

An Analysis of LEGO as an Investment Asset

Research Thesis

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by

Ameen Al-E-Jalil

The Ohio State University

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Project Advisors: Dr. Janet Box-Steffensemeier, Department of Political Science

Dr. Trevon Logan, Department of Economics

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1 - Abstract

In a world with increased information for investors, investors constantly seek new opportunities to maximize their return on investment. LEGO presents itself as a new, nontraditional investment asset type for investors. This paper collects information on approximately 3,300 LEGO sets released from 2000-2023 from brickset.com. From this data, the author performed a regression model and return on investment calculation to determine what aspects contribute to a LEGO set's ROI and if LEGO can outperform the stock market. This paper finds that while, on average, a LEGO set will not outperform the stock market, an investor with a keen eye and understanding of LEGO may find opportunities to outperform the stock market. For this reason and because LEGO is exposed to risk factors different from traditional investment assets, it is a viable and noteworthy investment option for investors willing to invest in nontraditional investment assets.

2 - Introduction

As a preface, the author of this paper is a passionate fan of LEGO *Star Wars* more than any other theme in LEGO's catalog. This passion is best demonstrated by the author's LEGO *Star Wars* fan film, *Star Wars: Echoes of the Wolfpack* (AI-E-Jalil 2024) [[Star Wars: Echoes of the Wolfpack](#)].

Over the past few decades, interest in alternative investment assets has grown, including art, wine, sneakers, stamps, and coins, just to name a few (Bodamer 2023). At the same time, LEGO's popularity has massively grown. LEGO's assets at the end of FY2023 are worth approximately 58.9B Danish Krona, equivalent to \$8.5B United States Dollars (The LEGO Group 2024). This is up from 37.2B Danish Krona in 2020 (USD 5.374B). The LEGO Group's growth in the toy industry, which has been declining, is impressive and only shows LEGO's growing popularity. From a quick Google search, one can see LEGO's large aftermarket and secondary market. This begs the question: is LEGO¹ a viable investment asset?

Only two papers have been written to analyze LEGO as an investment asset: Dobrynskaya and Kishilova (2018) and Shanaev et al. (2020). From the author's perspective, this area can be explored much more thoroughly. Prior research has shown that LEGO does not tend to outperform the stock market but does provide diversification opportunities because LEGO does not have the same risk exposure as regular investment assets Dobrynskaya & Kishilova (2018). The prior papers on this subject included any sets bought or sold from a specific time period, with sets coming out from the 1960s to the modern day. While this is a fair starting point for analysis, it is hard for a modern retail investor to buy a set manufactured in the 1960s. For

¹ For clarification, as this paper proceeds, LEGO is both a singular and plural word. If this paper refers to The LEGO Group, it will be written out as so. If LEGO is written as such, it refers to the brand or a group of LEGO sets.

this reason, this paper looks at the modern age of LEGO from 2000 onwards to determine what factors make LEGO a viable investment asset and if it is a viable investment asset.

3 - Literature Review

3.1 - LEGO Related Literature

Two primary papers have researched the LEGO resell market: “LEGO: The Toy of Smart Investors” by Dobrynskaya and Kishilova (2018) and “Children’s Toy or Grown-Ups’ Gamble? LEGO Sets as an Alternative Investment” by Shanaev et al. (2020). The main conclusion from both of these studies is that LEGO sets do not outperform the market as a whole but still have relatively solid returns and provide risk protection against market factors.

Dobrynskaya and Kishilova (2018) collected data from Brickpicker.com and used the pricing guide from Maciorowski & Maciorowski (2015). From this data, they construct a compound interest formula and a hedonic index² that considers the various characteristics of LEGO sets to calculate returns on investment. Both indices are highly correlated with each other and outperform the S&P500, but both fail to outperform the CRSP index. They conclude that LEGO sets are not exposed to the market, momentum, HML, or volatility factors but to SMB factors. This protection against market risk strongly incentivizes one to invest in LEGO. In terms of factors contributing to a LEGO set’s resale value, they find that rarity is the strongest. The authors conclude LEGO is a good option for diversification in one’s portfolio.

Shanaev et al. (2020) gathered their data from bricklink.com, the same website used for data collection in this paper. This paper chose to use bricklink.com because brickpicker.com does not have an easy way to gather pricing information efficiently in 2024. Shanaev et al.’s (2020)

² A hedonic index is used in economics to measure the change in pricing level of goods and services, taking into account various factors such as quantities and qualities of products. Please see this article to learn more: (<https://www.investopedia.com/terms/h/hedonic-regression.asp>).

data includes 10,588 sets from 1966 to 2018. In addition, they monitored transactions in this LEGO resale aftermarket from September 2018 to March 2019. One of the key factors this paper considers is transaction costs and survivorship bias. The authors use a regression model that includes the following variables: launch year, retail price, piece count, height, width, depth, volume, weight, price-to-piece, price-to-volume, price-to-weight, total return, and annual return.

After accounting for transaction costs and real rates of return, they find that LEGO has an inflation-adjusted return of 1.20% per year. Similar to Dobrynskaya and Kishilova's (2018) results, LEGO is exposed to different volatility factors than the stock market. While the rates of return differ, the same general conclusion is supported. LEGO provides a unique alternative investment asset by diversifying an investor's portfolio and providing positive returns on investment.

