Damages and valuation

Psychology, risk management and markets

Every year there are natural disasters. To a greater and greater extent they involve large amounts of property damage as land development encompasses larger and larger amounts of vulnerable land. Insurance companies use statistical modeling and reasonably accurately predict the premiums they need to cover their risk. Home and other property owners seem to feel they're luckier. There is an important dichotomy here. It shows up in other ways as well. Nor is the term "disaster" necessarily limited to natural phenomena. The glut of office properties that succeeded the Savings and Loan bubble was an economic disaster. Because we're human, our response to any disaster follows a similar path.

Lotteries are ironically referred to as a tax on people who are bad at math. Psychologists say that the potential reward, however unlikely, exceeds the perceived minimal cost. You may have very little chance of winning if you play, but you have no chance if you don't. So, if the cost is small it matches the reward. Statistically it is good for revenue, and also quite popular as compared to any other tax.

People basically calculate odds differently than insurance companies or lottery schemes. People necessarily have "the little picture" not "the big picture". This has been true for a long time. So, if the caveman encountered a bear in a particular cave, he would remember that, even pass along the knowledge. If it hadn't improved our survival odds, we might not be here, or at least still be dealing with cave bears. Nor is it unreasonable that it should have. If you find a bear in a cave, presumably there's something good for bears about that cave. The likelihood of finding one that was 'just checking it out' by chance is much smaller. Indeed bow hunters in the Nevada desert sometimes spend their idle time finding stone arrowheads indicating that their favorite hunting spot has been used for centuries. In Afghanistan today ambush sites are being used which probably date back centuries if not millenia. But, notwithstanding deer still use the trails in Nevada, as do soldiers in Afghanistan. Some are ignorant. Some are just unlucky. Most, however, get through just fine by considering the circumstances of the risk. Use the trail at night if the hazard is hunters. Bring sufficient force if the threat is an ambush or a cave bear. Even economists use shortcuts (Gigerenzer, "Simple Heuristics That Make Us Smart"). One asked another what he thought about taking a particular job. The second replied, "That's easy, sum up the respective probabilities and optimize." The first replied, "Really I don't have time for that." And, in fact we don't.

Finding examples and setting them up as paradigms is "Bayesian" probability. It works quite well, in fact, as long as the paradigm is appropriate. If a risk changes, then the paradigm is adjusted accordingly. A recent article in the Journal Real Estate Portfolio Analysis (July, 07, p179, "Hurricanes, Catastrophic Risk and Real Estate Market Recovery") gives the example of Cape Fear, North Carolina. The first hurricane didn't affect the market much, nor did the second. The third and fourth in three years, however, did. A respite in the weather brought a gradual recovery in the market. This sort of

pattern has also been documented with respect to earthquakes in both Southern California and Istanbul (Z. Onder, V. Dokmeci and B. Keskin (2004) "The impact of public perception of earthquake risk on Istanbul's housing market," Journal of Real Estate Literature, 12, 2, 181-197). For that matter, a lot in Oakland, California overlooking a landslide scarp down which fifty houses had fallen was advertised fifteen years later as having an unobstructed view.

Disasters and lotteries are similar in that both result in a few spectacular but fairly rare results. Our normal human response works fairly well in that sort of case. We avoid the spectacular loss or seek the spectacular gain, for a while. Lotteries keep their customers coming by trickling out small prizes to give the illusion of possible big success. In the case of long term landslides there is enough pain inflicted on property owners regularly to identify the problem in the market and, usually, motivate a response.

One difficulty with paradigms is when the ground rules shift. For hurricanes, earthquakes and landslides the 'built environment' has been changing. In the 19th century the low ground of New Orleans wasn't even considered developable. As we have seen, a sufficiently large hurricane proves the traditional wisdom. But it took a while. The present situation in Florida and the Barrier Islands of the East Coast is an example of a rapid change in the built environment. The chances are excellent that there will be a disaster. The fact that there hadn't been one when these areas were less developed will have shaped a perception which has been invalidated by change in land use. Earthquakes in California are bad enough. Again, the development all over the fault zones is an accident waiting to happen, but at least there is some awareness of the risk. Arguably it has been capitalized into prices. The most powerful earthquake in US history, however, was the New Madrid quake of the early 19th century. This was obviously a rare event. How rare, is unknown. Finally, there is a human scale to timelines. One lifetime is a long time. Four generations is sufficient in pre-literate cultures to turn a sufficiently notable event into a legend.

