



Valuation Project: Ginkgo BioWorks Inc

SHARE PRICE: \$1.25PS

INTRINSIC VALUATION: \$2.60PS

REGRESSION MULTIPLE VALUATION: \$1.79PS

RECOMMENDATION: BUY

DATE: 18 MAY 2023

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ADVANCED VALUATION CERTIFICATE, SPRING 2023

Ginkgo Bioworks Overview

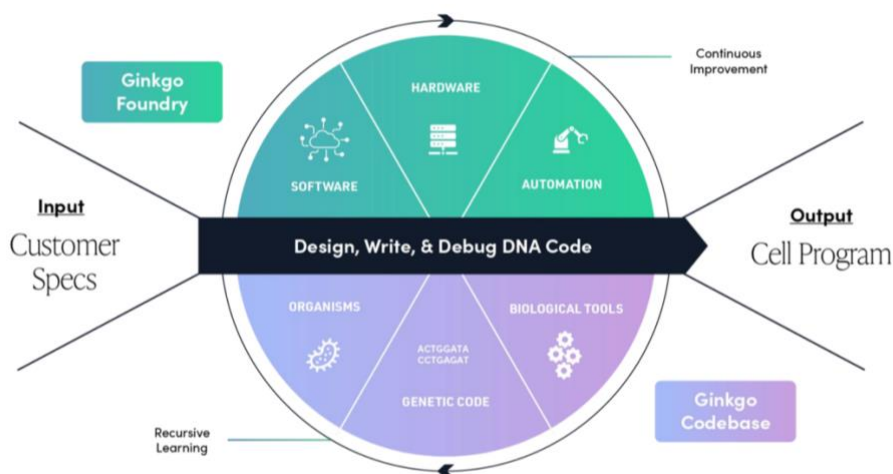
Boston-HQ Ginkgo Bioworks Inc (NYSE: DNA) runs the world's leading horizontal platform for cell programming, providing flexible, end-to-end services that solve challenges for organizations across diverse markets, from food and agriculture to pharmaceuticals to industrial and specialty chemicals.

Founded in 2008 by 5 MIT scientists, Ginkgo listed on the NYSE in 2021. The company is a Contract Research Organization (CRO) offering a unique full-stack integrated cell engineering platform covering enzyme engineering, protein production, strain optimization, process design, scale up and biosecurity services.

The foundation of the platform includes two core assets that execute a wide variety of cell programs for customers according to their specifications, namely the Foundry and the Codebase, which are operated and continuously expanded by a large team of experts in cell engineering, automation, analytics fermentation and more, including 350+ scientists, engineers, and technical experts, and 200+ infrastructure, digital tech, and data experts.

The Foundry wraps proprietary software and automation around core cell engineering workflows—designing DNA, writing DNA, inserting the DNA into cells, testing to measure cell performance—and leverages data analytics and data science to inform each iteration of design. These are flexible, scalable lab unit operations connected by proprietary software that allows Ginkgo to run high-throughput experiments.

The Codebase includes both Ginkgo's physical (engineered cells and genetic parts) and digital (genetic sequences and performance data) biological assets and accumulates as the company executes more cell programs on the platform. Every program, whether successful or not, generates valuable Codebase and helps inform future experimental designs and provides reusable genetic parts, making its overall cell program designs more efficient.



Source: Ginkgo Presentation, JP Morgan Healthcare Conference 2023

Supported by an ever-expanding proprietary library of cells, microbes, enzymes, strains and protein sequences, Ginkgo can offer customers not only with the speed and performance they need, but also with new IP that can be incorporated into their own products. That model creates differentiation for the customer and provides Ginkgo with room for more value sharing with customers.

Ginkgo's business model reflects the structure of the platform with the company being paid in 2 main ways:

- (1) Usage fees for Foundry services. The total addressable market for biological research and development ("R&D") services, including labor and tools, was estimated to be \$40 billion in 2022 and is growing strongly.
- (2) Value share with customers (typically in the form of royalties, milestones, and/or equity interests), aligning Ginkgo's economics with the success of the programs enabled by its platform.

Narrative and Intrinsic Valuation

The appeal of Ginkgo as a potential investment is based on the expectation that cell programming has the potential to be as ubiquitous in the physical world as computer programming has become in the digital world – meaning that in the future products, ingredients and feedstocks will be grown biologically.

In this context, Ginkgo's horizontal platform - making biology easier to engineer - gives the company a leading position and technical competitive advantage to gain further market share as the industry grows, allowing customers to develop the most advanced biology-driven products faster and at competitive price points. It is assumed that the company's share of the R&D cell programming market will reach 8% by year 10, while the underlying industry continues to grow at an average of 10%pa over the next decade.

