ASSET/LIABILITY MANAGEMENT: BEYOND INTEREST RATE RISK

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ABSTRACT

This paper addresses three questions typically neglected by proponents of asset/liability management. First, from a management perspective, which focuses on GAAP and statutory measures of profitability and net worth, is asset/liability management worthwhile? Second, does a company's balance sheet fully reflect the assets and liabilities that should be managed? Third, what risks should be the focus of asset/liability management?

The paper makes three principal arguments. First, asset/liability management contributes to a company's surplus growth, whether measured by GAAP, statutory, or economic criteria. Second, asset/liability management should explicitly take into account a company's franchise value -- the value of expected profit from future business. Third, asset/liability management must deal with more than just interest rate risk, more than just bonds, and more than a given set of liabilities. It's aim should be to assist management in designing their company's balance sheet, viewed as a portfolio of interdependent risks, so as to maximize the company's achievable rate of surplus growth.

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In late 1979 the Federal Reserve abandoned its policy of pegging interest rates and began instead to focus on monetary growth and exchange rates. The resulting increase in interest rate volatility is easily seen in Exhibit 1, which displays the one-month total return (accrued interest plus capital gains or losses) on ten-year treasuries. The market value of ten-year bonds has fallen by as much as six to eight percent in a single month, and daily gains or losses approaching two percent are now common.

Since insurers' profits depend directly upon the rates of return at which they invest premium receipts, such increased volatility has made insurance a financially more risky business. When interest rates were stable, sound underwriting practices were the principal guarantee of profitability. But today's volatile interest rates threaten future profitability because an insurer can no longer be certain of investing premium dollars at the rate it anticipated when it priced its product. This problem is especially critical in commercial lines, where investment income is still the principal component of overall profitability.

To reduce their exposure to such financial risk, some insurers have adopted a set of strategies and procedures known as asset/liability management. But the vast literature produced by proponents of asset/liability management has, in my view, neglected several fundamental questions that I shall address here. First, from a management perspective, is asset/liability management worthwhile? Second, what assets and liabilities should be managed? Third, what risks should be the focus of asset/liability management? As the title of my paper implies, I shall conclude that both conceptually and practically, asset/liability management pertains to more than just interest rate risk. To make this argument persuasive to as broad an audience as possible, I shall deliberately be nontechnical.

I. FROM A MANAGEMENT PERSPECTIVE, IS ASSET/LIABILITY MANAGEMENT WORTHWHILE?

Historically, property-casualty insurers have operated as if underwriting and investment were relatively independent activities. The essence of asset/liability management lies in coordinating these two activities to reduce the overall risk exposure of the firm. Such coordination is costly and inconvenient: it requires staff, training, software, and executive time, and it necessarily reduces the autonomy of the individuals and departments concerned. It is therefore quite reasonable for senior managers to ask whether the prospective benefits of asset/liability management outweigh the costs of such a program.

The affirmative answer most frequently offered by proponents of asset/liability management rests upon a premise that senior managers typically do not share, namely, that a company's net worth or surplus is best measured by the economic value of the company's balance sheet, defined as the market value of its assets less the present value of its liabilities, discounted at market yields. In this view, the present value of liabilities indicates the market value of assets needed to fund currently known or estimated future cash outflows. For example, when interest rates are low, more market-valued assets are required to pay off a given set of future liability cash flows than when rates are high. Net worth is therefore the difference between the market-valued assets owned by the company and those it needs to fund its liabilities. Changes in interest rates alter both of these market values. The essence of asset/liability management consists in coordinating the composition of assets and liabilities so that the difference between these two market values either remains constant when interest rates change or else is subject to a planned degree of exposure to risk. From this perspective, the net worth of

a company is affected both by capital gains or losses in its bond (and equity) portfolio, whether realized or not, as well as by the corresponding implicit capital losses or gains in the market value of its liabilities.

Managers, by contrast, are accustomed to viewing their company's performance and net worth in terms of GAAP or statutory accounting measures, both of which permit bonds to be carried on the company's balance sheet at their amortized book value. Since book value and market value coincide when the bond matures, and since most insurers hold their bonds to maturity, managers tend to consider unrealized capital gains or losses as relatively unimportant, although at times quite inconvenient. Furthermore, conventional accounting requires that liabilities be reported at their nominal values, and recognizes investment income only as it is accrued. This effectively conceals changes both in the amount of assets required and in the assets available to pay off liabilities.

When interest rates were low and stable, these differences between economic and accounting measures of net worth and return on equity were insignificant. But higher rates and increased rate volatility created a substantial gap between them. Even though higher rates forced managers to price their business based on market rates of investment return, conventional accounting still conceals from them the economic consequences for their companies of the highly volatile prices and yields typical of today's financial market. Conventional accounting thus predisposes managers to view their business in a way that obscures the financial risks that appear so evident to proponents of asset/liability management. Given these divergent points of view, how can the proponents of asset/liability management state their case in a way that is persuasive to the senior managers of their companies?

The answer -- or at least one answer -- consists in demonstrating to

managers the long-term consequences of risk for their company. This answer assumes that managers can agree on three essential premises. The first is that the corporate objective is to maximize its capital growth rate, by which I mean its long-run return on equity, the rate of growth of its net worth or surplus. The second is that the corporate return on equity will fluctuate from one year to the next in response to changes in interest rates, as well as changes in loss ratios, expense ratios, and the like. For example, even from a GAAP or statutory point of view, the investment income received on new cash will change with interest rates. Third, the long-run rate of return on equity will be approximately the same whether it is measured on a GAAP, statutory, or economic basis. Although each will produce different measures of return for a given year, over a series of years the timing differences that render them distinctive will gradually disappear, so that they converge to a single overall rate of growth.

