More Cash Is Better Than Less

Selecting Profitable Mutual Funds:

401(k), 403(b), IRA and Other Investors

An Interactive E-book

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Conlin + Howard Publishers

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ACKNOWLEDGEMENT

We originally developed ***More Cash*** to provide our employees with skills to build successful financial retirements. Along the way, we were beneficiaries of their questions and recommendations.

Special thanks to Tracy Haney and John Netherton. Tracy, our office manager and in-house accountant, suggested clarifications to the spreadsheets. John, our head of IT, used an early version to help family members select funds from their retirement plans. He also asked the magic question, "Have you ever considered publishing this?"

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Why *More Cash*?

Purpose

More Cash offers investors one and only one skill: how to identify profitable mutual funds.

Employers and Educators

Employers and educators have similar interests: employees and students are or probably will be enrolled in tax-deferred retirement plans. Among the initial questions our employees asked was, "What funds should I invest in?" Our experience is that employees are likely to participate in a 401(k) if they understand how to invest their hard-earned money. For both employees and students, performance measures and principles offered in ***More Cash*** will help them identify profitable funds and periodically monitor them. Furthermore, employers and educators are well-aware that tax-deferred retirement plans may not be perfect[1] and that participants may be unprepared to make investment decisions to secure retirement. However, they constitute a massive commitment to secure retirement for most Americans:

> 401(k) plans hold $7.4 trillion in assets as of December 31, 2023, in more than 710,000 plans, on behalf of about 70 million active participants and millions of former employees and retirees.[2]

The plans are what we have to work with, so let's make the best of them.

Disclaimer

More Cash does not predict future mutual fund performance. No person or system, including this manual, can do that.

The mutual funds evaluated in ***More Cash*** were a complete set chosen by a financial institution and offered to our employees as investment opportunities. Although actual mutual fund performance is assessed in ***More Cash***, no recommendation to invest in specific funds is being made. In truth, financial performance changes so quickly, information about individual funds will probably be outdated by the time this manual reaches readers. Regardless, *how* ***More Cash*** identifies profitable funds will not become outdated unless the Securities and Exchange Commission[3] no longer mandates that mutual funds publish audited reports.

Every reader is unique and should acquire knowledge from many sources to make investment decisions appropriate for his purposes. That said, "[We] assume no responsibility or liability for any errors or omissions in the content of this [manual]. The information contained [herein] is provided on an 'as is' basis with no guarantees of completeness, accuracy, usefulness or timeliness."[4]

We have never owned any mutual fund mentioned in ***More Cash***. Furthermore, we have never received fees for services from any mutual fund.

Preface

More Cash offers *performance measures and principles* to identify profitable mutual funds and monitor them over time whether from a list offered by an employer in a 401(k) or 403(b) or any set of mutual funds.[5]

Terminology

Mutual Fund Managers pool money from investors. They purchase a variety of securities including stocks and/or bonds. Their performance is measured and publicly reported in terms of return and expense ratios. The ratios are very small numbers and may be difficult to interpret. ***More Cash*** translates ratios to dollars and interprets them using readily understandable principles like *More cash is better than less.*

A **Sponsor** is an employer who offers employees a tax-deferred retirement plan like a 401(k). The plans are tax-deferred because taxes are paid when cash is withdrawn. If an employee chooses to enroll or is automatically enrolled, he is referred to as a **Participant** and the money he invests is called contributions. The plan investments are, for the most part, mutual funds.

Sponsors are responsible for selecting a lineup from thousands of available funds.[6] The lineup, usually about two dozen funds, is referred to as **Investment Opportunities**.

> A common belief is that offering more than two dozen investment options "…creates a challenge for participants who have to select among all those funds to make their investment allocation. Fewer funds lessen the burden on fiduciaries [Sponsors] and make it simpler for participants to choose where to invest."[7]

Participants are responsible for selecting their own investments from the lineup and the amount contributed to each. The specific funds and the amount contributed to each may be changed in accordance with the plan.

If a Participant is unfamiliar with finance, he may feel overwhelmed selecting his own investments. For example, if he searches the internet for "mutual fund financial information," he will find millions of resources. Rather than empowering him to make good choices, he may end up spinning his wheels and becoming frustrated.

It is understandable that a Participant may choose to hire a **Financial Advisor**. However, they are expensive. Advisor's fees are stated in very small numbers and may be difficult to interpret. If a Participant pays an Advisor as little as 1% annually, he could pay the Advisor tens of thousands of dollars over the life of his account. Furthermore, identifying a Financial Advisor may be more difficult than choosing profitable mutual funds. Unlike Mutual Fund Managers, Financial Advisors are not required to report their performance.

If a Participant elects to hire a Financial Advisor, ***More Cash*** offers tools to monitor the advice.

Introduction

Participants invest **cash** in mutual funds.
Mutual funds use **cash** to buy assets, e.g., stocks and bonds.
They periodically report performance by translating asset values to ratios.
More Cash translates the ratios back to **cash**.

A Sponsor offered Participants the following line-up of mutual funds in a 401(k) plan. Given the return and expense ratios, identify the profitable funds.

INVESTMENT OPPORTUNITIES AND THEIR RETURN AND EXPENSE RATIOS

A	B	C	D	E	F
Mutual Fund Tickers	**Returns Year 1**	**Returns Year 3**	**Returns Year 5**	**Returns Year 10**	**Expenses Annual**
ARTMX	-0.0089	0.0229	0.1194	0.087	0.0119
VFIAX	0.1193	0.0884	0.1462	0.0694	0.0005
DODBX	0.1656	0.0722	0.1336	0.0601	0.0053
DODIX	0.0561	0.0346	0.0377	0.0505	0.0043
VBTLX	0.026	0.0294	0.0214	0.0429	0.0006
MEIKX	0.1425	0.0798	0.1482	0.0691	0.0051
HACAX	-0.0107	0.0648	0.1396	0.0801	0.0065
VIMAX	0.1122	0.0767	0.1437	0.0766	0.0008
DHSIX	0.1445	0.0503	0.1293	0.0696	0.101
VSMAX	0.183	0.0701	0.1483	0.0818	0.0008
TCIEX	0.0122	-0.0163	0.0669	0.0085	0.0006
RERGX	0.0101	-0.006	0.0722	0.0289	0.005
VREMX	0.0159	-0.0061	0.0197	0.0424	0.0118
HWHAX	0.1569	0.0365	0.0728	0.1058	0.0095
SKIRX	0.1098	-0.0476	-0.0454	-0.021	0.0099
BPRIX	0.0411	0.0151	0.0055	0.0427	0.0035
VTHRX-2030	0.0785	0.0458	0.095	0.0498	0.0015

Difficult, to say the least.

Although different Sponsors offer different lineups, every investment lineup presents mutual funds by tickers, i.e., unique fund names, and fund performance by return and expense ratios.

How does *More Cash* help?

Mutual fund performance is reported in ratios.[8] ***More Cash*** translates ratios into dollars revealing profitability. Before translation details are introduced, consider how dollars might help guide decisions.

Two mutual funds included in Investment Opportunities, ARTMX and VIMAX, are grouped as Mid Caps and compared to each other because they invest in corporations generally valued between $2 billion and $10 billion. Their return ratios are repeated below:

Mutual Fund Ticker	Returns Y1	Returns Y3	Returns Y5	Returns Y10
ARTMX	-0.0089	0.0229	0.1194	0.087
VIMAX	0.1122	0.0767	0.1437	0.0767

The translation of Mid Cap return ratios into dollars implied the following cash choices:

Ticker	Cash Choices
ARTMX	$35,911
VIMAX	$77,627

VIMAX earned more than twice the cash as ARTMX and satisfied an intuitive investment principle *More cash is better than less*. Cash reveals profitability.

Part 1

Mutual Fund Groups, Performance Measures, and Ratios Translated to Dollars Organized in a Spreadsheet

> Translation is a common business activity. For example, consider a translation of Euros to U.S. Dollars: on March, 15, 2024, a Euro was equal to 1.0953 U.S. dollars; so, €10,000 equals $10,953. Exchange rates constantly change as do mutual fund return and expense ratios.

Three key ideas guide identification of profitable mutual funds. First is the practice of grouping funds which is consistent with financial diversification. Second are two performance measures and related principles. And third are ratios translated to dollars and organized in a spreadsheet.

(1) Mutual Fund Groups and Financial Diversification

Mutual Funds are grouped according to the type of companies *they* invest in. For example, Mid Cap funds, like VIMAX discussed in the Introduction, invest in companies generally characterized by their capitalization (market value) between $2 billion and $10 billion.

> ***Sidebar:*** *Capitalization is measured by market price per share of a stock multiplied by the number of its shares outstanding. For example, if a company at a particular time has 20 million shares outstanding and a market price of $150 per share, its capitalization is $3 billion. A market capitalization of $3 billion meets the definition of a Mid Cap company.*

VIMAX accomplishes, to a limited degree, financial diversification by investing in many, maybe hundreds, of Mid Cap companies. It reduces the risk of

bankruptcy or poor performance involved with investing in a few Mid Cap companies.

The Sponsor accommodated further risk reduction by offering several different groups of funds.[9] In addition to Mid Caps, Investment Opportunities included Large Cap, Small Cap, Balanced, Bond, Foreign, and Target-Date Funds.[10] When a Participant chooses to invest in many different groups of mutual funds, the expectation is that he further reduces his risk.

> Financial diversification, however, may not reduce systematic risk. "Systematic risk refers to the risk inherent to the entire market or market segment. Systematic risk, also known as undiversifiable risk, volatility risk, or market risk, affects the overall market, not just a particular stock or industry."[11]

(2) Performance Measures and Principles

More Cash applies performance measures and principles to identify profitable funds. Given a group of mutual funds:

- A preferred mutual fund earned more cash inflow (Ci) than other funds. In principle, *More cash inflow is better than less.* (Asset is a synonym for cash.)

  Ci corollary: A preferred mutual fund earned more cash inflow per invested dollar (CiP) than other funds. In principle, *More cash inflow per invested dollar is better than less. (Ci/I$)*

- A preferred mutual fund incurred less cash outflow (Co) than other funds. In principle, *Less cash outflow is better than more.*

Applications of Ci and Co are presented in Parts 2 and 3. They are *expressed mathematically* in Appendix 1.

(3) Ratios Translated and Organized in a Spreadsheet[12]

More Cash translates fund ratios to dollars a step-at-a-time in spreadsheets.

Click on **BULL.xlsx** and follow the discussion.

> *Sidebar: Please download and save copies of spreadsheets discussed in **More Cash**. We will show how to use them to assess **your** mutual funds.*[13]

Mutual fund tickers are arranged by fund groups in rows A5 through A21. Fund return and expense ratios are assigned to B5 through F21. Translation of ratios to dollars and identification of profitable funds are presented in G5 through P21.

Tickers and Fund Groups

Column A is the list of Investment Opportunities copied from the Introduction. The funds are rearranged into groups. Large Caps are in rows 5 through 7; Mid Caps, rows 8 and 9; Small Caps, rows 10 and 11; Balanced Funds, rows 12 and 13; Bond Funds, rows 14 through 17; Foreign Funds, rows 18 through 20; and a Retirement Date Fund (also known as a Target-Date Fund), row 21.

