividend Policy	146
3.2.2 Changing the Credit Policy	147
3.2.3 Changing the Investment Policy	148
4. A Scheme of Credit Contract Covenants	149
4.1 Credit Contract Covenants	149
4.2 Covenants Referring Indirectly to Means of Payment	150
4.2.1 Special Obligations of the Debtors	150
4.2.2 Special Rights of the Creditors	151
4.3 Claims of Creditors which Refer to Means of Payment	152
5. The Efficiency of Securing Debt	153
6. Appendix: Secured Debt and Uncertainty	154
6.1 The Firm's Position	154
6.2 Derivation of the Value of Secured Debt	156
6.3 Market Value of the Debt in Dependence of its Collateral Policy	157
6.4 The Maximization of the Market Value with Total Collateral Policy	158
References	160

1. A Survey of Credit Support Decision Models

1.1 Credit Decisions in a Restricted Capital Market

To discuss the comprehension of secured debt in the several approaches of financial theory it is useful to classify the assumptions about the expectations of the creditors in the different models of credit support decision, as shown in figure 1.

First of all one can distinguish credit support decisions when lenders have secure expectations from such decisions under risk or uncertainty. Credit support decisions with secure expectations are strictly spoken trivial decisions, but often discussed in connection with imperfect capital markets with credit restrictions and therefore this case is included in the scheme of figure 1. On restricted capital markets credit rationing is a characteristic feature. Credit rationing itself can be interpreted as a reaction of the lender on the uncertainty about the future financial result of his investments. This uncertainty is only implicitly treated in the lender's calculation, above all in the form of fixed credit lines. Collateralization in such an approach is to be seen as a different tool to limit the creditor's commitment.

1.2 Market Uncertainty

As Hirshleifer and Riley (1979) made clear in their remarkable expository survey on the economics of uncertainty and information that the analytical decision theory has to deal with two kinds of uncertainty: the market uncertainty and the technological or event uncertainty. Although the financial literature considers almost exclusively event uncertainty, there is the remarkable exception of Milde's (1980, 1981) approach which is of interest for our survey because of comprehending the phenomenon of securing debt explicitly.

We discuss this approach separated from other approaches of individual credit support decision, because the assumptions about the expectations of the creditors are not unique. Milde wants to explain why the credit market is characterized by a variety of different interest rates, a phenomenon called 'interest rate dispersion'.

Interest rate dispersion is not only evoked by different interest rates which relate to the different rating-classes of debtors, but furthermore because debtors do not know the specific security requirements of the banks. To prevent high costs of searching for the

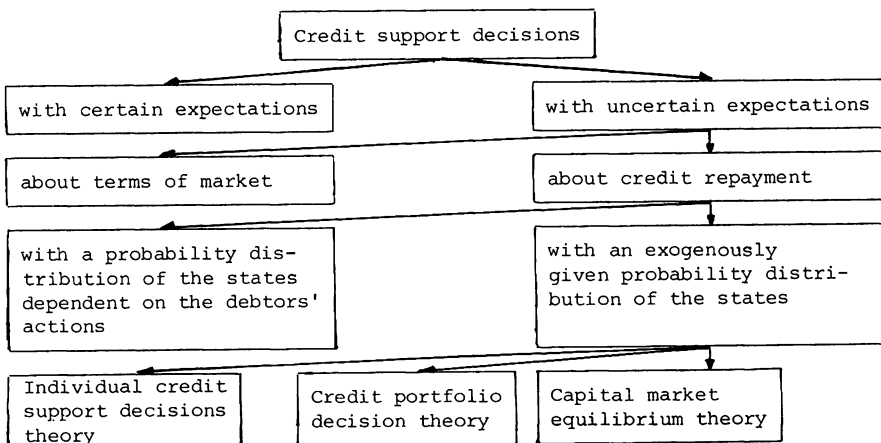


figure 1

debtor's specific risk class specialized bank, the borrowers accept interest rates too high in relation to their standing. The costs of searching are difficult to specify and thus one hardly expect prescriptive statements of this approach. But it is a convincing idea to explain interest dispersion with the prevention of searching costs.

Until now we did not specify Milde's definition of 'secured debt'. In his model the debtor pays his loan back with the proceeds $X(s)$ of the investment project, and, under certain circumstances with the liquidation proceeds $Y(s)$ of the collateral. $X(s)$ and $Y(s)$ are random numbers which are dependent on the state of the world s . If K is the amount of the credit, and r is the loan's interest rate at the end of the period, the bank will get:

$$Z = \min[(1+r)K, X(s) + Y(s)]$$

If there is no doubt about the borrower's willing to repay the credit, each asset of the debtor is liable to the bank even without a claim on a collateral security, and therefore the bank will not need a collateral Y to secure the debt claim. Securities in Milde's approach define the firm's level of solvency, which is measured by the amount of net property before credit support.

Therefore the results of the model do not refer to the collateral policy of the bank, but to the bank's solvency policy specifying the minimum solvency requirements for the customer. A similar argumentation can be shown to hold for the definition of secured debt in the

credit rationing approach of Stiglitz and Weiss (1981).

1.3 Credit Support Decisions with Event Uncertainty

We already mentioned that comprehending market uncertainty is the exception of the rule in credit support theory. Usually one regards event uncertainty, where an uncertainty about the future states is assumed which determine the repayment of the credit. Decision theory distinguishes between the risk situation, where the future states of the world will occur with specified given probabilities, and the gambling situation, where the states are the various acting possibilities of the opponent.

If the states of the world occur independently of the borrower's behavior, then the risk of the credit position is to be seen as the risk on the lacking credit standing of the debtor. If the states depend on the acting possibilities of the debtor, then the credit risk is a credit reliability risk. But one should assume that credit standing and credit reliability risk do not occur isolated but in combination.

The most elaborated neoclassical approach of the credit support theory considers the risk of a decreasing credit standing of the borrower exclusively. We will discuss the main models of the neoclassical approach in the next section.

2. Neoclassical Theory and Secured Debt

2.1 The Basic Approach

This theory assumes that a bank decides about an individual credit support at the time the customer asks for this loan. Each credit decision is made exclusively without considering the total credit engagement of the bank. The need of an individual decision is caused in default of information about the future credit demand, and by the organization of decentralized bank decisions, which is characteristic for branch bank systems (Rudolph 1974).

The bank's decisions about credit supports depend on the net profit of the credit positions. Let us define K as the demanded loan amount, and r as the interest rate. Further on i is the interest rate the bank has to pay for the refinancing of its credit support. Thus the mean of the interest excess G of a credit position will be

$$E(G) = (1+r)K \alpha(r,K) - (1+i)K ,$$

where α is the mean credit repayment quota. For $\alpha = 1$ the bank expects the repayment at the end of the period with certainty, for $\alpha < 1$ the bank expects with a certain probability which among others depends on the interest rate r and on the credit amount K that the credit will not be paid back in the whole amount.

Given this very easy approach, one can specify collateral as an instrument to raise the mean repayment quota α . But notice that such a reduction of the credit failure is only imaginable if several creditors share the chances and the risk of the debtor's assets. Only then it is possible for one creditor to shift risk to the others, if his individual debt contract contains collateral covenants. If the bank is the sole creditor the debtor's total property is liable and an additional collateral agreement can't improve the creditor's position.

Concerning credit collateral policy we do not get new fundamental results of the theory of credit portfolio decisions except the now necessary consideration of the correlation of expected future values of the collateral security with the expected future values of the firm's total assets.

2.2 Secured Debt and Capital Market Equilibrium

The theory of capital market equilibrium investigates among others whether a shift of default risks from one creditor to other creditors can cause any advantages for the debtor. In a corporation with outstanding debt these advantages would result in a rise of the market value of the debt and therefore in an increased market value of the firm.

If the creditors act rationally and on the presumptions usually summarized for the assumption of a perfect capital market one can show that the collateral policy of a levered firm is irrelevant for its market value. One could call this statement analogous to the irrelevance hypothesis of Modigliani and Miller (1958) the collateral irrelevance hypothesis: Given perfect capital markets possible risk differences between credit positions are fully reflected in their market values with the consequence that risk transfers between creditors will cause an altogether equally high total market value of the outstanding debt.

This result of capital market equilibrium theory (which will be proved in a more general way in the appendix) can be explained by a simple example. To that end we inspect a company with the invested capital containing only two assets. At the end of the period the liquidation proceeds of the two assets X and Y will depend on three states of the world s_1, s_2 and s_3 . The contingent proceeds are shown in table 1.

The firm incurs debt from bank A and bank B and has to redeem the amount of $T_A = 55$ and $T_B = 55$ at the end of the period. Presumed the default free interest rate is 10% and the market is risk neutral so that the present market value of financial claims is the discounted mean, the debt claims of bank A and B both have the value:

$$F_A = F_B = \frac{1}{2 \cdot 1.1} [0.3 \cdot 88 + 0.7 \cdot 110] = 47$$

liquidation proceeds	state probability	s_1	s_2	s_3	mean
		0.3	0.4	0.3	
X		60	60	60	60
Y		28	105	72	72
X + Y		88	165	132	132

table 1

The value of the equity of the firm amounts to

$$E = \frac{1}{1.1} [0.4 \cdot 55 + 0.3 \cdot 22] = 26$$

and the total value of the firm is

$$W = F_A + F_B + E = 120 .$$

Consider now bank A insisting on a collateral to secure its credit. The debt contract is secured if the firm pledges the asset X or Y or both assets to the bank with the provision that should the firm default the bank has the right to seize and sell the collateralized asset. Should the proceeds from the sale exceed the outstanding amount, the excess is returned to the firm. If the proceeds are insufficient to meet the outstanding amount, the bank retains all of the proceeds and becomes an unsecured creditor for the remaining debt.

