Decompose And Adjust Patent Sales Prices For Patent Portfolio Valuation

By Jiaqing "Jack" Lu

Background and The Research Project

Shortly after the Nortel transaction and Google's acquisition of Motorola Mobility in the summer of 2011, some industry observers quickly warned us that patent market was a bubble.[1] The debate over the patent bubble has been going on since then.[2] Some were saying that the patent bubble has already burst,[3] some saying it's about to,[4] while still others keep hailing the booming patent market.[5]

To be sure, all of the concerns over the patent bubble are legitimate, and as always, rational debate is beneficial to the healthy development of the patent market. There is no doubt that most of the opinions expressed were based on the observers' experience and the information available to them at the time. Unfortunately, unlike in the well-established financial markets where transaction information and price data are mostly available for research and analysis, the prices and deal terms in patent transactions are usually kept secret by the parties. Except for meeting certain regulatory requirements (such as SEC filing in the U.S.) for publicly-traded companies, there is usually not much additional motivation for the parties to release the prices and deal terms in patent transactions.

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The lack of disclosure leads to the scarcity of data, and what comes with the scarcity are the incompleteness and obscurity, all of which lead to misinterpretation of the data and information. More importantly, misinterpretation, in turn, can lead to mispricing and market inefficiency when the misinterpreted data is applied to value patents for transaction. For example, after the Nortel transaction and Google's acquisition of Motorola Mobility, some observers noticed that both deals were concluded on a per patent price close to $750K. Therefore, as the story goes, market price per patent was about $750K per patent.

Obviously, the basket of assets that Google acquired for $12.5 billion, which included both IP and other tangible/intangible assets, is quite different from the 6,000 patent and patent applications Nortel sold. Also, as discussed in some commentaries, pricing of both deals largely reflected the dynamics and strategic concerns leading to the transactions, which were mostly specific to the parties in the deals.[6] This raises many interesting questions, not only regarding how to interpret Nortel and Google transactions specifically, but more generally, about how to interpret and apply market prices for patent portfolio valuation. For example:

- Is per patent price meaningful across different transactions and can a simple average price per patent be applied to other transactions?

1. For example, Richard Waters, "Patent hunting is latest game on tech bubble circuit," *http://www.ft.com/intl/cms/s/0/16025f76-b868-11e0-b62b-00144feabdc0.html#axzz27XLSg1yO.* Scott Moritz, "Google, Apple Inflate Patent Bubble," *http://www.thestreet.com/story/11222039/1/google-apple-inflate-patent-bubble.html;* Steve Lohr, "A Bull Market in Tech Patents," *http://www.nytimes.com/2011/08/17/technology/a-bull-market-in-tech-patents.html?pagewanted=all.*

2. Brid-Aine Parnell, "Are we in the middle of a Patent Bubble? Fallout from the IP wars could mutate your smartphone," *http://www.theregister.co.uk/2011/11/04/is_there_a_patent_price_bubble/print.html;* Knowledge@Wharton, "What's Fueling the Tech Patent Bull Market?," *http://knowledge.wharton.upenn.edu/article.cfm?articleid=2845*; David Rosenbaum, "Welcome to the IP Bubble," *http://www3.cfo.com/article/2012/5/it-value_patent-values-skyrocket-high-tech-bubble-intellectual-property.*

3. Robert Cyran, "The Patent Bubble Finally Bursts," *http://www.theglobeandmail.com/globe-investor/investment-ideas/patent-bubble-finally-bursts/article1359652/;* Tim Carmody, "A Bankrupt Kodak Signals A Patent Bubble Burst," *http://www.wired.com/business/2012/01/a-bankrupt-kodak-signals-a-patent-bubble-burst/.*

4. Jeff John Roberts, "Big Tech's patent bubble: an 'aberration' waiting to burst," *http://gigaom.com/2012/08/10/big-techs-patent-bubble-an-aberration-waiting-to-burst/.*

5. Serena Saitto, "Patent Deals Give Investment Banks a Boost," *http://www.businessweek.com/articles/2012-07-19/patent-deals-give-investment-banks-a-boost#r=nav.*

6. Steve Lohr, "A Bull Market in Tech Patents," *http://www.nytimes.com/2011/08/17/technology/a-bull-market-in-tech-patents.html?pagewanted=all*; and *Knowledge@Wharton*, "What's Fueling the Tech Patent Bull Market?," *http://knowledge.wharton.upenn.edu/article.cfm?articleid=2845.*

- What value components are included in the reported market prices of patent portfolios and how is each value component priced?
- What should be done before the comparable prices are being applied for patent portfolio valuation?
- Has patent market pricing changed significantly since the Nortel and Google-Motorola Mobility deals?
- How should one decompose and adjust strategic value specific to certain deals to derive a more "reasonable and fair" price that is meaningful and useful for other transactions?
- How should one adjust other factors such as industry differences; seller/buyer organization type; *patent vs. patent applications*; and a wide variety of other payments and considerations such as licensing back, options to purchase, covenants not to sue/not to compete, product purchase payment scheduling and financing etc.?