The tickers, like RERGX in cell A18, are abbreviations identifying unique funds. An internet search reveals complete names and a wealth of information. RERGX's full name is American Funds EuroPacific Growth Fund® Class R-6. It invests in companies based outside the United States. At the time Investment

Opportunities were provided to Participants, RERGX invested in Nestle and Sony among other companies.

Return Ratios[14]

Columns B, C, D, and E house **return ratios** mutual funds reported for years (Y) 1, 3, 5, and 10, respectively. They measure asset **gains or losses** Mutual Fund Managers accomplished or incurred with the investments they bought.

The Managers are responsible for and evaluated in part based on their fund's performance as measured by return ratios.

Expense Ratios

Column F reports annual **expense ratios** for each fund. Expense ratios are measures of costs incurred by Mutual Fund Managers for buying and selling stocks or bonds, management salaries, and other operating charges. "Fund Management Fees" and "Administrative Fees" charged by some funds were added to their expense ratios. Mutual Fund Managers are responsible for and evaluated in part on fund performance as measured by expense ratios.

Returns ratios are reported net of (less the amount of) expenses. That is, *Mutual Fund Managers deduct expenses from their funds before returns are published.* This is discussed in detail later. It is important to note that Mutual Fund Managers charge fees even when their funds' investments decrease the wealth of Participants. In other words, Managers charge a percentage of whatever is in the Participant's account whether the balance has increased or decreased.

While return and expense ratios are commonly reported to the public as percentages, they are presented as decimals in Investment Opportunities and spreadsheets. For example, VFIAX's return ratio for year 3 in decimal form was .0884 (C5), whereas it was publicly reported as 8.84%. Ratios are converted from

percentages to decimals because, as demonstrated in **Appendix 1**, decimals accommodate translation of ratios to dollars.

More Cash translates ratios to dollars a step at a time in spreadsheets beginning with Periodic Investment Dollars (PI$) and years (Y) until cash is withdrawn. See, columns G and H.

Periodic Invested Dollars (PI$) and Expected Number of Investment Years (Y)

PI$ and Y are ***decisions made by a Participant***:

> **PI$** is exemplified with $10,000 in column G. A Participant's PI$ may be more or less and he may change it over time.[15] To evaluate funds from a Participant's perspective, PI$ should be the same for each fund. We typed $10,000 in G5 then highlighted the $10,000 in G5 down the empty cells from G6 to and including G21. The result is that $10,000 was copied in cells G6 through G21.
>
> **Y** is exemplified with 10 years in column H. A participant's Y may be more or less and he may change it over time. To evaluate all funds from a Participant's perspective, Y should be the same for each fund.

Assignment of PI$ and Y consistently to all funds is essential to identification of profitable funds. The spreadsheets can easily accommodate PI$ and Y other than $10,000 and 10 years as long as the choices are consistently applied to all funds under consideration. A specific dollar amount for PI$ as well as a specific number of years for Y is, in a sense, arbitrary. For example, a Participant's choices could have been $6,000 annual contribution for 30 years or $15,000 annual contribution for 22 years. They would not change the identification of profitable funds as long as they are consistently applied to each fund. **A**

Participant's personal PI$ and Y make the calculations and spreadsheets relevant to his unique financial circumstances.

Expect Change

Return ratios change constantly as the underlying fund investments in stocks and bonds change. Expense ratios change when fund costs change, like charges incurred to buy and sell investments. In other words, mutual fund profitability is a function of changing returns and expenses. And, like a picture, a snap-shot is taken from time-to-time.

Performance Expressed Mathematically and Embedded in Spreadsheet Cells

The details of Ci and Co are expressed in formulas and organized in **BULL.xlsx** columns I through O. The formulas require no more knowledge than addition, subtraction, multiplication, and division. **Appendix 1** provides details *how to calculate* the performance measures. **Parts 2** and **3** provide details *how to apply* them to identify profitable funds.

Conclusion

Part 1 discussed three key ideas that guide identification of profitable funds. First is grouping funds. Second is specifying performance measures and related principles. And third is organizing performance measures in a spreadsheet.

Participants can evaluate their own funds by (1) creating spreadsheets with the formulas presented in **Appendix 1** or (2) substituting their ratios, PI$, and Y in ***More Cash's*** spreadsheets as shown in **Part 2**.

Part 2

Profitable Mutual Funds

Each mutual fund is evaluated with return and expense ratios and the set of performance measures and principles. They answer two questions: (1) which fund was the most profitable in each group, and (2) what would they have implied for a Participant Account Balance (PAB)?

A Way To Start

Go to **BULL.xlsx** column L, and identify the fund with the largest Ci.

It is **VSMAX** whose Ci was $97,449 (L11) *over the 10-year period*. As a **Small Cap** fund, VSMAX generally invested in stocks whose market cap is between $250 million and $2 billion.

> **Sidebar:** Notice that VSMAX also reported the largest Average Return Ratio at .1208 (J11). As demonstrated throughout ***More Cash***, Ci is a mathematical function of its empirical ARR.

DHSIX is also a Small Cap. Its return ratios implied Ci would have been $73,744 (L10) *over the 10-year period*.

Because of the large difference in Ci, it may seem unnecessary to consider other performance measures and principles before making an investment decision. Simply choose VSMAX—*More Ci is better than less*. However, a choice may not always be this obvious, so withhold judgment.

For convenience, a review of Small Caps continues with performance measures repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
DHSIX	$73,744	$10,312
VSMAX	$97,449	$907

Furthermore, VSMAX's return ratios implied it would have earned about $.97 per dollar of investment *over the 10-year period*. (CiP = CI/TI$ where TI$ = $100,000 (column I)) On an *annual* basis, VSMAX's return on investment would have averaged about $.10 per dollar of investment (10%). (($97,449/$100,000)/10) Meanwhile, DHSIX's CiP would have earned about $.74 per dollar of investment over the 10-year period or annually about $.07 (7%).

VSMAX satisfies *More CiP is better than less.* Note that CiP is commonly known as return on investment (ROI). CiP is redundant in that Ci and CiP identify the same most profitable funds.

Co

VSMAX's implied Co of $907 (O11) was considerably less than DHSIX's Co of $10,312 (O10). *Less cash outflow is better than more* easily favored VSMAX. However, large performance differences should encourage a search for an explanation.

An Apparent Anomaly Worth investigating

DHSIX's implied Co ($10,312, O10) was ten times larger over the 10 years than VSMAXs Co ($907). Nevertheless, even if managers at DHSIX charged Participants nothing, its Ci would have been $84,056 ($10,312 + $73,744), still not earning as much as VSMAX's Ci. In other words, if DHSIX had not charged such high expenses, it still would not have earned a competitive Ci.

What explains the large difference in Co? Both invest in the same group of Small Caps, during the same time period, in the same economic environment. Are DHSIX's and VSMAX'S managerial tasks that much different from each other?

A relevant source of information is www.mutualfunds.com. Click on the website. Search for "VSMAX." Note VSMAX's full name is "Vanguard Small-Cap **Index Fund**." (Emphasis added.) Click on "Profile" and read "Fund Description" which is repeated below:

> The Fund employs an *indexing* investment approach designed to track the performance of the *CRSP US Small Cap* ***Index***, a broadly diversified index of stocks of small U.S. companies. *The Fund attempts to* ***replicate*** *the target* ***index*** by investing all, or substantially all, of its assets in the stocks that make up the Index, *holding each stock in approximately the same proportion as its weighting in the Index*.[16] (Emphasis added.)

An index like *CRSP US Small Cap Index*, is a well-defined list of similar companies. An index fund is also called a passively managed fund. VSMAX is said to mimic (mirror or replicate) *CRSP US Small Cap Index*. Mimicking an index can be computerized and is typically ***less expensive*** than a labor-intensive search for superior performing individual Small Cap companies. When a Participant invests in VSMAX, he invests in hundreds of Small Caps listed on the index that generally invests in stocks of corporations valued between $250 million and $2 billion. An index fund is also called a passively managed fund.

Do the same kind of search at www.mutualfunds.com for "DHSIX." Note DHSIX's full name is Diamond Hill Small Cap Fund. Click on "Profile" and read "Fund Description" which is repeated below:

> [DHSIX management (the "Adviser") invests in Small Caps he] *believes are undervalued… The Adviser focuses on estimating a company's value independent of its current stock price.* To estimate a company's value, the Adviser concentrates on the fundamental economic drivers of the

> business… *The **Adviser relies on individual stock selection*** and discipline in the investment process… *Once a stock is selected, the Adviser* **continues to monitor the company's strategies, financial performance and competitive environment.**[17] (Emphasis added.)

A **managed fund**, like DHSIX, is also called an actively managed fund. Mutual Fund Managers at DHSIX choose among hundreds of Small Cap companies they think have the highest potential profit. In effect, they try to "beat the [small cap] market." A consequence is that analysis of many individual companies is time-consuming and therefore expensive. Consistently "beating the market" by earning higher returns than an index is very difficult. **In fact, research suggests index funds usually outperform actively managed funds.**

> Actively managed funds in the United States missed the market index benchmark 88.4% of the time over the last 15 years. Large-cap funds fared worse than mid-caps and small-caps, with 87.7% underperforming the benchmark. Mid-cap and small-cap funds each missed the index 82.2% of the time.[18]

VSMAX and DHSIX exemplified this generalization.

The Selected Small Cap

Given ***More Cash's*** performance measures and principles, VSMAX would have been, *at the reported date of the ratios*, the preferred Small Cap. It is the Participant's first selected investment. See, P11.

Participant's Choice

Since VSMAX reported the best Ci of funds listed in Investments Opportunities, the Participant might be tempted to invest his entire annual contributions in VSMAX. Limiting investments to Small Caps may, however, be a risky strategy. As demonstrated later, when the market shifted to a bear market, it lost the top earnings position but continued to be profitable.

Given that investing in VSMAX constitutes financial diversification in Small Cap companies, a Participant might expect to enhance his overall diversification by investing in funds other than Small Caps. If so, he would anticipate investing in the most profitable funds of other groups. Assume, therefore, he allocates $3,000 of his $10,000 periodic investment to VSMAX, 30% of his annual investment. See, Q11.

Thirty percent is a judgment—call it a weight. The decision is supported on the basis that VSMAX reported the best performance not just of Small Caps but of all the Investment Opportunities. Participants can choose any weight to allocate their investments and can change them.

An investment in VSMAX of $3,000 per year for 10 years implies its Ci would have been $29,235 (U11). VSMAX's Ci would have contributed $29,235 to the Total Cash Inflow (TCi) of $85,701 (U23). TCi plus the Participant's TI$ of $100,000 (S23) would have been the Participant Account Balance (PAB) of $185,701 (R23) **before taxes and inflation**.