But folklore has its uses. In Turkey, folklore holds that houses should be built on gentle hillsides for earthquake safety. "Gecekondu", overnight houses, are Turkey's answer to affordable housing. They are typically small, on the order of 500 square feet, single story concrete block construction. We have the Homestead Act. Turkey's equivalent was decreed by the Sultan about the same time. It intended to populate Anatolia by allowing people to own houses built in one day on unused government land. What it achieved was the development of Ankara and Istanbul over the last half century. The process continues. On the news every evening in Istanbul are scenes of the police defending vacant government land. Downhill from the Mazlak campus of Istanbul Technical University is a police post. The armored cars are equipped with bulldozer blades. Built on hillsides, gecekondu have proven to be pretty earthquake resistant. The most dangerous is multi-story concrete built on recent alluvium. Surprise.

Whatever the critique of Bayesian probability is not to say that the mathematicians have it all right. Mandelbrot ("The (Mis)Behavior of Markets") summarizes some of his previous work in which he talks about weather. If wind speed was normally distributed,

hurricanes would be impossible. Average wind, worldwide, is something like 15 knots, 30 m/s. The limit on the downside is zero, therefore the two standard deviation limit on the upside has to be on the order of 30 knots rather than 130+. So pure statistical modeling of storm losses is likely to miss the mark. There's a larger question here on the whole subject of climate modeling, a.k.a. Global Warming. Wonder to what extent normal distributions are assumed in the variables used?

So, when the worst happens, then what?

Well, however you want to consider probability, if you "win" the disaster lottery, the immediate impact on value is likely to be severe, maybe total. Even if damages are finite and quantifiable, the supply of property available for sale may completely overwhelm any reduced demand. There were properties in New Orleans which weren't very seriously damaged by Katrina. Haven't heard of many of them selling.

More commonly there is some serious problem that simply affects the subject, or a small number of similar properties. Landslide comes to mind, but localized earthquake damage as in the Marina District of San Francisco is another possibility. Contamination is yet another thought. For that matter, police power impact can have a similar effect. Say that the Fish and Wildlife Service determines that you either host or are close to an endangered species habitat? Then there is the Corps of Engineers. One man's vernal pool is another man's mud puddle. These cases all fall into a second category. The quantity of property in the market generally is not affected, nor is demand, but suddenly there is a new submarket: damaged goods for which the extent of damages is unknown. The quantity available is some function of the affected properties. The demand for unknown problems is little or none.

Time enlightens everyone. Some problems are found to be incurable, physically or economically or both. Every once in a while a house will fall down a hill in the Bay Area, a total loss. The remaining land usually goes to the state for back taxes. Total loss. No value. Sometimes the problem is incurable but gradual. A mansion in Pacific Palisades took a couple generations to fall off the eastward retreating palisades. At one point, while the tennis court fence was hanging off the cliff , it was rented. It's last appearance was as a location in a television show, seen from below and represented as the headquarters of the villains. In the same area, westward spreading landslides over the last few decades have extended the shoreline. An old waterfront restaurant is now at the toe of a slide east of the relocated Highway One. It is red tagged because of the imminency of its possible destruction. These gradual problems may yield some interim rental value. Lava flows in Hawaii are similar problems. After the eruption the legal descriptions still exist and lots are sometimes sold, but the old infrastructure is buried under the flow. Access is a hike. Value is obviously a small fraction of the undamaged.

But why is there a large prior and undamaged value? Because at that point the disaster was just a probability, a lottery ticket. It might have been incalculable mathematically and the Bayesian paradigm was equally imponderable. A certainty on a geologic timescale may be a pretty small likelihood in the span of a human life.

As time marches on, curable problems are explored and ranges of mitigation estimated. The general rule is that damaged value equals unimpaired value less the "cost to cure" the damage. The trivial case is termite/dryrot work. It is expected and normal for a seller to address the items required by a structural pest control operator as part of the sale of the property. At the other extreme, nobody is expected to address beyond generalities the possibility of an earthquake or landslide which is yet to occur. In theory the market will consider these eventualities in price.

Scope of mitigation, though is a valid question in "cost to cure" a damage which has already occurred. Again, termite work is the simplest case. If a licensed pest control operator clears the property, it's clear. Unfortunately even that case is becoming more complex. There are nationally franchised operators that are more interested in prevention than cure. They will get rid of bugs, but may be incompetent to address structural damage issues. One case involved an inspection where the wood columns supporting the back steps failed to meet their concrete foundation block because of, probably, fungal deterioration. It was obvious but neither addressed nor estimated by the national firm. A local firm more interested in carpentry probably wouldn't have missed it. Moving on to more complex questions, there was a landslide affected house in the Santa Cruz mountains once upon a time. Its owners' landslide mitigation project was to spread plastic sheeting over the exposed earth. That technique was also used for the better part of a decade by a condominium development in Sausalito. In neither case, of course, did the cure do much to arrest the progress of the problem. But because it was so cheap, any time gained was probably worth the cost. From a valuation point of view, no buyer would consider the problem solved, or give much credit to a cure of this sort. At the other end of the spectrum might be a plan install a foundation to bedrock and excavate the entire slide, replacing it with engineered fill and suitable retaining walls. At that end, the question is, beyond simple feasibility, whether that work would constitute what is known in insurance damage work as a "betterment". A betterment leaves a property superior compared to its a priori situation. So, if value equals damage less "cost to cure", the questions of which cost for which cure still needs to be addressed.

