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Risk Aversion and Former Collegiate Athletes as Financial Investors

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Abstract

Risk aversion is a concept that tries to understand an individual's choice, when two options are presented with different levels of risk and reward. This concept can be applied to finance when looking at investors decisions to invest in options with different levels of risk and returns. This study examines if having played a collegiate sport will impact the level of risk aversion an investor has. In order to determine this, an experiment was given to Graduate students working on a Master's degree in business. The experiment consisted of six different stock options representing different levels of risk. From this data, it was found that playing a collegiate sport makes an investor more likely to invest in a risky investment, as well as value that investment as less risky than it should be valued.

Introduction

When an investor has to make a decision between two different investments and the outcome is uncertain, they weigh the risk and the reward between the investments. This preference in decision making is called risk aversion. Risk aversion is defined as the tendency of investors to avoid risky investments. If two investments offer the same expected yield but have different risk characteristics, investors will choose the one with the lowest variability in returns, more specifically, the investment with the least risk.

This thesis looks at risk aversion and its connection to former collegiate athletes. Collegiate athletes are individuals who played a competitive sport at any point during their years in college as an undergraduate or graduate student. Collegiate sports involve a

large time commitment, competitive games or meets against other college sports teams and you must be selected in order to be a part of the sport.

Literature Review – Risk Aversion

The general concept of risk aversion deals with choices. Individuals frequently must, or can, choose among alternatives that differ. In the areas of psychology and decision making, risk aversion and levels of risk have been studied extensively, and numbers of risk measurements models have been proposed. While these measurements have been used, they have two major drawbacks. These drawbacks are that the validity has been called into question and there is no clear way to link these measurements to decision making models. (Kimball, M.S., 1993) Since these measurements cannot be linked to decision making models, they will not help measure risk aversion in this thesis, but it is important to understand that the concept of risk aversion comes down to behavioral and psychological choices.

The concept of risk aversion that this thesis will present deals with choices and behaviors of investors where the financial outcome is uncertain. In finance, this can be seen when an investor must make an investment between different options. Financial risk aversion deals with the individual level of risk that an investor is willing to take on when making an investment. The risk they take on is directly proportional to the return they are seeking. If an investment has a higher risk, then its reward, or return, must be higher as well. The opposite is true that when the risk is low, the return must also be low.

When classifying investors on the level of risk aversion they have, they are grouped into three categories. These groups are risk-loving, risk-averse, and risk-neutral.

The first group, risk-loving, is defined by investors who are more willing to take risks in order to maximize the potential return. The second group, risk-averse, is defined by investors who are less willing to take risks in order to maximize the potential return. They look for investments that have little to no risk, and have a low but guaranteed return on the investment. The final group that investors are grouped into is risk-neutral. These types of investors do not have a preference in determining an investment. They will look for investments that are neither risk free nor risk extreme, but rather investments that fall between the two extremes.

Some experts, such as Edwin Cannan, in discussing the rate of return on investments states that “the probability is that the classes of investments which on the average return most to the investor are neither the very safest of all nor the very riskiest, but the intermediate classes which do not appeal either to timidity or to the gambling instinct.” (Friedman, M., Savage, L.J., 1948) This expert feels that most investors will be risk neutral when choosing an investment in order to get the best return.

The most extensively used measures of risk aversion are the expected utility theory and the Arrow-Pratt measures of absolute and relative risk aversion. The utility function is the first thing necessary to look at in order to understand the effects risk perception and risk preferences have on an individual. The two formulas by Arrow and Pratt are derived from the expected utility theory, which is as follows:

$$\text{The utility function} = E(u)$$

By using the expected utility theory, Kenneth Arrow and John W. Pratt were able to formulate two different measures of risk aversion. They are as follows:

ARA - The Arrow-Pratt measure of absolute risk-aversion (Arrow, K. J. 1971)

$$A(c) = - (u''(c) / u'(c))$$

RRA - The Arrow-Pratt measure of relative risk-aversion (Arrow, K. J. 1971)

$$R(c) = cA(c) = - cu''(c) / u'(c)$$

The arrow Pratt measure of absolute risk-aversion measures an individual's level of risk aversion. This formula can be used to measure any function, but usually is used to measure wealth. These formulas show that as wealth increases so does the level of risk aversion for an individual. That being said, the more money an individual has, the more likely they are to avoid risky investments and seek out investments that are less risky. In general, the absolute level of risk aversion represents the degree of risk aversion that a specific individual has. The relative level of risk aversion represents the risk aversion that an individual has when options are presented.

