

Emerging Growth Companies' Performance Under the JOBS Act

THESIS

Presented in Partial Fulfillment of the Requirements for the Business Administration Degree
with Honors Research Distinction in the Max M. Fisher College of Business at The Ohio State
University

By

Michael Korn

Undergraduate Degree in Business Administration with a Specialization in Finance

The Ohio State University

Fisher College of Business

2018

Copyrighted By

Michael Robert Marconi Korn

2018

III. Abstract

The number of public companies in the U.S. has steadily declined over the past two decades. To help reverse this trend and encourage small businesses to go public and receive funding, the U.S. passed the Jumpstart Our Business Startups Act, or JOBS Act, in 2012. This law helped small U.S. businesses go public by relaxing many of the typical securities regulations a public company would normally face. The part of the law that has gained the most attention is Title III, the CROWDFUND Act. This part of the law allows companies, called emerging growth companies, to use crowdfunding to issue securities, which was not allowed previously. This meant that non-accredited, or retail investors, could now invest in these IPOs. Because these emerging growth companies don't disseminate as much information about themselves as one would see from a typical public company, it makes it more difficult for investors to determine if an emerging growth company is a successful investment. This additional accessibility to retail investors combined with the relaxed reporting requirements led me to investigate whether or not investing in emerging growth companies would result in subpar relative returns. This study examines stock returns and volatility measures for emerging growth companies that have gone public since the passing of Title III of the JOBS Act and finds that these companies have had poor relative returns. When looking at the returns for these emerging growth companies, the 50th percentile and median of returns is -0.7%, far below the 50th percentile and median of the S&P 500 and other comparable indices. Preliminary results have also shown these emerging growth companies to be more volatile than most other stocks, meaning losses can happen quickly. Because these companies have shown to be poor and risky investments thus far while being able to take advantage of uninformed retail investors, actions must be taken to increase the reporting requirements for emerging growth companies.

IV. Table of Contents

I. Title page	1
II. Copyright page	2
III. Abstract	3
IV. Table of Contents	4
V. Introduction	5
VI. Literature Review	7
VII. Hypothesis	10
VIII. Methodology	11
IX. Data Analysis	12
X. Results	13
XI. Discussion	18
XII. Conclusion	20
XIII. Implications/Future Research	21
XIV. Acknowledgements	22
XV. Appendix	23
XVI. References	27

V. Introduction

In 2012, the Jumpstart Our Business Startups Act, or JOBS Act, was signed into law after being passed with bipartisan support. This law encouraged the funding of small businesses in the U.S. by relaxing many of the typical securities regulations a public company would normally face. The part of the law that has gained the most attention is Title III, the CROWDFUND Act. This part of the law allows companies to use crowdfunding to issue securities, something that was not allowed before. This opened up IPOs to non-accredited investors, i.e., retail investors, and not just institutional investors that you would see in a normal IPO. On October 30, 2015, the SEC adopted final rules allowing Title III equity crowdfunding, and these rules went into effect the following May 16. Additionally, Title IV of the JOBS Act, called Regulation A, provided another way for these companies to receive funding by allowing companies to raise up to \$50 million using its public solicitation of shares. Because these companies that have gone public under the JOBS Act don't need to report the same information and can receive funding from less-knowledgeable people in retail investors, it is hypothesized that investing in these companies will offer a significantly worse relative return than similar stocks.

There has been very little evidence that the JOBS Act has stimulated the IPO market in any way. The number of public companies is down a great deal compared to two decades ago, and the number of IPOs has been down as of late as well. A large reason for this is that there are other ways to receive funding in today's economic climate. Companies can raise plenty of money from venture capital, private equity, and other sources as well. There has been a rise in the number of "unicorns", or startups valued over \$1 billion, over the past few years. The reason that these companies are called "unicorns" is that it is very rare to see startup companies reach these high valuations just as it is rare to see the mythical unicorn. The fact that there has been

such a rise in the number of unicorns should raise some questions about the types of valuations these companies are getting in the private market. With the money available in the private markets and with the JOBS Act increasing the amount of shareholders a company can have by a multiple of four before the company has to disclose its financials publicly, it makes sense as to why the number of IPOs has declined so greatly over the past few years.

As some of these high-profile unicorns began to test the IPO market, these companies' valuations plummeted. When Square, Inc. went public in 2015, the public market priced them well below their valuation in the private market. German hotel search engine Trivago experienced the same situation when it went public in 2016. It became well-known that these unicorns were overvalued, yet some companies still decided they wanted to go public. Snap, Inc. was one IPO that was of interest to the author of this paper. Snap has yet to make any profits, yet their IPO received a lot of hype and media attention. Since it has gone public, their share price has decreased tremendously. As these larger, well-known former unicorns have had mixed results post-IPO, looking at the other end of the spectrum became something of interest. Would the smaller formerly private companies that have utilized the JOBS Act who don't have to report the same amount of financial information fair even worse than the unicorns? An answer to this question can be found in this paper.

