To the Money Tree: An Introduction to Trading the Coin-Flip Environment
Jeremy Gwiazda

Abstract: The purpose of this paper is to point the way to the money tree. Currently, almost all investment professionals think that outperformance requires an "edge," that is, the ability to predict the future to some degree. In this paper, I suggest that money can be made in a 0, or even slightly negative, expected value environment by carefully choosing investment/bet sizes. Philosophical considerations are found mainly in Section 4.[1]

1: The Coin Flip Environment and Silos

Let's say that you want to make a bunch of money. So you go to the capital markets, because that's where the money is. One thing you can do: try to predict the future. Perhaps you've just made a lot of money in Fed Funds futures, having seen the trouble coming and seen that the Fed was going to have to cut rates to 0 in a hurry. Now you're going to ride the strengthening of the U.S. dollar versus other currencies. At some point you'll get long silver futures. You'll get long before they rocket to the moon on central banks and governments carpet bombing the world with liquidity and cash. You pat yourself on the back and marvel at how rich you are soon to be.[2] But here's the issue: predicting the future is hard. Many people make a lot of money, and then lose it all.[3] In this paper, I discuss a different approach to making money. This approach does not rely on prediction. Instead, you use the capital markets[4] to slosh money around in a path dependent manner to make money. Let's turn to the *pure coin flip environment*.

      Imagine that the government makes an offer. Anyone can take fair coin flips (50/50) for even money. (Perhaps they set limits, e.g., you can only run $1 trillion through coin flips in a year, and each flip has a maximum of $1 billion.) What are we to make of this? I've talked to people in the investment world, and anecdotally about 8 out of 10 say "It's 0 expected value, so it's pointless." They generally have a bit of a moralizing tone, a bit of a finger-waving, don't gamble sort of mentality. Then there are the 2 out of 10 who say this is bad. Their reasoning? They assume a starting value, say $100, and run coin flips for, e.g., 50% of the current value. They see that the value is pulled to $0. And so, they figure, it must be bad. 10 out of 10 investment professionals see no value in the government's coin flip offer.[5]

      But here is the amazing thing—the investment professional is the client. The people who see that they are losing money are not making the additional leap, are not thinking-- where is the money going? It isn't magically being transported to Pluto. It is going to the government. There

---

[1] I was going to write this up in July 2020 and then decide what to do with the paper. But seems like this is a good time to post a shorter version. People may have some time on their hands to run simulations. The main shift is that this version will quickly pass over mathematical considerations and simulated examples. I'll try to include enough detail for everyone to follow the main idea.

[2] If the financial system survives.

[3] Jesse Livermore comes to mind as someone who made and lost fortunes. A common response is: just focus on risk control. The challenge there is: you don't know the exact nature of the risks or the severity. Again, predicting the future is hard. Risk control is *a lot* easier looking backwards.

[4] Or anything, e.g., betting markets. Anything that sloshes money around. Anything that can show profit or loss.

[5] Though, there are people who see value in the offer. It's just that all the people I talked to didn't see value. But I don't mean to imply that 100% of people see no value, which, surveying the investment landscape, strikes me as obviously false. Rather, close to 100% of people see no value.

are infinitely many strategies you can try in the coin-flip environment.[6] To try one strategy, and then decide that the whole set-up is no good strikes me as lacking in imagination. To try one strategy, see that it loses you money, and reject the whole set-up is to fail to see an avenue of opportunity: figure out what the government is doing[7], and do that.

And here the psychology becomes important. The best thing to do, dear reader,[8] is to go a bit Karate Kid. Sit down at a kitchen table with all sorts of bills and coins. And a coin to flip. Start with whatever amount, perhaps $100. Flip a coin for 50%, that is, $50. Win and you have $150. Lose and you have $50. Keep betting 50% of the money that you presently have. Continue. Repeat. When your money gets below, say, $10, reset (noting that you just lost over $90), that is, start again at $100. Do this for at least an hour. (Excel, R, Python, etc. don't give quite the same impression; they should come after.) *You will realize that you are pulled to $0, with occasional spikes of money along the way.* You are going to lose all your money, though things may look good for a spell.

The government is getting all the money. Well, what are they doing? There are a number of answers to this question. In this *introduction to trading the coin flip environment*, note that you are betting more when you win and betting less when you lose. The government is betting more when they lose and betting less when they win. That's one major factor, that will be discussed in the next section. But the key: you are going to lose all your money, though you may have large spikes of money along the way.