3.2 - The Literature Surrounding Other Alternative Investments, such as Wine, Art, and Sneakers

Other related literature is divided into collectibles, art, and sneakers. Erdos (2010) summarizes the entirety of collectibles, primarily focusing on art and wine, with the main takeaway that they tend to underperform and have risk factors different from those of the stock market. However, these risk factors could be arguably more risky, as these factors depend on the collector's future taste and the consensus of experts. This paper also examines the application of the random walk theory³ to art and finds that the random walk theory does not entirely hold for art pieces. It would be hard to suggest that LEGO would follow the random walk theory.

³ The random walk theory predicts that stock prices follow a random path and future prices are unpredictable. In addition, this theory is based on the efficient market hypothesis, which states that stock prices reflect all available information. Please see this article to learn more: (<https://www.investopedia.com/terms/r/randomwalktheory.asp>).

Öztürkkal & Eğrican (2019) focuses exclusively on art. The paper analyzed art auction data in the emerging Turkish art market to determine if art could be used as a hedging tool or as a safe haven during financial downturns. The paper finds that there is not enough evidence to discard the theory that art could be used for either of the mentioned functions, but there is not enough evidence to support it. However, they find that Turkish art has either a low or negative correlation with other investment assets. The art they observed also tended to perform better before and after times of financial crisis.

Mamarbachi, Day, and Favato (2008) applied a more strict economic analysis of art and sought to understand its rise as an alternative investment asset. Consistent with prior literature in this field, they find that art's illiquidity and high transaction costs are notable risks. The authors also find that art is a heterogeneous product with low liquidity and high barriers to entry. They found that art could be a good investment due to its inelastic demand curve and low correlation with other asset classes, which is consistent with other literature.

The Economics of Art and Culture: Second Edition, published by Helibrun and Gray in 2001, has findings consistent with other literature discussed. It goes into more depth regarding the art market and the specific transaction process. It also finds that information costs are an essential aspect that buyers and sellers must be aware of when transacting art. The art market can be divided into primary and secondary markets. The primary market is where original works of art are sold for the first time, while the secondary market is where art is resold. Helibrun and Gray find that the average annual compounded real rate of return on paintings was 0.55% from 1950 - 1987, indicating that art is unlikely to outperform traditional investment assets.

Storchmann (2012) looks into the economics of wine and why it should be distinct from other agricultural commodities. Storchmann argues it should be distinct because wine can have

very high prices and the ability to increase in value as it ages, and how experts typically are the ones that dictate the quality of a bottle of wine. These factors typically do not apply to other agricultural commodities. Storchmann refers to Burton and Jacobson's (2001) analysis of Bordeaux wines from 1986 to 1996 and finds an average nominal annual return of 7.9% for all wines. Still, the range varied from 5.3% to 16.2% depending on the specific type of wine. The paper finds that wine investments are, on average, more risky than stock investments, showing that the standard deviation of wine returns can be up to twice as high as the Dow Jones index. However, as a trend with alternative investment assets, the covariance with traditional investment vehicles is low, providing an opportunity for hedging against the stock market.

Finally, Deliana and Ekaputra (2020) investigate the sneaker resale market because of the growing popularity of sneakers as an investment asset. They gathered information from the Cowen Equity Research group, which estimated that the current total worth of the global sneakers market is approximately USD 100B, and the international resale market is about USD 6B. The authors also state that StockX predicts the secondary sneakers market size may be approximately 15-25% of the primary sneakers market size in 2025. Many sneakers are hyped up and have limited availability, contributing to the heightened resale price. Unsurprisingly, the study finds that returns tend to increase when investors pay more attention to a sneaker. However, they find that the sneaker secondary market exhibits short-term return reversals, showing a heightened volatility risk.

It is crucial to analyze the literature regarding alternative investment forms to understand how they compare and contrast to LEGO. For this paper, LEGO is considered an alternative investment asset. Many aspects of art and wine do not apply to LEGO. These include value being determined by experts, auction houses being the leading sellers, and price takers, which do not

apply to LEGO. In addition, LEGO quality is much less subjective than art or wine because more objective attributes make up LEGO's quality compared to art or wine. For example, preference for art and the taste of wine are both subjective. It is much easier to agree that a LEGO set is well-built than that a piece of art is visually appealing or that a bottle of wine tastes good. Since LEGO is exposed to risk factors different from the stock market, it is unlikely to follow a similar pattern to sneakers regarding short-term return reversals.

LEGO and these other alternative investments share similarities, such as their tendency to grow in value as they age and their exposure to risk factors different from those of the stock market, which provides diversification potential. Thanks to information regarding the growth of alternative investments, considering the immense secondary market for art, wine, and sneakers, it provides strong evidence that LEGO will follow the same path as the brand continues to grow in popularity. For future research, utilizing the same or similar methods used in the analysis for alternative investments on LEGO may produce new and surprising results.

