When Inflation Expectations Meet Probability Weighting: A Behavioral–Macro Portfolio Framework

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Abstract

This paper develops a behavioral–macro portfolio model that analytically links inflation expectations, subjective probability weighting, and optimal risky investment. Within a single-period framework featuring CRRA preferences and Prelec-type probability weighting, we show that higher inflation expectations reduce real wealth and shift the opportunity frontier downward, while probability weighting reshapes the investor's perception of state-dependent payoffs. Under decreasing absolute risk aversion (DARA), an increase in expected inflation uniformly lowers the optimal risky share, whereas greater overweighting of the good state raises it. The model provides closed-form comparative statics and a geometric representation of how inflation expectations and behavioral distortions jointly determine portfolio risk exposure. Policy implications emphasize that credible monetary communication can stabilize investors' real-return expectations and moderate behavioral shifts in risk-taking.

Keywords: Inflation expectations; Probability weighting; Behavioral portfolio theory; Risk-taking; Wealth effects

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1 Introduction

Understanding how inflation expectations shape portfolio decisions has long been a central issue in finance and macroeconomics. Classical portfolio theory (Markowitz, 1952; Merton, 1969) predicts that investors allocate wealth between risky and risk-free assets according to expected returns, variances, and individual risk aversion. However, in the presence of inflation uncertainty, real returns are distorted, and behavioral factors such as probability weighting further complicate optimal portfolio choices. Recent global inflation episodes and shifts in monetary policy regimes have renewed interest in the role of inflation expectations in shaping investor risk-taking and real asset allocation.

A growing body of literature explores the behavioral and macro-financial dimensions of inflation expectations. Empirically, rising inflation expectations tend to reduce investors' willingness to hold long-term or risky assets, consistent with precautionary motives and wealth effects (Coibion, Gorodnichenko and Weber, 2022). Theoretically, standard expected-utility frameworks have been extended to incorporate loss aversion (Barberis, Huang and Santos, 2001), ambiguity preferences (Epstein and Schneider, 2008), and probability weighting functions (Tversky and Kahneman, 1992; Prelec, 1998). In these models, subjective beliefs or distorted probabilities amplify deviations from rational benchmark outcomes. Within asset-pricing contexts, Barberis (2013) and Gollier (2018) show that behavioral probability transformations can generate non-linear portfolio responses to perceived risk and return asymmetries. More recently, Bansal and Yaron (2004) and Drechsler, Savov and Schnabl (2017) link macroeconomic uncertainty, inflation expectations, and asset risk premia through recursive preferences and belief updating. Yet, despite this progress, theoretical clarity remains limited on how inflation expectations interact with subjective probability weighting to jointly determine optimal risk exposure.

This paper develops a simple yet analytically tractable model that unifies these mechanisms. We consider an investor with constant relative risk aversion (CRRA) preferences and Prelec-type probability weighting, facing a single-period decision between a risk-free asset and a risky asset under two possible states of the world. Inflation expectations enter the model by shifting the real returns on both assets, thereby inducing a pure wealth effect without changing the slope of the opportunity set. Within this setting, we derive closed-form comparative statics showing that higher inflation expectations reduce the optimal risky share under decreasing absolute risk aversion (DARA), while stronger overweighting of the good state (through the parameter of the weighting function) increases the risky share. The model thus generates unambiguous analytical predictions linking behavioral distortions and macroeconomic expectations to portfolio rebalancing.

Our contribution is twofold. First, we provide a behavioral-macro portfolio framework that formally connects inflation expectations with subjective probability weighting in a unified optimization problem. To our knowledge, this is the first closed-form derivation showing how inflation expectations and probability weighting jointly affect the interior–corner boundary of portfolio choice, allowing direct comparative-statics interpretation. Second, we extend the classic mean–variance intuition into a behavioral–state space where inflation shifts the opportunity frontier in parallel, and probability weighting rotates indifference curves through nonlinear utility curvature. These interactions yield testable implications for inflation-driven asset reallocation and can serve as a microfoundation for behavioral extensions of dynamic stochastic general equilibrium (DSGE) or consumption-based asset pricing models.

The remainder of the paper proceeds as follows. Section 2 presents the theoretical model, including the investor's optimization problem and the resulting first-order conditions. We also derives comparative statics for inflation expectations and probability weighting, and provides a closed-form analysis under CRRA preferences, followed by graphical interpretations linking theory to policy-relevant intuition. Section 3 concludes with policy recommendations provided.