> ***Sidebar:*** *A review of* ***BULL.xlsx*** *reveals that the formulas used to identify the most profitable funds from each group are also used to calculate the implied monetary consequences of investing in the selected funds. Compare formulas in columns K, L, and O, with formulas in columns R, U, and V.*
>
> *Furthermore, it is easy to change the amount allocated to the selected funds and observe the consequences. A* ***what if*** *opportunity. Here's how to think about it: after allocating contributions to the selected funds in each group, consider different allocations to get an idea of the consequences. For example, what happens to the magnitude of a Participant Account Balance, (R23 or S23 + U23) when changes are made to various PI$s in column Q. Consideration of alternative opportunities offers a chance to assess whether the proposed annual allocations were likely to create sufficient wealth for retirement.*

Large Caps

MEIKX earned the next largest Ci. It is a Large Cap generally defined as investing in corporations valued more than $10 billion. Other Large Caps are VFIAX and HACAX. For convenience, Large Cap performance measures are repeated here:

TICKER	Ci (L)	Co (0)
VFIAX	$81,239	$518
MEIKX	$85,508	$5,491
HACAX	$46,545	$5,493

HACAX

HACAX's return ratios imply considerably less Ci ($46,545) and CiP ($.47) than VFIAX's or MEIKX's. HACAX's Co is also as large as MEIKX's Co but much larger than VFIAX's. Given HACAX's poor performance, it is easy to exclude from further consideration. That leaves VFIAX and MEIKX competing for investment dollars.

MEIKX and VFIAX

Ci and CiP favors MEIKX ($85,508, $.86) over VFIAX ($81,239, $.81) but not by much. In other words, MEIKX would have increased a Participant's wealth from $100,000 (TI$, I6) to $185,508 (RI$, K6) while VFIAX would have increased his wealth from $100,000 (I5) to $181,239 (K5).

Ci and CiP slightly favor MEIKX. However, VFIAX's ratios imply its Co would have been $518 (O5) over the 10 years, while MEIKIXs ratios imply Co of $5,491 (O6). MEIKIX's Co is ten times larger than VFIAXs! *Less cash outflow is better than more* favors VFIAX.

Given the significant differences in Co witnessed with Small Caps, a Participant might suspect that VFIAX is an index fund and MEIKX is a managed fund. An internet search confirms the suspicion. VFIAX mimics stocks listed on the Standard and Poor's 500 Index, which includes approximately 500 of the largest and most successful U.S. companies. It is designed to mirror the performance of the S&P 500 Index. On the other hand, managers at MEIKX invest in Large Caps they predicted would be the most profitable. As previously mentioned, research indicates managed funds are *unlikely* to outperform index funds. Will MEIKX's managers continue to outperform VFIAX's performance?

MEIKX's future performance depends on the consistent stock-picking skills of its managers. Of course, management changes from time to time, maybe often. That adds risk MEIKX may not continue its competitive performance.

All in all, given the excellent performance of MEIKX and VFIAX, the Participant is assumed to spit his planned $2,500 investment for Large Caps, $1,250 per year for 10 years in MEIKX (Q6) and $1,250 per year for 10 years in VFIAX (Q5). The investments imply that MEIKX's Ci would have been $10,689 (U6) and VFIAX's Ci would have been $10,155 (U5). They contribute **$20,843** to the TCi of $85,701 (U23).

Alternatively, the Participant might discount the research, eliminate the $1,250 allocation to VFIAX, allocate $2,500 to MEIKX, and let the spreadsheet rerun the numbers. Or, he might choose some other allocation.

Balanced Funds

DODBX was the third most profitable fund with Ci of $83,374 (L12). It invests in stocks and bonds. Since Retirement Date (Target-Date) Funds also invest in stocks and bonds, VTHRX-2030 is grouped with Balanced Funds. 2030 designates the approximate year in which a Participant expects to retire. VFIFX-

2050 (A30), for example, would indicate the Participant expects to retire in the 2050 time-frame.[19]

Retirement Date Funds gradually transition from stocks to bonds—reputedly from relatively risky to less volatile investments—as a Participant approaches retirement.[20] It is promoted as a "set and forget" investment strategy. A Participant who prefers not to make investment decisions might invest exclusively in a relevant Retirement Date Fund. Convenience, however, may not be a profitable strategy. For example, compare Ci of VTHRX-2030 at $45,575 (L21) to other funds in column L. *More net cash is better than less* relegates VTHRX-2030 to ninth place.

Although a Participant can invest in a Retirement Date Fund along with other funds, ***More Cash*** focuses on identifying the most profitable Balanced Fund, including VTHRX-2030. Their implied performance measures are repeated here:

TICKER	NC (L)	Co (O)
DODBX	$83,374	$5,642
SKIRX	-$576	$5,575
VTHRX-2030	$45,575	$1,240

SKIRX incurred negative Ci. The Participant's wealth (capital) would have decreased from $100,000 (I13) to $99,424 (RI$, K13). In other words, he would have incurred negative CiP (-$.01). SKIRX would have charged the Participant $5,575 (Co) which in effect reduced the Participant's wealth. If SKIRX charged the Participant nothing, it would, nevertheless, not have made SKIRX competitive. The Participant's implied Ci would have been $4,999 ($5,575 - $576) and his wealth would have increased from $100,000 to $104,999—irrelevant in comparison to DODBX's and VTHRX-2030's Ci performance. As if SKIRX's negative Ci were not concern enough, its poor performance occurred

during a **bull market!** The Participant would have excluded SKIRX from further consideration.

That left DODBX and VTHRX-2030. In DODBX's favor was its Ci ($83,374, L12) which was about 84% larger than VTHRX-2030's Ci ($45,575, L21). DODBX would have increased the Participant's wealth to $183,374 (RI$, K12) whereas VTHRX-2030 would have increased his wealth to $145,575 (RI$, K21). However, VTHRX-2030's Co of $1,240 (O21) was much less than DODBX's at $5,642 (O12). VTHRX-2030 invests in *several* index funds each of which charges its own expenses.[21] If, however, VTHRX-2030 had charged nothing, DODBX's Ci would still have been about 78% larger than VTHRX-2030's Ci. Costs in this case would not have made a difference in comparative profitability.

A Participant might ask, is DODBX's potential for considerably greater Ci enough to offset VTHRX-2030's Co and index advantages? If the Participant does not expect to retire for many years, DODBX's favorable Ci may seem the most important performance measure. Consider *Dow Jones Industrial Averages, 1896 – 2016*.[22] Click on it to see an enlarged chart.

Regardless of market declines over the past hundred years, and there were many, the historic direction of the Dow is up. NASDAQ and S&P 500 also hover around all-time highs. When all is said and done, only the Participant knows his tolerance for potential adverse economic events.[23]

Given time until retirement, the Participant, we assume, may prefer the potential for considerably greater Ci, is less concerned about economic downturns, and chooses to invest in DODBX.

An investment of $2,000 (Q12) per year for 10 years *implies* DODBX's Ci would have been $16,675 (U12).

> **Sidebar:** A Participant who does not mind making investment decisions may rebalance his investments from stock to bond funds as he gets close to retirement like a Retirement Date Fund. He can take advantage of investing in higher returns generally expected from equity funds then convert them to bond funds near retirement and hopefully escape volatility of equity funds. However, given an expectation of long-life *during* retirement (don't smoke, exercise regularly, eat wisely, etc.), extensive rebalancing may not be the best investment strategy.

Participants may not favor giving up additional earnings implied by equity funds or running out of money during retirement.

Mid Caps

VIMAX earned the next largest Ci. It and **ARTMX** invest in corporations generally valued between $2 billion and $10 billion. Their ten-year implied performance measures are repeated next:

TICKER	Ci (L)	Co (O)
ARTMX	$35,911	$9,438
VIMAX	$77,627	$813

VIMAX's return ratios implied better than twice the Ci and CiP than ARTMX's. VIMAX would have increased the Participant's wealth from $100,000 (TI$, I9) to $177,627 (RI$, K9) while ARTMX would have increased his wealth from $100,000 to $135,911 (K8). VIMAX was also less expensive than ARTMX. Its Co, $813 (O9), was smaller than ARTMX's at $9,438 (O8).

VIMAX's Co signals it is an index fund. In fact, it tracks the CRSP US Mid Cap Index.[24] Even though ARTMX's Co is 10 times larger than VIMAX's, if it charged Participants nothing, it would still not have Ci close to VIMAX's. [($35,911 + $9,438) < $77,627]

This is a straightforward choice. VIMAX exhibited all-round better performance than ARTMX. An investment in VIMAX of $2,000 (Q9) per year for 10 years *implies* its Ci would have been $15,525 (U9).

Bond Funds

DODIX, **VBTLX**, **HWHAX**, and **BPRIX** invest in debt instruments ranging from investment grade to speculative bonds. Their ten-year performance measures are repeated next

TICKER	Ci (L)	Co (O)
DODIX	$28,214	$3,132
VBTLX	$18,029	$396
HWHAX	$68,455	$9,375
BPRIX	$15,540	$2,275

Conventional wisdom is that bond values tend to decrease when stock values increase and vice versa which should advance financial diversification. But which Bond Fund should a Participant choose? HWHAX's ratios imply considerably larger Ci and CiP than the other bond funds but considerably larger Co.

VBTLX's relatively small Co of $396 (O15) signals it is an index fund. In fact, it tracks the Bloomberg U.S. Aggregate Float Adjusted Index. Its small Co does not, however, overcome the disadvantage of its low Ci of $18,029 (L15). VBTLX's Ci is about a fourth of HWHAX's Ci.

However, something does not seem quite right about HWHAX's performance measures when compared to other bond funds. HWHAX's Ci and Co seem quite a bit different. So much so that it warrants a search for an explanation. According to HWHAX's fund description,[25] it invests in bonds classified as ***speculative***, popularly known as ***junk*** bonds. Standard and Poor's, a credit-rating agency, assigns speculative grade to low credit-quality bonds. In other words, they have a greater chance of default, i.e., not paying their obligations, than investment grade bonds. Junk bonds offer higher interest rates to compensate for higher risk and to attract investors. Furthermore, investors are aware that it is highly unlikely that all investments in any mutual fund would fail, even a junk Bond Fund like HWHAX. HWHAX would, nevertheless, be expected to earn greater returns to compensate for its junk status. And it does. HWHAX would have increased Participant's wealth from $100,000 (TI$, I16) to

$168,455 (RI$, K16) while the second most profitable Bond Fund, DODIX, would have increased his wealth from $100,000 (I14) to $128,214 (K14).

As previously noted, it is assumed that the Participant exemplifies an investor with time to recover from potential losses. With an eye to financial diversification, assume the Participant annually invests $500 (Q16) in HWHAX, a small percentage (5%) of his annual contributions. The investment *implies* Ci would have been $3,423 (U16).

The Participant might consider an alternative strategy. Balanced Funds, like DODBX, include both stocks and bonds. Since DODBX has better implied Ci than HWHAX with approximately half the Co, he might invest a portion of his annual bond contribution in DODBX. A visit to mutualfund.com reports that DODBX invested approximately a third of its assets in bonds. Try assigning some or all of HWHAX's contribution in DODBX to see the difference in Ci. Then consider whether giving up some diversification would be worth the potential for greater Ci. A ***what if*** opportunity.

Foreign Funds

RERGX, **VREMX**, and **TCIEX** are international funds, i.e., they invest in non-U.S. companies. Their implied performance measures are repeated next.

TICKER	Ci (L)	Co (O)
RERGX	$15,669	$3,269
VREMX	$10,439	$7,491
TCIEX	$10,347	$368

Foreign Funds earned very poor Ci. Compare the performance of Foreign Funds to the performance of previously selected funds:

TICKER (Selected Funds)	Ci (L)	Co (O)
VFIAX	$81,239	$518
MEIKX	$85,508	$5,491
VIMAX	$77,627	$813
VSMAX	$97,449	$907
DODBX	$83,374	$5,642
HWHAX	$68,455	$9,375

The differences are best understood with Ci. Foreign Funds imply considerably less Ci than any of the selected funds. For example, Ci of the *best* Foreign Fund was about 23% of the Ci of the *worst* selected fund ($15,669/$68,455). The implied performance of the Foreign Funds is worse when the economy enters a bear market as reported in **Part 3**.

