ON THE PROBLEM OF MODERN PORTFOLIO THEORY:

In Search of a Timeless & Universal Investment Perspective[†]

A PHD DISSERTATION PRÉCIS

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[†] The salient feature of [this] financial crisis is that it was not caused by some external shock like OPEC raising the price of oil or a particular country or financial institution defaulting. The crisis was generated by the financial system itself. This fact – that the defect was inherent in the system – contradicts the prevailing theory, which holds that financial markets tend toward equilibrium and that deviations from the equilibrium either occur in a random manner or are caused by some sudden external event to which markets have difficulty adjusting. The severity and amplitude of the crisis provides convincing evidence that there is something fundamentally wrong with this prevailing theory and with the approach to market regulation that has gone with it. To understand what has happened, and what should be done to avoid such a catastrophic crisis in the future, will require a new way of thinking about how markets work.

– George Soros, *Statement before the U.S. House of Representatives Committee on Oversight and Government Reform,* 13 November 2008

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EPIGRAPH

Ever since the beginning of modern science, the best minds have recognized that 'the range of acknowledged ignorance will grow with the advance of science.' Unfortunately, the popular effect of this scientific advance has been a belief, seemingly shared by many scientists, that the range of our ignorance is steadily diminishing and that we can therefore aim at more comprehensive and deliberate control of all human activities. It is for this reason that those intoxicated by the advance of knowledge so often become the enemies of freedom… The growth of our knowledge of nature constantly discloses new realms of ignorance… The more men know, the smaller the share of all that knowledge becomes that any one mind can absorb. The more civilized we become, the more relatively ignorant must each individual be of the facts on which the working of his civilization depends.

— F.A. von Hayek, *The Use of Knowledge in Society*, 1945

Recall that I have waged a war against the charlatanism of some prominent financial economists for a long time. The points are as follows. One Harry Markowitz received something called the Nobel Memorial Prize in Economics…

What is his achievement? Creating an elaborate method of computing future uncertainty… An immediate result of Dr. Markowitz's theory was the near collapse of the financial system in the summer of 1998… by Long Term Capital Management ('LTCM'), a Greenwich, Connecticut, fund that had for principals two of Dr Markowitz's colleagues, 'Nobels' as well… somehow they thought they could scientifically 'measure' their risks. They made absolutely no allowance in the LTCM episode for the possibility of their not understanding markets and their methods being wrong.

— Nassim Taleb, *Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets,* 2001

ABSTRACT

The theory presented here, *Evolutionary Portfolio Theory* (EPT), derives evolutionarily stable strategy for optimizing investors, thereby informing individual (household) and institutional (hedge-funds, pensions, endowments, *etc.*) portfolio allocation and asset selections. EPT, in contradistinction to *Modern Portfolio Theory* (MPT), was not derived through inductive methods; rather, our theory was, by and large, informed by Karl Popper's solution to the problem of induction, and founded upon an original solution to what is arguably the most fundamental, long-standing, open problem in economics,[$] thereby tabling a revolutionary hypothesis and corresponding analytical tool that investors may utilize to adequately address the problem of systemic threats to the global financial markets.

[$] In economics the most fundamental… central problem is the theory of value. The theory of value must explain how the comparative values of different goods and services are established. Until that problem is solved, it is not possible to analyse for scientific purposes what will be produced and in what quantities, how the resources will be employed in producing the menu of outputs, and how the resources will be valued. Without a theory of value the economist can have no theory of international trade nor possibly a theory of money (Stigler 1982, p 61 ; *cf.* Weiser 1893).

§I – OVERVIEW

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[†] Leftschetz's… philosophy of graduate… education had its roots in the great German and French research universities. The main idea was to plunge students, as quickly as possible, into their own research, and to produce an acceptable dissertation quickly.… Lefschetz wasn't aiming for perfectly polished diamonds and indeed regarded too much polish… as antithetical to… creativity. The goal was not erudition…, but turning out men who could make original and important discoveries (Nasar 1998. p 60).

§II – PREFACE

On 16 October 1990, the Royal Swedish Academy announced it had awarded one-third of their Alfred Nobel memorial prize in economic science to Harry Markowitz, "for having developed the theory of portfolio choice" (Riksbank 1990). They elaborated upon this weighty decision by noting that

> financial markets serve a key purpose in a modern market economy by allocating productive resources among various areas of production. It is to a large extent through financial markets that saving in different sectors of the economy is transferred to firms for investments in buildings and machines. Financial markets also reflect firms' expected prospects and risks, which implies that risks can be spread and that savers and investors can acquire valuable information for their investment decisions.
>
> The first pioneering contribution in the field of financial economics was made in the 1950s by Harry Markowitz who developed a theory for households' and firms' allocation of financial assets under uncertainty, the so-called theory of portfolio choice. This theory analyzes how wealth can be optimally invested in assets which differ in regard to their expected return and risk, and thereby also how risks can be reduced (Ibid).

But was this the case?

Did Markowitz's contribution offer a tool by which we may analyze how wealth can be optimally invested?

Did it in fact represent a meaningful contribution to knowledge?

Several troubling events have transpired over the past two decades and several strong and influential critics have brought Markowitz's work (and the Swedish Academy's wisdom) into question. One notable critic is hedge-fund manager and author, Nassim Nicholas Taleb:

> Taleb, author of *The Black Swan*, said investors who lost money in the financial crisis should sue the Swedish Central Bank for awarding the Nobel Prize to economists whose theories he said brought down the global economy.
>
> "I want to make the Nobel accountable," Taleb said today in an interview in London. "Citizens should sue if they lost their job or business owing to the breakdown in the financial system."
>
> Taleb said that the Nobel Prize for Economics has conferred legitimacy on risk models that caused investors' losses and taxpayer-funded bailouts.…
>
> Taleb singled out the Nobel award to Harry Markowitz [and Merton Miller and William Sharpe] in 1990 for their work on portfolio theory and asset-pricing models.
>
> "People are using Sharpe theory that vastly underestimates the risks they're taking and overexposes them to equities," Taleb said. "I'm not blaming them for coming up with the idea, but I'm blaming the Nobel for giving them legitimacy. No one would have taken Markowitz seriously without the Nobel stamp."
>
> Markowitz, a professor of finance at the Rady School of Management at the University of California, San Diego, didn't return a phone call seeking comment. Miller, who was a professor at the University of Chicago, died in 2000 at the age of 77.

