Clarivate

Predict optimal drug deal values and success rates

Contents

Challenges associated with deal-making

Effective deal-making is the engine that drives growth and innovation in the pharmaceutical industry. Strategic partnerships and acquisitions not only accelerate new product development and market entry, but are increasingly vital in navigating today's complex drug development and commercialization landscape. In recent years, major pharmaceutical companies have shifted their focus toward later-stage deals, prioritizing later-stage assets closer to regulatory approval. This trend is largely a response to the 'patent cliff'— the impending expiration of exclusivity on blockbuster drugs — and the impact of regulatory changes such as the 2022 U.S. Inflation Reduction Act, which has intensified pressure to secure near-term, lower-risk revenue streams. However, many organizations face significant challenges in identifying the optimal time to enter or exit partnerships.

Evaluating a drug under development is fraught with risks due to complexities inherent in deal structures, resource limitations, and reliance on manual processes[1]. These challenges are further exacerbated by lengthy cycle times, escalating project costs, the high uncertainty associated with early-stage assets and ever evolving policy changes.

Early-stage partnering, without sufficient data or due diligence, can quickly result in inaccurate deal evaluations. Early innovators risk under-valuating their assets[2], and often find themselves having to repeatedly justify their worth. On the other hand, high partner expectations and demands can deter sellers from achieving their targets and milestones.

In our experience, buy-side stakeholders frequently demonstrate a preference for assets developed in-house. The extensive time and resources required to evaluate deals, analyze evidence, monitor global market trends, and develop strategies can introduce biases against in-licensing opportunities. This hesitation can delay decision-making and, in some cases, derail promising deals and partnerships entirely.

[1] Lee, J.H.; Kim, E.; Sung, T.-E.; Shin, K. Factors Affecting Pricing in Patent Licensing Contracts in the Biopharmaceutical Industry. Sustainability 2018, 10, 3143. doi.org/10.3390/su10093143

[2] www.acorns.com/money-basics/investing/what-is-an-ipo-and-is-it-a-good-investment-/

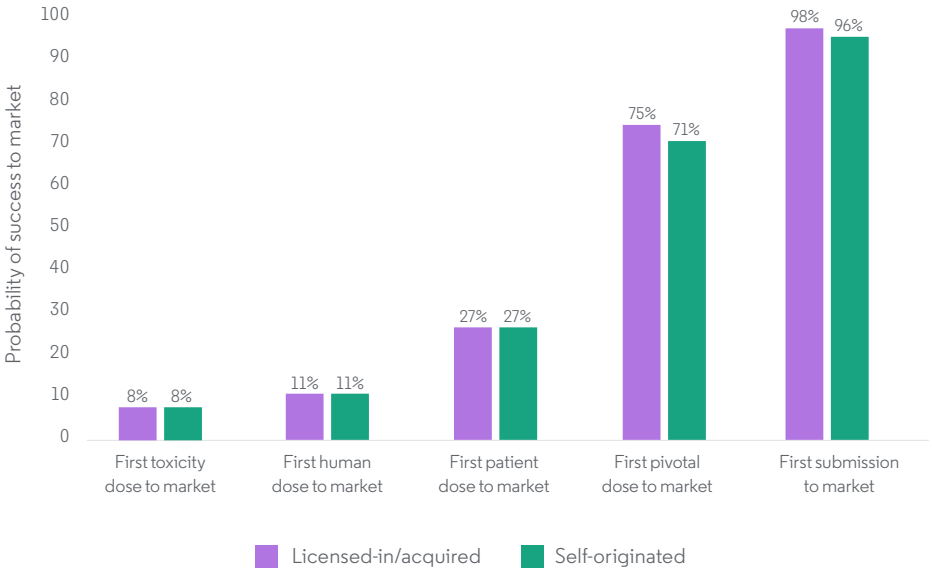
Calculated benefits of in-licensing drug assets

Despite the challenges and complexities brought on by COVID-19, geopolitical uncertainty, and the U.S. Inflation Reduction Act, M&A deal-making in the pharmaceutical industry sustained and continued into 2024[3],[4]. Data from Cortellis Deals Intelligence and other sources indicate that deal value increased by 12%, reaching $3.4tn[4].

