An Empirical Study of Distribution Rules Under California Corporations Code § 500: Are Creditors Adequately Protected?

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INTRODUCTION

California's new Corporations Code,[1] enacted in 1977, presents major innovations in the rules governing distributions[2] to shareholders. Prior California law regulated distributions by reference to the concept of legal capital[3] — a "trust fund" of shareholders' contributions that

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[1] CAL. CORP. CODE (West 1977 & Supp. 1982). Sections 500-510 contain the rules governing distributions to shareholders. For a discussion of the new distribution provisions and the changes from prior California law, see generally 2 H. MARSH, CALIFORNIA CORPORATION LAW AND PRACTICE §§ 13.1-13.30 (1982); Ackerman & Sterrett, *California's New Approach to Dividends and Reacquisitions of Shares*, 23 UCLA L. REV. 1052 (1976); Barton, *A Brief Look at the New General California Corporation Law*, 51 L.A.B.J. 210 (1975); Dreyfuss, *Distributions to Shareholders under the New California General Corporation Law*, 9 LOY. L.A.L. REV. 839 (1976); Review of Selected 1975 California Legislation, 7 PAC. L.J. 237, 264 (1976).

[2] Distributions are defined as:

> the transfer of cash or property by a corporation to its shareholders without consideration, whether by way of dividend or otherwise, except a dividend in shares of the corporation, or the purchase or redemption of its shares for cash or property, including such transfer, purchase or redemption by a subsidiary of the corporation.

CAL. CORP. CODE § 166 (West 1977).

[3] Or "stated capital," as it was called under the prior California code. *See* CAL.

could not be distributed to the detriment of creditors.[4] The new California Code abolished the concept of legal capital[5] and substituted, as the basis for governing distributions, criteria that analyze the overall financial condition of the corporation: retained earnings,[6] asset-liability ratios,[7] liquidation preferences,[8] and an equitable insolvency test.[9]

One of the most significant innovations of the California Code is Section 500(b).[10] This section constitutes the alternative distributions rule to Section 500(a),[11] under which a corporation with retained earnings may make distributions in the amount of those earnings. Under Section 500(b), a corporation may make distributions in excess of retained earnings if it can meet two financial ratio tests: total assets to total liabilities (total ratio),[12] and current assets to current liabilities (current ratio).[13]

The use of a combination of financial ratios to evaluate corporate solvency and stability is commonly referred to as a financial distress or bankruptcy[14] prediction model.[15] Government regulatory bodies use bankruptcy prediction models to monitor the solvency and stability of

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CORP. CODE §§ 1500-1501, 1707 (West 1955) (superseded). For a discussion of legal capital statutes, see generally B. MANNING, A CONCISE TEXTBOOK ON LEGAL CAPITAL (1977).

[4] B. MANNING, note 3 *supra*, at 46; 19 AM. JUR. 2D *Corporations* §§ 722, 936 (1964).

[5] *See* Ackerman & Sterrett, note 1 *supra*, at 1052-53; Dreyfuss, note 1 *supra*, at 840.

[6] CAL. CORP. CODE § 500(a) (West Supp. 1982).

[7] *Id.* § 500(b).

[8] CAL. CORP. CODE §§ 502-503 (West 1977).

[9] *Id.* § 501.

[10] CAL. CORP. CODE § 500(b) (West Supp. 1982), set forth in note 43 *infra*.

[11] *Id.* § 500(a), set forth in note 43 *infra*.

[12] *See* note 49 and accompanying text *infra*.

[13] *See* note 50 and accompanying text *infra*.

[14] As used in this Article, "bankruptcy" and "bankrupt" denote financial failure as indicated by the onset of either equitable insolvency, which is an inability to meet maturing debts, or bankruptcy insolvency, wherein total liabilities exceed total assets. For further discussion of these two forms of insolvency, see notes 31-34 and accompanying text *infra*.

[15] See the studies cited in note 62 *infra*. Prior to the development of models utilizing quantitative measures, the most common way of evaluating corporate performance and credit worthiness was by means of qualitative reports provided by specialized credit agencies. For example, Dun & Bradstreet was established in 1849 in order to provide independent credit investigations. Today, similar credit agencies, for example, Zeta Services, Inc., a financial consulting firm based in Mountainside, New Jersey, provide quantitative evaluations of corporate performance by using models of bankruptcy prediction. *See Companies That Face Financial Strain*, BUS. WK., May 17, 1982, at 110.

corporations such as insurance companies and banks.[16] Auditors employ such models as a basis for determining whether a business will continue as a going concern.[17] Lenders use the models to evaluate the credit worthiness of corporate borrowers,[18] and corporate management often uses the models for internal control and the establishment of investment criteria.[19]

However, prior to the enactment of the new California Corporations Code, developers of bankruptcy prediction models generally overlooked the models' potential application as a mechanism for regulating corporate distributions.[20] California, in Section 500(b), has taken a major step by becoming the first state[21] to use a combination of financial ratios, i.e., a bankruptcy prediction model,[22] to determine the permissibil-

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[16] *See* G. FOSTER, FINANCIAL STATEMENT ANALYSIS 460-71 (1978).

[17] *Id.*

[18] *Id.*; *see also* Altman, *Corporate Bankruptcy Prediction and Its Implications for Commercial Loan Evaluation*, 53 J. COM. BANK LENDING 8-22 (1970); Hammer & Orgler, *Developments in Credit Scoring for Commercial Loans*, 52 J. COM. BANK LENDING 25-31 (1969).

[19] *See* Altman, *Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy*, 23 J. FIN. 589, 606-09 (1968).

[20] *See, e.g.*, E. ALTMAN, CORPORATE BANKRUPTCY IN AMERICA 83-104 (1971). The author devoted a chapter to the implications and applications of bankruptcy prediction models, but did not include regulation of corporate distributions as one of the potential applications.

[21] Alaska is now considering adopting distribution provisions similar to those of California. *See* H.B. 343 (also introduced as S.B. 246), Alaska 13th Leg., 1st Sess. (1983), §§ 10.06.358, 10.06.360; COMMENTARY ON PROPOSED ALASKA CORPORATIONS CODE, ALASKA HOUSE AND SENATE JOINT J. SUPP. NO. 11, at 64-75 (Apr. 8, 1983).

[22] It is not the use of a financial ratio, as such, that constitutes a bankruptcy prediction model. For example, the Model Business Corporation Act of 1979 (Model Act) prohibits distributions if, as a result of the distributions, the ratio between total assets and total liabilities would fall below one-to-one. MODEL BUSINESS CORP. ACT § 45(b) (1979), set forth in note 32 *infra*. This total ratio, however, serves merely to ascertain rather than predict bankruptcy, because it does not include a predictive factor, i.e., a ratio in excess of one-to-one, nor is it used in combination with another ratio. Section 500(b) of the California Corporations Code, in contrast, attempts to predict bankruptcy by introducing a predictive factor of one-quarter into the total asset ratio, CAL. CORP. CODE § 500(b)(1) (West Supp. 1982); by requiring the same predictive factor in the current ratio when circumstances (interest expenses in excess of earnings) suggest a higher probability of bankruptcy, *id.* § 500(b)(2); and by examining the total and current ratios together. For further discussion, see notes 49-50 and accompanying text *infra*.

Similarly, prior California law contained a provision prohibiting distributions in a limited context (distributions on preferred shares from capital reduction surplus) unless "the assets of the corporation after such distribution or withdrawal taken at their fair present value will at least equal one and one-quarter times its debts and liabilities

ity of corporate distributions to shareholders.

The purpose of this Article is to examine the effectiveness of Section 500 in achieving the primary goal of distributions law: protection of creditors. The Article begins with a general critique of Section 500 against the background of more traditional distributions statutes.[23] It then presents the results of an empirical study which tested how efficiently the alternative distributions rules of Section 500 prevent distributions by corporations in financial distress.[24] After concluding that Section 500 does not provide sufficient protection to creditors, the Article proposes specific and general remedies for improving the operation of this section.[25]

I. PROTECTION OF CREDITORS: DISTRIBUTIONS LAW AND THE DUAL INSOLVENCY TEST

A major concern of corporate law is the specification of assets available for distribution to shareholders.[26] Without restrictions on such distributions, a financially distressed corporation could distribute its assets to shareholders, thereby impeding or preventing creditors from collecting their debts. The primary goal of distributions law is therefore the preservation of a minimum value of assets to secure payment of creditors' claims.[27] In turn, the value of these assets enables lenders to assess the credit worthiness of the corporation.[28] If a corporation is insolvent following a distribution of its assets to shareholders, the law of fraudulent conveyances may provide additional protection to creditors.[29]

. . . ." CAL. CORP. CODE § 1907 (West 1955) (superseded). Although § 1907 employed a predictive factor in its financial ratio, it did not use a combination of ratios. Moreover, the single ratio utilized was not derived from the balance sheet, because the assets could be valued at fair present value, rather than at historical cost as recorded on the balance sheet.

Section 500(b) is therefore the only existing statute to use a combination of financial ratios, which are derived from the balance sheet and contain predictive factors, to govern corporate distributions to shareholders.

[23] *See* notes 26-69 and accompanying text *infra*.

[24] *See* notes 70-144 and accompanying text *infra*.

[25] *See* notes 145-57 and accompanying text *infra*.

[26] For an historical background to the legal and accounting problems surrounding corporate distributions, see generally D. KEHL, CORPORATE DIVIDENDS (1941).

[27] *Id.* at 14-15.

[28] *Id.* at 20.

[29] The exact relationship between these two areas of law is often a source of confusion. *See, e.g.*, Kummert, *The Financial Provisions of the New Washington Business Corporation Act, Part II*, 42 WASH. L. REV. 119, 128-30 (1966) (questioning whether new corporation statute prohibiting insolvency dividends unnecessarily duplicates ex-

In recent years, scholars and legislators have sought alternatives to distributions statutes based on legal capital, a concept which tends to be arbitrary and subject to manipulation.[30] One alternative method of reg-

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isting fraudulent conveyance statute). The Uniform Fraudulent Conveyance Act (UFCA) provides that "[e]very conveyance made . . . by a person who is or will be thereby rendered insolvent is fraudulent as to creditors without regard to his actual intent if the conveyance is made . . . without a fair consideration." UNIF. FRAUDULENT CONVEYANCE ACT § 4, 7A U.L.A. 205 (1978). This section has been held applicable to determine the illegality of a distribution. Powers v. Heggie, 268 Mass. 233, 241, 167 N.E. 314, 317 (1929); *see also* Underwood v. Stafford, 270 N.C. 700, 705, 155 S.E.2d 211, 214 (1967) ("The distribution by a corporation of all of its assets among its stockholders without paying its debts is just a common, garden variety of a fraudulent conveyance.") (Lake, J., concurring). Additionally, fraudulent conveyance is often pleaded as an alternative theory to an illegal distribution. *See, e.g.*, Spanier v. United States Fidelity & Guar. Co., 127 Ariz. 589, 590-95, 623 P.2d 19, 20-25 (1980). But it remains unsettled whether a corporation's compliance with the applicable distribution statutes may be a defense to a creditor's claim that a distribution is void under a more restrictive fraudulent conveyance statute. At least one scholar has argued that fraudulent conveyance statutes should be interpreted to provide an *additional* set of restrictions that distributions must satisfy, Clark, *The Duties of the Corporate Debtor to Its Creditors*, 90 HARV. L. REV. 505, 557-58 (1977), but the American Bar Association (ABA) has expressed the view in the new Model Act that fraudulent conveyance statutes should *not* apply to distributions, lest such statutes establish an inconsistent standard with the distribution provisions of the Model Act. Report of Committee on Corporate Laws, *Changes in the Model Business Corporation Act — Amendments to Financial Provisions*, 34 BUS. LAW. 1867, 1882-83 (1979) [hereafter ABA Report]. The report was subsequently adopted by the ABA. *See* 35 BUS. LAW. 1365 (1980). The Model Act contains a new optional provision, § 152, under which the relevant distribution provisions of the Model Act are declared to supersede the applicability of other state laws with respect to the legality of distributions. MODEL BUSINESS CORP. ACT § 152 (1979); *see also* ABA Report *supra*, at 1877, 1889.

In addition, if a corporation enters bankruptcy following a distribution, two provisions of the Bankruptcy Reform Act of 1978 may enable the trustee in bankruptcy to void the distribution and recover the amounts distributed: § 548(a) (11 U.S.C. § 548(a) (Supp. IV 1980)), which contains the federal fraudulent conveyance provisions, and § 544(b) (11 U.S.C. § 544(b) (Supp. IV 1980)), which enables the trustee to void certain transfers of property that are voidable by an unsecured creditor under applicable state law.

[30] The legislative history to the new California Corporations Code, for example, noted:

> As a practical matter, these general restrictions [of existing law] do not provide adequate protection to creditors, particularly trade creditors. This results from the fact that all but an insignificant amount of the money originally received from shareholders can be designated as paid-in surplus rather than state [sic] capital.