4 - Case Studies

4.1 - LEGO *Star Wars*

While LEGO does not publish its sales by theme, it is possible to determine which LEGO theme is the best-selling theme by using three primary sources of information: the LEGO Group's official annual report, the number of sets in each theme, and the author's first-hand experience working as a Brick Specialist at a LEGO store. First, look at the LEGO Group's official annual report and see the most popular sets. In the 2023 annual report, LEGO reports its five most popular themes, which are in no particular order: LEGO City, LEGO *Star Wars*, LEGO Icons, LEGO Technic, and LEGO *Harry Potter* (The LEGO Group, 2024). These results are the

same from the 2023 annual report. Based on the information from the annual report, we know that whatever metric LEGO uses to calculate its most popular themes, LEGO *Star Wars* is in the top five of their most popular themes. Utilizing the second analysis point, we analyze the number of sets in each theme and see their relative popularity. Figure 1 contains such information from brickset.com.

LEGO <i>Star Wars</i> Theme Popularity			
Year	<i>Star Wars</i> Sets Released Out of Total Sets	<i>Star Wars</i> Sets Released Out of Total Sets as a Percentage	Popularity Relative to Other Themes
2023	49/958	5.11%	2nd
2022	42/972	4.32%	3rd
2021	38/946	4.02%	5th
2020	47/851	5.52%	3rd
2019	63/849	7.42%	1st

Source: Author gathered information from brickset.com

Despite LEGO *Star Wars* only being first place once in the previous five years, LEGO *Star Wars* remains a top-five-selling LEGO theme. Third, LEGO *Star Wars* was the most popular set sold during the author's own experience selling LEGO at an official LEGO store from June 2022 to August 2022. Combining all of these factors, LEGO *Star Wars* is most likely to be the top-selling LEGO theme and, if not, at least a top three-sold LEGO theme.

Some LEGO sets with the highest resale fall within the LEGO *Star Wars* theme. From the author's expertise and knowledge, several qualitative factors are found across these different sets with high resale value within the LEGO *Star Wars* theme. The first factor that stands out is regarding clone troopers. Thanks to prominent media, such as *Star Wars Episode II: Attack of the Clones* (2002), *Star Wars Episode III: Revenge of the Sith* (2005), *Star Wars: Battlefront II*

(2005), and *Star Wars: The Clone Wars TV Show* (2008-2020), the Clone Troopers grew to mass popularity with the same primary demographic that buys LEGO sets, those being males from the ages of four to twenty-five, on average. This has led the LEGO community to sponsor an “army” building culture, where collectors will build a large clone army. With this army, it is common to recreate epic battles from the various movies, video games, or TV shows the clones have been in. If a LEGO set contains clone troopers or unique clone troopers, such as Captain Rex, this set is much more likely to have a high resale value.

The second factor that must be considered is whether the set has a unique character or unique character design. This factor must be cross-referenced with how often this character has appeared in other sets. Unique characters such as Obi-Wan Kenobi and Anakin Skywalker appear in many sets, reducing the potential for a set to have a high resale value. There are exceptions to the rule, especially regarding significant character redesigns that appear in only one set. An example is Ahsoka Tano in LEGO Set 75158 - Rebel Combat Frigate. While Ahsoka appears in other LEGO sets, her appearance in this LEGO set introduced her design from the *Star Wars: Rebels* TV show. The set retailed for \$110 in 2016, and the cheapest new, sealed set on Bricklink.com costs \$475 as of February 2024. In used condition, the Ahsoka Tano minifigure from this set goes for, at minimum, \$222 as of February 2024. This trend can be seen with other minifigures, such as Boba Fett from LEGO Set 10123 - Cloud City, General Pong Krell, Captain Rex, and Commander Fox, just to name a few. Depending on the character’s design and popularity, this can significantly contribute to a set’s resell value.

The last factor that most contributes to a set’s resell value depends on how well the LEGO set is designed and what the set is based on. A well-designed set will tend to sell better than a poorly-designed set. A well-designed set is a set that accurately recreates the scene or

vehicle it is based on, has strong aesthetic appeal, has good displayability, and is good value for the money. A set that is based on a set-piece, for example, LEGO Set #75334, Obi-Wan Kenobi vs Darth Vader, will have a lower resell value than a set based on a vehicle, such as LEGO Set #75155, Rebel U-Wing. The common consensus surrounding LEGO Set #75334 is that this is a poorly designed set because it is not aesthetically pleasing, has a generally monotone color scheme, has no interesting design techniques, and is bad value for the money. This LEGO set retailed for \$45 when it was on shelves, and as of February 15, 2024, you can find this set for \$20-30 USD on the resale market.



[Figure 1, LEGO Set #75334: Obi-Wan Kenobi vs Darth Vader, released in 2022]



[Figure 2, LEGO Set #75155: Rebel U-wing Fighter, released in 2016]

Sets based on iconic and popular vehicles within the *Star Wars* universe, such as the Millennium Falcon, the Republic Low Altitude Assault Transport (LAAT) Gunship, and the Republic All Terrain Tactical Enforcer (AT-TE), all tend to have higher resale values than their non-popular counterparts. The popularity of a vehicle comes from the design of the vehicle in the content it was first introduced and the general association the fan has with that piece of content. For example, fans universally love *Star Wars Episode IV: A New Hope*, and the Millennium Falcon plays a prominent role. A charismatic pilot, Han Solo, pilots the Millennium Falcon. Our main protagonists spend a substantial amount of time within the Millennium Falcon during the original trilogy of *Star Wars* movies. However, more is needed to fully explain why vehicles such as the LAAT and the AT-TE are popular among fans.

