Are Equity Markets Really Casinos? When the timing is right.

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Abstract

This paper investigates if risk seeking investors substitute gambling activities for stock markets participation when volatility increases in stock markets. Using a large cross-section dataset of 20 countries over 17 years we find the relationship between stock market volatility and gambling index performance are negative and significant in quarterly and yearly regression subject to several performance and regulatory control variables. We also find the year after volatility in the stock market increases, gambling markets performance is positive and significant, revealing these gambling investors return to gambling activities after periods of high equity market volatility. The findings have very important implications for regulators who aim to reduce equity market volatility and reduce speculative bubbles caused by reckless gambling in the stock market.

I. Introduction

Recent stock market gyrations have created the belief that stock markets are both; a method for corporations to raise capital and a casino for short term gamblers to satisfy their speculative urges. These two dichotomous aspects of the stock market taken together can be dangerous, as large fluctuations in stock values can have potentially dangerous impacts on the overall economic growth and activity. The aim if this paper is to determine if characteristics of individual equity markets can transform a stock market from a primarily equity raising mechanism to a casino for gamblers to satisfy their speculative urges. We also determine the sensitivity of gambling activities to the overall wealth of potential stock market gamblers.

It has long been assumed that in times of market bubbles, rational investors, which are able to on average, properly discount future cash flows of corporations or other financial assets are consumed by "Animal Spirits" or "Irrational Exuberance" and through all prior knowledge and experience of asset pricing out the window in favor of "This time it's different" valuation models. This paper advances an alternative hypothesis in that rational investors remain rational, but when market conditions warrant their attention, risk-takers are attracted to markets, thereby causing extreme valuations or bubble to be created. This paper will argue that an individual does not change his market approach, despite the market conditions appearing to be greatly altered. The market conditions are simple attracting a new clientele to the market which also do not change but are simple responding to a new market condition.

The results of this paper have important implications for regulations across all markets for individual countries but also the global financial market place, which is designed to mitigate the negative impacts of financial contagions may not have intended consequence if risk seeking activities are a function of much more than just volatility. Mitigating characteristics which are more likely to result in gambling activities as opposed to one-size-fits-all global regulations may prove to be a more useful pursuit if reducing stock market volatility is the goal. Several country

level characteristics will be investigated to determine what kind of individual are most likely to substitute gaming for equity speculation and how wealth impacts these decisions.

II. Hypothesis and Related Literature

Stock markets and gambling have long been linked in a theoretical and behavioral perspectives, but this study will be the first to link these ideas in a macro and international environment. A common hypothesis to explain equity price dislocations has been along the lines of "Animal Spirits" or similar individual-based observations where an individual change their behavior when certain stimuli are applied. Behavioral research in Finance rests on this assumption that external stimuli will cause individuals, which are otherwise semi-rational, to behave in an irrational manner, driving equity prices far from standard valuation methods.

Since the stock market is just one of many alternatives for investors to utilize their capital, market conditions are not a closed system and testing how individuals react to stimuli is an incomplete hypothesis as any individual can enter or leave the equity markets at any time. We hypothesize that equity market investors are largely rational and employ standard valuation methods over realistic time periods during normal and abnormal market conditions. What causes markets to temporarily dislocate from standard models is a change in the population of investors due to changes in market conditions, rendering individual level analysis incomplete.

Lottery

Barber and Odean (2006) explored what investors choose to "gamble" on when purchasing stocks and find attention grabbing characteristics attracted buyers to a stock, Gao and Lin(2014) found that in Taiwan, investors substituted lottery tickets for stock trading when jackpots reached a certain threshold. Gao et al will serve as the main motivation for taking the study on a broader scale to discover if and where the effect more (less) powerful based on

country level characteristics. Han and Kumar (2011) found certain characteristics of stocks attracted gamblers and Staman (2002) linked stock trading and lotteries. All of the above studies have investigated only one country at a time, which limits the scope conclusions to a few countries and specific time periods.

