EXPERIENCING PRINCIPLES OF FINANCE IN THE CLASSROOM

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ABSTRACT

Learning styles may vary from person to person. Introducing experience into the learning process offers another dimension for the assimilation of important principles of finance. Think of pure lecture as one dimensional learning. Incorporating student dialogue and feedback into the learning experience is two dimensional learning. Crafting classroom experiences that illustrate principles of finance is akin to three dimensional learning. In this paper, the author draws from experiential learning literature and personal experience to present class room tested learning activities that 1) can be adapted and 2) will stimulate further creativity in the design of hands on learning activities by workshop participants.

INTRODUCTION

True learning is a lot like breathing. To breathe is to both take in air and let it out again. Similarly, effectual learning is both the acquisition (inhaling) and application (exhaling) of knowledge. We haven't really learned something until we are able to exercise that learning in appropriate ways. This is why incorporating experiences into the teaching process is so important.

When something is critically important, we are all big believers in experiential learning. If you were facing open heart surgery, would you rather have your surgeon be someone who spent the last ten years attending lectures and reading books and articles on how to perform heart surgery or someone that has spent the last ten years actually doing heart surgery? Ideally, our surgeon would have been doing both.

John Dewey is, ostensibly, the father of experiential education which he brought to the forefront of American educational psychology in 1938 with the publication of his book, "*Experience and Education"*. As of June of 2011, Google shows 9495 citations of that work. More recently, David Kolb has added much to our understanding of the value of experience in learning, particularly as it relates to business disciplines. [1] Kolb argues persuasively that:

> "In the emerging networked world of information-based economies, learning is becoming more important than productivity in determining a person's or an organization's adaptation, survival, and growth. Increasingly complex and service-oriented jobs demand flexibility as a requirement for sanity and success…Experiential Learning Theory helps us to understand learning and flexibility at a deeper and yet more comprehensive level than previously. It also provides guidance for application to helping people improve their learning and designing better processes in education and development.[2]

Personal Reflection

Ten years ago, I had the opportunity to teach business and economic principles to non-business majors during the summer at one of our remote campuses located in the north woods of Wisconsin. For over fifty years, experiential learning has been an integral component of the educational programs of HoneyRock Camp. The original vision was to use summer camp as a living laboratory to teach leadership to undergraduate men and women. Over the decades, that vision has expanded to use the north-woods camp context to teach a wide variety of disciplines. As a result, I was faced with a new challenge to use this wilderness camp context to teach principles of accounting, finance, management and marketing to students who had never before been in any kind of a business course.

I found that experience to be one of the most professionally energizing and developmentally stimulating opportunities of my 31 years of teaching in higher education. It has profoundly influenced my classroom teaching on our main campus during the fall and winter terms. Since being introduced to experiential learning, I have made it a point to design and incorporate experiences as a supplement to more traditional teaching methodologies. In this paper, I will describe activities that I have found useful to teach various concepts in a typical principles of finance course.

The Big Picture

Specialization has its advantages, to be sure. Marketing, management, finance and accounting have evolved into their own separate disciplines, each with several sub-disciplines. Within these disciplines, professionals have developed remarkable levels of expertise. The downside of specialization is that we can find ourselves living comfortably in our cozy little silos, making little effort to see the big picture of things. If we aren't careful, our undergraduate teaching of business can promote an un-integrated perspective of enterprise.

As I see it, Christians have two missions in life. One is the "missionary mandate" to go into all the world and make disciples. The other is the "creation mandate" which is to be fruitful and multiply. This fruitfulness and multiplication certainly includes the notion of propagation of the human race. But its meaning is more comprehensive than that. In Psalm 8, we read, "When I consider your heavens, the work of your fingers, what is man that you are mindful of him, or the son of man that you should care for him? Yet you have made him a little lower than the heavenly beings and have crowned him with honor and glory. ***You have given him dominion over all your works. You have put all things under his feet.***"[3]

The doing of business is a natural fulfillment of the creation mandate. God created the world with all of its resources, and then essentially said, "Now go multiply it!" The Hebrew word translated as "multiply" seems to capture the essence of true expansion. It is multiplicative and not just additive. It means combining 4 and 8 and making 32 and not just 12.

This is the essence of marketing. Marketing is process of value creation. Marketing describes the activities of combining resources in such a way that we end up with more than we started with. In doing so, we need to work effectively and efficiently with people to achieve the goals of value creation (management). Along the way, we have to make decisions. Although there is a role for intuition in making good decisions, over the long run, our ability to make good decisions will be constrained by our ability to deal effectively with good information. That's where things like accounting and statistics come into play. So what is the role of finance?

Principle 1 - Finance is About Resourcing the Value Creation Process

Only God can create out of nothing. The rest of us must start with something. This is what Finance is all about. Finance is the discipline that is concerned with properly resourcing the value creation process. The left side of the balance sheet presents the assets or economic resources from which new value is to be created. The right hand side of the balance sheet shows the financial resources which provide the means to acquire those assets. Businesses are built on a balance sheet. Show me a shaky balance sheet, and I'll show you a shaky value creation process.

To make this point, I use two activities on the first day of class.

Build Me a Tower.