Losing money isn't much fun. So let's do some winning.[9] Let's actively adopt the strategy that we forced the government to adopt, passively, when we were losing. We'll *get on the other side*. So now write down -$100. Bet 50% of the absolute value, so $50. If you lose, you go to -$150. If you win you go to -$50. Then bet 50% of the absolute value. Repeat.[10] Take your hour. Leave the computer aside—remember Daniel in The Karate Kid. The slow, boring, seemingly-pointless training can be key. *Now you will see that you are making all the money, with occasional spikes of loss* (that is, the dreaded drawdown). You are making money hand over fist *in a 0 expected value environment*.[11] It is bizarro world. Investment professionals always yammer about "Lose 50% and you have to make 100% to get back to even." (100 to 50 to 100.) But now, adopting the government's strategy, when you lose 50% you only have to make 33% to get back to even (-100 to -150 to -100). Up is down. Left is right. East is west…

---

[6] In mid-January 2020, after a number of months of all-consuming days on this stuff, this fact started to drive me a little crazy. Forget mathematical/physical infinity, where you can get cute and say things like "Well, there are infinitely many places you can set your thermostat." This is pragmatic infinity, where, in the coin-flip environment, the possible strategies explode in a bewildering and somewhat overwhelming manner. Once you've jotted down your 300th question in a notebook (a question that isn't necessarily that hard to answer, but that will take at least a week of work) it's tempting to throw up the hands and say, enough. (Bit of Tristram Shandy here.) Which is exactly what I did. Got to know when to fold'm. Or at least take a break.

[7] Is doing passively—you, the client, are choosing your strategy, which then defines a passive strategy for the government.

[8] And as ever, I expect 17 over the next decade, give or take.

[9] "I love winning, you hear what I'm saying, it's like, better than losing."

[10] Note that now you should track your profit/loss on paper. For example, starting at -$100 and losing takes you to -$150, where are down $50 and your next bet is $75. The physical money and accounting for money have decoupled.

[11] Go ahead and change it up. Have coin flips where you win 50% or lose 51%. You still make all the money, in a negative EV environment.

Let us introduce some terminology. A *silo* is the (accounting of) money through time. So starting with $100 and compounding 50% with coin flips may produce a silo:

$100
$150
$75
$37.50
…

Another silo, *the other side* of the above, looks as follows:

-$100
-$150
-$75
-$37.50
…

The first silo lost $62.50 and the second gained that amount.

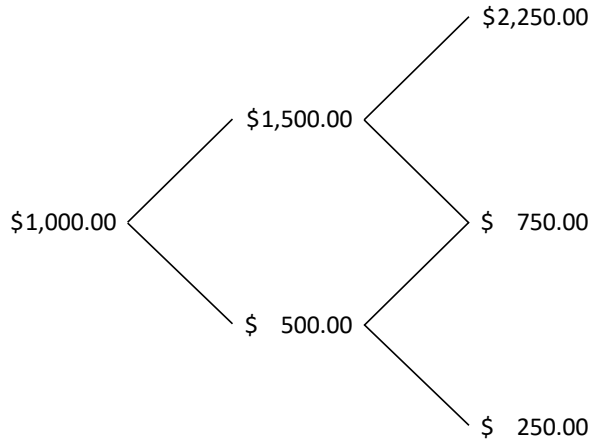2.1: The Expected Value Monster (EVM) and the Expected Value Fairy (EVF)

Why does it work to bet more into loss and bet less into gain (with *independent* bets)? In this section I'm going to start being a bit breezy.

The person who begins at $100 and compounds 50% into coin flips finds that one win and one loss leads to $100*1.5*0.5 = $75.[12] The product of one win and one loss is less than 1. This is one key. Compounding positive numbers into coin flips for 50% almost certainly pulls to 0, as you are almost always, over a number of flips, multiplying by a number less than 1. Similarly, compounding beginning at a negative number into coin flips for 50% almost certainly pulls to 0. But now this pull to 0, beginning at negative numbers, *is making money, not losing it.*

Let's consider another aspect. Flipping coins for even money has an expected value of 0 at every step/column of the tree. (Or, the expected gain/loss is 0 and the expected final value is the starting value.) So starting at $1,000 and multiplying the probability of the outcomes times the payouts sums to $1,000 through every column, e.g., 1/2*(1500) + 1/2*(500) = 1000.

---

[12] So you study tables of products. 1.8*0.2, 1.3*0.7, 2*0, 2.3*-0.3, etc. And those are just the EV = 0 cases. And just the fair coin cases. And you're only thinking of single silos (width = 1).

```
                                              $2,250.00

                        $1,500.00

$1,000.00                               $   750.00

                        $  500.00

                                          $  250.00
```

But, when starting with a positive amount, and increasing bets after a win, a huge amount of this expected value is going to a very unlikely tail—lots of wins. Lots of losses does not have much negative expected value (EV). All of the outcomes together have 0 EV, by assumption, and the two tails have positive EV. Which means that the bulk of the outcomes, the belly of the curve, has negative EV. I call this positive tail that will almost certainly never happen the Expected Value Monster (EVM). An example may help. The following table assumes that you start with $1,000 and compound 50% through 10 coin flips. Note the large amount of positive EV at the tail with many wins.

TABLE 1:

WINS	Occurrences (out of 1,024)	Probability	$	EV
0	1	0.098%	-999.02	-0.976
1	10	0.977%	-997.07	-9.737
2	45	4.395%	-991.21	-43.559
3	120	11.719%	-973.63	-114.098
4	210	20.508%	-920.90	-188.856
5	252	24.609%	-762.70	-187.695
6	210	20.508%	-288.09	-59.080
7	120	11.719%	1,135.74	133.095
8	45	4.395%	5,407.23	237.622
9	10	0.977%	18,221.68	177.946
10	1	0.098%	56,665.04	55.337
Totals	1024	100.000%		0

The 10-win case is (at least part of) the EVM.[13] By contrast, letting your losses potentially compound[14] and limiting your potential win forces a large amount of negative EV to the tails, leaving the bulk of outcomes (the belly of the curve) with gains. Doing so flips everything around, and employs an Expected Value Fairy (EVF). One way to the key, then, is to have massive losses of such a small probability as to be reasonably ignorable.[15]

So we have a silo. When compounding coin flips of a fixed percent, e.g. 50%, and beginning at a negative value, the silo (almost certainly/eventually) produces gains. The drawdowns can be brutal. And so we have the thesis of the paper:

Thesis: This is a path to the money tree.