Individual behavior and investing

Forces outside of the stock market itself have been found to impact trading behavior, political power was found to influence trading in Bonaparte and Kumar (2012) and New Year effect was found to explain behavior in Doran, Jiang, and Peterson (2011). We hope to find that volatility of stock exchanges draw in a gambling type investor and low volatility forces these same gamblers back into casinos. Barber and Odean (2000) found overconfidence among investors to cause excessive trading and Kyle and Wang (1997) show why this overconfidence may persist over long periods of time. Linking these two ideas could also explain why so many studies have found trading causes negative returns, yet investors continue to enter these bets. Excess trading is not the result of the same investors placing more trades, but new traders entering markets and conditions become more attractive to these gamblers, similar to Linnainmaa (2011) who models investors may trade to learn, we propose when gamblers are successful, confident and markets are signaling lottery features, gamblers will turn to markets for larger potential jackpots. If the gambling investors' is primarily responsible for these losing or learning trades, then some trading underperformance could be explained by these temporary traders.

Security characteristics

These studies also routinely identify individual securities and investigate the change in performance relative to change in lottery features, but index level analysis has not been investigated. In Kumar, Page and Splat (2014) the authors identify the challenges to finding a

"direct measure of stock-level gambling activities" and we address this by isolating how gambling indexes perform in relation to changes in country and investors level characteristics. If indexes are attracting gamblers from tables to the equity markets, a reduction in performance of gambling indexes will be detected when markets are most attractive to gamblers. Barber and Odean (2006) find attention grabbing stocks experience abnormal trading volume, we extend this to attention grabbing equity markets. General news media is often guilty of selecting extreme positive and negative equity market reactions. Our hypothesis is that attention grabbing markets will also result in abnormal trading volume and exhibit more lottery features.

Volatility and Skewness

The relationship between asset prices and volatility measures has been explored and reported using several different proxies and approaches. Most recently this topic has been investigated by Foucault, Sraer and Thesmar (2013) who find retail investor positively impact volatility of returns and Conrad, Dittmar and Ghysels (2013) find skewness is strongly related to future returns and Dreshler and Yaron (2011) find volatility can help predict excess market returns. Does this skewness and variance also carry-over to market indexes as well and can a specific individual investor be identified as the main contributor to this excess volatility?

Hypotheses

We characterize two investors as rational (R) and gambling rational (GR). In normal market times, market activities are dominated by R investors who make decisions based on rational expectations, using a variety of techniques of valuing stocks that are too numerous to define in this paper but are based in theory and models and result in a "normal" market valuation. Models of investors behavior and rational expectation hold during these normal market times, but at times, the markets experience trading behavior that cannot be describe as rational.

During normal market activity gambling rational (GR) investors do not participate in stock market activities as the rational models are accurate in estimating future trading profits. However, during times of high market volatility, numerous GR investors become attracted to the higher probability of higher skewed payouts and substitute their gambling activities for stock market activities which will result in a loss of gambling performance during periods of volatile equity market performance. GR investors by their nature place higher valuations on higher skewed returns and are attracted to markets that begin to offer these properties while R investors are not transformed when similar excess volatility occurs. If true, this result has significant implications for market regulators as changing rules and increasing regulations will not have desired result of lower volatility if GR participation is not accurately measured and underlying preferences by GR investors are not accounted for.

Our model for stock market behavior is based on a continuum where markets are either perfectly attractive for R investors designated by +1 and perfectly attracted to GR investors designated by -1. We define two market participants, one being a perfectly rational investor (R) who generally represent much of the market and (GR) who are only present in markets which they are attractive due to increased volatility, higher skewed payouts or some other factors.

MR = $R^{\rho} + GR^{\rho-1}$

Where

MR= Market Rationality (+1 perfectly rational to -1 perfectly irrational)

R = Proportion of Rational investors

GR = Proportion of Gambling Rational investors

This model allows rational investors to remain rational during all market conditions and explain apparent valuation dislocations with an increase or decrease in GR investors. The

market never reaches a perfectly rational or irrational point but sways between these two extremes as market and economic conditions change over time.