The fanbase of the *Star Wars* The Clone Wars TV show is primarily male children, teenagers, and young adults who like modern military vehicles. This can be best explained by young men and boys being conditioned from an early age to subscribe to traditional values of masculinity, which include ruggedness, strength, and stoicism (Ni 2023). These values may encourage young men to gravitate towards things that promote these values, such as military vehicles. The LAAT gunship is based on the former Soviet Union's Mi-24 "Hind" Attack Helicopter (Lucasfilm 2011). The Mi-24 has been ingrained in the minds and imaginations of a generation of men because of its prominence in the Cold War and its popularity in all forms of visual media.



[Figure 3, Mi-24 "Hind" Attack Helicopter]



[Figure 4, Low Altitude Assault Transport Gunship]

Many vehicles within the *Star Wars* universe have design aesthetics similar to those made from World War II onwards. How prominent modern conflicts have been in the minds of younger generations can explain why *Star Wars* fans greatly enjoy these vehicle designs, such as the LAAT, and why they are so popular among fans. This popularity is why these LEGO *Star Wars* sets sell well and have a heightened resell value.

When you consider sets with clone troopers, unique mini-figures, and based on a popular set or with a good set design, these sets tend to have much stronger resale values than their counterparts. An example is the 2008 LEGO Set 7675, AT-TE Walker, which has two clone troopers, one of them being Phase 1 armor Captain Rex, which currently has a high resale value. The resale value of this set is approximately \$500, compared to its MSRP of \$90 in 2008. This is

one example of many sets that fit this unique profile of qualitative factors that help lead to a high resale value.



[Figure 5, LEGO Set #7675: AT-TE Walker, released in 2008]

4.2 - Modular Buildings Collection

LEGO's modular buildings collection line is targeted toward adults, and intends to recreate a building on a city street. As part of the modular moniker, you can connect these sets to create a more mature LEGO city. While these sets include minifigures, the minifigures are not

anything too unique or noteworthy. The main attention factor for these sets is their build quality and modularity. The build quality is impressive, with these sets paying great attention to interior and exterior detailing, pleasant color schemes, and challenging, rewarding, and innovative build practices. See Table 1 for an analysis. Only two of the nineteen sets have an ROI of less than 8% annually. This theme within LEGO would support the hypothesis that a well-built set will contribute to a higher rate of return.

Table 1

Set Number	Set Name	MSRP	Pieces	Year of Release	# of Minifigs	Value new	Average ROI (%)	Average Yearly ROI (%)
10182	Cafe Corner	\$139.99	2056	2007	3	\$2,269.93	1521.49	101.43
10185	Green Grocer	\$149.99	2352	2008	4	\$1,423.61	849.14	60.65
10190	Market Street	\$89.99	1248	2007	3	\$1,974.95	2094.63	139.64
10197	Fire Brigade	\$149.99	2231	2009	4	\$562.94	275.32	21.18
10211	Grand Emporium	\$149.99	2182	2010	7	\$442.28	194.87	16.24
10218	Pet Shop	\$149.99	2032	2011	4	\$261.59	74.40	6.76
10224	Town Hall	\$199.99	2766	2012	8	\$824.23	312.14	31.21
10232	Palace Cinema	\$149.99	2196	2013	6	\$308.91	105.95	11.77
10243	Parisian Restaurant	\$159.99	2469	2014	5	\$315.80	97.39	12.17
10246	Detective's Office	\$159.99	2262	2015	6	\$393.36	145.87	20.84
10251	Brick Bank	\$169.99	2380	2016	5	\$530.95	212.34	35.39
10260	Downtown Diner	\$169.99	2480	2018	6	\$288.75	69.86	17.47
10264	Corner Garage	\$199.99	2569	2019	6	\$237.38	18.70	6.23

Source: Author.

Note: The 2017 release, Assembly Square, was excluded since it retired on December 31st, 2023, and hasn't had enough time on the secondary market to accumulate gains.

5 - Quantitative Analysis / Methodology

The quantitative analysis is divided into two main sections: return on investment (ROI) findings and regression results. Both sections focus on various LEGO sets and the LEGO Star Wars theme. The data and code used for this section are in the appendix.

5.1 - ROI Findings

Two benchmarks were used for the stock market to compare the return on investment of LEGO versus the stock market: the S&P 500 (Ticker: GSPC) and the Dow Jones Index (Ticker: DJI). All LEGO data was collected by scraping information from brickset.com from 2000 to 2023. The data is relevant and accurate as of February 14, 2024. The dependent variable of this data is new, unsealed LEGO sets. The data was then refined to remove LEGO sets with no MSRP, a new resale price, or less than thirty pieces. Sets that did not have the first two conditions may have been a gift with purchases (GWP) from LEGO, which is a gift from LEGO if your order from LEGO is above a certain price threshold, or may have been a limited edition gift at an event such as ComicCon. The issue with a LEGO set being a GWP or a limited edition gift is that there is no MSRP value for these gifts, so we cannot calculate an ROI. If a LEGO had less than thirty pieces, its resale price may have been too heavily skewed or irrelevant to the data.