> "People used the theory and assigned numerical forecasts to the algebra," said Sharpe, a professor of finance, emeritus, at the Graduate School of Business at Stanford University, in a telephone interview. "But I'm not going to take the blame for the numbers they put in."…
>
> In his 2007 bestseller *The Black Swan: The Impact of the Highly Improbable*, Taleb described how unforeseen events can roil markets. He warned that bankers were relying too much on probability models and disregarding the potential for unexpected catastrophes (Baker 2010 ; *cf.* **APPENDIX I** for more details).

Who's right? Markowitz? Taleb? Neither?

We shall explore this problematic situation in detail in due time, but for the time being we'll merely introduce the simple litmus test which we shall implement in our proposed dissertation:

> Is evolution a theory, a system, or a hypothesis? It is much more, it is a general postulate to which all theories, all hypothesis, all systems must henceforward bow and which they must satisfy in order to be thinkable and true. Evolution is a light which illuminates all facts, a trajectory which all lines of thought must follow, this is what evolution is (Dobzhansky 1973, p 129).

In short, we'll table an elegant proof, clearly demonstrating why MPT is, as Taleb strongly suggests, neither thinkable nor true. And better yet, we'll table a strong solution: a biological-based financial model: Evolutionary Portfolio Theory (EPT).

And, despite the fact that our theory is highly original, we may take some comfort in the fact that we do not travel alone. As highlighted in the 7th Annual Global ARC brochure

> Structurally, the market turbulence of 2007 and 2008 has profoundly shaken confidence in traditional physics based approaches to modeling financial structures. Rather than merely tweak existing physics models, Andrew Haldane of the Bank of England, Professor Lord Robert May, Baron of Oxford and Fellow of Oxford University and Professor George Sugihara of UC San Diego will argue that a more radical shift may be required: a full scale migration to biology based financial models (ARC 2009).

In essence, by migrating to a biological model and embracing an evolution worldview, amongst several key methodological shifts, we broaden our time horizon, thereby addressing the most fundamental problem associated with MPT and renders it particularly vulnerable to large-scale catastrophe's and global financial shocks: it's inherently myopic focus; as Ray Dalio, founder and CEO of the world's largest hedge fund, duly noted, "the greatest mistake in investing is exaggerating the importance of, and extrapolating, what's happened lately" (Dalio & Elliott 2006, p 5).

Furthermore, our efforts to grasp the true nature of global financial catastrophes (and how to avoid them)

will include reflections upon how *all* catastrophes have – and have not – been avoided in the past. Moreover, we will consider what deficiencies and obstacles we may need to overcome, and what "new way of thinking about how markets work" (see footnote on cover page) may be required in our necessarily never-ending quest to ensure financial stability, economic prosperity, and, ultimately, long-term human survival. So, with this noble quest and the spirit of the "struggle for life" (Darwin 1859) alive, let's travel back in time and introduce the philosophical founding father of the dissertation at hand, to a priestly thesis and invaluable lesson borne of catastrophe in Halifax harbour…

> On the morning of December 6, 1917, a bright, windless day, a French freighter called the *Mont Blanc* began to slowly pull out of the Halifax harbor in Nova Scotia. At the time, Halifax was one of the busiest ports in the British Empire. There was a war on in Europe, and the harbor groaned with the churn of ships, men, and weapons. The *Mont Blanc* was headed for France that day, carrying over twenty-five hundred tons of explosives, including TNT. While passing through a narrow channel in the harbor, a larger ship, the *Imo* from Belgium, accidentally rammed the bow of the *Mont Blanc*.
>
> The collision itself was not catastrophic. The Imo sailed on, in fact. But the crew of the Mont Blanc knew that their ship was a floating time bomb. They tried to put out the fire, but not for very long. Then they scrambled into lifeboats and paddled for shore. For a few heartbreaking moments, the *Mont Blanc* drifted in the harbor. It brushed up against the pier, setting it on fire. Children gathered to watch the spectacle.
>
> Many of the worst disasters in history started quite modestly. Once accident led to another, until a fault line opened up in a civilization. About twenty minutes after the collision, the *Mont Blanc* exploded, sending black rain, iron, fire, and wind whipsawing through the city. It was the largest bomb explosion on record. The blast shattered windows sixty miles away. Glass blinded some one thousand people. Next, a tidal wave caused by the explosion swamped the shore. Then fire began to creep across the city. In the harbor, a black column of fire and smoke turned into a hovering white mushroom cloud. Survivors fell to their knees, convinced that they had seen a German zeppelin in the sky.
>
> At the moment of the explosion, an Anglican priest and scholar named Samuel Henry Prince happened to be eating breakfast at a restaurant near the port. He ran to help, opening up his church as a triage station. It was, strangely enough, Prince's second disaster in five years. He had responded to another local cataclysm in 1912, when a luxury cruise liner called the *Titanic* had sunk some five hundred miles off the coast of Halifax. Back then, Prince had performed burials at sea in the frigid waters.
>
> Prince was the kind of man who marvelled at things others preferred not to think about. On the awful day of the explosion, he was astounded by what he saw. Prince watched men and women endure crude sidewalk operations without obvious pain. How as one young soldier able to work the entire day with one of his eyes knocked out? Some people experienced hallucinations. Why did parents fail to recognize their own children at the hospital – and especially, at the morgue? Small details nagged at Prince. On the morning of the explosion, why was the very first relief station set up by a troupe of actors, of all people?
>
> That night, a blizzard hit Halifax, the epic's final act. By the time the catastrophe had rippled out across the land, 1,963 people would be dead. In silent film footage taken after the blast, Halifax looks like it was hit by a nuclear weapon. Houses, train terminals, and churches lie like pick-up sticks on the snow-covered ground. Sleighs are piled high with corpses. "Here were to be found in one dread assembling the