We assume that R investors are always rational, do not change and if $R^{\rho} = +1$, a market would be perfectly rational, very low or absent volatility, minimal skewed payouts, or any other factor associated with the stock market being a casino. Alternatively, when markets reach MR = -1, R investors no longer able to make rational investing choices, would abandon the markets leaving only GR investors in the population resulting in extreme and random volatility.

GR investors seek risky activities in all aspects of gambling in addition to equity markets when conditions are favorable for them to participate. GR investors will be able to substitute their gambling activities between several options and only participate in equity market conditions when market exhibit favorable characteristics or GR heuristics (which are assumed to be unique and diverse among each GR investor). Some GR investors with a low propensity for substitution may be attracted to equity markets when the MR score is less than +1 while others will only substitute other gambling activities when the MR score is very close to -1.

We assume GR investors as a hole, seek risky propositions in all activities and only join equity markets as they see fit. We assume that the greatest beneficiaries of GR individuals are the gambling industry, where skewed payouts, volatile returns and short-term thrills are associated with every spin of the wheel, roll of the dice and turn of a card. In most times, activities offered by the gambling industries satisfies GR individuals preferences and why these industries persist despite almost all wagers being completely irrational offering expected values less than $1 for ever $1 "invested". These GR individuals are receiving some benefit from these activities, but clearly current economic models do not capture why one would risk $1 when the best outcome is less than $1 in all cases over long time periods.

A MR declines from being closer to +1 to closer to -1, GR investors begin to participate in the equity markets allocating more of their time, energy, wagers from gambling activities to equity market activities and we hypothesize that as MR falls closer to -1, more GR investors will participate in equity markets and reduce their participation in gambling activities.

We test this hypothesis by exploring the gambling index returns relative to stock market volatility. We hypothesize that volatile markets offering higher skewed returns will attract GR investors who migrate from gambling outlets to equity markets, negatively affecting gambling indexes within each country.

Hypothesis #1

H_0 = There is no relationship between volatility and gambling index performance

H_a = There is a significant and negative relationship between gambling index performance and stock market volatility

Gao and Lin (2014) find that high lottery jackpots will induce speculators to ditch their trading activities and satisfy their gambling cravings by purchasing lottery tickets, with extremely skewed payoffs instead of speculating in the stock markets. Anderson (2008) find strong links between the characteristics between frequent traders and problem gamblers in Sweden. It is unclear if this effect is only present in Taiwan and Sweden or is detectable in several market indices.

Country Characteristics

Determining which characteristics among individuals or within securities has been explored by several authors. Barberis, Huang and Thaler (2006) provide a framework to measure individual decision process when faced with gambling, we extend this to determine if different kind of gambles, stock vs. gambling, also have different decision motivations. Kumar, Page,

Spalt (2011) find religion impacts appetite for gambling in stock markets, Kumar and Lee (2006) find sentiment is strong factor in trading and Korniotis and Kumar (2011) find some individual characteristics can impact the local economy.

Barber, Lee, Liu, and Odean (2007) among Taiwan investors and Barber and Odean (200) among US investors that aggressive trading was a cause of negative performance among individuals. Trust will also negatively impact all stock participation as fond in Guiso, Sapienza, and Zingales (2007) and by extension, make it less likely for investors to substitute gaming for equity market speculation. Kaizler and Faustino find socio-economic factors impact appetite to gamble and Statman (2002) provides some justification why gambling persists despite being a negative sum game. Even weather in Bassi, Colacito and Fulghieri (2013) is found to influence risk taking. If the global warming hypothesis turns out to be true, we are all in for a wild market ride in the future...

Time is also a factor as with Doran, Jiang, and Peterson (2011) who find small investors prefer stocks with lottery features and options in the month of January and Eraker and Ready (2011) find investor will prefer OTC stocks with skewed payoffs even when doing so is a losing strategy.