Assume the firm offers the asset with the liquidation proceeds X as a security to the bank A . Because $X = 60$ for all states the credit position of A is riskless and the value of claim A now is

$$F_A = \frac{55}{1.1} = 50.$$

Because of Bank A 's exploitation right on the security the paying schedule for bank B changes in the state s_1 , and B 's claim now has a value of

$$F_B = \frac{1}{1.1} (0.3 \cdot 33 + 0.7 \cdot 55) = 44.$$

The value of the total debt, which is $F = 47 + 47 = 94$ without collateral, does not change with securing the debt position of bank A . The claim A 's value gains 3 units, but this rise is exactly compensated for by the 3 units decrease of the value of claim B .

2.3 Collateral Policy and Non-Market-Value Debt Claims

Contrary to the just discussed collateral irrelevance hypothesis Scott (1977) has shown that a firm can maximize its value when it uses all its assets as collateral for the creditors. Scott is arguing that in the case of the debtor's default some debt has to be paid before distributing the bankruptcy estate to the creditors. These costs are especially sales taxes, property taxes, excise taxes, the administrative costs of bankruptcy and legal damages claims. Typically, these claims have to be paid only under certain circumstances and they are not considered in the calculation of the value of the debt. Therefore they do not incur the value of the firm. Thus, if all the debtor's assets are transferred as collateral to the creditors with claims traded on the capital market, they outrank the mentioned non-market valued claims in case of default. The market value of the firm reaches its maximum when the claims with lacking market values have the lowest priority compared to the claims of the market participants.

One can easily confirm this result with the help of the former example. Look again at table 1 to see the distribution of the value of the firm's securities. Beside the payable debt of $T_A = 55$ and $T_B = 55$ consider now also some tax costs of $U = 33$, which have to be paid independent of the state of the world in $t = 1$. It is assumed that in a default of the firm the tax costs outrank the claims T_A and T_B .

Presumed further on a default free interest rate of 10 % and a risk neutral capital market, the value of the debt claims is

$$F_A = F_B = \frac{i}{2 \cdot 1.1} [0.3 (88 - 33) + 0.4 \cdot 110 + 0.3(132 - 33)] = 41$$

and the market value of equity is

$$E = \frac{1}{1.1} [0.4(165 - 110 - 33)] = 8 .$$

Thus the market value of the firm amounts to

$$W = F_A + F_B + E = 90 .$$

In a first step we will now secure the debt of bank A with the liquidation proceeds X , then in addition we will also secure the debt of bank B with the liquidation proceeds of Y to observe the altering of the firm value when different securing strategies are applied.

If bank A gets title on the asset with the liquidation proceeds X , its credit position is riskless and the market value has the amount of

$$F_A = \frac{55}{1.1} = 50 .$$

Bank B has to consider that in states s_1 and s_3 tax costs have a higher priority and the value of its claim thus will be only

$$F_B = \frac{1}{1.1} [0.4 \cdot 55 + 0.3 \cdot 44] = 32 .$$

The collateralization of bank A does not change the total market value of the debt $F = 82$ because the risk transfer fully diminishes the claim of bank B : the tax costs $U = 33$ outrank claim B in the case of default.

But if the claim of bank B is secured by exploitation rights of the liquidations proceeds Y (while bank A keeps its collateral), the market value of debt F will rise. In this case $F_A = 50$ again, but bank B receives the liquidation proceeds Y in the states s_1 and s_3 before the tax costs are paid and this will increase the value of its claim to

$$F_B = \frac{1}{1.1} [0.3 \cdot 28 + 0.7 \cdot 55] = 42.64 .$$

If bank B would have also a subordinate exploitation right on the collateral of bank A , it could obtain a 5 unit raised liquidation profit in the state s_1 , and the debt value would be:

$$F_B = \frac{1}{1.1} [0.3 \cdot 33 + 0.7 \cdot 55] = 44 .$$

The just described collateral policy can create the maximum value of the debt $F=94$ because the creditors A and B are able to shift the utmost risk on the claim U which does not possess a market value.

3. The Theory of Credit Support Decisions in the Light of the Economics of Information

3.1 Collaterals as a Tool to Limit the Creditability Risk

Our previous considerations about collateral policy in the scope of the neoclassical theory of credit support decisions focus in the following results of the theory of the credit market equilibrium:

- On a perfect and complete capital market the collateral policy of a firm is irrelevant for its market value (collateral irrelevance hypothesis).
- Considering insufficiencies of the capital market, i.e. market exogenous claims on the corporate's securities, a collateral policy shifting the utmost risk from the market creditors to the non-market creditors will cause the maximum market value of the firm (fully collateral policy).

We are not satisfied with these results of the neoclassical theory: Although securing debt causes high private and public costs (monitoring costs, contract costs, administrative costs, law costs etc.) this instrument is still of great importance on real financial markets. The neoclassical theory can explain this discrepancy only with the total collateral policy. But on real capital markets full collateralization is rather the exception than the rule.

On the other hand it is not unusual that debt contracts imply collateral-agreements even if the covenantee presumptively is and remains the sole creditor, so that in this case a risk transfer to other creditors is of no importance because secured and unsecured credit positions are equivalent.

Including the reasoning of the economics of information in the neoclassical theory of credit support decisions will disclose us a theoretical base to explain the practice of collateralization in creditor/debtor relations. But notice that the ideas of the economics of information are to complete our previous thoughts in such a way that deciding about credit support the bank has to consider

the risk of credit standing and of credit reliability combined.

To concrete the idea of the economics of information in this context it is useful to investigate in the first stage the isolated risk of credit reliability. It will be shown that collateral can bound or even eliminate that risk. In the next section we will examine the situation where both risks have to be considered conjointly.

The well known model of Jaffee and Russell (1976) is a first approach to investigate the isolated risk of credit reliability. The topic of the model is the phenomenon of credit rationing: "Credit rationing occurs when lenders quote an interest rate on loans and then proceed to supply a smaller loan size than that demanded by the borrowers".

The neoclassical solution of this gap proposes that the unsatisfied borrowers will offer a higher interest rate, which will motivate the bank to rise the loan supply for an increased risk premium; this process finally will end when credit supply and demand are in equilibrium at a certain interest rate.

Credit rationing is an instrument of the banks to influence the average solidity of their customership. A decrease of the mean credit supply can reduce the number of "dishonest" debtors, because the incentive to breach the contract is smaller if it is a paltry credit amount. Therefore credit reliability is not a permanent (fixed) unchangeable condition of the borrower, but a consequence of an economical reasoning.

The borrower will fulfill the contract (i.e. repay the loan) if it is economical advantageous and on the other side he will breach the contract if this behavior is profitable. Through its debt-policy the bank can influence the lucrateness of repayment for the debtor. If not paying involves certain costs for the borrower (cost to default) the bank can reduce the numbers of borrowers which have an advantage if they fail to repay. These costs are given exogenously in the Jaffee and Russell model, whereas the exogenously given amount can be different for each borrower.

In contrast to this assumption of an exogenous cost factor Rudolph (1982) showed the ability of the banks to influence the cost of default. Banks could especially increase these costs if they enclose collateral covenants in loan contracts so that in case of the

borrower's nonpayment he will lose part of his securities to the bank. Collaterals therefore can increase the probability of repayment.

With the inclusion of collateral in the model of Jaffee and Russell one gets a common price equilibrium instead of the rationing equilibrium, because with a given credit standing of the borrower the repayment of the loan is only a question of the debtor's will.

Since the assumption of a given credit standing is not realistic, we have to examine in the next section the decisions of a bank in the face of a credit standing risk and a credit reliability risk. We will discuss the problems of this situation with the help of our former numerical example.

3.2 Contemporaneous Examination of Credit Standing Risk and Credit Reliability Risk

Let us take again the probability distributions of X and Y , as shown in table 1 to demonstrate the simultaneous analysis of the credit-standing and credit-reliability risk of a firm. The distributions determine the debtor's credit standing for given loan quantities.

The credit reliability risk on the other hand is to be seen in the fact that the creditor does not know whether the firm will keep the assets with the liquidation proceeds X and Y until the end of the period to serve the bank's receivables or if the firm sells the assets and disposes of the proceeds in another way. Creditors are faced with uncertain expectations which of the alternatively possible plans of the firm will be realized after the credit is placed at the firm's disposition.

Swoboda (1975) calls these risks as distribution risks: "We'll call the risk that a position of a creditor alters caused by subsequent decisions of the firm distribution risk" (as e.g. issuing additional debt which will dilute the claim of the original creditor). Later on several articles of the financial literature focused on this problem and summarized the main post-credit strategies of debtors (Smith and Warner 1979b, Smith 1980). We will discuss these strategies based on the numerical example of table 1 and examine whether creditors could diminish the distribution risk with the help of collateral.