Assume the Participant invests in none of the Foreign Funds.

In this circumstance, Participants should ask their Sponsor whether there are better Foreign Funds than those offered in Investment Opportunities. Sponsors are obligated periodically to assess the funds and replace poor performers.[26] The issue is considered in detail in **Appendix 3**.

Were the Most Profitable Mutual Funds Identified?

An assessment of the Investment Opportunities is completed. Were the questions asked at the beginning of **Part 2** answered?

The first question was, which were the most profitable mutual funds in each group? They were VFIAX, MEIKX, VIMAX, VSMAX, DODBX, and HWHAX. RERGX

was the most profitable Foreign Fund but since its performance was so poor the assumption was the Participant did not select it.

The second question was, what would the selection of the most profitable funds imply for a Participant Account Balance (PAB), i.e., Total RI$, R23, over the 10-year period?

Participant Account Balance offers a sense of earnings and wealth over time. It is not a prediction. PAB is detailed in terms of an equation:

PAB = TCi + TI$
Total Ci and TI$ are reported in cells U23 and S23, respectively.

PAB is calculated as follows:

PAB = TCi + TI$
= $85,701 + $100,000
= $185,701

Alternatively, PAB would have been equal to Total RI$, $185,701 (R23).

From another perspective, a Participant would have earned an implied average annual return of 8.6% during the 10-year period (($85,701/$100,000)/10).

Compare…
… the above PAB to another PAB that does not apply ***More Cash's*** performance measures and principles. Assume, for example, he applies **intuition** or suggestions from a less than competent advisor.

BULL.2.xlsx recounts an intuitive Participant's choices and consequences. It includes the same information as **BULL.xlsx** in columns A through O. But,

BULL.2.xlsx is used exclusively to monetize an intuitive Participant's choices in columns P through V. In other words, the intuitive Participant does not know the analysis done in columns A through O nor does he apply ***More Cash's*** performance measures and principles.

Consider two scenarios.

(1) Assume the intuitive Participant invests $1,250 (Q7) in HACAX (P7); $1,250 (Q8) in ARTMX (P8); $2,000 (Q10) in DHSIX (P10); $3,000 (Q13) in SKIRX (P13); $2,000 (Q17) in BPRIX (P17); and $500 (Q19) in VREMX (P19).

What are the consequences?

The intuitive PAB, shown in **BULL.2.xlsx**, is $128,513 (R23). It is equal to Total Ci of $28,513 (U23) plus TI$ of $100,000 (S23).

$$\begin{aligned} PAB &= TCi + TI\$ \\ &= \$28,513 + \$100,000 \\ &= \$128,513 \end{aligned}$$

The intuitive Participant would have earned an implied average annual return of 2.8 % during the 10-year period (($28,513/100,000)/10) as compared to an implied annual average return of 8.6 % over the same 10-year period when applying ***More Cash's*** performance measures and principles.

(2) Assume the intuitive Participant, for whatever reasons, chose to invest all his contributions over the 10-year period in VSMAX which would imply a PAB of $197,449 (K11 or O11 + I11). Although he ignores the benefits of diversification, his implied Ci would have been $11,748 greater than the implied Ci deduced from the selected funds in **BULL.xlsx** ($97,449 (L11) – $85,701

(U23)). His implied average annual return would have been 9.7 % during the 10-year period (($97,449/$100,000)/10) and would have beaten the returns implied by ***More Cash's*** performance measures and principles.

Which roll of the dice should we expect from the intuitive Participant?

From Bull to Bear Market

So far, mutual fund assessments occurred during a bull market. Bull markets are favorable economic environments. Stocks and bonds, and by extension mutual funds, generally perform better during a booming economy. **Part 3** evaluates the mutual funds during a bear market.

Conclusion

Mutual funds report performance in terms of return and expense ratios. They are, as observed in the **Introduction**, difficult to interpret and compare. Translation of ratios to dollars and applications of performance measures and principles in **Part 2** facilitated identification of the most profitable funds.

Investment Opportunities in **Part 2** were evaluated during a decade-long bull market. It was one of the longest and most robust economies on record. Return ratios and consequently the translations to dollars were at the time at all-time highs.

Mutual fund ratios change as market values of stocks and bonds change and Mutual Fund Manager's charges for their services change. Sometimes they change dramatically. **Part 3** identifies the most profitable funds when ratios change during a turbulent economic environment. Are the funds identified as most profitable during a booming economy the same during an economic downturn?

Part 3

Bulls to Bears

"Buy low and sell high?"
A Bear-Participant buys low.

As mutual fund return and expense ratios change, fund profitability changes. For example, when an economy transitions from a bull to a bear market, expect return ratios and, therefore, profitability to decline. Of particular interest: Are the most profitable funds identified during a bull market the most profitable during a bear market?

What if . . .

. . . a Participant started work during a significant economic downturn? Assume the Sponsor offered him the Investment Opportunities shown in BEAR.xlsx.

Note that the funds are the same as were offered to the Sponsor's other employees during a bull market. The difference is return and expense ratios are updated to reflect the economic downturn.

Selecting Profitable Funds During a Bear Market

To compare bull and bear market performance, assume the Participant planned to invest $10,000 per year for 10 years. See columns G and H. The selection of the most profitable funds begins with Large Caps.

Large Caps

The implied Ci and Co are repeated from **BEAR.xlsx** rows 5, 6, and 7, columns L and O:

TICKER	Ci (L)	Co (O)
VFIAX	$30,592	$588
MEIKX	$25,038	$6,400
HACAX	-$43,962	$3,728

For ease of reference, the implied bull market performance measures will be repeated below the bear market performance measures. The following are the Large Cap performance measures repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
VFIAX	$81,239	$518
MEIKX	$85,508	$5,491
HACAX	$46,545	$5,493

All Large Cap performance measures plummeted, HACAX considerably more than either VFIAX or MEIKX.

HACAX was the worst Large Cap during the bull market and is the worst during the bear market. Its bear market ratios implied Ci would have been negative, that is, -$43,962 (L7). Negative Ci would have reduced the Participant's wealth from $100,000 (TI$) to $56,038 (RI$, K7). In short, for every dollar the Participant invested, he would have lost about $.44.

Consider MEIKX's weakness. Its Co is better than ten times VFIAX's Co, i.e., $6,400 versus $588. As a managed fund, its poor cost performance was expected when compared to Co of an index fund like VFIAX. In effect, MEIKX's much larger Co reduced the amount going to Participants and hurt its Ci comparative performance. If, during the bear market, it's Co had been about the same amount of VFIAX's Co, its Ci would have been about the same amount as

VFIAX's Ci. Their Participants would have benefited as did VFIAX's. Keep in mind, what goes to Fund Managers does not go to Participants.

Regardless, VFIAX's and MEIKX's bear market ratios implied their Ci would have been positive, earning $30,592 (L5) and $25,038 (L6), respectively. Their RI$ would have increased Participant wealth to $130,592 (K5) and $125,038 (K6), respectively. Or, stated differently, VFIAX's average annual rate of return would have been approximately 3.1% (($30,592/$100,000)/10) and MEIKX's would have been approximately 2.5% (($25,038/$100,000)/10). All in all, both exhibited similar performance during a bear market and much better than other funds listed on Investment Opportunities.

Given MEIKX's and VFIAX's performance, especially when considering the majority of funds whose returns imply negative Ci (column L), the Participant may invest in both funds regardless that there may not be much diversity in this choice.

Mid Caps

The Mid Cap ratios implied the following performance measures and are repeated from **BEAR.xlsx**, rows 8 and 9, columns L and O.

TICKER	Ci (L)	Co (O)
ARTMX	-$41,758	$6,752
VIMAX	$21,760	$683

Their bull market ratios implied the following performance measures and are repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
ARTMX	$35,911	$9,438
VIMAX	$77,627	$813

Both Mid Caps showed considerably worse performance during the bear market. VIMAX again clearly outperformed ARTMX.

ARTMX's bear market ratios implied its Ci was negative, that is, it lost $41,758 (L8). Its negative Ci reduced the Participant's wealth from $100,000 (TI$, I8) to $58,242 (RI$, K8). In short, for every dollar the Participant invested in ARTMX, he would have lost about $.42.

VIMAX's bear market ratios implied it earned Ci of $21,760 (L9). Its Ci would have increased the Participant's wealth from $100,000 (TI$, I9) to $121,760 (RI$, K9). Another way of looking at it, VIMAX's CiP would have been $.22 over the 10-year period or an average annual rate of return of 2.2% (($21,760/$100,000)/10). VIMAX's Co signals it is an index fund and has, according to research, the potential to continue outperforming ARTMX, an actively managed fund.

The bottom line, the Participant would have invested in VIMAX.

Small Caps

The Small Cap ratios implied the following performance measures and are repeated from **BEAR.xlsx**, rows 10 and 11, columns L and O.

TICKER	Ci (L)	Co (O)
DHSIX	-$22,940	$8,485
VSMAX	$19,070	$600

Their bull market ratios implied the following performance measures and are repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
DHSIX	$73,744	$10,312
VSMAX	$97,449	$907

VSMAX dropped from the highest Ci of the Investment Opportunities to fourth place behind VFIAX, MEIKX, and VIMAX. Furthermore, both Small Caps showed considerably worse performance. However, VSMAX again outperformed DHSIX.

DHSIX's bear market ratios implied its Ci was negative, that is, it lost $22,940 (L10). Its Ci would have reduced a Participant's wealth from $100,000 (TI$, I10) to $77,060 (RI$, K10). In short, for every dollar the Participant invested, he would have lost about $.23 over the 10-year period.

VSMAX's bear market ratios implied it would have earned Ci of $19,070 (L11). Its Ci would have increased a Participant's wealth from $100,000 (TI$, I11) to $119,070 (RI$, K11). Another way of looking at it, VSMAX's CiP was $.19 over the 10-year period or an average annual rate of return of approximately 1.9% (($19,070/$100,000)/10).

The Participant might choose to invest in VSMAX.

Balanced and Target Date Funds

DODBX's, SKIRX's and VTHRX-2030's ratios implied the following performance measures and are repeated from **BEAR.xlsx**, rows 12, 13 and 21, columns L and O:

TICKER	Ci (L)	Co (O)
DODBX	-$14,060	$5,345
SKIRX	-$47,157	$5,100
VTHRX-2030	-$13,241	$377

Their bull market ratios implied the following performance measures and are repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
DODBX	$83,374	$5,642
SKIRX	-$576	$5,575
VTHRX-2030	$45,575	$1,240

All the funds showed considerably worse performance. All incurred negative Ci and would have reduced a Participant's wealth (RI$).

Assume the Participant would, for the time being, pass on investing in any of them.