Additional investigation will be made to determine what causes some countries gambling index performance to be more sensitive levels of stock market volatility within each country. If all countries exhibit the same sensitivity to macro and financial factors, then worldwide regulations proposed by Basel III and other world agencies would be a welcome innovation. However, if citizens in certain countries are more sensitive to changes in market return characteristics, then any attempt to create a one-size fits all regulations, will fail.

The link between gambling features of stocks and investors has long been investigated, but jointly investigating the relationship between the wealth effect in Kumar, Page and

Splat(2014) volatility effect on gambling has not been tackled. Interpreting these two factors separately and their effects have important implication for regulations aimed at reducing volatility in the hopes of reducing incentives of risk seeking activities. If they are linked and magnify the total impact, all regulations should consider these two factors jointly. Failure to do so creates the potential for more catastrophic financial events.

Gamblers expect and incur negative returns in casino activities and may just transfer this mentality to the stock market when gambling features of stock markets are highest, where skewed payoffs are preferred to educated gambles.

III. Data and Methodology

Datastream country gambling indexes in local currency will be used to measure the return experienced by the gaming industry in each country and Datastream country market index in local currency will be used to measure return volatility within each country index. Gaming returns are used as a proxy for gamblers activity and we hypothesize that as market volatility increases within each country, gambling index performance will decrease.

During the study period, we first compute the logarithmic daily returns of market index. Then market volatility is the standard deviation of daily return by quarter and year. Quarterly and yearly gambling index returns are sum of logarithmic daily returns computed from daily gaming index closing prices. We match the quarterly and yearly returns from gambling index with the corresponding quarterly and yearly of market volatility. Specifically, daily market return and gaming index returns are computed as follows.

$$R^i_{d,M} = \ln(P^i_{d,M}/P^i_{d-1,M})$$

$$R^i_{d,G} = \ln(P^i_{d,G}/P^i_{d-1,G})$$

Where $R^i_{d,M}$ and $R^i_{d,G}$ are daily returns on day *d* and country *i*. P^i_d denotes the price index obtain from Datastream. M and G denote market and gaming indexes, respectively.

$$R^i_{t,G} = \sum_{d=1}^{D} R^i_{d,G} \qquad \text{and} \qquad R^i_{t,M} = \sum_{d=1}^{D} R^i_{d,M}$$

$$\tilde{R}^i_{t,G} = R^i_{t,G} - R^i_{t,M}$$

$$\left|R^i_{t,G}\right| = R^i_{t,G} - R^i_{t,M}$$

Quarterly and yearly returns are the sum of daily returns in the corresponding month (quarter), where d is the number of days in a month (quarter) of sample data. $\tilde{R}^i_{d,G}$ and $\left|R^i_{d,G}\right|$ is the abnormal and absolute gaming return, respectively. Note that the sum of approximately 20 (60) logarithmic daily returns is equivalent to the logarithmic monthly (quarterly) return.

Finding a significant relationship between market volatility, market index returns and gambling index performance, will show that a unique kind of investor is drawn to the stock market during periods of high market index volatility, which will in turn result in correspondingly low gambling index returns. Lagged periods will also be tested to investigate if a change in market volatility impacts gaming index performance for 1 quarter and one year. It is expected that the impact of high volatility will not instantly draw GR individuals to the market and the impact may take several months to occur.

We also use the Sharpe and Sortino ratios and a modified Sortino ratio called the Korn-Johnson ration (KJ) to test the impact of the gambling market performance.

Sharpe Ratio - The Sharpe Ratio [1966] evaluates how well a portfolio compensates investors for each unit of risk the portfolio experiences over an evaluation period. The higher the Sharpe ratio, the better is the performance of the portfolio.

$$Sharpe\ Ratio = \frac{(R_p - R_f)}{\sigma^p}$$

Where R_p = the portfolio return

R_f = the risk-free rate

σ^p = standard deviation of the portfolio

Sortino Ratio - The Sortino ratio [1991] differentiates between good and bad volatility, which is not the case with the Sharpe ratio, the first few weeks of January 2016 reveals the importance in distinguishing between positive and negative volatility. Similar to the Sharpe ratio, the higher the Sortino ratio, the better is the performance of a portfolio. The Sortino Ratio is shown as follows:

$$Sortino\ Ratio = \frac{(R_p - R_f)}{\sigma^p}$$

Where R_P and R_f are described as above and σ^p is the standard deviation of portfolio's negative returns.

