

Investing in the Future*

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Introduction

The title of this paper may come across as somewhat presumptuous. To be clear, it is not about a radically different investment approach, or about a revolutionary new trading technology. Investing *is* about the future, however. Putting capital to work with the expectation of generating a *future* stream of income, or that the investment will appreciate in value over time.

Global industrialization and population growth have a severe impact on the environment. As a result, food, energy supplies and healthcare resources are becoming in increasingly short supply, and hence more costly. Clearly, advanced solutions are crucial to maintain and expand a high quality of life.

In this work, we take a look at a nascent science – with reportedly significant future potential – driven, in part, by the effects of environmental change. This new science, *Synthetic Biology*, can be defined as “the design and construction of new biological devices and systems for useful purposes”.

This paper attempts to address the challenges of how to invest in Synthetic Biology firms, most of which are relatively new start-ups and unprofitable. Valuing an early-stage firm with only a brief operating history, little or no operating profit (or even revenue), and an immature and untested business concept, could be a formidable challenge. For example, standard fundamental analysis is not only difficult, but also meaningless for businesses with negative earnings and/or cash flows. Buying shares in such untried, untested and relatively unknown companies would be risky and speculative. In the theoretical and more practice-oriented literature, the topic of evaluating emerging, promising, but still unprofitable companies, rarely appears. This paper suggests a number of criteria - some quantitative, but mostly qualitative – for the potential investor to consider before making the decision to buy shares in the company.

· All information provided, and companies mentioned in this article are for illustrative purposes only and should not be considered a solicitation, or recommendation, to buy or sell any security. Every effort has been made to present the data/information correctly, however the author does not claim 100% accuracy.

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Synthetic Biology (SB).

According to the Synthetic Biology Project (<http://www.synbioproject.org>), SB is “evolving so rapidly that no widely accepted definitions exist.” However, most would agree that, in the most general terms, Synthetic Biology is the design and construction of new biological parts, devices, and systems, and the re-design of existing, natural biological systems for useful purposes (Kotler, 2012). It is a growing enterprise, as scientists are increasingly able to successfully manipulate an organism’s genetic code, as well as taking the code from one organism and add it to another one.

Synthetic Biology takes this one step further by creating completely new sequences of DNA, using computers and laboratory chemicals “to design organisms that do new things – like produce biofuels or excrete the precursors of medical drugs” (<http://www.synbioproject.org>). An example of the latter is the anti-malaria drug *Artemisinin*, which can now be produced – at a much lower cost - by using genetically-engineered yeast. The technology to create microbial strains to produce artemisinic acid - a precursor of *Artemisinin* – was developed by Amyris (<http://www.amyris.com>) (see also below).

What makes SB special? Rutherford (2013), points out that SB is uniquely suited to address global problems. That is to say, “engineered and constructed solutions” to the problems our planet faces, particularly in light of the effects of climate and environmental change. For example, in the areas of food and fuel production and the development of new synthetic medicines and vaccines. With these present and future creations, “we stand on the precipice of a new industrial revolution” (Rutherford, 2013, p.144).

With an annual budget of \$500 million, the Bioengineering Department at Stanford University (<http://bioengineering.stanford.edu>) is arguably the most important center for bioengineering in the U.S. Drew Endy, one of its faculty, estimates that today 2% of the US economy is derived from genetic engineering and synthetic biology, and that this proportion is growing at an annual rate of 12%. In terms of technology innovation and economic growth, synthetic biology will lead to a boom similar to the Internet, according to Endy. (Garrett, 2013).

Impediments

Possible hurdles on the path to acceptance and success of synthetic biology are primarily twofold, namely: dual-use research & applications and resistance by intermediate- and final consumers. Moreover, subsequent negative publicity could lead to greater regulation and trade restrictions.

Through the centuries scientific discoveries and advancements have been used in heinous ways. As a recent example, in 2011, a Dutch researcher had found a way to turn H5N1 (a highly contagious bird flu), into an equally contagious human-to-human influenza. As a point of reference, the 1918 flu pandemic killed 50 million people, so the potential for bioterrorism would be staggering (Garrett, 2013). Noble (2013), offers a stark reminder that: *The misuse of synthetic biology and similar pioneering*

scientific technologies represents a multidimensional global threat...Therefore, it requires a coordinated international response. A coordinated response by governments, academia, health professionals, and law enforcement agencies.