2 Model

2.1 Set up

Time is a single period. The investor has initial endowment $A > 0$ and allocates m to a risk-free asset and a to a risky asset, with $A = m + a$. There are two mutually exclusive states of the world, denoted S_1 (the "good" state) and S_2 (the "bad" state), occurring with objective probabilities p and $1 - p$, respectively.

The risk-free asset yields a nominal gross return $1 + r_f$. The risky asset yields state-dependent nominal returns $1 + r_1$ and $1 + r_2$, where $r_1 > r_f > r_2$. Here, r_1 represents the favorable state payoff (e.g., when the risky asset performs well or the economy expands), while r_2 represents the unfavorable state payoff (e.g., when the asset underperforms or the economy contracts). The spread $r_1 - r_2$ captures the degree of risk in the risky asset's payoff distribution, and the expected excess return is as follow:

$$p(r_1 - r_f) + (1 - p)(r_2 - r_f) \tag{1}$$

determines whether the investor optimally holds a positive position in the risky asset.

Inflation expectations π^e enter the model through real returns,

$$r'_f = r_f - \pi^e, \qquad r'_i = r_i - \pi^e, \quad i \in \{1, 2\}, \tag{2}$$

so that an increase in π^e uniformly reduces the real payoff of all assets without altering their relative slope.[1] Hence the excess real returns equal the nominal excess returns:

$$r_1' - r_f' = r_1 - r_f, \qquad r_2' - r_f' = r_2 - r_f. \tag{3}$$

Bernoulli utility $U : \mathbb{R}_+ \to \mathbb{R}$ is twice continuously differentiable with:

$$U'(W) > 0, \qquad U''(W) < 0, \tag{4}$$

where W denotes the investor's state-contingent real wealth, and the utility function (when invoked) exhibits decreasing absolute risk aversion (DARA),

$$\mathrm{R}_A(W) \equiv -\frac{U''(W)}{U'(W)} \text{ is strictly decreasing in } W. \tag{5}$$

Behavioral probability weighting $w : [0,1] \to [0,1]$ satisfies $w(0) = 0$, $w(1) = 1$, and is continuously differentiable and strictly increasing. The investor therefore evaluates uncertain outcomes using a subjective decision weight $w(p)$ rather than the objective probability p.

Using $m = A - a$, state-contingent real wealth is:

$$\begin{aligned} W_1(a, \pi^e) &= A + (A-a)r_f' + ar_1' = A + A(r_f - \pi^e) + a(r_1 - r_f), \\ W_2(a, \pi^e) &= A + (A-a)r_f' + ar_2' = A + A(r_f - \pi^e) + a(r_2 - r_f). \end{aligned} \tag{6}$$

The investor chooses $a \in [0, A]$ to maximize:

$$\max_{a\in[0,A]} f(a; \pi^e, p) \equiv w(p)U(W_1) + \big(1 - w(p)\big)U(W_2). \tag{7}$$

Eliminating a from (6), the opportunity line in (W_1, W_2)-space is:

$$(1+k)\big(A + Ar_f'\big) = kW_1 + W_2, \qquad k \equiv -\frac{r_2 - r_f}{r_1 - r_f}, \tag{8}$$

whose slope k is invariant to π^e by (3).

Differentiating (6), we get:

$$\frac{\partial W_1}{\partial a} = r_1 - r_f, \qquad \frac{\partial W_2}{\partial a} = r_2 - r_f. \tag{9}$$

[1] This structure allows us to isolate the wealth effect of inflation expectations while preserving the risk–return tradeoff across states.

For an interior optimum $a^\star \in (0, A)$, the first order condition (FOC) is:

$$0 = f_a(a^\star; \pi^e, p) = w(p)U'(W_1)(r_1 - r_f) + \big(1 - w(p)\big)U'(W_2)(r_2 - r_f). \tag{10}$$

The second order condition (SOC) is:

$$f_{aa}(a; \pi^e, p) = w(p)U''(W_1)(r_1 - r_f)^2 + \big(1 - w(p)\big)U''(W_2)(r_2 - r_f)^2 < 0, \tag{11}$$

which holds by (4) when at least one of $(r_1 - r_f)$, $(r_2 - r_f)$ is nonzero.