I divide the class into teams of two or three students. I provide each team with a supply (at least 50) of little plastic cups. (The kind that some churches use for communion). They are then given ten minutes to use the cups to build as high of a tower as they can. I set it up as a competition. Students throw themselves whole heartedly into the process. As you can imagine, a number of the towers succumb to gravity. Students learn in the process that they must give careful consideration to how they design and execute the base layer. If they neglect the base, their towers inevitably fall. In a short debrief, we discuss the importance of laying an appropriate foundation and then present the idea that the big idea of Finance is laying the appropriate foundation for the value creating process. A bullet list of some of the things that will come out in the debrief include:

- Note that every tower looks different-This undoubtedly reflects our God given creativity
- Before we start, we need some vision for what we are building
- We may adjust what our tower looks like along the way (Our vision needs to guide us but not be so rigid so as to stifle creative adaptations along the way)
- We build as a team
- We need to start with an excellent foundation
- We need to build carefully-It takes time - piece by piece
- We can't build with nothing- We need resources

Harley-Davidson

The second exercise involves Harley-Davidson. I ask students to take a piece of paper and write down what they think the foundation (balance sheet) of Harley-Davidson looks like in terms of the various items on both the left and right sides of the balance sheet, along with each item's relative percentage to total. I collect the answers and we project some of the responses for us all to see together. We then look at a recent annual report (10K). The students are shocked to see that the asset side of the balance sheet is dominated by financial assets, i.e., loans made by Harley-Davidson to its dealers and to retailer buyers of motorcycles. Harley-Davidson looks more like a huge bank than it does a manufacturer of motor cycles. This lays the groundwork for a fruitful discussion of the value chain and how finance plays a foundational role in the process.

Principle 2 - The Power of Diversification

The power of diversification to lower risk without reducing expected return is a profound principle of finance. Even though I've known about it for decades, I'm still a bit amazed every time I review the topic. Historically, I relied exclusively on a mathematical presentation to teach the principle. Students may be able to follow it well enough, and even replicate it if need be, but they really don't absorb the idea as well as I would like them to. In order to better help students internalize this idea, we now take a class period and do a "diversification exercise".

Here's how it works. We use the results of rolling dice to simulate returns of a particular investment. I divide the class into teams of six students. Each group is given five dice. Three are green and two are red. Five of the students in each group roll the dice with one student recording the results. The three green are positive and the two red are negative. The recorder then nets the results of each role and enters the net value on a summary excel sheet which I've provided at the outset to the recorder who has come to class with a laptop computer. The highest possible positive score would be 16 (three green sixes and two red ones). The lowest possible score is negative 9 (three green ones and two red sixes). So if the values of the green dice are 2, 5, and 3, with the value of the red dice being 2 and 3, then the net value would be 5 (10 for the green minus 5 for the red). Thus the investment's return for that period would be 5 percent. One round consists of 50 combined roles, simulating returns over 50 periods of time. The results are then averaged and the standard deviation for the round is calculated. This simulates the average return and risk on this investment over those fifty periods of time. You can surmise that since there are three green (positive) dice and two red (negative) dice, two of the red will on average cancel two of the green and so the expected value would be average of the possible values of the one remaining green die, or 3.5 ([1+2+3+4+5+6]/6=3.5). The standard deviation for the combined 50 roles will depend upon the actual results but will be on the order of 3.2 to 4.2.

Students are then asked to repeat this exercise for a second round, representing the results of a second firm. The average will again be on the order of 3.5 with a similar standard deviation. I provide a column on the spreadsheet which automatically calculates the expected return for a portfolio that contains 50% of Firm 1 and 50% of Firm 2. The result is interesting because it shows that while the average return of this portfolio is not

much different than that of each individual firm, the standard deviation is noticeably lower.

With an entire class period, student groups are able to complete a total of ten rounds of 50 rolls each, thereby simulating returns for ten different firms. The spreadsheet provided automatically calculates the average return and standard deviation for portfolios containing an equally weighted portion of each firm. The results are always compelling. Students see that the expected value of the portfolios converges to 3.5 but the standard deviation keeps decreasing. They begin to see that if we had sufficient number of firms, the standard deviation would approach a value of zero. Diversification eliminates the firm specific (nonsystematic) risk.

The partial table below illustrates what the spreadsheet looks like. The furthest most right column labeled Firms 1-10 shows the results of an equally weighted portfolio of firms 1 through 10. Note that the average return is 3.49 with a standard deviation of 1.05.

{Insert Table 1 Here}

It is important that students come to understand that while diversification can eliminate nonsystematic risk, it does not eliminate systematic risk. Systematic risk can be easily introduced with just a slight modification to the exercise. We assume that the return of an individual firm (stock) is based jointly on its own firm specific efforts but also on the economy (market) as a whole. Such an assumption is quite plausible since most businesses prosper or not to some extent in conjunction with the economy as a whole, much as the tide settles or lifts all boats as it ebbs or flows. The general risk of the market is the systematic risk which cannot be diversified away.

This simulation is accomplished by introducing an 11^{th} column to the above results which simulates the return of the market for each of the 50 periods of time. These numbers are generated by rolling two green and one red dice fifty times with the net result being the market return for that period. The range of possible market values is accordingly positive 11 to negative 4. I have done that prior to the class session and imbedded the results in the spreadsheet. Each firm's total return for any given period is the combination of the firm's result plus the net return of the market for that period. The table below shows the results of an actual exercise.

{Insert Table 2 Here}

The principle point of this exercise is to demonstrate that systematic risk is not eliminated by diversification. The results shown in Table 2 illustrate this point extremely well. The standard deviation of the market is 2.9 with an average return of 2.66. That return of 2.66 combined with the firm specific returns generated by rolling the dice (on the order of 3.5 or so) produce portfolio returns of around 6. Note that with a portfolio of 10 equally weighted firms' results, the standard deviation is 3.01 which is very close to the standard deviation of the market (2.90). And yet, the average return is very close to 6. The

portfolio of ten firms has essentially eliminated all but the systematic market risk while maintaining the integrity of the expected return.

While I have used this activity as an in-class exercise, it could also easily be assigned as an outside group assignment.

Principle 3 – There Is a Positive Relationship Between Risk and Reward

I don't know about you but once people find out that I teach principles of finance, it isn't unusual for them to follow up by asking for any investment tips I might be able to offer. Sometime the question comes in this form: "Where can I get the highest return on my investments?" What they don't understand is that they might as well be asking me: "Can you please direct me to the riskiest investment opportunity that you know of?"