Furthermore, in-licensed assets can be more likely to reach the market compared to self-originated compounds. According to data from the Centre for Medicines Research (CMR) International — a leading provider of pharmaceutical R&D performance metrics and a wholly owned subsidiary of Clarivate — in-licensed assets show similar or higher probabilities of advancing to market compared to self-originated assets across various development phases (Figure 1). This is based on phase transition data for active substances collected between 2020 and 2022.

Research also indicates that the cost to bring a drug to market — estimated at $2.8bn — far exceeds the average investment needed to acquire an asset[5]. As a result, there is a clear strategic benefit to in-licensing drug assets — it can help control R&D expenditures and help increase the probability of successfully bringing a product to market.

Figure 1: Probability of success to market by origin



Source: The Centre for Medicines Research (CMR) International in the 2024 Pharmaceutical R&D Factbook.

[3] Hodgson, J. Biotech back in the mainstream. Nat Biotechnol 42, 170–172 (2024). doi.org/10.1038/s41587-024-02126-1

[4] www.mckinsey.com/capabilities/m-and-a/our-insights/top-m-and-a-trends

[5] Wouters, OJ.; McKee, M.; Luyten, J. Estimated Research and Development Investment Needed to Bring a New Medicine to Market, 2009-2018. JAMA. 2020 Mar 3;323(9):844-853. doi: 10.1001/jama.2020.1166. PMID: 32125404; PMCID: PMC7054832

Predicting deal value and clinical success with a statistical model

Cortellis Deals Intelligence applies data science techniques, including a combination of automated machine learning and human intelligence, to more than 20 years of historic life sciences deals intelligence to help organizations accurately predict deal valuation and probability of success for partnered assets.

Cortellis Deals Intelligence — key data highlights.

135K+

life sciences deals

37K+

early-stage deals, including 10K+ M&A deals

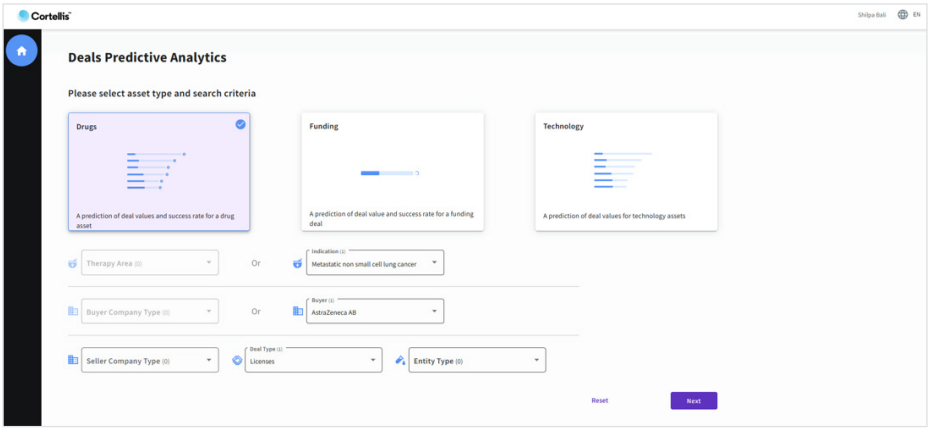
36K+

contracts, including 9.6K+ unredacted contracts

Note: data current as of March 2025.

A proprietary, predictive analytics algorithm draws on more than 20 traits from across the entire body of Cortellis data for a statistical model that calculates success after licensing and target valuation for each asset type for an individual drug class (see Figure 2). Additionally, organizations can better forecast timelines and probability of success with our complementary, patented, **Drug Timeline & Success Rates solution**.

Figure 2: Dashboard view of Deals Predictive Analytics



Source: Cortellis Deals Intelligence, April 2025.