Report of the Assembly Select Committee on the Revision of the Corporations Code 71 (1975) [hereafter Assembly Report]. *See also* Ackerman & Sterrett, note 1 *supra*, at 1061-62. For a discussion of the manipulability of capital to create surplus, see Israels,

ulating distributions is the dual insolvency test, originally a common law doctrine,[31] which the American Bar Association (ABA) adopted in a modern format in the new Model Business Corporations Act (Model Act).[32] The dual insolvency test prohibits distributions that cause either "equitable insolvency," an inability to pay debts as they become due,[33] or "bankruptcy insolvency," wherein total liabilities exceed total assets.[34]

Most states currently include some form of the dual insolvency test in

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Problems of Par and No-Par Shares: A Reappraisal, 47 COLUM. L. REV. 1279, 1293-95 (1947). Scholars have long argued for abandonment of the concept of legal capital in favor of more realistic balance sheet tests similar to those found in the new California Corporations Code. *See, e.g.*, Ballantine & Hills, *Corporate Capital and Restrictions upon Dividends under Modern Corporation Laws*, 23 CALIF. L. REV. 229, 262 (1935); Littleton, *A Substitute for Stated Capital*, 52 HARV. BUS. REV. 75 (1938).

[31] B. MANNING, note 3 *supra*, at 59-60.

[32] MODEL BUSINESS CORP. ACT § 45 (1979) provides:

> Subject to any restrictions in the articles of incorporation, the board of directors may authorize and the corporation may make distributions, except that no distribution may be made if, after giving effect thereto, either:
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> (a) the corporation would be unable to pay its debts as they become due in the usual course of its business; or
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> (b) the corporation's total assets would be less than the sum of its total liabilities and (unless the articles of incorporation otherwise permit) the maximum amount that then would be payable, in any liquidation, in respect of all outstanding shares having preferential rights in liquidation.
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> Determinations under subparagraph (b) may be based upon (i) financial statements prepared on the basis of accounting practices and principles that are reasonable in the circumstances, or (ii) a fair valuation or other method that is reasonable under the circumstances.

[33] *Id.* § 45(a).

[34] *Id.* § 45(b). The distinction between equitable and bankruptcy insolvency is both historical and practical:

> The test of insolvency in the equity courts was whether the debtor was unable to meet his obligations as they became due. The test for purposes of bankruptcy in the law courts was whether the aggregate dollar amount of the debtor's assets was less than the the total dollar amount of his liabilities. The difference between these two conceptions can be very great. Solvency in the equity sense is concerned with liquidity; a debtor may be able to cope with his bills as they roll in month by month even though the market value of all his assets is only a fraction of the aggregate of his liabilities maturing over time in the future. The emphasis of the bankruptcy sense of solvency is upon liquidation; a debtor might not be sufficiently liquid to meet his current obligations but still hold unliquid resources having a value far in excess of the total of his obligations.

B. MANNING, note 3 *supra*, at 59-60.

their distributions statutes. The dual insolvency test may be used to supplement the restrictions of legal capital statutes, as was done under prior California law,[35] or it may constitute the sole restriction on distributions, as in Massachusetts[36] or under the Model Act.[37] In some statutes, the use of the dual insolvency test is not explicit. For example, under the old Model Business Corporation Act, the source of distributions was limited to "earned surplus."[38] Since, by definition in the Act, earned surplus existed only to the extent that total assets exceeded total liabilities plus stated capital,[39] the bankruptcy insolvency test was embodied in this rule.

The dual insolvency test as it appears in the new Model Act has the merit of simplicity, but is deficient in two major respects. First, the dual insolvency test provides no consistent rule for determining the amount of allowable distributions.[40] Second, the dual insolvency test serves merely to *ascertain*, rather than *predict,* bankruptcy[41] and is therefore useful only after the fact as a tool for litigation, not planning.[42] Diligent creditors, unwilling to rely upon litigation in order to collect debts, will be forced to exercise considerable preventive supervision over corporate debtors and will incur substantial costs monitoring the debtors' financial developments.

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[35] CAL. CORP. CODE § 1501 (West 1955) (superseded).

[36] MASS. GEN. LAWS ANN. ch. 156, § 45; ch. 156B, § 61 (West 1970), in which the only limitation on distributions is that the corporation not be rendered "insolvent or bankrupt" by the distribution.

[37] MODEL BUSINESS CORP. ACT § 45 (1979).

[38] MODEL BUSINESS CORP. ACT § 45(a) (1974).

[39] *Id.* § 2(j)-(*l*).

[40] One obvious problem of statutes based on the dual insolvency test is how to calculate bankruptcy insolvency. Should assets be calculated according to historical value as recorded on the balance sheet, or according to market or liquidation value? The Model Act does not solve this problem. It appears to allow management considerable leeway in valuing assets by the alternative measures of historical cost, replacement cost, market value, or liquidation value for the purpose of applying the bankruptcy insolvency test. *See* MODEL BUSINESS CORP. ACT § 45(b) (1979), set forth in note 32 *supra.*

Moreover, the Model Act, unlike the California Corporations Code, does not exclude intangibles from the computation of assets and does not require unified accounting rules. The ABA Committee on Corporate Laws intentionally declined to require that financial statements comply with generally accepted accounting principles. *See* ABA Report, note 29 *supra*, at 1872, 1881-86.

[41] *See* note 22 *supra.*

[42] R. JENNINGS & R. BUXBAUM, CORPORATIONS 922 (5th ed. 1979).

II. CALIFORNIA CORPORATIONS CODE § 500: OPERATION AND CRITIQUE

Section 500 of the California Corporations Code[43] is an attempt, in part, to remedy the deficiencies of the dual insolvency test. Section 500 provides two alternative tests for computing amounts available for distribution. A proposed distribution which meets the equitable insolvency test of Section 501[44] must still meet one of the two alternative tests of

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[43] CAL. CORP. CODE § 500 (West Supp. 1982) provides:

> Neither a corporation nor any of its subsidiaries shall make any distribution to the corporation's shareholders . . . unless:
> (a) The amount of the retained earnings of the corporation immediately prior thereto equals or exceeds the amount of the proposed distribution; or
> (b) Immediately after giving effect thereto:
> (1) The sum of the assets of the corporation (exclusive of goodwill, capitalized research and development expenses and deferred charges) would be at least equal to 1-¼ times its liabilities (not including deferred taxes, deferred income and other deferred credits); and
> (2) The current assets of the corporation would be at least equal to its current liabilities or, if the average of the earnings of the corporation before taxes on income and before interest expense for the two preceding fiscal years was less than the average of the interest expense of the corporation for such fiscal years, at least equal to 1-¼ times its current liabilities, provided, however, that in determining the amount of the assets of the corporation profits derived from an exchange of assets shall not be included unless the assets received are currently realizable in cash; and provided, further, that for the purpose of this subdivision "current assets" may include net amounts which the board has determined in good faith may reasonably be expected to be received from customers during the 12-month period used in calculating current liabilities pursuant to existing contractual relationships obligating such customers to make fixed or periodic payments during the term of the contract or, in the case of public utilities, pursuant to service connections with customers, after in each case giving effect to future costs not then included in current liabilities but reasonably expected to be incurred by the corporation in performing such contracts or providing service to utility customers.
>
> The amount of any distribution payable in property shall, for the purpose of this chapter, be determined on the basis of the value at which such property is carried on the corporation's financial statements in accordance with generally accepted accounting principles. Paragraph (2) of subdivision (b) is not applicable to a corporation which does not classify its assets into current and fixed under generally accepted accounting principles.

[44] CAL. CORP. CODE § 501 (West 1977) provides:

Section 500.[45]

Section 500(a) permits distributions if retained earnings are at least equal to the amount of the proposed distributions.[46] This test is essentially a remnant of prior California law,[47] and its weakness is that the presence of retained earnings does not necessarily correlate with financial solvency. Indeed, a substantial number of the bankrupt corporations examined in the empirical study had retained earnings shortly before going bankrupt.[48]

Section 500(b), the alternative test for distributions, is the first statute that attempts to solve the two deficiencies of the dual insolvency test. This section provides clear guidelines for computing the amount permitted to be distributed and attempts to prohibit distributions *before* the onset of either equitable or bankruptcy insolvency.

A corporation must meet two balance sheet tests in order to make distributions under Section 500(b). The first test is based on the total ratio, exclusive of certain intangibles and deferred items: after the proposed distribution, total assets must equal one and one-quarter times total liabilities.[49] The second test is based on the current ratio: after the

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> Neither a corporation nor any of its subsidiaries shall make any distribution to the corporation's shareholders . . . if the corporation or the subsidiary making the distribution is, or as a result thereof would be, likely to be unable to meet its liabilities (except those whose payment is otherwise adequately provided for) as they mature.

[45] The provisions of Section 500 do not apply to certain distributions by regulated investment companies, as defined in the United States Internal Revenue Code, or by registered open-ended investment companies under the United States Investment Company Act of 1940. CAL. CORP. CODE § 504 (West 1977).

[46] CAL. CORP. CODE § 500(a) (West Supp. 1982). The code does not define retained earnings, but one standard definition is that they represent "the cumulative balance of periodic earnings less dividend distributions in cash, property or stock, plus or minus gains or losses of such magnitude as not to be properly included in periodic earnings." P. GRADY, INVENTORY OF GENERALLY ACCEPTED ACCOUNTING PRINCIPLES FOR BUSINESS ENTERPRISES 61 (AICPA, Accounting Research Study No. 7 (1965)).

[47] Under prior California law, distributions were permitted out of "earned surplus." CAL. CORP. CODE §§ 1500(a), 1707(c) (West 1955) (superseded). The difference between earned surplus and retained earnings is mainly a matter of accounting terminology, as both terms refer to the net worth of the corporation by virtue of transactions other than subscription or payment of capital. *See* Ackerman & Sterrett, note 1 *supra*, at 1060-63; Dreyfuss, note 1 *supra*, at 850-51.

[48] *See* Table 6 *infra*.

[49] CAL. CORP. CODE § 500(b)(1) (West Supp. 1982). The total ratio is a leverage ratio which measures the relative proportion of total assets that has been funded by creditors and equity holders. It is a simple way of depicting the extent of debt financing of the corporation, and may suggest potential borrowing power. The total ratio required by Section 500(b)(1) — assets at least equal to one and one-quarter times liabil-

proposed distribution, current assets must equal current liabilities, unless the average earnings of the corporation before taxes and interest was less than the average interest expense for the preceding two fiscal years, in which event current assets must equal one and one-quarter times current liabilities.[50] These tests are also known respectively as the

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ities — can also be expressed as a debt-to-equity ratio of not less than four-to-one. This is because by definition, liabilities (L) plus equity (E) equals assets (A); i.e., L + E = A. If assets equal one and one-quarter times liabilities, then L + E = 1¼ x L. Subtracting L from each side of the equation, E = ¼L, from which it follows that L = 4 x E. Thus, Section 500(b)(1) can be read to require that no distribution be made unless the debt-to-equity ratio following the distributions is four-to-one or less. Dreyfuss, note 1 *supra*, at 842 & n.16.

The purpose of excluding intangible and deferred items from the total ratio is to make the distributions test dependent upon those assets most likely to realize value if the corporation were liquidated on the distribution date. Thus, goodwill and deferred charges (such as start-up costs), as well as capitalized research and development expenses, which are essentially a special type of deferred charge, are not calculated as part of the corporation's total assets. CAL. CORP. CODE § 500(b)(1) (West Supp. 1982). Deferred taxes, deferred income, and other deferred credits are excluded from total liabilities. *Id.* Deferred liabilities exist for the accounting purpose of offsetting certain amounts of realized income, in order to defer recognition of those amounts until a future fiscal period. They therefore misrepresent the present liquidation value of the corporation. *See* 2 H. MARSH, CALIFORNIA CORPORATE LAW AND PRACTICE § 13.9 (1982).

[50] CAL. CORP. CODE § 500(b)(2) (West Supp. 1982). This subsection does not apply to corporations which do not classify their assets into current and fixed under generally accepted accounting principles. *Id.*

The current ratio is one measure of short-term, or "equitable," solvency, and therefore of the corporation's ability to meet maturing short-term debts. The higher the current ratio, the greater the margin of safety for meeting current debts in the event of a sudden reduction in cash flow or in the value of current assets.