3.2.1 Changing the Dividend Policy

After the issue of the credit, the firm can raise its dividend rate, in spite of a former declared lower rate, and thus increase the default risk for the creditors. The dividend payments can be financed by reduced investment (balance sheet cut) or financed by issuing additional debt (change of liabilities).

Dividend payments evoke a higher risk for the initial creditor, because liable capital (equity) is substituted by unliable capital (debt).

Let us consider the firm of our example adding a new loan with a receivable of $T_C = 22$ in $t=1$ to its senior debt (with receivables of $T_A = 55$ and $T_B = 55$).

After the additional loan is issued, the market value of the whole debt will be

$$F = \frac{1}{1.1} (0.3 \cdot 88 + 0.7 \cdot 132) = 108$$

compared to 94 before the junior debt. The corresponding equity values are $120 - 108 = 12$ (with new debt) and 26 (before new debt). The debt value gained 14 unities, while the equity value lost these 14 unities. Since the market value of Bank C's claim is:

$$F_C = \frac{22}{132} \cdot 108 = 18 ,$$

the firm did not get 14 but 18 unities by raising the additional loan.

Since the transaction changed the values of bank A's and bank B's claims from 47 to 45, the loan quantity should be divided in such a manner, that the capital owner would get 14 unities and each of the banks A and B would get 2 unities. This distribution would keep the old market value relation of the debt/equity claims. But distributing the whole loan amount of 18 to the capital owners, the stockholder's wealth is increased to the detriment of the original creditors.

A wealth-shifting on account of the creditors caused by a credit financed dividend payment can be limited (in special cases even eliminated) if the debt of the initial creditors is secured.

Let us consider the case that creditors A and B have property rights (claims) of the firm's assets, which are united in a se-

curity pool and consist of the liquidation proceeds X and Y . Under these assumptions the market value of the total debt and the value of the unsecured debt are corresponding as demonstrated in section 2.2, and $F = 47 + 47 = 94$.

If the senior debt is fully secured and the firm issues junior debt with the principal of $T_C = 22$, its value will be:

$$F_C = \frac{1}{1.1} \cdot 0.7 \cdot 22 = 14.$$

If the firm gets the disposal of this loan quantity and pays it instantly to the equity owners, the claims of the creditors A and B are not diluted. Since their debt is secured, they are protected against distribution risks caused by credit financed dividend payments to the equity owners.

As far as it concerns dividend payments by desinvestment (balance sheet cut), they too can be prevented by securing the debt. Secured debt gives the creditor the exploitation right on the security such that the management of the firm cannot arbitrarily dispose of the asset. Therefore the possibility of a dividend payment, financed with proceeds of sold assets, is reduced.

However, a total prevention of desinvestment financed payments is rather impossible. Creditors would have to use all the firm's assets as collateral to transfer the right to dispose over the firm's estate totally from the management to the lenders. Still, by securing debt, one can install upper bounds for dividend payments and protect those assets which may not be sold in order to use the proceeds for dividend payments (real estate, networking assets).

3.2.2 Changing the Credit Policy

The levered firm can repay its debt to some creditors premature or it can secure some creditor's debt. Both policies are disadvantageous for the other creditors because their claims' value decreases. In the case of a premature repayment all the risk is transferred to the residual debt, while in the case of secured debt the amount of shifted risk from secured to unsecured debt depends on the quality of the collateral. Creditors with contracts including collateral covenants usually do not have to fear these forms of the distribution risk.

3.2.3 Changing the Investment Policy

Finally the firm has a third opportunity to transfer risk investing in projects with higher risk than declared to the creditors. Such an altered investment policy can increase the value of equity, because although the default risk rises, the firm realizes higher yields for the benefit of the shareholders in default-free states (Swoboda 1982).

Let us assume again a firm with two assets with the liquidation proceeds X and Y and in addition the opportunity of the firm to keep two other assets with the liquidation proceeds Z and Y in its estate without any technical difficulties. Table 2 describes the yields of the alternative plans x and z .

Though the mean of the receipts distribution is similar for plan x and z creditors A and B with receivables of $T_A = 55$ and $T_B = 55$ have every reason to fear the realization of plan z instead of plan x . While the value of debt is $F = 94$ and the value of equity is $E = 26$ if plan x is chosen, plan z will produce an equity value of $E \approx 42,4$ and a debt value of only $F \approx 77,6$. Thus the firm's management can cause an essential increase of the value of equity by preferring projects with higher risk.

Collateral can be seen as a tool to prevent (or limit) distribution risk, caused by a change of investment policy, because the investment policy of the firm would be determined if bank A or B put the security with the yield X in pledge.

To prevent an investment policy change, it would even be sufficient in this case, that one of the creditors put pledge on asset X . Conditional of the given credit reliability risk, securing one bank's debt will also improve the unsecured claim, because the raised default risk, which the unsecured creditor has to face after the other creditors claim, can be more than compensated by the reduction of the credit reliability risk.

To prove these market value rising effects of collateral, we will presume that banks A and B expect with an a priori probability of 50% the realization of plan x or z . In this case the debt's value will be

$$F = 0.5 \cdot 94 + 0.5 \cdot 77.6 = 85.8$$

and the values of the claims A and B are 42.9 for each of the claims.

liquidation proceeds		state probability	s ₁	s ₂	s ₃	mean
			0,3	0,4	0,3	
plan x	X		60	60	60	60
	Y		28	105	72	72
	X+Y		88	165	132	132
plan z	Z		0	105	60	60
	Y		28	105	72	72
	Z+y		28	210	132	132

table 2

Now A gets the security with the liquidation proceeds X as collateral with the result of a raised value of $F=94$ caused by the dropped credit reliability risk. The collateral of A produces a risk shifting on account of B and favouring A .

The value of the secured claim A is 50 and the value of the unsecured debt B is only 44, thus inspite of the risk transfer on account of B the collateralization increases B's claim from 42.9 to 44 .

4. A Scheme of Credit Contract Covenants

4.1 Credit Contract Covenants

The previous sections should have made clear that collateralization can cause a risk transfer between the creditors, and collateralization can influence the behavior of the debtors during the period of credit. Especially, collateral can induce leveraged firms or other economic subjects to run a decent dividend, credit, and investment policy.

One can ascertain that securing debt with pledged assets is a rather strong policy to influence the behavior of the equity owners. Credit markets have developed also other and weaker instruments to lower the risk-shifting possibilities of the corporation. These strategies are documented in the several types of credit contract covenants in figure 2.

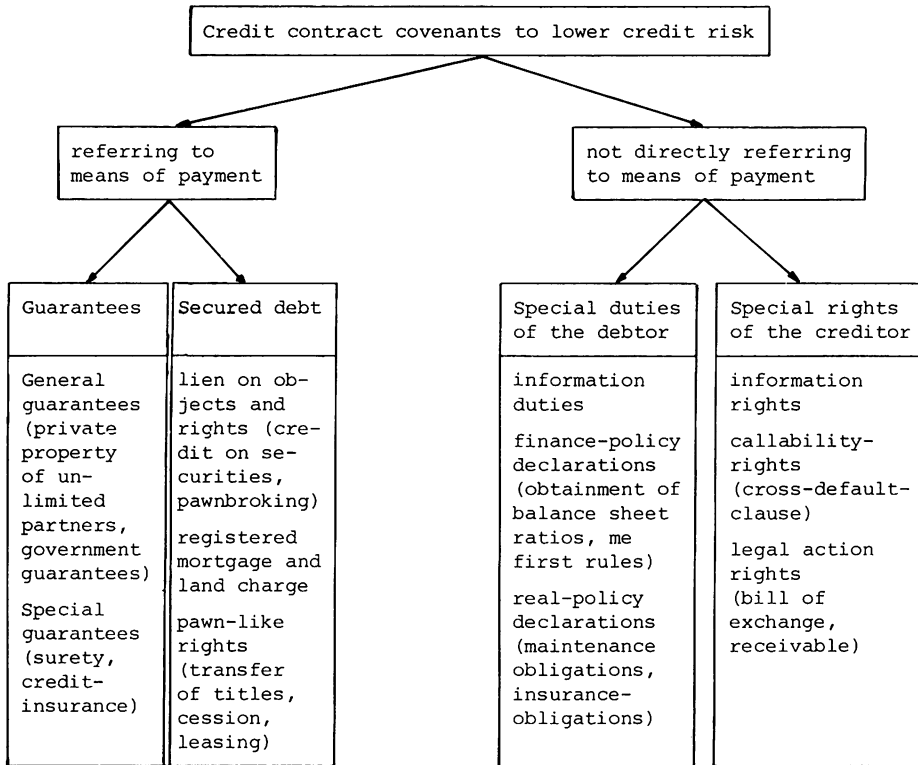


figure 2

Credit contract covenants are provisions included in debt contracts which either endow the creditors with special rights or bind the debtors to special obligations. These covenants in contrast to guarantee- or collateral-agreements, refer only indirectly to means of payment by influencing the probability distributions which determine the amount of repayment of the debtor.