VI. Literature Review

Since the legislation regarding emerging growth companies was passed in 2015, there is not a whole lot of research that has been done on the subject. However, there is plenty of research on the topics of IPOs. One of, if not the most knowledgeable sources on IPOs is Jay Ritter, a professor at the University of Florida. In Loughran and Ritter's 1995 paper titled "The New Issues Puzzle," the authors take a look at the underpricing of IPOs from 1970-1990 and their underperformance over the next few years. Loughran and Ritter used the buy-and-hold return method and matched each stock in their sample to a similar stock that had not recently gone public to measure the performance of stocks. They found that these companies issuing stock for the first time underperformed greatly, with the largest underperformance coming in months 6-24.

Since this paper will examine stock returns for up to a year, Mitchell and Stafford's 2000 paper titled "Managerial Decisions and Long-Term Stock Price Performance" is a paper that is of interest to the author. Mitchell and Stafford look at the effects of managerial decisions, seasoned equity offerings, and share repurchases rather than IPOs, but their methodology for abnormal long-run stock performance is useful. To measure stock performance over longer periods of time, they use both long-run buy-and-hold return (BHAR) and the calendar-time portfolio approach. The case against using long-run BHAR is that it assumes independence in the abnormal returns for stocks, but the case for using long-run BHAR is that it accurately represents the investor experience. The calendar-time portfolio approach takes into account the fact that abnormal stock returns for different companies may not be independent events, but it may have a low power to detect abnormal results because it averages over months of "hot" and "cold" returns.

Since initial-day IPO results are covered in this paper, taking a look at the literature in this area is helpful. Loughran and Ritter (2004) examines IPO underpricing for stock in 1999-2000. They find the underpricing to be a whopping 65% and offer a few hypotheses as to why the underpricing is so high. The most useful explanation they find is the spinning hypothesis, in which side payments were made to venture capitalists and executives of the issuing firm, which actually increased the incentive to hire a lead underwriter that prices the IPO lower. As more regulatory scrutiny regarding spinning came about after the bubble, the underpricing dropped back to an average of 12%.

Another paper written by Jay Ritter from 1991 title “The long-run performance of initial public offerings,” looks at the initial-day underpricing and longer-period returns using buy-and-hold return. Using common stock IPOs from 1975-1984, he finds the initial-day opening return at 16.4%. These companies averaged a return of 34.47% over their first three years, severely lagging a control group of matched companies which had a return of 61.86%. Another relevant study in this area was done by Lowry et al. in 2010. “The variability of IPO initial returns” highlighted underwriter’s difficulty in valuing companies with high uncertainty, which is similar to the companies that I will be looking at since these emerging growth companies don’t have the same reporting requirements. The authors find an average underpricing of 22% between 1965 and 2005, but a very small amount of stocks is even close to this number. They find that only about 5% of the initial returns are between 20% and 25% and that about one-third of the initial returns are negative. They also find the standard deviation of these returns to be 55%.

While there is not a whole lot of literature that looks at emerging growth companies’ performance under the JOBS Act, the process of examining both the underpricing of IPOs and returns over longer periods has been done many times before. This paper looks at stock returns

and volatility measures for newly public companies in ways similar to some of the papers mentioned already but looks at stocks that have not been examined very much before. In addition to influencing the methodology for this paper, the previous papers have helped develop the hypotheses for this paper as well.

VII. Hypothesis

The hypothesis of this research project is that emerging growth companies that have gone public under Title III of the JOBS Act since May 16, 2016 have had poor stock returns relative to comparable indices and have been more volatile compared to the S&P 500 and other comparable indices. Because they receive funding from retail investors and crowdfunding, something that was not previously permitted, and don't have to report the same amount of information that a company going public normally would, these companies' stocks will perform worse than the market.

Returns and volatility measures of emerging growth companies are compared against the S&P 500, measured by SPY, the prominent index that tracks the S&P 500. The other indices utilized are Wilshire Micro-Cap ETF, WMCR, which is comprised of 2000 microcap stocks, and FPX, an index that tracks companies after going public. It is hypothesized that the companies in this sample would have worse returns and higher measures of volatility than all of the comparable indices.

VIII. Methodology

Data Collection

A Bloomberg IPO screen was utilized to find IPOs that fit the necessary qualifications to be emerging growth companies. The IPO CACT function provided a way to search for U.S. IPOs under \$51 million in offering size (the maximum IPO size went slightly over \$50M, which is the upper limit in offering size to qualify as an emerging growth company under the JOBS Act and Regulation A, because some exceptions can be made to companies who receive slightly more than \$50 million) who announced their IPO past May 16, 2016. Once a list of emerging growth companies was compiled, the author found their IPO price on both Bloomberg and the NASDAQ website as the majority of these companies are listed on the NASDAQ. Then daily returns for as far back as the company has been trading on Yahoo Finance were downloaded. FPX, an ETF that tracks IPOs, WMCR, a popular microcap stock ETF, and SPY, an ETF that tracks the S&P 500, were used as comparisons for the returns of the stocks in the dataset.