While these measures of risk aversion are very in depth and statistically based, they represent the base for measurements involving risk aversion in relation to different investors. This thesis will use a simpler mathematical way of determining the level of risk aversion for specific investments.

There have already been factors proven to influence the levels of risk aversion for individuals. Two of the major influences on risk aversion are age and wealth. (Halek, M.,Eisenhauer, G., 2001) It has been found that age and wealth increases risk aversion. So as the older an individual gets and the more wealth they have, the more likely they are to be risk-averse, meaning they will take investments with little risk. Risk aversion has also been found to be different between males and females. In a study conducted, females were less like to take risks of gambling than males were. (Halek, M.,Eisenhauer, G., 2001) This means that they have a risk-averse attitude.

Recent research has started to look at the differences in risk aversion among demographic groups. Psychologist Marvin Zuckerman states that, “Demographic differences suggest alternative hypotheses of explanation, some to do with social learning and some with biological-developmental tendencies.” (Demographic of risk aversion) Some demographics that have been raised as possible influences on risk aversion are the elderly, athletes, students, parents, spouses, alcoholics and immigrants. Other social psychologists highlight cultural factors that influence individual’s attitudes. Such cultural factors as nationality, ethnicity, religion, occupation and sex will influence one’s personal identity. These cultural factors will influence how individuals view and undertake risky choices and investments.

With different demographics being proven to change individual’s levels of risk aversion, more questions are present to find what factors influence it. This thesis looks to prove that the demographic of former collegiate athletes will be a demographic that influences risk aversion. The culture of college sports as well as the influence it has on an individual’s identity may be a reason that risk aversion is different in this group. This thesis will prove there is a relationship.

Literature Review – Collegiate Athletes

Critical to this thesis is to identify what collegiate athletes do and learn that could influence their risk aversion later in life. At the most basic level the difference between collegiate athletes and college students is the simple fact that the former plays an intercollegiate sport while the latter does not. They both attend college, but their experiences are entirely different. Playing a collegiate sport adds a level of complexity to

student life. The college student athlete faces all the challenges that the non-athlete faces, namely social adjustment, career exploration and intellectual growth. (Watt, S.K., Moore III, J.L., 2001) In addition to the normal daily routine, college athletes have large time commitments to their sports with practice or games every day, traveling for away games, and studying team plays. (Watt, S.K., Moore III, J.L., 2001) The difficulty comes from having to balance the roles of student and athlete at the same time. Both students and athletes have commitments they have to honor and strive for, but when time is limited, it becomes hard to succeed in both fields. In addition, many factors distinguish athlete from athlete. These factors are division classification, sex, race, ability and sport. Each of these differences can change the way of defining and experiencing life as a student athlete. (Watt, S.K., Moore III, J.L., 2001) From this understanding it is clear that college athletes live different lives than college students who do not play a sport.

Playing collegiate sports has been proven to have a positive as well as a negative impact on the lives of college athletes. The first positive impact is that college sports have been linked to good health and well-being. (Watt, S.K., Moore III, J.L., 2001) It has also been proven that athletic participation in college develops a high level of self-esteem, leadership and teamwork skills, motivation and discipline. (Watt, S.K., Moore III, J.L., 2001) While there are these positive impacts, there are also negative impacts possible. One of the major negative consequences is increased aggressiveness. This can be caused because, in some institutions and in some sports, coach and teammates emphasize winning at all costs. Some researchers even say that this attitude can contribute to intolerance and promotion of sexual aggression, homophobia, steroid use, trash talk, and unhealthy body image. (Watt, S.K., Moore III, J.L., 2001) These studies

show that playing collegiate sports will have an impact on an individual's personality and character.

