PANAGORA

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Risk Parity™ and Inflation

Edward Qian, Ph.D., CFA
Chief Investment Officer and Head of Research, Macro Strategies
PanAgora Asset Management

Risk Parity and inflation protection

Risk Parity portfolios balance risk contribution from high-risk assets, such as equities and commodities, and low-risk assets, such as investment-grade bonds. To achieve true diversification without comprising the return/risk target, it is often necessary to have higher exposures to lower-risk assets, resulting in leverage at the portfolio level. As a result, when compared to traditional asset allocation approaches, Risk Parity portfolios tend to have a larger exposure to fixed income because investment-grade bonds have relatively lower return volatility. With bond yields near the lower end of their historical range, one natural concern about a Risk Parity portfolio is its exposure to a "leveraged" bond position. This concern becomes particularly worrisome if the economy enters a period of rising inflation. In spite of an unprecedented amount of monetary and fiscal accommodation, we believe that the current economic environment of high unemployment, low capacity utilization, and declining credit demand make hyperinflationary pressures unlikely for the foreseeable future. Regardless, higher inflation is certainly possible in the long run. As a result, it is prudent to study the investment consequence of a higher inflation scenario on asset allocation decisions in general and a Risk Parity approach in particular.

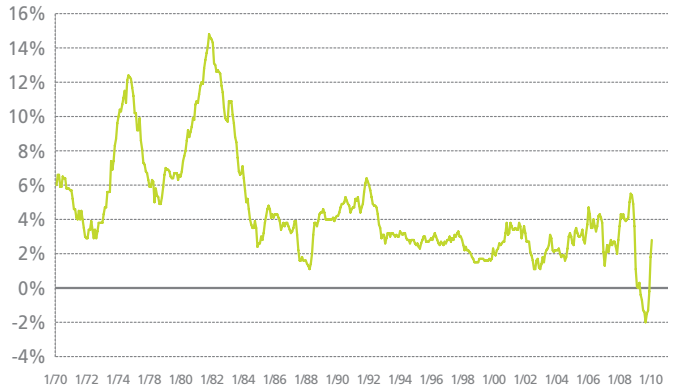
It is well understood that rising inflation hurts expected returns for nominal bonds as it leads to higher nominal interest rates. What is less appreciated, but equally important, is that rising inflation will not be kind to equity investments either. In theory, equity should provide inflation hedging since equity investors have a claim to real company earnings. In practice, however, this has not been the case, which is clearly demonstrated by comparing asset class returns from the 1970's. If a traditional approach toward asset allocation with an unbalanced risk allocation to equities is not the best defense for an environment of rising inflation, what approach should investors adopt? In our view, the answer is unequivocally the Risk Parity approach.

Unlike traditional allocation, there are two aspects of a Risk Parity portfolio that aim to defend against inflation risk and generate real rates of return that are lacking in traditional asset allocation. The first line of defense is through exposure to commodities and TIPS. The target baseline risk allocation to these two asset classes is 20%, which amounts to a significant notional exposure of 40% on average. The second is PanAgora's proprietary dynamic risk allocation process. Our research has shown that dynamic risk allocation is highly responsive to inflation cycles and provides an additional source of inflation hedging as it becomes necessary.

Historical analysis

To further study the issue, we turn to a historical perspective by examining Risk Parity portfolios in the high inflation period of the 1970's. Exhibit 1 shows annual CPI in the U.S. from 1970 to 2009. The 1970's are characterized by generally higher inflation that averaged 7.4% per year. In addition to elevated inflation on average, the 1970's also experienced two separate oil shocks causing inflation spikes above 10%. The following three decades saw much lower inflation: annualized CPI averaged 5.4% from 1980 to 1989, 2.9% from 1990 to 1999, and 2.5% from 2000 to 2009.

EXHIBIT 1: ANNUAL PERCENTAGE CHANGE OF U.S. CPI



Source: PanAgora.