The critic steps in. The critic says, "Everyone has always known that infinite money, or at least lots of it, can be made if a person has infinite money, or at least lots of it. The Martingale, in which a person bets $100, and doubles the bet until a win, always wins, so long as the bettor does not go broke. So this is all so much silliness. There is no path to the money tree. The drawdowns will always do in the bettor."

The synthesis is, quite simply, to note that the devil is in the details. "This" is a money tree leaves open the question: exactly what is this? And so, the claim is that there is at least one path to the money tree. Let us note that the critic is making a profoundly strong claim. The critic is saying that no strategy, of the infinitely many, in the coin-flip environment, is any good. And in fact, there is no rule that either side of a strategy has to be any good – in fact most pairs are no good on both sides (the EVM and EVF sides). That is to say, I would not want to trade markets betting 50% on coin flips starting at $1,000 (long the EVM), nor would I want to trade the other side starting at -$1,000 (long the EVF). Both strategies, in the grand scheme and over the very long run, are terrible. But I am suggesting that many strategies are quite good. The rest of the paper will outline some further considerations that may help point in the direction of better strategies.

But first let us fill in a bit of terminology. A strategy that bets more after a win, into independent bets, is being long the EVM. A strategy that bets more after a loss, into independent bets, is being long the EVF, which is the Expected Value Fairy. The EVF absorbs massive, unlikely loss, leading to the belly of the curve, in a EV = 0 environment, having gain. Any strategy has *the other side*. The strategy of starting at $100 and compounding 50% (long EVM) has, as the other side, the strategy of starting at -$100 and compounding 50% (long EVF). Not all strategies are long EVM or EVF. For example, simply betting $17 every bet is neither, and has itself as the other side. This is the drunkard's walk. (There are, of course, other notations and other language that could describe the exact same thing. For example, you could think of betting $50 and moving the bet amount 50% into gain/loss instead of using the silo at +/- $100 and figuring 50%.)

---

[13] Of course, you'd have to be insane to ignore a 1/1024 probability when you take the other side and go long the EVF (expected value fairy). The key is to get these probabilities very close to 0, where "very close" has a normative component, because at size, if you fail, you may start a chain reaction that brings down the global financial system. (Though it may be that a $50 billion dollar loss, say, is not what it once was.)

[14] Through carefully thought out, independent bets – a very important point.

[15] Useful to note that the history of finance is littered with things that were thought to be "reasonably ignorable," until they weren't.

2.2 An Example

The Silo accounts for money through time, and can be thought of as specifying the strategy (how much do I bet next?). Here are the first few rows of a Silo started at -$1,000 and run through 10,000 coin flips, with the amount reset at (greater than) $-10:

$	(1,000.00)	rand()	WIN?				294	Wins
$	(500.00)	0.655709487	0		$		(623,485.64)	MAX DD
$	(750.00)	0.082945486	0		$		(450.51)	END
$	(375.00)	0.805302074	0		$		291,060.00	$
$	(562.50)	0.29141202	0					
$	(281.25)	0.605319912	0					
$	(421.88)	0.214155892	0					
$	(210.94)	0.518352749	0					
$	(316.41)	0.335742216	0			1		
$	(158.20)	0.68622146	0			1		
$	(237.30)	0.071706638	0					
$	(118.65)	0.867230142	0					
$	(177.98)	0.013758827	0					
$	(266.97)	0.1492547	0					
$	(400.45)	0.486728184	0					
$	(200.23)	0.897488538	0					
$	(300.34)	0.065016737	0					
$	(150.17)	0.910182422	0					
$	(225.25)	0.098495434	0					
$	(112.63)	0.517181708	0					
$	(56.31)	0.850520535	0					
$	(28.16)	0.961900191	0					
$	(14.08)	0.81684479	0					
$	(21.12)	0.094033255	0					
$	(31.68)	0.005154042	0					
$	(15.84)	0.676878447	0					
$	(7.92)	0.812311399	1					
$	(1,000.00)	0.24467695	0					
$	(500.00)	0.94215774	0					

The Silo is the leftmost column. The random number determines win or loss. The "Win?" column actually just states whether the silo is reset. If the Silo value is >-$10, there is a reset and $990 is booked as winnings.[16] In this run, there were 294 wins leading to profit of $291,060. The Maximum Drawdown was over $600,000. And the last value was -$450.51. You made close to

---

[16] Though the actual amount would be at least $990, that is, if the Silo is -$5, then you made $995.

$300,000 (and ended with an account that made money moving from -1,000 to -450.51), but along the way you were down big.