Given these premises, the worth of asset/liability management can be demonstrated either mathematically or, as I've chosen here, in the form of the following story about two insurance companies. The unofficial motto of the Reckless Company, was "No risk, no reward." By taking on considerable risk, it was able to reap the reward of a high average return on equity. Risk had its cost, of course, in an economic return that fluctuated markedly from one year to the next. In some years profits were very very good, but in others they were terrible. However, by creative accounting, the managers were able to smooth out their reported earnings, taking capital gains and underreserving in bad years, and overly strengthening reserves during good years. The result was a record of which the CEO was proud, for when good years and bad years were averaged, the Reckless Company's yearly return on equity was a stunning 20%.

The Careful Company, was by contrast less aggressive but more predictable.

It attempted to minimize its risk, estimated its losses conservatively and consistently, and recognized capital gains only as an incidental consequence of occasionally restructuring its investment portfolio. The consequence was a return on equity that averaged 15% -- a few points better in some years, a few points worse in others.

Now the CEO of the Reckless Company paid little attention to his rival until one afternoon when the Careful Company's annual report crossed his desk. He recalled, as he picked up the report, that both companies had been founded in the same year, with the same initial capitalization, and both retained all their earnings. "It's really not nice to gloat," he thought to himself as he turned to the financials. Suddenly he stiffened. "How can this be?" he asked himself, astonished at what he had found. For before him, with supporting data that resisted all denial, was the inconceivable: despite its lower annual return, the Careful Company's net worth now exceeded the Reckless's, and by a considerable margin.

Now this story, like Aesop's fable of the tortoise and the hare, has an important moral. But first let's look at the data that startled the Reckless Company's CEO [Exhibit 2]. Here are the annual returns for the Careful Company and the Reckless Company for selected years. The return on equity is calculated on an economic basis, but recall that over a multi-year period GAAP, statutory, and economic measures of return will converge. Exhibit 3 shows the yearly net worth of each company over the full thirty-year period. At the end of thirty years the Careful Company's net worth clearly exceeds the Reckless Company's, but the difference is noticeable after only four or six years. The CEO's question is pertinent: how can this be, since the Reckless Company's annual return on equity averaged 5% better than that of the Careful Company?

Now some readers may wonder whether this example has been rigged in some

way. For example, they may recall that neither firm paid stockholder dividends, or note in Exhibit 3 that for both firms good and bad years alternate one after the other. But in fact, neither dividends or the length of the underwriting cycle is crucial to this example. Introducing these complexities would obscure the end result but not fundamentally alter it. Readers who are still not convinced are invited to spend ten minutes with a spreadsheet to verify it for themselves.

The real answer lies in the difference between average return and compound growth. I was recently reminded of this difference by a friend who invested a considerable sum in the stock market two years ago. When I asked him how his money was doing, he proudly reported, "Well, I lost 50% the first year, but I'm up 100% this year, so my average return is 25%, which isn't bad at all." Now although my friend had correctly calculated his average return, he ignored an important fact: if each $100 that he invested had fallen in value to $50 after one year, the second year's return of 100% merely brought its value back up from this lower base to its initial value of $100. Since he ended with the same amount with which he began, the compound growth rate of his investment was actually zero.

The fact that the Reckless Company had the higher average return was similarly irrelevant. What was crucial to the outcome was its capital growth rate, which was reduced by the company's high risk. The Careful Company, by effectively managing its risk, was therefore able to grow faster than the Reckless Company, despite the latter's higher average return. Thus, although risk -- variability in return -- has no effect on a company's average yearly return, it reduces the compound growth rate of a company's net worth -- the company's capital growth rate. The greater the risk, the lower the growth rate.

This point is so important that it deserves a more complete demonstration, illustrated in Exhibit 4. Suppose that each line on the table represents a different insurance company, and that for each company good years and bad years are equally probable. Each company's return on equity in bad years is shown in the first column, and its return on good years in the second column. All these companies have the same yearly expected or average return of 15%, as shown in column three. Column four shows the difference or "spread" between good years and bad years -- a crude measure of risk. The last column shows the resulting capital growth rate -- the long-run rate at which each company's net worth will grow.

What is crucial here is that all the companies have the same yearly expected return. But only for the first company, which has no risk at all, is the long-run growth rate of surplus identical to the yearly expected rate. As we go down the table to companies with greater risk, the long-run growth rate decreases, and eventually becomes negative. This fact is shown in Exhibit 5, where each company's long-run growth rate is plotted against its risk, crudely measured by the high-low spread.

Now here's why all this is so important. I began by explaining how conventional accounting predisposes managers to question the value of asset/liability management and asked how they might nonetheless be persuaded of its worth. The answer I've proposed rests upon the premise that their objective is to maximize the rate at which their company's surplus or net worth grows. If that is so, then these examples demonstrate that risk reduces that rate of growth. Asset/liability management is worthwhile because, by permitting a company to measure and control its exposure to risk, it increases the rate at which the company's net worth grows. Over a series of years -- and a short series at that -- asset/liability management contributes to a company's

surplus growth, however it is measured.

Although this point may not seem very original to those who are already convinced, it has one further implication to which I will return later on. In the meantime, let me turn to the second question I've posed.

II. WHAT ASSETS AND LIABILITIES SHOULD BE MANAGED?

A fact nearly always neglected by proponents of asset/liability management is that the conventional balance sheet for a company may not fully reflect its real assets and liabilities. To see why, let's look at the balance sheet of a hypothetical P/C company [Exhibit 6]. On January 1 of every year this company writes $1000 of premiums, for which it is paid a few days later, and every year it has incurred losses of $700 and expenses of $300. (All numbers are in thousands, by the way.) This balance sheet is for January 1. On the liability side, the company has an unearned premium reserve of $1000 for the policies it just wrote, and a loss reserve from prior years' incurred losses, since its loss payout curve extends over ten or so years. Its net worth is $500. On the asset side it has premiums receivable of $1000 for the policies just written, bonds with a book value of $1196, and cash of $704.

