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Financial Engineers: Who Are These Guys?

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Panelists: JOSEPH J. BUFF

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Summary: A search of the Internet under the topic of financial engineering leads to the discovery of topics like risk assessment, portfolio management, default risk, value-at-risk, pricing, hedging and trading derivatives, asset/liability management, contingent claims, financial mathematics, stochastic analysis, and market forecasting. This panel sheds light on this new “profession” and how it relates to what actuaries do. This is a follow-up from an oversold session at the last annual meeting.

Mr. Scott E. Wright: This session is sponsored by the Actuary of the Future Section Council, and one of the main goals is to expand the horizons for the actuarial profession. One of these expansion areas is financial engineering, a field that uses mathematics and, in particular, financial mathematics in a way that’s very similar to the skill sets that we’ve developed as actuaries.

Our speaker is Joe Buff, a practitioner of investment risk management and strategy development, asset/liability management, investment goal-setting and performance management, investment operations, and reengineering. He recently formed his own consulting firm, Joe Buff Inc., where he is managing director. Joe has worked at Guardian Life, Morgan Stanley, Tillinghast Towers Perrin, and Merrill Lynch. He helped develop the asset/liability efficient frontier for factoring liabilities and corporate goals into strategic asset allocations in a risk/return context. He played a role establishing the intercompany investment performance survey and has extensive experience at best practices review and process enhancement for investment departments and entire insurance companies.

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Note: The charts referred to in the text can be found at the end of the manuscript.

Mr. Joe Buff: When I was first recruited for this session, I thought it was sponsored by the Investment Section and was about investments. The real theme is the actuary of the future, the question of career planning, and the demand for actuaries. The Society is looking at the bigger picture of supply and demand for actuaries going forward. So I'll provide practical examples of what financial engineering means in terms of something that people, including some members of the SOA, do for a living.

We all know what the word "financial" means, but what does the word "engineering" mean? It has two interpretations. Some engineers are people who build useful things. Other engineers are people who drive choo-choo trains. And, in fact, both of them apply here.

The balance sheet and income statements of an enterprise, business, or corporation shows that the owner takes capital and puts it to work in a business and an industry, such as insurance, banking, Wall Street, or asset management (Chart 1). The whole idea is to achieve a return on that capital. One of the ways to achieve a return on capital is to take some of the money as cash, invest it in the capital market, and attempt an ROI, not to be confused with ROE. You want good investment return, whether it's yield, total return, or a combination of that and other measures.

The circle in the middle of Chart 1 shows the kinds of forces that are pushing and pulling and making the job of good, steady growth in income and of net worth harder. These are the various interdependencies between the different things on the balance sheets and the constant interactions they have with each other, with corporate objectives, with different parts of the company, and with the outside world.

Let's put on our financial engineering hat for a moment to look at this. Where does this say anything about an insurance company or actuaries? The point is that it doesn't. The theme is that the kinds of skills, traits, and work habits that are required to do financial engineering are, in fact, very consistent with those that the actuarial profession has always been pretty good at mastering. Other sessions on the program talk about how to position, enhance, and improve profit, embedded value, growth, and other issues. How do you convert a company onto an embedded value form of financial reporting if, in fact, that's something that you want to do?

A lot of the points that are mentioned here (Chart 2) are not unique to insurance companies, per se, such as the consolidation that's happening in the banking industry. There's been some of it in the asset management industry. Over the last 20 years, there's been a lot of it among Wall Street firms. Even changing to a stock

structure and demutualizing a mutual holding company, if you think about it, are not unique to insurance companies. Goldman Sachs is naming new partners, who may be the last partners, because eventually the company's going to do an initial public offering and convert to a stock company. The competition for capital is happening everywhere worldwide all the time.

Another theme, consumerism, although well-meant, can sometimes become unpleasantly politicized or divisive because of ill-informed interests that don't necessarily appreciate what insurance companies are doing. This is what attorneys call the trade, custom, and practice of the industry—ways of doing business that are completely valid and in the best interests of the consumers. That's a difficult question that has gotten headlines and will probably continue to do so.