In an effort to address some of the issues above, I started a project to collect and analyze patent sales data and information. It is an ongoing project with the following long term goals:

- Analyze and interpret the price information in patent market transactions;
- Decompose price data to identify value components and to quantify component premiums and discounts;
- Derive fair market prices based on adjustments made for various premiums and discounts;
- Use the model and insights derived from the analysis to value patent portfolios.

This article is based on the analysis of the data collected as of the middle September 2012. More samples will be added to the data pool, and analysis and results will be released periodically.

Data Collecting and Processing

1) Data Collecting

All of the transactions collected were from publicly disclosed sources, and no confidential information and data were included in the study. Most of the samples were obtained through online searches in regulatory filings, news reports, analyst reports, and other public sources. Another significant source of samples is RoyaltySource, one of the major data vendors for royalty data. As of the middle of September 2012, 42 samples were collected.

For a patent sale transaction to be included in the analysis, the payment and the number of patents in the portfolio must have been reported. Best efforts are then applied to collect other relevant information, including the time of the transaction, organization type of seller and buyer, strategic intention, industry or field of use, technology type, patent vs. patent applications, other monetary or in-kind payments, or any other considerations between the parties. The most challenging task is to identify any strategic goals that the parties intend to achieve through the transaction. While essentially all transactions involve certain strategic considerations, the most important issue is to identify those common intentions or goals that carry significant premiums or discounts in payments. This process, obviously, is subject to a data collector's interpretation and judgment. Further compounding the process is that the parties' strategic intentions may never be disclosed or reported.

The analysis so far has indicated that the strategic goals as revealed by several categories of information can have significant impact on transaction price. Such information includes settling patent infringement cases, preempting competitors or non-practising entities or NPEs (*i.e.*, defensive patent aggregating); acquiring patents to assert against target companies (*i.e.*, offensive patent aggregating), IP-oriented business acquisition, and IP acquisition for critical technologies.

2) Data Processing

Prior to analysis, the data has to be processed appropriately, and various adjustments have to be made to reflect the economics underlying the transactions. First of all, the payments are adjusted by inflation using the CPI indexes as of the transaction dates and those in June 2012. Second, a net payment for the patent portfolio needs to be estimated. This involves different adjustments based on accounting and financial data released. The step is especially important for the patent portfolios transacted as part of mergers and acquisitions or other assets-package sales.

One of such examples is Google's acquisition of Motorola Mobility mentioned earlier in this article. After the announcement, some of the observers simply took the total payment of $12.5 billion and divided it by 17,000, the number of patents, thereby reaching a per patent price of $735K. However, Google acquired the company's operating assets and

the patents are only part of the basket of the assets, although a significant part. One of the analysts estimated the fair market value of the patents as about $4.5 billion.[7] According to Google's SEC filing, however, the basket of "patents and developed technology," including patents, patent applications and other forms of technologies, was worth $5.5 billion in fair market value.[8] Therefore, adjustments have to be made accordingly for the Google-Motorola Mobility deal to be included in the analysis.

Descriptive Statistics

Among the total of 42 samples, the largest portfolio has 24,500 patents and applications, and the smallest, 1 patent. The highest payment is $5,571 million and the lowest around $113,000, after the reported payments are adjusted using the procedure highlighted above. While per patent price or payment shall not be used as a metrics for valuation across different patent portfolios, as to be discussed in detail later in this article, a per patent price is calculated for each transaction in an effort to illustrate pricing at anaggregate level. Also, a weighted average price per patent is computed as the sum of the payments divided by the sum of the numbers of patents across all of the portfolios analyzed. The basic descriptive statistics are shown in Table 1.[9]

The following sections will summarize the descriptive statistics by major features or characteristics of the transactions studied.

1) Transactions With Strategic Goals and All Other Transactions

As shown in Chart 1, there seems to be a significant difference in per patent prices between the transactions with strategic goals and those without. The conclusion remains true across all three measures, especially in terms of median and weighted average price per patent. In other words, all other things being equal, a buyer would be willing to pay, or a seller would be able to obtain, a higher per patent price for a transaction with strategic goals as defined earlier in this article.