Remark 1 (Tangency). Equation (10) is the tangency between the opportunity line (8) and a behavioral indifference curve $w(p)U(W_1) + [1 - w(p)]U(W_2) = \text{const}$.

Define $g(a; \pi^e, p) \equiv f_a(a; \pi^e, p)$.

Theorem 1 (Existence and uniqueness)**.** *Suppose* (4) *holds and at least one of* $(r_1 - r_f)$, $(r_2 - r_f)$ *is nonzero. Then for any* π^e *and* $p \in (0, 1)$, *there exists a unique maximizer* $a^\star \in [0, A]$. *If*

$$w(p)(r_1 - r_f) + \big(1 - w(p)\big)(r_2 - r_f) > 0, \tag{12}$$

then $a^\star \in (0, A)$*; otherwise* $a^\star = 0$.

Proof. Strict concavity. By (11), f is strictly concave, so any stationary point is the unique global maximizer.

Boundary signs. At $a = 0$, $W_1 = W_2 = A + Ar'_f$; hence

$$g(0; \pi^e, p) = U'(A + Ar'_f)\left[w(p)(r_1 - r_f) + (1 - w(p))(r_2 - r_f)\right].$$

Because $U' > 0$, the sign of $g(0)$ equals the bracketed term. At $a = A$, a similar expression obtains.

Interior vs. corner. If (12) holds, then $g(0) > 0$ and by (11) the function g is strictly decreasing in a, so there is a unique $a^\star \in (0, A)$ with $g(a^\star) = 0$. Otherwise $g(0) \le 0$ and strict concavity implies the left boundary $a^\star = 0$ maximizes f. □

Corollary 1 (Rational benchmark)**.** *If the probability weighting is rational, i.e.* $w(p) = p$, *then the interior–corner condition in Theorem 1*

$$w(p)(r_1 - r_f) + \big(1 - w(p)\big)(r_2 - r_f) > 0$$

reduces to

$$p(r_1 - r_f) + (1 - p)(r_2 - r_f) > 0,$$

which is the standard expected-excess-return condition. Under this inequality, the unique maximizer is interior $a^\star \in (0, A)$; if the inequality fails, the unique maximizer is the corner $a^\star = 0$.

Proof. Specialize the objective and its derivative under $w(p) = p$. From the general objective

$$f(a; \pi^e, p) = w(p)\, U(W_1(a, \pi^e)) + \big(1 - w(p)\big)\, U(W_2(a, \pi^e)),$$

setting $w(p) = p$ gives the expected-utility formulation

$$f(a; \pi^e, p) = p\, U(W_1) + (1 - p)\, U(W_2).$$

Differentiating with respect to a and using $\frac{\partial W_1}{\partial a} = r_1 - r_f$ and $\frac{\partial W_2}{\partial a} = r_2 - r_f$ from (9) yields

$$g(a; \pi^e, p) \equiv f_a(a; \pi^e, p) = p\, U'(W_1)(r_1 - r_f) + (1 - p)\, U'(W_2)(r_2 - r_f). \tag{13}$$

Strict concavity and uniqueness. By (11),

$$f_{aa}(a; \pi^e, p) = p\, U''(W_1)(r_1 - r_f)^2 + (1 - p)\, U''(W_2)(r_2 - r_f)^2 < 0,$$

since $U'' < 0$ and at least one of $(r_1 - r_f)$, $(r_2 - r_f)$ is nonzero. Thus f is strictly concave in a, and any zero of g is the unique global maximizer.

Evaluate the derivative at the left boundary $a = 0$. At $a = 0$, $W_1 = W_2 = A + Ar'_f$. Substituting into (13) gives

$$g(0; \pi^e, p) = U'(A + Ar'_f)\big[p(r_1 - r_f) + (1 - p)(r_2 - r_f)\big].$$

Because $U'(W) > 0$, the sign of $g(0)$ equals the sign of the expected excess return

$$\mathbb{E}[r - r_f] \equiv p(r_1 - r_f) + (1 - p)(r_2 - r_f).$$

I*nterior solution when $\mathbb{E}[r - r_f] > 0$.* If $\mathbb{E}[r - r_f] > 0$, then $g(0) > 0$. As $f_{aa} < 0$, $g(a)$ is strictly decreasing in a. Hence there exists a unique $a^\star \in (0, A)$ such that $g(a^\star) = 0$, which by concavity is the unique global maximizer.