Finally, in financial engineering, not only do you have to do a good job, but you also must prove it objectively and convincingly to three external audiences: the regulators, the rating agencies, and the research departments. The latter includes the various people in investment firms or on Wall Street who do equity research and fixed-income research. They look at various stocks and bonds and opine on their value as investments and make the buy/sell/hold recommendations that you can all get from your stockbrokers or find on many issues in your companies' investment departments on a day-to-day basis.

One part of becoming a stock company is mastering the intricate ballet involved in communicating with these people, who are experts at what they do, to convince them that you're actually experts at it also. Because the research departments are always looking ahead, it's very important to be able to deliver not only the financial results in numbers, but also the earnings trends going forward. And they're always looking at the quality of management. Just as you're used to doing for rating agencies, it's necessary to demonstrate that you have the in-house talent, procedures, and infrastructure to do the best job.

What does one do if one is, wants to become, or is thinking about becoming a financial engineer? You have an opportunity to leverage greater responsibilities in the whole process, meeting these various needs at the same time that you are able, as an actuary, to apply and extend in a broader context the skills and work habits I referred to earlier.

Some years ago, the SOA studied the question, "What is an actuary?" when it was a real issue. The SOA came up with about 19 different definitions, all of which some people at least believe worked as the definition of an actuary; for example, a businessman who's trained in insurance mathematics or an engineer or a scientist. What actuaries have always done is solve very open-ended business problems that

involve organizational and political considerations—issues such as return on capital, risk exposure, refining management information systems, communicating more effectively, and servicing the needs of the policyholders.

That definition goes back to the very beginning of the insurance industry in the U.S. about 150 years ago. One could make the claim, as one noted actuary on Wall Street did, that actuaries are uniquely suited to moving into the kind of work that many people on Wall Street are doing these days because they have the attention span, the analytic skills, the technical discipline, and a holistic perspective on understanding an entire industry and the different companies in it in a manner that you don't necessarily find in other professions. Actuaries have the standardized self-education process that evolves gradually, combined with constant on-the-job training and experience. This is one of the requirements for becoming a member of the AAA.

Here's an example of a quick attempt to characterize what financial engineering is all about. One definition you could use that seems to apply to many things that people are doing who consider themselves financial engineers is to look at the different building blocks that exist on a balance sheet that influence the net worth and the trend in income, as illustrated in the financial statements of an abstract company. Let's look at those different pieces and see how they can be broken up or added together to achieve positive net effects for the company.

There are three different ways that we can do this using three simple equations:

$$\begin{array}{l}
 S = \sum C_i \longrightarrow \text{Strip} \\
 C_1 + C_2 = S \longrightarrow \text{Buy} \\
 C_1 - C_2 = S \longrightarrow \text{Sell}
 \end{array}$$

S=Asset, Liability, or Surplus

C=Cash flows, Options/Futures, Spread or Basis, etc.

In the first, imagine that S represents an asset, a liability, or a surplus, something micro on the balance sheet such as an individual issue or a surplus fund of a company. You start with that, and then you recognize that it's actually composed of pieces—these capital infusion (C_i) things. What stripping is all about, and tranching is a variation on that, is defining the whole as the sum of the pieces, where the invention is the different pieces, and then going through the legal, tax, and other structuring aspects of creating those things that can then be fungibly traded separately. That's one thing that financial engineers do. They make it work once

the idea is there, but, more importantly, they look for ideas, and we'll talk about some of the specific ideas soon.

The second equation comes in where you start with separate securities. They could have plus or minus signs, depending on whether we're talking about an asset, a liability, or a surplus. You add them by buying different pieces to create a security synthetically. Replication is an example of this. Replication is a very broad theme in hedging and interest-sensitive products and various quasi-guaranteed separate account products.