2) *Patents Only vs. Patents and Patent Applications*

Chart 2 illustrates the per patent prices for the

Table 1. Per Patent Prices: Descriptive Statistics

USD in thousand	Actual Payment
Mean of Average Price Per Patent	$731
Median of Average Price Per Patent	$419
Weighted Average Price Per Patent	$295

Chart 1. Per Patent Price *(USD'000)* Transactions With Strategic Goals vs. All Other Transactions

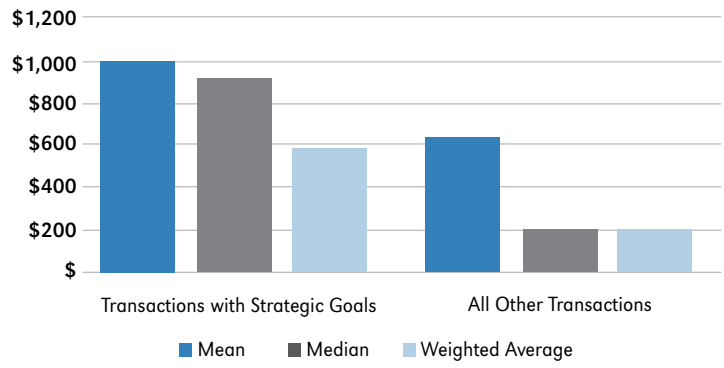
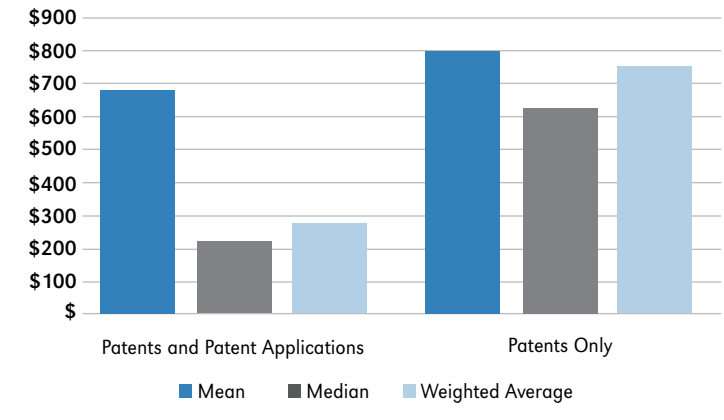


Chart 2. Per Patent Price *(USD'000)* Patents Only vs.Patents And Patent Applications



7. Lynnley Browning and Nanette Byrnes, "Motorola deal offers Google tax, patent benefits," *http://www.reuters.com/article/2011/08/31/us-motorola-mobility-google-tax-idUSTRE77U1QX20110831.*

8. Google 10-Q for the quarter ended June 30, 2012.

9. For simplicity, "per patent price" is used throughout the article to represent "the price per patent and/or patent application," unless being specified otherwise.

transactions that include patents only and those including both patents and patent applications. At this stage, an average price per patent application cannot be calculated, because for those transactions that include patent applications, the portfolios are reported as a combined category of "patents and patent applications." This said, Chart 2 shows that everything else being equal, the average per patent price is higher than the average price per patent and patent application.

3) Before and After Nortel Transaction

To test the hypothesis that the Nortel transaction had fundamentally changed the pricing in the patent sales market and might have caused the patent assets bubble, the samples of patent transactions are divided into two groups, a pre-Nortel group and a post-Nortel group. Table 2 summarizes the basic descriptive statistics of the two groups.

As shown in the table, the median and average per patent prices of the pre-Nortel deals were significantly higher than those of post-Nortel ones. However, the weighted average price of the post-Nortel transactions was above that of pre-Nortel ones, indicating that the data in the post-Nortel period might have been skewed by a few much larger and more expensive portfolios transacted. However, based only on the data in the table, the hypothesis of a patent bubble in the post-Nortel period cannot be rejected nor validated.

4) *NPEs vs. Non-NPEs*

Further efforts to test the hypothesis of the patent bubble shifted the research focus to another interesting phenomenon in the debate; that is, the complete absence of NPEs in the discussions. As shown in the commentaries cited in the beginning of this article, the discussions unanimously traced the same origin of the patent bubble, that is, the patent race among large practicing companies. It is a little surprising, especially in light of the frequently-seen and mostly negative coverage about NPE's role in other major areas of IP business such as licensing and litigation.

There is no doubt that NPEs have played an important role in the patent sales market. As summarized in an earlier study by Santa Clara University Law School Professor Colleen Chien, an overwhelming majority of the patents in the market before 2010 were sold to NPEs.[10] Also, the *Knowledge@Wharton* article cited above actually compared the roles of NPEs and practicing companies played in the market before and after the Nortel transaction. The article concludes that the bull patent market was fueled, not by NPEs (or patent trolls as called in the article), but mainly by the "mutually assured destruction between combatants in competitive industries."