Corner solution when $\mathbb{E}[r - r_f] \le 0$. If $\mathbb{E}[r - r_f] = 0$, then $g(0) = 0$ and $g(a) < 0$ for all $a > 0$, so f is weakly decreasing and the maximizer is the left boundary $a^\star = 0$. If $\mathbb{E}[r - r_f] < 0$, then $g(0) < 0$ and f is strictly decreasing from $a = 0$, again implying $a^\star = 0$.

Conclusion. Under rational weighting $w(p) = p$, the interior–corner condition in Theorem 1 reduces exactly to the sign of the expected excess return $p(r_1 - r_f) + (1 - p)(r_2 - r_f)$. A positive value implies an interior $a^\star \in (0, A)$, while a nonpositive value implies the corner $a^\star = 0$. $\square$

2.2 Comparative statics

We now study how the optimal risky share $a^\star$ responds to inflation expectations π^e and to probability weighting.

Theorem 2 (Effect of inflation expectations)**.** *Let $a^\star(\pi^e)$ denote the unique interior solution under* (12)*. Then:*

1. *The slope terms $(r_1 - r_f)$ and $(r_2 - r_f)$ are independent of π^e (cf.* (3)*).*
2. *If utility satisfies DARA* (5)*, then*
$$\frac{da^\star}{d\pi^e} < 0,$$
i.e., higher inflation expectations reduce the optimal risky investment.

Proof. Implicit function. Define $g(a, \pi^e) \equiv f_a(a; \pi^e, p)$ from (10). By the implicit function theorem,

$$\frac{da^\star}{d\pi^e} = -\frac{g_\pi(a^\star, \pi^e)}{g_a(a^\star, \pi^e)}. \tag{14}$$

By (11), $g_a = f_{aa} < 0$, so the sign of $\frac{da^\star}{d\pi^e}$ is the sign of g_π.

Computing g_π. From (6),

$$W_i = A + A(r_f - \pi^e) + a^\star(r_i - r_f).$$

Thus,

$$\frac{\partial W_i}{\partial \pi^e} = -A, \qquad \frac{\partial}{\partial \pi^e}(r_i - r_f) = 0 \quad \text{(by (3))}. \tag{15}$$

Differentiate,

$$g = w\,U'(W_1)(r_1 - r_f) + (1 - w)\,U'(W_2)(r_2 - r_f)$$

with respect to π^e:

$$\begin{aligned} g_\pi &= w\,U''(W_1)\frac{\partial W_1}{\partial \pi^e}(r_1 - r_f) + (1 - w)\,U''(W_2)\frac{\partial W_2}{\partial \pi^e}(r_2 - r_f) \\ &= -A\big[\,w\,U''(W_1)(r_1 - r_f) + (1 - w)\,U''(W_2)(r_2 - r_f)\,\big]. \end{aligned} \tag{16}$$

Using DARA to sign g_π. By DARA, when π^e rises, both W_1 and W_2 fall by the same amount A (cf. (6)), so absolute risk aversion:

$$R_A(W) = -\frac{U''(W)}{U'(W)}$$

increases at both states. Equivalently, $U''(W_i)$ becomes more negative, giving more weight (in magnitude) to $(r_i - r_f)$ in (16). With the standard ranking $r_1 > r_f > r_2$ (the up-state beats risk-free; the down-state underperforms), the term in brackets is negative:

$$w\, U''(W_1)(r_1 - r_f) + (1 - w)\, U''(W_2)(r_2 - r_f) < 0,$$

because $U''(W_1) < 0$ and $r_1 - r_f > 0$, while $U''(W_2) < 0$ and $r_2 - r_f < 0$. Hence $g_\pi > 0$ by (16) (noting the leading minus sign and $A > 0$). Finally, with $g_a < 0$ and $g_\pi > 0$, (14) implies

$$\frac{da^\star}{d\pi^e} < 0.$$

□

Theorem 3 (Effect of probability weighting)**.** *Fix π^e and let $a^\star(w)$ denote the interior solution for a weighting function w. Let ϑ parameterize w (e.g., Prelec weighting). Then:*

$$\frac{\partial a^\star}{\partial \vartheta} = -\frac{g_w(a^\star)}{g_a(a^\star)}\frac{\partial w}{\partial \vartheta}, \qquad \textit{with} \quad g_w(a) = U'(W_1)(r_1 - r_f) - U'(W_2)(r_2 - r_f). \tag{17}$$