Section 500(b)(2) would appear to make superfluous the application of Section 501 to distributions not out of retained earnings. Both sections formulate, in essence, an equitable insolvency test. Section 501 is a subjective test: management must decide whether, as a result of the distribution, the corporation is "likely to be unable to meet its liabilities . . . as they mature." CAL. CORP. CODE § 501 (West 1977), set forth in note 44 *supra*. Section 500(b)(2) imposes an objective, quantitative test which, if met, determines that the corporation is not near to equitable insolvency. Yet, the California Legislature made clear that the equitable insolvency test of Section 500(b)(2) is subject to the equitable insolvency test of Section 501: "If sufficient retained earnings are not available, a distribution is still possible provided the corporation meets *both* a balance sheet [§ 500(b)(1)] and liquidity [§ 500(b)(2)] test. However, *any* distribution is subject to a solvency [§ 501] test." Assembly Report, note 30 *supra*, at 9. Still, as a practical matter, it would be difficult to argue that any corporation meeting the requirements of Section 500(b)(2) could infringe the requirements of Section 501. If the statutory test of Section 500(b)(2) determines that the corporation should be able to meet its current obligations, a determination by the board of directors to the same effect is not likely to

"quantitative solvency" and "liquidity" tests, or together as "liability ratios."[51] They are, in fact, financial ratios used to determine the solvency of the corporation.

The balance sheet tests required by Section 500(b), however, suffer certain deficiencies from the standpoint of creditors. First is a practical problem of enforcement. Section 500(b)(2) allows the inclusion in current assets of net amounts expected to be received under existing contracts from customers within the corporation's twelve-month accounting period.[52] These amounts, however, do not always appear separately on corporate financial statements. Similarly, Section 500(b)(2) requires an increase in the current ratio if a corporation has not covered its interest expense with earnings (before tax and interest expense) for the two preceding fiscal years.[53] But most financial statements do not distinguish between interest expense and amortization of discount on debt.[54] Finally, Section 500(b)(2) excludes from current assets profits derived from an exchange of assets, unless the assets received are currently re-

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be questioned as unreasonable.

[51] *See, e.g.*, Barton, note 1 *supra*, at 212; Ackerman & Sterrett, note 1 *supra*, at 1063.

[52] CAL. CORP. CODE § 500(b)(2) (West Supp. 1982) provides that current assets "may include *net* amounts . . . expected to be received from customers during the 12-month period . . . pursuant to existing contractual relationships . . . after . . . giving effect to *future costs* . . . expected to be incurred by the corporation in performing such contracts . . . ." *Id.* (emphasis added). The phraseology is redundant. If only "net" amounts may be included, "future costs" incurred in generating those amounts must be taken into account. The allowance of this section extends, in the case of public utilities, to net amounts owing from customers with service connections. *Id.*

It is worth noting that the inclusion of certain receivables as current assets under Section 500(b)(2) is inconsistent with the exclusions required by Section 500(b)(1), *see* note 49 and accompanying text *supra,* because many existing but unperformed contracts will yield revenues only if the corporation continues as a going concern. The inconsistency would not exist if Section 500(b)(2) allowed as current assets receivables for already performed contracts, but this distinction is not made.

[53] CAL. CORP. CODE § 500(b)(2) (West Supp. 1982). This section increases the current ratio if the "*average* of the earnings . . . for the two preceding fiscal years was less than the *average* of the interest expense . . . for such fiscal years . . . ." *Id.* (emphasis added). The averaging is unnecessary. If average earnings exceed average interest expenses for the two prior fiscal years, then total earnings will also exceed total interest expenses for the same period.

It is also unclear whether "interest expense" under Section 500(b)(2) is intended to mean "net interest expense," a distinction that is necessary to prevent penalizing corporations that are able to obtain credit for a cost lower than the cost they charge when extending credit.

[54] *See* Accounting Principles Board (APB), Op. No. 21 (Aug. 1971), *revised by* FIN. ACCT. STANDARDS BD., 1 ACCOUNTING STANDARDS 302-03 (1982).

alizable in cash.[55] However, a determination of the nature of such assets normally requires investigation beyond the financial statement. In sum, without a statutory requirement that California corporations maintain financial statements with separate entries for all the items relevant to Section 500(b), compliance with this section will be difficult to supervise and enforce.

Second, the current ratio of Section 500(b)(2) is subject to manipulation. A corporation with borrowing power or expendable fixed assets can improve its current ratio by incurring additional long-term debt or by selling its fixed assets for cash.[56] The current ratio may also be manipulated through the practice of "window dressing," which involves retirement of current debt just prior to the financial statement date or deferral of current borrowing needs until just after the financial statement date.[57] Finally, the inclusion of inventory in current assets, as allowed by Section 500(b)(2), can be misleading, because inventory is not a completely liquid asset.[58] The shortcomings of the current ratio could be avoided by the use instead of a quick asset[59] or net working capital[60]

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[55] CAL. CORP. CODE § 500(b)(2) (West Supp. 1982).

[56] For example, assume two corporations with identical capital structures. The first corporation obtains a long-term loan secured by a lien on fixed assets, and enters the funds received as current assets on its balance sheet. The second corporation obtains no such loan. Although their financial situations are identical, the first corporation, because of the loan, improves its current ratio and thereby appears less susceptible to short-term insolvency than the second corporation. By the same token, a corporation may also sell its fixed (noncurrent) assets in order to obtain cash and thus improve its current ratio, but this policy does not generate income in the long run. On the contrary, it diminishes the corporation's earning power. For a criticism of current asset-based ratios as accurate measures of solvency, see Fess, *The Working Capital Concept*, 41 ACCT. REV. 266 (1966).

[57] For example, if a corporation with $150 of current assets and $50 of current liabilities uses $30 of the current assets to retire $30 of current debt, its current ratio will improve from 3:1 (150:50) to 6:1 (120:20), despite the absence of any significant change in its financial situation. For a discussion of window dressing abuses of the current ratio, see Sorter & Benson, *Appraising the Defensive Position of a Firm: The Interval Measure*, 35 ACCT. REV. 633 (1960).

[58] The potential illiquidity of inventory is particularly relevant for financially distressed corporations whose unwise purchasing policies lead to excessive or obsolete inventory that cannot easily be sold to obtain the cash necessary to pay maturing debts. *See* Beaver, *Alternative Accounting Measures as Predictors of Failure*, 43 ACCT. REV. 113, 115 (1968).

[59] The quick asset ratio divides cash and cash equivalents (e.g., marketable securities and receivables, but not inventory) by current liabilities.

[60] The net working capital ratio divides net working capital (current assets minus current liabilities) by total assets. Since incurring or repaying debt alters total assets, window dressing would be impossible.

ratio, but the California Legislature has forgone this option.

Third, as the empirical study confirmed, Section 500(b) is a relatively poor predictor of bankruptcy[61] compared with more modern and sophisticated models developed by scholars.[62] These modern models differ from Section 500(b) in several respects. First, they utilize, in combination, many more ratios than the two (total and current) ratios of

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[61] *See* notes 80-89 and accompanying text *infra*.

[62] Since the mid-1960s, a large number of studies have investigated the prediction of corporate failure. These studies vary with regard to the size and nature of the corporations involved and to the period of time prior to bankruptcy investigated. They also differ as to the types of financial ratios and statistical techniques utilized. The most notable are E. ALTMAN, CORPORATE BANKRUPTCY IN AMERICA (1971); Altman, *Predicting Railroad Bankruptcies in America*, 4 J. ECON. & MGMT. SCI. 184 (1973); Altman, *Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy*, 23 J. FIN. 589 (1968) [hereafter *Financial Ratios*]; Altman, *Corporate Bankruptcy Potential, Stockholder Returns and Share Valuation*, 24 J. FIN. 887 (1968); Altman, Haldeman & Narayanan, *ZETA Analysis: New Model to Identify Bankruptcy Risk of Corporations*, 1 J. BANKING & FIN. 29 (1977); Altman & Loris, *A Financial Early Warning System for Over-the-Counter Broker Dealers*, 31 J. FIN. 1201 (1976); Altman & McGough, *Evaluation of a Company as a Going Concern*, 138 J. ACCT. 50 (Dec. 1974); Beaver, *Alternative Accounting Measures as Predictors of Failure*, 43 ACCT. REV. 113 (1968) [hereafter *Alternative Accounting Measures*]; Beaver, *Market Prices, Financial Ratios and the Prediction of Failure*, 6 J. ACCT. RESEARCH 179 (1968); Beaver, *Financial Ratios as Predictors of Failure*, EMPIRICAL RESEARCH IN ACCOUNTING: SELECTED STUDIES 1966, Supp. to 4 J. ACCT. RESEARCH 71 (1966); Blum, *Failing Company Discriminant Analysis*, 12 J. ACCT. RESEARCH 1 (1974); Deakin, *A Discriminant Analysis of Predictors of Business Failure*, 10 J. ACCT. RESEARCH 167 (1972); Edmister, *An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction*, 7 J. FIN. & QUANTITATIVE ANALYSIS 1477 (1972) [hereafter *Empirical Test*]; Edmister, *Financial Ratio and Credit Scoring for Small Business Loans*, 54 J. COM. BANK LENDING 10 (1971); B. Lev, *Financial Failure and Information Decomposition Measures*, in ACCOUNTING IN PERSPECTIVE: CONTRIBUTIONS TO ACCOUNTING THOUGHTS BY OTHER DISCIPLINES 102-11 (R. Sterling & W. Bentz eds. 1971); Libby, *Accounting Ratios and the Prediction of Failure: Some Behavioral Evidence*, 13 J. ACCT. RESEARCH 150 (1975); Meyer & Pifer, *Prediction of Bank Failures*, 25 J. FIN. 853 (1970); Moyer, *Forecasting Financial Failures: A Re-Examination*, 6 FIN. MGMT. 11 (Spring 1977); Ohlson, *Financial Ratios and the Probabilistic Prediction of Bankruptcy*, 18 J. ACCT. RESEARCH 109 (1980); Santomero & Vinso, *Estimating the Probability of Failure for Commercial Banks and the Banking System*, 1 J. BANKING & FIN. 185 (1977); Wilcox, *A Prediction of Business Failure Using Accounting Data*, EMPIRICAL RESEARCH IN ACCOUNTING: SELECTED STUDIES 1973, Supp. to 11 J. ACCT. RESEARCH (1973); R. White & M. Turnbull, *The Probability of Bankruptcy: American Railroads*, Working Paper, Institute of Finance and Accounting, London University Graduate School of Business (Feb. 1975). *See also* Collins, *An Empirical Comparison of Bankruptcy Prediction Models*, 9 FIN. MGMT. 52 (Summer 1980).

Section 500(b),[63] and they cross-analyze the quantities used in the ratios.[64] Second, modern models do not necessarily denote a specific point at which a corporation is determined to go bankrupt. Many of the models recognize their own imperfections and attempt to demarcate a "gray area." Once the model classifies the corporation as falling into this gray area, a further study, usually qualitative rather than quantitative, is suggested.[65] Modern models also compensate against mistakes by using formulas that consider only the aggregate result of cumulatively examined variables and weigh different variables according to their empirically established predictive value.[66] Last, modern models are gener-

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[63] *See, e.g.*, Altman, *Financial Ratios*, note 62 *supra*, at 594-95 (using the following five ratios: working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets, market value of equity to book value of total debt, and sales to total assets); Meyer & Pifer, note 62 *supra*, at 860-62 (using the following nine ratios to predict bank failures: cash and securities to total assets, coefficient of variation in rate of interest on time deposit, time to demand deposit ratio, operating revenue to operating costs, operating income to total assets, growth of consumer loans to total assets, growth of cash and securities to total assets, coefficient of variation of total loans, real estate loans to total assets, and fixed assets to total assets); Ohlson, note 62 *supra*, at 118-19 (using nine variables, including the following ratios: log (total assets to GNP price-level index), which measures changes in corporate size, total liabilities to total assets, working capital to total assets, current liabilities to current assets, net income to total assets, and funds provided by operations to total liabilities).

For a criticism of early bankruptcy prediction models which, like Section 500(b), utilized a limited number of financial ratios, see Altman, *Financial Ratios*, note 62 *supra*, at 590-91.

[64] *See, e.g.*, Beaver, *Alternative Accounting Measures*, note 62 *supra*, at 115, 118 (comparing liquid with nonliquid asset measures, and liquid asset measures with each other by using the following ratios: cash flow to total debt, net income to total assets, and total debt to total assets; further comparing liquid asset measures (current assets, quick assets, net working capital, and cash) against total debt, current debt, and sales)). Section 500(b) fails to use all but two of these ratios, including the ratio of cash flow to total liabilities, which has been determined to be a strong predictor of bankruptcy. *Id.* at 118.

[65] *See e.g.*, Edmister, *Empirical Test*, note 62 *supra*, at 1489; Meyer & Pifer, note 62 *supra*, at 868. Professor Altman refers to this gray area as a "zone of ignorance." Altman, *Financial Ratios*, note 62 *supra*, at 606. State distributions statutes could use a model of bankruptcy prediction to define such a zone of ignorance. The statute could provide that in gray area cases, distributions will be permitted only if the corporation can obtain from an independent accountant an opinion, based on a qualitative study, approving such distributions. In the alternative, the statute could provide that distributions be made to shareholders contingent upon a recall in case of bankruptcy within a defined period.

