

## How the Law Changes Over Time

Abstract: We present a preliminary attempt at modeling how laws change over time. The paper begins with the motivation for the effort, problems encountered, and proposes several theoretical models that can provide quantitative results.

### Part 1. Motivation

One question we can ask is what does the law say about a particular topic. A client, walking into a law office, might ask whether a particular event that happened to him is a cause of action for a lawsuit. Another client might ask how to craft a corporate waste management policy so that no environmental laws are violated.

An equally useful, but more elusive question is what will the law say about a topic in the future. It is not necessary to predict how all aspects of the law change, or even to predict a narrow aspect of the law with high accuracy; it is possible to gain a strong competitive advantage by simply being able to predict a narrow aspect of the law with slightly greater accuracy than everybody else. Using financial derivatives, it is possible to craft an investment strategy that takes optimal advantage of the predictive strengths of a model while avoiding potential problems created by the model's weaknesses.

### Part 2. Reflexivity Extensions to the Median Voter Theorem

The Median Voter Theorem states that under certain conditions, the candidates in a 2-party political race will attempt to position themselves near the center of the political spectrum in their attempt to maximize the number of votes. The theorem has its flaws -- the empirical evidence suggests the theorem is more often violated than true -- but it serves as a starting point in that it captures the flavor of the analysis and gives clues on what to expect out of more sophisticated models.

According to the theory, the candidate who is slightly to the left of center will win all the Left votes, both moderate left and far left. The candidate who is slightly to the right will win all the Right votes. The reason for this is that if one of the candidates shifts too far towards the edge, the other candidate will follow this shift and capture additional votes. For example, if  $x = 0$  is the extreme left and  $x = 1$  is the extreme right, then the Left candidate, C1, will be at 0.4999 and the Right candidate, C2, will position herself at  $x = 0.5001$ . Had C1 foolishly positioned herself at, say, 0.43, then C2 would shift to 0.43001; the end result would be that C1 would capture all votes between  $x = 0$  and 0.43, and C2 would capture the votes between 0.43 and 1.0.

The situation is analogous to the Efficient Market Hypothesis in finance; in a perfectly efficient political market, the choice of candidates does not matter -- they will become indistinguishable. However, just as we can ask where EMH breaks down, we can ask where the Median Voter Theorem fails, and just as the exceptions to EMH provides opportunities for savvy investors to make an extraordinary profit, it

We can ask, in this simplified universe, what happens if the voters and the candidates attempt to anticipate shifts in public opinion. Soros applied this principle, which he calls “reflexivity”, to financial markets. Instead of making the usual micro-economic assumption that the supply and demand curves are independently given, Soros writes (The Alchemy of Finance, p. 29): “Nowhere is the role of expectations more clearly visible than in the financial markets. Buy and sell decisions are based on expectations about future prices, and future prices, in turn, are contingent on present buy and sell decisions.” Later (p48), he elaborates: “Stock market valuations have a direct way of influencing underlying values: through the issue and repurchase of shares and options and through corporate transactions of all kinds -- merges, acquisitions, going public, going private, and so on. There are also more subtle ways in which stock prices may influence the standing of a company: credit rating, consumer acceptance, management credibility, etc.”

Moreover, on p47, he writes: “... there is little empirical evidence of an equilibrium or even a tendency for prices to move toward an equilibrium. The concept of an equilibrium seems irrelevant at best and misleading at worst. The evidence shows persistent fluctuations, whatever length of time is chosen for the period of observation.

In a similar vein, many people think of the law as the equilibrium resulting from multiple opposing forces. For example, a person’s right to free speech -- and the benefits to society that free speech provides -- may be weighed such factors as national security, an individual’s right to privacy, etc. And yet, these calculations often involve predictions on the future of the issues involved.

I created a computer simulation that attempts to apply some of these ideas. In this model, I used two candidates that produced campaign ads on a regular basis, one TV station that had talk shows on a regular basis, and a hundred voters. I used the following assumptions.

1. At the start of the simulation, the voters were equally distributed between 0 and 1 on the political axis.
2. The media -- talk shows -- do not report an unbiased opinion of the candidates. Instead, they espouse the position of the candidate most favored in the latest polls.
3. Voters listening to campaign ads or talk shows will be swayed favorably if the ad or show espouses positions similar to their own; they will shift their opinions towards the opinion in the ad/talk show. If the ad or talk show espouses a position far away from their own, they will have an unfavorable reaction and shift their opinion away from that espoused in the ad/talk show.
4. Candidates try to stay close to the political center at every moment. If the political winds moves the median voter to the right, they will follow this shift.