There is an inextricable relationship between expected return and risk. Higher expected returns come at the cost of higher risk. It is interesting to ask students how they feel about "high yield bonds" and then follow that up with asking about how they feel about "junk bonds". They like the high yield but distain the junk and are shocked to learn that they are one in the same.

Of course the proper answer in these situations is to look for the highest possible expected returns commensurate with a desired level of risk. Higher expected returns are always tempting, but chasing after those returns can all too often be followed by bitter disappointment when the realities of risk set in with adverse results.

This simple but important principle of positive correlation between risk and expected return offers a great opportunity to break from the typical classroom session and have some fun that dramatically illustrates the principle. Here are a few ideas that I've used.

Water-balloons Activities

(Throw for Doe) Before class I make up a bucket of water-balloons. We go outside and I ask for two volunteers at a time to engage in a water-balloon toss activity. The two volunteers are then instructed to toss the balloon back and forth from a distance of their choosing. The number of times they must successfully toss the balloons is directly correlated to the number of steps between them. (They pick the number of steps but I do the stepping.) Four steps of separation require that they each successfully toss and catch the balloon four times. I offer rewards for successful completion of the task. For rewards, I've used quarters and candy or other desirable food items. The rewards proffered increase exponentially for increased distances. So if students choose to be four steps apart from each other, they'd earn four pieces of candy or four quarters. But if they chose to situate themselves eight steps apart rather than four, then they could win sixteen pieces of candy or sixteen quarters. Volunteers typically opt initially for low risk-reward scenarios. But soon, competition and one-ups-man-ship kicks in and volunteers start to come forward for some high stakes tossing. The record last time was two students opting

to toss a water balloon back and forth twelve times from a distance of twelve steps apart. They nearly pulled it off but ended up dropping the balloon and having it burst.

(Balloon on a spoon) In this activity, students are asked to carry a water balloon on a spoon while following a fairly snaky and circuitous chalk line that I've drawn on the sidewalk before class. Successful completion of the activity requires that they not drop the balloon nor at any point step off the line. The first is obvious. I rely on the collective judgment of the other students in the class that are watching to discern whether or not someone steps off the line. At the start of the exercise, I'll ask for four or so volunteers. At that point, they don't know what they're volunteering for but that doesn't seem to be an obstacle. After coming forward, I give each student four quarters and then explain the exercise. I then offer them, one by one, an opportunity to attempt the exercise or not, with the prospect of doubling their quarters if they successfully negotiate the activity. Failure, by either dropping the balloon or taking more than one step off the line, results in forfeiture of their initial booty of four quarters. I include one additional option which is to offer to triple the quarters if they choose to negotiate the activity while walking backwards instead of forwards. This obviously is more difficult and increases the risk of failure. In summary, students can choose to keep their four quarters or assume the risk of attempting the activity with the prospect of either doubling or tripling their quarters depending on the level of risk they're willing to take.

I've used other activities as well and the truth is that there are limitless ways to construct activities that model the relationship between risk and expected return. The amount of time devoted to these activities is quite flexible. I've typically devoted a half a class period to this particular principle. It makes for a memorable learning experience and breaks up the routine of typical in-class learning.

Principle 4 - Volatility and the Value of Options

Options can be confusing to undergraduate finance students. Figuring out how to value an option is a difficult challenge to virtually anyone. I use an activity to demonstrate the positive relationship between volatility and the value of an option.

I ask students to imagine a game where they simultaneously roll two dice, one red and another green. Red represents loss and green represents gain. If the net between the two is negative, you pay one dollar per negative unit. A net negative 3 means you pay $3. If on the other hand, the net result is positive, you receive a dollar for each positive unit. A net positive 4 means you get paid $4. Roll the dice 50 times and see what the value (on average) of playing the game would be to you.

I then have students break up into groups of five or six students, roll the dice 50 times and record the score on an excel spreadsheet. They then sort the column by values from highest to lowest, find the average and standard deviation for those 50 rolls. Note that about half of the values would be zero or positive and about half would be zero or negative. This is because with fifty iterations, on average, the positive and negative values of the two dice are going to cancel each other out. But what if you had the option

to enjoy only the upside results without having to pay if there was a loss? I then have the students compute the expected value of the game under that condition. Note that the expected value is now higher that zero. In this example, it is worth about $.90. This replicates what an option does for you. It gives you the right but not the obligation to pursue a specific course of action. You can get the upside without having to suffer the downside. This creates economic value.

Students then repeat the exercise using three red and three green dice. The results are recorded for each of the fifty iterations. I have them sort the results from high to low, compute the average and standard deviation. Because the 3 red dice generally cancel the 3 green dice, the expected value is pretty much the same as when we used just one of each. But the standard deviation is significantly greater because with three green and three red dice, the possible range is now from positive 15 to negative 15. I also have the students compute the expected value of the upper half, i.e. the zero to positive range of the results and compare that with the result of using just the one green and red dice. Of course, the expected valued is significantly greater. Students see quite clearly that the value of the positive range is much higher when there is greater volatility. This result isn't anywhere near the complexity of Black Sholes, but it does provide an excellent foundation for understanding complex methods for valuing options.

The tables below present the results of fifty rolls of initially one green and one red die and again using three green and three red dice. The average in each case is nearly zero (.04) but the standard deviation is 2.25 in the former and 3.97 in the latter. With increased volatility, the value of the option is $1.58 instead of $.90.

{Insert Table 3 Here}

Principle 5 – Growth Rates that Exceed a Firm's Ability to Adequately Finance Growth Lead to Failure of the Firm

Most new business ventures don't succeed. There are a variety of reasons for that, many of which are obvious. But there is one reason, in particular, that is counter-intuitive and thus, not so obvious. Having a great idea that takes off, in terms of accelerated sales growth, can actually sink a firm. This is because growth in sales is inevitably accompanied by growth in assets that are necessary to support the sales or value creation process. (Remember. Only God can create from nothing; People need to start with something.) Adding assets to the left hand side of the balance sheet without having a way to perpetually fund those assets on the right hand side of the balance sheet is a recipe for financial failure.