> combined horrors of war, earthquake, fire, flood, famine and storm – a combination for the first time in the records of human disaster," Prince would write. Later, scientists developing the atomic bomb would study the Halifax explosion to see how such a blast travels across land and sea.
>
> After helping rebuild Halifax, Prince moved to New York City to study sociology. For his PhD dissertation at Columbia University, he constructed the Halifax explosion. *Catastrophe and Social Change*, published in 1920, was the first systematic analysis of human behaviour in a disaster. "Life becomes like molten metal," he wrote. "Old customs crumble, and instability rules."
>
> What makes Prince's work so engaging is his optimism. Despite his funereal obsessions, he saw disasters as opportunities – not just, as he put it, "a series of vicissitudes mercifully ending one day in final cataclysm."…
>
> After Prince's death, the field of human behaviour in disasters would languish. Then with the onset of the cold war and a new host of anxieties about how the masses might respond to nuclear attacks, it would come back to life. After the fall of communism, it would stagnate again – until the terrorist attacks of September 11, 2001. Prince seemed to anticipate the temptation for people to avert their eyes. "This little volume on Halifax is offered as a beginning," he wrote. Don't let it be the end, he pleaded. "Knowledge will grow scientific only after the most faithful examination of many catastrophes" (Ripley 2008, p v-vii).

Like Father Prince (1920), we will not avert our eyes, and we shall remain faithful to maintaining a highly-principled, realistic, evolutionary worldview at all times (*cf.* Dalio 2010 ; Wallace & Darwin 1858 ; Darwin 1859 ; Dobzhansky 1964 ; Hayek 1974 ; Popper 1999 ; Sokal 2008).

Our dissertation endeavours to place another stone upon the foundation that Father Prince began in 1920.

But this shall be no easy task. Indeed, the temptation to take refuge in teleological comforts (Funk 2009a) or escape with a Canadian worldview.† Preliminary researches suggest that the tendency to avert our eyes from the most significant risks to the global financial markets is so great that we have not even begun to consider the most central, systemic, existential risks insofar as economic prosperity, financial stability, and long-term human survival are concerned (*cf.* Funk 2010a, 2010b, 2009a, 2009d, 2008).

Yes indeed, as Bertrand Russell once remarked, "In all affairs it's a healthy thing now and then to hang a question mark on the things you have long taken for granted," and so is the case with MPT.

But we may not be too surprised by what we uncover. Given the human penchant for teleological thinking (Funk 2009a), the potential for catastrophe has always been – and perhaps always likely will – be far, far greater

† Counselor of the Department of State Eliot Cohen and CSIS Director Jim Judd in Ottawa on July 2 discussed threats posed by violent Islamist groups in Canada, and recent developments in Pakistan and Afghanistan. (CSIS is Canada's lead agency for national security intelligence.) Director Judd ascribed an "Alice in Wonderland" worldview to Canadians and their courts, whose judges have tied CSIS "in knots," making it ever more difficult to detect and prevent terror attacks in Canada and abroad. The situation, he commented, left government security agencies on the defensive and losing public support for their effort to protect Canada and its allies (Cohen 2010).

than contemporary theorists are willing and/or able to imagine (*cf.* Funk 2010c, 2009d, 2008) – but the consequences of failing to recognize this potential is much more grave than most care to imagine.

However, following in the footsteps of fearless explorers, dedicated scholars, and relentless problem-solvers throughout the ages (Renatus 390 ; Smith 1776 ; Malthus 1798 ; Wallace 1855 ; Darwin 1859 ; Wieser 1893 ; Roosevelt 1900 ; Prince 1920 ; Neumann & Morgenstern 1944 ; Nash 1950 ; Popper 1959 ; Hayek 1974 ; Stigler 1982 ; Maynard Smith 1982 ; Falzon & Gardener 1999 ; Mayr 2001a ; Shiller 2000 ; Taleb 2001 ; Lewis 2007 ; Sokal 2008 ; Soros 2008 ; Kanipe 2009 ; Cassar 2010 ; Cohen 2010 ; Hoenig 2009 ; Loeb 2010a ; Bass 2010 ; Dalio 2010 ; Hreinsson, Gunnarson & Benediktsdóttir 2010 ; Fielding 2010), we must try to imagine (*cf.* Funk 2009b, pp 21-22).

§III – INTRODUCTION

The roots for this PhD undertaking sprouted from a single seed on 26 October, 2009, and a fruitful discussion developed and evolved over the past year (*cf.* Funk 2010b, pp 54-67).

This précis – borne of these most natural origins – serves as a constitution – a blueprint – which shall serve as a faithful guide for a ground-breaking dissertation, a timely and highly original exploration of the problem of systemic risks within the global financial markets insofar as investor strategy and behaviour is concerned.

Our subject is complex, our approach is unique, and our methods are unfashionable, but we are able to proceed rapidly and hit the ground running – *in media res,* so to speak – as this dissertation is erected upon foundational works – prequels of sorts, which are unified and summarized in: *The Principles of Economics* & *Evolution I: A Survival Guide for the Inhabitants of Small Islands, including the Inhabitants of the Small Island of Earth* (Funk 2010c). This treatise offers an excellent introduction to the "problem situation" at hand, our methods. It also offers an excellent introduction to analytical tools we shall employ (including game-theory and evolutionary theory), the problem of long-term human survival on Earth, and, moreover, it highlights the extraordinary and unprecedented level of international cooperation required in order for long-term economic prosperity, financial stability, and human survival to ultimately be achieved.