[66] *See, e.g.*, Ohlson, note 62 *supra*, at 117-23 (Model 1). This model uses the following formula to predict bankruptcy within one year:

ally tailored for application to a particular group of corporations with common characteristics. Only a few attempts have been made to construct a model applicable to corporations of dissimilar size and industry.[67] Section 500(b), on the other hand, uses a simple,[68] standard model applicable to all corporations regardless of size or industry.[69]

P = (−.407) Size + 6.03 TLTA + (−1.43) WCTA + 0.757 CLCA + (−2.37) NITA + (−1.83) FUTL + 0.285 INTWO + (−1.72) OENEG + (−.521) CHIN + (−1.32) CONST, where:

Size = leg (total assets/GNP price-level index).
TLTA = total liabilities divided by total assets.
WCTA = working capital divided by total assets.
CLCA = current liabilities divided by current assets.
OENEG = one if total liabilities exceeds total assets, zero otherwise.
NITA = net income divided by total assets.
FUTL = funds provided by operations divided by total liabilities.
INTWO = one if net income was negative for the last two years, zero otherwise.
CHIN = $(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$, where NI_t is net income for the most recent period.

The result obtained (P) will be between 0 and 1, inclusive. The cutoff point is 0.5: if $P > 0.5$, the corporation is predicted to go bankrupt; if $P < 0.5$, the corporation is classified as solvent. *Id.*; *see also* Altman, *Financial Ratios*, note 62 *supra*, at 593-94 (similar mistake-compensation formula). The formulas are arrived at by trial and error. The data available for the bankrupt corporations and the solvent control group are analyzed with computer regressions to determine the approximate point at which corporations may be predicted to go bankrupt. There is no evidence that the California Legislature attempted to conduct a similar study to develop a model based on empirical findings of bankrupt corporations in California.

[67] Professor Collins applied two bankruptcy models, originally developed to predict railroad bankruptcy, to federally chartered credit unions. *See* Collins, note 62 *supra*. The results were a 94.4% successful prediction rate under one model (that of Altman, *Financial Ratios*, note 62 *supra*, at 594-96), and a 92.5% successful prediction rate under the other (that of Meyer & Pifer, note 62 *supra*, at 856-62). *Id.* at 56.

[68] Simplicity, of course, is not necessarily undesirable, particularly if the simplicity of the model enhances its practical application. Professor Collins has, for example, found that the simpler model used by Altman (*see* Altman, *Financial Ratios*, note 62 *supra*) performs more accurately than the theoretically more advanced model used by Meyer and Pifer (*see* Meyer & Pifer, note 62 *supra*). Collins, note 62 *supra*, at 53. The Altman model, however, was itself much more elaborate than Section 500(b).

[69] The only measure of flexibility is in the current ratio of Section 500(b)(2), which distinguishes between corporations whose earnings cover their interest costs and corporations whose earnings do not cover these costs. CAL. CORP. CODE § 500(b)(2) (West Supp. 1982). Corporations that do not classify their assets as current and fixed are exempt from the current ratio test. *Id.* As a result of this exemption, a creditor is forced to rely on one financial ratio — the total ratio — as a sole predictor of bankruptcy. The total ratio of Section 500(b)(1) does not introduce any measure of flexibility, despite the fact that the significance attached to the total ratio may vary from industry to

III. CALIFORNIA CORPORATIONS CODE § 500: AN EMPIRICAL STUDY

In order to examine the effectiveness of the California distribution rules, an empirical study was conducted. This study applied the financial ratios required by Section 500(b) to the financial statements of one hundred corporations[70] that went bankrupt between 1970 and

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industry because of the varying risk associated with debt financing. *See* note 118 and accompanying text *infra*.

[70] *Methodology and Data Collection*: The corporations analyzed all were industrial corporations whose shares were traded on a public exchange or over-the-counter, and which entered bankruptcy proceedings between 1970 and 1976. Utilities and transportation companies were not analyzed due to problems of information gathering, which include the special treatment of utilities under CAL. CORP. CODE § 500(b)(2) (West Supp. 1982). The one hundred corporations analyzed were determined from a list of bankrupt corporations as they appeared in the Wall Street Journal Index for the given years, after deleting transportations, utilities, closely held corporations, and corporations for which financial statements were unavailable. It was deemed advisable to use only corporations whose shares were traded on a public exchange or over-the-counter, because information for such corporations is readily available and because they are subject to generally accepted accounting principles, the same principles to which California corporations are currently subject under CAL. CORP. CODE § 114 (West Supp. 1982).

Only five of the one hundred corporations analyzed were California corporations. The point is not significant, however, because the new California Corporations Code was enacted in 1977, after the corporations analyzed entered bankruptcy. Moreover, there is no inherent difference between corporations of different states. The study in effect subjected one hundred corporations nationwide to the distribution rules governing California corporations since 1977.

The financial data examined were obtained from 10-K reports, which are financial statements required to be filed annually with the Securities and Exchange Commission. Data from 10-K reports were regarded as preferable to those from Moody's Manual, the source of data in most past studies, because they are more extensive, and because they indicate the date of release of the financial statements to the public, thus allowing verification of whether the corporation entered bankruptcy proceedings before or after the statement became public.

Only original financial statements for the given fiscal year were considered, in order to apply Section 500(b) to the information available to both the public and to corporate boards of directors at the time of the proposed distribution. Thus, the study ignored subsequent modifications of the original statements (restated accounts) published in the following year's financial statements. The only exception to this procedure occurred when Section 500(b)(2) required examination of earnings and interest expense of two preceding fiscal statements in order to determine whether the current ratio should be increased. Therefore, for the limited purpose of acquiring data on earnings and interest expense, the study examined all financial statements, including subsequent restatements and modifications, because the information therein was publicly available at the time of the proposed distribution.

1976.[71] The application of Section 500(b) for one, two, and three years prior to bankruptcy tested the section's successful bankruptcy prediction rate during those years, or, in other words, tested how often Section 500(b) would have prohibited distributions by corporations that subsequently went bankrupt.[72]

Similarly, the study applied Section 500(b) to the financial statements of a control group of 2451 solvent corporations[73] during the same

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The study attempted not to use financial statements audited after the corporation had filed for bankruptcy in order to avoid "backcasting." Therefore, of the 18 financial statements in the year of bankrupcty that were accompanied by an auditor's report disclosing the petition for bankruptcy, 11 were discarded and replaced by a financial statement for the fourth fiscal year preceding bankruptcy. The other seven statements were maintained and examined, however, because additional statements for the fourth year preceding bankruptcy were unavailable, and because the study considered it statistically necessary to maintain the number of corporations analyzed as high as possible. In one case, the financial statement for the fiscal year preceding bankruptcy was not audited (for lack of corporate funds), but was nevertheless examined by the study. For all the corporations analyzed, the average time between the release date of the last financial statement examined and the date of petition for bankruptcy was approximately 13 months.

[71] The one hundred corporations entered bankruptcy proceedings under the following chapters of the Bankruptcy Act of 1898, *repealed by* Bankruptcy Reform Act of 1978, 11 U.S.C. §§101-151326 (Supp. IV 1980): 78 corporations entered under Chapter XI, 11 U.S.C. §§ 701-99 (1976) (repealed 1978); 14 corporations under Chapter X, 11 U.S.C. §§ 501-676 (1976) (repealed 1978); and eight corporations under other chapters or classification unknown.

The study deliberately analyzed corporations under the old Act, which required, for voluntary proceedings, that the debtor plead either equitable or bankruptcy insolvency, *see* 11 U.S.C. §§ 1(19) (defining insolvency), 530, 723, 823 (1976) (repealed 1978), and for involuntary proceedings, that the debtor be both bankruptcy insolvent and have committed an act of bankruptcy, *see* 11 U.S.C. § 21 (1976) (repealed 1978). The Bankruptcy Reform Act of 1978, however, abolished the requirements of bankruptcy insolvency and an act of bankruptcy for involuntary proceedings, and now requires only equitable insolvency. *See* 11 U.S.C. § 303(h)(1) (Supp. IV 1980); *see also* H.R. REP. NO. 595, 95th Cong., 1st Sess. 323, *reprinted in* 1978 U.S. CODE CONG. & AD. NEWS 6279-80. The study therefore assumed that bankruptcies under the old Act included a greater number of corporations that were insolvent in both senses and therefore would serve as a more appropriate sample against which to test the predictive powers of Section 500(b), which prohibits distributions if either equitable or bankruptcy insolvency is detected. This assumption is supported by recent studies of bankruptcies under the old Act. *See, e.g.,* M. White, Economics of Bankruptcy: Liquidation and Reorganization, Tables 1-2 (N.Y.U. Grad. School of Bus. Admin. Working Paper Series No. 239 (Aug. 1981)) (liabilities exceed assets by an average of 155% for corporations in reorganization and by 194% for corporations in liquidation).

[72] *See* notes 80-91 and accompanying text *infra.*

[73] The control group was obtained from the files of the Industrial Compustat Service, which contains libraries of financial, statistical, and market information. *See*

period[74] in order to test the incidence of overprediction by Section 500(b), that is, how often the section would have prohibited distributions by corporations that continued to be solvent.[75] The study also tested the sensitivity of Section 500(b) to the size[76] and industrial category[77] of the corporations to which it was applied. Finally, the study examined whether Section 500(a), the alternative test which allows distributions to the extent of retained earnings, is by itself a sufficient indicator of future solvency,[78] and whether the efficiency of Section 500 could be improved if Sections 500(a) and 500(b) were applied cumulatively rather than as alternative tests.[79]

A. Successful Prediction of Bankruptcy

The study examined the financial statements of the one hundred bankrupt corporations for the three years prior to bankruptcy. The following table displays the mean quantities of the four variables necessary to ascertain the total and current ratios of Section 500(b).

STANDARD & POOR'S, INTRODUCTION TO INDUSTRIAL COMPUSTAT § 3, at 1 (1981). The control group, like the one hundred bankrupt corporations analyzed, consisted only of industrial corporations whose shares were traded on a public exchange or over-the-counter. A computer program was prepared, and included all the financial data necessary to apply Section 500(b). This program was run against a Compustat Service computer disc that contained financial data on the 2451 solvent corporations for the relevant years. However, because of missing data, only 755 corporations were in fact examined. On the average, in each fiscal year the computer was able to obtain the necessary information for 696.5 corporations.

[74] Because the one hundred bankrupt corporations entered bankruptcy proceedings between 1970 and 1976, the financial statements examined in some cases date as far back as 1967 (the third year prior to bankrupcty). Accordingly, the financial statements of the solvent control group were examined for the years 1967 to 1976.

[75] *See* notes 104-10 and accompanying text *infra*.

[76] *See* notes 92-103 and accompanying text *infra*.

[77] *See* notes 111-23 and accompanying text *infra*.

[78] *See* notes 124-44 and accompanying text *infra*.

[79] *See* notes 145-49 and accompanying text *infra*.

TABLE 1
Profile Analysis:
Mean Quantities of Section 500(b) Variables
(in dollars)

Number of Years Prior to Bankruptcy	Three years	Two years	One year
Variable:[80]			
TOTAL ASSETS	44,263,390	52,226,790	47,765,040
TOTAL LIABILITIES	29,163,390	45,215,730	39,887,270
CURRENT ASSETS	30,107,245	34,589,571	32,142,449
CURRENT LIABILITIES	18,315,510	23,690,480	26,474,082

Table 2 displays the rate at which the total and current ratios of Section 500(b), applied separately and cumulatively to the one hundred bankrupt corporations, would have precluded distributions by successfully predicting bankruptcy.

[80] Total assets and total liabilities were calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982), and current assets and current liabilities were calculated under *id.* § 500(b)(2).

Two corporations did not classify their assets and liabilities into total and current, and therefore the current quantities were calculated for 98 corporations only.

The study assumed that the financial statements examined did not include future earnings in current assets, which is now allowed under Section 500(b)(2). This assumption was based on the fact that the corporations analyzed were not subject to the new California Code. Because California corporations will take advantage of the code's liberal definition of current assets, Section 500(b) in practice may allow distributions more often than indicated by the study. Also working in favor of a more frequent allowance of distributions by Section 500(b) in practice is the operation of "moral hazard," or of debtor's indifference to his creditor's increased risk. For a discussion of moral hazard, see Jackson & Kronman, *Secured Financing and Priorities Among Creditors*, 88 YALE L.J. 1143 (1979). California corporations, cognizant of the new distribution rules, may alter their accounting practices to the extent allowable under generally accepted accounting principles in order to maximize the opportunities to make distributions.