In particular, if $\frac{\partial w}{\partial \vartheta} > 0$ overweights the good state (relative to the benchmark), then:

$$\frac{\partial a^\star}{\partial \vartheta} > 0.$$

Proof. Treating a as the choice variable and w as a parameter, differentiate $g(a, w) = 0$ with respect to w:

$$\frac{\partial g}{\partial a}\frac{\partial a^\star}{\partial w} + \frac{\partial g}{\partial w} = 0 \quad \Rightarrow \quad \frac{\partial a^\star}{\partial w} = -\frac{g_w}{g_a}.$$

Composing with ϑ gives (17).

Since $g_a < 0$ by (11), the sign of $\frac{\partial a^\star}{\partial \vartheta}$ matches the sign of $g_w \frac{\partial w}{\partial \vartheta}$. If the parameter ϑ increases the weight on the good state, then $\frac{\partial w}{\partial \vartheta} > 0$. Moreover,

$$g_w = U'(W_1)(r_1 - r_f) - U'(W_2)(r_2 - r_f) > 0$$

under the usual ranking $r_1 > r_f > r_2$ and $U' > 0$. Therefore $\frac{\partial a^\star}{\partial \vartheta} > 0$. □

Corollary 2 (Rational benchmark)**.** *If $w(p) = p$ for all p (i.e., $\frac{\partial w}{\partial \vartheta} = 0$), then $\frac{\partial a^\star}{\partial \vartheta} = 0$, and Theorem 3 collapses to the standard case.*

Proof. FOC and notation. Recall $g(a,w) \equiv f_a(a;\pi^e,p)$ from (10):

$$g(a,w) = w\,U'(W_1)(r_1 - r_f) + (1-w)\,U'(W_2)(r_2 - r_f).$$

For an interior optimum $a^\star$, $g(a^\star,w) = 0$ and $g_a(a^\star,w) = f_{aa}(a^\star;\pi^e,p) < 0$ by (11).

Differentiate with respect to w. Treat a as the choice variable and w as a parameter. Totally differentiating $g(a^\star,w) = 0$ with respect to w gives

$$g_a(a^\star,w)\,\frac{\partial a^\star}{\partial w} + g_w(a^\star,w) = 0 \quad \Rightarrow \quad \frac{\partial a^\star}{\partial w} = -\frac{g_w(a^\star,w)}{g_a(a^\star,w)}.$$

Composing with the parameter ϑ that indexes w yields the general rule in (17):

$$\frac{\partial a^\star}{\partial \vartheta} = -\frac{g_w(a^\star,w)}{g_a(a^\star,w)}\,\frac{\partial w}{\partial \vartheta}.$$

Rational benchmark. Under the benchmark $w(p) = p$ for all p, w no longer depends on ϑ; hence:

$$\frac{\partial w}{\partial \vartheta} = 0.$$

Substituting into (17) gives immediately:

$$\frac{\partial a^\star}{\partial \vartheta} = 0.$$

Interpretation. Because ϑ affects the problem only through w, and w is constant at p in the rational benchmark, the optimal choice $a^\star$ is invariant to ϑ. Therefore, Theorem 3 reduces to the standard expected-utility case with objective probabilities. □

2.3 Closed-form comparative statics for CRRA (local)

To make the wealth effect explicit, consider CRRA utility:

$$U(W) = \frac{W^{1-\gamma}}{1-\gamma}, \qquad \gamma > 0,\ \gamma \neq 1.$$

where γ is coefficient of relative risk aversion which measures how strongly an investor dislikes risk relative to wealth.

Then $U'(W) = W^{-\gamma}$ and $U''(W) = -\gamma W^{-\gamma-1}$. Plugging into (10) yields:

$$w\, W_1^{-\gamma}(r_1 - r_f) + (1-w)\, W_2^{-\gamma}(r_2 - r_f) = 0. \tag{18}$$

Using (6), W_1 and W_2 are affine in a. The derivative terms become:

$$g_a = -\gamma\Big[\, w\, W_1^{-\gamma-1}(r_1 - r_f)^2 + (1-w)\, W_2^{-\gamma-1}(r_2 - r_f)^2\Big] < 0, \tag{19}$$

$$g_\pi = \gamma A\Big[\, w\, W_1^{-\gamma-1}(r_1 - r_f) + (1-w)\, W_2^{-\gamma-1}(r_2 - r_f)\Big]. \tag{20}$$