Now, the question is, whether the inconclusive hypothesis for the patent bubble being tested is caused by the differences in pricing behaviors between NPEs and non-NPEs? Conceptually, it is certainly possible. To further explore this possibility, the samples of patent transactions are divided into two categories, non-NPE and NPE; and then within the NPE category, two sub-groups of NPE buyer and NPE seller. The basic descriptive statistics are summarized in Table 3.

The statistics in the table indicate that the average prices of the deals with non-NPE parties are two to three times the price of those with at least one party being an NPE. Especially, NPE buyers seem to pay average prices that are closer to what non-NPEs are paying, while NPE sellers are likely to receive the lowest prices among all market players. Reading the data in Table 2, it is tentatively concluded that

Table 2. Per Patent Price Before And After Nortel Transaction

(USD '000)	Pre-Nortel	Post-Nortel
Average	$990	$445
Median	$578	$289
Weighted Average	$237	$319

Table 3. Per Patent Price: NPE vs. Non-NPE

(USD '000)	NPE	NPE Seller	NPE Buyer	Non-NPE
Average	$436	$261	$609	$974
Median	$154	$146	$488	$639
Weighted Average	$139	$147	$137	$325

10. Colleen Chien, 2010, "From Arms Race to Markletplace: The complex patent ecosystem and its implications for the patent system," *Hastings Law Journal*, Vol. 62, 297-356, December 2010.

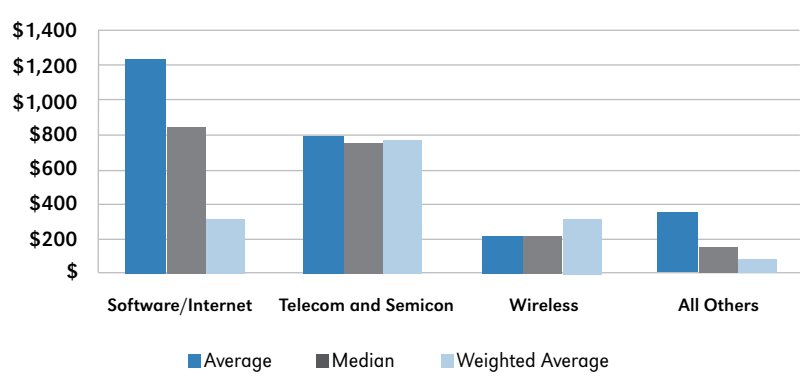
the inconclusive hypothesis for the patent bubble might have been caused by the fact that the higher prices realized in the patent race among non-NPEs were offset by the lower prices paid or received by NPEs.

5) Industry Differences

There are substantial differences in per patent prices among industries, as shown in Chart 3. Evidently, additional data samples are required to make the industry analysis more meaningful. Based on the current analysis, it seems that the samples in the wireless and in telecomm and semiconductor industries are fairly evenly distributed, while the opposite may be true for those in the software/Internet industries. Compared with the prices in other technology categories, the average and median prices of the portfolios in the software, Internet, telecommunication and semiconductor industries seem to be higher.

To conclude this section, it is evident that the basic descriptive statistics above reveal some important differences in the market pricing of various features and characteristics in patent portfolio transactions. However, the descriptive statistics can only illustrate the differences in one specific dimension at a time, such as strategic goal or NPE status, while holding all other factors equal. However, all other things are not equal, and the market prices reflect the different contributions from various other factors. In other words, the one-dimensional analysis above actually aggregates the effects of all other factors when contrasting the data along one specific dimension, instead of controlling for the differences that other factors have made. Obviously, a new approach is needed.

Chart 3. Per Patent Price *(USD'000)* By Major Industries



Econometric Analysis and Conclusions

A hedonic-model-like specification is designated to i) identify and quantify major value components; ii) decompose and adjust the market prices; and finally and hopefully, iii) price patent portfolios for monetization, licensing, and litigation. The dependent variable of the econometric model is the price or payment of the patent portfolio, and one of the most independent variable is the number of patents in each portfolio transacted. Each of the features and characteristics discussed above is represented by a dummy variable. For example, a time dummy variable is introduced to separate those deals done before and after the Nortel transaction. Also, an organization-type dummy variable is designated to indicate the status of NPE or non-NPE; and specifically, to obtain insights into any possible differences between NPE sellers and NPE buyers, two additional dummy variables are introduced in the model.

Before moving to discuss the major conclusions from the econometric analysis, it is important to keep in mind that the analysis is based on 42 transactions collected as of September 2012. As more samples are being gathered, it is expected that new independent variables will be added to the model, and that the coefficients and significances of the variables currently in the model will change accordingly. As a result, the following discussion will focus mainly on the generic relationships revealed between the patent portfolio price and various explanatory variables, and will address the quantitative association when it is necessitated by the context.