Now it so happens that this company's balance sheet is perfectly immunized -- that is, fully protected against interest rate risk. We can see this in two ways. First, if we look at the discounted balance sheet at the bottom of Exhibit 6, which shows present values rather than nominal ones, we see that the present value of the reserves on the liability side just equals the combined value of the receivables and bonds on the asset side, and net worth is offset by cash. Second, if we look at the actual cash flows themselves over time, as shown in Exhibit 7, we see that the positive net cash flows from investment (bonds and receivables, but not cash) exactly match the negative net cash flows

from underwriting. These underwriting cash flows include payments from the loss reserve, expected payments from future incurred losses and expenses on the policies just written, and premium receipts. When future cash inflows are perfectly matched to future cash outflows, as in this case, the balance sheet is perfectly protected not only against general up or down changes in interest rates, but also against twists in the yield curve.

There are two problems here that I'll just mention but not discuss. One is that underwriting cash flows are not perfectly predictable. The timing and magnitude of premium, loss, and expense payments can only be approximated. Consequently, immunization can likewise be only approximate. The second is that immunizing the whole balance sheet may not be sensible, since this requires that surplus be invested in short-term (and normally low-yielding) securities. (This problem is obscured here, since I've assumed a flat yield curve.) Investing corporate surplus in securities with longer durations would increase investment income but involve some risk. But the whole point of asset/liability management is to choose an appropriate trade-off between risk and return, not to avoid risk entirely.

The more serious problem that I do want to discuss is that this company's balance sheet is misleading. Here is a company that has immunized its balance sheet to protect its net worth from interest rate risk, and the discounted balance sheet shows its net worth to be $704. But remember that asset/liability management deals with the real economic value of a company's assets and liabilities. Is $704 this company's real net worth? There is a simple way to find out. Ask yourself how much you would be willing to pay to acquire this company. If you are like me, it would be more than $704.

Why? Because $704 is what the company would be worth only if it were liquidated and sold no more insurance. In fact, however, it is an ongoing

concern with prospective future earnings that you and I would value in addition to the assets and liabilities already on its books. Suppose we valued these future earnings at, say, $200. If we then acquired this hypothetical company for $900, we would add its assets and liabilities to those of our own company. But we would also add to the assets on our balance sheet, as goodwill, the $400 difference between what we paid for the company and its nominal net worth. Half of this goodwill would reflect the prospective earnings from business already on its books: the additional $204 in net worth that we found when we discounted the company's balance sheet. But the other half would represent the value we placed on business the company has not yet written. This value is real. The irony is that it doesn't appear on a balance sheet unless the company is acquired.

There is an important choice here. What assets and liabilities do we manage? Do we manage only those that show up on a conventional balance sheet, and thereby treat the company as if it were going to liquidate? Or do we also take into account the hidden assets and liabilities that reflect the company's value as a going concern?

This choice has important consequences for asset/liability management. Let me show why. Suppose we opted to treat this hypothetical company as a going concern, and reconstructed its balance sheet to reflect, say, three additional years of business not yet written. This result is shown in Exhibit 8. On the nominal balance sheet at the top, receivable premiums increase by $3000, as does the unearned premium reserve. Nominal net worth therefore remains unchanged. But the discounted values of these two items, shown at the bottom of the exhibit, are different. The unearned premium reserve number now reflects only the discounted value of the expected future losses and expenses associated with the three future years of business, while the discounted

premiums receivable now includes the present value of the three years of premium payments. Since these discounted future premiums are worth more than the additional discounted losses and expenses, net worth goes up as well. Note that I've left the investment portfolio, bonds and cash, *unchanged*. *If we opt* to treat the company as a going concern then this augmented balance sheet, or one similar to it, becomes the basis for asset/liability management.

Now let's look at the practical consequences of treating the firm as an ongoing concern. Recall that the original balance sheet, which reflected the liquidation value of the firm, was immunized: cash flows from underwriting were exactly matched by those from investment. But the cash flows implicit in this augmented balance sheet, shown on Exhibit 9, are strikingly different. Net cash flow from underwriting is now zero for the next three years, because the expected premiums from new business just equal the expected payments from the loss reserve, for new expenses, and for newly incurred losses.

The important consequence of treating the firm as an ongoing concern is that the new balance sheet is no longer immunized, for underwriting and investment cash flows are markedly mismatched. The duration or maturity structure of the investment portfolio is now too short relative to insurance assets and liabilities. The degree of mismatch would be even greater had we included more than just three years of future business.

In sum, asset/liability management requires a choice between treating the firm as if it were liquidating, or treating it as an ongoing concern. If we treat the firm as an ongoing concern, then we must augment its current balance sheet by adding to it assets and liabilities from future business not yet written. Although these additional assets and liabilities are not recognized by current accounting conventions, except when the firm is acquired, they are nonetheless real and are reflected in the firm's market value. In general,

treating the firm as an ongoing concern requires an investment portfolio with a longer duration than would otherwise be the case.

I say "in general" because the effect of interest rate changes on net worth is more complicated when we are considering expected cash flows from future business. The reason is that when interest rates change, management will respond in ways that change these expected future cash flows. When interest rates go down, so do insurance profits. Management will therefore tend to respond to a fall in rates by increasing the premium on that future business, and this response will change the future cash flows. When it comes to future business, then, the relationship between interest rates and net worth is no longer simple. Changes in interest rates will produce a management response that will in turn alter the future cash flows. However, the management response will itself depend on what their regulators, customers, and competing firms are doing at the same time. The relationship of interest rates to net worth is therefore much more complicated.

None of this is news to life companies, by the way. A few years ago their cash flow projections and carefully managed balance sheets were thrown into total disarray when interest rates rose. Their customers suddenly found themselves able to borrow the cash value of their life insurance policies at 4% interest and invest it in CD's at much higher rates. Cash flow projections ignored this likely response to higher rates only at considerable peril to the companies affected.

If future underwriting cash flows themselves change in response to changes in rates, asset/liability management requires a more sophisticated model of a company's balance sheet. Such a model must not only take into account expected cash flows from business not yet written; it must also project how these cash flow might themselves change as managers, customers, and competitors respond to

changes in interest rates and other factors. But once such a model is developed, asset/liability management can assist not only in reducing risk, but also in developing strategies the give management maximum flexibility in responding to changes in the economic environment.