Hence, from (14),

$$\frac{da^\star}{d\pi^e} = \frac{g_\pi}{g_a} = A\,\frac{\big[w\, W_1^{-\gamma-1}(r_1 - r_f) + (1-w)\, W_2^{-\gamma-1}(r_2 - r_f)\big]}{w\, W_1^{-\gamma-1}(r_1 - r_f)^2 + (1-w)\, W_2^{-\gamma-1}(r_2 - r_f)^2}. \tag{21}$$

Under the canonical ordering $r_1 > r_f > r_2$, the numerator in (21) is negative (the second term is negative because $r_2 - r_f < 0$), so $\frac{da^\star}{d\pi^e} < 0$. This recovers Theorem 2 and shows explicitly how wealth levels W_i scale the sensitivity through $W_i^{-\gamma-1}$.

Figure 1 provides a graphical counterpart to the analytical results derived above. The solid orange line and dashed blue line depict the opportunity sets corresponding to baseline and higher inflation expectations. Because inflation expectations π^e uniformly reduce real returns without altering the slope of excess returns $(r_1 - r_f)$ and $(r_2 - r_f)$, the opportunity set shifts downward in parallel when π^e rises. This movement represents a pure wealth effect that compresses the investor's attainable combinations of (W_1, W_2) across states.

The green indifference curves represent behavioral preferences under the baseline weighting function $w(p)$, while the blue curve represents an alternative scenario in which probability weighting places greater emphasis on the good state. The point of tangency between the baseline opportunity line and the yellow indifference curve identifies the optimal risky allocation $a^\star$. As inflation expectations increase, the tangency point shifts inward along the opportunity locus, confirming the analytical result in Theorem 2 that $\frac{da^\star}{d\pi^e} < 0$.

Comparatively, when the investor overweights the good state (higher $w(p)$), the indifference curves rotate outward, reflecting reduced perceived risk and higher marginal utility in the favorable outcome. This behavioral distortion increases the risky share, consistent with Theorem 3, where $\frac{\partial a^\star}{\partial \vartheta} > 0$. The 45-degree line, plotted as a reference, denotes the certainty locus $W_1 = W_2$. The feasible region below the opportunity frontier highlights all attainable wealth combinations given the investor's endowment and market structure. Together, these graphical features visually demonstrate how inflation expectations and probability weighting jointly determine optimal portfolio selection in the (W_1, W_2) space.

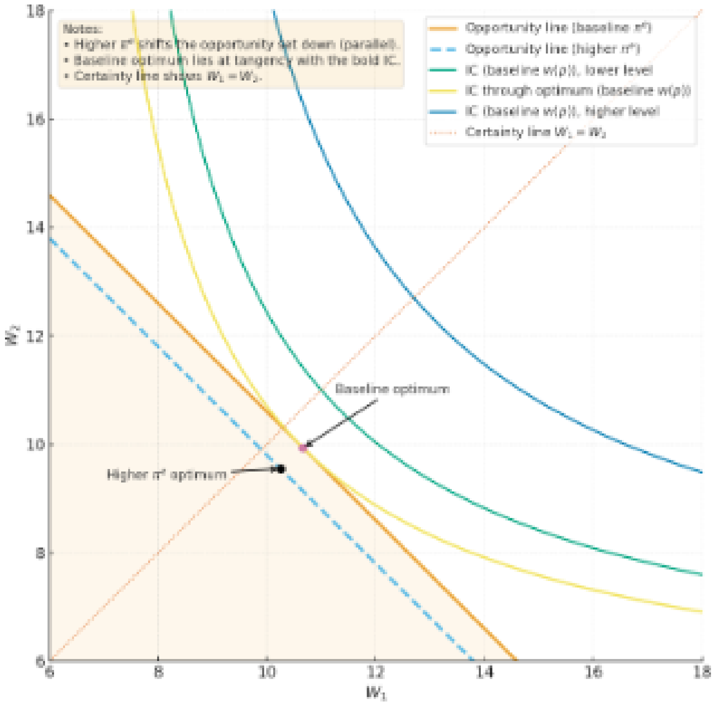

Figure 1: Opportunity line and indifference curves under shifts in inflation expectations π^e and probability weighting $w(p)$

Figure 2 visualizes the investor's expected utility $f(a; \pi^e, p)$ as a joint function of the risky investment share a and inflation expectations π^e. Each contour line traces combinations of (a, π^e) that yield the same level of utility under the model. Darker regions represent lower utility, whereas lighter regions indicate higher attainable utility given the investor's wealth, risk aversion, and behavioral weighting $w(p)$.