The last of the three equations applies when you synthesize something by subtracting something from something else. You break it up into pieces and sell off some of the pieces. Again, this is the theme in tranching and in stripping, and it can be manifest on the asset side of the balance sheet, the liability side, or the surplus side. It involves more complex representations where you could have a general security, which is the sum of a weighted linear form, or you could have weights that are positive or negative—real numbers, presumably. Someone made a joke yesterday about using imaginary numbers. Let's not spend more time on that thought.

Building Blocks for Engineering

Going back to the general from the specific, the whole point of explaining the breaking up, adding together, buying and selling, and all the day-to-day work that's involved, is that some of it is extremely detail-oriented. It requires very good organizational habits, a long attention span, and the ability to learn new things. You have to be able to talk to lawyers, accountants, and people on Wall Street. Or, if you're on Wall Street, you have to be able to talk to people on the buy side who are concerned about their financial reporting, which is exceedingly different in many ways from any Wall Street firm's own annual statements.

The organization is trying to achieve goals and objectives. Here is a simple list of five action verbs: balance, position, idealize, achieve, communicate. You need to "balance" the various objectives like growth, profitability, and service to shareholders versus to consumers if you're not a mutual company. Even if you are a mutual company, there are always policyholders and contract holders who are not participating in the surplus.

Then you are attempting to "position" your portfolio inventories, again thinking of the inventory as the net of things with plus and minus signs, assets and liabilities, for the purpose of "idealizing" the exposures that the company has in the different markets and to the different risks over time going forward. That's because the act of measuring and reporting past performance and benchmarking is, by definition, a

retrospective process that's very challenging and complex. There are different approaches, and it's something that actuaries play a tremendous role in, sometimes working with an investment department or a line of business. Or the person may be a chief financial officer who also has FSA after his or her name, etc. The point is the difference between all of that measuring and reporting and the establishment of the portfolio and its exposure prospectively; you don't know what the markets are going to do and you don't know what insurance consumer behavior is going to be exactly, so you have to plunk down your bets and let the wheels spin. Some of these processes are stochastic, so you come back to it after a nonzero stretch of time, measure your results, and report them again.

Another goal is to "achieve" superior financials, and if you're a publicly traded company, you're used to this. There's a certain amount of competition, especially in a confused or bear market, in terms of how much money is looking to buy stock in a particular sector like insurance as opposed to how much is out there that's been issued. Your stock will do better if there is more demand for it, and sometimes that demand is driven by a perception of your relative competitiveness and your business. Also, there's the process of documenting, convincing, and demonstrating to others that your results are superior if, in fact, they are. This hits on the final action verb, which is to "communicate."

Let's go through a short list of some practical examples. The first one refers to interesting developments during the last couple of years in inflation, bonds, and derivatives. We saw a bit of issuance by the U.S. Treasury of bonds that have built into them, as part of the same inherent security, indexing of the principal and/or the coupon to future CPI or some other measure of inflation. That's attractive to an insurance company because some companies view their surplus, in part, as something they want to invest in things that hedge against inflation. Or, since it's their net worth, they want it to grow without thinking about what new net worth is added. But they want the net worth to grow at least as fast as inflation; otherwise, they're losing real inherent value. So, one could potentially put some investment into such bonds, and there are also derivatives that have the same effect as a derivative overlay, where you can create synthetic securities.

Employing this on the liability side, there's a lot of discussion about privatizing Social Security in the U.S. What do you get from Social Security? Basically, it's an inflation-indexed life annuity with certain forms of survivor benefit. Wouldn't it be interesting if people actually had IRAs of some form, instead of putting the 7.5% or whatever up to the wage base in every year? Then they would have this pot of gold when they retire, instead of Social Security, which gives them something that has no necessary relationship to the money they've contributed. You actually can cash out in the insurance industry or provide annuities that replicate the benefit patterns.

This would be an ideal investment strategy. And, given the problem of Social Security and the aging of the baby boomers—that big bulge in the population pyramid that isn't going away—it is something to keep an eye on.