This sort of simple Excel sheet is a good way to start playing around with silos. You can work with 1.5/0.5 in a flat environment (EV = 0) with reset at -$10, or in a 1.505/0.5 which is a -101 environment (-101, that is, bet 101 to win 100) with reset at -$127.73, or 1.2/0.8, or 2.313/-0.3, etc… You are limited only by your imagination. In the next section, let's briefly outline some types of Silos.

3.0 We move to section 3. You're going to make all the money. But the drawdowns are brutal. How do you limit the drawdowns? This section briefly outlines some considerations that may prove helpful in attempting to limit drawdowns.

3.1 This section has been moved to the appendix as it is in very abbreviated form.

3.2: You can combine silos into the same underlying bet

To this point we've discussed single silos. But multiple silos, running in parallel, can be combined into the same underlying bet/investment. So for example, you have 10,000 Silos (width = 10,000) that are run for 5,000 coin flips (depth = 5,000), that begin at -$1 and reset at -$0.07, with a 1.404/0.6 strategy, so a -101 environment. Now, you can try all sorts of combinations. There's no reason each silo has to run the same strategy. Some could be 1.404/0.6, some could be 1.808/0.2, some could be 2.212/-0.2 etc. This assumes a -101 environment. Some could change depending on the silo value. Some could be randomly determined. Some could bet over 100%. These sorts of silos are outlined in the appendix.

The specifics: Each Silo has a coin flip to determine if it goes long or short. All silos are then combined into one bet. The bet itself comes out long or short, that is, the bet sloshes the money around. Silos are then updated. Repeat. Running silos in parallel is crucial. For example, here's a set-up I tried out somewhere early on (many actual values don't matter, rather the ratios do, as many things can scale):

Silo Start: -0.0001
Silo Reset/Take Profit: -0.000051
Width (Silo Count): 10,000
Depth (Coin Flips)[17]: 500
Environment: -101
Strategy/Bets: 2.212/-0.2 to a silo value of -$1; then 1.505/0.5 when less than -$1

3.3 Un-Siloing Silos

The whole problem is that Silos "spike out" into massive loss. It's all probabilistic, but what you want is a perpetual money machine. You want less than, say, $1/(10^{10})$ of going bankrupt in any given year. So "rare" huge drawdowns are no comfort, unless that are profoundly rare. So you study single silos in all their variety and glory. Then you study silos running in parallel. Next you figure, well, if a silo "spikes out" into a massive drawdown, then why not have the Silo share some of its loss? Or create new Silos to handle the loss. Or pause

---

[17] Of course, it's worth running these things somewhat indefinitely to get a sense of what goes on "in the long run."

other silos to deal with the issue. Or give up on coin flips to determine Long and Short positions, and rather set other positions opposite of the spiked-out silo. These sorts of strategies are *un-siloing the silos*. The silos now interact. If this research doesn't drive you insane, kudos.[18]

Our critic may get mad and say, "but the -101 environment, the environment where you lose $101 and only win $100 (or any multiples thereof), well it's impossible to make money there! And here is the proof." Then any proof generally looks something like: assume coin flips are i.i.d (independent and identically distributed) and then in the long run you lose money.

That may be true enough. But the critic misses the fact that there are ways around every one of these 3 components (independence, identically-distributed, and the long run[19]) for the coin flip environment trader. What I am suggesting in this section, is that the "independence" may be the most challenging of the 3 to employ successfully.

3.4 Section Concluded

Recall the overall setting—the government has offered coin flips for even money. Is there any value here? I've suggested that there is. One key tool is to bet more after loss, which I've called *using the Expected Value Fairy (EVF)*. Using this strategy and a single Silo, money is made, but with huge drawdowns along the way. The question then becomes: can these drawdowns be tamed? I've suggested that they can. Some tools are: understanding single silos and their properties (3.1), using parallel silos into the same bet (3.2), mixing and matching different silos in parallel, and allowing silos to interact (3.3). There are other tools. And, this is just the EVF considerations. The coin flip environment is something of a nightmare in terms of the explosion of possibilities. But for those who are interested in such things, it can be fun. Until it isn't.

4.0: Philosophical Considerations

Here I'm going to shift gears, and assume that a lot of money can be made sloshing money around in the capital markets, with absolutely no effort at prediction. Recall: the best way to get a coin flip is to flip a coin. That is, you devise a bet/investment that has two possible outcomes (a possible gain and a possible loss) *and you flip a coin to determine which side you take. You use a coin flip to get a coin flip, regardless of the probabilities of the event.*[20]

It doesn't make a lot of sense to flip a coin to go long or short Coke, as there's no reason to assume equal sized moves are equiprobable. A move in the right direction is to take Coke and Pepsi, and flip a coin to determine which you'll short and which you'll go long. Better yet, maybe you pair stocks up via coin flip. In this paper, I'm not going to talk much about applying pure coin flip environment strategies to the capital markets.

It may be useful to reiterate: you're not trying to predict anything. You're randomly taking positions. The bet could be "will the sun come up tomorrow." You could flip a coin to

---

[18] It seems like hiring a nuclear physicist/reactor operator would be the way to go here. I know nothing about nuclear reactions, but it seems like silos sharing loss very often "go critical" and just blow everything up. Which gets frustrating.