Numerical vs. Ordinal Effect of Patent Portfolio Size

Unsurprisingly, the independent variable of patent portfolio size is statistically significant and explains away most of the variance with patent sale price. The econometric analysis yields an evident numerical effect, that is, patent portfolio price increases with number of patents in a portfolio, although the increase is not constant, *i.e.*, the relationship between price and number of portfolio is nonlinear. In the meantime, pricing seems to be segmented by the scale of size of patent portfolio, which means that the nonlinear relationships between the number of patents and price may actually vary across different

scales of size of patent portfolios. Further analysis on more data samples is certainly needed to validate or invalidate this ordinal effect. If both effects are confirmed, for the same percentage increases of number of patents, the difference in pricing effects between a smaller patent portfolio and big one may be decomposed into two components: a numerical effect due to the nonlinear relationship between price and number of patents, and an ordinal effect due to the pricing segmentation by the scale of size of the portfolios.

Even if the ordinal effect is invalidated eventually, the conclusion above raises an important question over the use of per patent price as a metrics in patent portfolio valuation. On the one hand, most commentaries cite per patent price as a value metrics when discussing patent portfolio valuation, because the numbers of patents in different portfolios are usually different, and per patent price is the only normalized benchmark that can highlight the difference in portfolio valuations. On the other hand, it is evident from the econometric analysis above that valuation does not increase linearly with the number of patents in a portfolio. Therefore, unless the numbers of patents in portfolios are fairly close, per patent price derived from one portfolio should not be applied to another portfolio for the purpose of valuation, even if all other features and characteristics such as technology type and organization type are fairly similar. This conclusion is especially true if further analysis eventually validates the ordinal effect.

Patent Bubble, NPEs' Role, and *Patents vs. Patent Applications*

Patent Bubble. After adjusting various other factors, the coefficient of the time dummy variable is not statistically significant, indicating that the Nortel deal did not fundamentally change the market pricing of patent portfolios. In other words, patent market has not been a bubble.

NPEs' Role in Patent Sales Market. Although the descriptive statistics in Table 3 point to the possibility that the inconclusive hypothesis test in the patent bubble might have been caused by the offsetting effects in pricings between NPEs and non-NPEs, the econometric analysis does not support this possibility. In other words, after adjusting the effects of all other factors, there is no difference in pricings between the transactions with at least one part being NPE and those with both parties being non-NPEs. Also, the analysis in this study offers further support to the conclusions I reached in my recent NPE researches;[11, 12] and in one of my recent presentations,[13] that is, NPE is simply a business model, and there is no systematic evidence to prove that NPEs behave differently than other players in the licensing market and patent sales market.

Patents vs. Patent Applications. As mentioned above, while some data samples include only patent transactions, patent applications are usually reported in a combined category of "patents and patent applications." This is especially true for most of the transactions involving very large portfolios consisting of hundreds or thousands of patents and patent applications. After controlling for all other factors, the econometric analysis fails to reject the hypothesis that there is no difference in market pricing of patents only vs. patents and patent applications. Of course, with more samples being added to the data pool, it will be possible to further separate and quantify the effects of patents, patent applications, and the combination of patents and patent applications.

Model-Generated Benchmark, Adjusted and Forecasted Prices, and Case Studies

Stepwise regression analysis is conducted to remove all independent variables that are not statistically significant, and to identify the significant value components. The coefficients of these value components, after the appropriate transformation, can be interpreted as the premiums of the components. For example, software and Internet patents enjoy a significant premium in market price as compared with those in other industries. This is consistent with the conclusions from royalty studies, by which software and Internet patents usually have relatively high royalty rates.[14] Also, when a patent portfolio is transacted with certain strategic goals, the strategic value can lift the price significantly, granting the portfolio a substantial premium.

Based on the coefficients generated from the mod-

11. Jiaqing "Jack" Lu, "The Economics And Controversies Of Nonpracticing Entities (NPEs): How NPEs And Defensive Patent Aggregators Will Change The License Market," Part I & II, *les Nouvelles*, March and June, 2012.

12. Jiaqing "Jack" Lu, "The Myths and Facts of Patent Troll and Excessive Payment: Have Non-Practicing Entities (NPEs) Been Overcompensated?" *Business Economics*, Vol. 47 No. 4, October, 2012.