The next subject is the world of equity-linked products that exists on the asset side and on the liability side. Although it may seem like I've completely changed the subject, it's financial engineering, and it's about making insurance companies and their consumers happier. Equity-linked notes have existed for a number of years now. Some people have purchased them because they like the way they can sculpt the exposure to fixed-income versus equity returns and have a downside protection, the same way that the liability side of this, the general account or registered products that are equity-indexed annuities (EIAs), provides consumer protection. Some of us were joking the other day that if people had bought an EIA, say, five or seven years ago, when it was in the window of withdrawal without surrender charges, over the last couple of months they would look like they were a terrific buy, but it all depends on the structure of the option. If they have a two-year ratchet like some products do, they may actually get a benefit, which is not particularly related to what's happened in the last couple of months, and they may be happy in some ways and not happy in others.

Asset securitization and tranching are also examples of financial engineering. They are taking things that are illiquid and making them become liquid by changing their nature as a security. They're taking bundled products and breaking them into pieces with different characteristics that people can purchase. And, on this point, a lot of people who are currently practitioners of investment risk scale and things of that sort—actuaries who are in investment departments—date their entry into the field at around 1982, 1984, or so. That being the case, for them, this is very much the actuary of the past and the present as well. It's a question of relative emphasis, leveraging that expertise, and moving it more in the direction of how to do the most for the most possible consumers within different financial organizations. I think it's also an indication of the Society wanting to study the question of young people—although you don't necessarily have to be young—coming in, starting to take exams, being attracted to the profession, and wondering where will they get a job or what kinds of things will they do over the course of their working lifetimes.

Something that is rather new is the question of insurance risk transfer. Where this is and where it's going depends on whether you talk to people on the buy side or the sell side. This emerging new asset class, which is certainly what it is, attaches sometimes to life insurance and sometimes to property and casualty (P&C) insurance risk. It is typically a kind of stop loss, the most extreme level of the loss tail in a security that you then buy as a package. So if you were an investor, you would play a role similar to that of a traditional reinsurer. You get a high-yield bond

with a risk attached to it. It isn't like traditional credit risk, but if some event happens to the issuer, you stand to lose some or all of your interest and/or principal. In that sense, it's vaguely comparable to a junk bond default. There are a lot of very sophisticated models that casualty actuaries use to try to study things like windstorm damage.

These have been applied by various entities working with or for the rating agencies and the Wall Street firms to try to translate the loss behavior, that stochastic curve, for these securities into something equivalent to the loss of the understood junk bond market and then translate that into a credit rating. So, these things are often coming out with ratings. Depending on whether there's a tremendous amount of insurance risk transfer, it's possible to become very well-diversified. One thing I can say from talking to people in the Wall Street firms who have groups is that a lot of resources are being placed into this, and there is activity worldwide. Some of these issues are being gobbled up in Europe by asset management firms and hedge funds, which hopefully won't become the latest dirty word because of some unpleasantness in a few specific instances. The Japanese market for windstorm and earthquake damage and the laying off of that risk is also extremely active.

But if we look at wearing our traditional actuary hats, just like anything else, we want to diversify the risk. The larger the sample, the less risk there is in any individual security. And someone observed that, if ten different insurance companies sell hurricane bonds on their exposure, the Gulf Coast or the East Coast, and some hurricane hits Florida, they all correlate perfectly.

This asset class has an advantage in that it's somewhat noncorrelated with other investments that you can purchase. It presumably opens up a more efficient segment of the efficient frontier or gives you a better value-at-risk, if you like to think about that measure. But, there's this real question of diversification and the whole problem of contagion. If you have a portfolio of lives whose mortality experience is not independent, the expected loss on the entire portfolio is not the same as you would get from the basic probability calculations.

Here's an example, inspired by recent Hollywood disaster movies, of how these things could experience a form of contagion that one needs to think about. You can have an earthquake where Los Angeles slides into the Pacific Ocean. That will create a tsunami that will wipe out Hawaii and the east coast of Japan. So, there's going to be a lot of contagion in the form of risk exposure within that asset class. Having said that, I still think there's a lot of potential, and we're going to see more and more of these issues.