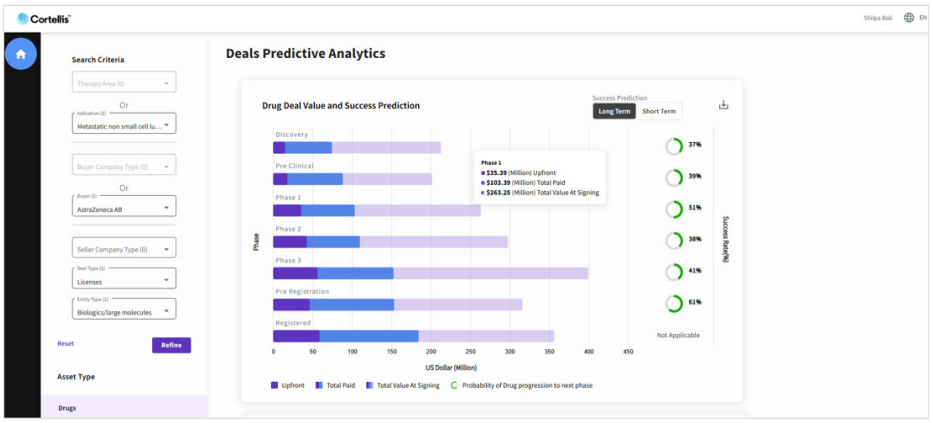
Our approach includes multivariate analysis and statistical modeling of more than 20 qualitative traits to describe a successful deal outcome, including milestone events, deal transaction type, deal therapy and indication, related drug phase, related technology category, drug molecule type, seller/buyer type, companies and more.

Each trait is identified and weighted for its ability to predict success and deal value, which is then used to build a statistical model that calculates success *after* licensing and target valuation for each asset type. **Our statistical model refines predictions as new data becomes available, providing a reliable and realistic target deal value in real-time**.

Our model uses the total number of historic deals to account for the highly dynamic and continuously evolving deal values over time. Instead of relying on a fixed template for all drug classes, the model accounts for currency fluctuations, clinical trial outcomes, market sizing, disease landscape, companies' deal experience and more.

Additionally, the forecast prediction is unique to each therapy indication, company, phase, and transaction type (see Figure 3), and automatically adjusts for variations impacting total deal value. These predictions can be used to explore the target deal value, negotiate the optimal deal structure and explore attributes that contribute towards a lucrative deal.

Figure 3: Dashboard view of Deals Predictive Analytics results page

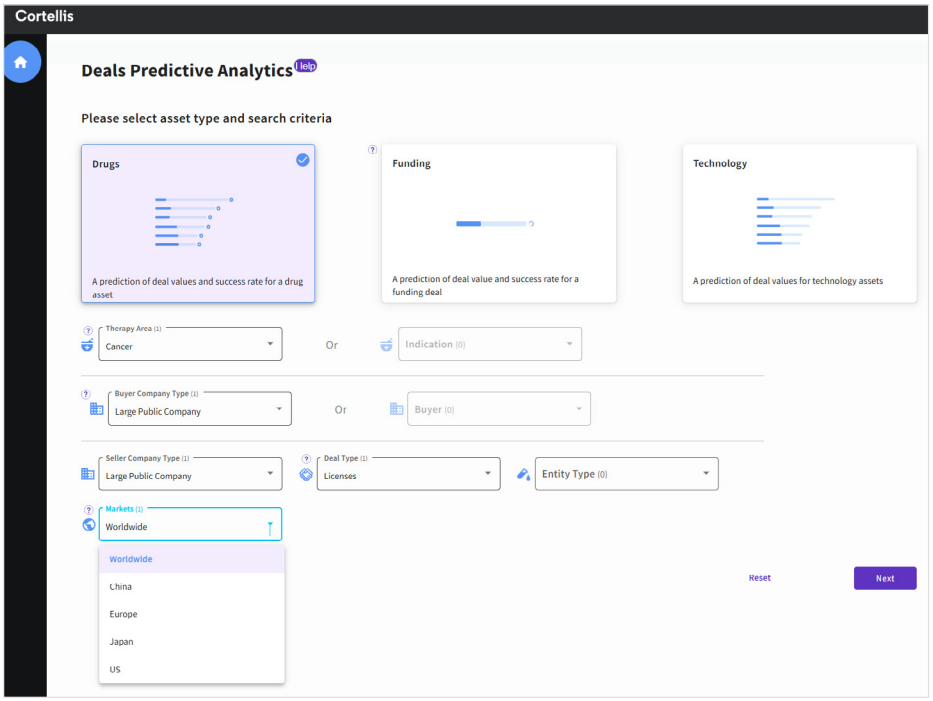


Source: Cortellis Deals Intelligence, April 2025.