Data Clean Up

Each stock in the database was reexamined to make sure it qualified as an emerging growth company by looking at the company's documents, primarily their S-3, on the SEC EDGAR website. After verifying that each company in the database was actually an emerging growth company, the stocks in the database were looked at to account for dividends. It was predicted that these newer stocks, especially ones that weren't profitable, wouldn't be paying out dividends, and that ended up being the case.

IX. Data Analysis

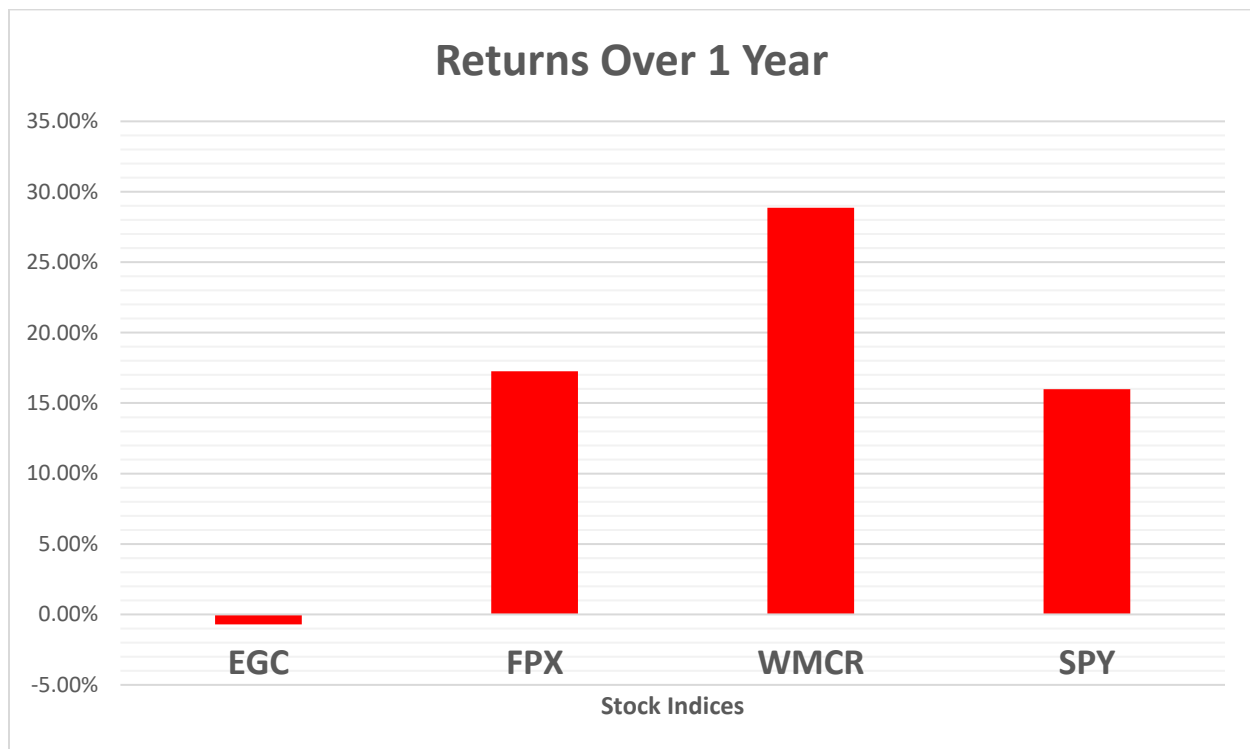
To compare the stock returns of the companies in the database and the indices that were used as comparisons, 1-day, 1-month, 6-month, and 1-year returns were calculated. I then took an average of the returns in my database and compared it to SPY, FPX, and WMCR. Since the number of companies in the dataset wasn't very large, especially for companies with a year of return data, the median and the 10th, 50th, and 90th percentile were found as the average was not always a good representation of the data. These returns were also compared directly against the aforementioned indices to find abnormal return.

To measure the volatility of the stock in the dataset, beta and annualized standard deviation was calculated. To calculate beta, the slope function on Microsoft Excel was used and the returns of a selected stock were run against the returns of SPY for the same dates. The longest timeframe available was used for the stocks' beta calculation. For example, if a stock had over a year of return information in the dataset, a year's worth of returns, rather than 6 months or 1 month of data, was used in the calculation. To calculate standard deviation, the standard deviation function (stdev.p) on Excel was utilized using the longest timeframe of data available in order to calculate daily volatility. In order to annualize the data, the daily volatility numbers were multiplied by the square root of 252 (assuming 252 trading days in a year).

X. Results

The results uncovered in the data analysis stage were similar to what was hypothesized. A lot of these companies have not performed well since going public in 2016 or 2017 despite favorable conditions in a bull market. The median return for the emerging growth companies in my dataset over 1 year was -0.7% while FPX, WMCR, and SPY had a 1-year return of 17.26%, 28.87%, and 15.99% respectively. This data can be seen below in Figure 1.