[19] For example, pay me $2 trillion for one series of coin flips. When the first heads come up on flip n, I'll pay you $2^n. The St. Petersburg game. I would lose money over the long run, but would be happy to take many such bets.

[20] Some of the most challenging issues involve the question of when to use randomness and when to override randomness and make decisions. I may return to this point.

determine which side you take.[21] The bet/investment simply sloshes the money around. The whole game is in devising a strategy that limits drawdowns. (Our critic, who has said this is all sort much absurdness, because it's just iterated fractional martingales, has been somewhat helpful. The martingale is a useful strategy to keep in mind, and potentially to use—possibly even mini-martingales-for-more (MMM)).

I suggest, without having really given anything close to proof, that 30% a year can be returned, conservatively, *by properly situated institutions*. (Do I have any reason to believe that? Yes. Results from the pure coin flip environment are suggestive. And 60 lines of code banged into Quantopian, and that sort of thing, are also suggestive. It is fun to see the beta hover right around 0.) How? Recall the psychology of being long the EVF: you're going to make all the money, you just may have horrible drawdowns that bankrupt you first. A good strategy tames the drawdowns. But there will be drawdowns. So, perhaps you can make 40% on a *base amount*, where you need 10x that amount set aside for drawdowns. If you have $10 million and can't borrow any money, then your base amount is $1 million. You can make 40% of $1 million and make a percent or 2 on the unused portion of the $9 million. So that gets you to about 5% on your $10 million.[22] But, oh the wonders of leverage, enter lending-- up to $90 million, at 5%. *Now your base amount is $10 million*, and you pay 5% on the cash you borrow. The relevant weighted borrowing may average $20 million across a year. So now you make $4 million (40% of $10,000,000) and pay $1 million (5% of $20 million) for profit of $3 million, which is 30% of $10 million. You also would like, and this is key, to be able to go long and short very inexpensively: you care excessively about any and all transaction costs.

4.1

Here is the fundamental philosophical question: Can going long the EVF, or any strategies devised for the coin flip environment generally, be used to make the world a better place?[23] Now, if your response to reading that sentence was to turn your head to the side and vomit as you rolled your eyes and thought about your favorite scenes from *Silicon Valley*, well then we are not so different. For all that I'm serious. There is the notion that if people understood banking they would revolt overnight. That goes doubly if people understood central banking. We have set up a system that is not only something of a casino, but it is a casino where the wealthy and smart can make staggering amounts of money, *especially in downturns*.[24] And if things get really bad, the taxpayer is on the hook to bail everything out.[25]

You've studied everything you could about rates and financial history. There are suggestions that, over long timeframes, there are massive buildups of debt and wealth inequality that then deleverage horrifically. The U.S. 10 year Treasury falls over time to around 2% and

---

[21] People often say, but what if the market crashes? Sure, it may crash. A well-devised plan will be short about half the time and long about half the time. The market just sloshes the money around. It's a different mindset from predicting the future. Obviously, in the sun rising case, you should just bet that the sun will come up, but you see the point.

[22] 40% of $1 million and, say, 1% of $9 million is $400,000 + $90,000 is 4.9% of $10 million.

[23] How should this tool be used? Perhaps even more important and prior: does it make sense to have a financial system (low borrowing costs, low transaction costs, the availability of massive leverage, fiat currency, tax-payer backed, etc.) that allows this tool to be used?

[24] Rates, rates, rates and fx, fx, fx. It's ridiculous. Or so I think.

[25] Which will work, until it doesn't.

you have WWII.[26] Then rates rise until 1982 or so, fall from 1982 to the present, and how do we think this is going to end? This will be the first massive, unorderly deleveraging[27] in the age of nuclear weapons. Who thinks that goes well?[28] The system is idiotic in a number of ways and is not serving people well, potentially including those who seem to benefit in the short to medium term. You should not digress too much, however; these are considerations for another day. In the context of the present paper, the point is a simple one: finance, investing, and the like must be channeled to serve the general interest.[29]

4.2: Outlines of More Specific Questions

4.2.1: Do any long EVF strategies work, with acceptable risk?

4.2.1.1: Can EVF strategies be used to help smooth any cycles?

4.4.1.2: How do EVF and EVM strategies mesh? Or fail to mesh?

4.2.2: What is acceptable risk? For example, is a $1 / 10^{10}$ probability per year of destroying the global financial system acceptable? Some of the considerations of the lottery paradox examine what we should make of a small probability of huge gain. Here, we are faced with the small probability of huge loss. Some analyses of the lottery paradox may shift over to this EVF case in interesting ways.

4.2.3: The Odysseus Issue/Paradox. Let's say you are flipping coins for cash and are willing to lose $100 billion at a $1/ 10^{10}$ probability. If all but half of that probability comes through, then you have a coin flip (50/50) for $50 billion,[30] give or take. Do you call off the coin flip, or do you soldier on (lash yourself to the mast)? And, if you are going to call off the coin flip, then shouldn't you have set a lower "willing to lose" amount from the outset, that is, $50 billion? But the issue would seem to iterate. The challenge is that a $1 / 10^{10}$ probability of a huge loss seems just fine, right up until the point where you start getting close to it. Then the psychology changes from "Oh, that will never happen," to "Oh no, we're in trouble, what do we do? Do we call it off?"