The 1970's lends itself to be an ideal stress-testing environment for the Risk Parity approach to asset allocation. In addition to elevated inflation, the 1970's also experienced a massive increase in the level of interest rates. During the decade, the federal funds rate was increased by 1200 basis points (from 3.50% to 15.50%) and 10-year yields increased by 400 basis points (from 5.35% to 9.35%). In the face of these extreme conditions, would Risk Parity be able to pass the test? To answer the question, we simulate its performance using four asset classes: U.S. equity (S&P 500), U.S. nominal bonds (5-year U.S. Treasury bonds), commodities (GSCI), and U.S. TIPS. The selection of these four was based on data availability and their relevance to Risk Parity portfolios.[1] TIPS are an integral component of a Risk Parity portfolio, particularly during periods of rising inflation. The challenge with evaluating TIPS in historical studies is that the U.S. government only started issuing TIPS in 1997. For the purposes of this study, we overcome this data limitation by simulating U.S. TIPS returns using prevailing real yields, derived from nominal bond yields and long-term inflation.

Exhibit 2 shows four decades of annualized returns for various asset classes as well as for CPI. One of the asset classes included in Exhibit 2 is cash. Cash returns are important since Risk Parity portfolios partly depend on excess returns of "risk" assets over cash. In the 1970's when inflation was high and volatile, cash, nominal bonds, and stocks had positive returns but they all underperformed CPI, resulting in negative real returns. GSCI was by far the best-performing asset while TIPS also returned 3% higher than CPI. The fortunes reversed in the following two decades. With declining inflation came booming stock markets and sizable nominal bond returns while the return of real assets declined. Despite relative underperformance, both GSCI and TIPS still delivered positive real returns in the 1980's and 1990's. Disinflation continued in the most recent decade. GSCI, TIPS,[2] and nominal bonds all delivered low, single-digit returns but were able to outperform cash and CPI. In contrast, stock markets had negative returns for the past 10 years with the bursting of the tech and credit bubbles.

EXHIBIT 2: ANNUALIZED PERCENTAGE CHANGE IN CPI AND ANNUALIZED RETURNS OF FINANCIAL ASSETS

	CPI	Cash	GSCI	TIPS	U.S. Bonds	S&P 500
1970–1979	7.4%	6.5%	21.2%	10.4%	6.7%	5.9%
1980–1989	5.1%	9.1%	10.7%	6.6%	12.1%	17.6%
1990–1999	2.9%	5.0%	3.9%	5.3%	7.2%	18.2%
2000–2009	2.5%	2.8%	5.1%	5.7%	5.3%	-0.9%

Source: PanAgora.

We simulate Risk Parity portfolio returns based on four assets (five, including cash), according to the same investment process we follow in practice. We assign risk allocation targets to each asset class and estimate a covariance matrix. Next, we find the portfolio that matches the risk allocation targets and total portfolio risk for the next period. In addition, we simulated two versions of Risk Parity: Risk Parity Foundation, with fixed risk targets, and Risk Parity Dynamic, with dynamic risk allocation targets based on our proprietary dynamic risk allocation process. For comparison, we also show returns of a traditional 60/40 stock/bond portfolio using the same asset class returns.[3]

1 The Risk Parity portfolio invests in nine asset classes: U.S. large-cap equity, U.S. small-cap equity, international equity, emerging-market equity, U.S. Treasury bonds, international government bonds, U.S. corporate bonds, TIPS, and commodities.