Public and industry acceptance of genetically-manipulated / bioengineered products is also far from certain. AquaBounty Technologies, a U.S. aquaculture company, has experienced overwhelming resistance from various special interest groups. The company managed to add a growth hormone gene from the Chinook salmon to the Atlantic salmon, which allows the latter to grow to market size in half the time of “regular” salmon. (<http://aquabounty.com>).

Although, the FDA is expected to approve the product, environmental- and consumer organizations have voiced strong opposition to it. According to *Friends of the Earth*, nearly 2 million people - including scientists, fishermen, business owners, and consumers - have written to the FDA opposing the approval of genetically engineered salmon (<http://www.foe.org>).

Conversely, in 2012, a group of 56 scientists, developers, and investors that support AquaBounty Technologies’ application to the FDA, sent a letter to President Obama asking for his help in removing the regulatory bottleneck that is holding up the review process (<http://aquacomgroup.com>). So, after almost 20 years of numerous tests and studies, the FDA will probably approve this incipient, genetically-engineered, food animal, and will likely not be labeled as such.

More worrisome, especially for investors, is the growing list of more than 60 U.S. supermarket chains that will not sell the salmon. Still, AquaBounty remains optimistic, expecting that once consumers have an opportunity to see, feel, and taste the product, “they will wonder what all the fuss was about” (<http://aquabounty.com>).

The fear of misuse (e.g. bioterrorism), consumer resistance, and a challenging regulatory environment are serious obstacles in this area. That is, the social, legal and ethical implications to use these technologies and products could inhibit the growth of the Synthetic Biology market.

But, let us remind ourselves that we are investors. Individuals who employ capital with the expectation of a positive return. If we agree that Synthetic Biology firms have the *potential* to offer an opportunity to earn a decent return, the next question is how? And more specifically, who?

Synthetic Biology Companies

Before looking into specific companies, let us be clear about the following. First and foremost, note that the word “potential” is used here, as almost all of the newer, smaller listed SB companies have negative earnings. They are, therefore, difficult to value as possible candidates for investment. *Caveat emptor*: investing in businesses with negative earnings, or cash flow, is a high-risk proposition and should be avoided by the conservative investor.

There are several other issues, such as the lack of (consistent) revenue. Sometimes, these new synthetic biology firms receive government subsidies and/or grants from private foundations, which of course cannot be considered sources of income.

Furthermore, these new firms usually “burn” cash as development costs keep mounting – building new (and often expensive!) facilities and logistic systems, buying equipment, developing the product(s), etc. Hence, most Synthetic Biology firms have negative cash flows.

Obtaining bank loans is a major challenge for these companies. Contrary to what the Federal Reserve had hoped for at the beginning of the financial crisis, Western banks are still reluctant to issue loans, especially to these new (risky) firms. So how then will these companies obtain the necessary funds to keep the business afloat? By issuing corporate debt, and by issuing new shares. Given their precarious cash positions, these firms will be hard-pressed to make the interest payments (on a corporate bond), let alone pay back the principal on a bank loan. So, the only viable alternative is to issue new shares.

However, this share dilution reduces the proportional ownership of existing shareholders in the company – not an attractive prospect for most investors. Warren Buffet points out that a shareholder is a part-owner of a business, and not simply someone who possesses a piece of paper. No owner likes to see his stake in the business being reduced. Creditors would probably not object for the company to keep raising equity, but shareholders are only willing to throw so much good money after bad. Finally, in order to attract and keep management talent, new companies issue stock options at extremely attractive prices to these individuals – but again, this comes at the expense of regular shareholders who pay full price.

So, definitely potential, but possibly at a cost!

Specific Companies.

Now, let’s take a random look at a few listed companies working in Synthetic Biology space, namely: Amyris (AMRS); Intrexon (XON); Solazyme (SZYM); and Evolva (EVE:SWX). All these are US-based, except for Evolva which is a Swiss company. It is important to know is that these companies do not produce and market final products (the exception being Solazyme). Instead, they produce ingredients and/or offer platforms to other (often larger) so-called “partner companies”. Equally – if not more important – is the fact that none of these companies are profitable (yet). Again, please note that this article is for educational purposes only and should not be taken as an investment recommendation.