We also introduce (as far as we can determine) a measure to capture the positive volatility in the market called the Korn-Johnson (KJ) ratio which captures the volatility of a market's positive returns. Of all the previous measures, this is the most important to capture significance as this is the kind of market that would attract GR individuals. Positive and volatile market returns are just the markets that would attract GR individuals.

$$KJ = \frac{(R_p - R_f)}{\sigma^p}$$

Where R_P and R_f are described as above and σ^p is the standard deviation of portfolio's positive returns.

Regression

We run fixed effects panel regressions where data is available for the 20 countries with a gambling index in Datastream and market index in Datastream. We eliminate Spain as the Gambling market index experienced a nearly 90% drop during the period and unclear if this was due to a change in regulation or other country specific idiosyncrasies. The first set of tests is a univariate test of all variables included in study to isolate exact relationship of each variable in isolation. In addition, we include performance variables of the Sharpe ratio, Sortino ratio and KJ ratio to determine if market conditions are driving the changes in gambling market performance. We also include yearly regulatory variables to determine if changes in regulatory regimes has any impact on the propensity for market volatility to attract GR investors. Performance variables are calculated for both the quietly and yearly regressions while yearly regulatory variables are only available on a yearly frequency.

Quarterly

Gambling returns = $\alpha + \beta_1 Vol_i + \beta_2 Vol_{i-1} + \beta_3 Performance_i + \varepsilon_i$

Yearly

Gambling returns = $\alpha + \beta_1 Vol_i + \beta_2 Vol_{i-1} + \beta_3 Performance_i + \beta_4 Heritage_i + \varepsilon_i$

Where

Gambling Returns =Datastream gambling index returns

Vol = Standard deviation of daily Datastream market index returns

Performance = Performance measures of Sharpe, Sortino and KJ ratio

Heritage = Yearly freedom scored calculated by The Heritage Foundation

IV. Results

The first set of results reflect the relationship on a quarterly basis. Table I reports the descriptive statistics for the sample of 20 countries daily return, standard deviation for the Data stream country market index and the Datastream gambling index for each country for a quarterly and yearly basis.

(Table I about here)

One noticeable result from the descriptive statistics table is that the Gambling index is much more volatile than the overall market, signifying that this sector is either more volatile than average compared to the market or experiences large swings from time to time. We hypothesize the latter and explain this happens when GR investors leave the tables to engage in the stock market.

(Table II about here)

Table II reports the results for a fixed effects panel regression for the quarterly data frequency. We find the variable of stock market volatility to be negative and significant in all 8 regressions and significant at the 1% level where 11 of 12 adjusted r^2 fall between .45 and .75. There is a significant relationship between stock market volatility and gambling index performance, we reject the null and accept the alternative of Hypothesis #1. The data reveals that when the stock market experience high levels of volatility, gamblers vacate the tables and we hypothesize they substitute their gambling activities for stock market activities as the payoffs are adjusted during large market swings.

A very interesting finding is in the regressions including the lagged one quarter standard deviation, we find that when both current quarterly volatility and lagged volatility are

included in a regression the lagged volatility is positive and significant. We explain this result since, volatility spikes are just that spikes and once the increased volatility subsides, GR investors return to the tables. In all four regressions containing both Vol and Vol -1, the coefficient is positive and significant at the 1% level. This was an unsuspected result and will play an important role in the selection of control variables for the yearly regressions.

The short time frame of a quarter on almost all cases, will eliminate the potential for any regulatory changes. GR investors show up when markets are attractive for themselves and then leave when markets are not as attractive as gambling. The results reveal that regulation will unlikely be significant in determining GR investors to participate in the markets once the markets are attractive. This does not eliminate the possibility that normally rational investors don't magically change their behavior, consumed by "animal spirits" but leads one to the conclusions that new GR investors are entering these volatile markets for the sort term, only to leave once the volatility party is over.