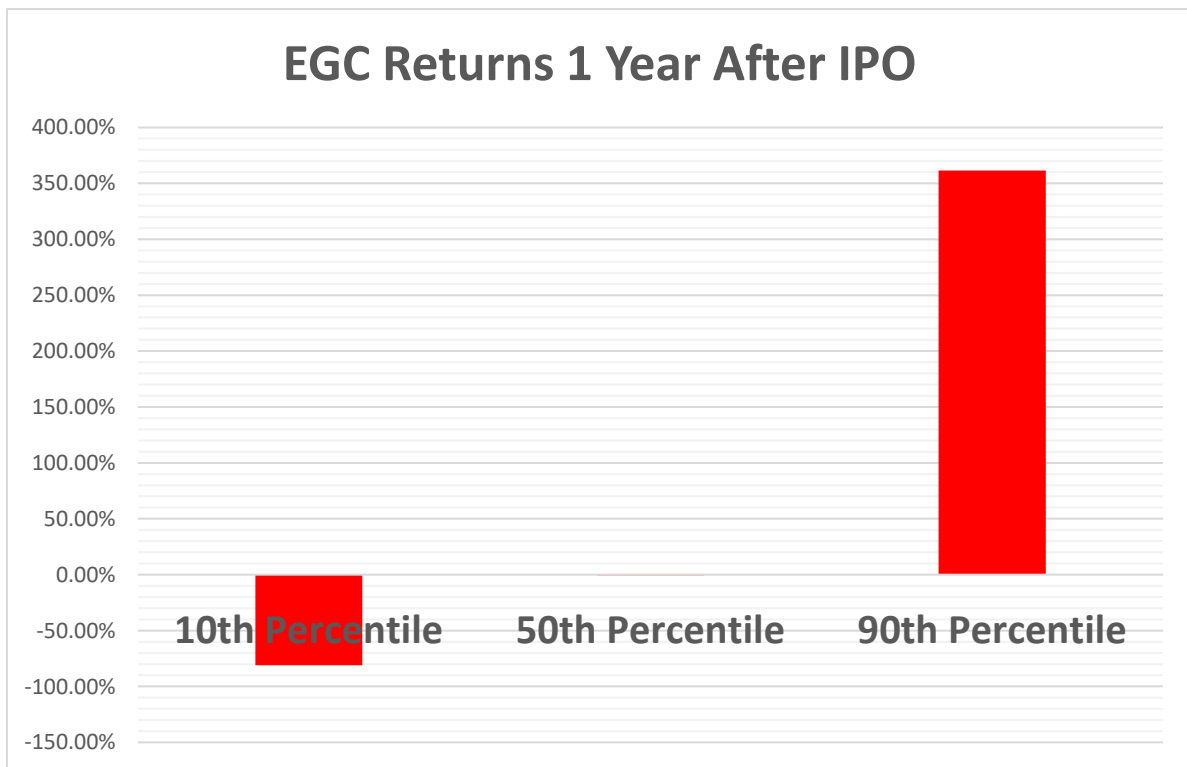
Figure 1



The magnitude to which emerging growth companies lagged behind these comparable indices is quite astounding. Continuing to look at 1-year returns, as illustrated below in Figure 2, the 10th percentile of emerging growth companies had a return of -81%. An overwhelming

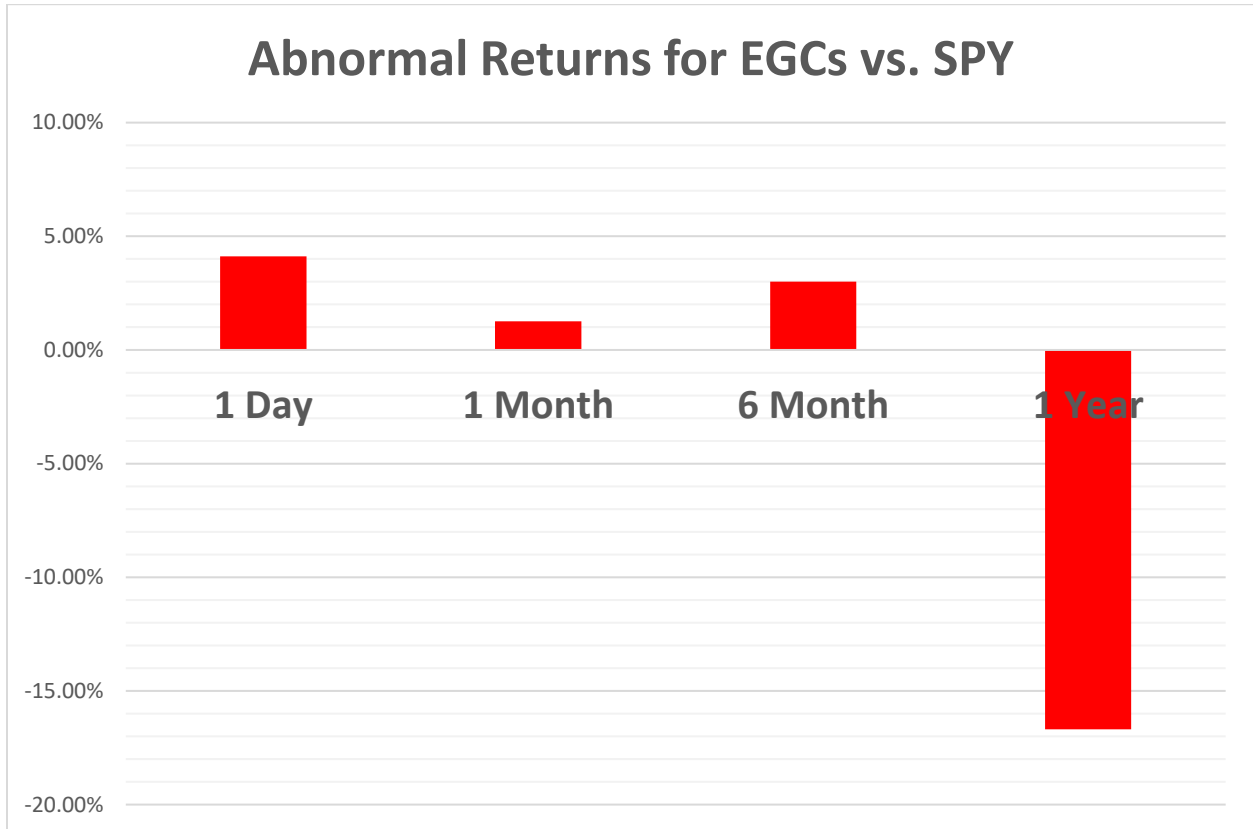
majority of the money invested in these companies would have been lost over 1 year. At the other end of dataset, the 90th percentile of emerging growth companies returned 461.58% over 1 year. However, there was just one company that heavily influenced this number. Pulse Biosciences (Ticker: PLSE) amassed over a 603.5% return in its first year after going public. The company's shares were listed for \$4 at their IPO, and at one point the stock price reached over \$40. As of early April 2018, PLSE's share price is under \$18, still providing a great return since the IPO, but a lot of market capitalization has been wiped out. While investing in the 90th percentile of emerging growth companies would have been a profitable venture, in order to realize much of the gains investors would have had to call the top. This is very difficult for any investor to do, let alone a retail investor analyzing a small company that may not be disclosing all relevant information.