Deal value and success predictions by geography

At times, pharmaceutical licensing deals can be limited to specific geographic regions. According to data from Cortellis Deals Intelligence, these territory-restricted agreements represent a relatively small portion of overall pharmaceutical transactions — approximately 10%. However, they are much more common within drug licensing deals, where they account for roughly 30% of such agreements. This provides sufficient data to estimate market share percentages for four major markets: the U.S., Mainland China, Japan, and the European continent considered as a single market (Figure 4).

Figure 4: Dashboard view of Deals Predictive Analytics entry page for licensing deal value predictions by major markets



Source: Cortellis Deals Intelligence, April 2025.

A deal's value can be estimated by summing up the major markets it covers. For example, if a deal is structured as 'excluding Japan,' its estimated value can be calculated by adjusting the worldwide deal value based on the market share percentages for the U.S., Mainland China, Europe, and the Rest of the World.

By incorporating these market share percentages into a log-normal model for predicting global deal values, we derived a non-linear model to estimate the market shares of these four major regions in drug licensing deals. However, deal territories are not always defined strictly by these markets. Some agreements may include territories such as 'U.S. and Canada' or 'Europe excluding Nordic countries,' introducing complexity and data limitations.

To address these limitations, two restrictions were applied to the model to ensure that the market share percentage for the 'Rest of the World' must be no lower than that of Mainland China or Japan. This is consistent with World Health Organization healthcare expenditure data[6] and country-level GDP estimates, both of which show that total healthcare spending in the Rest of the World exceeds that of Mainland China or Japan individually.

To test the efficacy of the non-linear model estimates, mean absolute errors between predicted and observed deal values were calculated and compared. The results indicate that the non-linear model yielded deal value predictions that were over 30% more accurate than those derived solely on healthcare spending percentages. Furthermore, the model was 40% more accurate when forecasting upfront payments associated with licensing agreements (Table 1).

[6] apps.who.int/nha/database/Select/Indicators/en

Table 1: Mean absolute errors of predicted value vs. observed value

	pct_ U.S.	pct_ Europe	pct_ Mainland China	pct_ Japan	pct_ Rest of World	MAE reduction
GDP % in 2022	25%	23%	18%	6%	28%	–
Health spending % in 2020	43%	27%	9%	6%	15%	–
Value total at signing	27%	22%	19%	13%	19%	**32%**
Value paid	26%	22%	18%	16%	18%	**36%**
Value upfront	26%	21%	18%	18%	18%	**40%**

Additionally, territory indicators were incorporated into our deal success model to assess the impact of territory restrictions on the success rates of drug licensing deals. Historical data reveal significant differences between worldwide deals and those with territory restrictions, but no significant differences among the four major markets themselves. These insights have been incorporated into our predictive modeling to enhance the accuracy of our deal success rate forecasts across key regions. This enables dealmakers to accurately assess success rates by phase when negotiating deals within major markets such as Japan or Mainland China.

Data validation of the deals analytics algorithm

To prove the accuracy, reliability and thoroughness of the Cortellis Deals Intelligence predictive analytics algorithm, we ran our data set through a number of validation efforts.

Our model's data aligns with industry standards.

First, we compared the Cortellis Deals Intelligence data set to a 2020 report from Nature, Deal-making in 2020: navigating a new landscape[7]. The editorial team at Nature based its analysis on data from April 2020 that reflected licensing and M&A transactions with disclosed deal values.

The report found an average value of $55m for all deals with reported values from Q1 2016 to Q1 2020. Our dataset from the same time period closely mirrors their findings, both in terms of average deal value and total number of reported deals. This consistency demonstrates that the data used to build our predictive model is aligned with widely trusted, peer-reviewed industry benchmarks — reinforcing the credibility and accuracy of our approach.

[7] Deal-making in 2020: navigating a new landscape online: www.nature.com/articles/d43747-020-00939-y

A predictive model that is more than twice as reliable than conventional averaging.