Figure 1 below, depicts the stock prices for Intrexon (XON), Amyris (AMRS), and Solazyme (SZYM) over the past year. From October 2014, we see a clear divergence in the three stocks’ performance.



Figure 1. Stock prices for Intrexon (XON), Amyris (AMRS), and Solazyme (SZYM). 01/2014 – 01/2015.

According to the company website, Amyris is a renewable products company providing sustainable alternatives to a broad range of petroleum-sourced products. The company has “a desire to have a lasting positive impact on the planet”. Founded in 2003, Amyris applies its industrial synthetic biology platform to convert plant sugars into a variety of molecules - flexible building blocks that can be used in a wide range of products. (<http://www.amyris.com>). Its main product is Biofene, a renewable farnesene, that can be adapted to function as a viable substitute to fossil fuel-derived products, such as fuels, lubricants, polymers & plastic additives, and cosmetics, among others. The company went public in 2010, with an IPO of \$16 per share. One of the driving forces within the company is Jay Keasling, professor of bioengineering at UC Berkeley. Nonetheless, Amyris has yet to show a profit and the stock currently (January 2015) trades at \$1.86. Apparently, things work well in the lab, but large-scale commercialization is still years off (Rutherford, 2013). In all fairness, the price of crude oil has declined by more than half over the last 6 months, causing the benefits of using alternative fuels to decline accordingly.

Intrexon (<http://www.dna.com>) was founded in 1998 and designs, builds, and regulates gene programs, which are DNA sequences that consist of key genetic components using its proprietary and complementary technologies (*Yahoo Finance*). Intrexon is active in five main areas: Health; Food; Energy; Consumer; and the Environment, using an Exclusive Channel Collaboration (ECC) business model. The company owns almost 60% of the aforementioned Aquabounty Technologies stock. Intrexon provides its ECC partners with industrial-scale design and development of complex biological systems through its proprietary UltraVector platform. Intrexon’s IPO took place only in mid-2013 at \$16. The company is not yet profitable, but its shares traded as high as \$38.50 (January 2014). Today (January 2015), it trades again at this level – more than twice the IPO price.

Solazyme (<http://solazyme.com>) manufactures and sells renewable oils and other bio products. Its proprietary technology transforms plant-based sugars into triglyceride oils and other bio products (*Yahoo Finance*). Target markets for the use of their technology platform include fuels, chemicals, nutritionals, and skin and personal care products. Solazyme held its IPO in 2011 at \$18 a share. The company is not profitable and its shares currently trade at \$2.20. The effects of the sharp decline in crude oil prices apply here as well.

Our only European Synthetic Biology firm is Evolva (<http://www.evolva.com>). Founded in Switzerland in 2004, it produces ingredients (and provides technologies for making ingredients) to other companies, in particular in the food & beverage, consumer health and pharmaceutical sectors. For example, Evolva has succeeded in making the key individual components of the popular natural sweetener Stevia, through yeast fermentation, using low-cost plant sugars. In early 2013, the company entered into an agreement with Cargill to jointly develop and commercialize fermentation-derived steviol glycosides. Cargill is one of the largest privately-held companies in the world, with revenues well over \$130 billion. It is these kinds of collaborative agreements that are essential for synthetic biology companies to grow and prosper. The company went public as Evolva Holding in 2009 with an IPO of CHF 1.32 a share. In early 2014, the company issued 27 million new shares at CHF 1.37 per share. Today it trades at CHF 1.47 while earnings remain negative.

Earlier, we mentioned the phenomenon of share dilution. In February 2014, Evolva placed 27 million new shares. At its 2014 annual meeting, Intrexon asked its shareholders to approve an additional 3 million share issue. According to its proxy statement, the company believes “it has an insufficient number of outstanding shares to allow for adequate long-term equity incentives, as part of their executive compensation program”. In March 2014 Solazyme announced its intention to offer \$100 million in convertible senior subordinated notes, as well as 5 million shares of its common stock “to fund capital expenditures, working capital and general corporate purposes”. Jim Cramer (a popular TV investment commentator) promptly rated the stock as a “Sell”.