This model begins to show some interesting behavior. Under certain conditions, one candidate will lead early on in the race, but the other candidate may gain the majority soon afterwards. After several shifts in the balance of power, the market settles down and a clear victor emerges. However, at the end, the voters are no longer evenly distributed along the political spectrum; the center has shifted significantly from 0.5.

The same positive feedback loops that Soros describes in finance (inflated stock prices allow the company to sell shares at the inflated price, which allows them to raise additional money for marketing and R&D expenses, which in turn leads to successes that further inflate the stock price) now occur in our model. The lead candidate will be favored by the TV station, which will create talk shows that help sway voters towards that candidate, which puts that candidate further in the lead.

### Part 3. Static Model of Law

Before we ask how to model changes in law, it is useful to ask how can we take a snapshot of the law.

#### Part 3.1 Tree Model

The naive approach would be to assume that all law, including case law, can be translated into a set of statutes; these statutes, in turn, can be translated into computer software. One could imagine the entire body of law in the United States is one huge tree. Law that applies in California would be a branch on that tree. That branch, in turn, would have several branches emanating from it: civil procedure, criminal law, etc. Further along, we would find a small branch that represents burglary, and twigs emanating from that branch that represents the elements of burglary.

This model does yield some useful results. In some cases, the law seems to migrate across boundaries -- the effect of English common law on the American legal system, for example. Several books seem to focus on this effect and describe a taxonomy of the variations of this process, using botanical terms like "implantation", "cross-pollination", "re-potting", etc.

From a computer science angle, John Koza and others have developed a computer model that represents computer programs as trees (very common in the industry) and then proceeds to apply the grafting process along with evolutionary pressures (survival of the fittest.) Although a rigorous mathematical analysis of this computer model has yet to be done, the model has successfully created computer programs with great skill; the programs that survive the evolutionary pressures and reproduce are remarkably "fit". One might imagine a similar process occurring in the law; successful legal "branches" reproduce if successful, but die out if they are "unfit".

In addition, there are a number of computer techniques for modeling the growth of plants: fractals and Lindenmayer systems. I have yet to look into this area.

## 3.2 Case-Based Reasoning

One of the problems with the “tree” approach is that the information contained in the body of cases does not translate well into a set of statutes; attempts at creating artificial intelligences that use this approach have met with success in some areas, but failure in others. An important aspect of legal reasoning is determining which cases serve as the best precedents for the case in question. James Popple’s computer program, “Shyster”, attempts to mimic this approach using a kind of cluster analysis algorithm on a pre-determined set of axes.

When we add the notion of time and change to this model, we get something similar to the model we used in the Median Voter Theorem, except that there are several axes on which change can occur. I have not yet analyzed the implications of this, or how changes in the clustering affect legal decisions.

## Part 4. Stages of Change

One way of modeling changes in law is to identify several distinct stages; afterwards, one can attempt to predict when these changes occur and how they spread to other jurisdictions.

I applied this idea to the spread of the bad faith cause of action in insurance claims. Here’s a summary of the situation: Abe insures Bob for up to \$100,000, who runs Charlie over with his car. Charlie sues Bob for half a million but offers to settle for only \$100,000. Bob’s contract with Abe says that Abe gets to decide whether or not to settle. Since Abe’s liability is maxed out at \$100,000, it is in his favor to refuse the settlement in the hopes that the litigation will end up in his favor; he has nothing to lose and everything to gain. From Bob’s point of view, it is in his best interest to settle; he has everything to lose and nothing to gain.

There appear to be several stages in how the law treated the situation:

Stage 1: Insurers were sued on a breach of contracts theory; no punitive damages were awarded, and Abe was liable for only \$100,000.

Stage 2: In the late 1930s, they were sued on a negligence/fraud/fiduciary duty theory.

Stage 3: In the late 1950s, there was a shift towards implied covenants.

Stage 4: In the 1970s, there was a shift towards first party claims (formerly, only 3rd party claims).

Stage 5: There was an (aborted) shift towards applying the bad faith cause of action to employment cases and other areas of law.

One could make further subdivisions. For example, we could ask when did the idea of each stage appear in a law review article, when it first became dicta in a case, and when did it finally become part of the reasoning. I will look at this at a later time.

We could also ask how what Benjamin Cardozo calls a normative rule (a custom) becomes a constructive rule (a law that can be enforced.) Although Cardozo and others state that generally a rule is normative before it becomes constructive, some recent ideas in the field of organizational development suggest that the order can sometimes be reversed: the official policy paves the way for social change. This is another area I will look at later.