Furthermore, as emphasized in the **ABSTRACT**, there is a singular, unifying theory, a core finding which catalyzes and synthesizes all three volumes, informs strategy, and guides our way throughout, a distillation which serves as a 3-page abstract for this entire dissertation: *Truly Non-Cooperative Games: A Unified Theory* (Funk 2010a).

§IV – EVOLUTIONARY PORTFOLIO THEORY

Two decades ago, the the Royal Swedish Academy explained that

> the contribution for which Harry Markowitz [received] his award was first *published in an essay entitled Portfolio Selection (1952), and later, more extensively, in his book, Portfolio Selection: Efficient Diversification* (1959). The so-called theory of portfolio selection that was developed in this early work was originally a normative theory for investment managers, *i.e.*, a theory for optimal investment of wealth in assets which differ in regard to their expected return and risk. On a general level, of course, investment managers and academic economists have long been aware of the necessity of taking returns as well as risk into account: "all the eggs should not be placed in the same basket". Markowitz's primary contribution consisted of developing a rigorously formulated, operational theory for portfolio selection under uncertainty – a theory which evolved into a foundation for further research in financial economics.
>
> Markowitz showed that under certain given conditions, an investor's portfolio choice can be reduced to balancing two dimensions, *i.e.*, the expected return on the portfolio and its variance. Due to the possibility of reducing risk through diversification, the risk of the portfolio, measured as its variance, will depend not only on the individual variances of the return on different assets, but also on the pairwise covariances of all assets.
>
> Hence, the essential aspect pertaining to the risk of an asset is not the risk of each asset in isolation, but the contribution of each asset to the risk of the aggregate portfolio. However, the "law of large numbers" is not wholly applicable to the diversification of risks in portfolio choice because the returns on different assets are correlated in practice. Thus, in general, risk cannot be totally eliminated, regardless of how many types of securities are represented in a portfolio.
>
> In this way, the complicated and multidimensional problem of portfolio choice with respect to a large number of different assets, each with varying properties, is reduced to a conceptually simple two-dimensional problem – known as mean-variance analysis. In an essay in 1956, Markowitz also showed how the problem of actually calculating the optimal portfolio could be solved. (In technical terms, this means that the analysis is formulated as a quadratic programming problem; the building blocks are a quadratic utility function, expected returns on the different assets, the variance and covariance of the assets and the investor's budget restrictions.) The model has won wide acclaim due to its algebraic simplicity and suitability for empirical applications.
>
> Generally speaking, Markowitz's work on portfolio theory may be regarded as having established financial micro analysis as a respectable research area in economic analysis.

Markowitz himself noted, "my work on portfolio theory considers how an optimizing investor would behave" (1990, p 279). Modern Portfolio Theory (MPT) is "a theory which can be used to direct practice, at least by large (usually institutional) investors" (Ibid). Markowitz also remarked: "I was convinced by Leonard J. Savage, one of my great teachers at the University of Chicago, that a rational agent acting under uncertainty would act according to 'probability beliefs'…. The discussion of principles of rational behavior under uncertainty in Part IV of my 1959 book starts with a variant of L. J. Savage's axioms. From such axioms it follows that one should choose

a strategy which maximizes expected utility for a many-period game (Ibid, pp 280-281).

Our theory (as well as our critique of MPT), in contradistinction, is founded upon an entirely different set of axioms (*cf.* Funk 2009d), an entirely different set of 'probability beliefs' (*cf.* Popper 1959), and an entirely different worldview – an evolutionary worldview (*cf.* Darwin & Wallace 1858 ; Darwin 1859 ; Dobzhansky 1973 ; Gould 2002 ; Funk 2009a). Indeed, Our journey charts a course then sets sail over perilous seas of thought in search of "evolutionarily stable" (*cf.* Maynard Smith 1982) investment strategy (*cf.* Funk 2011).

Although much of our theory relates to investors at all levels, full utilization of our this theoretical development may only be achieved by large individuals (>$100MM USD liquid assets), institutional investors (including pensions, for example), hedge-funds, *etc.* However, hedge-funds represent a somewhat problematic arena which requires additional attention.† We must also be careful with this key term because, as Ray Dalio, founder and CEO of the world's largest hedge fund once remarked, "I don't like it when people call me a hedge fund manager because I don't know exactly what a hedge fund is" (2006). Indeed, we'll explore this somewhat telling observation at the outset by carefully and concretely defining what a hedge fund is, what it once was, what it could be, and, perhaps, what it should be. In fact, the following open letter to Ray Dalio presents a creative summary and contextual overview of our evolving and ongoing search for 'evolutionarily stable' alternative investment strategy (also see Funk 2011)…

† Are hedge funds engaged in activities that can destabilize financial markets and cause widespread dislocation throughout the industry? This concern was first brought to public awareness in August 1998 when the default of Russian government debt triggered a global "flight to quality" that caught many hedge funds by surprise. One of the most significant players in this market, LTCM [Long Term Capital Management], lost most of its multi-billion-dollar capital base in a matter of weeks. Ultimately, LTCM was bailed out by a consortium organized by the Federal Reserve Bank of New York because its collapse might have set off a chain reaction of failures of other major financial institutions.

The possibility of a "domino effect" in the hedge-fund industry is one of the most important revelations to have come out of the LTCM debacle.