2 TIPS returns are simulated for the period 1970–1996. Assumptions and calculation methodology available upon request.

3 The 60/40 portfolio represents a blend of 60% MSCI World Index and 40% Citigroup World Government Bond Index returns.

EXHIBIT 3: SIMULATED ANNUALIZED RETURNS FOR RISK PARITY PORTFOLIOS AND 60/40 PORTFOLIO (GROSS OF FEES)

	Risk Parity Foundation	Risk Parity Dynamic	60/40	CPI
1970–1979	10.5%	11.7%	6.5%	7.4%
1980–1989	14.3%	14.9%	15.7%	5.1%
1990–1999	12.2%	13.5%	13.9%	2.9%
2000–2009	5.4%	6.4%	2.0%	2.5%

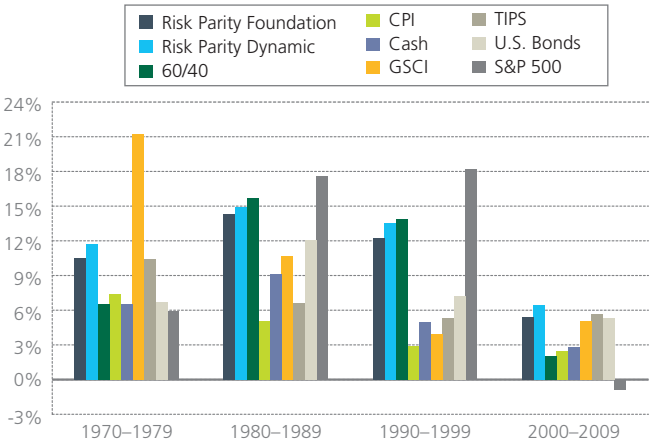
The hypothetical performance information presented is supplemental to the GIPS-compliant presentation for the Risk Parity strategy included as part of these materials.

Past performance is not a guarantee of future results.

Source: PanAgora.

Exhibit 3 shows the returns of the Risk Parity Foundation, Risk Parity Dynamic, and 60/40 portfolios for the past four decades. Exhibit 4 displays a graphical illustration as well as the combined results. There are several notable findings in this table. First and foremost, the hypothetical Risk Parity portfolios performed quite well in the 1970's. The Risk Parity portfolios generated nominal returns above 10%, and real returns above 3%, while the 60/40 portfolio delivered an annualized average real return of -0.9% for the decade.[4] Exposures to commodities and TIPS in the Risk Parity portfolios indeed provided inflation hedging to generate positive real rates of return. Second, we note that the Risk Parity portfolio with dynamic risk allocation delivered higher returns than the Foundation portfolio in all four decades, with outperformance ranging from 0.6% to 1.3%. This demonstrates that dynamic risk allocation can add value in different economic environments. Third, Risk Parity generated similar performance to 60/40 in the 1980's and 1990's. This is achieved with a much lower allocation to equities during a period when equities had the best 20-year period of performance in the history of investing.[5] Fourth, even though Risk Parity's returns in the 2000's are lower than those of the previous decades, the real returns (returns in excess of CPI) were still +3% compared with the negative real returns of the 60/40 portfolio. Finally, we note that returns of Risk Parity portfolios are significantly more stable over the four periods, due to a balanced risk allocation and true portfolio diversification. On the contrary, the returns of the 60/40 portfolio are mostly reliant on the fate of equity returns, which results in a portfolio with poor diversification and high variability of returns over the four periods.

EXHIBIT 4: RETURNS OF UNDERLYING ASSETS AND HYPOTHETICAL RISK PARITY PORTFOLIOS (GROSS OF FEES)



The hypothetical performance information presented is supplemental to the GIPS-compliant presentation for the Risk Parity strategy included as part of these materials.

Past performance is not a guarantee of future results.

Source: PanAgora.