I created a model that included the different jurisdictions (States) in the U.S. Each state had a number that measured their propensity to innovate, and a number that measured the prestige of legal opinions published by that state (how easily those opinions swayed other jurisdictions). All the states began in Stage 1. At any time, each state had the opportunity to innovate by moving to the next stage; if this happened, their move was published in a legal opinion that was read by all the other states. States who “bought” the opinion moved to the stage described in that opinion.

In this model, I chose California and New York as states that had both a higher than average propensity to innovate, and a higher than average prestige. At this time, I do not have enough information to complete this model and measure its results against what actually occurred. Also, I have not yet implemented a satisfactory representation of stare decisis, which would be necessary for explaining why the jurisdictions stopped short of Stage 5 and stayed at Stage 4.

## 5. Difficulties in Measuring

There are a number of difficulties involved in measuring the changes in law.

First, a law may have fallen into disuse; even though it is officially the law, it is never invoked in practice. One example of this is a case in England in 1818. The defendant, accused of the rape and murder of a woman, invoked an ancient law of trial by combat which had not been used for several centuries. The plaintiff, brother of the deceased woman, dropped the suit but appealed the court’s decision. The appellate court upheld. The legislature officially revoked the law in 1819. If it were not for this highly publicized case, the law would probably have remained on the books for several more centuries.

Second, there is the problem of legal fictions. Henry(?) Maine defined legal fiction somewhat differently than how it was used in England. In his book, *Ancient Law*, (pp. 24-25), he wrote:

“Ficto, in old Roman law, is properly a term of pleading, and signifies a false averment on the part of the plaintiff which the defendant was not allowed to traverse; such, for example, as an averment that the plaintiff was a Roman citizen when in truth he was a foreigner. The object of these `fictiones’ was, of course, to give jurisdiction... But now I employ the expression `Legal Fiction’ to signify any assumption which conceals, or affects to conceal, the fact that a rule of law has undergone alterations, its letter remaining unchanged, its operation being modified.”

A more modern example of a legal fiction is ejectment, which was eliminated in England in the middle of the 19th century. Ejectment involved creating two fictitious people and two fictitious leases on a property. "This mummery (which everyone, the court included, knew to be false) served the purpose of bringing the issue of title before the court; but at the same time, because it was a lease case, the ancient land actions (which did not apply to leases) were avoided. (Friedman, A History of American Law, p. 18).

Third, the social mechanisms that produced laws in ancient times differ greatly the mechanisms of modern times. Henry(?) Maine comments (Ancient Law, p7):

"it is certain that, in the infancy of mankind, no sort of legislature, not even a distinct author of law, is contemplated or conceived of. Law has scarcely reached the footing of custom; it is rather a habit. It is, to use a French phrase, "in the air." The only authoritative statement of right and wrong is a judicial sentence after the facts, not one presupposing a law which has been violated, but one which is breathed for the first time by a higher power into the judge's mind at the moment of adjudication."

Benjamin Cardozo's Growth of Law, published in 1924, emphasizes what seems obvious to a present day reader; quoting a study of Holmes to support the idea that law is not static. With the modern emphasis on improvements and innovations in processes -- Total Quality Management, for example -- one might expect that the rate at which rules change has greatly accelerated. A model that assumes things like rational agents that maximize profits or votes may not apply to a situation where laws are assumed to be divinely inspired.

Finally, there is the difficulty of retroactivity, which applies to civil cases which have not yet been reduced to judgment. The difficulty here is that there are multiple sets of laws operating at any given moment in time. For example, let us pretend that there are three identical torts. One occurs in 1990 and is settled in 1990. The second occurs in 1990 but the appeals process was not concluded until 2000; the end result reflects a change in legal climate that occurred in 1995. The third tort occurs in 1992 and is settled in 1994 and reflects the 1990 opinion. What should our model say about the year 1993? The first tort has already concluded with the old rule, but the second and third torts are still pending and different rules apply to each. In effect, we have to split time into two dimensions: one for when the tort occurred, and a second dimension for when the judgment is rendered.

What is even more confusing is that the retroactivity rule for civil cases was itself in dispute for some number of years. Attempting to model the change of the notion of time is difficult enough; if a jurisdiction applied the retroactivity standard inconsistently (switching back and forth between multiple inconsistent notions of time), the notion of time becomes too ill-defined to model. For example, let's say that tomorrow the Supreme Court overruled the retroactivity decision -- is this new retroactivity rule retroactive? If not, then the old retroactivity rule holds and the new decision should be retroactive. The law becomes entangled in self-reference problems, similar to asking what is the truth value of a statement like "this sentence is false."

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