Bond Funds

Bond Fund ratios implied the following performance measures and are repeated from **BEAR.xlsx**, rows 14 through 17, columns L and O:

TICKER	Ci (L)	CO (O)
DODIX	-$23,454	$3,829
VBTLX	-$26,162	$355
HWHAX	-$26,456	$7,048
BPRIX	-$25,271	$2,642

Their bull market ratios implied the following performance measures and are repeated from **BULL.xlsx**:

TICKER	Ci (L)	Co (O)
DODIX	$28,214	$3,132
VBTLX	$18,029	$396
HWHAX	$68,455	$9,375
BPRIX	$15,540	$2,275

All Bond Funds showed considerably worse performance. All incurred negative Ci and would have reduced a Participant's wealth (RI$).

Assume the participant would, for the time being, pass on investing in Bond Funds.

Foreign Funds

All Foreign Funds showed considerably worse performance. They all incurred negative Ci. VREMX, for example, scored the worst Ci of any fund listed in Investment Opportunities, i.e., -$51,013 (L19). It would have reduced a Participant's wealth (RI$, K19) by more than half!

Assume the Participant would, for the time being, pass on investing in Foreign Funds.

Applications of ***More Cash*** performance measures and principles during the bear market identified VFIAX, MEIKX, VIMAX and VSMAX as the most profitable funds. Note that three of the four, VFIAX, VIMAX, and VSMAX, were index funds. Furthermore, all four funds were identified as the most profitable funds during the bull market.

What if . . .

. . . a Participant invested annual contributions of $10,000 for 10 years in the four profitable bear market funds as follows: $3,000 each to VFIAX and MEIKX and $2,000 each to VIMAX and VSMAX? Open BEAR.2.xlsx. What would the implied amount have been in his PAB?

At the end of 10 years, the Participant would have had an implied balance of $124,855 (R23), ***before taxes and inflation***. PAB would have been composed of Total Ci, $24,855 (T23) and TI$, $100,000 (S23). The Participant would have earned an implied average annual return of 2.5% (($24,855/$100,000)/10).

The implied average annual returns during bull and bear markets were 8.6 % and 2.5%, respectively. As expected, the bull market returns were considerably larger than the bear market returns.

It is worthwhile to repeat that four of the best funds during the bull market were also the best during the bear market. They were VFIAX, MEIKX, VIMAX, and VSMAX. Although their best in-group performance may not continue in the future, the Participant can, nevertheless, monitor performance real-time with ***More Cash*** measures and principles.

Buy Low

Timing a market downturn may have been unpredictable, but it may also have been an opportunity. Remember the adage, "Buy low and sell high?" Half the adage was satisfied: the Participant is buying low when he starts investing in VFIAX, MEIKX, VIMAX, and VSMAX during the bear market. If the market rebounds as it has done in the past, the Participant stands to earn a substantial return on his investments.

Conclusion

Review of Fundamentals

Three fundamentals guided identification of the most profitable mutual funds.

I. First was the common practice of grouping mutual funds. The Investment Opportunities in ***More Cash*** were grouped into Large Cap, Mid Cap, Small Cap, Balanced, Bond, Foreign, and Target-Date funds.

II. Second were two mutual fund performance measures and principles:

1. Cash inflow (Ci): More cash inflow is better than less. Ci is commonly understood as earnings;

   Corollary: Cash inflow per dollar of investment (CiP = Ci/TI$)—More cash inflow per dollar of investment is better than less. Also known as Return on Investment (ROI).

2. Cash Outflow (Co): Less cash outflow is better than more. Co is commonly understood as costs or expenses.

III. Third was translation of fund ratios to dollars organized in a spreadsheet and identification of the most profitable funds in each group. The spreadsheets did the calculations.

Also investigated was what happens when ratios change. It was exemplified with an economic downturn from a bull to a bear market. Regardless of whether change is dramatic, periodic monitoring of fund performance is the watchword.

Costs not Incurred by Mutual Fund Managers: Taxes and Inflation

Issues not previously discussed include: (1) expenses not incurred by Mutual Fund Managers but nevertheless charged to retirement accounts and (2) taxes and inflation.

1. There are fees incurred by Participants or Sponsors other than the expenses charged by Mutual Fund Managers. A common example is a fee charged by Providers. They help Sponsors select a lineup of mutual funds from the thousands of available funds. They also furnish administrative services, including bookkeeping, compliance with government regulations, and providing Participants computer access to their accounts.

   If a Sponsor does not pay the Provider's fee, it is paid from Participants' accounts. The fee may differ from one tax-deferred program to another and reduce a Participant's account balance. If the fee was included in ***More Cash*** analysis, it would complicate the spreadsheets but not change the selection of the most profitable funds.

2. The amount in a Participant's account is composed of pre-tax earnings and pre-tax investments. They have less purchasing power because of taxes and inflation. Taxes and inflation come into play when money is withdrawn from an account, not when identifying the most profitable funds. Since our goal is to identify the most profitable mutual funds when purchased or monitored over time, accounting for taxes and inflation was not needed. Of course, they are relevant when budgeting for retirement or when cash is withdrawn.

Taxes and inflation can be incorporated in the spreadsheets but they would unnecessarily add layers of unique assumptions and calculations but would not change identification of the most profitable funds.

Appendix 1

Measures Expressed Mathematically Embedded in Spreadsheet Cells

Performance measures—Cash inflow (Ci) and Cash outflow (Co)—are expressed with formulas and embedded in spreadsheet cells. The formulas are introduced in this Appendix in both *traditional* and *spreadsheet notation*. They appear in *traditional notation* on row 2 of the spreadsheets and in *spreadsheet notation* on the ***fx*** line at the top of the spreadsheets and embedded in spreadsheet cells. *Traditional notation* is offered to help Participants transition to *spreadsheet notation*.

The formulas enable a Participant to create his own spreadsheets. Alternatively, a Participant has the option to exchange ***More Cash's*** spreadsheet tickers and ratios for his tickers and ratios. He can also use a formulas-ready spreadsheet: SPREAD.xlsx.[27] Although other spreadsheets included in ***More Cash*** can be used with the reader's mutual funds of interest, SPREAD.xlsx is less cluttered.

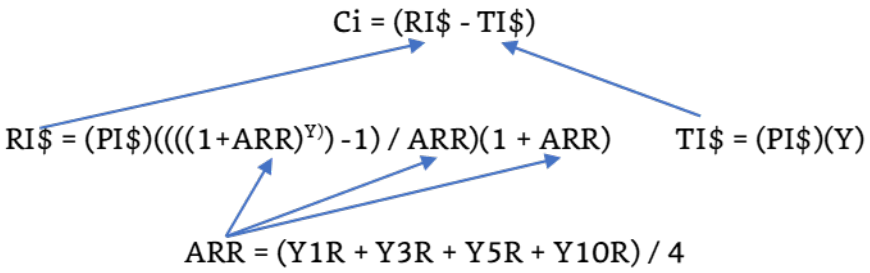
Each mutual fund in ***More Cash*** is evaluated with (1) its return ratios for Y1, Y3, Y5, and Y10, (2) its expense ratio, and (3) performance measures and principles: more Ci and less Co the better.

Part 1 began construction of **BULL.xlsx** with columns A through H. It included tickers, return and expense ratios, as well as a Participant's annual investment (PI$) and number of invested years (Y). Appendix 1 continues with Ci formulated in columns I through L. Return to **BULL.xlsx** and follow its further development.

Cash Inflow Expressed Mathematically

Ci is the most important mutual fund performance measure. It is expressed in *traditional* ***notation*** as Return and Invested Dollars (RI$) less Total Invested Dollars (TI$): Ci = (RI$ - TI$).

The Ci is unpacked in **five Steps**:



Step 1: Begin with TI$ at the far-right side of the equation. TI$ is the product of Periodic Invested Dollars (PI$) and Years (Y), columns G and H, respectively. TI$ is the total amount a Participant is assumed to contribute (invest).

VFIAX, the first fund listed on row 5, illustrates calculations beginning with TI$, $100,000 (I5). **BULL.xlsx** expresses TI$ in *spreadsheet notation*: =(G5*H5) Click on I5 and see =(G5*H5) on the function line, *fx*, at the top of the spreadsheet. It instructs the spreadsheet to multiply (*) the amounts in cells G5 and H5 and place the product, $100,000, in cell I5. TI$ expressed in *traditional notation* is TI$ = (PI$)(Y) = ($10,000)(10). Both notations produce the same result, $100,000.

Since identification of the most profitable funds assumes TI$ should be the same for each fund, copy $100,000 to the other funds in column I. **Here's how to copy:** Highlight $100,000 in cell I5 and continue the highlight down all empty cells to and including I21. TI$, $100,000, and the *appropriate formulas,* are now embedded in column I for each fund. For example, the appropriate

formula and amount to calculate MEIKX's TI$ in cell I6 is *=(G6*H6)* and $100,000 and to calculate HACAX in cell I7 is *=(G7*H7)* and $100,000*, etc*.

Use the copy function to complete calculations of the remaining columns as they are introduced.

Step 2: ***More Cash*** averages return ratios and reports them in column J as Average Return Ratio (ARR). Return to the Ci formula. ARR is equal to the sum of return ratios for Y1, Y3, Y5, and Y10 divided by 4: ARR = ((Y1 + Y3 + Y5 +Y10)/4.

Let's back up and discuss return ratios. ***More Cash*** offered intuitive notions of return ratios in Parts 1 and 2. Now consider where they come from and how are they calculated.

Y1 return ratio is calculated by a fund's Net Asset Value (NAV) at the end of a period minus NAV at the beginning of a period divided by the beginning period NAV. NAV is the sum of a fund's market prices of all its investments, like stocks and/or bonds and cash, less liabilities. For example, assume, for purposes of illustration, a fund's market values of all assets at a beginning of the year is $1,015M and the market values of all its investments at the end of the year is $1,129M, then its return ratio for the Y1 period would be: ($1,129M - $1,015M)/$1,015,M = .1122 or 11.2%.[28] If we had access to actual data, this is how VIMAX would have calculated its Y1 return ratio that appears in cell B9.

Y3, Y5 and Y10's return ratios are calculated differently. They are "annualized" calculations. "To find a mutual fund's annualized return, add the annual returns for every year within a specific time frame, such as three years, five years, or 10 years, and divide the total return by the number of years."[29]

Why not use just Y10 return ratio as a fund's ARR? It includes all ten years of annual returns to calculate Y10's annualized return. The short answer is, you can. Consider, however, reasons Y1, Y3, Y5 are in fact included in funds' financial reports along with Y10.

Like investors who typically study the market trying to estimate performance of future opportunities, ***More Cash*** assumes current conditions may be relatively more important than distant past conditions. ARR is a form of weighted average which "… puts more weight on recent data and less on past data…" and therefore "follows [current] prices more closely."[30]

So, by including all four reported return ratios in ARR, ***More Cash*** weights current years to favor more recent information. Readers are, nevertheless, free to use Y10 or any combination of returns Y1, Y3, Y5, and Y10 as the ARR. Since spreadsheets do the calculations, it is easy to try any combination of return ratios as an ARR.

Return to Ci formula and continue with a formal understanding of ARR.[31]

More Cash calculates ARR as follows:

ARR = (Y1R + Y3R + Y5R + Y10R) / 4. (J2)

VFIAX's ARR in *traditional notation* is (.1193+.0884+.1462+.0694)/4 = .105825. (J5)

VFIAX's ARR in *spreadsheet notation* is *=SUM(B5:E5)/4 = .105825.* (J5)

Alternatively, use *=AVERAGE(B5:E5)*.

"=SUM(B5:E5)/4" says add numbers in cells B5, C5, D5, and E5, then divide by 4. The result in cell J5 is .105825.