13. Jiaqing "Jack" Lu, "Patent Monetization in the NPE-Driven Patent Market: Economic Decision-makings for University TTOs," Technology Transfer Tactics, July 27, 2012, *http://www.technologytransfertactics.com/content/audioc/07272012/Mass-Aggregators-NPEs-and-Patent-Trolls-PM713.ppt.*

14. *Licensing Economics Review*, December 2011.

el, the following adjusted and forecasted prices are calculated for each of the patent portfolios included in the study:

i) A model-generated benchmark price based only on the number of patents in the portfolio;

ii) The benchmark price from i) plus strategic premium;

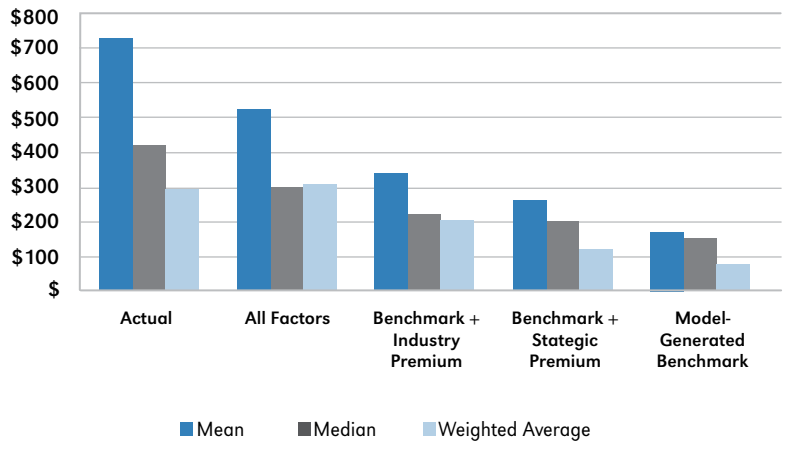
iii) The benchmark price from i) plus industry premium;

iv) The forecasted price based on the model.

For the purpose of illustration, per patent prices are computed for each portfolio based on the four adjusted and forecasted prices above, and are shown in Chart 4. Also shown in the chart are the averages of the actual prices from the data from Table 1. A couple of conclusions can be drawn from the chart. First, based on the model-generated benchmark prices, the median and average per patent prices are around $150K to $170K, while the weighted average actually is much lower at about $75K.

Second, the industry or strategic premium, measured by the increase in median per patent price, is about 30 percent to 40 percent. Interestingly, the median per patent price stays within in a tight range of $150K to $220K despite industry or strategic premium being added to the model-generated benchmark. By contrast, the average and weighted average price per patent increase significantly with a premium being added, indicating that the studied samples contain several very large and expensive (*i.e.*, transacted with large premiums) patent portfolios.

Chart 4. Per Patent Price *(USD'000)*
Actual vs. Predicted And Adjusted



Third, the in-sample forecasting reports that for the 42 samples analyzed, the forecasted median and weighted average price per patents are about $300K, while the forecasted average value is much higher at north of half a million dollars.

Finally, to demonstrate how the model adjusts and forecasts patent portfolio prices, in-sample tests on two transactions, AOL patent sale to Microsoft and Nortel patent auction, are highlighted below. Also illustrated below is an out-of-sample forecasting for Kodak's 1,100 imaging patents put on sale since early 2012.[15]

1) AOL Patent Sales to Microsoft in April 2012

In April 2012, AOL sold 925 patents and patent applications, including 800 patents, to Microsoft for $1.056 billion. Prior to the sale, different valuations were released by analysts, ranging from $290 million by M-Cam to more than $1 billion by MDB.[16]

According to the model developed for this article, the benchmark value of the AOL portfolio is barely $100 million. The likely price range is $300 million to $350 million if industry premiums or strategic premium is included, and the forecasted price is about $1.07 billion.

2) Nortel Patent Sales in July 2011

In July 2011, Nortel sold 6,000 patents and patent applications to Rockstar, a consortium led by Apple and Microsoft through an auction. The bids started at $900 million, and the portfolio was sold at $4.5 billion. One of the industry observers commented that conventionally the portfolio could have been priced at the $100 million to $200 million range.[17] The model-generated benchmark price of the Nortel portfolio is about $450 million, and premi-

15. The portfolio was recently sold to a consortium led by Intellectual Ventures and RPX, see *http://www.reuters.com/article/2012/12/19/us-kodak-patent-sale-idUSBRE8BI0R520121219*. The transaction is not included in the 42 samples.

16. Edmund Lee, "AOL Inc.'s Patent Sale May Yield $290 Million," *http://www.bloomberg.com/news/2012-03-29/aol-inc-s-patent-sale-may-yield-290-million.html.*

17. David Rosenbaum, "Welcome to the IP Bubble," *http://www3.cfo.com/article/2012/5/it-value_patent-values-skyrocket-high-tech-bubble-intellectual-property.*

ums push the price to the neighborhood of $1.5 billion. The in-sample forecasted price is more than $5 billion.