TABLE 2

Section 500(b): Preclusion of Distributions Through Successful Prediction of Bankruptcy

numbers and (percentage)

Number of Years Prior to Bankruptcy	Three years	Two years	One year
Test:			
TOTAL RATIO[81]	19 (19.00)	34 (34.00)	57 (57.00)
CURRENT RATIO[82]	14 (14.28)	26 (26.53)	50 (51.02)
CAL. CORP. CODE § 500(b)[83]	24 (24.00)	40 (40.00)	68 (68.00)

Tables 1 and 2 reveal important findings on the utility of total and current ratios in general, and those of Section 500(b) in particular. Table 1 shows that despite the eventual bankruptcy of all the corporations analyzed, mean total and current assets exceeded, respectively, mean total and current liabilities during each of the three years preceding bankruptcy.[84] Although this finding does not prove that the total and current ratios lack any predictive power whatsoever, it does indicate that, unsupplemented by additional ratios, they may portray a misleading picture of the corporation's financial condition. Also, although the exact calculation of assets and liabilities may vary with different distributions statutes, this finding generally confirms the observation that

[81] Calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982). One hundred corporations were analyzed.

[82] Calculated under *id.* § 500(b)(2). Ninety-eight corporations were analyzed, because two corporations did not classify their assets into total and current.

[83] *Id.* § 500(b). The total and current ratios combined. One hundred corporations were analyzed.

[84] It is also interesting to note the trends in assets and liabilities across the three years. Although there is a constant increase in current liabilities, the total liabilities decreased from the second year to the first year prior to bankruptcy. This trend may be due to the practices of financial institutions. Banks will continue to extend long-term credit to a corporation as long as it is not predicted to go bankrupt. The corporation will use this long-term credit to repay other debts and to expand its business activities. However, once a corporation is predicted to go bankrupt, the banks will stop extending it long-term credit, but may, unless the corporation is on the verge of financial collapse, continue to extend it short-term credit. Thus, one year prior to bankruptcy the balance sheet may record a decrease in total liabilities, opposite an increase in current liabilities. The assets, both current and total, decreased in these years, yet did not fall to the low amounts of three years prior to bankruptcy. This may reflect last minute attempts by the corporations to avoid bankruptcy.

statutes based on the dual insolvency test merely ascertain rather than predict bankruptcy.[85] Because the dual insolvency test prohibits only those distributions that actually render the corporation equitably or bankruptcy insolvent, it in effect prohibits only fraudulent conveyances.[86]

Table 2 reveals that the ratios required by Section 500(b) display at least some predictive power, albeit at a relatively low level. One year prior to bankruptcy, Section 500(b) detected only 68% of the impending bankruptcies, thus allowing the remaining 32% of corporations to distribute assets to shareholders. In contrast, modern models of bankruptcy prediction have achieved considerably higher successful prediction rates, in the range of 90% and higher.[87] Two and three years prior to bankruptcy, the successful prediction rates of Section 500(b) were, respectively, 40% and 24% — so low that prudent creditors will resort to alternative means of protection, for example, limitations on distributions as a term of credit agreements, and will likely incur surveillance costs otherwise avoidable had Section 500(b) predicted bankruptcy more successfully.

The information in Table 2 also confirms the findings of other studies which attribute little predictive power to the current, as compared

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[85] *See* notes 22, 41 and accompanying text *supra*. Moreover, the dual insolvency test of the Model Act, unlike Section 500(b), does not exclude intangibles from the calculation of assets. MODEL BUSINESS CORP. ACT § 45 (1979), set forth in note 32 *supra*. Thus, for purposes of applying § 45 of the Model Act, assets would exceed liabilities by more than depicted in Table 1.

[86] In practice, the Uniform Fraudulent Conveyance Act (UFCA), if applicable to corporate distributions, *see* note 29 *supra*, may impose a *stricter* test than the dual insolvency test as calculated under the Model Act. The Model Act grants management considerable leeway in adopting a method to value assets for purposes of applying the bankruptcy insolvency test, *see* MODEL BUSINESS CORP. ACT § 45(b) (1979), set forth in note 32 *supra; see also* note 40 *supra*. The UFCA, however, defines insolvency as "when the *present fair salable value* of . . . assets is less than the amount that will be required to pay . . . probable liability on . . . existing debts as they become absolute and matured." UNIF. FRAUDULENT CONVEYANCE ACT § 2(1), 7A U.L.A. 176 (1978) (emphasis added). *See* ABA Report, note 29 *supra*, at 1882. Therefore, if the "present fair salable value" of a corporation's assets is less than the value of those assets under the calculation method selected by management, the UFCA will detect an illegal conveyance before the Model Act detects an illegal distribution.

[87] *See, e.g.*, Altman, *Financial Ratios*, note 62 *supra*, at 604 (95% one year prior to bankruptcy, 72% two years prior to bankruptcy, and 48% three years prior to bankruptcy); Collins, note 62 *supra*, at 55-56 (94.4% and 92.5% one year prior to bankruptcy under two different models); Edmister, *Empirical Test*, note 62 *supra*, at 1488 (93% one year prior to bankruptcy); Ohlson, note 62 *supra*, at 121 (96.12% one year prior to bankruptcy).

with the total, ratio.[88] The current ratio, when combined with the total ratio in Section 500(b), predicted additional bankruptcies that the total ratio alone did not detect for only 5% of the corporations three years prior to bankruptcy, 6% two years prior to bankruptcy, and 11% one year prior to bankruptcy.[89]

B. Upper and Lower Bounds of Successful Prediction of Bankruptcy

The empirical study also tested the range of prediction of Section 500(b), that is, the *supremum* and *infimum* predictive rates of the section when applied to the general population of bankrupt corporations.

The test results show that there exists only a 1% chance that Section 500(b) will achieve a bankruptcy prediction rate higher than 80.2% or lower than 55.8% one year prior to bankruptcy.[90] Even the upper bound of 80.2% is inferior to the average performance of modern models of bankruptcy prediction.[91]

C. Sensitivity Analysis: The Effect of Corporate Size on Successful Prediction of Bankruptcy

At least one modern study attributes considerable importance to corporate size as a major variable in bankruptcy prediction.[92] Section 500(b), however, establishes a standard model to be applied uniformly to corporations of all sizes.

This study tested whether, in fact, Section 500(b) is sensitive to the size of the corporation, predicting bankruptcy more or less successfully when applied to corporations of a particular size. In order to test the assumption of sensitivity to size, the study arranged the one hundred bankrupt corporations along a continuum according to total assets[93] and

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[88] *See, e.g.*, Beaver, *Alternative Accounting Measures*, note 62 *supra*, at 121.

[89] Computed as the difference between the results of the total ratio and those of CAL. CORP. CODE § 500(b). *See* Table 2 *supra*.

[90] The range is determined by constructing a confidence interval, that is, an allowance for error consisting of two boundary points representing the maximum and minimum rates at which a variable can be predicted within a specified degree of accuracy (usually 99% or 95%). *See generally* P. HOEL, INTRODUCTION TO MATHEMATICAL STATISTICS (2d ed. 1954); D. KLEINBAUM & L. KUPPER, APPLIED REGRESSION ANALYSIS AND OTHER MULTIVARIABLE METHODS 23-25 (1978). For the complete calculation of the confidence interval, see Appendix B *infra*.

[91] *See* note 87 and accompanying text *supra*.

[92] Ohlson, note 62 *supra*, at 122-23.

[93] Calculated under CAL. CORP. CODE § 500(b) (West Supp. 1982).

divided them into three groups:[94] corporations with total assets under $8,500,000 (Group I);[95] corporations with total assets between $8,500,000 and $30,000,000 (Group II);[96] and corporations with total assets in excess of $30,000,000 (Group III).[97] The following table displays the results of the application of Section 500(b) to the one hundred corporations as divided into the three size groups.[98]

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[94] The study also made a similar division into two groups, *see* note 103 *infra*, but did not make a division into more than three groups because of the small number of corporations involved. Such further division would have violated the condition of large numbers of observations required by the Central Limit Theorem. *See* note 161 *infra*.

[95] Thirty-three corporations, with total assets ranging from $383,000 to $8,221,000.

[96] Thirty-four corporations, with total assets ranging from $8,500,000 to $29,699,000.

[97] Thirty-three corporations, with total assets ranging from $30,666,000 to $1,252,982,000.

[98] Table 3 displays the same tests as Table 2 *supra*, but with the one hundred corporations divided into the three size groups.

TABLE 3

Section 500(b): The Effect of Corporate Size on Successful Prediction of Bankruptcy (in percentage)

Number of Years Prior to Bankruptcy	Three years			Two years			One year		
Size Group[99]	I	II	III	I	II	III	I	II	III
Test:									
TOTAL RATIO[100]	18.2	23.5	15.1	33.3	35.3	33.3	51.5	61.8	57.6
CURRENT RATIO[101]	24.2	15.1	3.1	45.4	18.1	15.6	72.7	45.4	34.3
CAL. CORP. CODE § 500(b)[102]	24.2	29.4	18.2	45.5	38.2	36.4	72.7	67.6	63.6

Table 3 indicates a consistent pattern of disparity between the three groups, suggesting that Section 500(b) predicts bankruptcy more successfully for smaller (Group I) than for larger (Group III) corporations. Thus, one year prior to bankruptcy, the successful bankruptcy prediction rate of Section 500(b) for Group I was 72.7% compared with 67.6% for Group II, and 63.6% for Group III. Two years prior to bankruptcy, the rate decreased to 45.5% for Group I, 38.2% for Group II, and 36.4% for Group III. And three years prior to bankruptcy, the rate was 24.2% for Group I, 29.4% for Group II (the only deviation from the pattern), and 18.2% for Group III. These rates may be compared to the average successful prediction rate of Section 500(b) for all three groups — 68%, 40%, and 24% respectively for one, two, and three years prior to bankruptcy — as displayed by Table 2.

The study tested, however, the statistical significance of the disparate rates one year prior to bankruptcy and concluded that the disparities were not statistically significant.[103] The predictive power of Section

[99] *See* notes 93-97 and accompanying text *supra*.

[100] Calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982). One hundred corporations were analyzed.

[101] Calculated under *id.* § 500(b)(2). Ninety-eight corporations were analyzed, because two corporations (one in Group II; one in Group III) did not classify their assets into total and current.

[102] *Id.* § 500(b). The total and current ratios combined. One hundred corporations were analyzed.

[103] The statistical significance of the disparities was determined using a method of hypothesis testing. *See generally* D. KLEINBAUM & L. KUPPER, note 90 *supra*, at 25-

500(b), when applied to the general population of bankrupt corporations, therefore will not vary significantly according to the size of the corporation examined. The relative uniformity of the results of Section 500(b) is one of the statute's few advantages. However, the overall low prediction rate of Section 500(b) would probably lead cautious creditors not to rely on this statutory protection at all.

D. Overprediction of Bankruptcy

In order to assess the overall predictive power of Section 500(b), the study tested not only the rate at which bankrupt corporations were misclassified as solvent, but also the rate at which solvent corporations were misclassified as bankrupt. The rate of overprediction is important, because in practice management and creditors will apply Section 500(b) to corporations without knowing whether, in fact, the corporations will remain solvent or go bankrupt.

The incidence of overprediction of Section 500(b) was determined by applying the section to the financial statements of the solvent control group for fiscal years 1967-1976, the same years analyzed for the bankrupt corporations.[104] The following table displays the results.

29; T. WONNACOTT & R. WONNACOTT, INTRODUCTORY STATISTICS FOR BUSINESS AND ECONOMICS 241-45 (2d ed. 1977). The test values calculated for comparisons between Groups I and II, II and III, and I and III were .455, .345 and .798 respectively. These values were less than the critical values for each variable at 95% and 99% levels of confidence. The conclusion is that Section 500(b) does not predict bankruptcy significantly better or worse, in a statistical sense, for corporations of a particular size. For the complete calculation of the test values, see Appendix A *infra*.

A similar check was conducted by dividing the one hundred bankrupt corporations into two, rather than three, groups according to total assets. Section 500(b) achieved a 72% successful prediction rate one year prior to bankruptcy for the large asset group and a 64% rate for the small asset group. However, utilizing the same test for significance as above, the study attributed no statistical significance to the disparity.

[104] *See* note 74 *supra*.

TABLE 4

Overprediction of Bankruptcy: Section 500(b)
Applied to Solvent Control Group
numbers and (percentage)

Fiscal year	Number of Financial Statements Examined[105]	TOTAL RATIO[106]	CURRENT RATIO[107] 1:1	1¼:1	CAL. CORP. CODE §500(b)[108]
1967	650 (100)	20 (3.08)	15 (2.31)	9 (1.38)	41 (6.31)
1968	633 (100)	24 (3.79)	24 (3.79)	13 (2.05)	56 (8.85)
1969	662 (100)	31 (4.68)	18 (2.72)	18 (2.72)	56 (8.46)
1970	717 (100)	41 (5.72)	20 (2.79)	20 (2.79)	74(10.32)
1971	748 (100)	44 (5.88)	24 (3.21)	16 (2.14)	76(10.16)
1972	703 (100)	35 (4.98)	29 (4.13)	16 (2.28)	71(10.10)
1973	701 (100)	34 (4.85)	26 (3.71)	10 (1.43)	63 (8.99)
1974	739 (100)	34 (4.60)	25 (3.38)	21 (2.84)	70 (9.47)
1975	729 (100)	37 (5.08)	27 (3.70)	16 (2.19)	68 (9.33)
1976	742 (100)	36 (4.85)	28 (3.77)	14 (1.89)	67 (9.03)
TOTAL	7024 (100)	336 (4.78)	236 (3.36)	153 (2.18)	642 (9.14)

As Table 4 shows, Section 500(b) misclassified as going bankrupt an average of 9.14% of the financial statements of the solvent control group.[109] In contrast, modern models of bankruptcy prediction have achieved a significantly lower overprediction rate, in the range of 2%-3%.[110]

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[105] *See* note 73 *supra.*

[106] Calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982).

