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# Using citation analysis to value patents



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A useful, efficient and increasingly utilised indication of the value of a patent is the number of times that it is cited by a later patent ('forward citations'). More valuable patents (that is, patents for which there is relatively high demand for the technology described in that patent) tend to be cited more often than less valuable patents. An analysis of patent citations to determine the value of patents has been used in the academic literature since at least the 1980s. The basic concept has broad recognition and has been extensively tested empirically. It is often used in the commercial practice of valuing intellectual property and cited in studies by WIPO and the OECD.

The intuition behind the positive correlation between the intrinsic value of a patent and the number of forward citations is

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**Intellectual property**



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are likely to encourage research and patenting in very similar areas. There is an economic incentive to research areas and claim ideas that are very close to the original patent. A patent application must cite all ideas that are precedents to the idea being patented. The larger amount of research focused on an area related to a valuable patent is more likely to result in a greater number of citations to the original patent.

This can be a useful tool in valuation. In a simple example, a patent that has been sold for \$10,000 may have been cited 20 times by later patents. A patent in the same general area of technology that has 50 forward citations might be inferred to be more valuable than the \$10,000 patent.

However, the absolute number of citations is not, by itself, a clear indicator of relative value. Patents in different technologies tend to be cited at different rates, and patents that are older, obviously, tend to have more citations than patents that were issued more recently. To estimate the relative value of a patent or a group of patents, one needs to account for these differences. One way to do so is to identify other patents of the same class of technology ('technologically similar patents') and the same 'vintage' (year of application and/or publication). One can then calculate the average or median number of forward citations received by technologically similar patents of the same age. Such an average or median can be compared to the number of forward citations received by the patent of interest to get an indication of how valuable it is.

Identifying patents of the same age is relatively easy since the application and issuing dates appear on every patent. Identifying patents that are technologically similar for the purposes of citation analysis is more difficult but can be addressed by using other information on the patent. Major patent offices classify patents by technology according to an international standard classification scheme, the International Patent Classification (IPC) system. In the United States, these classifications are assigned at the time that the patent is granted by the patent examiner. The system allows patents to be classified by technology in categories of increasing specificity that vary from one to 10 digits.

To describe, more explicitly, how such data might be used, suppose that a company is interested in assessing the value of the '650 patent which was issued by the United States Patent Office in April of 2010 and which was placed in GO6F, 'Electric Digital Data Processing', under the IPC convention. The analyst could identify all, say, 5755 patents issued within three months of the issue date in that IPC class and count all the forward citations received by each of those patents. If the '650 patent received more forward citations than 99 percent of all the other technologically similar patents of the same age, that would be an indicator that it may be a patent of considerable value. On the other hand, the opposite inference would be made if it

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Data is frequently available on the prices paid for patents in sales between companies. Information on royalties in patent licences is also frequently available. Such information can be used in combination with citation data to provide more precise estimates of value along the lines suggested in the example above. If the objective is to value a large portfolio of patents, this exercise can be repeated for each of the patents in the portfolio.

Patent citation analysis allows one to draw certain conclusions about the relative value of patents in a portfolio. Patents cited more frequently than other patents in the portfolio can be viewed as relatively more valuable. In a frequent scenario faced in litigation, a patent will be asserted that has recently been sold as part of a large portfolio of dozens of patents. The plaintiff will claim that the patent being litigated represented most of the value of, or the entire value of, that portfolio. Such a claim may be supported by testimony of the plaintiff's technical expert. The sort of analysis described above can be used to assist in determining if such a claim is credible. This is accomplished by looking at the number of forward citations received by the asserted patents compared to the other patents in the portfolio, properly correcting for age and technology, as described above. While such testimony cannot entirely replace expert technical testimony for the defendant in this situation, use of IPCs has the advantage that they are assigned by a patent examiner who has to be totally indifferent to the outcome of a litigation that is being filed many years after he or she makes the assignment to an IPC class.

While this is, at its core, a relatively straightforward methodology which can be applied to a number of valuation scenarios, it is crucial that it is applied correctly to the problem at hand. There are many details that need to be thought through carefully, many of which are addressed in the academic and trade literature. One issue is that some patents being assessed for valuation may have been issued very recently. Such patents, and those in their comparison group, will have a limited time to develop a track record of citations. However, a model can be used to predict the number of citations that patents will achieve over their lifetimes, allowing better citation-based valuations of more recently issued patents.

A correctly implemented citation analysis requires calculations that may involve the analysis of a very large number of patents. There may be thousands of technologically similar patents of the same vintage as a patent of interest, as was the case in the hypothetical '650 patent mentioned above. Such an analysis does require access to a comprehensive patent database, but there are several academic and commercial databases available for such an investigation. These computations on massive amounts of data, however, are amenable to being addressed by computer programs and should not be an obstacle to getting useful information from forward citations.

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