Before discussing the cases in which the lenders should use the stronger or the weaker policy to control the debtor's behavior, we will give a short survey of the different types of covenants.

4.2 Covenants Referring Indirectly to Means of Payment

4.2.1 Special Obligations of the Debtors

Special obligations are duties which are not generally requested by the codes of civil law. A firm, for example, can be obliged to supply financial and other information for the credit period. The informa-

tion about the economic status of the firm can be general (balance sheets, financial statements, reports etc.) or refer to special situations as changes in mortgage rights or in management. Additionally, the borrower can bind himself to obtain certain balance sheet relations, liquidity ratios or capital structure relations as long as the debt is outstanding.

Of great importance are the so called 'me first' rules. By including a me first rule in his debt contract a creditor wants to protect his position against dilution, which can be evoked if the firm issues additional debt. We can differ between three types of me first rules:

- The debtor can assure that he will not issue debt with a higher priority or doing so the existing debt will be upgraded (debt-priority-equality).
- Secured debt is often endowed with the obligation of the debtor that he will not sell, lease or pawn the security, with other words, the debtor 'reserves' the pledged asset to the creditor.
- The most restrictive type of me first rules binds the debtor not to sell, lease or pawn his assets, not to secure any other debt, or in the extreme case even not to issue any additional debt at all.

This last type leads us to a group of restrictions which binds the debtor to a specific maintenance of these assets. These obligations include for example the duty to treat real estate, machines or raw material in an orderly manner, or to insure these items. All these provisions interfere with the real-sphere of the firm and usually generate costs.

4.2.2 Special Rights of the Creditors

According to the special duties of the debtors we will first refer to the information rights of the lenders which are not installed in civil law. Banks often include in their general credit requirements the right of an insight in the economic situation of the borrower at any time wanted. Another right of the general requirement is the callability clause: the creditor can request the immediate repayment of the credit, if the debtor does not fulfill his special obligations.

Euro Bond contracts for example often include the so called 'cross default clause' which gives the creditor the right to call the credit if the debtor fails to fulfill his payment-obligations punctually to any other creditor.

The creditors can also be endowed with special rights to call in their due receivables. The creditor, whose claim is based on a bill of exchange does not need to remind the debtor and has to take no account of any terms if the debtor does not repay punctually. The bill credit endows the creditor with the right of the billprotest: the creditor gets a day of court hearing at an early date and he gets in the declaratory suit an enforceable title against the bill debtor. Thus the bill of exchange facilitates the action for payment, and therefore endows the bill creditor with extra rights compared to the usual civil law regulations of credit contracts.

4.3 Claims of Creditors which Refer to Means of Payment

While the just described covenants refer only indirectly to means of payment by influencing the probability distribution, we now discuss the claim of creditors which do refer to means of payment directly. This type of covenants can be divided in collateral-agreements (secured debt) and in guarantee-agreements.

Secured debt endows the lender with the right to seize a pledged asset of the firm's estate in case of default and to sell it. If a bank for example secures a corporation credit with the seized deposit of securities of the firm and the corporation defaults, the bank can sell the securities. Should the proceeds from the sale exceed the receivables of the bank, the excess is returned to the debtor or his estate; if the proceeds are insufficient, the bank retains all of the proceeds and becomes an unsecured creditor for the remainder due to him.

Depending on the legal classification of secured debt one can distinguish between lien on objects and rights, registered mortgage and land charge and pawn-like rights like cession and the transfer of titles for the purpose of securing debt.

Guarantees are claims of the lenders on means of payment of a third party. If the original borrower cannot repay the credit, the guarantor is obliged to fulfill the debtor's liabilities.

If guarantees serve to improve the position of all creditors, they are said to be general guarantees. General guarantees increase the liable property of the company. Examples are government guarantees or the private property of unlimited partners. If guarantees refer to an individual debt contract (which is to a certain creditor or a group of creditors) they are said to be special guarantees.

5. The Efficiency of Securing Debt

One cannot answer generally the question if creditors should use a strong instrument as collateralization to influence the owner's policy, or if a weaker policy (covenants) is sufficient, because it depends on the specific credit situation. The interbank market for example can do without collateralization, because the market participants know each other well, and the market participants are in steady commercial intercourse. If a borrowing bank undertook a business policy on the creditor's detriment, it could very easily lose its standing and could be excluded from the market. Therefore it seems to be dispensable on such a market to influence the debtor's policy explicitly.

On the commercial credit market, where longterm creditor/debtor relations are ascertainable, one can observe collateralization and nonpecuniary covenants to regulate the behavior of the debtor. Actually these nonpecuniary covenants are extremely important (as the first rules). Concerning smaller firms, collateralization is regular, whereas the crediting banks request especially real estate as securities.

If firms issue only small loan quantities and are relatively unknown to the crediting bank (because the credit contract is the sole relation between customer and bank) the bank will secure its debt with collateral-agreements to influence (although indirectly) the firm's business policy during the period of credit. In this case, collateral is an efficient and cheap instrument of debtor's self binding, which can save the creditor/debtor relation costly planning- and monitoring costs (Drukarczyk 1983, 1984).

6. Appendix: Secured Debt and Uncertainty

6.1 The Firm's Position

The financial effects of securing debt shall be derived in a single period model of a stock company. The firm's estate contains two assets, each of which can be values independently of the other asset's value. The market valued of the securities at the end of the period are given by $X(s) \geq 0$ and $Y(s) \geq 0$, where $s(s=1,2,\dots,\bar{s})$ is the occurring state in $t=1$. If $q(\hat{s})$ is the present value of a financial claim which will pay its owner one unity of money if state \hat{s} occurs, the market value V of the firm in $t=0$ is given by:

$$V = \sum_{s=1}^{\bar{s}} q(s)[X(s) + Y(s)] . \quad (1)$$

The firm has issued credit from bank A and B with the quantities K_A and K_B . The debt has to be repaid in $t=1$ in the amount of T_A and T_B (the repayment includes the interest).

Furtheron we assume that during the period liabilities in the amount of U will evoke which are not priced on the capital market, and which in case of default outrank the receivables T_A and T_B . To keep the analysis simple, let us assume $U < X(s) + Y(s)$ holds for all s such that the market value of the firm's securities in $t=1$ is in no case lower than the amount of the liability U . Given the total claim of the creditors on the firm is $T = T_A + T_B$ in $t=1$, debt's value in $t=0$ will be:

$$F = \sum_{s=1}^{\bar{s}} q(s) \min[T, X(s) + Y(s) - U] , \quad (2)$$

because the banks will get their receivable T or in case of default the residual of the firm's value minus the amount of U , since U has the higher priority. This residual amount will be smaller than the value of T , but since we assumed $U < X(s) + Y(s)$, the repayment to the banks cannot be negative.

Given $X+Y \geq U+T$ holds for each state s , where $s=1,2,\dots,k-1$ and $X+Y < U+T$ holds for each state s , where $s=k,k+1,\dots,\bar{s}$, we deliver a rule of distribution of the firm's estate to the creditors which corresponds to the Act of Bankruptcy. If the states of the world are divided in the described way, the value of the debt will be:

$$F = T \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{\bar{s}} q(s) [X(s) + Y(s) - U] . \quad (3)$$

In the case of default the residual amount of the firm's estate minus U will be shared between creditors proportional to their original receivables T_A and T_B . Thus the market value of bank A's part of the debt will be (on account of a clearer presentation we will stop indicating X and Y further on):

$$\begin{aligned} F_A &= \sum_{s=1}^{\bar{s}} q(s) \min \left[T_A, \frac{T_A}{T} (X + Y - U) \right] \\ &= \frac{T_A}{T} \sum_{s=1}^{\bar{s}} q(s) \min [T, X + Y - U] \\ &= \frac{T_A}{T} F , \end{aligned} \quad (4)$$

and the market value of bank B's receivable is:

$$\begin{aligned} F_B &= \sum_{s=1}^{\bar{s}} q(s) \min \left[T_B, \frac{T_B}{T} (X + Y - U) \right] \\ &= \frac{T_B}{T} \sum_{s=1}^{\bar{s}} q(s) \min [T, X + Y - U] \\ &= \frac{T_B}{T} F . \end{aligned} \quad (5)$$

Since the shareholders have claim on the firm's assets minus the sum of liabilities in $t=1$, and because of the limited liability of common stock, the value of the equity will be:

$$\begin{aligned} E &= \sum_{s=1}^{\bar{s}} q(s) \max [X + Y - U - T, 0] \\ &= \sum_{s=1}^{k-1} q(s) [X + Y - U - T] \end{aligned} \quad (6)$$

Since the market value of the firm is the sum of the values of equity and debt and at the same time the market value V of the asset minus the present values of the non market valued liabilities, one can write:

$$\begin{aligned} W &= E + F \\ &= \sum_{s=1}^{\bar{s}} q(s) [X + Y - U] \\ &= V - U \sum_{s=1}^{\bar{s}} q(s) . \end{aligned} \quad (7)$$

6.2 Derivation of the Value of Secured Debt

Let us assume now that bank A gets the asset with the market value X as a collateral for its credit. In the case of default A has a claim on the asset with value X ; thus the market value of bank A's receivable is:

$$F_A = T_A \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{\bar{s}} q(s) \min \left[T_A, X + \max \left\{ \frac{T_A - X}{T - X} (Y - U), 0 \right\} \right] . \quad (8)$$

The first sum of (8) considers that if the firm does not default A will get the entire amount of its receivable T_A , while the second sum of (8) describes the payoff to A in case of default (all states where $U + T > X + Y$ holds), where A makes use of the collateral and receives its market value $X(s)$. If the proceeds $X(s)$ exceed T_A , the surplus is given back to the bankrupt's estate, because the repayment to A may not exceed its receivable T_A . But if the receivable T_A exceeds the proceeds of X ($T_A > X$), bank A has a residual claim on the bankrupt's estate in the amount of the excess $T_A - X$, which is outranked by the tax costs U , but is on equal priority with the receivables of bank B. In the case of $Y > U$, the residual claim of bank A will yield the positive ratio $(T_A - X) / (T - X)$, whereas otherwise the ratio will be zero, because the residual assets are used to pay the liability U .