Other studies have also shown the impact that playing a collegiate sport has on individuals. Impacts such as achievement orientation and competitiveness are clear among sports participants and how they link sport achievement behaviors and success. (Gill, D.L., Dzewaltowski, D.A., 1988) According to Atkinson's achievement motivation theory highly achievement orientated individuals approach achievement situations, try hard and strive for success against achievement standards, and persist in the face of failure. (Gill, D.L., Dzewaltowski, D.A., 1988) Collegiate athletes are defined exactly by this statement. They enter competitive sports and accept challenges, these individuals set and strive for high performance standards, and they persist in those efforts until they attain their goals. Thus, highly successful athletes should be characterized by high achievement motivation. (Gill, D.L., Dzewaltowski, D.A., 1988) With previous research showing that playing college sports changes an individual's attitude and personality, one can look to examine if this impacts other areas of their lives. This thesis proves that these differences will impact the levels of risk aversion former collegiate athletes have when acting as financial investors.

Studies have also shown that playing a collegiate sport helps individuals succeed in different professions. It has been shown that many former collegiate athletes are enrolled in the fields of teaching, business, military and manual labor. (Do college altherels) In all of these fields except for teaching, former collegiate athletes on average are paid a wage premium in comparison to others in their field. "Intuitive arguments could be made that skills obtained or improved during athletic participation would justify wage premiums in these occupations. Teamwork skills and an enhanced competitive

drive to succeed could be useful in the business world. Physical strength and other athletic attributes may make manual laborers and military professionals more productive at their jobs, justifying higher wages. The ability to apply strategic thinking and adjust a particular strategy during a game may be particularly important while using military tactics” (Do College)

Following that question one must look at how being a collegiate athlete changes an individual’s mindset and attitudes. For this thesis there will be two different types of investors defined. The first is former collegiate athlete investors (FCAIs). FCAIs are investors who played a collegiate sport while enrolled as an undergraduate or graduate student. The other type of investors will be defined as regular investors (RIs). These investors did not play a collegiate sport while enrolled as an undergraduate or graduate student.

Methodology

Measuring the risk aversion of individual investors was the goal of this thesis. In order to best capture this data, the methodology used was an experiment and a survey. The experiment was used to measure what investment decisions investors would make and how they ranked the risk of those investment decisions. The survey was given to gather background information on each investor to help find what factors influence their level of risk aversion.

Methodology - Experiment

In the experiment investors were presented with six different stock options. The stock investment options were gathered from an experiment in the article “*Perceived Risk Attitudes Relating Risk perception to Risky Choice*” (Weber, E., Milliman, R.). Unlike their experiment, the stocks were given different alphabetical names (A through F) in order to remove any influence a company’s name may have on an investor’s decision to invest in the stock. In addition, there were three versions given of this experiment where stocks were listed in different orders. These changes were critical to aid in removing any other variables that would impact investment decisions and contaminate the data collected.

Each investor had to determine only one stock they could make an investment in. This stock represented the stock option that they believed to be the best investment possible. For each stock option, the following data was given to investors to make their decision: Current Price, Shares Outstanding, 52 Week High, 52 Week Low, Yesterdays Trades, Beta, EPS, Last 52 Week Prices, Last 52 Week Volume, PE and Alpha. From this data investors had to make their decision and state the level of confidence they had for their investment. Information was also collected on which data factors presented were the most important in their investment decision.

Two different examples of the stock options presented in the experiment:

Stock	A	Stock	B
Current Price	\$57.80	Current Price	\$25.10
Shares Outstanding	800,000	Shares Outstanding	700,000
52 Week High	\$58.40	52 Week High	\$32.70
52 Week Low	\$52.10	52 Week Low	\$22.10
Yesterday's Trades	107	Yesterday's Trades	26
Beta	1.08	Beta	2.38
EPS	3.50	EPS	6.00
PE	15	PE	20
Alpha	-.88	Alpha	.96

After determining what stock they would invest in, all investors had to rank each individual stock on the level of risk they perceived it to be. Each participant was asked to rank each stock on a scale from 0 (“not at all risky”) to 100 (“extremely risky”). By having each investor rank the level of risk for each stock, it becomes possible to identify which stocks are the most risky and least risky to investors.

Beta is defined as the volatility of an asset in relationship to the market. Beta is the measure of market risk that any given asset has. For this experiment the asset that is being presented is stocks. A beta of zero for a stock would indicate that a stock's return moves independently from the market's return and would be less risky. A higher beta would indicate that a stock's return moves with the market's return and therefore has a higher market risk. Based on this information it is possible to classify the six stock options into the three different categories of risk aversion. Stocks B and D would be classified as risk-seeking. Stocks A and F are classified as risk neutral. Stocks C and E are classified as risk averse. These classifications are important when examining the stock choices of investors.