When market performance measures of Sharpe, Sortino and KJ ratios are included, the control variables are positive and significant in all 9 regressions, although economic impact is minimal. Their inclusion does dispute one counter argument that the poor gambling index performance is only capturing a down market. In this case we would expect negative performance measures to be associated with poor market conditions. The minimal economic significance of these variables shows that market performance is not a significant factor in explaining the gambling market index returns in the quarterly regressions.

The results in the quarterly regressions adjusted the selection of yearly independent variables. The quarterly results suggest regulation is not responsible for mitigating any market volatility, it's simply the migration of GR investors from gaming activities to equity markets then back to gaming activities.

Yearly regressions paint a similar picture.

(Table IV about here)

(Table V about here)

(Table VI about here)

We find volatility to be negative and significant in six of ten regression, four times significant at the 1% level and twice at the 10% level. Stock market volatility is negative for gambling market indexes across 20 countries over 17 years. Lagged volatility was also consistent with the quarterly results in that the coefficient was positive and significant in three of 10 regressions once at the 1% level and twice at the 10% level. The results are expected as we identify each year by calendar year and not indicate exactly when the volatility spikes occur in each country in each year. A detailed analysis of each country and each instance of increased volatility would result in a much more specific result. Also consistent with the quarterly results are the performance measures were all were positive but only marginally significant. Which brings us to the regulation results.

Heritage freedom scores are just that, they measure freedom in a variety of categories. A common response to spikes in volatility is for lawmakers and regulators to come to the rescue as they who have no skin in the game are clearly more invested in maintaining a "fair" market. If regulation were truly saving investors from themselves, we would find that high regulations (low scores) would result in a mitigated migration from gaming to markets. But we find the opposite, although not significantly. All Heritage Freedom scores resulted in a negative sign where although only two regressions resulted in significance at the 5% level for the overall freedom score.

Based on the results above, there are some investors who are replacing their gaming activities for stock market activities when stock markets are most volatile, then returning to the gaming tables once the volatility normalizes, which is independent of regulations.

The results of the paper have many important contributions. First, GR investors are leaving gaming activities and entering markets during times of increased volatility. This

shows that it is not rational investors are not temporarily changing their behavior and may in fact remain completely rational during all market times. Gaming rational investors are entering already volatile markets creating ever more volatility until there are no more entrants and rational investors reduce their holdings, ending any temporary bubble or volatile trading periods.

The second important finding is this is all accomplished without the intervention of additional regulations. Markets will adjust over time and once settled any additional regulation will not have any impact as the GR investors will return to gaming activities. Additional regulations will punish rational investors are the cost to invest will increase.

From a policy standpoint, there are some general suggestions. The best way to reduce periods of high volatility is to reduce the participation rates and impact of new entrants to a market. Something as simple as restricting the number of trades for accounts open less than 90 days could be enough to reduce the influx of GR investors when natural waves of volatility occur in rational markets. Onerous regulations places on all market participants will not result in a lowering of volatility or even a reduction in future volatility as GR investors are comfortable making irrational decisions.

V. Conclusion

Using a large panel data set containing 20 countries over 17 years we find stock market volatility significantly reduces gambling market index returns. This result is robust to several performance and regulatory control variables. We also find that gambling returns increase after periods of stock market volatility revealing investors who were temporarily attracted to markets during times of high volatility return to the gambling activities independent of regulations.

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Table I

Descriptive Statistics for the Yearly and Quarterly daily return data for Datastream gambling index, Datastream market index and standard deviation of Datastream daily market index returns from 1/1/2000 to 12/31/2017 for the 20 countries included in the study.