III. BEYOND INTEREST RATE RISK

Until recently, asset/liability management has been applied principally to pension funds and to certain life company operations. As a consequence, much of what's been written on the subject gives the impression that asset/liability management consists in adapting a bond portfolio to a given set of liabilities so as to control interest rate risk. For property-casualty companies this impression is misleading on three counts. First, asset/liability management requires dealing with other risks besides interest rate risk. Second, it applies as much to equities as to bonds. Third, it requires managing liabilities as well as managing assets. Let's take each of these in turn.

First, asset liability management must deal with more that just interest rate risk. As we've already seen, a company's capital growth rate is influenced by the magnitude of its overall business risk. Although interest rate risk may well be one of the most important components of business risk, it is by no means the only one. Consequently, a company that wishes to maximize its capital growth rate has a compelling reason to deal as effectively as it can with all sources of risk. Indeed, you may have noticed that everything I've stated so far applies to any kind of risk whatever, not just to interest rate risk. A company that manages its assets and liabilities only with regard to interest rate risk is thereby foregoing a valuable opportunity.

But more is at stake here than just lost opportunity. Managing only one kind of risk may in fact increase the sensitivity of a company's balance sheet

to other kinds of risk. To see why, let's return to our hypothetical P/C company and, to make things simple, let's look only at its expected underwriting cash flows for business already written, shown on Exhibit 10. This is the same cash flow profile we saw before in Exhibit 6.

When a company estimates its incurred losses, it implicitly assumes a certain rate of inflation by which claim costs will increase before they are ultimately settled. This assumed rate of inflation is therefore already built in to its estimated loss reserve. But if the rate of inflation increases, so will expected settlement costs. Exhibit 10 shows what will happen to underwriting cash flows if there is a change in the rate of inflation. We call this "adverse loss development." In the 1970's, property-casualty companies learned the hard way that such adverse loss development resulting from inflation is just as damaging to its financial performance as interest rate risk.

Now if the world were simple, so that interest rates always rose or fell in perfect harmony with the inflation rate, there would be a simple solution to this problem. In such a simple world one could construct a bond portfolio that would immunize a company's balance sheet against <u>both</u> interest rate risk and inflation risk. For reasons I won't explain here, such a bond portfolio would have a <u>shorter</u> duration than would net insurance liabilities.

The trouble is that the world is not that simple. Although interest rates and the inflation rate are related, this relationship is by no means perfect. There are leads and lags and gaps between one and the other. The consequence is that in this real world <u>the bond portfolio that is ideal for protecting the balance sheet against interest rate risk may fail to protect it against inflation risk</u>. During some historical periods, immunizing against interest rate risk would have increased balance sheet sensitivity to inflation risk.

One such period was the late 1970's, when the inflation rate increased much faster than did interest rates.

This doesn't mean that protecting a company's balance sheet against interest rate risk is a bad idea. It means that asset/liability management must concern itself with other kinds of risk as well -- inflation risk, for example. Asset/liability management must go beyond interest rate risk.

So how do we go about doing that? How, for example, could our hypothetical company protect itself against adverse loss development from unexpected changes in the rate of inflation? Here is where equities have an important role in asset/liability management. Equities are far more diverse than bonds in their response to changes in the economy. This makes them better instruments than bonds for coping with other sources of risk -- like inflation -- that are only imperfectly correlated with changes in interest rates.

The principle involved is the same, whether one is choosing bonds or stocks. I like to call it the "teeter-totter principle," for reasons that should be evident from Exhibit II, where I've applied it to interest rate risk. In this illustration interest rates are seated on one side of the teeter-totter. Assets and liabilities are seated on the other side, at a distance from the fulcrum that corresponds to their durations (a measure of the sensitive of their market value to changes in interest rates). If interest rates go up, as in the illustration, the economic value of both assets and liabilities will go down by an amount that depends on their distance from the fulcrum. If, as shown here, assets are further from the fulcrum (have a longer duration) than liabilities, their value will go down further than will the value of liabilities, producing an economic loss to the company. The way to minimize the risk of such a loss is to keep assets and liabilities seated close together, so that their economic values are equally sensitive to a rise or fall

in interest rates.

Now let's get back to inflation risk. The teeter-totter principle applies here as well, as shown in Exhibit 12. In this case, the economic value of liabilities rises with increased inflation, since we're holding interest rates constant but increasing future loss payments to reflect greater inflation. But this consequence can be offset by having specific assets whose value likewise increases with the rate of inflation. In Exhibit 12 I've divided assets into two parts: equities whose value rises with inflation, and other assets whose value falls. In this case, the combined change in asset values equals the inflation-induced change in the value of liabilities. In effect, this company has used its equity portfolio to immunize its balance sheet against the risk of adverse loss development resulting from unexpected inflation. Note, however, that not just any equity portfolio will serve this purpose. The portfolio must consist of particular equities -- perhaps energy stocks and real estate -- selected specifically for this purpose.

In principle, then, an equity portfolio can be a conservative component of an insurer's balance sheet, provided that it is selected with the aim of reducing specific sources of business risk. In practice, this means that an equity portfolio should not be selected solely with an eye to its expected return. What must also be considered is the degree to which this equity portfolio reduces or magnifies the company's overall business risk from changes in interest rates, the inflation rate, and other factors as well.

The idea of investing in equities in order to reduce overall risk may at first seem somewhat unusual. But it is consistent with the fact that different risks are not necessarily additive. Selling umbrellas, for example, is risky: no rain, no profit. Selling sunglasses is likewise risky, since sales vary with the amount of sunshine. But combining the two activities into a single

enterprise is less risky than either one taken separately. Thus, whether or not a particular activity or investment -- selling umbrellas or buying equities -- is risky depends upon what other activities or investments are reflected on a company's balance sheet.