The bold solid curve corresponds to the locus of optimal allocations $a^\star(\pi^e)$, that is, the ridge line of maximal utility for each inflation expectation. This ridge illustrates that as π^e rises, the investor's real wealth declines, reducing the feasible opportunity set and shifting the optimal risky position leftward. Consequently, the optimal risky investment $a^\star$ declines monotonically with inflation expectations, consistent with Theorem 2, which establishes $\frac{da^\star}{d\pi^e} < 0$ under DARA preferences.

Economically, Figure 2 provides a local visualization of the wealth effect embedded in the comparative-statics analysis. The downward slope of the $a^\star(\pi^e)$ path reflects that higher expected inflation—by eroding real returns—induces investors to rebalance away from risky assets toward the risk-free component. This contour representation thus complements Figure 1 by translating the theoretical geometry of (W_1, W_2) space into the policy space (a, π^e), making explicit the continuous relationship between inflation expectations and optimal portfolio risk exposure.

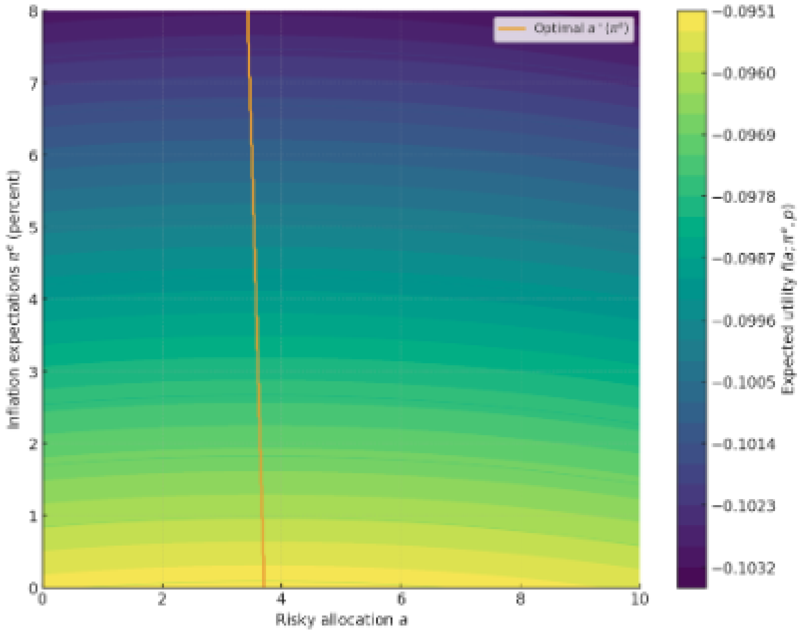

Figure 2: Contour map of expected utility $f(a;\pi^e,p)$ over the (a,π^e) space, with the optimal policy path $a^\star(\pi^e)$ indicated by the solid curve.

3 Conclusion and Policy Implications

This paper develops a unified behavioral–macro portfolio model that analytically links inflation expectations, probability weighting, and optimal risky investment under CRRA preferences. Within a single-period framework, we show that higher inflation expectations uniformly reduce real returns, generating a pure wealth effect that shifts the opportunity frontier downward without altering its slope. Under decreasing absolute risk aversion (DARA), this wealth compression lowers the investor's optimal risky share. In contrast, a higher subjective weight on the good state—as in a Prelec-type probability weighting—rotates indifference curves outward, raising the optimal risky exposure. Together, these results provide a closed-form behavioral foundation for how macroeconomic expectations and subjective probability distortions jointly shape portfolio allocation.

Our analytical results have several implications for monetary policy and financial stability. First, they highlight that persistent increases in inflation expectations may systematically reduce investors' risk appetite and shift wealth toward safer assets, amplifying risk-off episodes in financial markets. Central banks should therefore monitor not only the level of inflation expectations but also their dispersion across households and institutions, since heterogeneous expectations can generate portfolio imbalances and asset-price volatility. Second, the framework suggests that improving the credibility and transparency of monetary communication can stabilize investors' real-return expectations, mitigating behavioral distortions in risk-taking. Finally, the model's comparative statics provide a theoretical rationale for incorporating behavioral probability weighting into macroprudential stress testing, where distorted perceptions of "good" and "bad" states affect capital allocation and liquidity preference.