[107] Calculated under *id.* § 500(b)(2). Corporations whose earnings did not cover interest expenses for the two prior fiscal years were therefore examined under the increased ratio of 1¼ to 1.

[108] *Id.* § 500(b). The total and current ratios combined.

[109] The upward trend in the overprediction rate of Section 500(b) during the ten years, which was steepest between 1967 (6.31%) and 1970 (10.32%), may reflect changing patterns of capitalization. It has been observed that between 1958 and 1968 there occurred a general increase in debt financing in the United States. V. BRUDNEY & M. CHIRELSTEIN, CASES AND MATERIALS ON CORPORATE FINANCE 359 (1972). Increased debt financing, which increases the corporation's debt-to-equity ratio, naturally would make the financial ratio tests more difficult to meet, because Section 500(b)(1) prohibits distributions if, as a result, the distributing corporation's debt-to-equity ratio would fall below four-to-one. *See* note 49 *supra*; *see also* notes 117-118 and accompanying text *infra.*

[110] *See, e.g.*, Collins, note 62 *supra*, at 55 (Exhibit 3) (1.86% overprediction rate applying an Altman-type model with six variables to federally chartered credit unions); *id.* at 56 (Exhibit 4) (3.11% overprediction rate applying a Meyer & Pifer-type model

E. Sensitivity Analysis: The Effect of Industrial Category on Overprediction and Successful Prediction of Bankruptcy

The standard model of Section 500(b), unlike most modern models of bankruptcy prediction, is intended to be uniformly applicable to corporations of all industries.[111] In order to test whether Section 500(b) is sensitive to industrial category, predicting bankruptcy more or less successfully when applied to corporations of a particular industry, the study divided both the one hundred bankrupt corporations and the solvent control group into ten industrial categories.[112] The following table displays the results of the application of Section 500(b) to the solvent control group and to the one hundred bankrupt corporations one year prior to bankruptcy, as divided into industrial categories.

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with six variables to federally chartered credit unions).

[111] *See* notes 67-69 and accompanying text *supra*.

[112] The study also attempted to determine in which specific industries misclassification occurred most often, by further dividing the one hundred bankrupt corporations and the solvent control group into 231 industrial subcategories. These subcategories accord with the Standard Industry Classification (SIC) of the U.S. Department of Commerce as recorded in the Industrial Compustat file. *See* STANDARD & POOR'S, INTRODUCTION TO INDUSTRIAL COMPUSTAT, Appendix B at 3-17 (1981). The results may mitigate the impact of misclassification by the model, because knowing which industries are more susceptible to misclassification will allow creditors to evaluate more accurately the risk arising from a specific corporation. *See* Appendices C and D to this Article (copies on file at U.C. Davis Law Review office). It should be noted that not all 231 industrial categories include sufficient numbers of sample corporations. The results are therefore reliable only in a few of the 231 categories.

TABLE 5

Section 500(b): The Effect of Industrial Category on Overprediction (I) and Successful Prediction (II) of Bankruptcy

numbers and (percentage)

Industrial Category	Number of Financial[113] Statements Examined		TOTAL RATIO[114]		CURRENT RATIO[115] 1:1		CURRENT RATIO[115] 1¼:1		CAL. CORP. CODE § 500(b)[116]	
	I	II	I	II	I	II	I	II	I	II
Agriculture, Forestry, and Fishing	28(100)	1(100)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Mining	398(100)	3(100)	7(1.76)	2(66.66)	39(9.80)	2(100)	23(5.78)	0(0.00)	66(16.58)	3(100)
Construction	112(100)	1(100)	14(12.50)	1(100)	4(3.57)	1(100)	7(6.25)	0(0.00)	21(18.75)	1(100)
Manufacturing	4,416(100)	47(100)	145(3.28)	29(61.70)	5(0.11)	21(44.68)	39(0.88)	3(6.38)	169(3.83)	33(70.21)
Transportation, Communication, and other Public Utilities	400(100)	6(100)	26(6.50)	5(83.33)	117(29.25)	5(100)	24(6.00)	0(0.00)	153(38.25)	6(100)
Wholesale trade	297(100)	6(100)	20(6.73)	3(50.00)	3(1.01)	1(16.66)	3(1.01)	1(16.66)	25(8.42)	4(66.66)
Retail trade	684(100)	24(100)	11(1.61)	8(33.33)	15(2.19)	5(20.83)	7(1.02)	2(8.33)	31(4.53)	11(45.83)
Finance, Insurance, and Real Estate	211(100)	3(100)	75(35.54)	3(100)	32(15.16)	2(66.66)	19(9.00)	1(33.33)	93(44.07)	3(100)
Services	419(100)	9(100)	29(6.92)	6(66.66)	21(5.01)	4(44.44)	30(7.16)	2(22.22)	75(17.90)	7(77.77)
Conglomerates	59(100)	0(100)	9(15.25)	0(0.00)	0(0.00)	0(0.00)	1(1.69)	0(0.00)	9(15.25)	0(0.00)
TOTAL	7,024(100)	100(100)	336(4.78)	57(57.00)	236(3.36)	41(41.84)	153(2.18)	9(9.18)	642(9.14)	68(68.00)

[113] Columns "I" indicate overprediction of bankruptcy: Section 500(b) applied to the financial statements of the solvent control group for the fiscal years 1967-1976. *See* notes 73-74 *supra*. Columns "II" indicate successful prediction: Section 500(b) applied to the one hundred bankrupt corporations one year prior to bankruptcy.

[114] Calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982).

[115] Calculated under *id.* § 500(b)(2). Only ninety-eight bankrupt corporations were analyzed, because one of the three bankrupt corporations in Mining and one of the six bankrupt corporations in Transportation, Communication and other Public Utilities did not classify assets into total and current. Therefore, the numbers successfully predicted under these categories by the one-to-one current ratio (two and five respectively) represent 100% of the financial statements examined.

[116] *Id.* § 500(b). The total and current ratios combined.

The number of bankrupt corporations in each of the ten industrial categories of Table 5 is not large enough in all cases to permit definitive conclusions. Nevertheless, some trends may be discerned. First, in most industrial categories, the higher the rate of overprediction, the higher the rate of successful prediction.[117] The most extreme case is the finance, insurance, and real estate category, which under Section 500(b) resulted in the highest rate of both overprediction (44.07%) and successful prediction (100%). Although this category is not inherently more unstable than the others, high rates of successful prediction and overprediction should be fully expected, because these industries normally maintain high debt-to-equity ratios.[118]

The above trend has one notable exception. The overprediction rate of Section 500(b) for manufacturing corporations was the lowest rate found in the study (3.83%, compared with the average of 9.14%), but the successful prediction rate for the same category was slightly above average (70.21%, compared with the average of 68%).[119] This finding attributes relatively high reliability to the operation of Section 500(b) on manufacturing corporations. In contrast, the application of Section 500(b) to retail trade corporations resulted in a below average overprediction rate of 4.53%, but also in a far below average successful prediction rate of 45.83% — results that indicate very little reliability to the operation of Section 500(b) on retail trade corporations.[120]

Second, an examination of Table 5 reveals a possible cause of the

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[117] Compare the results for Mining, Construction, Transportation, and Services (above average rates of overprediction and successful prediction) with the results for Wholesale Trade and Retail Trade (underaverage rates of overprediction and successful prediction).

[118] For example, the average debt-to-equity ratio for U.S. commercial banks in 1973 was 14.2 to 1. D. JACOBS, H. BEIGHLY, & J. BOYD, THE FINANCIAL STRUCTURE OF BANK HOLDING COMPANIES 2 (1975); *see also* Y. ORGLER & B. WOLKOWITZ, BANK CAPITAL 92 (Table 5.1) (1976). This ratio is considered a normal level of risk for the finance industry, but Section 500(b)(1) nevertheless prohibits distributions by all corporations with a debt-to-equity ratio in excess of four-to-one, *see* note 49 *supra*. Section 500(b) therefore discriminates against corporations with high debt financing.

[119] Statistically, however, there is no significant difference between the successful prediction rate for manufacturing corporations and the average successful prediction rate.

[120] The disparity of results between manufacturing and retail trade corporations may be the result of differing patterns of capitalization. Retail trade corporations normally have few fixed assets but many current assets. Manufacturing corporations, in contrast, are characterized by many fixed assets and few current assets due to heavy investment in means of production. But compare the results of Retail Trade with those of Services (77.77% successful prediction and 17.90% overprediction), which are also characterized by relatively more current than fixed assets.

relatively low successful prediction rate (68%) and high overprediction rate (9.14%) of Section 500(b) compared to modern models. Of the 68 bankrupt corporations successfully predicted by Section 500(b) one year prior to bankruptcy, 39, or 57.35%, were detected by *both* the total and current ratios.[121] However, of the 642 financial statements of the solvent control group that were overpredicted by Section 500(b), only 83, or 12.93%, were so misclassified by both ratios.[122] Section 500(b) gives equal weight to the total and current ratios, prohibiting distributions if either ratio test is not met. However, as the above figures indicate, a corporation in financial distress is likely to be detected by both ratios. A financially sound corporation, in contrast, is not likely to be misclassified by both ratios, but may be misclassified nevertheless by one or the other.

The inability of Section 500(b) to modify the weight of the two ratios according to their relevance to different industrial categories, and its further inability to examine the cumulative rather than independent results of the two variables, contribute to its poor predictive powers relative to modern models.[123]

F. The Alternative Retained Earnings Test of California Corporations Code § 500(a)

Section 500(a), the alternative test for distributions, allows a corporation to make distributions up to the amount of its retained earnings[124] without meeting the financial ratio tests of Section 500(b).[125] The unwritten assumption of Section 500(a) is that the presence of retained earnings indicates that the corporation is sufficiently far from financial failure that distributions should be allowed, subject only to the subjective equitable insolvency test of Section 501.[126]

The study tested this assumption and the relevance of retained earnings generally to successful prediction and overprediction of bankruptcy. The following two tables display the results.

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[121] Calculated as follows from the column II totals of Table 5: 57 (total ratio) + 41 + 9 (current ratio) − 68 (CAL. CORP. CODE § 500(b)) = 39, or 57.35% of 68.

[122] Calculated as follows from the column I totals of Table 5: 336 (total ratio) + 236 + 153 (current ratio) − 642 (CAL. CORP. CODE § 500(b)) = 83, or 12.93% of 642.

[123] *See* notes 61-69 and accompanying text *supra*.

[124] For a definition of retained earnings, see note 46 *supra*.

[125] CAL. CORP. CODE § 500(a) (West Supp. 1982), set forth in note 43 *supra*. Hybrid situations may exist as well. If the amount of the proposed distribution exceeds the amount of retained earnings, the corporation will have to meet the tests of Section 500(b) with regard to the excess.

[126] CAL. CORP. CODE § 501 (West 1977), set forth in note 44 *supra*.

TABLE 6

Successful Prediction of Bankruptcy: Section 500(b) Applied to Bankrupt Corporations With and Without Retained Earnings

numbers and (percentage)

Number of Years Prior to Bankruptcy	Number of Corporations Analyzed	Number of Corporations With Retained Earnings	Number of Corporations Without Retained Earnings	TOTAL RATIO[127] Applied to Corporations Without Retained Earnings	CURRENT RATIO[128] Applied to Corporations Without Retained Earnings		CAL. CORP. CODE §500(b)[129] Applied to Corporations:	
					1:1	1¼:1	Without Retained Earnings	With Retained Earnings
One Year	100(100)	34(34)	66(66)	49(49)	38(38)	6(6)	57(57)	11(11)
Two Years	100(100)	63(63)	37(37)	23(23)	15(15)	5(5)	25(25)	15(15)
Three Years	100(100)	74(74)	26(26)	10(10)	7 (7)	3(3)	11(11)	13(13)

[127] Calculated under CAL. CORP. CODE § 500(b)(1) (West Supp. 1982).

[128] Calculated under *id.* § 500(b)(2). Ninety-eight corporations were analyzed, because two corporations did not classify their assets into total and current.

[129] *Id.* § 500(b). The total and current ratios combined. One hundred corporations were analyzed.