Figure 2



On a 6-month basis, the median return for emerging growth companies was 7.2%. This fared favorably against the FPX and SPY indices, which returned 4.69% and 4.19% respectively. However, these emerging growth companies' returns lagged behind the returns of WMCR, which had a 16.42% return over the 6-month period. These emerging growth companies were able to capture some of the momentum that existed in small-cap stocks, but not quite as much as one would hope if invested in these emerging growth companies. Abnormal returns for emerging growth companies compared to SPY are summarized below in Figure 3. On a 1-month basis, emerging growth companies had a median return of -0.1%, which was very similar to the other indices. On a 1-day basis, the median return for emerging growth companies was 2%. It is worth noting that stock returns for the emerging growth companies in the dataset on a 1-month and especially the 1-day basis were heavily influenced by the mechanics of IPO pricing. Whether the company was initially priced too high or too low had a major effect on returns, and the return numbers on a 6-month and 1-year basis are more informative of the true performance of these stocks.

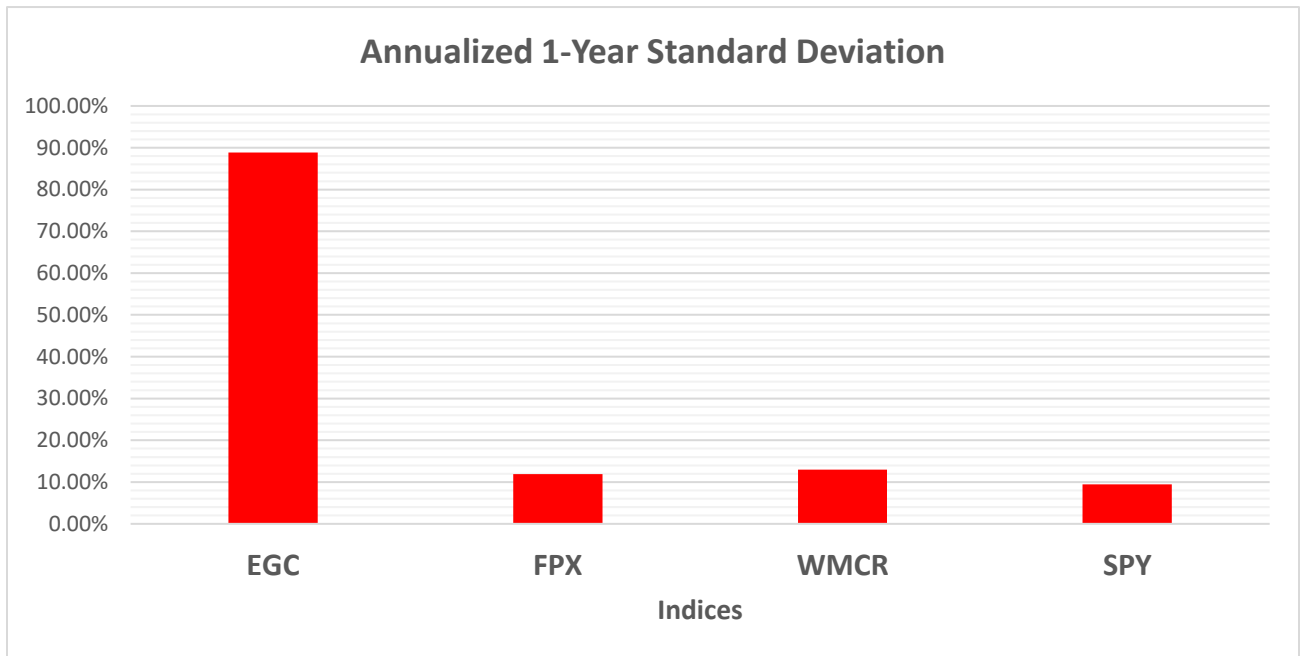
Figure 3



After looking at the betas that were calculated, it could not be confirmed that these emerging growth companies were riskier than the market. The beta calculated for the companies in the dataset was 0.616. However, this number is probably not truly reflective of how volatile these companies are. Every company that had at least one month of returns is included in this calculation, and the overall beta was 0.616. However, it is worth noting that there some extreme values that went into this beta. For example, ShiftPixy (Ticker: PIXY) had a beta of over 9.38 while AzurRX BioPharma (Ticker: AZRX) had a beta of -3.69. A beta of 0.616 does not imply much price movement compared to the market, but there were lots of seemingly lots of risky stocks that went into this overall beta.

While it could not be concluded that these emerging growth companies are more volatile than the market based off the beta numbers, it is apparent from the annualized standard deviation statistics that these companies are more volatile. Figure 4 shows that for the EGCs in the dataset, the 1-month, 6-month, and 1-year standard deviation numbers were 64.80%, 69.83%, and 88.84%. FPX and WMCR were more volatile than SPY during these time periods, and neither of those indices experienced 15% volatility in any of those time periods. Much of this volatility could be a result of IPO underpricing and overpricing and the price movement after going public, which typically involves much bigger price swings than the normal market experiences on a typical day, but with standard deviations that are so much higher than that of the other comparable indices it can be concluded that these emerging growth companies are more volatile than the market.

Figure 4



XI. Discussion

It was hypothesized that the performance of these emerging growth companies would lag the returns of the other comparable indices in addition to being more volatile and risky, and that is what has been uncovered in this paper. Having the hypothesis of this paper confirmed is not too surprising, but the fact that these companies had a negative median return and standard deviations of returns about seven times higher than the comparable indices is quite surprising. Despite being in a strong, steady bull market, the median return for emerging growth companies was negative. The returns for emerging growth companies varied greatly, with the 10th percentile of returns offering a -81% return and the 90th percentile offering a 361.58% return. Seeing a wide range of returns like this is somewhat expected since these small IPOs are inherently riskier than most other stocks that have been around for a while and have an established track record. In a normal risk-return model, one would expect to see these EGCs have a higher return than the market average because they are riskier, but again, this is not what we find.