Prior to August 1998, vulnerabilities in the global financial system involved stock market crashes, bank runs, and hyperinflation—otherwise known as "systemic risk"—were largely the province of central bankers and finance ministers. Such events were rare but generally well understood, as in the case of the Asian Crisis of 1997 in which over-leveraged financial institutions and weak corporate governance led to a series of currency devaluations, stock market crashes, and defaults in Korea, Thailand, Indonesia and other Asian countries. However, with the collapse of LTCM, a new source of systemic risk was born: the hedge fund. Given how little is known about these unregulated entities, a natural reaction to August 1998 is to regulate them. However, the specific information about LTCM's activities that might have helped regulators and investors to avoid the stunning losses of 1998—the fund's leverage, the number of credit lines available to the fund, the vulnerability of those credit lines during extreme market conditions, and the degree to which other funds had similar positions—is currently not required of registered investment advisers.

Apart from the costs and benefits of requiring hedge funds to register, it is clear that a different approach is needed to address the larger issue of systemic risk posed by hedge funds (Getmansky, Lo & Mei 2004, p 29).

MATT FUNK

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> [Do not] believe anything that I suggest! Please do not believe a word! I know that that is asking too much, as I will speak only the truth, as well as I can. But I warn you: I know nothing, or almost nothing. We all know nothing or almost nothing. I conjecture that that is a basic fact of life. We know nothing, we can only conjecture: we guess.
>
> – Sir Karl Popper, *All life is Problem Solving,* 1999

TO: Ray Dalio
Bridgewater Associates, Inc.
One Glendinning Place
Westport, CT 06880
U.S.A.

CC: Dan Loeb
Third Point LLC
390 Park Avenue
New York, NY 10022
U.S.A.

RE: Thanksgiving

25 November 2010

Dear Ray,

I'm writing to inform you that you've made another mistake.

Your error (which relates to logical implications which follow from your 13th principle) occurred to me a few days ago, after receiving a generous reply from Dan Loeb.

But as an economist and evolutionary theorist, your *Principles* appeal to me at every level. Although I have not discovered any references to the influence of Karl Popper's (1999) central thesis, your *Principles* appear to be in line with Popper's thinking about correction-of-error through open criticism. Indeed, it appears that Bridgewater may represent the kind of problem-solving community that may be interested in several problems to which I have devoted years of research. Furthermore, as noted in my previous correspondence [**APPENDIX II**], I am, by-and-large, in agreement with all of your *Principles*, thus I'll save most of this debate for another holiday.

But in the meantime, you may wish to reflect upon the following three brief examples in consideration of my conjecture that principle 13 presents counter-productive limitations and obstructions to principles 52, 60, 140, and 276. Example #1: Consider the nontrivial educational value of Dan Loeb's famed, seminal, and widely

broadcast email exchange with Alan Lewis (*cf.* McGrath 2005), which you may find within the pages of a Halloween letter to Dan (*cf.* Funk 2010c); as a fellow hunter with an apparent preference for the relative insularity of Belle Haven and a perpetual "fear of messing up" (O'Keefe 2009), you may find the entire contents of this tasty Halloween treat worthwhile. Example #2: If you should happen to decide that this curious Thanksgiving communique may be useful to others, you need not waste any of time (or mine, for that matter) by requesting my permission to pass it along with any criticisms or words of agreement you may feel fit.† As a famous copyright and First Amendment attorney recently attested to uncommon beauty of our constitution and copyright laws:

> The most important privilege, from a [problem-solver's] point of view, is truth. If your remarks hurt someone's reputation, but your remarks are true, you are absolutely privileged. An absolute privilege cannot be lost through bad faith or abuse. So even if you maliciously defame another person, you will be privileged if the statement is true. Truth is an absolute privilege because [American] society values truth more than a person's [privacy or] reputation (Litwak 2010).

Example #3: Although Litwak (2010) highlights highlights the extraordinary educational value of the "fair use" provision in U.S. copyright law, the "radical transparency" granted by Sweden's "fair use" laws trump all others (*cf.* Cohen 2010).

Presently, however, I will bring a more pressing problem-solving possibility to your attention: your observations about the heavy, largely unrecognized (*i.e.*, Jensen, Yechiely, & Rotenberg 2006), and thus inherently dangerous correlations between most fund strategies and beta is consistent with my researches into Popper's solution to Hume's problem of induction. In short, I have conceptualize (and, moreover propose to help develop and launch with you at Bridgewater) the most *evolutionarily stable* fund the alternative investment community has ever seen. This concept represents a long conversation, but Funk (2010c, pp 44-47) offers a good introduction.

For now, however, briefly, over the past decade I have developed several original solutions and re-discovered a few long-forgotten truths (*e.g.,* Funk 2009c), but perhaps my most significant theoretical development is a solution to the most long-standing, fundamental, open problem in economics: a unified economic &

† The theory… [the author] has sketched [in this letter]… accounts to his own understanding…, but whether it will have the same effect upon others must be left to the judgment of his readers. If he should succeed in drawing the attention of more able men to what he conceives to be the principal difficulty in… society and should, in consequence, see this difficulty removed, even in theory, he will gladly retract his present opinions and rejoice in a conviction of his error (Malthus 1798).

evolutionary theory of value. In short, this solution offers a unique competitive advantage, informing a highly original global, macro-driven valuation strategy. Funk (2010a) distills this theory in 3-pages, outlining my insights into systemic risks and asset valuation.

The implications which follow from this dissertation are vast and interrelated, but are especially useful when it comes to evaluating the three most *evolutionarily stable* asset classes: agricultural land (*i.e.*, farmlands, rangelands, and wildlife production systems), reserve currencies, and gold bullion (also see Dichev & Yu 2009).

Adam Smith said almost everything that needs to be said regarding the "stable" nature of farmland in 1776,[†] Funk (2008) corroborated (*reductio ad absurdum*) his strong conjecture, and an insightful article from yesterday's *Globe and Mail* (Waldie & Leeder 2010) added yet more testimony. For brevity's sake, I'll save my analysis of special reserve currencies for another occasion, and thus I will confine the remainder of this discussion to a few dimly seen and misunderstood aspects of gold.