---

[26] I had a letter in Barron's that noted this. Barron's, March 9th, page 39.

[27] I forget what we, the world, is up to, but it's along the lines of $280 trillion in debt and $80 trillion in income. And the income side just experienced a hard stop/shock. Any system that allows that buildup is no good. To the people who say, we couldn't have foreseen the current trouble, I say, correct enough, *but we can foresee that there will be trouble*. It's a bad idea to spread gasoline around your house, even if you don't know the exact catalyst that will make it all go awry. "Who knew that grandma smokes?!" is an odd reply when your house burns down. Similarly, it's a bad idea to allow massive debt buildup, even if you don't know the exact catalyst that will make it implode.

[28] William Faulkner had something along the lines of, "The only question is: When will we be blown up?" The fear is that he was early, but not wrong.

[29] General interest is a vague undefined term. For all that, I suggest that it has meaning and that we can recognize when the general interest is not being served. You don't need a sharp distinction to recognize the clear cases at the extremes.

[30] A crucial question for actual application: what is the largest "coin flip" that can be found?

4.2.4: The Russian Roulette Issue/Paradox. Let's imagine that your initial reactions are to be ok with a 1 in 100 risk of some bad outcome over a year. But that you are not ok with a greater than 50% chance of that same bad outcome occurring over 70 years. But $(0.99)^{70}$ is less than 1/2: that is, there is a greater than 50% chance of the bad outcome's occurrence over 70 years. Are you ok with the risk or not? Note that once you make it through a year, the probability is the same over the next 70 years as it was a year ago—the year you made it through does not ding you going forward. I don't know what to make of this. The application to EVF strategies is that you may have a strategy where you like the odds over a year, but don't like them so much over 200 years.[31] What should we make of these sorts of cases?

4.2.5: The Application of Possible Worlds. This is the area I'm most interested in. Assume that each coin flip splits a universe in 2, into a multiverse, where you have multiple universes and ours is one. Can we come up with EVF strategies that benefit our universe at the expense of other universes? To my mind, this may be a fruitful way to think through these strategies. And it's got a nice us-them, ingroup-outgroup feel to it. The ingroup is every sentient being is this universe. The outgroup is the other universes that are causally separate from us. Let's work together to help us even if it hurts them. What's not to like?[32]

4.3: Unintended Effects

It's nice to think that we can use the EVF strategies to help the world. And, in the long run, I think we can. But, let's work from fundamental truths: 1) All change is bad, and 2) Never underestimate people's ability to screw everything up.

Here are four of the ways this could go sideways.

4.3.1: You could have massive failure of one entity (employing an EVF strategy), that brings down the global financial system.

4.3.2: Systemic failure across entities. You could have many entities employing EVF strategies, that manage to bring down the system. How this would occur is an interesting and challenging question.

4.3.3: Recall that you're assuming that a good EVF strategy can return an easy 30% a year. It's possible you simply lost your mind sometime in early January. But if not, there could be a massive pull of money from EVM strategies to EVF strategies. This massive pull of money could, for example, send P/E ratios on major stock indexes sharply lower. The next few years would be a bad time for that to happen.

---

[31] "Calculating the odds" is also, frankly, impossible in these contexts. Anyone who seriously uses this should have a huge margin of safety. You need that strategy where you figure, "well this is a perpetual money machine. The only thing that would take us out is if the system is going to crash anyway." And recall, the strategy done well has no exposure to anything. Put differently, you take the major factors/positions and are long/short each about 50/50.

[32] Anybody who raises the ethical consideration: should we worry about people in the other universes, well, let's worry about our universe for a bit.

4.3.4: You've suggested that institutions that can borrow inexpensively and that can go short for very low cost can make lots of money. *If they can borrow lots of money as needed.* A move to EVF strategies could lead to greater demand for money. Now, my sense is that most institutions are already levered as far as regulations allow. But it may be worth worrying that an increased demand for borrowing could have negative effects at this time.

There are a number of other worries if EVF strategies prove very effective for low-rate, low-transaction-cost entities.

5. A Handful of Remaining Considerations

5.1: Starting at a negative number for your silo, you want to be pulled to 0, as that is making money. You don't want to fly off towards negative infinity. As you progress, you get the sense that a greater pull to 0 may also be associated with a greater tendency to fly off towards negative infinity. The paper has focused on changing bet sizes multiplicatively, e.g., a loss multiplies your silo times 1.5. Put differently, you next bet is 50% larger. But there are no rules in the pure coin flip environment; it's just flat out chaos that you are trying to get a handle on. You can work additively. For example, start at -$1,000, bet $100. If you lose, bet $1 more; if you win, bet $1 less. Then a loss and a win gains you $1. (Either -1000 to -1100 to -999 or -1000 to -900 to -999.) So you study this additive world for awhile. Then you decide you want to study the realm that lies between multiplication and addition. And there's a couple weeks.