My final point is that this conclusion applies to liabilities as well as to assets. The extent to which a particular line of business adds to overall corporate risk depends in part on what other lines of business are present as well. Diversification among multiple lines of business does not necessarily reduce risk, just as selling umbrellas and raincoats is hardly less risky than selling either separately. The aim of asset/liability management consists in part of examining alternative mixes to determine their impact on the company's capital growth rate. In short, its aim must be efficient diversification.

IV. CONCLUSION

I began by posing three questions seldom discussed by proponents of asset/liability management, and I've now reached three main conclusions. First, even from the perspective of managers who adhere to conventional accounting measures of net worth and profitability, asset/liability management is worthwhile because measuring and controlling exposure to risk increases a company's capital growth rate -- the rate at which its net worth increases over time. A company with a high average return on equity, if it fails to manage risk, increases its surplus at a slower rate than a company with a lower average return but less risk. Although this effect shows up clearly in the long run, it is noticeable even over a period of four to six years. Second, in conducting asset/liability management it is important to view a company as an ongoing concern and therefore to take into account assets and liabilities that normally do not appear on a company's balance sheet. Although these assets and

liabilities reflect business not yet written, they are nonetheless real, for they are reflected in the market value of the firm. In taking these hidden assets and liabilities into account, asset/liability management must allow for management responses to future changes in interest rates, inflation, and other variables, and can assist management in designing strategies that have maximum flexibility. Third, asset/liability management must go beyond interest rate risk. It must deal with adverse loss development resulting from inflation, and with other sources of risk as well. To address these other risks it must deal with equities as well as with bonds, for a properly-constructed equity portfolio can reduce risk as well as increasing return. It must likewise deal with the company's insurance line-of-business mix, so as to achieve efficient diversification of risk.

To fully accomplish its aim of increasing a company's capital growth rate, asset/liability management cannot deal piecemeal with particular investments or particular lines of business, for separate risks are not necessarily additive. Whether or not a particular line of business or a particular investment increases or decreases overall business risk depends upon what other assets and liabilities are present on the company's balance sheet. A balance sheet must therefore be managed as an overall portfolio of interdependent risks. The aim of asset/liability management is then to assist in designing that balance sheet portfolio so that its overall combination of risk and return will maximize the achievable rate of capital growth.

ONE-MONTH HOLDING PERIOD RETURN

TEN-YEAR TREASURIES

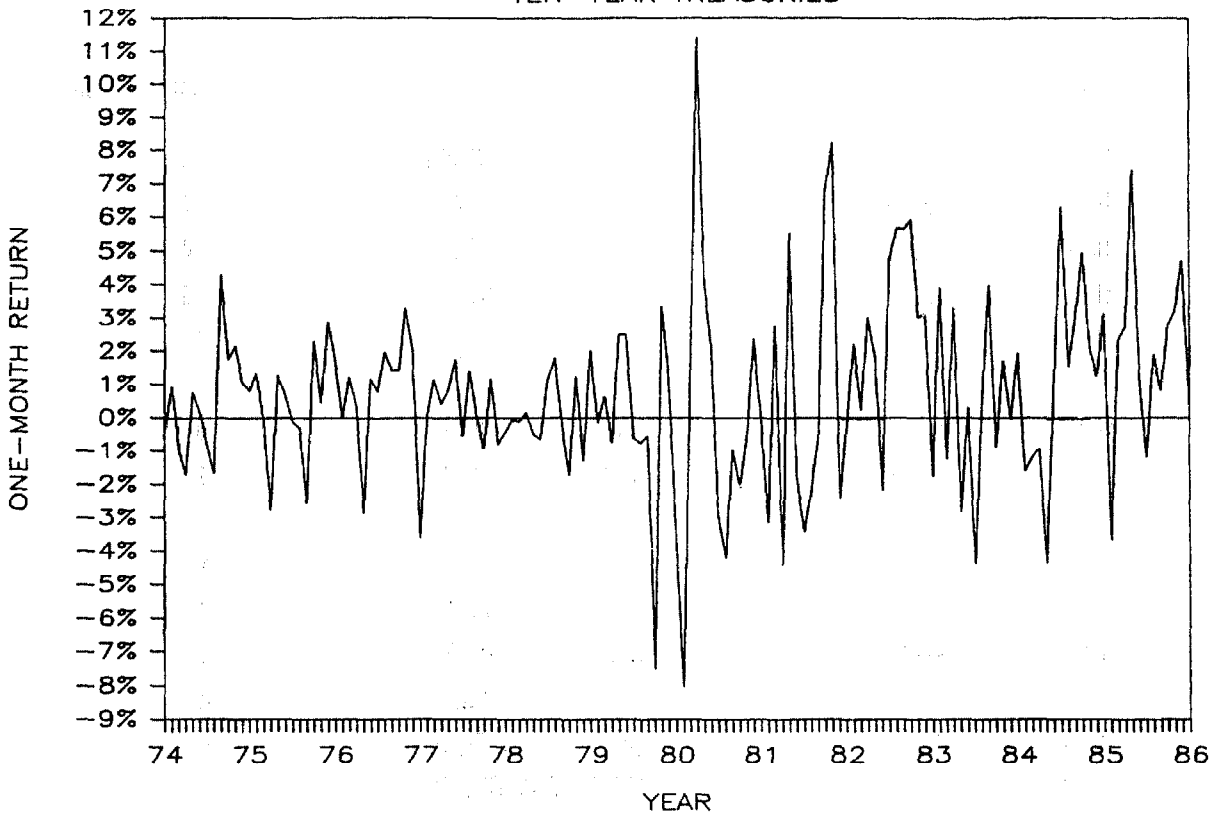


EXHIBIT 1

	CAREFUL		RECKLESS	
YEAR	SURPLUS	ROE	SURPLUS	ROE
0	1000		1000	
1	1250	25%	1600	60%
2	1313	5%	1280	-20%
3	1641	25%	2048	60%
4	1723	5%	1638	-20%
5	2153	25%	2621	60%
6	2261	5%	2097	-20%
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
27	42875	25%	39614	60%
28	45018	5%	31691	-20%
29	56273	25%	50706	60%
30	59087	5%	40565	-20%
AVERAGE ROE		15%		20%