A closer look at the 1970's

While the 1970's experienced elevated inflation on average, the level of inflation from year to year was quite volatile. Therefore, it is worth taking a detailed look at asset returns from year to year. Exhibit 5 expands the returns for the decade to individual calendar years. Consistent with Exhibit 1, there were two inflation cycles in the 10-year period. From 1970 to 1972, inflation declined only to spike in 1973 and 1974. From 1975 to 1976, inflation declined again only to spike again from 1977 to 1979. During the two periods where inflation spiked, asset classes behaved more or less with a predictable pattern. In 1973 and 1974, equities were down sharply while commodities and TIPS kept up with rising inflation and nominal bonds had positive nominal returns but negative real returns. From 1977 to 1979, commodities performed well throughout while other asset classes showed some deviations. Equities had two sub-par years but managed to come back in 1979. Nominal bonds experienced very low returns, while TIPS outperformed nominal bonds but failed to beat inflation due to the widening of the real yield. On a relative basis, Risk Parity portfolios outperformed 60/40 portfolios in both the rising and declining inflation sub-periods of the 1970's. In the last inflationary sub-period of the decade (1977–1979), the Risk Parity portfolios were able to limit losses in real terms, due to inflation hedging and dynamic risk allocation.

[4] The hypothetical performance information presented is supplemental to the GIPS-compliant presentation for the Risk Parity strategy included as part of these materials. Past performance is not a guarantee of future results.

[5] Risk Parity, with nine asset classes, actually outperformed 60/40 during the 20-year period between 1980 and 2000 due to greater diversification.

Source: PanAgora.

EXHIBIT 5: ANNUAL RETURNS OF UNDERLYING ASSETS AND HYPOTHETICAL RISK PARITY PORTFOLIOS (GROSS OF FEES)

	Risk Parity Foundation	Risk Parity Dynamic	60/40	CPI	Cash	GSCI	TIPS	U.S. Bonds	S&P 500
1970	21.2%	21.2%	9.8%	5.7%	6.5%	15.1%	22.1%	18.2%	3.9%
1971	17.5%	16.3%	12.1%	2.9%	4.4%	21.1%	10.7%	8.3%	14.3%
1972	17.6%	18.4%	12.3%	3.8%	4.2%	42.4%	4.3%	2.8%	19.0%
1973	10.5%	14.9%	-7.1%	8.7%	7.3%	75.0%	12.4%	4.5%	-14.7%
1974	-3.1%	1.6%	-14.3%	12.2%	8.0%	39.5%	17.6%	5.7%	-26.5%
1975	14.9%	11.0%	24.9%	6.8%	5.9%	-17.2%	8.4%	7.4%	37.2%
1976	19.7%	21.5%	20.0%	4.9%	5.1%	-11.9%	14.1%	13.8%	23.9%
1977	-3.9%	-2.9%	-3.9%	6.7%	5.5%	10.4%	2.1%	1.1%	-7.2%
1978	3.5%	5.8%	4.6%	9.1%	7.6%	31.6%	2.8%	1.0%	6.6%
1979	10.4%	11.8%	13.2%	13.3%	10.6%	33.8%	11.0%	5.3%	18.6%

The hypothetical performance information presented is supplemental to the GIPS-compliant presentation for the Risk Parity strategy included as part of these materials. Past performance is not a guarantee of future results.
Source: PanAgora.

Summary

Rising inflation is potentially harmful to both fixed income and equity returns. We believe substantial allocation to real assets, such as those in the Risk Parity portfolios, is necessary for inflation hedging and generating real return. Using simulation, we are able to examine Risk Parity portfolios during the high inflation period of the 1970's. The main findings are:

- Risk Parity portfolios were able to provide a real return (close to 4%) while 60/40 failed to do so.
- Dynamic risk allocation was adaptive in all periods, providing additional protection against rising inflation.
- Closer examination of annual data from 1970 to 1979 reinforced overall study results.
- While the focus of the paper is on inflation risk, the results again show that Risk Parity portfolios, with a balanced risk allocation to a variety of assets — high risk and low risk, nominal and real — can, under the circumstances described herein, deliver true diversification and more stable long-term returns than traditional asset allocation portfolios.

Hypothetical performance results have many inherent limitations, some of which are described below. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any particular investment program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or to adhere to a particular investment program in spite of trading losses are material points that can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific investment program that cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.