The last point I'll make is that some outside asset management firms, as opposed to the Wall Street firms, are creating funds where they will purchase these different things, manage them, and conduct the kinds of credit risk and risk management that are appropriate. So, somebody can give them \$5 million, \$10 million, or whatever to invest across the board in whatever is outstanding. We may see more of that, and it sounds like an idea with a lot of potential.

What this is all about is developing clever ideas for doing useful stuff to the balance sheet and the inventory of an insurance company that also has nice effects on the income statement and the various perceptions and valuations of the company. Where do these good ideas come from? It's hard to say, but there are these different activities that all revolve around each other. Ultimately, of course, is creativity. And I believe that actuaries are very good at that because of the open-ended aspect of their training as well as the business problems that they solve routinely. You need to know what you're doing in the field. You need to have the necessary computer modeling to support the analytics. The more experience you have, the more you'll get of that kind of experience—nothing succeeds like success. It's a process where the learning curve has an inversion to its slope in that the more of this you do, the more you gain a facility to have new ideas, understand an idea that someone else offers you, capitalize on an idea quickly or not, etc. The whole point is to develop momentum.

Presumably, one of the goals that the Society's Actuary of the Future Section and actuaries as a whole have is to achieve some momentum in expanding the penetration and exposure of the number of people who are doing this sort of work, appreciate this sort of work, want to do it, and want to hire or work with people who do it in insurance companies and potentially also in banks, asset management firms, and other financial entities. If we want to consider an extremely broad application of this, having actuaries involved in projections of the financial impact of contingent events would make sense for any business. And, just as every insurance company has a chief actuary, it would make sense to have a chief actuary, whatever the business is, because every business involves some kind of contingent event, whether it's life or P&C.

Mr. Gary Corbett: I haven't done any of this type of work, but I am familiar with Joe's past. I'm more concerned about what financial engineering is today, how broad the compass is, and what it might be in the future. I do not know how to do it, but I'm aware that actuaries and other mathematically trained people are doing work in options and other financial products. But I gather that it's becoming somewhat broader and that there are people who could be called financial engineers, whether they are or not.

Doing this type of quantitative work applies to finance in areas beyond what I would call traditional/nontraditional work. However, the type of thing you've done, Joe, in a sense has become part of at least a few actuaries' traditional work. Can you comment on some of these other fields that are beyond what we've tended to accept as common in the asset area?

Mr. Buff: Gary's point is very well-taken. I have a couple of examples, both of which revolve around a task force that Jack Gibson is chairing. He was on a panel that covered the issue of banks and insurance, which is another angle on the question of actuarial professional applications and career planning and so on. There are some members of that task force who are actuaries now working in the credit departments of commercial banks. They don't apply any of their specific actuarial expertise, but they apply their whole point of view of underwriting things, of assuming nothing and questioning everything, and of being able to learn new things. Another thing about the traditional actuary career track is that, in consulting firms and insurance companies, people often are rotated professionally or work on different projects over a period of a few years. So, in fact, actuaries tend to have experience at quickly going from one thing to another and mastering it rapidly. There may be not too many other careers that provide that as part of the standard package.

Another example of people who are probably truly former actuaries but are applying their skills to something different are actuaries who are working on Wall Street doing things that don't have anything to do with insurance, or at least not much. Some actuaries are traders and they're doing things that traders on Wall Street do. They may have a bit of a leg up because some of the clients that are involved in their trades are insurance companies or banks, but primarily they're applying their technical skills, their ability to think quickly on their feet, and their ability to communicate with all different sorts of audiences.

From the Floor: I'd like to turn that question around and focus not so much on what present or former actuaries are doing, but on who these nonactuaries are. What jobs are they doing that potentially could get folded into the actuarial profession? That's what Howard was talking about. Those are the people I don't know about.