As Ginkgo adds new programs, its portfolio of customer programs with “downstream” value potential is expected to grow. And the upside to the company and consequently valuation, comes from future income that may be generated from milestone payments and royalties associated with the successful commercialization of products by Ginkgo's customers. Industry sources suggest that the market for bioengineered products could reach between \$2 and \$4trillion over the next 2 decades, which provides a solid tailwind for Ginkgo's large portfolio of programs across multiple industry applications.

That said, and given the highly uncertain nature of these future income streams, a small 2% premium over the industry EBIT margin was assumed in our valuation to cater for the downstream upside. To date, no competing horizontal cell programming platform has been identified but it is assumed that the major competitor(s) for Ginkgo will remain the internal R&D capabilities of corporates, which are inferior in terms of performance but more closely imbedded in the corporate activities.

Below I summarize the key assumptions behind the discounted FCFF valuation of Ginkgo, which assumes a period of strong growth during the first 10 years, before reverting to more normal or stable growth patterns.

Based on Year End 31 Dec		Base Year 2022	1 2023	2 2024	3 2025	4 2026	5 2027	6 2028	7 2029	8 2030	9 2031	10 2032	Terminal Year
Revenue Growth	%	52,2%	41,1%	71,1%	71,2%	24,0%	33,5%	18,1%	23,4%	27,0%	17,4%	16,9%	3,3%
Revenues	US\$m	477,7	674,2	1.153,4	1.974,3	2.448,9	3.269,7	3.860,7	4.764,9	6.050,4	7.100,4	8.300,0	8.573,9
EBIT Margin	%	-56,1%	-41,1%	-26,1%	-11,1%	1,3%	5,4%	10,2%	12,6%	13,8%	14,4%	15,0%	
EBIT	US\$m	-268,0	-277,2	-301,1	-219,3	31,8	177,6	394,4	600,8	835,2	1.022,6	1.245,0	1.286,1
Effective Tax Rate	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	40%	23%
EBIT (1-t)	US\$m	-268,0	-277,2	-301,1	-219,3	31,8	177,6	394,4	600,8	835,2	1.022,6	747,0	986,4
Reinvestment	US\$m	77,1	187,9	321,9	186,1	321,9	321,8	354,6	504,1	411,8	470,4	0,0	
FCFF	US\$m		-354,2	-489,0	-541,2	-154,3	-144,3	162,7	246,2	331,1	610,8	276,6	715,2
NOL	US\$m	3.397,7	3.674,8	3.976,0	4.195,3	4.163,5	3.985,9	3.591,5	2.990,7	2.155,5	1.132,9	-112,1	0,0
Cost of Capital	%	10,31%	10,31%	10,31%	10,31%	10,31%	10,31%	9,96%	9,61%	9,26%	8,91%	8,56%	8,41%
Cum Cost of Capital	x	0,907	0,822	0,745	0,675	0,612	0,557	0,508	0,465	0,427	0,393		
PV FCFF	US\$m		-321,1	-401,9	-403,2	-104,2	-88,3	90,6	125,1	153,9	260,8	108,8	
Sales / Capital	x		2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	
Invested Capital	US\$m	420,5	497,6	685,5	1.007,4	1.193,5	1.515,4	1.747,2	2.101,7	2.605,9	3.017,6	3.488,0	
ROIC	%	-63,74%	-55,71%	-43,93%	-21,77%	2,66%	11,72%	22,57%	28,58%	32,05%	33,89%	21,42%	12,00%
Cell Programming R&D Market	US\$m	40.000,0	44.000,0	48.400,0	53.240,0	58.564,0	64.420,4	70.862,4	77.948,7	85.743,6	94.317,9	103.749,7	
Ginkgo Share of R&D CP Market	%	1,2%	1,5%	2,4%	3,7%	4,2%	5,1%	5,4%	6,1%	7,1%	7,5%	8,0%	

Intrinsic Value Calculation		
PV Terminal Value	US\$m	5504,8
PV of FCFF 10 years	US\$m	-579,7
Sum of PV of Operating Assets	US\$m	4925,1
Probability of Failure	%	15%
Proceeds if Firm Fails	US\$m	1853,8
Value of Operating Assets	US\$m	4464,4
- Debt Incl Leases	US\$m	413,3
- Minority Interests	US\$m	13,2
+ Cash	US\$m	1315,8
- Non-Operating Assets	US\$m	0,0
Value of Equity	US\$m	5353,8
- Value of Options	US\$m	15,3
Common Equity Value	US\$m	5338,5
Shares on issue	Mill shares	2056,4
Equity Value per share	US\$ps	2,60
Current Share Price	US\$ps	1,25
Intrinsic Valuation Upside	%	108%