Let us additionally divide the states of the world ($k, k+1, \dots, \bar{s}$) in the states ($k, k+1, \dots, l-1$), where $X \geq T_A$ holds, and in the states ($l, l+1, \dots, \bar{s}$), where $X < T_A$ holds, and we can change (8) to:

$$F_A = T_A \sum_{s=1}^{l-1} q(s) + \sum_{s=l}^{\bar{s}} q(s) \left[X + \max \left\{ \frac{T_A - X}{T - X} (Y - U), 0 \right\} \right] . \quad (9)$$

The first sum of equation (9) shows that A will get the whole amount of its receivable if the firm does not default ($s = 1, 2, \dots, k-1$), or if default does occur, the liquidation proceeds of the collateral are sufficient to pay T_A completely ($s = k, k+1, \dots, l-1$). The second sum includes the present value of bankrupt's estate if the receivable T_A exceeds the yields of the collateral. In this case the bank will get the value X of the collateral and its part of the redundancy $Y - U$, if this margin is positive.

Comparing equation (9) to (4), whereas equation (4) values the unsecured credit of A, and (9) the secured claim, one can see that collateralization

- has raised the probability of a total repayment to bank A, unless none of the states $s = (k, k+1, \dots, l-1)$ occurs.
- has diminished the amount of an eventual lack of payment to bank A, unless $X = 0$ holds for $s = (l, l+1, \dots, \bar{s})$.

If one excludes the extreme case where $X = 0$ holds for $s = (k, k+1, \dots, \bar{s})$, the market value of the secured debt quantified by (9) is higher than the one of the unsecured debt in equation (4). And finally it is possible that, although a positive default risk occurs, bank A can construct a riskless credit position by collateralization. If $X \geq T_A$ holds for all states $s = (k, k+1, \dots, \bar{s})$ bank A's claim is free of any credit risk and its value is:

$$F_A = T_A \sum_{s=1}^{\bar{s}} q(s)$$

6.3 Market Value of the Debt in Dependence of its Collateral Policy

Now we have to examine the influence of collateralization on the value of the debt and of the firm. If securing bank A's debt raises not only the value of its receivable but also the market value of the debt, the market value of the firm can also be increased. To prove these relations, we will first inspect the interdependency of the value of bank A's receivable with the collateralization of its debt.

We can express the value of the unsecured debt by:

$$F_B = T_B \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{l-1} q(s) \max \{ (X - T_A) + (Y - U), 0 \} + \sum_{s=l}^{\bar{s}} q(s) \max \left\{ \frac{T_B}{T-X} (Y - U), 0 \right\} \quad (10)$$

The first sum stands for the market value of the receivable in those states where default does not occur. The second sum indicates the market value in the case that the proceeds of security X in excess of the receivable T_A of bank A along with the proceeds of security Y serve to pay the liability U. After this liability is paid too, bank B can dispose over the residual bankrupt's estate.

The third sum refers to the situation, where the collateral-proceeds cannot satisfy bank A's receivable entirely, such that A and B have to share out $Y - U$ proportional to the quantity of their claim after the liability U is paid.

If you add the market values of (9) and (10) you will get the market value F_0 of the debt under the assumption that creditor A gets the asset with the value X as a collateral for its credit.

$$F_0 = T \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{l-1} q(s) \max\{X+Y-U, T_A\} + \sum_{s=1}^{\bar{s}} q(s) \max\{X+Y-U, X\} . \quad (11)$$

We will now compare this market value F_0 with the market value given in (3) which indicates the value of the unsecured debt. For an easier demonstration equation (3) is rewritten as:

$$F = T \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{l-1} q(s)[X+Y-U] + \sum_{s=1}^{\bar{s}} q(s)[X+Y-U] . \quad (3')$$

Formulas (3') and (11) yield

$$F_0 = F + \sum_{s=k}^{l-1} q(s) \max\{0, (T_A - X) + (U - Y)\} + \sum_{s=1}^{\bar{s}} q(s) \max\{0, (U - Y)\} \geq F \quad (12)$$

whereby the inequality $F_0 \geq F$ can be strict since some states could occur where creditors will receive liquidation proceeds on account of the receivables U . From (12) we see that this is the case if $T_A > X + Y - U$ holds for at least one of the states $s = k, \dots, l-1$ or if $Y < U$ holds for at least one of the states $s = 1, \dots, \bar{s}$.

The size of the increase of F_0 depends on the amount of the default risk which is transferred to the creditor with receivable U , caused by securing the debt of A.

6.4 The Maximization of the Market Value with Total Collateral Policy

If bank A would not get only proceeds X , but also Y as a collateral, the market value of its claim would be:

$$F_A = T_A \sum_{s=1}^{m-1} q(s) + \sum_{s=1}^{\bar{s}} q(s)[X+Y] , \quad (13)$$

if states $(1, 1+1, \dots, \bar{s})$ are divided in $(1, 1+1, \dots, m-1)$, where $X + Y \geq T_A$ holds, and in $(m, m+1, \dots, \bar{s})$, where $X + Y < T_A$ holds.

The market value of bank B's claim would then be:

$$F_B = T_B \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{m-1} q(s) \max \{X + Y - T_A - U, 0\} . \quad (14)$$

Adding the market values of (13) und (14) to the market value F_{00} of the debt, if A is totally secured, one receives:

$$F_{00} = T \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{m-1} q(s) \max \{X + Y - U, T_A\} + \sum_{s=m}^{\bar{s}} q(s) [X + Y] . \quad (15)$$

Comparing (15) with the market value F of the debt given in (3), which refers to the unsecured debt, one can see that the market value of the debt is:

$$F_{00} = F + \sum_{s=k}^{m-1} q(s) \max \{0, T_A + U - (X + Y)\} + U \sum_{s=m}^{\bar{s}} q(s) \geq F_0 \geq F , \quad (16)$$

if the claim of bank A is totally secured. Corresponding to this derivation it could be easily confirmed that the market value of the debt could be raised, if bank B's debt would be also secured. The risk transfer to U is obtained independently of the chosen form of collateralization. Whether the securities which serve as collateral are ordered in a ranking (first and second mortgage e.g.) or a securities pool is of no importance.

If no receivables U have to be considered, (16) shows that since $U = 0$ and $X \geq T_A$ holds for $s = k, k+1, \dots, l-1$, resp. $X + Y \geq T_A$ holds for $s = 1, 1+1, \dots, m-1$, the market value of the debt, if debt A is totally secured, equals the value of the debt without collateralization. Thus, if the chosen collateral is only the liquidation proceeds X, as described in section 2.2, a market value rise can neither be achieved, since if $U = 0$ in (11), one gets:

$$\begin{aligned} \max \{X + Y, T_A\} &= (X + Y) \quad \text{in } s = k, \dots, l-1 \quad \text{and} \\ \max \{X + Y, X\} &= (X + Y) \quad \text{in } s = 1, \dots, \bar{s} \end{aligned}$$

and thus

$$F_0 = T \sum_{s=1}^{k-1} q(s) + \sum_{s=k}^{\bar{s}} q(s) (X + Y) , \quad (17)$$

and therefore

$$F_0 = F . \quad (18)$$

With F from (3') and $U=0$ one gets the result that although the collateral causes a creditor's risk transfer from bank A to bank B, the debt policy is irrelevant for the amount of the market value of the total debt and therefore also irrelevant for the market value of the firm, if all claims on the firm are valued on the market.