In our experience, relying on conventional averaging methods to estimate deal value presents a significant risk of under-valuation. Traditional approaches often overlook key contextual factors, relying on hierarchical classifications that fail to account for the nuanced drivers of deal-making. These methods are also constrained by the limited number of deals available to calculate the average deal value, especially for preclinical assets, where available deal data is substantially smaller than for later development phases.

To validate the reliability of our predictive approach, we compared its accuracy against industry-standard conventional averaging. More than 5,000 deals — randomly selected across therapy areas, molecule types, deal types, and global regions — were intentionally excluded from model training. These test samples were then compared to publicly reported deal values.

The method of conventional averaging refers to the range of data on historic reported deals, organized by therapeutic area, phase, drug molecule type and novelty. The information is put into context and further refined by contextual insights. Predicted deal values were grouped into five incremental buckets (Table 2).

Relying on conventional averaging methods to estimate deal value presents a significant risk of under-valuation.

Table 2: Predicted deal value buckets from test data

Active deal value	< $1m	$1m — $3m	$3m — $10m	$10m — $50m	$50m+

Source: Cortellis Deals Intelligence, May 2022.

The Cortellis Deals Intelligence predictive analytics algorithm is more than twice as reliable compared to conventional methods.

The total value for reported deals that support the context and historic conditions of pharma drug deals was averaged for a sample size of n=>5000, and grouped into the incremental range of deal values shown above. When predicted values were in the same range as the actual deal value, these were counted as a 'good' predictor (see Appendix 1, Table 1).

A quick analysis of the deals review showed that based on historic data, an average deal value calculated using conventional methods is between $3m and $10m.

The final calculation based on conventional averages revealed just a 16.6% accuracy rate at the $3m to $10m range compared to reported deal value, with over 83% not complying to the conventional standard (see Appendix 1, Table 2). However, for Cortellis Deals Intelligence, the total percentage of 'good' predictions was 44.8%, hence, more than twice as reliable than conventional averaging.

With 23% of deals exceeding the $50m mark, the more than 38% of deals undervalued based on conventional averaging can severely diminish the realized value of a deal (refer to Appendix 1, Table 3).

Furthermore, our recent enhancement for predicting deal value at a more granular level by indication/partner name is 39% more accurate as compared to conventional averages (refer to Appendix 3, Table 4 and Table 5).

Calculation of Mean Absolute Error

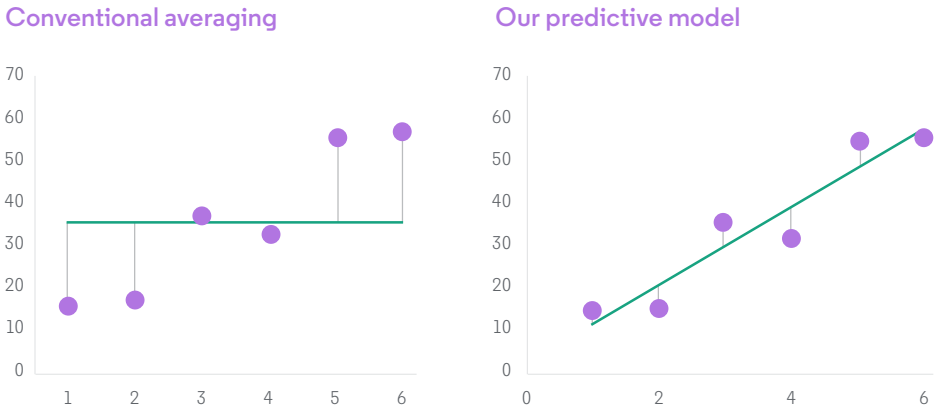
Mean absolute error (MAE)[8] is a measure of errors between paired observations expressing the same phenomenon. For the algorithm validation testing, MAE was calculated based on the difference between the assumed deal value (as indicated by the green lines in Figure 5 below) and actual deal value for the test data points using the conventional averages and predicted value (Figure 6).

[8]. Mean absolute error - Willmott, Cort J.; Matsuura, Kenji (December 19, 2005). 'Advantages of the mean absolute error (MAE) over the root mean square error (RMSE) in assessing average model performance'. Climate Research. 30: 79–82. doi:10.3354/cr030079.