A Money-Losing Proposition?

So, why would anybody invest in Synthetic Biology businesses? Mostly, it appears to be a money-losing proposition. They are all burning cash, regularly issue new shares, and for their survival depend heavily on the continuous success of their collaborative arrangements with other firms.

There are hundreds of listed companies that report losses quarter after quarter and only a few of those “hit the jackpot” and become highly-profitable, well-known names in their field. Staying within the Biotech space, the more intrepid investor is hoping to be to pick the next Amgen, Gilead Sciences, Celgene, or Novo Nordisk. These biotech companies – without exception – have become excellent businesses, richly rewarding their (especially early) shareholders.

Like Heck & Rogers (2014) and Funk (2014), Rutherford (2013), also remains very optimistic going forward: “This manipulation of four billion years of evolution, specifically for the creation of unnatural biological tools, is potentially a revolution, one that is occurring right now” (p.181). He agrees with the United Nations’ Intergovernmental Panel on Climate Change (IPCC) and Lovelock (2014) that people – and by extension businesses – are not going to change their behavior in any significant way and therefore climate and environmental change are unavoidable. This, almost by necessity, will have an effect on how the Synthetic Biology industry will evolve over the next decades, in terms of scale and innovation.

The question then remains: How do you assess the potential of these new businesses? How do you separate the wheat from the chaff? Traditional valuation methods e.g.

those based on earnings and cash flows are, of course, meaningless. Here are some tentative suggestions:

- 1). Are Total Revenues increasing? Is the Price/Sales ratio improving?
- 2). What are the trends for Total Assets and Total Debt?
- 3). Is the value and quality of the Collaborative Agreements increasing?
- 4). Market Size and Market Growth for the company's product(s).
- 5). Competition and Barriers to Entry.
- 6). Are Earnings Per Share (EPS) "improving", i.e. is the negative number consistently getting smaller?
- 7). Analysts' Estimates & Opinions. Although of some value, we should of course be aware of the inherent conflicts with Sell-Side research. That is, analysts like to keep their jobs and their client base. The Financial Industry Regulatory Authority (FINRA) (<http://www.finra.org>) lists five "conflicts that analysts may face, as they develop and offer their opinions in research reports": Investment Banking Relationships; Analyst Compensation; Brokerage Commissions; Buy-Side Pressures; and Ownership Interests in the Company. The message is clear: *Do your own homework!*

In addition, there are several qualitative criteria one could consider when valuing a loss-making business (Bacher, 2014). These would include, but are not limited to:

- 8). Who are the Founding Team members and who is running the business now? The quality of the management team is one of Warren Buffett's key investing tenets - management that keeps in mind the concerns of the shareholders.
- 9). Does the company have a technical and intellectual history, or did it start from scratch?
- 10). What is the company's business model? Collaborative agreements with much larger enterprises (e.g. for commercialization purposes) appears to be the standard model for most Synthetic Biology firms. SB companies typically get compensated through payment for technology-access fees, royalties, milestones, and the reimbursement of certain costs. In theory, this model allows them to leverage their know-how, capital, and other resources across a potentially wider scope of products and markets than would be possible without collaboration.
- 11). Who are the current investors in the company? Founders, institutional investors, hedge funds, well-known individual investors? What is their background, technical expertise, overall performance, etc.?
- 12). Commercialization Prospects. Commercialization is the final stage of the new product development process (Cooper, 2011). It involves bringing the final product successfully to market. However, a Synthetic Biology firm rarely brings a final product to a final buyer. Instead, it offers a technology-platform, or perhaps a vital ingredient, to a collaborating partner company. Thus, by definition, commercialization is limited to establishing the largest possible number of alliances.

Valuing early-stage businesses is a subjective, and hence precarious undertaking, as the focus tends to be more on qualitative rather than quantitative information. Still, these companies with negative earnings and cash flows are often found in industries, such as alternative energy, robotics, and biotech, where the potential reward can far outweigh the risk. In the next part of this paper, we will “apply” the above twelve valuation criteria to a specific US-listed company. For this we have selected – for illustrative purposes only – INTREXON (ticker = XON). Intrexon was chosen from the companies listed above, because it was the only one with a current stock price still trading well above its IPO.