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Author Index

- Adams, M. 160
Agnew, R.A. 16,49
Allais, M. 20,49
Allingham, M.G. 35,49
Ananthanarayanan, A.C. 110,122,128
Arditti, F.D. 17,49
Arrow, K.J. 26,49,190,206
- Ball, C.A. 94,96,109,110,127
Baltensperger, E. 160
Bamberg, G. 1ff,3,7ff,45,46,49,50,51,53,55,77,129,209
Baron, D.P. 8,49
Barro, R.J. 160
Bartter, B.J. 207
Bawa, V.S. 11,50,59,61,77
Beckers, S. 122,127
Beedles, W.L. 17,53
Benjamin, D.K. 160
Berges, A. 166,187
Bey, R.P. 11,14,52
Bhattacharya, M. 100-102,107,109,110,127
Bierlein, D. 66,77
Bierweg, G.O. 8,50
Black, F. 3,80,88,89,95-97,108-110,114,116,117,119,127,164,165,167,187,
193,206
Blomeyer, E.C. 110,113,119,127
Bodurtha, J. 93,120,128
Bookstaber, R.M. 118,128
Boot, J.C.G. 62,78
Borch, K. 8,18,50
Boyle, P.P. 110,111,122,128
Brans, J.P. 77
Breedon, D.T. 206
Brennan, M.J. 4,34,36,50,95,96,97,113,128,163ff,206,209
Brenner, M. 50,94,127,128,129,130,206
Brown, S.J. 59,61,77
Bühler, W. 66,77
Burger, E. 70,77
Buttler, J.S. 122,128
- Carr, R. 125,188
Chamberlain, G. 17,18,50
Chipman, J.S. 8,20,50
Chiras, D.P. 110,118,128
Cohen, Y.J. 50,77
Cooley, P.L. 130
Copeland, T.E. 8,50
Courtadon, G. 93,94,96,120,128
Cox, J.C. 89,90-92,94,96,97,113,127,128,129,193,206
- Debreu, G. 190,196,206
DeGroot, M.H. 59,77
Denneberg, D. 15,50
Dietrich-Campbell, B. 120,129

- Dimson, E. 174,177,180,182,187
Dothan, U.L. 129
Drèze, J.F. 206
Drobnig, U. 160
Drukarczyk, J. 8,50,153,150
Dyer, J.S. 50
- Egle, K. 95,129
Effron, B. 115,129
Elton, E.J. 204,206
Emanuel, D.C. 97,110-112,114,129
Epps, T.W. 3,21,23,24,50
- Fahrion, R. 66,78
Fama, E.F. 2,15,16,50,167,174,175,187
Farkas, J. 200
Farkas, K.L. 113,129
Feldstein, M.S. 8,50
Finnerty, J.E. 110,129
Firchau, V. 3,40,49,50,55ff,209
Fischer, E.O. 129
Fowler, D.J. 174,175,187
Fuller, R.J. 129
- Galai, D. 97,100-102,104,107,110,117,118,128-130
Garman, M.B. 122,130
Gerth, A. 160
Geske, R. 4,51,79ff,85,99,91,93,95,97,103,110-115,122,130,206,209
Gibbons, M. 167,174,180,188
Gladstein, M.L. 131
Goel, P.K. 59,77
Gombola, M.J. 130
Gonzales, N. 8,51
Göppl, H. 49,50,129,133,161
Gould, J. 104,130
Gruber, M.J. 204,206
Gultekin, N.B. 130
- Hakansson, F.H. 8,51
Harrison, J.M. 94,130,206
Hawawini, G.A. 58,77
Henn, R. 49,50,54,129,133,161
Hirshleifer, J. 136,160
Hogan, W.W. 11,12,51
Hoskin, R.E. 113,129
Hsia, C. 207
Hsu, D.A. 58,77
Hubermann, G. 207
Huschens, S. 66,78
- Ibbotson, R. 185,188
Ingersoll, J.E. 96,97,128,131
- Jahankhani, A. 11,51
Jaffee, D.M. 144,160
Jarrow, R. 40-44,51
Jean, W. 51
Jennings, R.H. 59,77
Jensen, M.C. 167,187,188
Jevons, W.S. 192
Jobson, J.D. 58,77

Jog, V. 174,187
 John, F. 23,48,51
 Johnson, U. 110,113,127
 Johnson, H.E. 85,93,130

 Kalay, A. 160
 Kallberg, J.G. 19,51
 Kalymon, B.A. 59,78
 Kandel, S. 165,188
 Keynes, J.M. 193
 Klass, M.J. 122,130
 Klein, R.W. 59,61,77
 Klemkosky, R.C. 104-106,110,119,127,131
 Knight, F. 191,207
 Kofler, E. 66,67,78
 Korkie, B. 58,77
 Kraus, A. 17,51
 Kreps, D.M. 94,130,131,206
 Kroll, Y. 58,78
 Kuhn, T. 190,207
 Kuss, U. 66,78

 Latané, H.A. 108,110,122,131
 LaValle, I.H. 60,78
 Leland, H.E. 97,131
 Levy, H. 8,17,49,51,58,78,132
 Lewis, D.C. 11,14,52
 Lin, W.T. 3,62,63,65,78
 Lindenberg, E.B. 11,50
 Lintner, J. 21,27,28,40,51,72,78
 Litzenger, R. 8,17,51,167,188,206

 MacBeth, J.D. 110,112,114,116,129,131,167,174,175,187
 Madansky, A. 131
 Maier, S.F. 58,77,78
 Malinvaud, E. 179,187,188
 Manaster, S. 110,118,128
 Mao, J.C.T. 11,51,59,78
 Markowitz, H.M. 8,11,51,190,191,207
 Massé, P. 10,51
 Masulis, R.W. 97,130
 Mayers, D. 165,188
 Meckling, W.H. 160
 Menges, G. 66,67,78
 Merville, L.J. 110,112,114,116,131
 Merton, R.C. 81,83,84,89,92,97,104,109,110,131,182,188,207
 Milde, H. 136,137,161
 Miller, M.H. 1,2,15,16,42,50,52,139,161,190,193
 Minkowski, H. 200
 Modigliani, F. 1,139,161,190,193
 Morgan, I. 173,188
 Morris, C. 129
 Morris, J.R. 59,78,116
 Möschlin, O. 54
 Mosler, K.C. 52
 Mossin, J. 31,32,35,52,95,131
 Müller, S. 52,207
 Myers, S.C. 161

 Nantell, T.J. 11,52
 Nikaido, H. 201,207

- Owen, J. 16,52
- Pareto, V. 190
- Parkinson, M. 113,122,132
- Patell, J.M. 132
- Peterson, D. 40,52
- Peterson, D.W. 53,78
- Peterson, P. 40,52
- Phillips, S.M. 99,106,118,132
- Plaut, J.E. 161
- Porter, R.E. 11,14,52
- Pratt, J.W. 47,52,57,78
- Price, B. 11,52
- Price, K. 11,52
- Rabinovich, R. 16,52
- Raiffa, H. 78
- Ramaswamy, K. 94,132,167,138
- Rendleman, R.J. 108,110,122,131,207
- Resnick, B.G. 104-106,127,131
- Richter, H. 66,78
- Riley, J.G. 136,160
- Robinson, A. 185,188
- Rockafellar, R.T. 69,78
- Roenfeldt, R.L. 130
- Rogalski, R.J. 110,130
- Rolfo, J. 8
- Roll, R. 4,15,52,93,103,110-116,118,122,130,132,153,154,157,198,207
- Rorke, H. 174,175,187
- Ross, S.A. 52,89,90-92,94,96,97,113,128,129,165,188,193,206,207
- Rubinstein, M. 89,90,92,94,95,110,112-115,127,129,132,193,206,207
- Rudolph, B. 4,8,45,52,135ff,138,144,161,210
- Russell, T. 144,160
- Saelzle, R. 36,39,52
- Samuelson, P.A. 52
- Sarin, R.K. 50
- Sarnat, M. 19,53,132
- Särndel, C.E. 59,78
- Schachter, B. 122,128
- Schildbach, T. 161
- Schlaifer, R. 57,78
- Schmalensee, R. 110,132
- Schmidt, R.H. 161
- Schmitz, N. 54
- Schneeweiß, H. 8,10,14,20,53
- Schneller, M.I. 97,130
- Schneider, D. 53
- Scholes, M.S. 3,80,88,89,95,97,108-110,114,116,117,119,127,131,157,175-177,187,188,193,206
- Schwartz, E.S. 4,96,97,113,120,128,129,153ff,210
- Schwartz, R.A. 58,77
- Scott, J. 4,141,161
- Sengupta, J.K. 53
- Shastri, K. 33,94,103,110,120,130,132
- Sharpe, W.F. 12,41,53
- Simkowitz, M.A. 17,53
- Smith, A. 189
- Smith, C.W. 97,99,106,118,132,145,161,207
- Solnik, B. 165,188
- Spremann, K. 1ff,4,45,46,49-51,53,55,57,77,129,160,189ff,207,210
- Stahlschmidt, D. 161

Stambaugh, R. 167,179,188
Stehle, R. 4,163,166,185,188
Stein, C. 116
Stiglitz, J.E. 35,53,136,161
Stoll, H.R. 104,132
Stulz, R. 165,166,132
Subrahmanyam, M. 94,128
Sundaresan, S.M. 94,132
Swoboda, P. 53,145,148,162

Takayama, A. 201,207
Tandon, K. 93,94,120,132
Thorpe, E. 122,132
Tinic, S.M. 110,130
Tobin, J. 8,19,21,53
Torous, W.N. 94,96,109,110,127
Trautmann, S. 4,79ff,95,102,105,110,112,115,129,133,211
Trippi, R.R. 110,132,133
Tsiang, S.C. 8,53
Turgeon, G. 173,188