This principle is usually taught in a Principle of Finance course using the equation for determining the amount external financing required (*EFR*) to support expected growth.

$$EFR = \Delta S \frac{A_S}{S} - \Delta S \frac{L_S}{S} - S_{t+1} m(1-D) = \Delta S\left(\frac{A_S}{S} - \frac{L_S}{S}\right) - S(1+g)m(1-D)$$

The term, $\Delta S \frac{A_S}{S}$, represents the growth in assets that are spontaneously driven by the growth in sales(ΔS), noting that there is a natural relationship between the level of certain assets (A_S) and sales(S).

Some of this spontaneous growth in assets will, of course, be financed by growth in liabilities (L_S) that naturally occurs when assets grow. This sort of spontaneous financing would come from things like increases in trade payables and certain accruals. It is represented by the term, $\Delta S \frac{L_S}{S}$. It is also true that a certain amount of new financing can come from increases in retained earnings which is represented by the term, $S_{t+1} m(1-D)$. S_{t+1} represents the new higher level of total sales, m being the profit margin on those sales and $(1-D)$ being the portion of those earnings that are not paid out as dividends.

The big principle here is that balance sheets have to balance. This is much more than a mere accounting phenomenon. It is the primary role of finance. Successful financial managers will be attentive to both sides of the balance sheet. There is a name term for unbalanced balance sheets. Bankrupt! Do you want to grow a business? Fine! But know that you are going to need more assets to do it and those assets must be financed. It is a balancing act, balancing additional assets with additional financing.

To emphasize this point, I employ a relatively simple activity that requires students to successfully balance things on a scale. Students work to win a variety of chocolate items like Hershey's kisses, or mini Snickers, Milky-ways and such. I group the students into teams of three or four. Teams take turns at trying to make things balance on a scale that I have placed at the front of the room on a table where everyone can see it. I let the students choose as much candy as they want to be placed on the left side of the scale. The only caveat is that if they can't make the scale balance, then they forfeit the right to keep the candy items they've selected. To balance the scale, I provide a rather abundant number of very small items like, nuts, bolts, screws, nails, small pieces of wood, pennies, nickels, quarters and such. I provide each team with a mix of these items which they then use to try and balance their booty of candy items. The groups take turns. They first give careful consideration to the mix of assets (candy items) that they want to add to the left side of the scale. The dynamics are fun to watch as they argue about what candies to select and more importantly, how much should they go for given the constraint of the counter weights (capital?) that they have to work with. Next comes the drama where they actually test their choices. With the assets placed on the left hand side, they carefully begin adding the counterweights to the right hand side. As you can anticipate, groups that are overly aggressive on the asset side cannot make the scale balance. Much to their consternation, but to the amusement of their classmates, they fail the exercise and forfeit the candy.

I find that most groups are more conservative and end up keeping the candy. I usually spend fifteen to twenty minutes on the balancing exercise as a way to set up the

mathematical presentation, showing how we can actually go about estimating how much external financing is required to finance growth. The math is always important but many students' eyes glaze over at the prospect. In this case, I've followed the advice of Mary Poppins, in that " A spoon full of sugar make the medicine go down!".

Principle 6 There Is a Natural Sustainable Growth Rate that is Based On a Firm's Inherent Financial Metrics

This principle is closely related to the principle of financing growth. It is expressed mathematically as follows:

$g^* = \frac{m(1-D)\frac{A}{E}}{\frac{A}{S} - m(1-D)\frac{A}{E}}$, where g^* is the natural sustainable growth rate, *m* is the profit margin on sales, *(1-D)* is one minus the dividend payout ratio, *A/E* is the firms' desired ratio of assets to equity and *A/S* is the inverse of the firm's inherent asset turnover ratio. The development of this ratio is presented in Appendix A and generally follows the broad brush presentation found in Chapter 15 of Megginson and Smart.[4]

Here again is one of those situations where students can easily get bogged down in the math and miss the larger issue, which in this case is:

Businesses have a natural rate of sustainable growth which is dictated by profitability, dividend policy and the inherent structure of the balance sheet for firms in that industry.

Figuring out a suitable activity to illustrate this point has been a challenge. The main point was to find some way to give students the sense that financing a firm has certain constraints inherent to a particular industry. While there is certainly some latitude for variability from firm to firm within an industry, each industry has a range of norms with respect to its financial metrics. For example, it just isn't reasonable to expect a bank to have a debt to equity ratio of one to one. Bank capital will fall somewhere between 8% to 10% of its total assets.

To that end, I designed an activity where students feed balls into one end of a contraption (pictured in Exhibit 4) which then shuttles the balls down a series of descending ramps and spits them out at the other end, whereby, they are to be caught and fed back in at the top of the contraption. The goal of the activity is to see how many balls can be put into the cycle and then recycled without having any of the balls drop. I use groups of three or four students at a time.

{Insert Exhibit 1 here}

In this exercise, students observe that there is narrow range of 8 to 10 balls that they are able to keep being recycled in a steady state, given the size of the contraption, the nature of the balls and the force of gravity. The exercise is a fun way to take twenty minutes of

class time to introduce the mathematical presentation of a natural rate of growth. All it takes is a quick trip to Home Depot, thirty dollars or so for materials and time to construct your own contraption.