Jeremy Grantham once quipped,

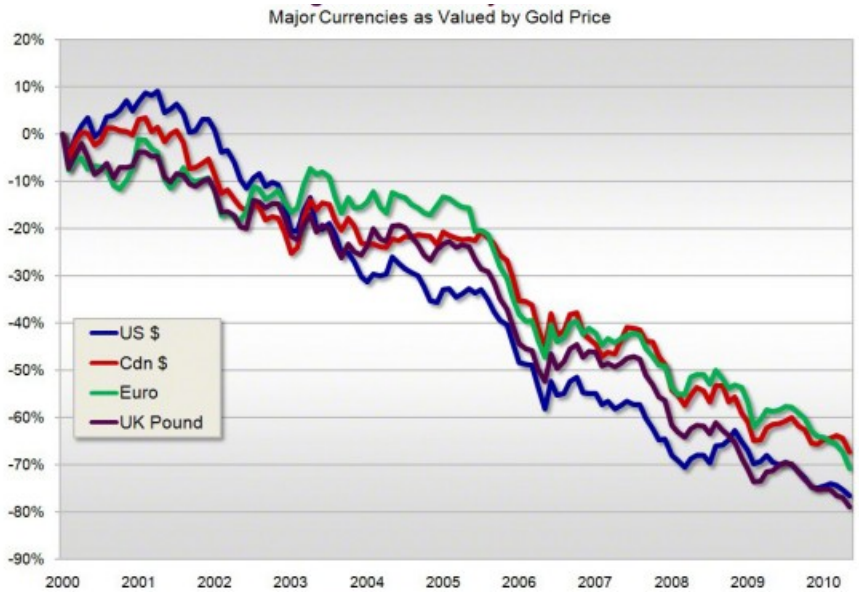
> I hate gold. It does not pay a dividend, it has no value, and you can't work out what it should or shouldn't be worth. It is the last refuge of the desperate (Blumen 2010).

A few weeks ago I collected anecdotal evidence that this viewpoint is not that uncommon: I recently enjoyed an informative trip to New York, where I had several fortunate and enlightening encounters: When George Michelakis (Gladstone Partners) was informed that I had a few interesting ideas about gold, he dismissed me as "another gold retard" (though I spent a fascinating hour suggesting otherwise, the verdict is still out – but he did follow up to request my researches). Simon Langdon (Schonfeld) appeared to listen with genuine interest, but perhaps hinted likewise by relating that he "knew another gold-bug back in the 70's". David Dix (AMP Capital) listened very graciously over the course of several discussions throughout the week, but didn't tip his hand one way or the other. However, there was one remarkable exception to the bearish gold sentiments noted above: To

[†] The unstable and perishable nature of stock and credit, however, render them unfit to be trusted to as the principal funds of that sure, steady, and permanent revenue which can alone give security and dignity… The government of no great nation that was advanced beyond the shepherd state seems ever to have derived the greater part of its public revenue from such sources.
Land is a fund of a more stable and permanent nature (Smith 1776).

borrow a poetic phrase from Mr Loeb, "I was tipping back a few pints" with Perennial Capital's Jay Cassidy, Chris Whitney (whom happen to hail from Weston and Westport, respectively), and their chief economist, a razor-sharp Brooklyn-raised, Princeton man named Will. Although I didn't have the opportunity to discuss this matter with Jay or Chris, Will followed my long story intently and paid me a great compliment at the end, "How long do you think it will be before people know what you know?"

In any case, to make a very long story short, I know that Granthan is wrong: Gold is not the last refuge of the desperate, rather, it is the very first refuge of the wise. If you'd like to follow this thread, I detailed the true value of gold in one long argument, a spirited letter to President Obama (Funk 2010b), which I summarized in **§IV –** I also revisited this the theme in regards to QEII: https://files.me.com/mattfunk/as3wab. Although Funk (2010b) is indeed one long argument, here's a snapshot of a related reserve currency issue this letter explores at great length:



In closing, I will also relate how my unified theory of value and my rare rare combination of "common sense, character, and creativity" (Dalio 2006) enabled me to recognize the error to which I referred in my previous correspondence [**APPENDIX II**]. As you noted…

> Since I believe that a big common mistake that caused many investors problems in 2008 was not having a broad enough perspective, I believe that one of the most important lessons for those who did badly in 2008 is to have a "timeless and universal investment" perspective, which means to broaden your perspective to understand what happened in long ago times (*e.g.*, in the 1930s) (Dalio 2008).

However, as I had remarked [**APPENDIX II**], if you wish to develop a timeless and universal perspective, you must broaden your perspective to understand what happened much, much prior to the 1930s, a perspective I outlined and highlighted in a recent publication (Funk 2009a). Once armed with this perspective – a truly evolutionary worldview – I believe a number of inter-related errors may also come to your attention, including your valuation of gold. Consider this 2009 interview excerpt:

> *Barron's*: Are you a fan of gold?
> *Dalio*: Yes.
> *Barron's*: Have you always been?
> *Dalio*: No. Gold is horrible sometimes and great other times. But like any other asset class, everybody always should have a piece of it in their portfolio (Dalio & Ward 2009).

But that is not true.

Gold has *always* been great – and, theoretically speaking, it always will.

Your mistake, as noted, is that looking back to the 1930s is not far enough – as you know well, "the greatest mistake in investing is exaggerating the importance of, and extrapolating, what's happened lately" (Dalio & Elliott 2006, p 5). But gazing back over the past 2,700 years of human civilization – beginning with the first "white gold" coin, minted and issued King Alyattes in Sardis, Lydia, *c.* 600 BC[†] – begins to offer a better perspective and more reliable conclusions.