Cost of Capital Parameters			
RF Rate:	3,56%	US 10-Yr T-Bond 16 May 23	
Beta:	1,09	Unlevered beta 1,06 weighted by revs 70% Biotech Services 30% Computer Services	
ERP	6,02%	Based on weighted geo revenues USA, Germany, UK, Switzerland	
Tax Rate	40%	US Marginal Tax Rate	
PT Cost Debt	23,38%	Synthetic Rating D2/D Interest cover is currently negative	
Cost of Equity	10,14%	Equity Weight	95,53%
Cost of Debt	14,03%	Debt Weight	4,47%
Cost of Capital	10,31%		

Stable Growth Parameters		
Growth in perpetuity	%	3,30%
ROIC in perpetuity	%	12,0%
Reinvestment Rate	%	27,5%
Cost of Capital	%	8,41%
Model Key Parameters		
Target EBIT Margin Year 10		15,00%
2% premium over Computer & Biotech Services		
Assumes Ginkgo retains its platform leadership		
Target Ginkgo Market Share Year 10		8,0%
Relative to exp. growth in cell programming R&D		
Sales to Capital Ratio for Year 1 to 10		2,55x
Based on avg S/C for Computer Services / Biotech		
Effective Tax rate		23,3%
W. avg for Computer/Biotech Services by Revs		

GINKGO BIOWORKS VALUATION – 18 MAY 2023

Regarding the assumptions made in the valuation, it's worthwhile providing more information on the below points:

- **Cost of capital:** As the company transitions from loss making to a positive cashflow business, its overall risk profile declines and a more optimal use of debt supports a gradual decline in cost of capital from 10.31% in year 1 to 8.41% at terminal value.
- **NOL and effective tax rate:** The company has sizable losses carried forward from previous years, which will limit tax payments for an extended period. Once that reverts, the effective tax rate is assumed to be 23.3%, inline with the weighted average effective tax rate for Computer Services and Biotech Services.
- **Reinvestment needs:** Ginkgo model is based on material automation, data analysis and robotics which is currently heavily underutilized as the company builds and expands its customer programs. During its growth period, the sales/capital ratio is assumed to replicate the average of the Computer-Biotech services sectors. During its more stable growth stage, reflected on the terminal value estimates, the reinvestment rate is then projected to be around 27.5% as economies of scale become more pronounced, its overall platform becomes more efficient.
- **Employee options:** The value of employee options is based on an average exercise price of \$11.50ps, volatility of 71.5%, term of 4 years and RF interest rate of 4.11% is estimated at \$15.3m, which is effectively just time value given that these options are significantly out of the money following the material decline in the share price of Ginkgo.
- **Probability of failure:** Ginkgo remains a loss-making platform. To cater for the risk of Ginkgo not reaching its profitability inflection point and face bankruptcy, a probability of failure of 15% was factored in the valuation. In the case of liquidation, the value to be realized from proceeds is estimated at 60% of net assets.

Sensitivity Analysis

I have assessed how sensitive the intrinsic valuation of Ginkgo is to 2 key variables assumed as part of the valuation process, namely (1) Ginkgo's target market share in R&D cell programming by year 10, which dictates its revenues at the end of its high growth period, and (2) the target operating margin by year 10, which incorporates the average margins for comparable sectors (Computer Services and Biotech/HealthCare Services) plus a 2% premium to reflect the future income streams from royalties and milestone payments.

		Ginkgo Share of R&D Cell Programming Market						
		2%	4%	6%	8%	10%	12%	14%
EBIT Margin (%)	23%	1,63	2,59	3,49	4,34	5,27	6,21	7,00
	21%	1,51	2,40	3,20	3,96	4,69	5,50	6,31
	19%	1,38	2,15	2,84	3,48	4,20	4,79	5,49
	17%	1,25	1,90	2,54	3,09	3,60	4,20	4,80
	15%	1,13	1,64	2,16	2,60	3,09	3,48	3,96
	13%	1,00	1,39	1,79	2,18	2,57	2,85	3,23
	11%	0,88	1,14	1,41	1,68	1,94	2,21	2,47
	9%	0,75	0,89	1,03	1,17	1,32	1,46	1,60
	7%	0,62	0,64	0,66	0,67	0,69	0,71	0,72
	5%	0,50	0,39	0,28	0,17	0,07	0,00	0,00

The operating margins variation highlights how Ginkgo's valuation upside will depend on its ability to deliver margins similar to other CROs and comparable service providers, as well as the future commercial success of the products being enabled and designed by Ginkgo's platform.