	Yearly			Quarterly		
	Gambling	Market	Std. Dev.	Gambling	Market	Std. Dev.
Mean	0.203817	0.051968	0.011691	0.013879	0.011677	0.008805
Median	0.07651	0.079194	0.010644	0.024392	0.019723	0.007926
Maximum	8.139695	0.629965	0.031389	0.105562	0.073151	0.020099
Minimum	-0.81582	-0.66208	0.003472	-0.16462	-0.12255	0.004219
Std. Dev.	0.788441	0.216481	0.005127	0.05812	0.042291	0.003482
Skewness	5.087818	-0.50628	1.035309	-1.4351	-1.62896	1.779922
Kurtosis	40.97913	3.446635	3.930663	5.593498	6.17716	6.592886
Observations	338	338	338	5856	5856	5856

Table II

Fixed Effects panel regressions where the dependent variable is the quarterly Datastream gambling index return by country and independent variables are the standard deviation of the Datastream country index return by quarter (Vol) and lagged one quarter (-1) and Datastream quarterly Sharpe ratio for each country from 1/1/2000 to 12/31/2017. The first item is the coefficient, then t-stat the p-value for each regression. Significance is denoted at the 10%, 5% and 1% by *,** and ***.

	Intercept	Vol	Vol(-1)	Sharpe	adj r^2
1	0.131319	-13.3372			0.617044
	25.44248	-24.4631			
	0	***0			
2	0.039531		-2.89184		-0.03234
	4.341184		-3.06293		
	0		***0.0024		
3	0.108081	-15.5465	4.737131		0.677352
	18.9284	-26.5078	7.879592		
	0	***0	***0		
4	0.106502	-10.9372		0.004265	0.705012
	20.66803	-20.4733		10.10406	
	0	***0		***0	
5	0.038924		-4.39053	0.010615	0.517194
	6.250257		-6.75018	19.08105	
	0		***0	***0	
6	0.089953	-11.4987	2.061885	0.004879	0.745016
	16.52959	-16.8857	3.392236	9.240461	
	0	***0	***0.0008	***0	

Table III

Fixed effects panel regressions where the dependent variable is the quarterly Datastream gambling index return by country and independent variables are the standard deviation of the Datastream country index return by quarter Vol and lagged one quarter Vol (-1) and Datastream quarterly Sortino and Korn ratio for each country from 1/1/2000 to 12/31/2017. The first item is the coefficient, then t-stat the p-value for each regression.

Significance is denoted at the 10%, 5% and 1% by *,** and ***.

	Intercept	Vol	Vol(-1)	Sortino	Korn	adj r^2
1	0.107681	-11.1506		0.002357		0.685293
	19.86257	-20.0778		8.632331		
	0	***0		***0		
2	0.038066		-4.50991	0.006253		0.470813
	5.838083		-6.60976	17.44429		
	0		***0	***0		
3	0.092849	-12.22	2.481726	0.002408		0.718905
	16.10501	-16.7829	3.825558	6.928769		
	0	***0	***0.0002	***0		
4	0.10852	-10.9861			0.002582	0.703976
	21.38072	-20.5882			10.02759	
	0	***0			***0	
5	0.040971		-4.15659		0.006356	0.499844
	6.463488		-6.29084		18.45061	
	0		***0		***0	
6	0.09175	-11.6935	2.267405		0.00291	0.744959
	17.0675	-17.5107	3.793757		9.235592	
	0	***0	***0.0002		***0	

Table IV

Fixed Effects panel regressions where the dependent variable is the yearly Datastream gambling index return by country and independent variables are the standard deviation of the Datastream country index return by year (Vol) and lagged one-year Vol (-1) and Datastream yearly Sortino and Korn ratio for each country from 1/1/2000 to 12/31/2017. The first item is the coefficient, then t-stat the p-value for each regression. Significance is denoted at the 10%, 5% and 1% by *,** and ***.