While the model yields clean analytical insights, several limitations merit attention. First, the single-period structure abstracts from dynamic feedback between expectations, wealth accumulation, and learning over time. Extending the framework into a multi-period or stochastic dynamic general equilibrium (DSGE) environment would allow analysis of persistence and intertemporal substitution effects. Second, our behavioral weighting function is parameterized exogenously; empirical calibration using experimental or survey-based probability judgments could better quantify the magnitude of distortion across investor types. Third, the model focuses on two discrete states of the world. Incorporating continuous return distributions or ambiguity-averse preferences (as in Epstein and Schneider, 2008) would enhance realism and robustness.

Future research may integrate this behavioral portfolio mechanism into asset-pricing and macro-finance models to study how inflation expectations propagate through financial markets, or how policy announcements dynamically reshape investors' subjective state probabilities. Such extensions could inform central-bank communication strategies and the design of behavioral macroprudential tools in inflationary environments.

References

Barberis, N., Huang, M., and Santos, T. (2001). Prospect theory and asset prices. *Quarterly Journal of Economics*, 116(1), 1–53.

Barberis, N. (2013). Thirty years of prospect theory in economics: A review and assessment. *Journal of Economic Perspectives*, 27(1), 173–196.

Bansal, R., and Yaron, A. (2004). Risks for the long run: A potential resolution of asset pricing puzzles. *Journal of Finance*, 59(4), 1481–1509.

Coibion, O., Gorodnichenko, Y., and Weber, M. (2023). Monetary policy communications and their effects on household inflation expectations. *Journal of Political Economy*, 130(6), 1537-1584.

Drechsler, I., Savov, A., and Schnabl, P. (2017). The deposits channel of monetary policy. *Quarterly Journal of Economics*, 132(4), 1819-1876.

Epstein, L.G., and Schneider, M. (2008). Ambiguity, information quality, and asset pricing. *Journal of Finance*, 63(1), 197–228.

Gollier, C. (2018). The Economics of Risk and Uncertainty, Edward Elgar Publishing, number 17427.

Markowitz, H. (1952). Portfolio selection. *Journal of Finance*, 7(1), 77–91.

Merton, R. C. (1969). Lifetime portfolio selection under uncertainty: The continuous-time case. *Review of Economics and Statistics*, 51(3), 247–257.

Prelec, D. (1998). The probability weighting function. *Econometrica*, 66(3), 497–528.

Tversky, A., and Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297–323.

Appendix A: Detailed Differentiations

A.1 Derivative with respect to a

From (6),

$$W_i = \bar{W} + a(r_i - r_f) \quad \text{with} \quad \bar{W} \equiv A + A(r_f - \pi^e).$$

Thus,

$$\frac{\partial W_i}{\partial a} = r_i - r_f, \qquad \frac{\partial^2 W_i}{\partial a^2} = 0.$$

Therefore,

$$\frac{\partial}{\partial a}\left\{ w\, U(W_1) \right\} = w\, U'(W_1)(r_1 - r_f), \qquad \frac{\partial}{\partial a}\left\{ (1-w)\, U(W_2) \right\} = (1-w)\, U'(W_2)(r_2 - r_f),$$

which yields (10); a second derivative gives (11).

A.2 Derivative with respect to π^e

From (6),

$$\frac{\partial W_i}{\partial \pi^e} = -A \quad \text{and} \quad \frac{\partial (r_i - r_f)}{\partial \pi^e} = 0.$$

Hence,

$$g_\pi = w\, U''(W_1)\,(-A)(r_1 - r_f) + (1-w)\, U''(W_2)\,(-A)(r_2 - r_f),$$

giving (16) and Theorem 2 via (14).

A.3 Derivative with respect to w

Treating w as a parameter,

$$g_w = \frac{\partial}{\partial w}\left[w\, U'(W_1)(r_1 - r_f) + (1-w)\, U'(W_2)(r_2 - r_f) \right] = U'(W_1)(r_1 - r_f) - U'(W_2)(r_2 - r_f),$$

which implies (17).