The basic parameters, of course, are efficacy and feasibility. Any cure worthy of the name should cure the problem to an extent largely acceptable in the market place at a cost somewhat proportionate to the increment of value it adds. The first test can be addressed, to some extent, by interviews of market participants. Caution here: this technique is also known as "contingent valuation". It is generally accepted in valuing the environment, but tricky to apply accurately. Generally people will agree with larger numbers if it isn't actually their decision and their pocketbooks. There may be some cases of known problems with sold properties which have been addressed to a greater or lesser degree, but that path of research is going to be time consuming. Feasibility is a little easier. If we are talking about a problem which threatens the whole property value, that value sets an upper limit to mitigation cost. Thus, the cost of controlling a receding cliff in Pacific Palisades exceded even the value of a mansion. In that case there was, as discussed above, a residual value based on the remaining physical life of the improvements. If there is a time dimension in the problem, residual value may exist. In some cases the time

dimension is so short that while a fix might eventually have been found, even a feasible one, the situation deteriorated too fast. The low parts of New Orleans come to mind. If the flooding could have been halted somehow, fixing the dikes would certainly have cost less than writing off a large portion of the city. The New Orleans example also exemplifies the a posteriori question. The structures that were destroyed were already pretty heavily depreciated, so how do you justify reconstruction with new ones? In large issues like that politics will probably trump theory, but an equitable solution would be to have a one-off payment to property owners equal to the value prior to the loss. The theory would be that because public protective structures failed, the public has an obligation to those who lost by that event. As a national policy, however, that would tend to encourage development of similarly high risk areas. So the public had better watch that in future it doesn't create situations which will give rise to that sort of liability. But there are all sorts of intermediate situations in which the market has found acceptable solutions. In the Berkeley hills, all sorts of structural solutions have been applied to stabilize properties affected by landslide. Many have worked for decades and been accepted by the market when those properties were sold.

This blends into the topic of stigma. There is a theory that impaired value equals unimpaired less stigma. Unfortunately quantifying that latter term has been a bit problematic. One analysis I read tried paired sales during an era of house price inflation. It neglected the inflation and ascribed the lower, earlier, prices to a stigmatic influence. There are cases where "stigma" shows up pretty convincingly in sales. There was a recent study that validated the old rule of thumb that proximity to a service station was bad for residential values. The old rule of thumb rested on obvious environmental factors such as noise, traffic, lights and smells. The new one attributed the loss to leaking underground storage tanks (LUSTs). Unfortunately the follow-up study which compared sales of proximal property affected by the contaminated groundwater as compared to those that were unaffected, found no difference. That leaves the old common sense reason as plausible, if not proven. Other stigmas include earthquake fear. The Istanbul study found some, but a fairly small amount, a couple years after the 'quake. San Fernando Valley and the Marina District of San Francisco had small and vanishing effects. This squares better with Bayesian paradigms than with Gaussian statistics. But the statistical probability of an earthquake in, say, the San Francisco Bay Area any given year is on the order of 3%, as currently calculated. Because it would probably not affect the whole area equally, the East Bay along the Hayward Fault is judged more likely to shake, the risk is smaller for many properties.

For events of small likelihood, sorting out whether the most appropriate metric is Bayesian or Gaussian, or Fractal is going to be a problem. Even in systems where there are many data points, financial markets for instance, it is not clear that modelling has captured the difference ("A Demon of Our Own Design" - Bookstaber, "The Black Swan" - Taleb, "The (Mis)Behavior of Markets"- Mandelbrot, "Calculated Risks" - Gigerenzer). It is less clear that even correct models are correctly applied by practitioners ("Calculated Risks" - Gigerenzer). In fact, experts are often less likely to come up with a correct answer than the collective multitude ("The Wisdom of Crowds" - Surowiecki). That does not relieve valuation professionals of a responsibility to form opinions on

reasonable, defensible bases. Where the multitude for various reasons can't be consulted, public purposes may still need unbiased answers.