The JOBS Act was signed into law with great support, but the findings of this paper suggest that the law has had some unintended consequences. A major reason why many private companies do not go public is because they don't want to deal with the extra work, extra costs, and scrutiny that comes with being a public company. Having to deal with the SEC can create some extra headaches. With some of these laws being relaxed, it has incentivized more small, private companies to go public. However, it is possible that some of these companies have been going public so the owners of the companies can cash out. It is easy to picture the owners of a small, private company seeing this new law allowing them to not deviate too much from their current ways while tapping money from the equity market and retail investors, who are known to make poor investment decisions. It is very possible that the owners of EGCs make their money

once the company goes public, sell their shares to cash out, and then no longer have the incentive to stress too much about company performance. This possible explanation for the poor performance of emerging growth companies would show the JOBS Act and the CROWDFUND Act are acting in unintended ways. While the JOBS Act still seems like a positive from the perspective of encouraging innovation from American companies, there clearly seems to be a negative impact on investors who are putting their money into these companies. For that reason, it may be worth considering taking another look at CROWDFUND Act.

XII. Conclusion

It was hypothesized in this paper that emerging growth companies would lag the returns of comparable indices while also being more volatile. Through the stock return data analyzed, the hypothesis has been confirmed. Emerging growth companies experienced an abnormal return of -16.69% over a one-year period compared to the SPY ETF. Not only did emerging growth companies trail SPY by a significant amount, the median return for emerging growth companies was -0.7%. These companies had a median return over a year that was negative despite being in a strong bull market where comparable indices WMCR, FPX, and SPY were all up between 15.99% and 28.87%.

Annualized standard deviation numbers show emerging growth companies to be much more volatile than comparable indices. Over a 1-year period, emerging growth companies had an annualized volatility of 88.84%, compared to just 9.46% for SPY, 13% for WMCR, and 11.91% for FPX. Even during a time of relatively little volatility, emerging growth companies had extremely volatile returns. While the beta for the dataset was just 0.616, indicating there wasn't very much price movement as the market moves, there were extreme values both positive and negative that averaged out to a rather tame beta. These analyses show that emerging growth companies have had returns that lag comparable indices greatly when they should outperform based on the amount of risk involved with these companies, and that these companies are indeed much more volatile. When you combine these bad returns, high levels of volatility, and access to non-accredited, or retail, investors, it becomes apparent that these companies have not been successful investments and from an investor's point of view, it may be worth taking another look at the elements of the JOBS Act.