The information presented is based upon the following hypothetical assumptions: Risk Parity Foundation and Risk Parity Dynamic portfolios were constructed using a hypothetical combination of nine index returns based on the following indices: GSCI Commodity Index (Commodities), Barclays Capital Government Bond Index (U.S. Gov.), Barclays Capital TIPS Index (TIPS), iShares iBoxx Investment Grade Corporate Bond Fund (Corporate Credit), Salomon Smith Barney World Government Bond Index ex-U.S. (Int'l Gov.), S&P 500 (U.S. Large Cap), Russell 2000 (U.S. Small Cap), MSCI Emerging Markets (EM Stocks), and MSCI EAFE (Int'l Stocks). The Risk Parity Foundation portfolio monthly rebalance targets constant risk allocation from stocks, bonds, and commodities. The Risk Parity Dynamic portfolio rebalances monthly, and the risk allocation to the nine asset classes differs based on the forecasted Sharpe Ratios of each asset class.

Certain of the assumptions have been made for modeling purposes and are unlikely to be realized. No representation or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the returns have been stated or fully considered. Changes in the assumptions may have a material impact on the hypothetical returns presented.

International investing involves certain risks, such as currency fluctuations, economic instability, and political developments. Additional risks may be associated with emerging-market securities, including illiquidity and volatility. Active currency management, like any other investment strategy, involves risk, including market risk and event risk, and the risk of loss of principal amount invested. The use of alpha overlay strategies consists of hedging, which may in certain circumstances cause the value of a portfolio to appreciate or depreciate at a greater rate than if such techniques were not used, which in turn could result in significant losses. Derivative instruments may at times be illiquid, subject to wide swings in prices, difficult to value accurately, and subject to default by the issuer. Strategies that use leverage extensively to gain exposure to various markets may not be suitable for all investors. Any use of leverage exposes the strategy to risk of loss. In some cases, the risk may be substantial. The use of an alpha overlay strategy consists of hedging, which may in certain circumstances cause the value of a portfolio to appreciate or depreciate at a greater rate than if such techniques were not used, which in turn could result in significant losses. Derivative instruments may at times be illiquid, subject to wide swings in prices, difficult to value accurately, and subject to default by the issuer.

Risk Parity Composite

Composite: Risk Parity (As of 12/31/2009)

Benchmark: 60% MSCI World/40% Citigroup World Government Bond Index

	Gross of Fees Return (%)	Net of Fees Return (%)	Annual Index Return (%)	High Return* (%)	Low Return* (%)	Composite Assets ($ Millions)	Firm Assets (%)	Number of Accounts	Percent of Composite that are Non-fee paying accounts	Assets Under Management ($ Millions)
12/31/09	7.23%	6.85%	18.72%	N/A	N/A	$26.73	0.17%	<5	0.0%	$16,084
12/31/08	-12.64%	-12.95%	-22.97%	N/A	N/A	$17.37	0.14%	<5	14.2%	$12,775
12/31/07	11.91%	11.53%	9.98%	N/A	N/A	$5.91	0.02%	<5	100.0%	$25,484
12/31/06	-1. 22%	-1.57%	14.39%	N/A	N/A	$5.29	0.02%	<5	100.0%	$22,615

* High/Low Returns have not been provided for composites with fewer than two accounts in the composite for the entire year.

Firm Overview

PanAgora Asset Management, Inc. (the "Firm") has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®). A complete listing and description of all composites is available upon request.

For the purposes of compliance with GIPS, the Firm is defined as a broad-based investment management organization that provides investment services to institutions through separately managed accounts, pooled funds, and mutual funds. The Firm is an independent investment advisor registered under the Investment Advisers Act of 1940 specializing in quantitative investment strategies. For determination of firm-wide compliance with GIPS, the Firm has currently defined assets under management as all assets that are managed by the Firm.