EXHIBIT 2

AVERAGE RETURN VS COMPOUND GROWTH

FOR TWO HYPOTHETICAL FIRMS

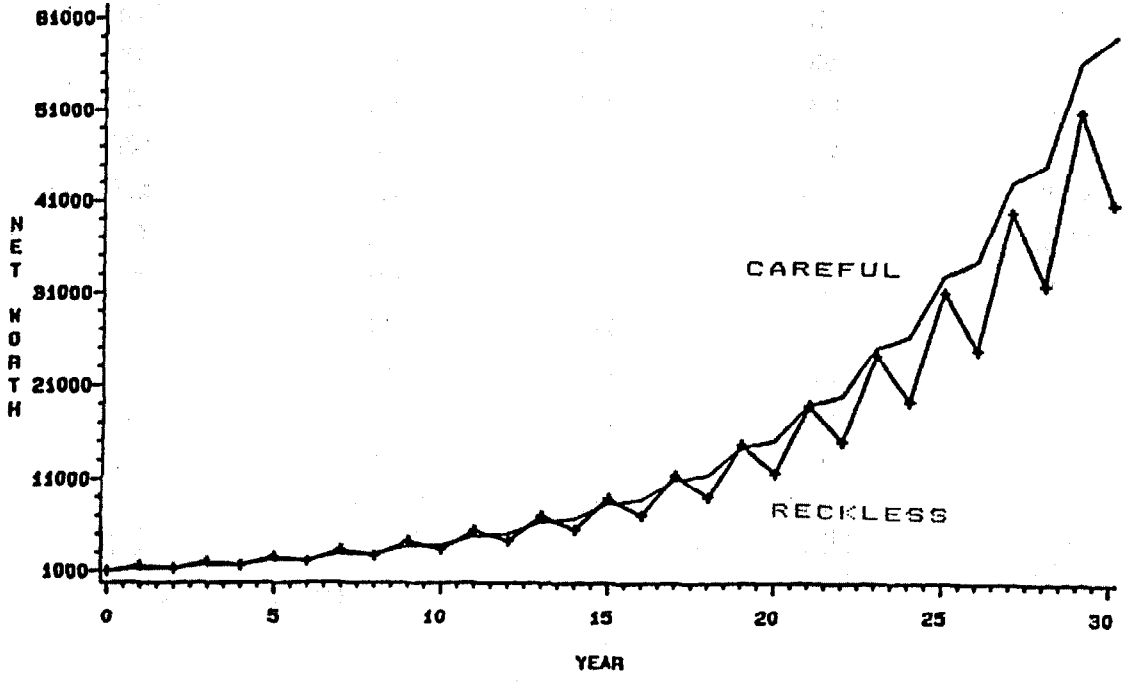


EXHIBIT 3

TABLE 1: LONG-TERM GROWTH RATE RESULTING FROM TARGET EXPECTED RETURN

TARGET EXPECTED RETURN ON EQUITY

15.0%

(EQUALLY PROBABLE) LOW RETURN (L)	HIGH RETURN (H1)	YEARLY EXPECTED RETURN (E1)	YEARLY RETURN "SPREAD" (H1-L)	LONG RUN GROWTH RATE (G1)
15%	15%	15%	0%	15.0%
10%	20%	15%	10%	14.9%
5%	25%	15%	20%	14.6%
0%	30%	15%	30%	14.0%
-5%	35%	15%	40%	13.2%
-10%	40%	15%	50%	12.2%
-15%	45%	15%	60%	11.0%
-20%	50%	15%	70%	9.5%
-25%	55%	15%	80%	7.8%
-30%	60%	15%	90%	5.8%
-35%	65%	15%	100%	3.6%
-40%	70%	15%	110%	1.0%
-45%	75%	15%	120%	-1.9%
-50%	80%	15%	130%	-5.1%

RETURN VARIABILITY LOWERS GROWTH RATE

when expected return is held constant

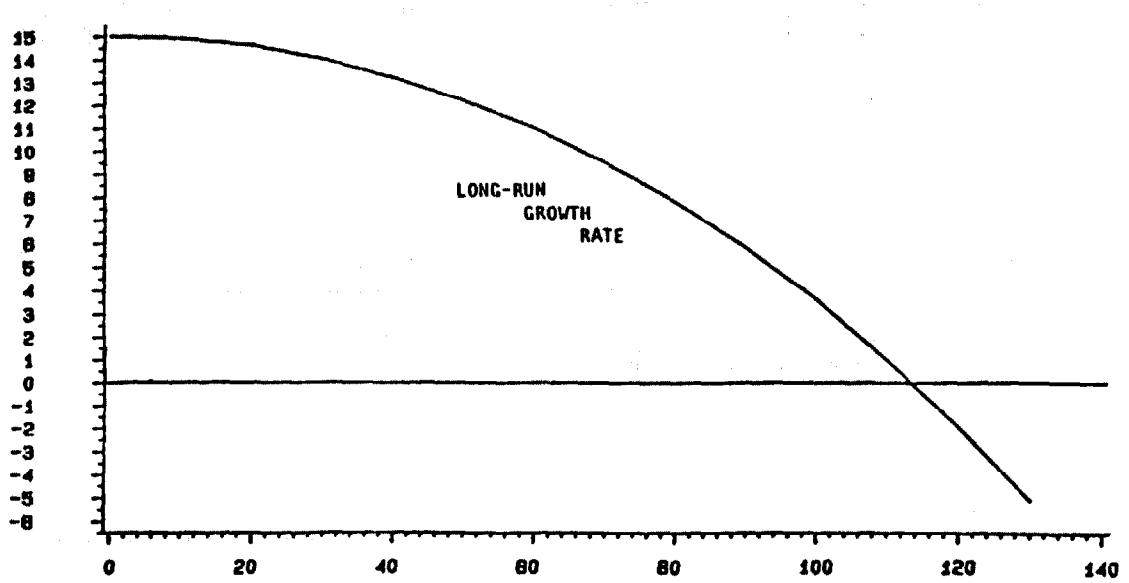


EXHIBIT 5

BALANCE SHEET FOR A HYPOTHETICAL P/C COMPANY

FUTURE YEARS COUNTED:
0

ASSETS (000)		LIABILITIES (000)	
PREMIUMS RECEIVABLE	1,000	UNEARNED PREM RESERVE	1,000
BONDS (BOOK VALUE)	1,196	LOSS/LAE RESERVE	1,400
CASH	704	NET WORTH	500
TOTAL	2,900	TOTAL	2,900