Figure 5: Scientific comparison by Mean Absolute Error (MAE)

Data Science Measurement

Scientific comparison by Mean Absolute Error.



	Mean Absolute Error
Conventional avg.	133.5516
Cortellis Deals Intelligence	**107.6370**

← **19% more accurate**

Note:

- Each purple dot is an actual deal value
- Green lines represent predicted values using Conventional averages
- The length of grey lines are absolute errors
- Mean Absolute Error is defined as the average of grey line lengths

Source: Cortellis Deals Intelligence, April 2025.

Figure 6: Standard calculation of MAE.

$$\mathrm{MAE} = \frac{\sum_{i=1}^{n} |y_i - x_i|}{n} = \frac{\sum_{i=1}^{n} |e_i|}{n}.$$ [1]

(MAE from conventional averages – MAE of predicted value) / MAE from conventional averages

As such, the MAE for conventional averages was calculated at $133.5516m deviation, while the MAE for the predictive model was calculated at $107.6370m deviation.

Thus, we can conclude that Cortellis Deals Intelligence analytics is 19% more accurate using MAE calculations compared to conventional averages.

Oncology test sample

In 2022, oncology continued to command the highest share of pharmaceutical R&D spending, with 35% of all expenditures dedicated to anti-cancer therapies, according to the Centre for Medicines Research (CMR) International's 2024 Pharmaceutical R&D Factbook. This focus was reflected in the biopharma deal landscape in 2023[9], where oncology accounted for 50% of the global deal volume, including Pfizer's notable $43bn acquisition of Seagen.

However, 2024 saw a slowdown in oncology deal activity, both in terms of deal value and volume[10]. Oncology-related drug licensing totalled $65bn, while disclosed oncology M&A deal value amounted to approximately $21bn, with a growing preference for assets with multi-indication potential[11].

Deal value forecasts from Cortellis Deals Intelligence suggest that up-front payments for oncology assets vary considerably by development stage. At the discovery or preclinical stage, the average up-front payment is predicted to be $46.4m, increasing to $112.2m at pre-registration. The total deal value is predicted to be $338.4m for discovery/preclinical assets and $646.1m for assets at pre-registration, particularly for large, publicly listed companies. As expected, late-phase oncology assets command substantially higher deal values, allowing biotechnology companies to capture more value and negotiate from a stronger position (see Table 3).

Table 3: Up-front and total deal value forecasts for a biologic/large molecule drug asset for an oncology deal by phase

	Discovery Preclinical	Phase I	Phase II	Phase III	Pre- Registration	Launched
Value up-front in millions	$46.4	$46.7	$69.1	$79.4	$112.2	$89.6
Total deal value in millions	$338.4	$387.2	$523.1	$516.0	$646.1	$529.1

Source: Cortellis Deals Intelligence, April 2025.

[9] www.lek.com/insights/hea/global/ei/oncology-bdl-winning-increasingly-competitive-environment

[10] www.lek.com/insights/hea/global/ei/oncology-bdl-winning-increasingly-competitive-environment

[11] Senior, M. Oncology dealmakers seek multi-indication therapies. Nature Biopharma Dealmakers, 2025

Benefits of a data-driven approach for optimal deal evaluation

Our analysis demonstrates that predictive modeling offers a key advantage — forecasts remain dynamic, adjusting in real time as new development milestones are reached. Cortellis Deals Intelligence delivers a fully data-driven, unbiased, and forecast-based approach — providing the most accurate insights and actionable analytics available.

The underlying algorithm continuously learns from new data inputs, adapting to the ever-changing pharmaceutical deals and partnerships landscape. With Cortellis Deals Intelligence, organizations can benchmark against competitors, analyze comparable deals, and gain a distinct competitive edge.

Empowered by these insights, organizations can make more informed investment and portfolio decisions, identify and negotiate optimal deal terms, maximize return on investment, and structure deals and partnerships for long-term success.

Learn more

Negotiate your best possible deal with Cortellis Deals Intelligence.