After initial data processing, two areas of analysis became important. Looking at the top ten percent of return on investments and the overall average return on investment. The same analysis was conducted but exclusively for the *Star Wars* theme. It is important to determine the

high end for returns on investment so that investors can figure out which attributes are associated with LEGO sets that provide heightened ROI. At the same time, learning the overall average ROI of LEGO sets can give investors the necessary knowledge about what to expect from the LEGO resell market.

ROI outliers were removed from the dataset to determine the average return on investment. *Outliers* were defined as any ROI value greater than or less than two standard deviations from the mean⁴. On the other hand, to determine the LEGO sets with the highest ROI, the data was filtered in descending order from the highest percent change. After this, the top 10% of values were selected to create a new dataset. The following equation calculated ROI:

$$ROI = \frac{resalevaluenew - msrp}{msrp}$$

Now that ROI has been calculated for all our relevant datasets, the next step was to determine the overall mean and median and compare this to the S&P 500 and Dow Jones Index. The following tables present this information.

Table 2

⁴ For the overall dataset, 144 outliers were removed. See the sample size in Figure 6. Most of these outliers were ones that overperformed the mean and median ROI, instead of underperforming.

LEGO ROIs			
Dataset	Mean ROI	Median ROI	Sample Size
<i>Overall data with outliers</i>	157.369%	67.511%	3385
<i>Overall data without outliers</i>	112.404%	61.127%	3241
<i>Overall data top 10% ROI</i>	809.261%	667.795%	339
<i>Star Wars data with outliers</i>	290.953%	184.758%	335
<i>Star Wars data without outliers</i>	225.602%	175.396%	317
<i>Star Wars data top 10% ROI</i>	1123.840%	896.614%	34

Source: Author

Table 3

Stock Market ROIs	
Ticker	ROI
<i>S&P 500</i>	240.11%
<i>Dow Jones Index</i>	243.97%

Source: Author

The findings of this research present some unique takeaways. First, the LEGO *Star Wars* theme tends to outperform the overall LEGO data, even though the overall LEGO data incorporates the LEGO *Star Wars* theme. Unsurprisingly, ROI falls whenever outliers are excluded from the data, as we remove some of the highest ROI-performing LEGO sets. One important point to note with the overall data is that it includes all sets from 2000-2023 and calculates the average of their ROI, while the S&P 500 and Dow Jones Index start from January

1, 2000, and go to February 14, 2024. The *Star Wars* data runs from 1999, the first year the theme was introduced into the LEGO Catalog, to 2023. To compare the ROI of LEGO sets released in a specific year to the various stock market returns from that year, a comprehensive year-by-year analysis was done for the overall data set, the overall data set with outliers filtered out, and the equivalents for the *Star Wars* dataset.

Table 4

Overall Data Year-by-Year Analysis with Outliers (In %)					
Year	Number of Data Points	Mean ROI	Median ROI	DJIA ROI	S&P 500 ROI
2000	105	247.88	135.00	240.11	243.97
2001	86	397.94	189.13	262.84	290.06
2002	110	376.78	140.00	283.47	333.51
2003	124	356.27	274.79	348.77	450.65
2004	123	280.63	232.76	271.07	351.57
2005	130	313.99	191.68	260.02	316.41
2006	111	391.59	283.21	256.10	294.51
2007	122	330.34	202.21	209.66	253.35
2008	130	263.47	156.19	196.14	245.89
2009	143	215.37	126.31	327.55	437.19
2010	130	116.75	109.34	264.97	341.80
2011	160	130.48	96.61	230.98	293.56

2012	196	114.37	88.62	211.58	291.96
2013	207	92.15	52.59	188.00	242.28
2014	194	98.51	65.75	134.94	173.23
2015	204	103.02	75.14	116.61	143.20
2016	207	93.05	49.89	125.25	148.70
2017	192	58.59	36.49	94.29	121.70
2018	171	49.82	27.43	55.61	85.68
2019	154	55.93	20.05	65.46	99.42
2020	172	6.34	-2.45	33.81	53.65
2021	126	-12.01	-14.53	27.81	35.26
2022	76	-25.97	-27.56	5.58	4.36
2023	12	-21.00	-23.69	16.57	30.89

Source: Author

Table 5

Overall Data Year-by-Year Analysis without Outliers (in %)						
Year	Number of Data		Mean ROI	Median ROI	DJIA ROI	S&P 500 ROI
	Points					
2000	92		153.52	82.73	240.11	243.97
2001	72		156.76	124.68	262.84	290.06
2002	91		166.20	124.66	283.47	333.51
2003	109		248.89	209.40	348.77	450.65
2004	115		231.69	208.00	271.07	351.57

2005	116	227.31	158.80	260.02	316.41
2006	92	255.39	234.93	256.10	294.51
2007	102	183.39	148.90	209.66	253.35
2008	119	188.48	135.13	196.14	245.89
2009	141	183.32	125.85	327.55	437.19
2010	130	116.75	109.34	264.97	341.80
2011	159	125.55	96.48	230.98	293.56
2012	194	107.67	85.97	211.58	291.96
2013	206	84.95	52.53	188.00	242.28
2014	194	98.51	65.75	134.94	173.23
2015	204	103.02	75.14	116.61	143.20
2016	207	93.05	49.89	125.25	148.70
2017	191	55.03	36.13	94.29	121.70
2018	171	49.82	27.43	55.61	85.68
2019	150	25.65	19.46	65.46	99.42
2020	172	6.34	-2.45	33.81	53.65
2021	126	-12.01	-14.53	27.81	35.26
2022	76	-25.97	-27.56	5.58	4.36
2023	12	-21.00	-23.69	16.57	30.89