3) Kodak Patents on Sale

Kodak put 1,100 imaging patents together as a block in 2011, and expected to sell the portfolio for $2.2 billion to $2.6 billion, which is the price range provided by a valuation firm engaged by Kodak. According to *The Wall Street Journal*, as of August 2012, the bids received ranged from $150 million to $250 million.[18]

As an example of out-of-sample forecasting, the coefficients generated from the model are applied to the Kodak patent portfolio, which yields a benchmark price of about $110 million. Depending on the composition of the patent portfolio and how strategic goals can be factored into pricing, the portfolio could be worth $360 million to $380 million. If all premiums associated with the value components can be materialized, the model-forecasted price could be as high as $1.2 billion. The portfolio was sold in December 2012 for $525 million.

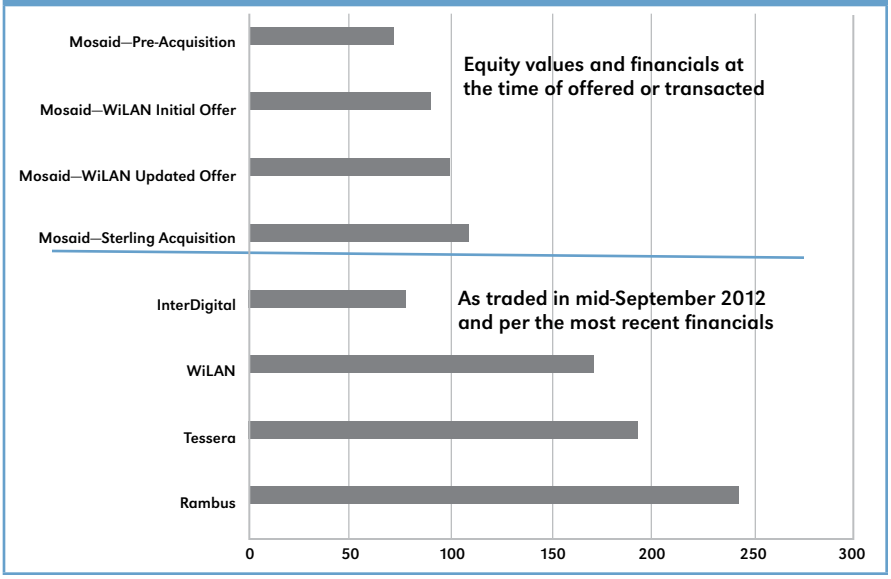
A Sanity Check: Stock Market Pricing of Patents and Cost of Patent Acquisitions

As shown in Chart 4, the benchmark and adjusted median per patent price stays within a tight range of $150K to $220K. For a sanity check, the analysis looks into publicly-traded patent licensing and aggregating companies for additional patent pricing information. As mentioned in an earlier study,[19] assuming that markets are efficient, the pricing of the same patent portfolio across markets, such as licensing market and stock market, shall be consistent. By the same token, it is expected that the pricing across the stock market and patent sale market shall be compatible and that prices realized in the stock market shall coincide with those in the patent sale market.

Chart 5 presents the stock market valuation of patent licensing firms, with the data being collected and prices calculated as of September 2012. Enterprise value, defined as market cap plus total debt minus cash and short-term securities, is used as the valuation measure, and the per patent prices are calculated as enterprise value per patent based on the number of patents a firm held at the time. The top panel of the chart shows the August 2011 valuation of Mosaid, the prices offered by WiLAN to acquire Mosaid since then, and the acquisition price paid by Sterling Partners to acquire Mosaid in October 2011. The bottom panel demonstrates the per patent prices of four major patent licensing firms in North America, including InterDigital, Rambus, Tessera, and WiLAN. As shown in the chart, except for Mosaid valuation in August 2011 and the InterDigital valuation, the four traded or executed prices per patent are all above $100K, and three of them actually range from $150K to $240K, which is consistent with the $150K to $220K range generated by the model.

It is interesting to notice that Mosaid patent assets were traded at a significant discount from $100K in August 2011 and so were the patents held by InterDigital. Mosaid later became a takeover target of WiLAN, and was eventually acquired by Sterling Partners. InterDigital had been an acquisition target since the Nortel transaction in July 2011, and was reported in talks with several firms including Google, Samsung, and Intel. Although the talks did not lead to an acquisition of the entire company, In-