TABLE 7

Overprediction of Bankruptcy: Section 500(b) Applied
To Solvent Control Group With and Without Retained Earnings
numbers and (percentage)

Fiscal Year	Number of Financial Statements Examined[130]	TOTAL RATIO[131] Applied to Corporations Without Retained Earnings	CURRENT RATIO[132] Applied to Corporations Without Retained Earnings		CAL. CORP. CODE § 500(b)[133] Applied to Corporations:	
			1:1	1¼:1	Without Retained Earnings	With Retained Earnings
1967	650(100)	3 (0.46)	0 (0.00)	4 (0.62)	35 (5.38)	6 (0.92)
1968	633(100)	6 (0.95)	0 (0.00)	5 (0.79)	46 (7.27)	10 (1.58)
1969	662(100)	10 (1.51)	0 (0.00)	9 (1.36)	42 (6.34)	14 (2.11)
1970	717(100)	16 (2.23)	0 (0.00)	7 (0.98)	53 (7.39)	21 (2.93)
1971	748(100)	20 (2.67)	1 (0.13)	11 (1.47)	50 (6.68)	26 (3.48)
1972	703(100)	15 (2.13)	1 (0.14)	5 (0.71)	54 (7.68)	17 (2.42)
1973	701(100)	19 (2.71)	0 (0.00)	4 (0.57)	43 (6.13)	20 (2.85)
1974	739(100)	16 (2.17)	0 (0.00)	10 (1.35)	51 (6.90)	19 (2.57)
1975	729(100)	15 (2.06)	2 (0.27)	5 (0.69)	51 (7.00)	17 (2.33)
1976	742(100)	13 (1.75)	2 (0.27)	7 (0.94)	52 (7.01)	15 (2.02)
TOTAL	7024(100)	133 (1.89)	6 (0.09)	67 (0.95)	477 (6.79)	165 (2.35)

[130] *See* notes 73-74 *supra*. The study did not record the exact number of financial statements with and without retained earnings for each year examined, although the numbers were in fact ascertained for the purpose of applying Section 500(b). However, the upper and lower bounds were recorded: for the fiscal years examined, the number of financial statements with retained earnings ranged from 92%-98% of the total number of statements examined.

[131] Calculated under CAL. CORP. CODE § 500(b)(1) (West 1982).

[132] Calculated under *id.* § 500(b)(2).

[133] *Id.* § 500(b). The total and current ratios combined.

Table 6 shows that one, two, and three years prior to bankruptcy, 34%, 63%, and 74% of the one hundred bankrupt corporations had retained earnings and would therefore be entitled under Section 500(a) to make distributions in the amount of those earnings.[134]

These results negate the assumption that corporations with retained earnings are, by that measure alone, financially stable. Corporations commonly enter bankruptcy because retained earnings are insufficient to replace resources, including obsolete plant and equipment, which are necessary to sustain profitable operations — a dilemma particularly acute during inflationary periods.[135] Witness, for example, the current troubles of the airline industry, many of whose members cannot afford the new fuel-efficient jets necessary to operate profitably.[136] The problem of plant and equipment renewal may further be exacerbated by sudden changes in credit availability or poor forecasting by management as to the cost of such replacements. Finally, sudden political or market events, labor problems, or even natural disaster may all cause corporations with retained earnings to seek protection in bankruptcy.[137]

Table 6 also shows how the presence of Section 500(a) as an alternative test undermines the overall efficacy of Section 500. Because a cor-

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[134] Note also that the distributions test of Section 500(b) is only marginally more efficient than that of Section 500(a). Almost the same percentage of bankrupt corporations was precluded from making distributions under each section. Compare Table 6 *supra* (percentage of corporations without retained earnings) (66% one year prior to bankruptcy) with Table 2 *supra* (CAL. CORP. CODE § 500(b)) (68% one year prior to bankruptcy).

[135] During inflationary periods, at least part of net earnings after taxes represents an illusion of operating capability, because if too much of earnings is distributed as dividends, the corporation will not retain enough out of revenue to replace expended resources at inflation-increased prices. Inflation increases the possibility that all or more of *real* earnings may be distributed as dividends, a shortfall which conventional accounting does not measure. ARTHUR YOUNG, FINANCIAL REPORTING AND CHANGING PRICES 13 (1980). A recent study by Arthur Young & Co., a leading accounting firm, of 279 nonfinancial corporations reveals that approximately 33% of the corporations distributed more in dividends than they earned, if the corporations' financial statements are analyzed on a constant dollar, current cost basis. *Id.* Analyzed on an historical cost basis — the conventional and legally accepted accounting measure — only 2% of the corporations distributed more than they earned. *Id.*; *see also Is Business Overdoing Dividend Payments?*, BUS. WK., Jan. 10, 1983, at 18.

[136] *See* Welling, *The Airlines' Dilemma: No Cash to Buy Fuel Efficient Jets*, BUS. WK., Sept. 27, 1982, at 65.

[137] However, a study of 7564 business failures in 1979 identifies natural disaster as the underlying cause of only 0.6% of all cases. DUN & BRADSTREET, BUSINESS FAILURE RECORD 12 (1981). The same study identifies managerial incompetence as the leading cause (44.4%) of business failures. *Id.*

poration will rely on Section 500(a) to make distributions to the extent of its retained earnings, it will in practice apply Section 500(b) to its balance sheet only after retained earnings are exhausted. Sections 500(a) and (b), applied as alternative tests to the one hundred bankrupt corporations, achieved a successful prediction rate of 57%, 25%, and 11% for the three years prior to bankruptcy[138] — significantly lower than the overall rate of Section 500(b) alone.[139] Although Section 500(b), as applied only to corporations without retained earnings, achieved a significantly higher successful prediction rate (86.36%, 67.57%, and 42.30% for the three years prior to bankruptcy[140] versus 68%, 40%, and 24% as applied to all bankrupt corporations)[141] and a significantly lower overprediction rate (2.35%[142] versus 9.14% as applied to the entire solvent control group),[143] this improvement is meaningless since it leaves Section 500 without any mechanism whatsoever for predicting bankruptcy among corporations *with* retained earnings.[144]

G. Combining Sections 500(a) and (b): A Proposed Cumulative Test

A simple approach to improving the overall operation of Section 500 would be to change Sections 500(a) and (b) from alternative tests to one cumulative test. The cumulative test would allow distributions only if the corporation both had retained earnings *and* met the financial ratio tests of Section 500(b). The following table displays the rate of success-

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[138] *See* Table 6 *supra* (Section 500(b) applied to corporations without retained earnings). The corporations with retained earnings could make distributions under Section 500(a).

[139] *See* Table 2 *supra.*

[140] *See* Table 6 *supra.* Calculated by dividing the number of corporations without retained earnings that Section 500(b) predicted to go bankrupt by the total number of corporations without retained earnings: 57/66 (86.36%) for year one; 25/37 (67.57%) for year two; 11/26 (42.30%) for year three.

[141] *See* Table 2 *supra.*

[142] *See* Table 7 *supra.*

[143] *See* Table 4 *supra.*

[144] As Table 6 reveals, Section 500(b) displayed at least some predictive power when applied to corporations with retained earnings. Section 500(b) predicted 11 of the 34 bankruptcies, or 32.35%, among corporations with retained earnings one year prior to bankruptcy — much lower than the overall successful prediction rate of 68%, *see* Table 2 *supra.* Similarly, Section 500(b) achieved a successful prediction of 23.80% (15 of 63) two years prior to bankruptcy and 17.56% (13 of 74) three years prior to bankruptcy when applied to bankrupt corporations with retained earnings.

ful bankruptcy prediction of Sections 500(a) and (b), applied separately and cumulatively to the one hundred bankrupt corporations.

TABLE 8

Sections 500(a) and (b) Applied Separately and Cumulatively to One Hundred Bankrupt Corporations
numbers and (percentage)

Number of Years Prior to Bankruptcy	Three years	Two years	One year
Test:			
CAL. CORP. CODE § 500(a)[145]	26 (26.00)	37 (37.00)	66 (66.00)
CAL. CORP. CODE § 500(b)[146]	24 (24.00)	40 (40.00)	68 (68.00)
CAL. CORP. CODE §§ 500(a) and (b)[147]	39 (39.00)	52 (52.00)	77 (77.00)

As Table 8 shows, Sections 500(a) and (b), applied cumulatively to the one hundred bankrupt corporations, resulted in a successful prediction rate of 77%, 52%, and 39% for one, two, and three years prior to bankruptcy — higher than the successful prediction rate of either section alone, especially for two and three years prior to bankruptcy. However, the proposed cumulative test also resulted in an overprediction rate ranging from 8.79% to 14.79% when applied to the solvent control group[148] — somewhat higher than the average overprediction

[145] CAL. CORP. CODE § 500(a) (West Supp. 1982). The number and (percentage) of the one hundred bankrupt corporations without retained earnings. *See* Table 6 *supra.*

[146] CAL. CORP. CODE § 500(b) (West Supp. 1982). *See* Table 2 *supra.*

[147] CAL. CORP. CODE § 500 (West Supp. 1982). Sections 500(a) and (b) applied cumulatively. The numbers were calculated as follows from Table 6 *supra.* For three years prior to bankruptcy, 39 = 26 + 13 (three years prior to bankruptcy, 26 corporations did not have retained earnings; of the remaining 74 corporations with retained earnings, 13 failed to meet the financial ratio tests of Section 500(b)). Similarly, for two years prior to bankruptcy, 52 = 37 + 15, and for one year prior to bankruptcy, 77 = 66 + 11.

[148] Although the study did not determine the exact number of financial statements of the solvent control group with or without retained earnings for each fiscal year, *see* note 130 *supra*, the overall average of financial statements without retained earnings ranged from 2%-8% for the fiscal years analyzed. As applied to the remaining 92%-98% of the financial statements of the solvent control group with retained earnings, Section 500(b) resulted in an average 6.79% overprediction rate. Therefore, the combined test resulted in an overprediction rate ranging from 8.79% to 14.79% (6.79% plus 2%-8%).

rate of 9.14% for Section 500(b) alone.[149]

The choice between Section 500 as it exists and the suggested cumulative test is a matter of policy. If the statute allows a significant number of financially distressed corporations to distribute assets to shareholders, as the study revealed Section 500 to do, then corporate creditors are not adequately protected. Creditors naturally would prefer the more restrictive proposed cumulative test. However, since the cumulative test also increased the overprediction rate at which distributions by financial stable corporations are prohibited, the question is: who should bear the risk, creditors or shareholders?[150] This policy issue is relevant not only in the context of the proposed cumulative test, but also in any future deliberations by the California Legislature on whether to incorporate into the distributions statute a more restrictive model of bankruptcy prediction.

It may be argued that although creditors will incur considerable loss from an underpredictive distributions statute, shareholders' potential loss from an overpredictive statute is minimal and perhaps nonexistent. If a corporation is forced to retain rather than distribute its earnings, shareholders' equity — and the value of the corporation's stock — will likely increase, and the shareholders can then sell part of their appreciated stock if necessary to obtain cash.[151] Conversely, if a corporation

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[149] *See* Table 4 *supra*.

[150] Because the consequence of an overpredictive distributions statute is that a financially healthy corporation will be forced to retain rather than distribute a larger portion of its earnings, creditors will attach less significance to the overprediction rate than will management or shareholders. Creditors presumably will be indifferent to a high overprediction rate, if it accompanies a high successful prediction rate.

This presumed indifference points to the different function of bankruptcy prediction models in the context of a distributions statute. Existing models have been developed primarily for the purpose of credit evaluation by banks and loan institutions. In the context of credit evaluation, banks are concerned not only with successful prediction, to avoid extending credit to failing corporations, but also with overprediction, in order not to discourage credit worthy loan customers. Hence, banks attempting to maximize their loan activity may prefer a model that is slightly underpredictive, if the model also avoids overprediction and its consequent business-retarding effects. In the context of a distributions statute, creditors' priorities are reversed, because a restrictive, overpredictive model will merely force the corporation to retain more assets which will then be available to secure creditors' claims. It may be shareholders, however, who object to an overpredictive statute which denies them the supposed benefits of a liberal distributions policy.

[151] This assumes, of course, that the stock is publicly traded. The case may be otherwise for closely held corporations if no market exists for the stock or if shareholders' agreements restrict transfer of the stock. However, closely held corporations may distribute profits to their shareholders through means other than dividends.

distributes all its excess earnings as cash dividends to shareholders, the value of the corporation's stock is less likely to increase, but shareholders who do not need the cash dividend can reinvest it in the stock in order to increase the value of their holdings. Shareholders, in other words, are not substantially affected by the corporation's decision to retain or distribute earnings. Moreover, if a corporation distributes to shareholders funds that the corporation otherwise needs for investment or expansion, the corporation may recover the needed funds by a new stock issuance that dilutes the shareholders' proportionate equity interests, thereby offsetting the benefit of the distribution.