Source: Author

Table 6

Star Wars Year-by-Year Analysis					
Year	Number of Data Points	Mean ROI	Median ROI	DJIA ROI	S&P 500 ROI
1999	13	642.80	576.70	320.59	307.59
2000	14	575.03	455.25	240.11	243.97
2001	5	758.21	667.80	262.84	290.06
2002	11	751.94	292.78	283.47	333.51
2003	16	638.68	455.39	348.77	450.65
2004	11	370.23	370.14	271.07	351.57
2005	12	849.38	798.56	260.02	316.41
2006	5	550.49	498.26	256.10	294.51
2007	10	269.26	245.58	209.66	253.35
2008	11	372.80	404.75	196.14	245.89
2009	14	306.45	290.79	327.55	437.19
2010	13	202.46	183.23	264.97	341.80
2011	17	189.66	168.75	230.98	293.56
2012	18	181.22	183.51	211.58	291.96
2013	22	282.16	198.02	188.00	242.28
2014	24	234.30	184.90	134.94	173.23
2015	19	146.97	86.56	116.61	143.20
2016	24	92.45	56.52	125.25	148.70
2017	23	87.11	55.03	94.29	121.70
2018	18	70.61	61.32	55.61	85.68

2019	16	42.29	36.40	65.46	99.42
2020	14	57.39	28.15	33.81	53.65
2021	3	-1.74	6.54	27.81	35.26
2022	1	-9.20	-9.20	5.58	4.36
2023	1	-20.24	-20.24	16.57	30.89

Source: Author

Table 7

Star Wars Year-by-Year Analysis with Filtered Value					
Year	Number of Data Points	Mean ROI	Median ROI	DJIA ROI	S&P 500 ROI
1999	11	509.37	519.95	320.59	307.59
2000	12	491.14	434.84	240.11	243.97
2001	4	439.40	433.81	262.84	290.06
2002	9	320.95	261.12	283.47	333.51
2003	12	408.85	403.24	348.77	450.65
2004	11	370.23	370.14	271.07	351.57
2005	7	639.67	723.94	260.02	316.41
2006	4	431.83	413.66	256.10	294.51
2007	10	269.26	245.58	209.66	253.35
2008	11	372.80	404.75	196.14	245.89
2009	14	306.45	290.79	327.55	437.19

2010	13	202.46	183.23	264.97	341.80
2011	17	189.66	168.75	230.98	293.56
2012	18	181.22	183.51	211.58	291.96
2013	21	220.62	197.72	188.00	242.28
2014	24	234.30	184.90	134.94	173.23
2015	19	146.97	86.56	116.61	143.20
2016	24	92.45	56.52	125.25	148.70
2017	23	87.11	55.03	94.29	121.70
2018	18	70.61	61.32	55.61	85.68
2019	16	42.29	36.40	65.46	99.42
2020	14	57.39	28.15	33.81	53.65
2021	3	-1.74	6.54	27.81	35.26
2022	1	-9.20	-9.20	5.58	4.36
2023	1	-20.24	-20.24	16.57	30.89

Source: Author

A key trend across these tables is that the average ROI for the LEGO sets tends to be smaller than the S&P 500 and DJIX from 2009 onwards. Considering the US economy suffered from the great recession in 2007-2008 and began its rebound in 2009, this trend makes sense. LEGO sets before 2009 also tend to have a heightened resale value, thanks to the nostalgia that is often associated with these LEGO sets. Around 2008, the modern style of LEGO set design and minifigure design came to fruition. While there have been changes since the design was heavily introduced around 2008, the designs are still the same at its core. This may also explain why resale values fell off around 2009; there is less nostalgia for sets released after 2008. See Figures

6, 7, 8, and 9 for an example comparison between the 2003, 2008, 2013, and 2022 AT-TEs. This comparison is representative of the general design changes LEGO has had over the years.



[Figure 6, LEGO Set #4482: AT-TE, released in 2003]



[Figure 7, LEGO Set #7675: AT-TE Walker, released in 2008]



[Figure 8, LEGO Set #75019: AT-TE, released in 2013]



[Figure 9, LEGO Set #75337: AT-TE Walker, released in 2022]

5.2 - Regression Results

With the same dataset from the overall dataset used in section 5.1 (with outliers), a linear regression was conducted to see what aspects of a LEGO set best contribute to its resell value, which is the dependent variable. The independent variables collected included pieces, minifigs, and the MSRP price. The dependent variable is the current resell value of the LEGO set. This same regression was also done for the LEGO *Star Wars* dataset. The following tables present the following about the linear regression results.

Table 8

Overall Data Regression Results			
	Pieces	Minifigs	MSRP
Coefficient	0.0681	1.678	1.449
Standard error	0.00904	0.964	0.0910
Z-score	7.54	1.74	15.92
VIF	3.88	1.54	4.51

Source: Author

Note: Adjusted R² is 0.32, Intercept is 9.794

Table 9

LEGO <i>Star Wars</i> Regression Results		
	Minifigs	MSRP
Coefficient	-16.66	4.79
Standard error	7.48	0.39
Z-score	-2.23	12.4
VIF	1.81	1.81

Source: Author

Note: Adjusted R^2 is 0.62, Intercept is 30.22. Pieces were removed from the regression as including both pieces and MSRP caused VIF for pieces to be 14.280 and VIF for MSRP to be 16.024.