Van der Weide, J.H. 58,78
Vasicek, O. 133
Vickson, R.G. 53

Wald, A. 190
Walras, L. 190
Warner, J.D. 145,161
Warren, J.M. 11,12,51
Weiss, A. 138,161
Weston, J.F. 8,50
Whaley, R.E. 93,94,108,110,111,114,116,118,120,133
Whitcomb, D.K. 50,77
Wilhelm, J.E.W. 53,54,59,78,207,208
Williams, J. 175-177,188
Wilson, R. 94,133
Winkler, R.L. 59,78
Wolfson, M.A. 132

Zachow, E.W. 54
Zechner, R. 129
Ziemba, W.T. 19,51
Zimmerman, J. 97,132

Subject Index

Above-normal 97,98,99,100,102,104,108,118
Absolute risk aversion 21,23,24,95
Act of Bankruptcy 154
Additive separable 31
Aggregation 27,28,30,32,36,39,40,42,45,94
American call 83,96,103,113,114,204
- put 84,85,96,104,105,113
- option 4,80,83,94,104,111
Amplitude factor 126
Analytic formula 93
- model 93
APM (Arbitrage Pricing Model) 81,98,166
Arbitrage 2,3,4,5,81,82,86,189,192,195,198,203
- boundaries 79
- condition 79,80,85
- opportunities 104
- portfolio 92
- pricing model 81,94
- profit 98
- relation 89
- restrictions 84,85
Asset 91,92,97,98
- , omitted 163,165,170,171,181,182,183
- , riskless (risk-free) 11,17,18,22,24,92,125,164
- , risky 22,28,39,81,92,125,164
- valuation 81
Asset pricing model 163,167,171,174,177
- , generalized 164,168,169,171,175,178,179,180
- , global 163
- , international 165
- , national 163
- , North American 163
- , Zero Beta 164,175,180,181
Asynchronous market 105
At-the-money option 110
Average deviation 15
Average profit 101

Balance sheet 92,150,151
Bank of Canada Review 173
Bankruptcy 4,142
Bayes 3,57,58,65,67
Belief 9,39,44,94,191
Berkeley Options Transactions Data Base 115,116
Bernoulli distribution 18
Beta (factor) 4,30,168,169,170,173,174,175,176,178,182
Bias 4,108,112,113,114,116,122,175
Bid-ask-spread 99,101,102,106,118,119,120,121
Bill of exchange 152
Billprotest 152
Binomial model 89,90,93,123
Bivariate normal 125
Black-Scholes Model 89,90,91,96,109,112,113,114,115,119,122,123
- equation 89,92
- formula 3,4,91,109,111,115

Black-Scholes value 115,118,126
 Bond 89,96,97,165,181,182,193
 - , discount 91
 - , Government 181,183
 Boundary
 - condition 80,99,100,104,107
 - violation 101,104
 Borrow 22,32,90,121,144
 Box spreader 85
 Branch bank system 138
 Brokerage fee 99
 Brownian 97
 Butterfly spread 82,84

 Call (option) 3,34,81,82,85,89,93,100,102,104,107,114,116,119,120,123,
 204,205,206
 Call value 82,86,123,125,126
 Callability clause 151
 Canadian 163,165,166,167,171,172,173,174,180,181,182,183,184,185,186
 Capital
 - gain 34
 - market line 12
 - structure 1,34,91,190
 CAPM (Capital Asset Pricing Model) 2,7,9,14,17,33,81,98,186,191
 Cash flow 94
 CBOE (Chicago Board Options Exchange) 100,101,102,104,107,113,114,
 115,117,118,119
 Certainty equivalent 30,35,57,63,68,69
 Cession 150,152
 CEV (Constant Elasticity of Variance Model) 89,91,112,113,124
 CME (Chicago Mercantile Exchange) 120
 Coefficient of determination 111,112,114
 Collateral 135,137,139,140,144,145,148,149,158
 - agreement 152,153
 - covenant 147
 - irrelevance hypothesis 2,139,141,143
 - policy 4,137,139,141,143,157
 - security 137
 Collateralization 2,136,153
 Commissions costs 99
 Commodities 119
 Comparative static 9,45
 Complementary
 - binomial distribution function 124
 - Poisson 92,126
 - standard gamma density function 124
 Complete capital market 204,205
 Compound Option Model 89,91,92,93,111,124
 Concave 35,46
 Consol 173
 Constant risk aversion 7,21,23,55
 Constant stochastic return to scale 26
 Converter 85
 Convex 22,64,66,67,69,70,75,82,84,86,164
 Corner 56,58
 Corporate debt 91
 - taxes 34
 Co-semivariance 12,13,14
 covariance 12,14,18,38
 - matrix 18,22,26,44,61
 CPRA 95

Credit
 - covenant 135,149
 - line 136
 - rationing 144
 - reliability risk 139,143,145,149,149
 - repayment quota 139
 - standing 138,145
 - support decision (model) 135,136,138
 Creditability risk 143
 Cross-sectional regression 112,114
 CRSP (Chicago Record of Stock Prices) 173
 Currency 93,94,95,96,119,120,121

 Data synchronization 98
 Debt 4,96,139,146,147,151,155,159
 - , convertible 97
 - , -equity ratio 125,146,191
 - , junior 97,147
 - , option 119,120,121
 - , policy 160
 - , secured 152,154,157
 - , senior 146,147
 - , totally secured 159
 - , unsecured 157,159
 Default risk 146,148,157,158
 Demand 27,39,94,144,191
 Derivative contract 202,203,204
 Diffusion 86,89,92
 - -jump 89,126
 - -jump model 92,126
 - model 109
 Dimson's beta estimation 4,174,175,176,177,178,179,181,182,186
 Discount bond 91
 Discrete process 90
 Displaced 89
 - diffusion model 92,125
 Distribution-free 79,80,81
 Distribution risk 145,147,148
 Diversifiable 93,126
 Diversification 17,27,87,165
 Dividend 34,82,83,85,93,96,101,103,104,105,114,115,116,119,121,125,
 147,191
 - policy 146
 - protected 106,112
 - uncertainty 115
 - unprotected 82,104,113
 Down jump 124
 Down movement 90
 Dyopolistic 14,45

 Early exercise 93,96,103,111,112,114,119,120
 Efficient frontier 171
 - portfolio 164
 - set 11,16,168
 Elasticity 91
 Elliptical distribution 16
 Empirical test 97,99
 Employee stock 97
 End-of-period
 - -value 8,9,13,22,26,55,56
 - -wealth 8,17,19,21,22,24,25,56

Equilibrium 1,8,27,28,89,94,96,139,189,190,199
 - condition 7,13,27,73,76,201,203,204,205
 - point 70
 - price 3,7,35,36,43,73,76
 - strategy 70
 - value 28,38
 Equity 146,148,155,166
 - debt ratio 1
 - option 107,121
 Estimation risk 61
 Euro Bond 152
 European Option 4,80,85,89,93,96,111
 - call 82,83,96,123,204
 - lower bound 101,102,103
 - put 84
 Event 196,197,200
 - uncertainty 136,138
 Ex-ante profit 100
 - test 98,99,101,104,105,117
 Exchange membership 107
 Ex-dividend 83,102
 Exercise price 81,82,83,84,89,103,104,113,116,121,123
 - value 82,90,102
 Expectations
 - , heterogeneous 7,39,41,42
 - , homogeneous 27,39,41,72
 Expected
 - rate of return 8
 - return 95,98
 - utility 9,10,13,14,15,16,17,18,23,33,47,81,94
 - value 10,94
 Expiration 81,82,83,89,90,93,103,123,124,126
 - date 80,82,104,116,121,204
 Explicit
 - representation 9
 - solution 7,21,23,25,27,30
 - valuation formula 3,13,28,45
 Exploitation right 142,147
 Exponential utility 3,21
 Ex-post profit 100
 - test 98,99,117

 Face value 96
 Financial intermediation 1
 Firm value 9,29,30,38,140
 FOE (Frankfurt Option Exchange) 102,106,112,115
 Fractile 15
 Frankfurt Stock Exchange 106
 Free lunch 194,198,203
 Futures 4,81,82,93,94,95,96,119,120,121,190,192,196,197,198,200

 Game theory 45
 Gamma density 124
 Germany 36,93,99,103
 Geske-Johnson American model 113,120
 Gibbons' maximum likelihood approach 4,175,178
 Government bond 98
 - security 96
 Gradient 35,42
 Grand mean 122
 Gross default clause 152
 Guarantee-agreement 152

Guarantees

- , general 153
- , special 153

Hedge 86,87,88,89,106,107,121

- portfolio 87
- position 104,105,106,108,117,118
- ratio 87,93,109,117,118
- return 110,111,116,117,118