5.2: Betting more after a win is engaging the EVM. It is the way the world is set up. Your stocks go up, and you have more money at risk. The world is massively long the EVM. When Joe Shmoe retail investor inherits a million dollars, he throws it at SPY. Then, it goes up and more is at risk; is goes down less is at risk. (It's a good bit of work to figure, let's divide the money into silos, where each silo bets more after a loss and less after a win. And let's figure out how to limit the drawdowns.) But, I suggest, the world could benefit from moving to being longer the EVF. One key question is: How do the EVM and the EVF interact? This question is very general, and quickly splits into many other, more specific questions. The hope is that they interact well. One way to view some of these strategies is as the ultimate in long vol, positive carry strategies. (When money is sloshing around faster, the strategies stand to make money faster. The interaction of market movement and the strategies is very complex, and so I don't mean to assume any specific definition of "vol," which makes my use of it a bit misleading.) Making some money on a large drop in an asset class, on the face of it, would seem to be a good thing.
    What will financial historians, 200 years from now, think of our time? For one, I think that they will marvel at the absurdity of central banks. First, why would a group of people be able to set prices (rates) effectively? No one sets the price of shoes. Why should the Fed set interest rates? Beyond that, I imagine someone will write something along the lines of, "So Alan Greenspan ran around to dinner parties and got slapped on the back for such a 'good' stock market. And he could cut rates whenever he wanted? And he never had to raise them? And people figured that that would end well? Really? And Janet Yellen said we'd never have a

downturn? Really?"[33] We digress. To the theme of this paper: it's not impossible that they will marvel at our being so overly long the EVM.

5.3: I haven't written much about moving from the pure coin flip environment to the capital markets, but I'll jot down a few thoughts here. The pure coin flip environment lacks all sorts of risks. You always get 50/50 coin flips (or whatever percent you're using for your coin flips). You always get paid. There is no gappiness. You can bet as big as you want. Anyone who has experience in the markets knows that things are nothing like this. So, shifting over, you are faced with sometimes seemingly silly, but, in reality, very difficult questions: How do you approximate a 50/50 coin flip for even money? What if your model says exit at $7,000,000, and you exit at a $7,347,000 loss? If you have 7,000 silos running, where in the world do you "put" this excess loss? How do you prepare for markets that may gap? How do you move in and out of positions? Do you take positions and exit them entirely, or aim to move more smoothly into and out of positions? What is needed, at the end of the day, is a great pure coin flip environment strategy, an understanding of what can go wrong in the markets, a serious fear, a huge margin of safety across a variety of "dimensions," and some serious empirical work to attempt to answer the questions listed above (and others). (Let's be honest, you're going to feel most comfortable starting with other people's money in the futures markets.)

5.4: You don't need the coin flips to be 50/50, and in fact, depending on what you're doing, you may very well not want them to be. I'm not going to say a lot on this point. But, the coin flips have interesting, and somewhat subtle, implications. So for example, and independent of using the EVF, it makes sense to cut losses on individual bets in order to starve the EVM[34] (again, even as the overall point of the EVF is to bet more after loss on independent bets).

5.5: There is a whole literature on people betting when losing (being down money) but not when winning (being up money). And in fact, what this paper suggests is that in the case of compounded, even money, fair coin flips, this is perfectly rational. Taking fair coin flips for 50% of $1,000 losses you money. Taking fair coin flips for 50% of -$1,000 gains you money. The suggestion is that people may be being rational by doing this, but that, e.g., casinos hijack this rationality by making games that seems like even money games, but that are not.

5.6: Speaking of casinos, should they worry? I've worked in -110, -105, +110, +105, and everything from -101 to +101 environments. My sense is that casinos could be taken for some cash in certain craps bets and optimal basic strategy in blackjack, by someone employing the EVF. The two key issues would seem to be granularity of bets (I'm not going to be able to bet $127.93 at a blackjack table) and the factor between the minimum bet and maximum bet. A good

---

[33] And Bernanke studied the Great Depression, where some mistakes were made with over-tightening of financial conditions. And so he was going to be loose. This is surely like a plane crash "expert" who studies one plane crash, where the plane stalled. So the expect says, "here's what we do—point the nose of the plane at the ground and we'll be fine." Sure—good thinking. With an n of 1, the Great Depression, it was obvious that Bernanke was going to err too far to the other side. Aristotle suggests that we aim for the mean between extremes.

[34] This often comes up as "cut your losses and let your winners run."

strategy would also need some sort of computer to spit out the bet size. And casinos could easily spot such betting, because the "pattern" of bet sizes would appear *to be truly bizarre.*[35]

5.7: How does this look from the outside? Well, a good start is to just run a bunch of simple, single silo strategies, and then do simplistic analyses on the data. For example, group the bets into bands of bet size, and see what percentage of bets was won in each band. This can be enlightening. Recall that all bets are assumed to be 50/50, but that a good strategy wins slightly more of the bigger bets *by design*. (And, no single-silo-strategy is good, it's just a starting point.)

5.8: My sense is that EVF strategies are a bit like a nuclear reactor. There's lots of power there. You just need to not blow up.[36] It's possible that regulators are going to need to regulate.

5.9: You go to the head of your organization, or your chief risk officer. You are excited. "There's these great strategies. You predict nothing, and don't even particularly care if you have a very slightly negative expected value. (Though, of course, you'd much rather have EV = 0 or positive EV.) You flip a coin to determine which side of positions you take. You bet more after loss." Chief risk officer: "Get out of my office and never come back."