Also, as a US exchange-listed company, financial data and other important company information is more readily available and reliable than a non-US firm. It should be pointed out that today, with the Internet as a global investment platform (Choffray & Pahud de Mortanges, 2014), the investor has a plethora of free analytical tools at his disposal, from websites such as Yahoo Finance, MSN Money, NASDAQ and especially the Securities & Exchange Commission (SEC).

To ensure a certain level of availability and reliability the main source of information used, is obtained from the company filings with the SEC, primarily Forms 10-K (Annual Report), 10-Q (Quarterly Report) and 8-K (unscheduled material events, or corporate changes). All filings are current, freely available and can be viewed online (<http://www.sec.gov>).

Intrexon.

Intrexon describes itself as “a leader in synthetic biology”, focused on working with other companies through exclusive collaboration partnerships in the health, food, energy, and environment sectors to create new bio-genetically-engineered products that improve the quality of life as well as the planet’s health” (<http://www.dna.com>).

Intrexon aims to create value from use of its biotech platforms across different industries and partner companies. A very ambitious proposition, to say the least. So, let’s take a closer look at Intrexon in an attempt to “analyze” this company – both from a (very limited) quantitative and from a somewhat more elaborate qualitative perspective, following the above list of 12 suggestions.

1). Are Total Revenues increasing? Year-on-year, Intrexon grew revenues 70.63% from \$13.93m. to \$23.76m., while net income improved from a loss of \$81.87m. to a smaller loss of \$38.98m. over the past 3 years. A positive development.

The Price/Sales ratio of Intrexon on May 5, 2014 is 44.67, based on trailing 12 month sales, which is close to its average of 46.88. Investors are willing to pay, on average, almost \$47 for every dollar the business generates in sales. That seems exceedingly high, given that today’s P/S ratio is only 1.68 for the S&P 500 and 10.27 for the Biotech industry as a whole (<http://pages.stern.nyu.edu/~adamodar/>). To compare, Solazyme’s P/S is 18, Amyris P/S is 5.87. Based on this ratio, buying Intrexon stock can be considered extremely risky.

2). What are the trends for Total Assets and Total Debt? Intrexon Corp uses little debt in its capital structure as supported by a debt to capital ratio of 0.44%, compared to 1.37 for the S&P 500 and 0.68 for the Biotech & Drug industry as a whole. Current Ratio is 9.46. Less debt equals less risk, as the company funds its projects mostly through equity instead of through bank loans and/or corporate bonds. This is in line with what we discussed above, i.e. the difficulty companies are having in the current environment obtaining bank loans, especially untried and untested, loss-making firms.

3). Is the value of their collaborative agreements increasing? Intrexon brings its products to market through Exclusive Channel Collaborations (ECCs). According to their SEC Filing 10-K (2013), they had 20 active ECCs in the fields of healthcare and foods. Intrexon Collaboration revenues have increased almost threefold from \$8,013,000 (2011) to \$23,760,000 (2013). This is a positive development. However, the company's growth prospects depend to a large extent on its ECC partners' successes, and the company will surely feel the impact from any key partner's failure. Also, the quality of the ECC's has been put into question, however their ECC with Johnson & Johnson has been seen as a positive development in this regard. Still, as of March 2014, There have been no commercialized products derived from the Intrexon's collaborations.

4). Market Size and Market Growth for Synthetic Biology products in general. The global market for Synthetic Biology generated \$233.8 million in 2008. According to a market study by *Transparency Market Research*, the global Synthetic Biology market was valued at \$1.8 billion in 2012 and is expected to reach \$13.4 billion in 2019 - growing at a CAGR of 32.6% from 2013 to 2019. Interestingly, Europe holds the maximum market share, and is expected to maintain its lead position in terms of revenue. EU governments and private organizations are the major driving force for continued growth of the Synthetic Biology market (<http://www.transparencymarketresearch.com/synthetic-biology-market.html>). This is a positive factor for Intrexon.

5). Competition & Barriers to Entry. The market for synthetic biology is segmented by products, by technologies and by applications. Different levels of competition and different entry barriers exist for these three segments. Intrexon does not market final products, but sees itself a leader in Scientific Biology applications. These applications are based on proprietary & complementary technologies, that are difficult to replicate for new entrants, which it "markets" through ECCs.