Hedging 80

- model 90,92,94
- , perfect 94
- probability 123
- , riskless 95

Hierarchical 59

Historical volatility 112,118

Hybrid model 3,7,9,17,23,31,33,35,42,45,46,55,60,67,72

Hyperparameter 59

Imperfect capital market 7

Implicit (characterization, representation) 3,9,28,30

Implied variance 122

Incentive 1,46

Income tax 34

- smoothing 45

Index 66,95,117,164,165,169,170,171,173,183,185

Information 92,98,122,150

- heterogeneous 2
- incomplete 2,3

Informational asymmetrie 1

Initial wealth 4,22,23,25,55

Insurance 97,197

Integrated capital market 167

Interbank market 153

Intercept 104

Interest (rate) 36,96,121

Interest-rate dispersion 136,137

Interest-rate-parity theory 193

Inter-stock comparison 122

In-the-money option 102,112,114,115

Inventory 81

Investment 97,148

Irrelevance theorem 1,190

ISD (implied standard deviation) 108,111,112,114,115,118

Issue price 201,202

Issuing strategy 46,146

Jaffee and Russel model 144,145

Joint hypothesis 80,99,100

- test 98,99

Jump 89,90,92,94,109,123,125,126

- amplitude 126
- frequency 125,126
- model 92,125
- process 92,125
- size 123

Lag term 174,184

Lagrangian multiplier 42

Laval Securities Tape 173

Lead term 174,184

Leasing 97,150,151

Least-squares 104
 Lend 22,32,85,103,121,136,144
 Leverage 91
 - ratio 91
 Levered position 90
 Liability 92
 Limited liability 34,82,84,155
 Lin's approach 62,63,65
 Lintner's inverse additivity rule 27,28
 Liquidation proceeds 140,141,142,147,159
 Lognormal 81,86,95,109,111,126
 Long hedge position 105,106
 Long position 105
 Long term Treasury Bill 119
 Loss-function 63
 Loss-offset 34,35
 Lower bound
 - , European 101,102,103
 - , pseudo-American 101,102,103
 - , violation 101
 Lowest cost trader 99,106

 Macroeconomic variable 116
 Maintenance 150,151
 Marginal tax rate 35,36,37
 Market
 - clearing (condition) 28,32,33,43,94
 - efficiency 80,97,98,99,100,101,106,107,108,120
 - factor 16
 - imperfection 1,7,22,44,99
 - index 174,181,182,183,184,185
 - inefficiency 104,108
 - integration 171,186
 - model 16
 - portfolio 7,12,163,164,169,171,191
 - portfolio proxy 165,167
 - price 97,103
 - price of risk 7,8,9,14,28,29
 - , secondary 112,117
 - synchronization 98,100,108
 - value 102,124
 Maturity 102,108,109,112,115,120,124
 MaxEmin(-criterion) 67,68,69,70,71
 Maximum likelihood 4,178,179,184,185,186,187
 Mean absolut deviation 15
 Mean-semivariance 7,11,13
 Mean-variance 4,7,8,11,17,21,24,30,47,191
 - efficiency 164,165,166
 Median 10,15
 Me first rules 150,151,153
 Milde's approach 136,137
 Minkowski-Farkas-Lemma 200
 Minmax 3,59,67,70
 Mispricing (signal) 98,101,102,104,106,110
 Mode 15
 Modigliani-Miller theorem 1,139,193
 Moment 15,17
 - generating function 48
 Monitoring costs 143,153
 Monopolistic 9,14,27
 Mortgage 150,152
 Motion equation 89,123,124

Multiplicative separable 31
 Multivariate normal 7,23,25,55,178

 Neoclassical approach 138,143
 Net income 34
 No-arbitrage 95
 Non-hedging model 94
 Nonparametric test 115
 Non-saturated 192,195
 Normal (distribution) 3,7,15,19,20,21,24,25,34,48,56,60,67,81,86,89,
 92,95,115,125
 NYSE (New York Stock Exchange) 101,109,165

 Odd-lot price 106
 Oligopolistic 9,14
 OLS (Ordinary Least Squares) 187
 Omitted asset 4,163,165,170,181,182
 One factor market model 16
 OPM (Option Pricing Model) 81,107
 Option valuation 79,81,90,94
 - , American 80
 - , European 80
 - instruments 80
 - , listed 93,111
 - pricing 2,79
 Ordinal parameter 10,15
 OTC (Over-the-Counter) 103,104,117
 Out-of-the-money 99,109,112,113,114,115,120
 Overpriced 97,108,112,116,118
 Overvalued 89,114,116,120,121

 Partial differential equation 7,20,23,31,48,93
 - equilibrium 3,89
 - information 66,67,72
 - moment 11
 - uncertainty 72
 Payout-protected 85,103
 Perfect (capital) market 81,105,139
 Perfectly divisible 23
 Philadelphia Stock Exchange 104
 Philadelphia Stock Exchange Foreign Currency Option Market 120
 Poisson 67
 Polyhedron 67
 Portfolio 3,4,21,25,27,28,31,56,63,64,92,93,95,111,168
 - composition 25,92,165
 - selection 2,3,10,190
 - strategy 98
 Predictability test 107,108,111
 Prediction error 108,111,114,115
 Preference assumptions 94
 - -based 94,95
 - -free 79,80,81,94,95
 - functional 10,13,15,19,20,23,31
 Preferred stock 97
 Preknowledge 3,56,65,68,75
 Premature exercise 84,85,93,96,105
 Present value 82,85,90,91,103,154
 Price taker 22,44
 Principal 147
 Prior distribution 3,56,59,60,61,63,66,67,68,72,75
 Production 192,199
 Profit 103,104,105,106,107

- , paper 105,118
- Progressive taxation 35
- Property rights 146
- Proportional risk aversion 95
 - tax schedule 34,35
- Pseudo-American lower bound 101,102,103
- Put (option) 81,83,85,93,96,100,104,107,119,120
- Put-call parity 85,104,120
- Put value 84

- Quadratic utility 9,18,19,31,81

- Rate of return 89,91,108,125
 - required 9
 - , risk-free 8,22,98
- Rationality 9,20,47,81,86
- Rational portfolio models 10
- Rationing 46,136,138,144
- Real estate 147,165
- Recomposition 198
- Refinancement 138
- Registered mortgage 152
- Regression 104,111,112,114,116,170,174,175,184
- Reverse converter 85
- Rights offering 97
- Risk 191
 - -adjusted 30,98,100
 - aversion 7,17,19,21,25,27,36,47,55,95
 - , diffusion 93
 - -factor 166
 - , jump
 - measure 10,11
 - neutrality 14,94,95,140
 - premium 166,169
 - , systematic 117
 - -taking 35
- Riskless interest rate 82,94,123
 - bond 89
 - hedging 95
- Risk neutral valuation relationship 34
- Robustness 107,109,111

- Sample size 102,103,107
- Scholes-Williams (procedure) 175,176,177
- Searching cost 136,137
- SEC (Securities and Exchange Commission) 95,119
- Secured debt 137,139
- Security agreement 4,135
- Segmentation 4,163,166,167,171
- Self-financing 87,94
- Semi-expectation 15
- Semi-interquartile range 15
- Semistandard-deviation 11
- Semivariance 11,12,13,14
- Separable preference functional 31,32
- Separation property 25,32,73
 - theorem 190,198,200
- Share 9,22,87,98,103
 - price 27,28
- Sharpe-Lintner model (= CAPM) 163,164,169,170,171,175,177,178,180,181,184,185
- Short hedge position 106

Short sales restriction 7,42,43,44
 - selling 3,18,22,26,28,40,41,42,56,71,72,103
 - term Treasury Bond 119
 Shrinking 116,122
 Simulated data 108
 Skew 111
 Slackness-condition 42
 Slope coefficient 114
 Small
 - economy 4
 - firm assumption 9,14,45
 Spherically distributed 17,18
 Spot price 199
 Spreading strategy 118
 Stable distribution 15,16
 Standard deviation 108
 State (of natures, of the world) 154,196
 State-preference-approach 59
 Stationary 109
 Stein (estimator) 116
 Stochastic dominance 7,18,20
 Stock 87,103,108,122
 - price 82,85,86,89,90,91,92,94
 Strike price 81,108,114,115,122

 Tangency portfolio 12,163,169
 Target
 - rate 12,14
 - value 11,13,15
 Taste 9,21,191
 Tax 1,3,4,22,34,35,36,37,38,81,98,99,142,156,166
 - deductible 34
 Tender offer 92
 Term deposit 193,201
 - structure 96
 Test 4,98,99,101,104,107,108,109,111,113,116
 Thinness 107
 Thin trading 174,175,177,178,186
 Time lag 98,101
 Time premium 82
 Time value 83
 Toronto Stock Exchange 173,174
 Trading floor 99,106
 - strategy 98,102,103,118
 Transactions costs 1,94,98,101,102,104,106,107,117,119
 Treasury Bill options 121
 Two-level (approach) 59,60,62,65

 Unbiasedness 107,108,113
 Uncertainty 55,59,60,66,77,81,121,136,154,191,192
 Underpriced 97,108,116,118
 Undervalued 89,112,113,114,116
 Unit of time 123
 Unprotected 84
 Up jump 123
 Up movement 90
 U.S. 41,93,99,101,104,163,166,171,181,184,185,186
 Utility
 - , exponential 3,21,55,59
 - function 10,18,47,55,94
 - , linear 10

Utility

- , quadratic 9,18,19,81

Validity 97,99,107

Variance 11,15,89,90,92,93,122,126

- reduction 45

Volatility 30,91,92,108,109,112,113,114,116,121,122,126

Wall Street Journal 120

Warrant 97

Zero beta 178

Zero coupon debt 124