Based on the table above, for the DCF valuation to converge to the current share price of Ginkgo of \$1.25ps, the assumption for the company's share of the R&D cell programming market needs to be reduced from 8% and the operating margins must be lowered below industry averages, with Ginkgo not realizing any value from royalties in the future. Such scenario paints a bearish picture, and one I do not subscribe to, noting that I see room for significant upside to margins and cashflows from future recurring royalties, milestones and equity agreements.

Relative Valuation

Ginkgo is a young growth company and will remain loss making for some years before becoming profitable. Given its profile and stage of development, Enterprise Value to Sales (EV/S) is the multiple chosen to price the company against its peers.

Using S&P Capital IQ data, a filtered list of CROs was created and refined to exclude companies with (1) revenues below \$100m pa, (2) market capitalizations below \$300m and (3) companies missing data regarding forward revenues or EV/S forward multiples. The result was a list of 35 companies which were used to compile the table below:

	EV/Sales	Operating Margin	Sales Growth	Capex to Sales	1-yr Beta	Net Debt
Median	3,01x	12,4%	12,06%	9,1%	0,34	9,10
Mean	3,96x	13,4%	17,70%	14,0%	0,49	-98,40
Ginkgo	5,96x	-41,1%	52,21%	10,9%	2,46	-802,00

Looking purely on an EV/Sales ratio, Ginkgo looks overvalued versus other CROs, but that seems partially a function of its above industry growth rates and the expectations that their major operating market (cell programming R&D) will continue to grow at a much faster pace than (and capture market share from) more conventional CRO segments within pharmaceuticals.

Overall this initial relative assessment reinforces the Ginkgo overall proposition of being a leading player in an emerging sector (intersection of biology and computer sciences) where material growth is required until the business can reach its cashflow and profitability inflection point in years to come.

Given the limited insights provided by this relative assessment, it's prudent to use regression to better grasp what or how Ginkgo could or should be priced. Of the variables initially considered, net debt was discharged as it provided a low t-stat. All other variables were included in the regression as per below:

Regression Statistics	
R Square	69,0%
Adjusted R Square	57,9%
Standard Error	0,97
Observations	35

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0,41	0,82	-0,90	0,38
Operating Margin	13,13	3,84	3,93	0,00
Sales Growth	1,78	1,49	1,20	0,25
Capex to Sales	0,14	0,03	1,49	0,16
1-yr Beta	2,17	0,99	2,58	0,02

$$EV / Sales = -0.41 + 13.13 \times (EBIT \text{ Margin}) + 1.78 \times (\text{Revenue Growth}) + 0.142 \times (\text{Capex to Sales}) + 2.17 \times (1\text{-yr Beta})$$

Based on the regression equation above, Ginkgo's implied EV/Sales is 4.21, resulting in an Enterprise Value of \$2,840million. Adjusting for cash, debt, minority interests and option value, the implied Equity value per share is **\$1.79ps**, which is still well above its current stock price of \$1.25ps.

Investment Recommendation and Risks

Based on our intrinsic valuation and regression-driven pricing estimate, Ginkgo appears to be significantly undervalued. While the upside potential also carries a high degree of risk given the nature of the company and its stage of development, the recommendation is a **BUY**.

Ginkgo is not an investment for the heart fainted and the share price has and may continue to experience material volatility and price swings, which can be partially explained by the fact that the company operates in an emerging field with few true comparables, and the fact that it remains cashflow negative as it grows its CRO customer base. That same volatility provides opportunities for investors to enter the stock at attractive prices, as that is considered to be the case today – hence the BUY recommendation.

On the risk front, Ginkgo is loss making and will remain loss making for some time, and prior to reaching profitability it will require substantial, additional capital to fund its growth. It's ability to generate sizable streams from royalties and equity stakes in customer programs remains uncertain. Their success will also rely on its ability to maintain the competitive advantage and leadership of its cell programming platform and intellectual property in synthetic biology, which is a rapidly changing sector. The unique nature of cell programming also implies that Ginkgo has few true peers, and that is likely to remain the case in the near to mid-term.

While these risks should remain top of mind for investors, those have been somewhat catered for in the projections, and the valuation suggests that the upside potential out weights the downside risks.