Intrexon does not have direct competitors, i.e. those who offer similar technologies and applications. Competition is, therefore, more indirect coming from large industrial companies who may develop their own methods and products. This is a business with strong patent protection worldwide, raising barriers to entry.

6). Earnings Per Share (EPS). Although EPS was still negative for 2013, it has become significantly less so over the past 3 years. Intrexon reported annual 2013 losses of \$ -1.40 per share. Year-on-year, growth in Earnings Per Share excluding extraordinary items increased 92.54%. On May 07, 2014, the company reported 1st quarter 2014 earnings of \$0.04 per share – missing analysts' estimates by \$0.02.

7). Analysts' Estimates & Opinions. As of May 02, 2014, the consensus forecast amongst four investment analysts is that the company will outperform the market. Twelve-month price targets for Intrexon have a median target of \$31.00, with a high

estimate of \$40.00 and a low estimate of \$18.00. The median estimate represents a 96.70% increase from the May 9, 2014 price of \$15.76.

8). Founders and Current Management. The company was founded 1998 by Thomas Reed Ph.D., a molecular geneticist. Dr. Reed is the company's Chief Science Officer and a Company Director since 1998. The other 12 executive officers were appointed more recently – between 2007 and 2014. Four executive officers hold a Ph.D. in various relevant fields and one holds an MD degree. Possibly significant is the background of the current CEO & Chairman of the Board, Randal J. Kirk. He has a successful track record as a biotech entrepreneur and investor, who also owns about 64% of Intrexon shares. According to one Biotech publication, Kirk has kept Intrexon well funded and is busily securing deals with a constellation of players in drug development, aquaculture, animal health and agriculture". Or, using a Warren Buffett phrase, Mr. Kirk has considerable "skin in the game".

It could thus be said that Randal J. Kirk is by far the key player who "runs the show" at Intrexon. In the SEC Form 10-K (2013) filing it is stated that...*We have historically been controlled, managed and principally funded by Randal J. Kirk, our Chief Executive Officer, and affiliates of Mr. Kirk. As of December 31, 2013, Mr. Kirk and shareholders affiliated with him beneficially owned approximately 64 percent of our voting stock. Mr. Kirk is able to control or significantly influence all matters requiring approval by our shareholders, including the election of directors and the approval of mergers or other business combination transactions. The interests of Mr. Kirk may not always coincide with the interests of other shareholders, and he may take actions that advance his personal interests and are contrary to the desires of our other shareholders.....*

Is there a potential conflict of interest here?....Intrexon has *engaged in a variety of transactions with companies in which Mr. Kirk and affiliates of Mr. Kirk have an interest. To put investors minds at ease....We [Intrexon] believe that each of these transactions was on terms no less favorable to us than terms we could have obtained from unaffiliated third parties, and each of these transactions was approved by at least a majority of the disinterested members of our board of directors.* But still, with respect to Intrexon stock...*If Mr. Kirk or any of his affiliates were to sell a substantial portion of the shares they hold, it could cause our stock price to decline.*

So, for Intrexon, it would behoove an investor to "keep a close eye" on Mr. Kirk and his insider transactions. Kirk has been described as one of the most successful healthcare leaders of all time (Chase, 2014) and investors might be tempted to replicate his transactions, because of his impressive track record with previous investments. Be that as it may, investors should also ask, what would happen to the company if Randal Kirk were no longer there?

9). Technical & Intellectual history. Intrexon was founded by Thomas D. Reed in 1998, while still a Ph.D. candidate, and has no prior technical, or intellectual history. All proprietary technology and intellectual property was started from scratch.

10). The company's business model. Intrexon's business model is to commercialize their technologies through Exclusive Channel Collaborations, or ECCs, with collaborators that have industry expertise, development resources and sales and marketing capabilities to bring new and improved products and processes to market. Although still largely untested, this model seems to work well for Intrexon, as most of

their revenues are derived from ECCs. Moreover, it can focus on research and development of platforms without having to spend considerable capital on commercialization. In such situations, technical risk is greater than market risk (Bacher, 2014).