This data provides interesting takeaways concerning the impact of MSRP and minifigs on the resale value of the LEGO set. We can include both the MSRP and pieces in the grander LEGO dataset. With the LEGO *Star Wars* data, pieces had to be removed to prevent the problem of multicollinearity in the data.

Considering the overall dataset, R^2 being 0.32 shows there is still more to be explained regarding the set outside the measurable, quantitative factors⁵. This supports the thesis in this paper that qualitative factors play an important role in LEGO set resale values. Examples of factors are the presence of unique minifigures and/or clone troopers and a good set design. Nostalgia may play a significant role in helping to shape LEGO resale values, as people look fondly at the older LEGO set themes, such as the Pirates line, Power Miners, and Bionicle.

Interestingly, the adjusted R^2 value jumps to 0.62 within the LEGO *Star Wars* data, indicating that these quantitative factors play a larger role in determining a LEGO *Star Wars* set's resale price. This may be the case because fan sentiment towards sets is not fully incorporated into the data within the larger data set. Every LEGO consumer has different fan sentiment to different product lines within LEGO's catalog. Within LEGO *Star Wars*, since fans may already have a positive attitude towards the franchise, that data already incorporates this information. A LASSO and logistic regression were considered, and the results of the LASSO regression were very similar to those presented here. Logistic regression was not done as the y-variable is not continuous. The author thinks that qualitative factors, examples of which are *Star Wars*'

⁵ For future work, a random effects regression model may better help to explain more of the data.

popularity at the time of the LEGO set's release, fan sentiment towards the franchise, and the presence of fan-favorite characters or clone troopers meaningfully contribute to the resale value of these LEGO sets.

The results from this section support what was expected from the case study section and other prior studies. This methodical approach to determining what contributes to a LEGO's resale value from a quantitative perspective makes it easier for retail investors to determine which sets will make for strong investments in the future.

6 - Predictions

This section makes investment predictions based on the information in this paper, the author's intimate knowledge of the LEGO market, and the paper's intention to be tailored for retail investors. The author is not a certified financial advisor and has not undergone any formal wealth management training. Any predictions that are followed are solely at the risk of the investor. The author is not liable for any losses an investor may incur based on the predictions given in this paper.

6.1 - LEGO *Star Wars*

This is where the predictions align with the author's interest and expertise in *Star Wars*. As a note, many of these LEGO sets can be found on sale at third-party retailers, such as Amazon and Walmart. The first set the author predicts will do well is set #75337 - AT-TE. The set's price looks resilient to new releases, as seen by looking at the three prior LEGO AT-TEs that have been released. This new AT-TE has a strong set design, plenty of clone troopers in the set, plenty of fan appreciation for this vehicle, and a unique Minifigure in the form of Phase 2

Commander Cody. The LEGO AT-TE is well designed because it is a faithful recreation of the one present in various *Star Wars* media, is aesthetically pleasing, and has strong playability features. For context, regarding phase 2 Commander Cody, the clone troopers wore two phases of armor, phase 1 and phase 2 armor.



[Figure 10: Phase 1 Clone Armor on the left, Phase 2 Clone Armor on the right]

LEGO released a phase 1 Commander Cody but not a phase 2 Commander Cody until set #75337 - AT-TE was released. There is no indication that LEGO intends to release phase 2 Commander Cody in another set. As of March 26, 2024, phase 2 Commander Cody's resell value on bricklink.com is about \$15. Considering these factors and the fact that Commander Cody is a beloved character by the *Star Wars* community, it's safe to say that his presence in the AT-TE will help the resale value of the set. This LEGO set retails for \$140, and based on the regression analysis, MSRP plays a significant role in the future resale value of the set. All factors point to the AT-TE being a strong candidate for resale in the future.



[Figure 11, LEGO Set #75337: AT-TE Walker, released in 2022]

The next LEGO set is set #75354 - Coruscant Guard Gunship. This set's predecessors, other Republic Gunship (also known as LAATs), show similar price resilience to when new variants of the set have come out. What differentiates this set from other Republic Gunships is that this gunship has a predominantly red with white accents color scheme. Other gunships in the past have been primarily all-white. While this gunship is arguably not of the same design quality as prior gunships, it is still a well-designed set. This set is well designed because it has strong playability features, uses innovative design techniques, and is a faithful recreation of the Republic Gunship fans are used to seeing.

Another factor supporting the future resale value of this LEGO set is the minifigures. Three of the minifigures in this set are likely unique minifigures. Senator Padme Amidala, Chancellor Sheev Palpatine, and Commander Fox of the Coruscant Guard. As of March 26,

2024, with prices collected from bricklink.com, Senator Amidala’s minifigure from this set resells for \$13 new, Chancellor Palpatine’s minifigure resells for \$15 new, and Commander Fox resells for about \$20 new. In addition, the gunship retails for \$140. Considering these factors, this LEGO set seems likely to have a high resale value.