XIII. Implications/Future Research

It is clear that emerging growth companies have not performed well over the time periods I have examined. However, further research that gives an update on the performance of these companies is something that would be useful to look at. As the market has seen a correction and increased volatility in the first few months of 2018, it would be interesting to know how emerging growth companies have responded. Another area for future research would be to see what has been driving the big winners such as Pulse Biosciences (Ticker: PLSE) and biggest losers in the dataset. Are there fundamental reasons why some of these emerging growth companies have performed so well or so poorly? Do these companies seem to have exceptionally strong balance sheets or income statements that have been driving the upward pressure on their share prices? Examining the financials of these emerging growth companies would offer an interesting analysis. If there doesn't seem to be a fundamental reason why these companies have either performed so well or so poorly, looking at different behavioral finance phenomena for an explanation may also be useful.

One other area for further research involves the investment banks pricing these IPOs. Because these IPOs from emerging growth companies are small, under \$50 million in market cap, there isn't as much money to be made by the investment banks for underwriting the IPOs. Because of this, the large, brand name investment banks like Goldman Sachs and Morgan Stanley most likely will not be involved with the underwriting process. Smaller, and probably less capable, investment banks will be the ones underwriting the IPOs, which can lead to a more inaccurate IPO price. This larger overpricing or underpricing can have a large effect on the returns of these stocks.

XIV. Acknowledgements

I would like to recognize Roger Bailey for his guidance while running the Honors Contract Program.

I would also like to recognize Michael Schwert for the time, effort, and assistance he has given me throughout the research process.

XV. Appendix

Appendix A – Returns for Emerging Growth Companies

Stock	Size	Date	Returns			
			1 Day	1 Month	6 Month	1 Year
CLSD US	50.4	01/08/2016	3.57%	-1.43%	123.14%	5.29%
TRMT US	50	07/07/2017	-13.55%	-15.00%		
ASNS US	46	10/20/2017	40.30%			
KRYS US	45.54	08/21/2017	6.40%	-0.10%		
CSTR US	44.592	08/29/2016	6.00%	18.13%	26.67%	20.00%
FLGT US	43.47	09/02/2016	2.00%	0.00%	21.11%	-53.00%
TCMD US	41.2	01/25/2016	10.80%	37.70%	49.20%	200.30%
YOGA US	40.15	06/23/2017	-12.72%	-26.73%		
MRAM US	40	09/09/2016	0.25%	-14.50%	8.75%	11.13%
ESQ US	38.059	05/31/2017	8.93%	4.36%		
ATXI US	37.95	04/28/2017	37.50%	16.33%		
VERI US	37.5	03/15/2017	-12.87%	-17.93%		
SSTI US	35.42	05/02/2017	30.73%	17.64%		
ASV US	30.59	03/24/2017	12.14%	19.71%		
GEMP US	30.278	04/18/2016	-8.00%	32.80%	7.20%	-0.70%
CSSE US	30	07/17/2017	-22.92%	-41.08%		
HAIR US	28.7791	09/01/2017	41.71%	-4.43%		
PBNC US	28.7776	05/26/2016	-20.00%	2.94%	21.59%	51.12%
CELC US	26.22	08/23/2017	50.42%	70.95%		
ATOM US	24	06/30/2016	6.67%	28.00%	-24.24%	-34.53%
FAT US	24	08/03/2017	-5.67%	-15.40%		
PLSE US	23	12/22/2015	4.25%	8.75%	49.25%	603.50%
POLA US	19.32	09/09/2016	28.57%	19.00%	-26.00%	
PZRX US	18.5	04/18/2016	0.40%	-3.60%	-76.00%	-77.00%
RMBL US	16.005	09/01/2017	-7.45%	-1.82%		
SNES US	15	09/21/2016	2.00%	-2.13%	-29.88%	
SACH US	13	10/28/2016	-4.99%	-5.75%	-4.57%	
ADOM US	12.5	04/25/2017	45.00%	155.00%		
AIRG US	12	07/15/2016	0.00%	66.00%	106.13%	23.88%
PIXY US	12	11/21/2016	28.33%	-4.33%		
LEVB US	12	09/18/2017	1.81%			
ACMR US	11.2	09/13/2017	8.04%			
MBRX US	9.24	02/01/2016	33.33%	14.17%	-56.17%	-87.00%
MSDI US	9.1125	11/10/2015	-29.56%	-30.67%	-70.67%	-75.33%
CODX US	7.071	04/28/2017	-3.17%	-30.00%		
AMRH US	6.0696	09/18/2017	-15.29%			
NAOV US	6.0001	06/21/2017				
AZRX US	5.28	07/13/2016	-9.45%	-17.45%	-27.76%	-33.42%
BYSI US	3.486	11/15/2016	-16.00%	-0.15%	82.55%	
Average EGC			6.04%	8.11%	8.14%	35.98%