In fact, the further we cast our gaze back in time, and the further we project into the future, the more valuable gold becomes in the present! Although unraveling this long yarn takes time, I hope that we may have the fortune to discuss these weighty matters and great opportunities soon.

[†] [See image on cover]: The lion was the heraldic animal of the Mernmads, the royal dynasty of Lydia; it was seen as the earthly representative of the sun god. Thus it is highly probable that this coin is of Lydian origin…. Judging from the large number of such coins that have survived, they must have been part of a quite sizeable issue, extending over a prolonged period which, although it cannot be dated precisely, most probably fell within the reign of King Alyattes. This specimen is a one third stater struck according to a weight system common in Asia Minor which is known as the Babylonian or Milesian standard of coinage. This denomination in particular seems to have been well suited for use as a medium of exchange in trade, and thus popular, for it has survived in greater numbers than the whole staters, for example (Conzett 2010).

My approach to risk and liquidity is unusual, my island-based (Funk 2009b) researches are unconventional, and the path I've followed has been rather uncommon. Naturally, I have much to learn. But I have just as much to offer. To echo a poetic truth a great scholar discovered in the backwoods, not far from Fairfield County, "Two roads diverged in a wood, and I—I took the one less traveled by. And that has made all the difference" (Frost 1916).

And, by the way, if you're curious, the first pure gold coins – the first truly reliable monetary storage vessels for value – were issued by King Alyattes' successor, Croesus.[†]

Happy Thanksgiving,

Matt Funk[$]

[†] Herodotus… gave account that the Lydians had been the first to mint their coins from… "white gold" [(electrum)], a natural alloy of gold and silver [see cover image].

These early coins [(*c.* 600 BC)] could not be allotted with a definite value, however, because the percentage of gold and silver in electrum changed. Therefore King Croesus of Lydia [(*c.* 550 BC)] decided… to have his coins henceforth minted either from gold or silver.…

This light 1/3 stater [pictured above] is part of the regular coin issues of King Croesus. Like all this king's coins it depicts a roaring lion fiercely attacking a bull (Conzett 2010).

[$] The writer's object in putting forward his views in the present imperfect manner is to submit them to the test of other minds, and to be made aware of all the facts supposed to be inconsistent with them. As his hypothesis is one which claims acceptance solely as explaining and connecting facts which exist in nature, he expects facts alone to be brought to disprove it; not *à-priori* arguments against its probability (Wallace 1885, p 191).

§V – AFTERWORD: A SUDDEN CHANCE FOR SOCIAL CHANGE

I would simply like to take a moment to reflect back upon our **ABSTRACT** and consider a closing remark by our dissertation's founding father: Father Prince (*cf.* **§II**).

Although our researches are complex and exhaustive, they are, simply, informed by Sir Karl Popper's (1959) solution to David Hume's (1739) *Problem of Induction,* and an original solution to the most fundamental, long-standing, open problem in economics: namely, a unified of value (Funk 2010a).

But a of course theoretical solutions – even when they've withstood tests of refutations – are neither always accepted nor applied. Have the harsh lessons from the most recent financial crisis – which, by many metrics, is not even over yet – *been learned*? Has this brief window in time opened wide enough for change to come in?

> When our habits are settled and running smoothly they most resemble the instincts of animals. And the great part of our life is lived in the region of habit. The habits like the instincts are safe and serviceable.
>
> They have been tried and are associated with a feeling of security. There consequently grows up in the folk mind a determined resistance to change … a state of rapid and constant change implies loss of settled habits and disorganization. As a result, all societies view change with suspicion, and the attempt to revise certain habits is even viewed as immorality.
>
> But when there comes the shattering of the matrix of custom by catastrophe, then mores are broken up and scattered right and left. Fluidity is accomplished at a stroke. There comes a sudden chance for permanent social change.
>
> Social changes follow both minor and major disasters. The destruction of a mill may change the economic outlook of a village. The loss of a bridge may result in an entirely different school system for an isolated community ; a cloud-burst may move a town. Great visitations, like the Chicago fire or the San Francisco earthquake, reveal these social processes in larger and more legible scale (Prince 1920, p 20).

Perhaps all we're able to say at this juncture is this: Only time will tell.

A one-page summary of the theoretical exploration proposed herein may also be found in an abstract that was recently accepted for presentation at the International Rangeland Congress IX in Rosario, Argentina (*cf.* Funk 2011).

The author would like to dedicate these closing lines to an extraordinary gentleman and scholar: Professor Joseph Falzon. This Précis would not have been remotely possible without his great patience, perfect guidance, unflagging support. Thank you!

APPENDIX I – THE PSEUDO-SCIENCE HURTING MARKETS

By Nassim Nicholas Taleb. *Financial Times*. 23 October 2007.

Last August, *The Wall Street Journal* published a statement by one Matthew Rothman, financial economist, expressing his surprise that financial markets experienced a string of events that "would happen once in 10,000 years". A portrait of Mr Rothman accompanying the article reveals that he is considerably younger than 10,000 years; it is therefore fair to assume he is not drawing his inference from his own empirical experience but from some theoretical model that produces the risk of rare events, or what he perceives to be rare events.

The theories Mr Rothman was using to produce his odds of these events were "Nobel-crowned" methods of the so-called modern portfolio theory designed to compute the risks of financial portfolios. MPT is the foundation of works in economics and finance that several times received the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel. The prize was created (and funded) by the Swedish central bank and has been progressively confused with the regular Nobel set up by Alfred Nobel; it is now mislabelled the "Nobel Prize for economics".