Copy J5 down to and including J21.

The copy function is at its most useful for this and later equations. When cell J5 is highlighted down to and including J21, each fund's *unique* Average Return Ratio is calculated. For example, click on MEIKX's ARR in cell J6. See .1099, which is equal to (.1425 + .0798 + .1482 + .0691) / 4. Also, when clicking on J6, the function line, ***fx***, reports *=SUM(B6:E6)/4*.

Step 3: Once ARRs are calculated, data is available to compute **Return and Invested Dollars (RI$)** with ***Value of an Annuity Due*, VAD:**

$$RI\$ = (PI\$)((((1+ARR)^{Y})-1)/ARR)(1+ARR). \quad (K2)$$

If a Participant is unfamiliar with VAD, ***More Cash*** presents how it works in detail with a common application, a savings account. Instead of periodic contributions to a mutual fund, periodic deposits are made to a savings account. Bank interest rates and deposits, *and* mutual fund ratios and contributions, can be monetized with VAD:

$$\text{Bank Balance} = (\text{Deposits})((((1 + r)^{y}) - 1) / r)(1 + r)$$

$$RI\$ = (PI\$)((((1+ARR)^{Y})-1)/ARR)(1+ARR)$$

VAD is mathematically the same whether applied to a mutual fund or a bank account. Bank Balance corresponds to RI$. Deposits correspond to PI$. Interest rate, r, corresponds to ARR.

Bank interest rates change over time as do ARRs. Both, however, are assumed to be constant for a given period of time. ***More Cash*** will also assume constant deposits and PI$.

VAD in detail: Assume a saver deposits $10,000 at the beginning of each year that pays 2% interest (r = .02) compounded annually for 3 years (y = 3).[32] How much would be in the account at the end of 3 years?

To see exactly how VAD works, the Bank Balance will be calculated year-by-year, then confirmed with VAD.

	Deposit at beginning of year	Interest Earned, Year End	Bank Balance, Year End
Year 1	$10,000	$10,000(.02)=$200	$10,000+$200 =$10,200
Year 2	$10,000 + $10,200 =$20,200	$20,200(.02)=$404	$20,200+$404=$20,604
Year 3	$10,000+$20,604=$30,604	$30,604(.02)=$612	$30,604+$612=$31,216
Total	$30,000	Total Interest Earned $1,216	Bank Balance $31,216

Start with a $10,000 deposit which earns 2%, i.e., $200 interest the first year. They sum to the first year's ending balance, $10,200. At the beginning of the second-year, deposit another $10,000. Add the second deposit to the ending balance from the first-year. That equals $20,200. The savings account earns .02 interest during the second year, $404 this time. Add $20,200 to the second year's interest, $404. The balance at the end of the second year is $20,604. Repeat the routine and the balance at the end of the third-year is $31,216.08. The following equation summarizes VAD results:

Bank Balance = Interest + Deposits
= $1,216 + $30,000
= $31,216

The savings account earns interest on the deposits *and* interest on previous earnings, all told commonly referred to as *compounding*.

Now confirm that VAD efficiently and accurately calculates the Bank Balance:

$$\text{Bank Balance} = (\text{Deposit})((((1 + r)^{y}) - 1) / r)(1 + r)$$
$$= (\$10{,}000)((((1 + .02)^{3}) - 1) /.02)(1+.02)$$
$$= \$31{,}216$$

VAD is more than a convenience. When considering a time frame of a decade or more, the step-by-step approach to calculate an account balance is impractical. Consider an example: apply VAD when periodic annual deposits are $10,000 for 10 years at 2% interest; y and r are held constant:

$$\text{Bank Balance} = (\$10{,}000)((((1 + .02)^{10}) - 1) / .02)(1 + .02)$$
$$= \$111{,}687$$

The deposits in a savings account over the 10 years is $100,000. How much interest income would have been earned?

Bank Balance – Deposits = Interest

$111,687 – $100,000 = $11,687

It is instructive to compare bank and mutual fund balances. Both can be organized with similar equations:

Bank Balance = Interest + Deposits

RI$ = Ci + TI$

Bank balance is like RI$; interest is like Ci; and deposits are like TI$.

Now, compare the interest the bank would have earned over the 10 years, $11,687, to the Ci each mutual fund would have earned over the same 10 years in column L of **BULL.xlsx**. Find the fund with the closest Ci to the interest earned on the bank account, $11,687.

It is VREMX at Ci of $10,439 in cell L19. VREMX's ARR of .017975 (J19) was closest to the bank interest rate of .02. Its RI$ of $110,439 (K19) was closest to the bank balance at $111,687.

A review of column L also identifies VREMX as one of the poorest-performing mutual funds on the list of Investment Opportunities. Other poor performers included TCIEX, RERGX, BPRIX, VBTLX, and SKIRX. As previously mentioned, the economic environment was a bull market. These Investment Opportunities were poor performers during a decade-long booming economy!

Poor performance can always get worse. For example, open BEAR.xlsx and look at Ci, column L. Most funds listed in Investment Opportunities experienced negative Ci, that is, the funds lost wealth (RI$). Participants who invested in the poor performing funds during a bull market would have seen a substantial decline in the value of their retirement accounts during a bear market.

Consider VREMX, again. The Participant's RI$ was $48,987. See, K19. That means VREMX's Ci lost $51,013 (L19)!

RI$ = Ci + TI$
Subtract TI$ from each side of the equation.
RI$ - TI$ = Ci
$48,987 - $100,00 = -$51,013
Negative Ci implies a loss of capital (wealth), in VREMX's case $51,013.

Note, however, several funds earned positive Ci during the bear market: VFIAX (L5), MEIKX (L6), VIMAX (L9), and VSMAX (L11). They were identified as the most profitable funds during a bull market, too. **Consistently investing in excellent-performing mutual funds regardless of the economic environment is generally more profitable than putting money in savings accounts or poor performing mutual funds. *BUT*, a Participant must first measure the performance of mutual funds to know. Think about the ratios on the list of Investment Opportunities reported in the Introduction. How would a Participant know which funds to invest in without a sound evaluation process?**

Step 4: Now, apply VAD to imply RI$ for each mutual fund, which, once again, is illustrated with VFIAX in **BULL.xlsx**.

VFIAX's RI$ in traditional notation is
($10,000)((((1+.105825)^{10})-1)/.105825)(1+.105825) = $181,239. Cell K5.

VFIAX's RI$ in spreadsheet notation is
=G5((((1+J5)^{H5})-1)/J5)*(1+J5) = $181,239.* Cell K5.

Step 5: The last step to calculate Ci is

Ci = RI$ – TI$. Cell L2.

VFIAX's Ci in traditional notation is $181,239 - $100,000 = $81,239. Cell L5.

VFIAX's Ci in spreadsheet notation is *=(K5–I5) = $81,239*. Cell L5.

Ci, column L, measures the implied earnings of each fund. The relevant investment principle is *More Ci is better than less*.

Ci Per Dollar of Investment (CiP)

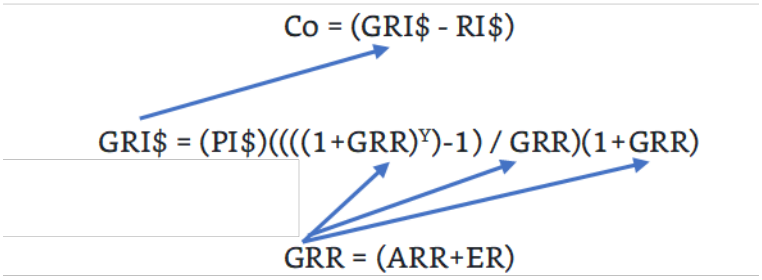
The measures are now available to calculate *CiP, i.e.,* Ci/TI$. While Ci provides returns in dollars, CiP calculates each fund's earnings per dollar of investment. It is a measure of output, Ci, over input, TI$, which is an efficiency ratio, also known in finance as return on investment, ROI. And, as a matter of fact, it identifies the same most profitable funds identified by Ci and ranks the funds in the same order as Ci. Regardless of its redundancy, CiP is commonly used in financial analysis.

For example, VFIAX's CiP is $81,239/$100,000 = $.81. It earns $.81 per dollar of investment over the ten-year period. In spreadsheet notation, VFIAX's CiP would be =L5/I5.

The investment principle is *More CiP is better than less*.

Cash Outflow (Co)

Co formula is Gross Return and Invested Dollars (GRI$) less RI$. Co = (GRI$ - RI$). Here are the details of Co:



Start with RI$ on the far-right side of the Co equation. Although it was previously calculated, a short review will help clarify how it contributes to the Co calculation.

As noted, return ratios are reported to the public ***after*** the Mutual Fund Manager deducts his expenses. Therefore, expenses are added back to return ratios (ARR). The sum is referred to as **GRR** (Gross Return Ratio). GRRs are monetized with VAD to imply **GRI$**:

$GRI\$ = (PI\$)((((1+GRR)^{Y})-1)/GRR)(1+GRR)$

GRI$ ***includes*** the Fund Manager's expenses that were previously subtracted.

The components are now available to measure Co, that is, GRI$ that ***include*** the Fund Manager's expenses over time and the RI$ that ***exclude*** the Fund Manager's expenses over time.

Co = (GRI$ - RI$).

Here's an example of how to calculate Co: Begin on the right side of the Co formula with RI$. It was previously calculated and the results are housed in column K for each fund. Two steps remain to calculate GRI$: add expense ratio to ARR in order to calculate GRR then monetize GRR with VAD to get GRI$.

Calculate GRR by *adding* ARR reported in column J to expense ratio reported in column F.

GRR = ARR+ER. Cell M2.

VFIAX's GRR in *traditional notation* is .105825 + .0005 = .106325. Cell M5.

VFIAX's GRR in *spreadsheet notation* is *=(J5+F5) = .106325*. Cell M5.

Now, monetize GRR using VAD.

GRI$ = (PI$)((((1+GRR)^{Y})-1)/GRR)(1+GRR). Cell N2.

VFIAX's GRI$ in traditional notation is
($10,000)((((1 + .106325)^{10}) -1) /.106325)(1 + .106325) = $181,757. Cell N5.

VFIAX's GRI$ in spreadsheet notation is
=G5((((1+M5)^^{H5})-1)/M5)*(1+M5) = $181,757.* Cell N5.

The last step to calculate Co is to subtract RI$ from GRI$.

Co = GRI$ - RI$. Cell O2.

VFIAX's Co in traditional notation is ($181,757 - $181,239) = $518. Cell O5.

VFIAX's Co in spreadsheet notation is *=(N5-K5) = $518.* Cell O5.

The Co performance principle is *Less cash outflow is better than more*.

A review of the Co column O reveals large differences. Details are discussed in Part 2 and Appendices 2 and 3. Co is a matter of concern because cash that goes to Mutual Fund Managers does not go to Participants.

Risk^{STDEV}: Optional

Risk can be measured in several ways but is commonly estimated with standard deviation.[33] A preferred mutual fund experiences acceptable dispersion (risk) of return ratios compared to other funds' dispersion of return ratios.

Standard deviation (s)[34] is a statistic that measures how annual returns [in this example, Y1R, Y3R, Y5R, and Y10R] might vary from the expected [ARR] return.