Principle 7 The Mix Between Fixed and Variable Costs Impacts Risk and Reward

With the increased opportunities for outsourcing, firms have more options for controlling their inherent cost structure by employing outsourcing contracts that are either fixed rate or variable rate based. This will impact a firm's degree of operating leverage. [5]

When the weather is nice, students long to "have class outside". I found a way to accommodate that desire and use it for a teachable moment. We do "the breakeven game" outside. I divide the class up into groups of five. Within the confines of a prescribed area, the teams are to begin at one end of the area, and then march arm in arm towards a finish line marked out at the end of the prescribed area. There are a couple of interesting caveats. Three students are facing forward towards the finish line with the other two facing in the opposite direction. I instruct the team that they are required to make as many iterations as it takes to get their team completely across the finish line. An iteration consists of locking arms and together taking five steps forward followed by three steps back. Theoretically, they should be advancing a net two steps each iteration. Before embarking on the exercise, they have to write down on a slip of paper how many iterations they think it will take to get their team across the finish line at the end of the field. The team that gets closest to their original guess is declared the winner. The exhibit below illustrates how this works.

{Insert Exhibit 2 Here}

The application to breakeven analysis is quite obvious. The five steps forward represent five dollars of revenue per unit. The three steps back depict unit variable costs. The net of the two can be construed as unit contribution margin. The distance to the finish line is the amount of fixed cost that needs to be recovered before the firm enters into "profit land".

With this basic format, the exercise can be embellished to show that the same number of iterations will be sufficient to achieve a finish line that is farther away if the number of steps backward is reduced. Students begin to appreciate the fact that, while the net gain each iteration is greater, it is an inherently riskier proposition since the finish line or "profit land" is further away. The exercise takes thirty minutes and provides a useful framework for thinking about both break even analysis and operating leverage.

Principle 8 Leverage of Any Kind Simultaneously Increases Risk and Potential Returns

Can there be any more important principle of finance that the relationship between leverage, risk and reward? Of course there are two types of leverage. There is financial leverage that relates to the mixture of debt and equity employed in the capital structure.

The other type of leverage is operating leverage which relates to the mixture of fixed and variable costs in a given firm's operations.

I have found it helpful to use a brief but simple exercise that illustrates the impact of financial and operating leverage on a firm's risk/reward profile. The exercise involves simulating random increases or decreases in a firm's sales units and then seeing what impact changes in sales has on the firm's profitability, given its degree of operating and financial leverage. Students are presented with an excel template with four different embedded risk structures; 1) Low operating and low financial leverage, 2) Higher operating and low financial leverage, 3) Low operating and high financial leverage, 4) High operating and high financial leverage.

The exhibit below illustrates the template provided to the students. At the outset of the exercise, only the first column for sales of 10,000 units is completed for each scenario. The values have been chosen such that, at a sales level of 10,000 units, earnings before interest and taxes (EBIT) is identical with each scenario.

{Insert Exhibit 3 Here}

At first blush, the uniformed observer might conclude that four firms represented by the four scenarios are identical. This would be a natural conclusion because each firm has the same product, the same level of revenue and enjoys the same EBIT. Why would they be considered to be very similar firms? The answer to that question becomes apparent as the level of sales begins to vary. We revert once again to the roll of the dice to introduce random variations in sales. Students use a combination of red and green dice (five of each) to determine the percentage increase or decrease in sales for the next period. If the net value of the ten die is positive 18, then the quantity that is 18% higher than the previous column is entered in the first cell. Students enter a value of 11,800 in the quantity cell for the next row. The spreadsheet is designed to key off that new value and immediately fills in the rest of the cells for the four different scenarios. Students see that EBIT for the four different cases is dramatically different. The spreadsheet is set up to accommodate ten different quantities of sales, which means students roll the dice nine times. At the end, they compare the results, particularly focusing on the variability in EBIT with the four different scenarios. I employ a naïve assumption for market return using a 10% market return corresponding to 10,000 unit sales as a starting point and then assume that the market return will respond proportionately to match the increase or decrease in unit sales for each period. Thus if sales increase from 10,000 to 12,000 units, the return for the market as a whole will increase from 10% to 12%. With this assumption, students see that depending on the scenario, there is considerable difference in relative returns in profit as compared to what may be happening to the market as a whole.

The exhibit below shows a typical result for five successive rolls of the dice determining the new levels of sales volume.

{Insert Exhibit 4 Here}

Looking specifically at the results for columns three and five with unit sales of 8,400 and 13,500 respectively, the impact of leverage is dramatic. At 8,400 units sold, the low leverage return on equity is 4% while the highly leveraged firm suffers a negative 22% return on equity. When sales units increase to 13,500, the low leverage firm earns a very respectable 24% ROE but the highly leveraged firm returns an astounding 131% on its equity.

The entire exercise takes about 30 minutes to work through. While I have used it exclusively as a classroom exercise, it could easily be adapted as an extended homework problem/project where students have responsibility for creating the spreadsheet itself.

Summary

When I first entered the teaching profession thirty-two years ago, I was convinced that good teaching was giving my students as much as I possibly could. I was jealous of every minute of class time and I tried to pack as much as I could into each session. This approach all too often led to overwhelming my students with content. I now think less about what I give my students and more about what it is that they actually take away. Using experiences in the classroom takes time but I will argue that it is worth it. I believe experiential learning is an example of where less is more. You will not be able to cover as much content in your normal allotment of class time. But the things you do cover will be learned more deeply at an intuitive level.

I have found the road to experiential learning to be an exhilarating journey. In this paper I shared some examples of what I have found to be helpful in teaching principles of finance. Each year I try to add some new experiences that will replace some that may not have worked all that well in the past. It is an on-going process of trial and error. I would encourage my colleagues in the CBFA to embrace their own creativity and design your own classroom experiences to enhance your students' learning. I welcome any suggestions that you have for enriching learning through experience and look forward to learning about your success in this area.

Endnotes

[1] Kolb, David A., *Experiential Learning: Experience as the source of Learning and Development*, New Jersey: Prentice-Hall, 1984.

[2] Kolb, D.A., Boyatzis, R.E., Mainemelis, C., "Experiential Learning Theory: Previous Research and New Directions, R. J. Sternberg and L. F. Zhang (Eds), *Perspectives on Cognitive Learning and Thinking Styles*, NJ, Erlbaum, 2000.