Mr. Buff: That's a question that requires research because we, as actuaries, don't have a lot of information on that. One thing we're doing is looking at the membership breakdown by employment category to try to identify members of the SOA who work for different kinds of banks—investment banks, commercial banks, etc.—and send them a letter asking these kinds of questions. Ultimately, it's a networking and brainstorming problem—the more people contributing to solve it,

the better. And there are probably other research initiatives or task forces and committees that are looking at it also. That's a very good question that requires some work.

Ali Arouri*: I work at the AAA and we are asking the question, "Who are those financial engineers?" We also would like to know what to do with them once we identify who they are. We can't do this by ourselves, so we're asking for volunteers to help us on a committee that would look at the issue.

Mr. Buff: It sounds like I've just been volunteered.

From the Floor: I'll just follow up on this thing that nobody seems to have an answer to. These other people who are doing things we don't know about, do we know where they come from or what kind of training they have?

Mr. Buff: How could we by definition? We're trying to find out. First we have to figure out how we're going to find out.

Mr. Harvey S. Galloway: What's your best guess about who these people are and what they've been doing and how they're trained?

Mr. Buff: If you're talking about nontraditional fields, some actuaries get into executive recruiting because they have the network and understand the needs of the individuals and their employers. One could begin to speculate on the financial engineers. I know that there are some who get other credentials and then make a career of being two different things at once. For instance, a person may be a Chartered Financial Analyst. There's more and more of that happening. But we talked about investments in MBAs. I think there's a lot of that. You could do various different things in business with it. You could conceivably become an attorney or a medical doctor and specialize as an expert witness in different kinds of malpractice or other class-action lawsuits. There's the legal arena where people with two credentials, one of them being LLD after their name, can find a very interesting way to make a living. I'm not sure how many people actually do that.

*Mr. Arouri, not a member of the sponsoring organizations, is Senior Policy Analyst for the AAA in Washington, D.C.

CHART 1
INVESTMENT RISK/CAPITAL MANAGEMENT

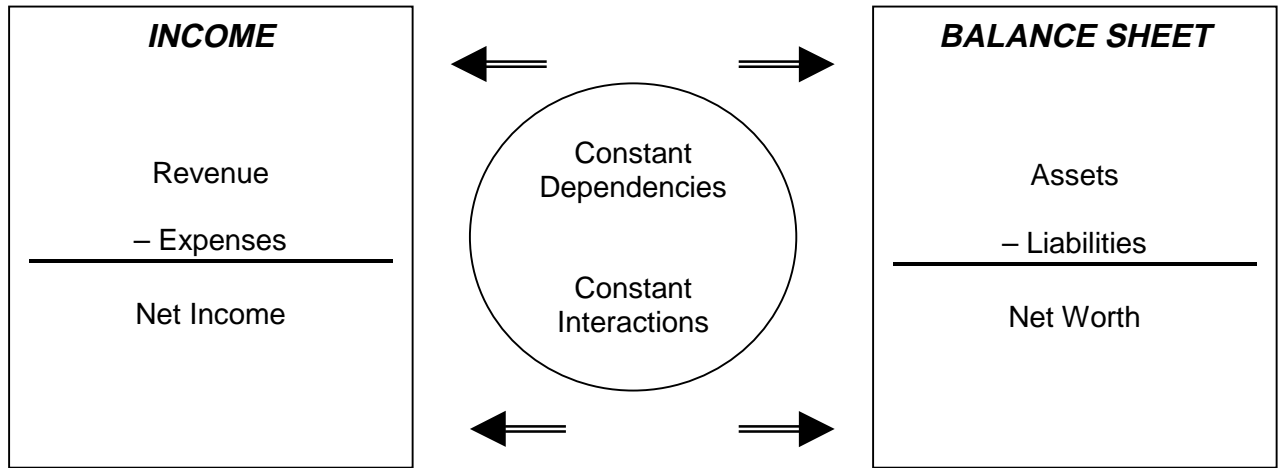


CHART 2
PROFIT, EMBEDDED VALUE, GROWTH