Apart from what was already mentioned in 3), what are the drawbacks of Intrexon's ECC model? First of all, there is a time lag between the granting of the initial license to enable Intrexon technologies, and when a stream of royalty payments begins, as this is dependent upon the collaborators' abilities and time needed to successfully develop and commercialize their own products. Several ECCs are established through the efforts of Randal Kirk and have been "allowed" to pay for Intrexon's technology with their own shares, increasing Intrexon's exposure to the risks inherent in the collaborators' business. Also, stock is not the same as cash. Except in limited circumstances, Intrexon does not have the right to terminate an ECC agreement.

There was a concern that Intrexon's ECCs were mostly smaller, relatively unknown companies. However, Intrexon recently announced a collaboration with Johnson & Johnson, for advancing new skin and hair care products (<http://www.dna.com/consumer/collaborations/JohnsonJohnson>).

In their SEC Form 10-K filing (Annual Report), Intrexon lists a considerable number of risks associated with the ECC business model (<https://www.sec.gov>). It should be noted, however, that these risks would seem inherent in all organizations that employ business models with significant collaborative elements and these types of risks are not unique to Intrexon.

11). Who are the current investors in the company. First and foremost CEO & Chairman Randal J. Kirk and his affiliates own 64% of the shares. During the third quarter of 2013, David Einhorn's hedge fund Greenlight Capital bought 2,176,868 Intrexon shares, representing 0.9% of Greenlight's portfolio. Dan Loeb's Third Point hedge fund acquired 2.17 million shares in 2011, when the company was still private. According to his Q4 2013 Letter, Loeb has continued to accumulate Intrexon stock since its August 2013 IPO. At a more modest level, T. Boone Pickens (a well-known takeover artist during the 1980s) bought 12,000 shares in September 2013. For a more extensive overview of hedge fund holdings of Intrexon stock see: <http://www.insidermonkey.com/insider-trading/company/intrexon+corp/1356090/hedge-funds/>

Overall institutional ownership for Intrexon shares is 80.74% (<http://www.nasdaq.com/symbol/xon/institutional-holdings>). Stocks with high institutional ownership could be attractive on the assumption that financial institutions will be longer-term shareholders. Still, larger institutional owners obviously have the potential to create *and* destroy value for individual investors. Consequently, it is imperative that investors follow closely and react effectively, to the moves the stock's biggest players are making.

Insider buying: Conventional wisdom states that if insiders (e.g. company officers) are buying the stock, it is a positive indicator. It is assumed that people within the company know the current business environment and the future prospects of the business better than anyone else. For example, at a recent price dip CEO & Chairman Randal Kirk bought an additional 65,173 shares.

12). Commercialization Prospects. As mentioned before, Intrexon does not commercialize any products itself. Instead, it relies on partners through Exclusive Channel Collaborations (ECCs). ECCs obtain exclusive access to Intrexon's proprietary technologies for use in the development and commercialization of their own products and/or treatments. The SEC 10-K (2013) filing states that none of the company's collaborators has received marketing approval, or has commercialized any products, enabled by Intrexon technologies. Intrexon expects the first revenues from commercialized products by 2015.

Intrexon first important successful commercialization would, most likely, be Aquabounty salmon, given its imminent FDA approval. In general, food and healthcare are the first areas that have achieved initial promise of market success. In healthcare, programs in oncology, anti-infectives, antibiotics, and tissue repair have resulted in some high-profile collaborations.

Intrexon is also in the process of establishing collaborations in the areas of energy and the environment. In energy, the company has formed Intrexon Energy Partners (IEP). IEP's first target product is isobutanol for gasoline blending. With respect to the environment, Intrexon entered into a joint R&D agreement with Rentokil Initial PLC (<http://www.rentokil-initial.com>) that may lead to a new generation of pest control products (<http://www.dna.com>).

Business Valuation using *Monte Carlo Simulation*.

The purpose of this paper was to suggest several – mostly qualitative – approaches to value an early-stage enterprise, with only a brief operating history, little or no revenue and/or operating profit, and an immature and untested business model. However, for more quantitatively-inclined investors, familiar with advanced statistical analysis, there is a method which can address real-world uncertainties by modeling future results in complex and unpredictable situations.