Very volatile investments have larger standard deviations because their annual returns can vary considerably from their average annual return. Less volatile [investments] have smaller standard deviations because their annual returns are closer to their average annual return.

The following diagrams provide pictorial representations of volatility. In Diagram 1, Return Ratios (represented as dots) appear "far" from their ARR (line) which signals "more" volatility and a "larger" standard deviation. Compare it to Diagram 2. Its Return Ratios are "close" to their ARR (line) which signals "less" volatility and a "smaller" standard deviation.

Diagram 1
Relatively Large s

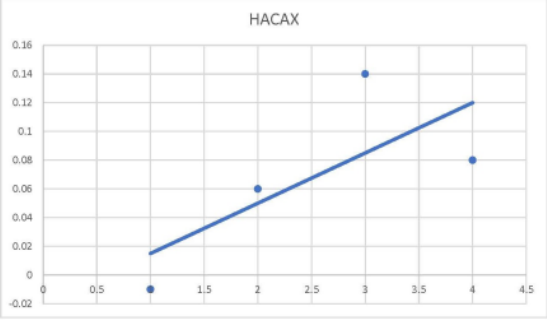
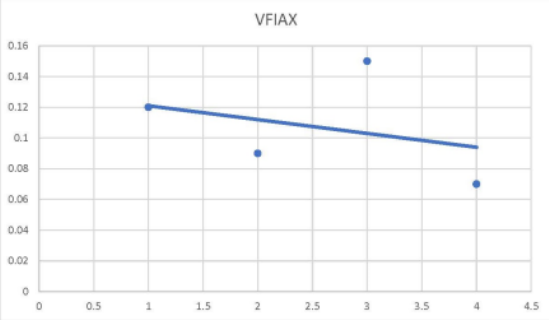


Diagram 2
Relatively Small s



The Risk^{STDEV} measure for VFIAX in Diagram 2 is:

$$s^2 = \sum_{i=1}^{4} (R_i - ARR)^2 / (N - 1)$$

$$= [(.1193 - .105825)^2 + \ldots + (.0694 - .105825)^2] / (4 - 1)$$

$$= 0.0034421275 / 3$$

$$= 0.001147375833333$$

$$s = \sqrt{0.001147375833333}$$

$$= 0.033872936591523$$

$$= 0.03$$

Diagram 1 picturing HACAX's return ratios implies a standard deviation of .06.

A relatively small standard deviation *SUGGESTS* future returns *MAY BE* near the average historic return. In other words, given a relatively small s, future returns *MAY BE* more predictable than future returns measured by a relatively large s. For additional details, see, calculator.net.[35]

VFIAX's standard deviation in spreadsheet notation is calculated with *=STDEV(B5:E5)*. Its result is 0.033872936591523, which is rounded to .03.

$Risk^{STDEV}$ measures can serve to bracket Ci. ***More Cash*** suggests brackets to represent a dispersion of potential Ci values based on 2 standard deviations. The dispersion can be said to range from a potential downside boundary to a potential upside boundary of the Ci point estimate. Downside Ci would be the left side and upside Ci would be the right side. Negative Ci reverses upside and downside measures.

$[Ci - ((2)(Risk^{STDDEV})(Ci))]$ $[Ci + ((2)(Risk^{STDDEV})(Ci))]$

The assumption is that most instances of Ci would fall within 2 standard deviations of the point estimate of Ci. Such inference is applied to funds if their return ratios were tested for and found to exhibit normal distributions. All tested normal for the bull market.[36]

Consider how boundaries work. When Ci is positive, an implied downside boundary is [Ci–((2)($Risk^{STDEV}$)(Ci))] and an implied upside boundary is [Ci+((2)($Risk^{STDEV}$)(Ci))]. Most instances of VSMAX's and DHSIX's Ci would have more often than not occurred within the following brackets:

VSMAX Downside Risk	Cash Inflow	VSMAX Upside Risk
[Ci- ((2)($Risk^{STDEV}$)(Ci))]	Ci	[Ci+((2)($Risk^{STDEV}$)(Ci))]
$86,943 (S11)	$97,449 (L11)	$107, 954 (T11)

DHSIX Downside Risk	Cash Inflow	DHSIX Upside Risk
[Ci- ((2)($Risk^{STDEV}$)(Ci))]	Ci	[Ci+((2)($Risk^{STDEV}$)(Ci))]
$67,027 (S10)	$73,744 (L10)	$80,461 (T10)

VSMAX's $Risk^{STDEV}$ measure implies its Ci point estimate of $97,449 had a downside bracket of $86,943, and an upside bracket of $107,954. Its range—dispersion—would have been $21,011 (U11). DHSIX's $Risk^{STDEV}$ measure implies its Ci point estimate of $73,744 had an implied downside bracket of $67,027, and an implied upside bracket of $80,461. Its range would have been $13,435.

DHSIX's Ci upside bracket of $80,461 was considerably less than VSMAX's Ci downside bracket of $86,943. In other words, DHSIX's dispersion is completely outside of and on the downside of VSMAX's dispersion. Although VSMAX's potential Ci may occur farther from its point estimate of Ci, its downside Ci bracket was much larger than DHSIX's upside Ci bracket.

VSMAX's point estimate of Ci was, therefore, considerably larger than DHSIX's point estimate of Ci."[37]

Why not prefer a mutual fund that reports smaller dispersion of Return Ratios compared to other funds with larger dispersions? Afterall, a relatively small standard deviation provides information that *SUGGESTS* returns *MAY BE* closer to the ARR and therefore MAY BE more predictable.

A retiree may prefer more predictable withdrawals. However, a relatively low $Risk^{STDEV}$ measure may be associated with a mutual fund that exhibits considerably lower Ci. A Participant with time until retirement may choose to go with the more profitable fund when compared to in-group competitors whose $Risk^{STDEV}$ is smaller but accompanies a much smaller Ci.

Applications of $Risk^{STDEV}$ did not change identification of most profitable funds applying Ci and Co measures. Nevertheless, Participants are free to apply $Risk^{STDEV}$ to assess their funds. ***More Cash*** excludes $Risk^{STDEV}$, and for the same reason could have excluded CiP, in deference to simplicity and redundancy. Occam's Razor.

Conclusion

Two important performance measures have been mathematically expressed in Appendix 1: Ci and Co. They offer objective evidence to select the most profitable funds within groups at a point in time. Generally, *More Ci is better than less. Less Co is better than more.*

Appendix 2[38]

Index Funds Versus Managed Funds

As discussed in Part 2, research suggests index funds are likely to outperform managed funds.[39] What does *likely* look like?

A Prosperous Economy

In early May 2022, *Kiplinger,* a popular business publication, offered "buy" or "hold" recommendations for nine Large Cap *managed* mutual funds. The article was entitled, "The Best Vanguard Funds for 401(k) Retirement Savers."[40] In early May, seven of the oldest and largest S&P 500 index funds were selected for comparison from a list at *mutualfunds.com*, "All Fund Companies." They were the first group of *index* funds on the list.

Open KIPLINGER.xlsx and follow the comparison.

The S&P 500 index funds are reported on rows 5 through 11. The managed funds *Kiplinger* recommended are reported on rows 16 through 24.

Their implied average Ci and Co are reported in columns O and N, respectively.

Implied Averages	Ci (o)	Co (N)
Index S&P 500	$149,685	$3,244
Managed S&P 500	$38,377	$4,999

The implied average Ci of the index funds was $149,685 (O12) which was almost four times larger than the implied average Ci of managed funds at $38,377 (O25). Averages can hide information, so consider a couple details. Ci of the best managed fund was about half the Ci of the worst index fund. Compare

VEIPX's Ci of $79,360 (O16), the best performing managed fund, to MSPIX's Ci of $147,329 (O11), the worst index fund.

As expected, average S&P 500 index funds incurred lower Co than average S&P 500 managed funds: compare $3,244 (N12) to $4,999 (N25). They also improved Participant wealth (RI$) considerably more than S&P 500 managed funds during the prosperous times: compare $249,685 (K12) to $138,377 (K25).

S&P index funds performed considerably better than S&P managed funds. What about performance over time?

An Economic Downturn

Nine months later in early February 2023, an economic downturn adversely affected the performance of mutual funds. The S&P 500 index funds are reported in rows 32 through 38 and the managed funds are reported in rows 43 through 51. For convenience, performance measures are repeated here:

Implied Averages	Ci (O)	Co (N)
Index S&P 500	$14,610	$1,304
Managed S&P 500	-$13,224	$3,049

The performance of both index and managed funds declined considerably. Implied average Ci of S&P 500 index funds remained positive at $14,610 (O39), while average implied Ci of S&P 500 managed funds was negative at -$13,224 (O52). On average the managed funds lost wealth (RI$) for their investors. Generally, S&P 500 index funds outperformed S&P 500 managed funds during weak economic times.

Averages again concealed information. The average Ci of S&P 500 managed funds was negative, but VEIPX's Ci was positive at $3,789 (O43). Although implied average Ci of S&P 500 index funds was positive, it also conceals details. Implied Ci of DSPIX (O37) and MSPIX (O38) were both negative; they would have lost wealth (RI$) for their Participants.

In summary, the S&P 500 index funds showed considerably better performance than S&P 500 managed funds recommended by *Kiplinger* during a favorable economy and a market downturn. Of greater usefulness to Participants than this comparison is that ***More Cash*** offers measures to evaluate mutual fund recommendations from any source.

Appendix 3 [41]

Not All S&P 500 Index Funds are the Same

Recommendations to Sponsors

Are there better funds than those listed in a Sponsor's Investment Opportunities? This is a natural question because retirement plans generally limit Participant Investment Opportunities to about two dozen funds from approximately 8,000 mutual funds in the U.S.[42]

Participants have a direct interest in funds offered in a tax-deferred retirement plan. If the funds perform poorly, the amount available during retirement will be less than it could have been with more profitable funds. Sponsors may have a similar financial interest because they, too, may be Participants. Furthermore, Sponsors are responsible, according to ERISA, to exercise reasonable care when selecting investment opportunities and to periodically assess them.[43] While Sponsors typically rely on Providers to make fund recommendations, they cannot delegate ultimate responsibility for fund choices.

Sponsors should establish an investment committee to, among other things, help periodically assess funds. Sponsors may also assign appropriately skilled employees to answer questions about the retirement plan. Participants, therefore, may have communication channels to discuss which funds should be included in investment opportunities.[44]

What if . . .

. . . during the market downturn of March 2023, a Participant observed that MSPIX, one of his selected funds, reported a loss. He wondered, were there better S&P 500 index funds? Or were all S&P 500 index funds losing money? Since they are generally described as "mimicking" the S&P 500 index, intuition suggested they all would have nearly identical Ci and Co.

To evaluate these questions, seven of the largest and oldest S&P index funds listed in *mutualfunds.com* were input in S&P500INDEX.xlsx**.** Their ratios were monetized assuming PI$ of $10,000 per year for 10 years. **The PI$ and Y were selected to provide a sense of magnitude for return and expense ratios, not as predictions. Any PI$ and Y consistently applied to all funds would produce the same conclusions.**

Consider a bear market first, rows 5 through 11. The ratios for MSPIX were included in row 11. Cell O11 confirmed the Ci loss of $16,025. MSPIX was one of the worst but not *the* worst performing S&P 500 index fund. See, DSPIX with a loss of $21,586 (O10).