[3] Psalm 8: 4 ESV

[4] Megginson, Smart, *Introduction to Corporate Finance 2E*, South Western-Cengage Learning, Mason, Ohio, 2009.

[5] I addressed this issue more completely in the article, "Cost Swaps and Risk: An Analysis of the Effect of Cost Swaps on Degree of Operating Leverage and Break-Even Points", *Journal of Applied Business Research*, JABR #870, Winter 2000.

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Table 1

Results of Diversification Activity Showing the Effects of Diversification on Nonsystematic Risk

	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Firm 6	Firm 7	Firm 8	Firm 9	Firm 10	Portfolio Firms 1&2	Portfolio Firms 1,2&3	Portfolio Firms 1-5	Portfolio Firms 1-10
1	6	6	-3	10	11	5	-1	1	10	2	6.00	3.00	6.00	4.70
2	6	2	5	3	3	5	-3	7	10	-2	4.00	4.33	3.80	3.60
3	8	3	12	4	-1	1	0	-2	10	0	5.50	7.67	5.20	3.50
4	8	1	9	4	0	10	8	9	4	6	4.50	6.00	4.40	5.90
5	8	4	4	1	2	-3	3	0	3	10	6.00	5.33	3.80	3.20
45	1	4	3	7	2	6	3	4	1	11	2.50	2.67	3.40	4.20
46	7	6	7	6	-2	6	2	11	3	2	6.50	6.67	4.80	4.80
47	-3	6	2	6	3	8	1	8	-1	-1	1.50	1.67	2.80	2.90
48	8	12	8	5	8	3	-4	6	2	-3	10.00	9.33	8.20	4.50
49	2	6	7	8	0	6	-4	2	2	1	4.00	5.00	4.60	3.00
50	-3	-1	-1	10	1	12	7	1	4	3	-2.00	-1.67	1.20	3.30
Average Return	3.52	2.80	3.94	2.80	3.06	4.02	2.50	4.28	4.44	3.52	3.16	3.42	3.22	**3.49**
Standard Deviation	3.82	3.64	3.86	3.77	3.22	3.90	3.69	3.59	3.78	4.23	3.09	2.46	1.74	**1.05**

Table 2

Results of Diversification Activity Comparing the Effects of Diversification on Nonsystematic Risk and Systematic Risk

	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Firm 6	Firm 7	Firm 8	Firm 9	Firm 10	Market Return	Firms 1&2 Portfolio Return	Firms 1-5 Portfolio Return	Firms 1-10 Portfolio Return
1	6	6	-3	10	11	5	-1	1	10	2	**3**	9	9.00	7.70
2	6	2	5	3	3	5	-3	7	10	-2	**6**	10	9.80	9.60
3	8	3	12	4	-1	1	0	-2	10	0	**1**	6.5	6.20	4.50
4	8	1	9	4	0	10	8	9	4	6	**2**	6.5	6.40	7.90
5	8	4	4	1	2	-3	3	0	3	10	**6**	12	9.80	9.20
46	7	6	7	6	-2	6	2	11	3	2	**1**	7.5	5.80	5.80
47	-3	6	2	6	3	8	1	8	-1	-1	**6**	7.5	8.80	8.90
48	8	12	8	5	8	3	-4	6	2	-3	**9**	19	17.20	13.50
49	2	6	7	8	0	6	-4	2	2	1	**3**	7	7.60	6.00
50	-3	-1	-1	10	1	12	7	1	4	3	**4**	2	5.20	7.30
AVG	3.52	2.80	3.94	2.80	3.06	4.02	2.50	4.28	4.44	3.52	**2.66**	5.82	5.88	**6.15**
SD	3.82	3.64	3.86	3.77	3.22	3.90	3.69	3.59	3.78	4.23	**2.90**	4.25	3.35	**3.01**

Table 3

Example of Results from Using Two and Six Dice

Results Using One Green and One Red Die			Results Using Three Green and Three Red Dice		
Roll Number	Results sorted from High to Low	Expected Value of the Non-negative Results	Roll Number	Results sorted from High to Low	Expected Value of the Non-negative Results
1	5	5	1	8	8
2	5	5	2	7	7
3	3	3	3	7	7
4	3	3	4	6	6
5	3	3	5	5	5
6	3	3	6	5	5
7	2	2	7	4	4
8	2	2	8	4	4
9	2	2	9	4	4
10	2	2	10	4	4
11	2	2	11	4	4
12	2	2	12	4	4
13	2	2	13	3	3
14	2	2	14	3	3
15	2	2	15	3	3
16	1	1	16	2	2
17	1	1	17	2	2
18	1	1	18	1	1
19	1	1	19	1	1
20	1	1	20	1	1
21	0	0	21	1	1
22	0	0	22	0	0
23	0	0	23	0	0
24	0	0	24	0	0
25	0	0	25	0	0
26	0	0	26	0	0
27	-1	0	27	-1	0
28	-1	0	28	-1	0
29	-1	0	29	-1	0
36	-1	0	36	-2	0
37	-2	0	37	-2	0
38	-2	0	38	-3	0
39	-2	0	39	-3	0
40	-2	0	40	-4	0
41	-2	0	41	-4	0
42	-2	0	42	-4	0
43	-2	0	43	-4	0
44	-2	0	44	-5	0
45	-2	0	45	-5	0
46	-3	0	46	-5	0
47	-3	0	47	-6	0
48	-4	0	48	-6	0
49	-4	0	49	-6	0
50	-5	0	50	-10	0
Average (Expected Value)	**-0.04**	**0.90**	**Average (Expected Value)**	**-0.04**	**1.58**
Standard Deviation	**2.25**		**Standard Deviation**	**3.97**	