	Intercept	Vol	Vol(-1)	Sortino	Korn	adj r^2	Prob (F-stat)
1	0.638262	-37.1619				0.05386	0.008911
	5.490909	-4.00422					
	0	***0.0001					
2	0.023766		15.97395			0.018314	0.176589
	0.184762		1.595066				
	0.8535		0.1117				
3	0.352059	-52.0206	38.55439			0.089918	0.000346
	2.508815	-4.97605	3.6178				
	0.0126	***0	***0.0003				
4	0.359666	-18.7944		0.00598		0.081017	0.000603
	2.505295	-1.74352		3.219889			
	0.0127	*0.0822		***0.0014			
5	-0.07946		17.01223	0.007657		0.081377	0.000864
	-0.6287		1.755621	4.661798			
	0.53		*0.0802	***0			
6	0.395532	-21.2889			0.005037	0.073208	0.001415
	2.7314	-1.96444			2.760022		
	0.0067	*0.0504			***0.0061		
7	-0.08705		17.95618		0.006922	0.071694	0.002327
	-0.68149		1.841756		4.285565		
	0.4961		*0.0665		***0		

Table V

Fixed Effects panel regressions where the dependent variable is the yearly Datastream gambling index return by country and independent variables are the standard deviation of the Datastream country index return by year (Vol) and lagged one-year Vol (-1) and yearly Heritage Freedom scores for Finance Financial Freedom, Business Freedom and Investment Freedom for each country from 2000 to 2017 where available. The first item is the coefficient, then t-stat the p-value for each regression

Significance is denoted at the 10%, 5% and 1% by *,** and ***.

	Intercept	Vol	Vol(-1)	Finance	Business	Investment	adj r^2	Prob (F-stat)
1	1.103692	-37.4431		-0.00683			0.055079	0.008874
	2.698932	-4.03581		-1.18705				
	0.0073	***0.0001		0.2361				
2	0.575609		15.69483	-0.00809			0.020375	0.160476
	1.2785		1.568471	-1.27891				
	0.2021		0.1178	0.2019				
3	0.529819	15.72018			-0.00616		0.017426	0.192026
	0.872579	1.568326			-0.85281			
	0.3836	0.1179			0.3944			
4	0.529819		15.72018		-0.00616		0.017426	0.192026
	0.872579		1.568326		-0.85281			
	0.3836		0.1179		0.3944			
5	1.144963	-38.323				-0.00713	0.055686	0.008374
	2.755636	-4.11337				-1.27012		
	0.0062	***0				0.205		
6	0.588272		15.3273			-0.00803	0.020737	0.156893
	1.319136		1.530559			-1.32189		
	0.1881		0.1269			0.1872		

Table VI

Fixed Effects panel regressions where the dependent variable is the yearly Datastream gambling index return by country and independent variables are the standard deviation of the Datastream country index return by year (Vol) and lagged one-year Vol (-1) and yearly Heritage Freedom scores for Trade Freedom, Overall Score and Property Rights for each country from 2000 to 2017 where available. The first item is the coefficient, then t-stat the p-value for each regression.

Significance is denoted at the 10%, 5% and 1% by *,** and ***.

	Intercept	Vol	Vol(-1)	Trade	Overall	Property	adj r^2	Prob (F-stat)
1	1.220739	-37.5192		-0.00707			0.05203	0.011828
	1.295473	-4.03114		-0.6229				
	0.1961	***0.0001		0.5338				
2	0.688157		16.0629	-0.00811			0.016366	0.204407
	0.651884		1.602203	-0.63411				
	0.515		0.1102	0.5265				
3	3.484645	-38.3388			-0.03997		0.064516	0.003503
	2.618909	-4.14718			-2.14734			
	0.0092	***0			**0.0325			
4	3.224468		13.57528		-0.04472		0.030547	0.081303
	2.201232		1.355913		-2.19338			
	0.0285		0.1761		**0.029			
5	1.299741	-38.2122				-0.00884	0.05441	0.009457
	2.100387	-4.09649				-1.08832		
	0.0365	***0.0001				0.2773		
6	0.478273		15.9074			-0.00619	0.016561	0.202088
	0.702239		1.58693			-0.6796		
	0.4831		0.1136			0.4973		