Composition of Composite

The accounts within the Risk Parity Composite (the "Composite") seek to generate competitive returns for long-term investors via efficient beta allocation. The strategy seeks to deliver true diversification through balanced risk budgeting between equities and bonds. The Composite is currently managed at 8% annualized volatility. The Composite is comprised of all discretionary institutional accounts managed by the Firm in this investment style. The creation date for the Composite was July 1, 2009, and the inception date for the Composite was January 1, 2006. There is a minimum of $2 million in assets for inclusion in this composite.

Leverage is used as an active part of the Composite strategy in which a client's assets are invested in long and short positions in a combination of futures contracts, physicals, equities, TIPS, and ETFs traded on global exchanges. Although the extent of leverage will vary by client, the long and short positions generally will range from approximately 1.7 to 2.4 times the market value of a client's account.

New portfolios are added to a composite in the beginning of the first complete month after the portfolio is started. Terminated portfolios are included through the final full month of management. Composites may include portfolios with certain existing investment restrictions that the Firm believes do not materially impact the investment strategy.

Calculation of Composite

A Composite's monthly return is computed by asset weighting the portfolio returns within the Composite, using the beginning of period market values. The quarterly return of a Composite is computed by geometrically linking the returns of each month within the calendar quarter. The annual return of a Composite is computed by geometrically linking the returns of each quarter within the calendar year

Investments held by all portfolios are valued on a trade-date basis using accrual accounting. Individual portfolio returns are calculated on a time-weighted basis using the Modified Dietz methodology. Performance is expressed in U.S. dollars. Additional information regarding policies for calculating and reporting returns is available upon request. Returns are net of foreign withholding taxes on dividends, interest, and capital gains. The benchmark returns assume dividends are reinvested monthly and are presented net after withholding taxes assuming the most conservative tax perspective, that of a Luxembourg holding company.

Index Disclosure

The benchmark for this Composite is composed of 60% of the MSCI World Index and 40% of the Citigroup World Bond Index. The 60% MSCI World and 40% Citigroup WGBI is a blended benchmark. The MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. As of June 2007 the MSCI World Index consisted of 23 developed market country indices. The Citigroup World Government Bond Index (WGBI) includes the 23 government bond markets of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Malaysia, the Netherlands, Norway, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Benchmarks are generally taken from published sources and may have different calculation methodologies, pricing times, and foreign exchange sources than the Composite. The effect of those differences is deemed to be immaterial. The securities holdings of the Composite may differ materially from those of the index used for comparative purposes. Indexes are unmanaged and do not incur expenses. You cannot invest directly in an index.

Gross and Net of Fees Disclosure

Gross of Fee returns are net of transaction costs but do not include the deduction of management fees and other expenses that may be incurred in managing an investment account. A portfolio's return will be reduced by management and other fees. The impact of management fees can be material. Investment returns are reduced by advisory fees as in the following example. Over a five-year period, if a $100 portfolio has an annual return of 10%, it would grow to $161.05. The net compounded effect of a 35-basis-point annual investment management fee (without custody charges) would total $2.55 and result in a portfolio value of $158.51.

Net of Fee return results are calculated as the Gross of Fee Returns minus a model fee equal to the highest standard Separate Account Management Fee that a client invested in this strategy would have paid during the performance period as described in Part II of the Firm's Form ADV for information on management fees.

Fee Schedule

The following is the standard fee schedule based on the market value of an account's assets under management and stated on an annual basis. This fee schedule represents the highest fee as disclosed in the Firm's ADV Part II, which is available upon request. Separate account fees are for investment management services only. Custodial fees, which are not charged to an account, are not included in the Net of Fee returns.

Separate Account Management:

0.35 of 1% of assets under management.

The minimum annual fee is $100,000.

This fee schedule has been prepared for informational purposes for the purpose of the Firm's global compliance with GIPS and should not be construed as an offer or solicitation.

Past performance is not a guarantee of future performance. No assurance can be given as to future performance.

PANAGORA

PanAgora Asset Management
470 Atlantic Avenue
Boston, MA 02210
United States of America
+1-617-439-6300

www.panagora.com

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