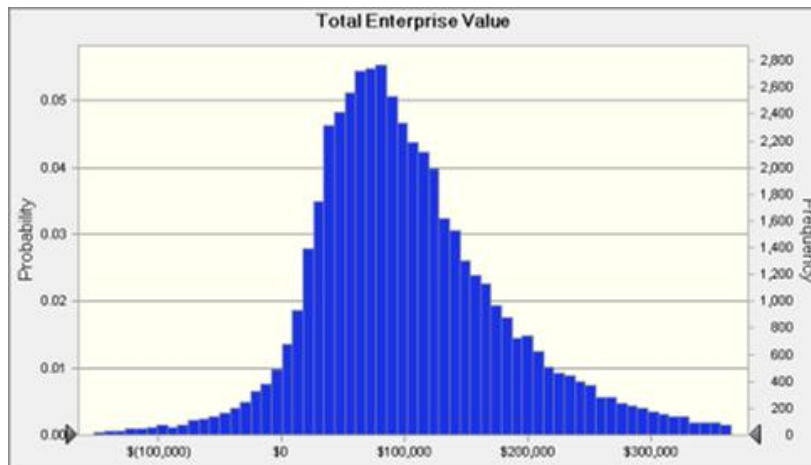
Monte Carlo Simulation is a multivariate modeling technique that allows investors/analysts to run multiple trials and define potential outcomes of an event or investment. As such, it does not produce a single-value answer (Razgaitis, 2009). Instead, a Monte Carlo simulation creates a probability distribution, or risk assessment, for a given investment under review.

(<http://www.investopedia.com/articles/financial-theory/08/monte-carlo-multivariate-model.asp>).

According to Evergreen Advisors: Monte Carlo Simulation “is useful when valuing early-stage businesses because it provides the ability to estimate value, based on a statistical analysis of several uncertain but correlated future events.”

It is beyond the scope of this paper to perform a Monte Carlo Simulation for the company Intrexon. However, Evergreen Advisors offers the following basic example: *Assume we are valuing a technology start-up, and management has identified the drivers of its profitability as gross profit margin, product price and volume of sales. We then make underlying assumptions regarding key parameters: the discount rate, value range constraints, type of probability distribution, the variables in question and correlations between variables. These assumptions and variables are then analyzed*

with an algorithm, yielding an array of conclusions which provides an estimation of the most likely outcomes, as well as insight into the probability of unanticipated events. In this example, a simulation of 50,000 random trials resulted in probability-based estimates for revenue, profit margin, and earnings growth. Whereas the lack of operating history and unproven concept would ordinarily make forecasting an overly speculative exercise, we now have a statistical basis for projecting future results and developing a cash flow forecast. The results of Monte Carlo simulations are presented graphically as frequency distributions, as shown in the figure below.



Source: <http://evergreenadvisorsllc.com/monte-carlo-simulation-as-a-business-valuation-tool/>

Conclusion

So, what have learned? Identifying new companies, with cutting-edge technologies and innovative approaches to solving today’s problems, can be one of the most rewarding pursuits for the individual investor. Especially, if the company in question later turns out to be hugely successful, which implies to “get in” early. Intrexon is a perfect example: a risky stock “surrounded by several indicators of success” going forward (Chase, 2014). *Prima facie*, Intrexon also faces far too many uncertainties for most people. Therefore, it is imperative that an investor makes a serious effort to understand the business well enough to be comfortable in risking his money. Extensive due diligence is of the essence!

Investing in businesses with mostly negative fundamentals is a risky proposition, but by using appropriate valuation techniques an investor stands a better chance of reducing the current risk and reap future rewards.

In this paper we have suggested a very limited number of quantitative, and a larger number of qualitative criteria. An investor may consider these when faced with analyzing a new untried and untested business, but one he/she believes has considerable potential for success in the future. Qualitative criteria were added because the investor will, most likely, be faced with negative earnings, a limited company history and very few comparables. Regular fundamental analysis would, therefore, be almost meaningless because of mostly negative results. Moreover, most models depend on positive earnings growth to make projections for the future. Even if

we have a fairly good idea of what drives value the most, it is based on (uncertain) future growth. Investors who attempt to value such a business with an emphasis on qualitative data will be better prepared for the volatility that comes with investing in these stocks.

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