DISCOUNTED VALUES

PREMIUMS RECEIVABLE	1,000	UNEARNED PREM RESERVE	935
BONDS (BOOK VALUE)	1,196	LOSS/LAE RESERVE	1,261
CASH	704	NET WORTH	704
TOTAL	2,900	TOTAL	2,900

INTEREST RATE - B.T.:	10.0%	ANNUAL WRITTEN PREMIUMS:	1,000
FEDERAL TAX RATE:	46.0%	ANNUAL INCURRED LOSSES/LAE	(700)
INTEREST RATE - A.T.:	5.4%	ANNUAL UNDERWRITING EXPENSES	(300)

EXHIBIT 6

CASH FLOWS IMPLIED BY BALANCE SHEET

TOP: INVESTMENT BOTTOM: UNDERWRITING

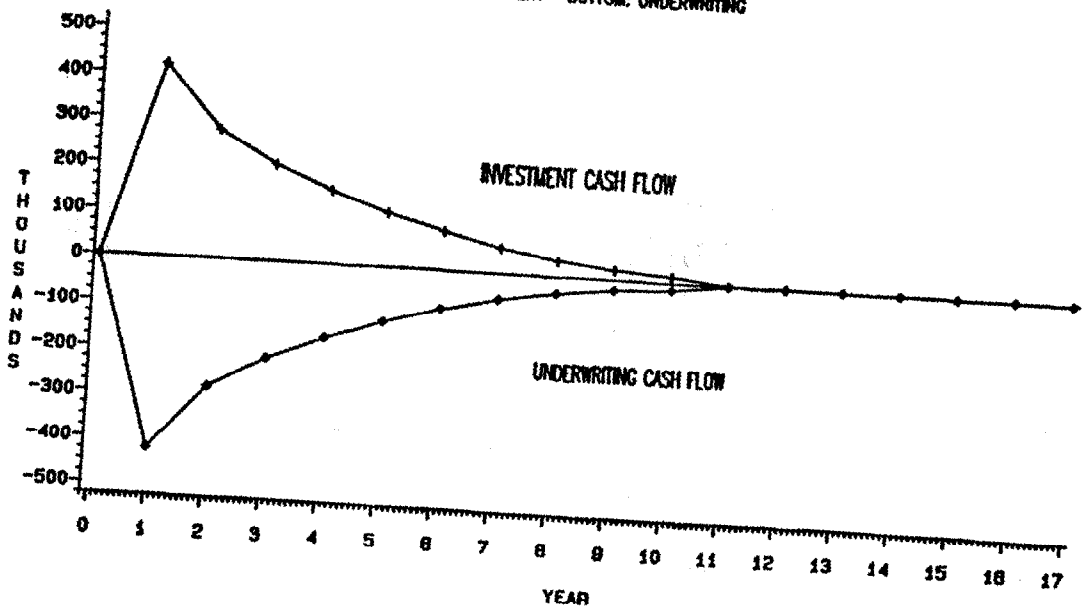


EXHIBIT 7

BALANCE SHEET FOR A HYPOTHETICAL P/C COMPANY

FUTURE YEARS COUNTED:
3

ASSETS (000)		LIABILITIES (000)	
PREMIUMS RECEIVABLE	4,000	UNEARNED PREM RESERVE	4,000
BONDS (BOOK VALUE)	1,196	LOSS/LAE RESERVE	1,400
CASH	704	NET WORTH	500
TOTAL	5,900	TOTAL	5,900

DISCOUNTED VALUES

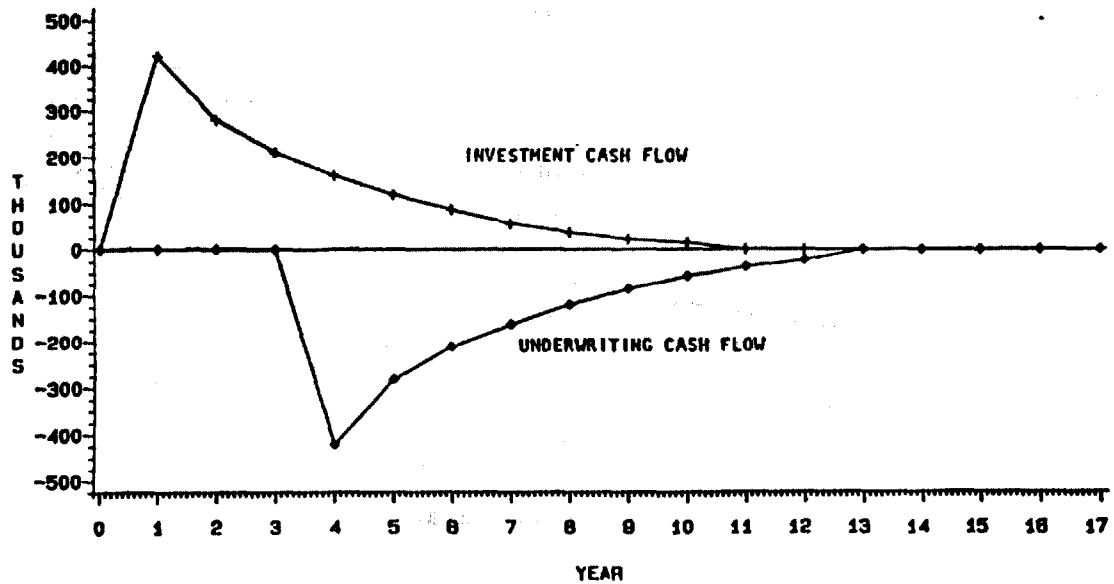
PREMIUMS RECEIVABLE	3,703	UNEARNED PREM RESERVE	3,464
BONDS (BOOK VALUE)	1,196	LOSS/LAE RESERVE	1,261
CASH	704	NET WORTH	879
TOTAL	5,603	TOTAL	5,603