Methodology - Survey

Following the experiment there was a survey given to gather background data on each investor. Investors were asked about their: age, gender, race, marital status, level of education. Also, had they ever or did they currently own stock, their involvement with the stock market and confidence in the stock market, how risky they saw themselves as investors, and if they played high school and college sports.

Ages were grouped in categories that differed by 7 years. The age groups listed were 18-25, 26-33, 34-41, 42-49, 50-57, 58-65 and 66 and older. The two gender options presented were male and female. Marital status options were single, married, divorced, separated and other. Annual income was presented in groups of \$20,000, starting at \$0-\$19,999 and going all the way up to \$100,000 or more. Level of education was listed but irrelevant since every participant was from the graduate school at University of Massachusetts at Boston. Identifying whether participants had ever or currently owned stock was simply a yes or no option for both questions. Involvement and confidence in the stock market were measured on a scale of 1 to 10, with one being not involved and not confident and ten being extremely involved and very confident. These measures were important, but the last two measures were the most crucial to this thesis.

The most important data collected was the risk level ranking each investor gave themselves as well as if they played collegiate sports. The risk ranking allows for insight on if playing collegiate sports impacts how an investor view's their risk level and how this also affects their investment decisions. Playing a collegiate sport is important because it is the key factor looked at in this experiment and its impact on risk aversion. With this background information it becomes possible to understand which factors do and

do not have an impact on the level of risk aversion with investment decisions of the investors.

Participants (Investors)

Investors were sampled from graduate courses in business at The University of Massachusetts at Boston. There were a total of 32 graduate students that participated in the experiment and survey. From these 32 participants, 5 were former collegiate athletes and 27 did not play collegiate sports. Participants were selected in this manner in order to achieve a random sample of investors. If FCAIs and RIs were sought after and selected individually it may have led to skewed results.

Hypotheses

The null hypothesis states that playing a sport in college has no impact on risk aversion. Both former collegiate athlete investors and regular investors will have the same level of risk. This may be because the mindsets and skills developed while playing collegiate sports do not have a link to risk aversion in investing.

H₀: Playing collegiate sports has no impact on an investor's level of risk aversion when making an investment decision.

Hypothesis 1 states that playing collegiate sports will make an investor more risk adverse. They will invest in stocks that have a low level of risk. This may be a result of their focus on performance and not the outcome. This will influence their decisions to invest in stocks that have less risk in order to guarantee a return.

H₁: Playing collegiate sports will impact an investor's level of risk aversion and make them more risk-averse.

Hypothesis 2 states that playing collegiate sports will make an investor more risk-loving. They will invest in stocks that have a high level of risk. This may be because playing collegiate sports creates a mindset of winning big, such as a championship, so they will want the big reward, not a small one.

H₂: Playing collegiate sports will impact an investor's level of risk aversion and make them more risk-loving.

Hypothesis 3 states that playing sports in high school or college will have the same impact on risk aversion. This means that if playing college sports lowers or raises risk aversion for an investor, playing a high school sport should also have the same impact.

H₃: Playing a sport in college or high school will have the same impact on an investor's level of risk aversion.

Hypothesis 4 states that playing sports in high school and college will have a different impact on risk aversion. This means that playing a sport in high school and playing a sport in college will have a different impact on the risk aversion of financial investors. One will make them more risk averse and the other will make them more risk seeking.

H₄: Playing a sport in college or high school will have a different impact on an investor's level of risk aversion.

Data

Data collected from the experiment and survey was analyzed in order to find if there was a relationship between a former collegiate athlete investor (FCAI) and a regular investor (RI) when it came to their levels of risk aversion and their perceived levels of personal risk. The data was collected over a two week period from two separate graduate courses offered at the University of Massachusetts at Boston. The following is the summary (counts and means) of the data that was collected from the experiment.

The following is the number of investment options chosen by the two groups as well as overall.