Exhibit 1

Exhibit 2

Break-Even Exercise

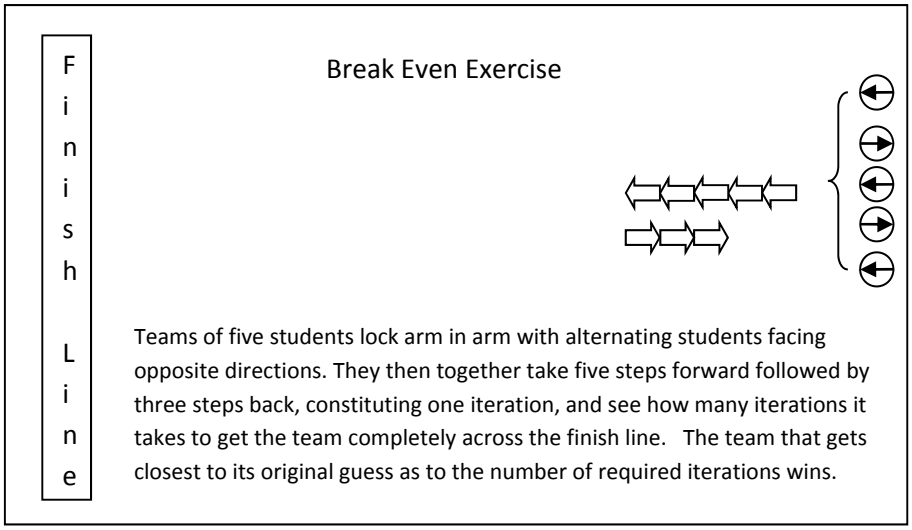

Exhibit 3-Part 1

The Impact of Cost Structure on Operating Leverage Template

Low Operating Leverage and Low Financial Leverage					
Units Sold	10,000	?	?	?	?
Selling Price	$10	$10	$10	$10	$10
Unit Variable Cost	$6	$6	$6	$6	$6
Fixed Costs	$30,000	$30,000	$30,000	$30,000	$30,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$0	$0	$0	$0	$0
Equity	$100,000	$100,000	$100,000	$100,000	$100,000
Sales	$100,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Variable Costs	($60,000)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Contribution Margin	$40,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fixed Costs	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)
EBIT	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Interest @ 6%	$0	$0	$0	$0	$0
Net Income	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Return on Assets EBIT/Assets	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Return on Equity	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Market Return	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Higher Operating Leverage and Low Financial Leverage					
Units Sold	10,000	?	?	?	?
Selling Price	$10	$10	$10	$10	$10
Unit Variable Cost	$4	$4	$4	$4	$4
Fixed Costs	$50,000	$50,000	$50,000	$50,000	$50,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$0	$0	$0	$0	$0
Equity	$100,000	$100,000	$100,000	$100,000	$100,000
Sales	$100,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Variable Costs	($40,000)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Contribution Margin	$60,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fixed Costs	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)
EBIT	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Interest @ 6%	$0	$0	$0	$0	$0
Net Income	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Return on Assets EBIT/Assets	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Return on Equity	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Market Return	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Exhibit 3- Part 2

Low Operating Leverage and High Financial Leverage

Units Sold	10,000	?	?	?	?
Selling Price	$10	$10	$10	$10	$10
Unit Variable Cost	$6	$6	$6	$6	$6
Fixed Costs	$30,000	$30,000	$30,000	$30,000	$30,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$80,000	$80,000	$80,000	$80,000	$80,000
Equity	$20,000	$20,000	$20,000	$20,000	$20,000
Sales	$100,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Variable Costs	($60,000)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Contribution Margin	$40,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fixed Costs	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)
EBIT	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Interest @ 6%	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)
Net Income	**$5,200**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Return on Assets EBIT/Assets	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Return on Equity	26%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Market Return	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!

High Operating Leverage and High Financial Leverage

Units Sold	10,000	?	?	?	?
Selling Price	$10	$10	$10	$10	$10
Unit Variable Cost	$4	$4	$4	$4	$4
Fixed Costs	$50,000	$50,000	$50,000	$50,000	$50,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$80,000	$80,000	$80,000	$80,000	$80,000
Equity	$20,000	$20,000	$20,000	$20,000	$20,000
Sales	$100,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Variable Costs	($40,000)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Contribution Margin	$60,000	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fixed Costs	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)
EBIT	**$10,000**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Interest @ 6%	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)
Net Income	**$5,200**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Return on Assets EBIT/Assets	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Return on Equity	26%	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Market Return	10%	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Exhibit 4 -Part 1

Example of Results Determining Sales Levels Using Dice

Low Operating Leverage and Low Financial Leverage

Units Sold	10,000	11,800	8,400	12,200	13,500	10,600
Selling Price	$10	$10	$10	$10	$10	$10
Unit Variable Cost	$6	$6	$6	$6	$6	$6
Fixed Costs	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$0	$0	$0	$0	$0	$0
Equity	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Sales	$100,000	$118,000	$84,000	$122,000	$135,000	$106,000
Variable Costs	($60,000)	($70,800)	($50,400)	($73,200)	($81,000)	($63,600)
Contribution Margin	$40,000	$47,200	$33,600	$48,800	$54,000	$42,400
Fixed Costs	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)
EBIT	**$10,000**	**$17,200**	**$3,600**	**$18,800**	**$24,000**	**$12,400**
Interest @ 6%	$0	$0	$0	$0	$0	$0
Net Income	**$10,000**	**$17,200**	**$3,600**	**$18,800**	**$24,000**	**$12,400**
Return on Assets EBIT/Assets	10%	17%	4%	19%	24%	12%
Return on Equity	10%	17%	4%	19%	24%	12%
Market Return	10%	11.8%	8.4%	12.2%	13.5%	10.6%