Disclaimer: This algorithm is a service provided to Clarivate customers for general information purposes only, and does not constitute professional advice. Users of the tool are responsible for interpretation and use of the data and deliverables, and any decisions made as a result.

Data sources and contributors

Clarivate has applied the proprietary technologies, tools, and sources trusted by global life sciences customers to produce the deals methodology report.

Cortellis Deals Intelligence provides access to data such as deals, contracts, patents, company types, along with a proprietary predictive analytic tool.

Cortellis Competitive Intelligence provides access to data such as drug pipeline, deals, patents, global conferences, milestones, SWOT analysis and sales forecast.

Cortellis Clinical Trials Intelligence provides access to clinical trials data such as trial sites, trial outcomes and arms, biomarkers, protocol design, along with incidence and prevalence heatmaps.

CMR International is a world leader in global pharmaceutical R&D performance measurements.

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Appendix 1.

Percentage of 'good' predictions of total value for reported deals

Table 1. Deal value groupings

Active deal value	< $1m	$1m — $3m	$3m — $10m	$10m— $50m	$50m+

When predicted value is in the same bucket of actual value, it's counted as a 'good' prediction. For Cortellis Deals Intelligence predictions, the total percentage of 'good' predictions is about 45% (see Table 2 below for details; highlighted are percentages of 'good' predictions).

Table 2: Actual deal value by predicted value using Cortellis Deals Intelligence for test set

N= 5,340	Value grouping	Predicted deal value					
		< $1m	**$1m — $3m**	**$3m — $10m**	**$10m — $50m**	**$50m+**	**Total**
Actual deal value	**< $1m**	12.53%	10.86%	3.31%	1.09%	0.09%	27.88%
	$1m — $3m	3.52%	8.20%	4.14%	1.52%	0.34%	17.72%
	$3m — $10m	1.87%	5.94%	4.94%	2.98%	0.88%	16.61%
	$10m — $50m	0.64%	3.33%	3.86%	4.38%	2.32%	14.53%
	$50m+	0.07%	0.90%	1.88%	5.73%	14.76%	23.26%
	Total	18.63%	29.23%	18.05%	15.69%	18.39%	100.00%

Conventional averaging means using the simple average as predicted value.

The percentage of 'good' prediction using conventional averaging is only 17% (see Table 3 below; highlighted are percentages of 'good' predictions).

Table 3: Actual deal value by predicted value using conventional averaging for test set

N= 5,340	Value grouping	Calculated deal value					
		< $1m	$1m — $3m	$3m — $10m	$10m — $50m	$50m+	Total
Actual deal value	< $1m	0.00%	0.00%	27.88%	0.00%	0.00%	27.88%
	$1m — $3m	0.00%	0.00%	17.72%	0.00%	0.00%	17.72%
	$3m — $10m	0.00%	0.00%	16.61%	0.00%	0.00%	16.61%
	$10m — $50m	0.00%	0.00%	14.53%	0.00%	0.00%	14.53%
	$50m+	0.00%	0.00%	23.26%	0.00%	0.00%	23.26%
	Total	0.00%	0.00%	100.00%	0.00%	0.00%	100.00%

Appendix 2.

Detailed analysis of the algorithm validation

To build our predictive model, we leveraged 70% of the Cortellis deals data called 'training data', and excluded 30% of the total deals called the 'test data' to compare actual deal values to the predicted value. The 'test data' and the 'training data' were randomly selected across all therapy areas, drug types, deal types and regions from twenty years of data.

The unequal buckets can be explained by the total number of test data available for each bucket, with '$10m — $50m' depicting the smallest bucket at 15% of total deals and the 'less than $1m' representing the largest bucket with 28% of total deals in the test data (Appendix 1 Table 2). The variation in the deal value selection can be attributed to the total number of deals in each section, with significant effort to ensure an acceptable n value in each deal bucket selection.

A quick analysis of the deals review data shows that an average deal value calculated using conventional methods is between $3m — $10m.

Of the more than 12,000 deals with reported values, more than 5,000 deals were randomly selected and intentionally left out of the model to support the algorithm validation process. Of the 5,000+ deals analyzed, 1,400+ deals had actual values at less than $1m. Of those 1,400+ deals, our algorithm predicted that 669 deals would have total value less than $1m, therefore 12.53% (669/5340*100) of the overall deals is considered as 'good' predictions within this bucket.