	Number Invested In		
	Overall	RIs	FCAIs
Stock A	8	6	2
Stock B	6	5	0
Stock C	5	5	1
Stock D	5	5	1
Stock E	6	5	1
Stock F	2	1	0

The data collected shows the distribution between each stock investment and the number of FCAIs and RIs that invested in each one. The largest stock option invested in for both groups was stock A. For RIs, six invested in stock A. Following that, RIs had an equal investment in stocks B, C, D and E with five investors in each. Only one RI invested in stock F. For FCAIs, the greatest number of investors invested in stock A. Two FCAIs invested in stock A. There was an equal investment in Stock C, D and E with one investor each. For FCAIs, none invested in stocks B or D.

The following is the stock risk ranking means given by the two groups as well as overall for each stock.

	Stock Risk Ranking		
	Overall	RIIs	FCAIs
Stock A	43	45	30
Stock B	44	46	33
Stock C	51	50	56
Stock D	46	48	35
Stock E	63	63	62
Stock F	55	55	52

The riskiest stock ranking given by RIIs was stock E with a risk ranking of 63.

The riskiest stock ranking given by FCAIs was also stock E, with a risk ranking of 62.

The least risky stock ranking given by RIIs was stock A, with a risk ranking of 45. The least risky stock ranking given by FCAIs was also stock A, with a risk ranking of 30.

The overall rankings also show these same results.

The following is the data collected from the survey.

Marital Status	
Single	21
Married	9
Divorced	0
Seperated	0
Other	0

Annual Income	
Less than \$20,000	12
\$20,000-\$39,999	2
\$40,000-\$59,999	3
\$60,000-\$79,999	6
\$80,000-\$99,999	3
Greater than \$100,000	3

The largest numbers of investors were between the ages of 26 and 33, with the next largest group being 18 to 25. Only four investors fell in age groups outside of this range. This was to be expected with all 32 investors being from graduate courses at the University of Massachusetts at Boston.

Age	
18-25	9
26-33	18
34-41	2
42-49	2
50-57	0
58-65	0
66+	0

Race	
Caucasian	20
Asian	8
Indian	1
Hispanic/Latino	1
Middle Eastern	1

Gender	
Male	19
Female	13

The majority of investors were single, with 21, nine were married. Two investors did not fill in their marital status. The annual income for investors was focused on the category of less than \$20,000, with 12, the rest of the investors were spread out evenly among the other annual income categories.

Results

From this data it is possible to see where connection can be drawn and hypothesis testing can begin. Risk perception was the first concept that can be discussed from the data collected. Looking at the data collected on the ranking that each investor gave themselves during the survey it is possible to see if there is a difference between former collegiate athlete investors (FCAIs) and regular investors (RIs). In order to determine if there is a difference a test was run to check if the means of the two groups were able to disprove the null hypothesis. The null hypothesis states that there is no difference between the FCAIs and RIs when it comes to risk aversion and perceived risk aversion. In order to reject the null hypothesis there must be a one and two tail test of $p < .10$ for our thesis. The following is the t-test results based on the risk ranking each investor gave to themselves.

t-Test: Two-Sample Assuming Equal Variances		
	<i>RIs</i>	<i>FCAIs</i>
Mean	45.7407407	57.8
Variance	772.507123	1089.2
Observations	27	5
Pooled Variance	814.73284	
Hypothesized Mean Difference	0.1	
df	30	
t Stat	-0.8749665	
P(T<=t) one-tail	0.19427181	
t Critical one-tail	1.69726089	
P(T<=t) two-tail	0.38854361	
t Critical two-tail	2.04227246	

When looking at the results for the one and two tail tests, it shows that $p > .10$ with a value of .194 for the one tail test and $p > .10$ with a value of .389 for the two tail test. Based on this test the null hypothesis cannot be rejected; that there is no difference between individual risk perception among FCAIs and RIs.

One should note that there is a large mean difference between RIs and FCAIs. RIs had a mean value of 45.74 for their perceived level of risk aversion while FCAIs had a mean value of 57.80. These means differ by 14.06 points and show that there is a difference between the two groups. This difference means that FCAIs and RIs believe they have different levels of risk aversion. It seems that FCAIs see themselves to be more risk seeking as financial investors. It also shows that RIs see themselves as more risk averse when it comes to making financial investments. While this difference is not significant enough to reject the null hypothesis, it is shown that it may be possible to find enough of a difference between the two groups if further research is performed.