MPT produces measures such as "sigmas", "betas", "Sharpe ratios", "correlation", "value at risk", "optimal portfolios" and "capital asset pricing model" that are incompatible with the possibility of those consequential rare events I call "black swans" (owing to their rarity, as most swans are white). So my problem is that the prize is not just an insult to science; it has been putting the financial system at risk of blow-ups.

I was a trader and risk manager for almost 20 years (before experiencing battle fatigue). There is no way my and my colleagues' accumulated knowledge of market risks can be passed on to the next generation. Business schools block the transmission of our practical know-how and empirical tricks and the knowledge dies with us. We learn from crisis to crisis that MPT has the empirical and scientific validity of astrology (without the aesthetics), yet the lessons are ignored in what is taught to 150,000 business school students worldwide.

Academic economists are no more self-serving than other professions. You should blame those in the real world who give them the means to be taken seriously: those awarding that "Nobel" prize.

In 1990 William Sharpe and Harry Markowitz won the prize three years after the stock market crash of 1987, an event that, if anything, completely demolished the laureates' ideas on portfolio construction. Further, the crash of 1987 was no exception: the great mathematical scientist Benoît Mandelbrot showed in the 1960s that these wild variations play a cumulative role in markets – they are "unexpected" only by the fools of economic theories.

Then, in 1997, the Royal Swedish Academy of Sciences awarded the prize to Robert Merton and Myron Scholes for their option pricing formula. I (and many traders) find the prize offensive: many, such as the mathematician and trader Ed Thorp, used a more realistic approach to the formula years before. What Mr Merton and Mr Scholes did was to make it compatible with financial economic theory, by "re-deriving" it assuming "dynamic hedging", a method of continuous adjustment of portfolios by buying and selling securities in response to price variations.

Dynamic hedging assumes no jumps – it fails miserably in all markets and did so catastrophically in 1987 (failures textbooks do not like to mention).

Later, Robert Engle received the prize for "Arch", a complicated method of prediction of volatility that does not predict better than simple rules – it was "successful" academically, even though it underperformed simple volatility forecasts that my colleagues and I used to make a living.

The environment in financial economics is reminiscent of medieval medicine, which refused to incorporate the observations and experiences of the plebeian barbers and surgeons. Medicine used to kill more patients than it saved – just as financial economics endangers the system by creating, not reducing, risk. But how did financial economics take on the appearance of a science? Not by experiments (perhaps the only true scientist who got the

prize was Daniel Kahneman, who happens to be a psychologist, not an economist). It did so by drowning us in mathematics with abstract "theorems". Prof Merton's book Continuous Time Finance contains 339 mentions of the word "theorem" (or equivalent). An average physics book of the same length has 25 such mentions. Yet while economic models, it has been shown, work hardly better than random guesses or the intuition of cab drivers, physics can predict a wide range of phenomena with a tenth decimal precision.

Every time I have questioned these methods I have been abruptly countered with: "they have the Nobel", which I have found impossible to argue with. There are even practitioner associations such as the International Association of Financial Engineers partaking of the cover-up and promoting this pseudo- science among financial institutions. The knowledge and risk awareness we are accumulating from the current subprime crisis and its aftermath will most certainly not make it to business schools. The previous dozen crises and experiences did not do so. It will be dying with us, unless we discredit that absurd Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel commonly called the "Nobel Prize".

The writer is author of "The Black Swan: The Impact of the Highly Improbable", shortlisted for the "FT/Goldman Sachs Business Book of the Year Award". The winner will be announced at a dinner in London tomorrow night

APPENDIX II – ON TIMELESS & UNIVERSAL INVESTMENT PERSPECTIVES

MATT FUNK

17 Olde Brighton Lane – Charlottetown – Prince Edward Island – Canada – C1A-0A7

TO: Ray Dalio **29 October 2010**
Bridgewater Associates, Inc.
One Glendinning Place
Westport, Connecticut, 06880
The United States of America

VIA FACSIMILE: +1 (203) 291-7300

Sir:

I am writing to inform you that you have made a great mistake.

Although I must emphasize the magnitude of your error, it seems you may cherish this criticism. Furthermore, I believe you may be so impressed by my solution that you will feel compelled to invite me to join your team at Bridgewater.

But in any case, the nature of your error occurred to me as I reviewed your 2008 investor letter, wherein you had noted:

> Since I believe that a big common mistake that caused many investors problems in 2008 was not having a broad enough perspective, I believe that one of the most important lessons for those who did badly in 2008 is to have a "timeless and universal investment" perspective, which means to broaden your perspective to understand what happened in long ago times (*e.g.*, in the 1930s).

In brief, if you truly wish to develop a truly timeless and universal investment perspective, you must broaden your perspective to understand what happened much, much prior to the 1930's. Although this understanding may require a rather long conversation, you may find that I poured the foundation for this understanding in a forthcoming publication: *On the Origin of Mass Extinctions: Darwin's Nontrivial Error* (Funk 2009a).

I would appreciate the opportunity to discuss and highlight the logical implications which follow from this recent discovery, especially as they illuminate both unseen risks and unrecognized opportunities for you and Bridgewater.

I might also briefly note that it is no coincidence that my two latest dissertations were titled *The Principles of Economics & Evolution I* (Funk 2010c) and *The Principles of Economics & Evolution II* (Funk 2010b) – it seems we share much in common when it comes to "principles".

In fact, I am confident that the following game-theoretical development (which begins to outline the solution to the problem sketched in the publication linked above) clearly demonstrates that I do indeed embrace 276 of your 277, awe-inspiring principles, and that the revolutionary discovery detailed above was the direct result of reflecting upon and correcting what may be the most humiliating error I have committed to date: *On the Truly Noncooperative Game of Life on Earth: In Search of the Unity of Nature & Evolutionary Stable Strategy* (Funk 2008)

I will follow-up with a call to your office next week to see if you would like to meet to discuss this problem and my proposed solution.

Yours very truly,

Matt Funk

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