The best funds—SWPPX (P5), FXAIX (P7), and WFSPX (P9)—easily outperformed MSPIX. The three were identified performing best in Ci and Co. The relevant information is repeated next:

TICKER	Ci (O)	Co (N)
MSPIX	-$16,025	$1,884
SWPPX	$26,624	$284
FXAIX	$26,447	$284
WFSPX	$24,864	$420

As the Participant previously observed, MSPIX incurred negative Ci (O11), i.e., a loss of wealth. His investment of $100,000 after ten years would have been reduced to $83,975 (RI$, K11). Meanwhile, SWPPX (O5), FXAIX (O7), and WFSPX (O9) would have earned positive Ci which would have increased their Participants' wealth (RI$) to $126,624 (K5), $126,447 (K7), and $124,864 (K9), respectively.

Although MSPIX incurred considerably greater Co (N11) than SWPPX (N5), FXAIX (N7), or WFSPX (N9), the extent of its poor performance is not explained by its Cash Outflow. It could have charged no fees and it would not have had positive Ci.

Other performance differences among S&P 500 Index Funds warrant attention. VFINX (O6) and PREIX (O8) earned similar Ci as SWPPX (P5), FXAIX (P7), or WFSPX (P9), but they charged considerably larger Co. Compare VFINX's Co (N6) and PREIX's Co (N8) to Co of SWPPX (N5), FXAIX (N7), and WFSPX (N9).

VFINX and PREIX are identified as relatively less efficient. They charged greater fees for doing basically the same service without greater Ci to Participants. The Co and inefficiency signal a caution to Participants. A reminder: cash that goes to Mutual Fund Managers does not go to Participants. The bottom line: S&P 500 index funds can be considerably different.

Why Would a Participant or Sponsor Select MSPIX?

Let's speculate. Consider the mutual funds during a bull market, May 2022, S&P500INDEX.xlsx rows 18 through 24:

TICKER	Ci (O)	Co (N)
MSPIX	$147,329	$5,911
SWPPX	$151,278	$580
FXAIX	$151,278	$580
WFSPX	$151,278	$870

SWPPX, FXAIX, or WFSPX implied slightly better Ci than MSPIX. However, MSPIX's ratios implied *considerably greater* Co, ten times greater. A speculation is that the Sponsor may have noted MSPIX's competitive Ci during the bull market and not paid attention to its considerably larger Co. That left no obvious

reason to question its performance. Ci and Co may provide a more complete view of fund performance than Ci alone.

The bottom line: Not all S&P Index Funds are the same. As a matter of fact, they can be quite different.

The Participant might consider offering the information outlined above to his Sponsor. A dialogue could ensue. The Sponsor, for example, may offer that there are good reasons not to immediately remove MSPIX. When a fund is removed at low performance, especially an S&P 500 index fund that invests in 500 of the largest and best companies in the U.S., it may lock in losses for Participants. It may be better to wait for a market recovery. When the fund regains its value, a Participant could sell it and reinvest in a better performing S&P 500 index fund. Regardless, the Sponsor could, without delay, add one or more of the better performing S&P index funds to the Investment Opportunities.[45]

The Sponsor could also offer Participants the option of a **self-directed brokerage account**. Participants would have the option to select from a broader range of investments including individual stocks and bonds.[46]

Appendix 4

Participants contribute ***cash*** to and withdraw ***cash*** from mutual funds.

Just For Fun …

… run profitability calculations for a longer period of time than ten years (Y) and for different Periodic Invested Dollars (PI$).

For example, modify **BULL.xlsx** by simply increasing Y from 10 to 40 in column H and decreasing PI$ from $10,000 to $3,000 per year and observe the results. Forty years would roughly estimate the duration of work-life. The Participant Account Balance would have been $1,864,320.

If PI$ continued at $10,000 per year, PAB would have been $6,614,399.

The time-value of money is the lesson, but, and this is a BIG BUT, reliance on assumptions of such calculations is very risky. They are, to say the least, unrealistic. For example, the calculations would assume no interruption of work or contributions, no emergency withdrawals, and consistency of return and expense ratios over an extended period of time.

Endnotes

[1] Birdthistle, William A. "Empire of the Fund." Oxford University Press, 2016. "Empire of the Fund" is an analysis of the strengths and weaknesses of mutual funds.

[2] 401(k) Resource Center." Investment Company Institute, 2023.

[3] Securities and Exchange Commission. Office of Investor, Education and Advocacy. SEC Pub. No. 138 (4/13).

[4] Pegarella, Sara. "Disclaimer Examples." TermsFeed, 2023.

[5] All Fund Companies. MutualFunds.com, 2023. https://mutualfunds.com/fund-company/.

[6] MarketWatch, 2023.

[7] Miller, Stephen. "Number of 401(k) Funds Offered to Plan Participants Shrinks." SHRM, December 1, 2020.

[8] Updated return and expense ratios can be found at MutualFund.com.

[9] Best Practices (for plan fiduciaries). The Vanguard Group, 2019.

[10] If a Sponsor does not identify a fund's group, it can be found at MutualFunds.com.

[11] https://www.investopedia.com/ask/answers/09/systemic-systematic-risk.asp

[12] If a Sponsor provides grouped data on a computer, the Participant can use the copy-paste function to replace our tickers and ratios with his. The spreadsheet will do the calculations for his investment opportunities. He can then assess his funds more quickly as demonstrated in Parts 2 and 3. Alternatively, the Participant can create his own spreadsheets with the formulas presented in Appendix 1.

[13] To download individual spreadsheets:
1. Open spreadsheet
2. Click on file tab.
3. You will see Save As at top of popup page.
4. You will see Download.
5. Click on Download a Copy. Select where you want to save it.

6. Repeat for each spreadsheet.

Note that the downloadable spreadsheets in ***More Cash*** were created using Microsoft Excel®. However, if you don't own Excel®, there are a number of spreadsheet programs which you may download free online. We searched for "free spreadsheets that work with spreadsheets created in excel." The search produced a list of available free spreadsheet programs which include, for example, https://spreadsheetpoint.com/best-free-spreadsheet-software/, https://www.google.com/sheets/about/, and, https://www.freeoffice.com/en/.

[14] "What Is Mutual Fund Return & How To Calculate it?" "Expense Ratio: What is it, Components, Formula and How to Calculate?" Also, see, endnote 3.

[15] If the Sponsor includes a matching contribution, assume that it is included in the Periodic Invested Dollars, PI$. A matching contribution occurs when an employer adds money—often characterized as "free money"— to an employee's retirement account.

[16] https://www.mutualfunds.com/funds/vsmax-vanguard-small-cap-index-adm/#profile-anchor.

[17] https://www.mutualfunds.com/funds/dhsix-diamond-hill-small-cap-i/#profile-anchor.

[18] Rosenberg, Eric. "Actively Managed vs. Passively Managed Funds," investorjunkie, updated February 3, 2023.

[19] The Sponsor included several other Retirement Date Funds not shown on the list of Investment Opportunities. They were VFORX-2040, VFIFX-2050, and VTTSX-2060. See, rows 29 through 31 in **BULL.xlsx**. ***More Cash*** assesses only one target date fund.

[20] Segal, Troy. "What is a Target-Date Fund? Risk Tolerance and Example." Investopedia, October 2, 2022.

[21] "Each of [Vangard's] Target Retirement Funds invests in [the] broadest index funds, giving you access to thousands of U.S. and international stocks and bonds."

[22] "The Dow Jones Industrial Average, 1896 to 2016."

[23] Statman, Meir. "Your Tolerance for Investment Risk Is Probably Not What You Think." The Wall Street Journal, September 10, 2017.

[24] "There are four different mid-cap indexes: the CRSP U.S. Mid Cap Index, the Russell Midcap Index, the Dow Jones U.S. Mid-Cap Total Stock Market Index, and the S&P MidCap 400 Index." Johnston, Matthew. "Comparing Mid-Cap Indexes." Investopedia, updated August 27, 2022.

[25] MutualFunds.com, 2023.

[26] 401(k) helpcenter.com, 2023.

[27] After you insert your fund information in **SPREAD.xlsx**, you can delete the row containing ABCDX. Bear in mind, if you inadvertently erase the embedded formulas, you can download another copy and begin again.

[28] What Is a Good Annual Return for a Mutual Fund? The Balance, November 20, 2021.

[29] 13 Things You Need To Know About Mutual Fund NAV. Grow, February 26, 2024.

[30] Weighted Moving Average (WMA), Fidelity.

[31] What Is a Good Annual Return for a Mutual Fund?, The Balance, November 20, 2021.

[32] Current interest rates are relatively high, but during the bull market of the recent past decade, interest rates on savings accounts were generally less than 2%, and often less than .25%.

[33] "There are five main indicators of investment risk that apply to the analysis of stocks, bonds, and mutual fund portfolios. They are alpha, beta, r-squared, standard deviation and the Sharpe ratio." Banton, Caroline. "5 Ways to Measure Mutual Fund Risk." Investopedia, updated December 14, 2021.

[34] "Standard deviation." Wikipedia, June 7, 2023.

[35] "Standard Deviation Calculator." Calculator.net, 2023.

[36] https://www.statskingdom.com/shapiro-wilk-test-calculator.html.

[37] https://www.nlm.nih.gov/oet/ed/stats/02-900.html#:~:text=A%20standard%20deviation%20(or%20%CF%83,data%20are%20more%20spread%20out.

[38] The analysis in Appendix 2 employs sets of funds different from the Investment Opportunities evaluated in the Introduction, Parts 1 – 3, and Appendix 1.

[39] For example, see "Mutual Funds That Consistently Beat the Market? Not One of 2,132." The New York Times, April 13, 2023.

[40] Haung, Nellie, S. "The Best Vanguard Funds For 401(k) Retirement Savers." Kiplinger, September 29, 2020. Vanguard Target-Date Fund was excluded from the comparison because it invests in stocks and bonds.

[41] The analysis in Appendix 3 employs sets of funds different from Investment Opportunities evaluated in the Introduction, Parts 1 – 3, and Appendix 1.

[42] See, Statista Research Department, September 14, 2023, "Number of mutual funds in the United States from 1997 to 2022." "In 2022, there were 7,393 mutual funds in the United States. This is a reasonable decline from the previous year [7,478], and reverses the upward trend of the preceding decade, most likely due to the economic effects of the global coronavirus (COVID-19) pandemic."

[43] The Employee Retirement Income Security Act of 1974 (ERISA) (Pub. L. 93–406, 88 Stat. 829, enacted September 2, 1974, codified in part at 29 U.S.C. ch. 18) is a U.S. federal tax and labor law that establishes minimum standards for pension plans in private industry. It contains rules on the federal income tax effects of transactions associated with employee benefit plans.

[44] Participants are provided plan information about Sponsor and Participant duties and responsibilities. For example, rules about withdrawing money, changing investments, tax consequences of early withdrawal, whether borrowing against plan assets is allowed, services offered by the Provider including access to an online account and many others. Internal Revenue Service, "401(k) Resource Guide – Plan Participants – General Distribution Rules." IRS, updated January 4, 2023.

[45] Miller, Stephen. "Number of 401(k) Funds Offered to Plan Participant Shrink." SHRM, December 1, 2020.

[46] Pastor, Renee. "Does Your 401(k) Come with a Self-Directed Brokerage Account Option?" Kiplinger, February 11, 2021.