The likelihood of shareholder indifference to the retention or distribution of corporate earnings is the basis of the theory of "irrelevance" of corporate distribution policy.[152] If the irrelevance theory is accepted, then an overpredictive distributions statute causes no damage to shareholders. But even if the theory is rejected, because, for example, the stock of closely held corporations is not readily marketable,[153] a weighing of the relative interests of the parties justifies a preference for overprediction to underprediction. An overpredictive statute that forces a financially healthy corporation to retain more earnings than is necessary to secure creditors' claims causes cash-needy shareholders the inconvenience of illiquidity, if their stock is not marketable or transferrable, and perhaps the incurrence of brokerage transaction costs in order to market their shares.[154] However, this inconvenience is minor compared to the potentially irreversible and total loss to creditors resulting from an underpredictive statute that allows a financially distressed corporation to distribute to shareholders assets which are needed to guarantee full payment of creditors' claims. In the absence of an ideal model that achieves one hundred percent successful prediction without any overprediction, policy should therefore favor a more restrictive distribution statute, despite any concomitant increase in the

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[152] *See* Miller & Modigliani, *Dividend Policy, Growth and the Valuation of Shares*, 34 J. BUS. 411, 420 (1961). For a debate on the irrelevance theory, compare Fischel, *The Law and Economics of Dividend Policy*, 67 VA. L. REV. 699 (1981) with Brudney, *Dividends, Discretion, and Disclosure*, 66 VA. L. REV. 85 (1980).

[153] *See* note 151 and accompanying text *supra*.

[154] The transaction costs of converting stock to cash, however, may at least partially be offset by the tax savings resulting from disposition of the stock asset at the long-term capital gains rate, *see* 26 U.S.C. §§ 1202(a), 1221, 1222(3), (11) (1976 & Supp. IV 1980), which is lower than the ordinary income rate at which cash dividends are taxed, *see id.* §§ 301(a), (c)(1), 316. *See generally* B. BITTKER & J. EUSTICE, FUNDAMENTALS OF FEDERAL INCOME TAXATION OF CORPORATIONS AND SHAREHOLDERS ¶¶ 7.01-.07 (1980).

overprediction rate.

Furthermore, a more restrictive distributions statute can, in fact, serve the interests of the investing public by alleviating the potential for misuse of distributions. Some scholars argue that despite the supposed "irrelevance" of a corporation's distributions policy, management often favors distribution over retention of corporate earnings because payment of dividends conveys a favorable image of financial stability to the investment public.[155] The danger therefore exists that management will, by an aggressive distributions policy, portray a misleading picture of financial stability to uninformed investors.[156] A restrictive distributions statute would provide uninformed investors with safeguards against such a practice, and would also guarantee generally that corporations maintain sufficient capital to conduct and, when appropriate, expand the business activity for which they were formed.[157]

CONCLUSION

The California Corporations Code presents a modern approach to

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[155] *See, e.g.*, Feldstein & Green, *Why Do Companies Pay Dividends?*, 73 AM. ECON. REV. 17, 18 & n.6 (Mar. 1983); S. Penman, Tests of Dividend-Signaling: A Comparative Analysis (unpublished manuscript, U.C. Berkeley, 1981).

[156] Brudney, note 152 *supra*, at 109-14.

The issue of dividend distributions as an economic signal was investigated after the bankruptcy of the Penn Central Railroad. The investigating committee questioned Penn Central's dividend distribution policies, and determined that dividend payments during the six years preceding bankruptcy were "extremely detrimental to the Railroad and were entirely unjustified." STAFF OF HOUSE COMM. ON BANKING AND CURRENCY, 92d CONG., 1st SESS., THE PENN CENTRAL FAILURE AND THE ROLE OF FINANCIAL INSTITUTIONS 174 (Comm. Print 1972). The Committee suggested that Penn Central's management continued to distribute dividends because it wanted to divert investor attention from the company's losses and at the same time maintain the price of the stock and placate the company's bank creditors, many of whom held large blocks of Penn Central stock. *Id.*

[157] *See Is Business Overdoing Dividend Payments?*, BUS. WK., Jan. 10, 1983, at 18. A recent study by Salomon Brothers concludes that even in the face of recession and slumping profits, corporations have attempted to maintain dividend payments to shareholders in order to protect the market value of their stock. The study shows that during the 1982 recession, dividend payments amounted to 63% of corporate profits, far higher than the 48% in the 1973-1975 recession, and close to the record level of 67% in the 1970 recession. The study finds this higher payout alarming because corporate balance sheets are weaker today than in past recessions. *Id.*

The distribution of such a high percentage of corporate profits poses two problems. First, by not using earnings to retire debt, corporations keep credit demands and interest rates high. Second, by not retaining earnings, corporations weaken their ability to invest when an economic recovery comes. *Id.*

the regulation of distributions to shareholders. Section 500(b)'s use of a bankruptcy prediction model to detect financial distress and prohibit distributions before the onset of insolvency is a practical, economic method of governing distributions and protecting creditors. However, as the empirical study revealed, the simple model contained in Section 500(b) fails to achieve a successful prediction rate high enough to offer meaningful protection to creditors. Moreover, because Sections 500(a) and (b) exist as alternative tests, the overall protection of Section 500 is very poor indeed, and prudent creditors may be expected to seek alternative, nonstatutory means of protection.

The California Legislature, as a short-term solution, should combine the alternative tests of Section 500 into one cumulative test, on the assumption that the significant additional protection thereby obtained for creditors justifies any marginal loss of convenience to shareholders. In the future, the legislature should incorporate into the distributions statutes a more sophisticated model of bankruptcy prediction which, based on a diverse set of predictors, will take into account the industrial category of the corporation and evaluate business trends across several financial statements. Such a model can best achieve the goals of distributions law.

APPENDIX A[158]

The three groups were compared in the following order: Group I to Group II; Group II to Group III; and Group I to Group III.

The null hypothesis assumes that the prediction rate of Section 500(b) will be the same for all three groups. For example, assume that the parameter θ — the statistical hypothesis to be tested — has the value of 2. Denote the null hypothesis by H_0. Let H_1 denote the alternative hypothesis (the parameter θ different from 2). The alternative hypothesis assumes that the prediction rate is better for small than for large corporations. This alternative was selected because of the mean difference between the groups evidenced by Table 3 *supra*. Thus, the problem is one of testing the H_0 against H_1.

Mathematical presentation of the assumptions:

$H_0:\pi_1=\pi_2=\pi_3$, where i is the proportion of successful bankruptcy prediction for the general population of bankrupt corporations. For the first comparison, $H_1:\pi_1>\pi_2$; for the second comparison, $H_1:\pi_2>\pi_3$; and for the third comparison, $H_1:\pi_1>\pi_3$.

Let:

$\bar{X}i$ = The mean probability prediction rate of sample group i (where i = I, II, III)

Si = The standard deviation of sample group i (where i = I, II, III)

The issue to be analyzed is whether or not a corporation will be accurately predicted to go bankrupt. This can be presented by a 0-1 variable.

Let the event "prediction of bankruptcy" be the A event, so:

$X_j = 1$, if bankruptcy was successfully predicted; and

$X_j = 0$, if bankruptcy was not predicted.

The sample parameters are:

$\bar{X}_I = P_I = 0.727$; $\qquad S_I = P_I\,(1\text{-}P_I) = 0.445$;

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[158] *See* note 103 and accompanying text *supra*.

$$\bar{X}_{II} = P_{II} = 0.676; \qquad S_{II} = P_{II}(1-P_{II}) = 0.468;$$

$$\bar{X}_{III} = P_{III} = 0.636; \qquad S_{III} = P_{III}(1-P_{III}) = 0.481,$$

when P_i equals the proportion of predicted bankruptcies in sample group i (where i = I, II, III) and 1 - P_i equals the proportion of unpredicted bankruptcies in sample group i.[159]

If the standard deviation[160] of the general population of bankrupt corporations were known, the standardized values (Z) for the sample proportions could be computed by using the Central Limit Theorem[161] and compared to the critical values (Z_{cr}) from the Standard Normal Cumulative Probability Table in order to test the hypothesis.

However, the standard deviation of the general population of bankrupt corporations is unknown. Using the Central Limit Theorem and the standard deviation estimate, instead of the standard deviation, one is able to test the hypothesis. The test is done by computing the t values for the sample porportions and comparing them to the critical values from the t Distribution Table.[162] If the computed t is smaller than the critical t (t_{cr}), the alternative hypothesis (H_1) is rejected for a given accuracy level. Alternatively, if t is larger than t_{cr}, the null hypothesis is rejected for a given accuracy level.

The formula for calculating the computed t value is:

$$t = \frac{(\bar{X}_i - \bar{X}_j) - (\pi_i - \pi_j)}{\sqrt{\frac{S_i^2}{n_i} + \frac{S_j^2}{n_j}}}$$

for the case when the alternative hypothesis (H_1) is $\pi_i > \pi_j$, and the value of $\pi_i - \pi_j$ is zero, as yielded by the null hypothesis.

The choices of confidence level are 0.99 and 0.95. The degrees of freedom (there are n - 1 degrees of freedom in a sample of n observations) are 65 for the comparison of Groups I and II, and Groups II and III; and 64 for the comparison of Groups I and III. For these degrees

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[159] *See* T. WONNACOTT & R. WONNACOTT, note 103 *supra*, at 167.

[160] The standard deviation is a measure of the variance of the variable values from the calculated mean of the entire population. *See id.* at 22-25.

[161] The Central Limit Theorem states that as the sample size increases, the distribution of the mean of a random sample taken from almost any population approaches a normal distribution. *Id.* at 151-55.

[162] For the t Distribution Table, see *id.* at 712.

of freedom the difference between the relevant t values for these given confidence levels are immaterial. Thus, the same t values are used for all comparisons. The relevant t_{cr} for these confidence levels according to the t Distribution Table are:

$t_{.01} = 2.39$ for confidence level of 0.99

$t_{.05} = 1.671$ for confidence level of 0.95.

Calculation of the t values:

1. For Group I v. Group II, t = .455, as follows:

$H_0: \pi_1 = \pi_2$

$H_1: \pi_1 > \pi_2$

$\bar{X}_I = 0.727 \qquad S_I = 0.445 \qquad n_I = 33$

$\bar{X}_{II} = 0.676 \qquad S_{II} = 0.468 \qquad n_{II} = 34$

$$t = \frac{(0.727 - 0.676) - 0}{\sqrt{\frac{0.445^2}{33} + \frac{0.468^2}{34}}}$$

$$t = \frac{0.051}{0.112} = 0.455$$

2. For Group II v. Group III, t = .345, as follows:

$H_0: \pi_2 = \pi_3$

$H_1: \pi_2 > \pi_3$

$\bar{X}_{II} = 0.676 \qquad S_{II} = 0.468 \qquad n_{II} = 34$

$\bar{X}_{III} = 0.636 \qquad S_{III} = 0.481 \qquad n_{III} = 33$

$$t = \frac{(0.676 - 0.636) - 0}{\sqrt{\frac{0.468^2}{34} + \frac{0.481^2}{33}}}$$

$$t = \frac{0.04}{0.116} = 0.345$$

3. For Group I v. Group III, t = .798, as follows:

$H_0: \pi_1 = \pi_3$

$H_1: \pi_1 > \pi_3$

$\overline{X}_I = 0.727 \qquad S_I = 0.445 \qquad n_I = 33$

$\overline{X}_{III} = 0.636 \qquad S_{III} = 0.481 \qquad n_{III} = 33$

$$t = \frac{(0.727 - 0.636) - 0}{\sqrt{\frac{0.445^2}{33} + \frac{0.481^2}{33}}}$$

$$t = \frac{0.091}{0.114} = 0.798$$

In each of the three comparisons, the value obtained for t is smaller than $t_{.01}$ and $t_{.05}$. Therefore, the null hypothesis is not rejected. The conclusion is that Section 500(b) does not predict bankruptcy significantly better or worse, in a statistical sense, for corporations of a particular size.

APPENDIX B[163]

The bounds of the confidence interval were determined by applying the following formula:

Let:

$\overline{X}$ = proportion of successful prediction in a sample of size n

S = standard deviation of the sample

π = the proportion of the one hundred bankrupt corporations successfully predicted for a confidence level of 0.99

$$\overline{X} - t_{.005}\frac{S}{\sqrt{n}} < \pi < \overline{X} + t_{.005}\frac{S}{\sqrt{n}}$$

$$0.68 - 2.617\frac{0.68-0.32}{100} < \pi < 0.68 + 2.617\frac{0.68-0.32}{100}$$

$$0.558 < \pi < 0.802$$

The same test was conducted under a confidence level of 0.95:

$$\overline{X} - t_{.025}\frac{S}{\sqrt{n}} < \pi < \overline{X} + t_{.025}\frac{S}{\sqrt{n}}$$

$$0.68 - 1.98\sqrt{\frac{0.68-0.32}{100}} < \pi < 0.68 + 1.98\sqrt{\frac{0.68-0.32}{100}}$$

$$0.588 < \pi < 0.772$$

[163] *See* note 90 and accompanying text *supra*.