Appendix B – Returns for Selected Indices

	1 Day	1 Month	6 Month	1 Year
FPX	-0.60%	-0.99%	4.69%	17.26%
WMCR	-0.20%	1.53%	16.42%	28.87%
SPY	-2.12%	-1.37%	4.19%	15.99%

Appendix C – Percentile Returns for Emerging Growth Companies

	1 Day	1 Month	6 Month	1 Year
10th Percentile	-16.00%	-28.04%	-70.67%	-81.00%
50th Percentile	2.00%	-0.10%	7.20%	-0.70%
90th Percentile	40.30%	49.02%	106.13%	361.58%

Appendix D - Emerging Growth Company Annualized Standard Deviations

	1 Month	6 Month	1 Year
CLSD US	27.43%	95.15%	87.05%
TRMT US	51.33%		
KRYS US	65.90%		
CSTR US	26.65%	31.03%	29.16%
FLGT US	63.35%	59.00%	71.71%
TCMD US	55.02%	53.62%	52.27%
YOGA US	102.22%		
MRAM US	86.79%	61.93%	77.85%
ESQ US	33.00%		
ATXI US	132.55%		
VERI US	93.27%	155.52%	
SSTI US	127.49%		
ASV US	46.67%	35.28%	
GEMP US	83.07%	67.18%	77.95%
CSSE US	109.08%		
HAIR US	188.68%		
PBNC US	78.06%	37.85%	30.67%
CELC US	173.48%		
ATOM US	64.16%	54.62%	47.84%
FAT US	62.64%		
PLSE US	26.91%	40.08%	78.60%
POLA US	117.94%	70.40%	
PZRX US	62.40%	81.82%	181.30%
RMBL US	63.24%		
SNES US	25.83%	63.78%	
SACH US	23.38%	45.10%	
ADOM US	218.80%		
AIRG US	110.46%	106.94%	85.02%
PIXY US	176.85%		
LEVB US			
ACMR US			
MBRX US	135.98%	132.67%	135.09%
MSDI US			223.02%
CODX US	76.79%		
AMRH US			
AZRX US	58.38%	59.48%	66.26%
BYSI US	83.23%	75.39%	

Appendix E – Comparable Index Betas

	Beta
EGC	0.62
FPX	1.15
WMCR	0.94
SPY	1

Appendix F – Annualized Standard Deviation of Returns

	1 Month	6 Month	1 Year
EGC	64.80%	69.83%	88.84%
FPX	11.36%	14.08%	11.91%
WMCR	14.11%	14.30%	13.00%
SPY	8.12%	11.43%	9.46%

Appendix G – Emerging Growth Company Betas

	Beta
CLSD	0.57
TRMT	2.11
KRYS	1.03
CSTR	0.62
FLGT	0.21
TCMD	0.47
YOGA	-1.87
MRAM	1.39
ESQ	-1.25
ATXI	-5.92
VERI	0.96
SSTI	2.96
ASV	-0.38
GEMP	0.74
CSSE	4.08
HAIR	-2.48
PBNC	0.43
CELC	-3.81
ATOM	0.10
FAT	0.72

PLSE	0.19
POLA	1.55
PZRX	1.50
RMBL	0.88
SNES	1.84
SACH	-0.42
ADOM	2.09
AIRG	3.10
PIXY	9.38
MBRX	0.83
MSDI	0.10
CODX	1.35
AZRX	-3.69
BYSI	<u>1.55</u>
Avg. Beta	0.62

XVI. References

- Abraham, R., Harris, J., & Auerbach, J. (2016). IPO performance at announcement and in the aftermarket. *Journal of Economic Studies*, 43(4), 574-586.
- Bain, Benjamin and Robinson, Matt. "Inside the Dangerous World of Tiny IPOs." *Bloomberg*, 8 Nov. 2017, <https://www.bloomberg.com/news/articles/2017-11-08/tiny-ipos-huge-losses-inside-one-of-the-wildest-u-s-markets>. Accessed 15 Nov. 2017.
- Beatty, Randolph P., & Ritter, Jay R. (1986). Investment banking, reputation, and the underpricing of initial public offerings. *Journal of Financial Economics* 15, 213-222.
- Loughran, Tim, & Ritter, Jay R. (1995). The new issues puzzle. *Journal of Finance*, 50(1), 23-51.
- Loughran, Tim, & Ritter, Jay R. (2004). Why has IPO underpricing changed over time? *Financial Management*, 33(3), 5-37.
- LOWRY, M., OFFICER, M. S., & SCHWERT, G. W. (2010). The variability of IPO initial returns. *Journal of Finance*, 65(2), 425-465.
- Mitchell, Mark L., & Stafford, Erik. (2000). Managerial decisions and long-term stock price performance. *Journal of Business*, 73(3), 287-329.
- Ritter, Jay R. (1991). The long-run performance of initial public offerings. *Journal of Finance*, 46(1), 3-27.

Ritter, Jay R., & Welch, Ivo. (2002). A review of IPO activity, pricing, and allocations. *Journal of Finance*, 57(4), 1795-1828.