INTEREST RATE - B.T.:	10.0%	ANNUAL WRITTEN PREMIUMS:	1,000
FEDERAL TAX RATE:	46.0%	ANNUAL INCURRED LOSSES/LAE	(700)
INTEREST RATE - A.T.:	5.4%	ANNUAL UNDERWRITING EXPENSES	(300)

EXHIBIT 8

CASH FLOWS IMPLIED BY BALANCE SHEET

TOP: INVESTMENT BOTTOM: UNDERWRITING



CASH FLOWS IMPLIED BY BALANCE SHEET

TOP: INVESTMENT BOTTOM: UNDERWRITING

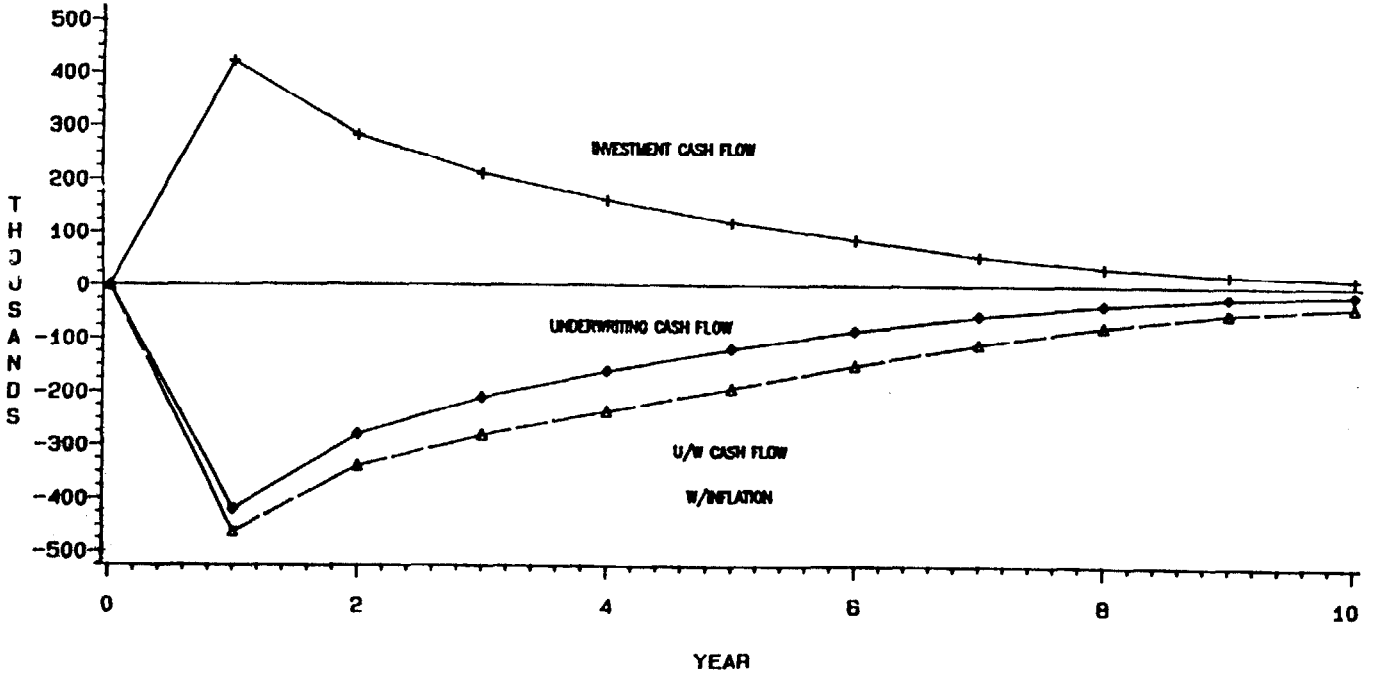


EXHIBIT 10

THE TEETER-TOTTER PRINCIPLE

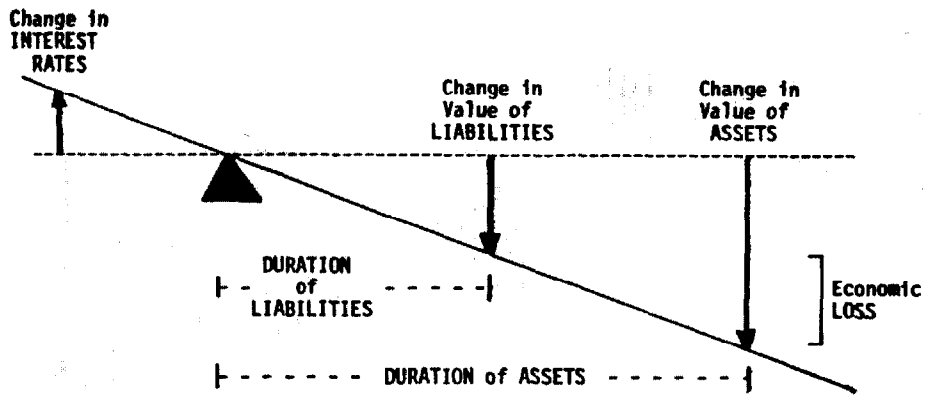


EXHIBIT 11

EXHIBIT 12

THE TEETER-TOTTER PRINCIPLE APPLIED TO INFLATION