Higher Operating Leverage and Low Financial Leverage

Units Sold	10,000	11,800	8,400	12,200	13,500	10,600
Selling Price	$10	$10	$10	$10	$10	$10
Unit Variable Cost	$4	$4	$4	$4	$4	$4
Fixed Costs	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$0	$0	$0	$0	$0	$0
Equity	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Sales	$100,000	$118,000	$84,000	$122,000	$135,000	$106,000
Variable Costs	($40,000)	($47,200)	($33,600)	($48,800)	($54,000)	($42,400)
Contribution Margin	$60,000	$70,800	$50,400	$73,200	$81,000	$63,600
Fixed Costs	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)
EBIT	**$10,000**	**$20,800**	**$400**	**$23,200**	**$31,000**	**$13,600**
Interest @ 6%	$0	$0	$0	$0	$0	$0
Net Income	**$10,000**	**$20,800**	**$400**	**$23,200**	**$31,000**	**$13,600**
Return on Assets EBIT/Assets	10%	21%	0%	23%	31%	14%
Return on Equity	10%	21%	0%	23%	31%	14%
Market Return	10%	11.8%	8.4%	12.2%	13.5%	10.6%

Exhibit 4 Part 2

Low Operating Leverage and High Financial Leverage						
Units Sold	10,000	11,800	8,400	12,200	13,500	10,600
Selling Price	$10	$10	$10	$10	$10	$10
Unit Variable Cost	$6	$6	$6	$6	$6	$6
Fixed Costs	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$80,000	$80,000	$80,000	$80,000	$80,000	$80,000
Equity	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Sales	$100,000	$118,000	$84,000	$122,000	$135,000	$106,000
Variable Costs	($60,000)	($70,800)	($50,400)	($73,200)	($81,000)	($63,600)
Contribution Margin	$40,000	$47,200	$33,600	$48,800	$54,000	$42,400
Fixed Costs	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)	($30,000)
EBIT	**$10,000**	**$17,200**	**$3,600**	**$18,800**	**$24,000**	**$12,400**
Interest @ 6%	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)
Net Income	**$5,200**	**$12,400**	**($1,200)**	**$14,000**	**$19,200**	**$7,600**
Return on Assets EBIT/Assets	10%	17%	4%	19%	24%	12%
Return on Equity	26%	62%	-6%	70%	96%	38%
Market Return	10%	11.8%	8.4%	12.2%	13.5%	10.6%

High Operating Leverage and High Financial Leverage						
Units Sold	10,000	11,800	8,400	12,200	13,500	10,600
Selling Price	$10	$10	$10	$10	$10	$10
Unit Variable Cost	$4	$4	$4	$4	$4	$4
Fixed Costs	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Assets	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Debt	$80,000	$80,000	$80,000	$80,000	$80,000	$80,000
Equity	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Sales	$100,000	$118,000	$84,000	$122,000	$135,000	$106,000
Variable Costs	($40,000)	($47,200)	($33,600)	($48,800)	($54,000)	($42,400)
Contribution Margin	$60,000	$70,800	$50,400	$73,200	$81,000	$63,600
Fixed Costs	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)	($50,000)
EBIT	**$10,000**	**$20,800**	**$400**	**$23,200**	**$31,000**	**$13,600**
Interest @ 6%	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)	($4,800)
Net Income	**$5,200**	**$16,000**	**($4,400)**	**$18,400**	**$26,200**	**$8,800**
Return on Assets EBIT/Assets	10%	21%	0%	23%	31%	14%
Return on Equity	26%	80%	-22%	92%	131%	44%
Market Return	10%	11.8%	8.4%	12.2%	13.5%	10.6%

Appendix A - Derivation of Sustainable Growth Formula

Assumptions:

1. No new equity-a firm relies solely on increases in retained earnings for equity financing.
2. The asset turnover ratio is constant.
3. The firm maintains a constant dividend payout ratio.
4. The firm has adopted a policy for a given ratio of debt to equity
5. The firm's net profit margin is constant.

$A = L + E$

The change in Assets must equal a corresponding change in Liabilities and Owners' Equity.

How will Owners' Equity change? By the increase in Retained Earnings

$\Delta RE = (1+g)S \bullet m \bullet (1-D)$

If the ratio of L/E is to remain constant, than for every $1 increase in retained earnings, there must be a corresponding increase in liabilities in the amount of (L/E). For example, if the ratio of debt to equity was 2 to 1, then a $1 increase in Retained Earnings would need to be matched by a $2 increase in liabilities to maintain an overall L/E ratio of 2. As such, the increase in debt can be stated as the change in retained earning X the L/E ratio:

$$\Delta L = \Delta RE \bullet \frac{L}{E} = ((1+g)S \bullet m \bullet (1-D)) \bullet \frac{L}{E}$$

The change in assets will equal the change in liabilities plus the change in retained earnings.

$\Delta A = g \bullet A = \Delta L + \Delta RE$ Putting it all together:

$$gA = (1+g)Sm(1-D)\frac{L}{E} + (1+g)Sm(1-D)$$

Increase in liabilities Increase in Retained Earnings

Divide through by Sales (S)

$$\frac{gA}{S} = (1+g)m(1-D)\frac{L}{E} + (1+g)m(1-D)$$

Factoring

$$g\frac{A}{S} = [(1+g)m(1-D)][\frac{L}{E}+1]$$

$A = L + E \Rightarrow \frac{A}{E} = \frac{L}{E} + 1$ Substitution yields:

$$g\frac{A}{S} = [(1+g)][m(1-D)\frac{A}{E}]$$ Multiplying through yields:

$$g\frac{A}{S} = m(1-D)\frac{A}{E} + gm(1-D)\frac{A}{E}$$ Gathering "g" terms on the left hand side yields:

$$g\frac{A}{S} - gm(1-D)\frac{A}{E} = m(1-D)\frac{A}{E} \Rightarrow g[\frac{A}{S} - m(1-d)\frac{A}{E}] = m(1-d)\frac{A}{E}$$ Solving for "g":

Equation A.1 $$g^* = \frac{m(1-D)\frac{A}{E}}{\frac{A}{S} - m(1-D)\frac{A}{E}}$$