[Figure 12, LEGO Set #75354: Coruscant Guard Gunship, released in 2023]

Finally, the last LEGO *Star Wars* set the author expects to do well in the future is set #75367 - UCS Venator-class Republic Attack Cruiser. This set is the second LEGO recreation of the Venator, and the fans adore this ship. This set is well-designed because it pays great attention to the small details of the Venator, such as a small Republic Attack Shuttle, is faithful to the one present in countless *Star Wars* media, and is generally aesthetically pleasing. This set also contains two highly sought-after Minifigures: Phase 2 Captain Rex and Admiral Yularen. LEGO has previously released a Phase 2 Captain Rex, but this is an updated design. However, LEGO is expected to release this exact Captain Rex in a \$12 set, which will remove the scarcity around

the figure. However, Admiral Yularen is expected to be an exclusive to this set, and he is a well-liked character by the fans. Since MSRP plays a big role in determining the future resale value of a set, it is good to know this set's MSRP is \$650. This set will have a substantial resale value in the future.



[Figure 13, LEGO Set #75367: Venator-class Republic Attack Cruiser, released in 2023]

6.2 - Other LEGO sets

Recently, *Dune Part Two* was released to critical acclaim by fans and critics alike. This can be seen with *Dune Part Two*'s 8.8/10 stars on IMDb, a website review platform by movie viewers. As of March 31st, 2024, about 290,000 reviews have been made on the website. Thanks to this rating on IMDb, this places *Dune Part Two* as IMDb's 15th highest-rated movie of all time. On Rotten Tomatoes, another movie review website, it currently has a 93% positive rating by critics and a 95% positive rating by fans, with over 5,000 reviews.

Understanding that fan sentiment towards a franchise plays a role in helping the future resale value of a LEGO set, it makes sense to look at any released LEGO *Dune* set. Set #10327—Dune Atreides Royal Ornithopter was released on February 1, 2024. The first two

things that stand out are the build of the Ornithopter and the Minifig quality and selection. The Ornithopter is incredibly well-built. This set is well-built because it respects the design of the one present in the movie, uses innovative design techniques (such as the wings), and provides the builder with a challenging yet rewarding build process. The Minifig selection is impeccable, providing a wide range of the main characters from *Dune* (2021). These characters boast unique designs that incorporate many of the unique aspects of the characters' outfits. Most of the minifigures in this set currently sell for \$10 each. The set retails for \$165.

It's unlikely that LEGO will create another *Dune* set. This is because this set was released three years after the first movie and targeted the 18+ crowd. Based on what they have released in their LEGO Icons line in the past, LEGO does not typically make multiples of these types of sets that meet this criteria. For all these reasons, this set is likely to have a high resale value in the future.



[Figure 14, LEGO Set #10327: Dune Atreides Royal Ornithopter, released in 2024]

The next two sets belong to the Modular Buildings Collection. The first is set #10297 - Boutique Hotel. The minifigures are not the main point of this set, but the hotel itself. This

design is well-made⁶. The main attractive point of the hotel to city builders and resellers is that it is a corner building. This way, you can finish your LEGO city block and wrap it around to another city block. It comes at a relatively affordable price of \$230; all signs indicate this set will have a strong resale value.



[Figure 15, LEGO Set #10297: Boutique Hotel, released in 2022]

The final set the author predicts will do well in the future is set #10326 - Natural History Museum. This set is one of the larger buildings in the Modular Buildings Collection, comparable

⁶ See the reasons stated in the case study section of the paper regarding the Modular Buildings Collection.

to a prior set, Assembly Square. This set continues the trend of being well-built⁷. The minifigures are nothing noteworthy. The set retails for \$300, helping its case for a high resale value in the future.



[Figure 16, LEGO Set #10326: Natural History Museum, released in 2024]

7 - Conclusions

This paper is tailored towards LEGO sets already on store shelves. It provides retail investors with quantitative and qualitative factors to form a solid base for investing in LEGO. While this study does not look into LEGO's volatility aspects, other literature on LEGO and other alternative assets suggests that LEGO is not exposed to the same volatility factors as traditional investment assets. From the discussion of this paper, it seems LEGO is less volatile than other alternative investments. This is because LEGO has more objective quality metrics

⁷ See the reasons stated in the case study section of the paper regarding the Modular Buildings Collection.

than other alternative investments. If one is to pick a random LEGO to invest in, the odds are that your investment will underperform the stock market. However, it is the belief of the author that if you are a fan of LEGO or someone willing to perform research into LEGO, it is more than possible to earn a positive return on investment⁸.

Future research should consider quantifiable measures of the qualitative aspects presented in this paper. An interesting example is tying the Google search popularity index with a LEGO set's release. That is, ascertaining the relative popularity of a LEGO *Star Wars* set when it comes out due to the LEGO set releasing with a new piece of *Star Wars* medium and seeing how it performs in the future when similar *Star Wars* media releases.

In summary, LEGO is a new avenue for investors to consider. LEGO is an enticing option for any retail investor with the potential to outperform the stock market while providing diversification in an investor's portfolio from traditional risk.

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⁸ This paper has considered the resale value of these sets in terms of new, sealed sets. While sets that are displayed and are kept in good condition will have good resale value in the future, it will not be anywhere near the same as a new, sealed set.

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