Chart 5. Enerprise Value Per Patent *(USD'000)*

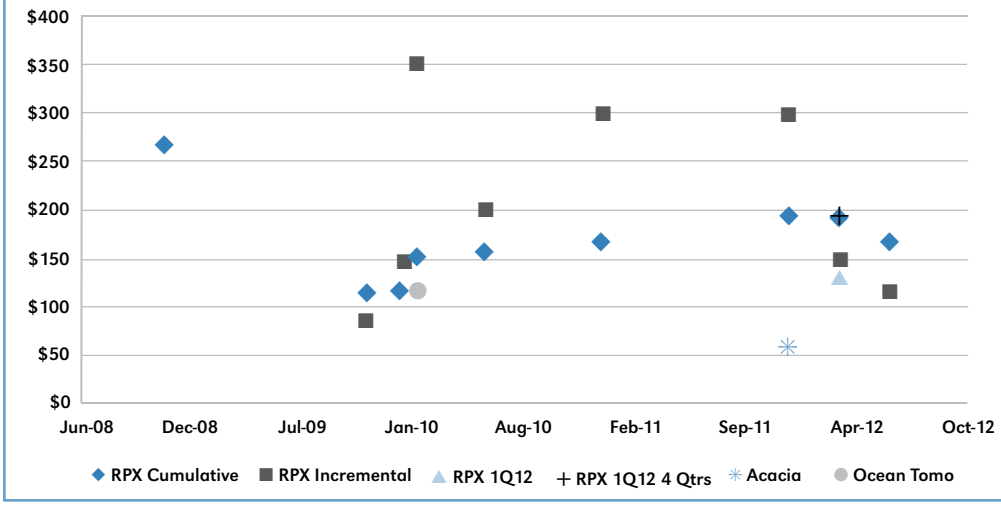


18. See *http://online.wsj.com/article/SB10000872396390443517104577573551386718134.html and http://online.wsj.com/article/SB10000872396390444184704577587650743007954.html.*

19. Jiaqing "Jack" Lu, "Intangible Assets Valuation by License Market and Stock Market: Cross-Industry Analysis Based on Royalty Rate and Tobin's Q," *les Nouvelles*, June 2012.

terDigital did sell 1,700 patents to Intel for $375 million in June 2012. Certainly more data samples are needed and further analysis warranted; still, based on Chart 5, it is tentative to conclude that a patent portfolio traded at a significant discount, say 25 percent to 30 percent discount to $100K in enterprise value per patent, is deemed to be undervalued by the market, and therefore may be subject to takeover bids.

Chart 6. Acquisition Cost Per Patent *(USD'000)*
Calculated Based On Various News Releases And SEC Filings



Finally, Chart 6 summarizes the patent acquisition costs by publicly traded patent aggregators and patent licensing/monetizing firms. The prices in the chart were calculated from the data in the companies' SEC filings and in news reports. As shown in the chart, while there are a few transactions with higher per patent prices, most of the patents were acquired at the price of $100K to $200K, which further corroborates the price range generated by the econometric model above.

Conclusions

In an effort to decompose and adjust patent sales prices for patent portfolio valuation, this article analyzes 42 patent transactions collected as of September 2012. After presenting the descriptive statistics, the analysis designates a hedonic-model-like specification to identify the value components and quantify component premiums. According to the model, the Nortel transaction in July 2011 did not fundamentally change the pricing of patent portfolios, and the patent market has not been in a bubble. Also, while NPEs play an active role in the patent sale market, there is no difference in pricings between the transactions with at least one part being NPE and those with both parties being non-NPEs.

As expected, the econometric model reports a significant numerical effect of patent portfolio size, by which patent portfolio price increases nonlinearly with the number of patents in a portfolio. In addition to the numerical effect, the analysis also tentatively indicates an ordinal effect, which means that patent portfolio pricing seems to be segmented by the scale or size of the patent portfolio. Based on the value components identified and premiums quantified, the model generates a benchmark price, an adjusted price and a forecasted price for each portfolio included in the study. The median prices per patent calculated from the benchmark prices and adjusted prices generally fall into a tight range of $150K to $220K.

As a sanity check, this article finally analyzes two sets of price data collected from publicly-traded patent licensing and aggregating firms. The data corroborates the price range derived from the model. Additionally, the data also shows that a patent portfolio traded at a significant discount, about 25 percent to 30 percent discount to $100K in enterprise value per patent, is deemed to be undervalued by the market, and therefore may be subject to takeover bids. ■

Disclaimers and Acknowledgments

This article is based on a presentation given at the Annual Conference of LES(USA & Canada) on October 16, 2012, and also includes part of a blog published by IPWatchdog.com on October 10, 2012. The views expressed in this article are the author's, not those of Applied Economics Consulting Group, Inc. or the data providers. The time spent on the research leading to this article was not charged to Applied Economics Consulting Group, Inc. or its clients.

The author would like to thank RoyaltySource and several colleagues and friends for the help in data collection.

At the request of data providers, data of each individual transaction will not be disclosed. Analysis of the aggregate data will be released periodically.