5.10: From October to the middle of January you were in it. Then you needed a break. It was too much. For years you've listened to Erik Townsend's Macrovoices. He warned. He tweeted on February 8th, here is what is coming and why. His reasoning was strong. And there you were, having spent months studying the negative behavior of, for example, compounding 1.3. A lot of 30% losses in a row can blow up a silo, when you're betting more into loss; the losses behave like gains normally do. It's all you had looked at for months. And so you tried to warn people. But you weren't important enough. And besides, no one really cared.[37] The EVF strategies that were done in by consecutive losses, that exponential growth, it was about to be applied to the world. But here you lapse into falsehoods. It wasn't *about to be applied, it was being applied to the world*. Exponential growth, at the beginning, does not seem so bad.[38] January was tough, February worse. February made you laugh about thinking January was bad. And what is coming? Whatever it is, it will likely make February look tame. You look at the books on your endtable: 1931, When Money Dies, The Great Depression: A Biography, The Great Influenza; Viruses, Plagues, and History; Our Mysterious Panics, An Unconventional Guide to Investing in Troubled Time, Investing Through the Looking Glass, Floored!, and My Struggle book 2 by Karl Ove Knausgaard, in which series the world found out how fascinating it is to read about a man frying potatoes.[39] You know that people have a profound desire to think that things are normal. That things will revert to the mean. But you've seen enough and read enough and invested enough to

---

[35] For example, the bets spit out of the 10,000 wide silo set-up, listed above, are somewhat hilarious to look at, in their seeming lack of order/pattern.

[36] A quick insert: depending on the percent bet, there are cases where you are worried about, e.g., 20 losses in a row and other cases where you are worried about, e.g., 85 losses out of 100.

[37] History, or course, being littered with people being very understanding about other's serious concerns. "Cassandra, girlfriend, we may not agree with you, but tell us your worries."

[38] If a nuclear bomb goes off and you could freeze time after 10 people died, that's not comforting. Timescales matter.

[39] This, of course, is unfair. Some of the passages in the 3,600 pages, the musings, and the descriptions of emotions and relationships, are incredible. They are not believable at least in the sense that describing the book to people, they don't believe that the books can be worth reading.

know that trends can run for a long, long time. And this trend is down. So what? You get up and do what you can. Right now what you can do is say, "Hey, if anyone cares, I think this is a path to the money tree. Maybe it is and maybe it isn't. If it is, maybe it can help us someday." You shoot for the moon, you hit the roof..[40] Others, in more important fields, are putting in a brave daily grind. And shooting for the moon. Some will make it.

[40] Eric Stoltz in Kicking and Screaming.

Appendix

3.1: Types of Silo

Constant Silo

Throughout I assume even odds coin flips, i.e. 50/50. The *constant silo* bets some fixed percent each bet, above I assumed 50%. That leads to the money, $M, either going to 1.5 times M (in the event of a loss when starting at a negative number) or 0.5 times M (in the event of a win/gain). I'll write this: 1.5/0.5. And so 1.2/0.8 is 20% bet. Through most of this paper I assume a 0 EV. But most of the work I did was in a -101 environment, so you have to bet 101 to win 100. That leads to, e.g., 1.505/0.5. Or 2.01/0. Etc.

An example: we begin at negative numbers. So -$100 goes to -$150.50 in the event of a loss or -$50 in the case of a win (in a -101 environment, $50.50 must be wagered to win $50).

Variable Silos

Variable silos determine the percent bet based on the silo amount. Silos can also vary based on the state of multiple silos. As with all of this, you are limited only by your imagination.

Random Silos

Random silos determine the percent bet based on a randomly generated number, within some band/restrictions. For example, I looked at 0.17 + 0.67*rand(), where rand() runs from 0 to 1. So if rand() is 1, that is 1.84/0.16, i.e. -$100 goes to -$184 with a loss or -$16 with a win. I found random silos to be surprisingly effective. They also struck me as capital markets reaching the heights of absurdity. Using capital markets to slosh money around with (close to) a 50% chance of win and 50% chance of loss, where the exit amount/percent is also determined by a random number, well, it's a long way from the standard descriptions of the functions of capital markets.[41]

Mini Martingale for More (MMM) Silos

The MMM silo is, e.g., 2.3/-0.3, that is, you bet $130 on your -$100, and go to -$230 or +30, where a +30 is a $130 gain and an immediate reset. The nice thing about MMM silos (a special case of Constant Silo) is that the math simplifies, as a single win leads to a reset (take the cash and reset the silo amount (to, e.g., -$100).

The critic has made a good point – we should keep the martingale in mind. With the martingale, so long as a person does not go broke, money is made. How? Well, the person wins the biggest bet. Similarly, to trade the coin flip environment well, you win ever so slightly more of your larger bets – even though all the bets are 50%/50%. (I'm assuming 50/50 coin flips. There's no rule that one needs to aim for 50/50.)

---

[41] Which are themselves rubbish to some degree. Vague memories of Doug Henwood's Wall Street as being spot on in places bubble into memory.