Similarly, of the 887 deals whose actual values are between $3m —$10m, our algorithm accurately predicted 264 deals, therefore 4.94% (264/5340*100) of the total deals is considered as 'good' predictions within this bucket.

A quick summation of the total accurate deal value prediction (12.53% + 8.20% + 4.94% + 4.38% + 14.76% = 44.81%) indicates that the deals analytics model accuracy is about 45% across all deal types.

Appendix 3.

Indication and potential partner (company) level predictions

The Indication and potential partner (company) level prediction is meant to give users information at more granular levels (indication level vs therapeutic area level, and partner name level vs. partner type/size level). It is a weighted average that combines group level predictions (therapeutic area and partner type), and historical averages by indication and/or by partner names.

For example, for a user that specified stomach cancer and Pfizer, the predicted value will be calculated using a group level prediction for cancer and large public company, historical average for stomach cancer deals, and historical average for Pfizer deals.

To validate the prediction accuracy, we again compared Cortellis Deals Intelligence predictions to conventional averaging (using the simple average as predicted value). By comparing percentage of 'good' predictions, the Cortellis Deals Intelligence predicted value at the indication/partner level is 39% more accurate as compared to conventional averages.

When the predicted value is in the same bucket of actual value, it is counted as a 'good' prediction. For Cortellis Deals Intelligence predictions, the total percentage of 'good' predictions is about 26% (see Table 4 below for details; highlighted are percentages of 'good' predictions).

Conventional averaging means using the simple average as predicted value. The percentage of 'good' prediction using conventional averaging is only 19% (see Table 5 below for details; highlighted are percentage of 'good' predictions.)

Table 4: Actual deal value by predicted value at indication/partner level for test set

N=2,114	Value grouping	Calculated deal value					
		< $10m	$10m — $50m	$50m — $200m	$200m — $700m	$700m+	Total
Actual deal value	< $10m	0.57%	12.58%	6.29%	0.80%	0.00%	20.25%
	$10m — $50m	0.24%	7.62%	9.27%	1.42%	0.00%	18.54%
	$50m — $200m	0.05%	5.06%	12.44%	3.26%	0.00%	20.81%
	$200m — $700m	0.05%	2.22%	11.02%	5.58%	0.00%	18.87%
	$700m+	0.00%	0.99%	9.65%	10.88%	0.00%	21.52%
	Total	0.90%	28.48%	48.68%	21.95%	0.00%	100.00%

Note: This comparison only involves drug or technology deals.

Table 5: Actual deal value by predicted value using conventional averaging for test set

N=2,114	Value grouping	Calculated deal value					
		< $10m	$10m — $50m	$50m — $200m	$200m — $700m	$700m+	Total
Actual deal value	< $10m	0.00%	0.00%	0.00%	20.25%	0.00%	20.25%
	$10m — $50m	0.00%	0.00%	0.00%	18.54%	0.00%	18.54%
	$50m — $200m	0.00%	0.00%	0.00%	20.81%	0.00%	20.81%
	$200m — $700m	0.00%	0.00%	0.00%	18.87%	0.00%	18.87%
	$700m+	0.00%	0.00%	0.00%	21.52%	0.00%	21.52%
	Total	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%

Note: This comparison only involves drug or technology deals.

We also used mean absolute error (MAE) as comparison method between Cortellis Deals Intelligence and conventional averages. Cortellis Deals Intelligence predicted value at indication/partner level is 30% more accurate as compared to conventional averages. (see Table 6 below for details).

Table 6: Mean absolute error (MAE) comparison between indication/partner level prediction and conventional averaging

	Mean Absolute Error
Conventional avg.	696.9
Indication/partner level prediction	485.9

Note: This comparison only involves drug or technology deals.

Acknowledgement

The author, Fatima Kakal, and the data scientists, Xiaodong Zhou and Shenglei Cao would like to acknowledge the invaluable support from **Laura Vitez** for her guidance in refining the algorithm and developing the methodology comparison and output analysis of the deal forecasts described in this paper.

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About Clarivate

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