With the null hypothesis not able to be rejected, hypothesis 3 must now be tested. Hypothesis 3 states that playing a sport in college or high school will have the same impact on an investor's level of risk aversion. By using a t-test it is possible to see if this hypothesis is true.

The following is the t-test presented for this hypothesis.

t-Test: Two-Sample Assuming Equal Variances		
	<i>Never Played a Sport</i>	<i>Played High School Sports</i>
Mean	55	41.88888889
Variance	700	858.9281046
Observations	14	18
Pooled Variance	790.0592593	
Hypothesized Mean Difference	0.1	
df	30	
t Stat	1.29900204	
P(T<=t) one-tail	0.101919432	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	0.203838864	
t Critical two-tail	2.042272456	

The one and two tail tests both fall above the mean difference of 0.1 so we must reject this hypothesis and conclude that playing a high school sport does not differ from an investor who never played sports. While this test disproves the hypothesis, the one tail test gives a result of $p > 0.1$ with a value of 0.1019. This shows that it just narrowly missed proving this test correct. The mean of an investor who played collegiate sports ranked themselves as a 41.88 while investors who never played a sport ranked themselves as 55.0. This difference shows that playing high school sports seems to have an opposite effect on the level of risk perception an investor has of themselves. When looking at investors who played a college sport they value themselves as more risky than regular investors, but here investors who played a high school sport value themselves as less risky than regular investors.

There also is a connection between the perceived risk levels of stock investments with the choice to invest in that stock. The majority of RIs, 16 of 27, invested in the stock investment that was not the one they valued as the least risky of the six options. The opposite is true for FCAIs. The majority of FCAIs, 3 of 5, invested in the stock that

they valued as the least risky among the six different options. These results show that RIs seem to be more risk seeking because they do not invest in the stock investment that they thought was the most risk averse. FCAIs seemed to be more risk averse in their investments because they invest in the stock options that they perceived as less risky. These outcomes are interesting because they go against the previous findings. It seems that FCAIs feel they are more risk seeking, but they then invest in the stock investments they feel are the least risky. The opposite is true for RIs. They rank themselves as less risky, but then the majority of them invest in stock options they do not value as risk averse.

Risk aversion in relation to the stock investment decision each investor made also shows us interesting results. As mentioned earlier, the six different stock options were categorized on their levels of risk based on their betas. Stocks B and D are classified as risk-seeking, stocks A and F are classified as risk neutral and stocks C and E are classified as risk averse. Two of the FCAIs invested in stock D, while the other three invested in stocks A, C and E. This breakdown shows us that two FCAIs invested in a risk-seeking stock, one in a risk-neutral stock, and two in a risk-averse stock. Of the RIs, seven invested in stock A, six in stock B, four in stock C, three in stock D, five in stock E and two in stock F. This shows us that nine RIs invested in risk-seeking stocks, nine RIs invested in risk-neutral stocks and nine invested in risk-averse stocks. There is an even distribution between the three types of stocks for RIs while FCAIs had an uneven distribution. These results show us that RIs do not have a preference when it comes to the risk levels of their stock investments. However, we can see that FCAIs usually fall to

one extreme of the spectrum, either being more risk-averse or risk-seeking in their stock investments.

Conclusion

The null hypothesis was accepted that playing collegiate sports has no impact on an investor's level of risk aversion when making an investment decision. While the null hypothesis was accepted, it may be disproved if more participants are gathered and more data collected. It seems that former collegiate athlete investors (FCAs) view themselves as much more risk-seeking than regular investors (RIs) do when judging their perceived levels of risk aversion. In addition, it seems that FCAs view the investment decisions they make as less risky than RIs value them as. This may exist because FCAs are over confident in their ability to succeed in the investment they choose.

When looking at the risk aversion of the investments each investor selected, RIs had no preference between risk-seeking, risk-neutral and risk-averse investment options. FCAs however, seemed to invest in either end of the rankings, investing in either risk-seeking investments or risk-neutral ones.

Future research may look into why there is a difference in the perceived level of risk aversion between investors who played high school sports and those who played college sports. There possibly will be a reason that different levels of sports competition may change investor's levels of risk aversion.

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