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Incentives in Hedge Funds

(Forthcoming)

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What is HF? (1)

Financial Intermediation: **cf. Bank, MF**

Private Partnership: **Investor (Unsophisticated Investor)**

Manager (Manager + Sophisticated Investors)

What is HF? (2)

Investor: **1 Unit of Fund**

No Withdrawal

Manager: **M Units of Self-Fund**

Run Investor's Fund and Part of Self-Fund

Low Transparency

Weak Regulation

Dynamical Investment Strategy: **cf. Buy-and-Hold**

What is HF? (3)

Return for Investor's Fund: $x \in [0,\infty)$

Alpha: $x-1$

Manager's Fee Scheme: $y:[0,\infty)\to[-M,\infty]$

$y(x)\in[-M,\infty)$

Maximal Penalty: $w(y)\equiv \max[-\min_{x\in[0,\infty)} y(x),0]\geq 0$

What is HF? (4)

Real Fee Scheme: **2:20**

Asymmetry

No Penalty, $w(y) = 0$

Convexity

High-Powered

Criticisms: **Positive Penalty** $w(y) > 0$**, Linear, Symmetry, Fulcrum**

Lower-Powered

Warren Buffet

HF Problem (1)

Fake Alpha: Performance Mimicry

Option Trading Induces Market Failure

Hidden Action (Moral Hazard): **Skilled Manager Mimics High Performance**

Hidden Information (Lemon): **Unskilled Enters and Mimics Skilled**

Real HF: **Much Lower Alpha than Expected**

HF Problem (2)

Capital Decimation Partners (CDP)

Andrew Lo (2001): **2:20 Scheme Motivates CDP**

Foster-Young (FY, 2008): **In Theory, Incentive Scheme is Impossible to Design**

Press Releases: **FT (18/3/08), NYT (3/8/08), etc**

"Ideal HF Never Survives. More Transparency!"

My Research (1)

Q: **Why Is FY so Pessimistic?**

A: **Incentives in HFs are Special:**

Maximal Penalty $w(y)$ Must be Put in Escrow: **Unmanageable**

Skilled is Deprived of Self-fund Management: **Distortion, Lemon**

My Research (2)

Q: **Is FY True?**

A: **No!**

FY Depends on ‘No Capital Gain Tax (CGT)’

My Research (3)

Incentive Fee Scheme: $y(x) \in [-M, \infty), \ x \in [0, \infty)$

Five Requirements:

① **Skilled Manager's Entry**

② **Unskilled Manager's Exit**

③ **Investor's Entry**

④ **Welfare Improvement**

⑤ **Skilled Manager's Performance Mimicry**

My Research (4)

Q: **Does Incentive Scheme Exist?**

What Condition?

How to Design?

Welfare-Optimal?

How to Implement?

Results (1)

- **CGT Matters:**

  No CGT **Incentive Scheme Never Exists!**

  Allow Positive CGT **Incentive Scheme Does Exist!**

- **Shape of Incentive Scheme:** **Positive Penalty** $w(y) > 0$**, Linear,**

  Symmetry, Fulcrum …

Results (2)

- **Welfare-Optimal CGT Rate:** **Low Enough to Keep Skilled Manager's Entry Binding**

- **Implementation:** **Manager Prefers Over-Solvency**

  'Tax on Manager's Fee' Matters

  Tax Rate on Fee Must be Bigger than CGT Rate

Manager's Types: Skilled and Unskilled (1)

Skilled Manager:

Investment Strategy:

Action $a \in [0,\infty)$

Alpha a

Non-pecuniary Cost $c(a)$**: Increasing, Convex, …**

Side Contracting (CDP):

$F : [0,\infty) \to [0,1] \in \Phi(a)$

$E[z \mid F] = a + 1$

$y(z) - c(a)$

Manager's Types: Skilled and Unskilled (2)

Unskilled Manager:

No Investment Strategy: $a = 0$

Only Performance Mimics: $F : [0,\infty) \to [0,1] \in \Phi(0)$

$E[z \mid F] = 1$

$y(z) - c(0) = y(z)$

Other Characters

Investor: $x - y(x)$

Third Party: **Option Buyer, Arbitrageur**

Escrow Service: **Make Manager Solvent to Penalty and Side Contract**

Government: **CGT Rate** $t \geq 0$

Tax on Fee Rate $\tau \geq 0$

CDP: Performance Mimicry (1)

By Selling Covered Options, Unskilled Manager Mimics 'Alpha $a = \frac{1}{1-p}$ with Prob. $1-p$'

Put Investor's Fund in Escrow

Give it to Buyer if S&P 500 Stock Index Declines 20%: Prob. p

Give Nothing Otherwise: Prob. $1-p$

Option Price p

Put p in Escrow and Sell Options Further, …

Total Option Sale: $1 + p + p^2 + \cdots = \frac{1}{1-p}$

Total Return:

$\frac{1}{1-p}$ **Prob.** $1-p$

0 **Prob.** p

CDP: Performance Mimicry (2)

By Using CDP, Even Skilled Manager Can Mimic High Performance

CDP Implements Any Side Contract

Requirements ②&⑤: Linearity, Symmetry

Requirement ①: Skilled Manager's Entry

Outside Opportunity: **Manage Self-Fund** M

Select $a = \tilde{a}(1-t)$ **to Maximize** $(1-t)a - c(a)$

$$\bar{V}(t) \equiv M\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

Payoff: **Put** $w(y)$ **in Escrow, Unmanageable**

$$V(y,\tau,t) \equiv \min[(1-\tau)y(a^*(y,\tau)+1), y(a^*(y,\tau)+1)] - c(a^*(y,\tau))$$
$$+\{M - w(y)\}\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

Entry $V(y,t,\tau) \geq \bar{V}(t)$**:**

$$\min[(1-\tau)y(a^*(y,\tau)+1), y(a^*(y,\tau)+1)] - c(a^*(y,\tau))$$
$$\geq w(y)\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

Requirement ②: Unskilled Manager's Exit

Outside Opportunity: **Zero**

Payoff: $\max_{F \in \Phi} E[\min[(1-\tau)y(z), y(z)] \mid F]$

Exit: $\max_{F \in \Phi} E[\min[(1-\tau)y(z), y(z)] \mid F] \leq 0$

Requirement ③: Investor's Entry

Outside Opportunity: **Zero**

payoff: $$U(y,t,\tau) \equiv \min[(1-t)\{a^*(y,\tau) - y(a^*(y,\tau)+1)\}, a^*(y,\tau) - y(a^*(y,\tau)+1)]$$

Entry $U(y,t,\tau) \geq 0$: $$a^*(y,\tau) \geq y(a^*(y,\tau)+1)$$

Requirement ④: Welfare Improvement

Status Quo: **No HF,** $t = \tau = 0$

$$\bar{S} \equiv M\{\tilde{a}(1) - c(\tilde{a}(1))\}$$

Social Surplus:

$$S(y,t,\tau) \equiv a^*(y,\tau) - c(a^*(y,\tau)) + \{M - w(y)\}\{\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

$S(y,t,\tau) > \bar{S}$

$$a^*(y,\tau) - c(a^*(y,\tau)) + \{M - w(y)\}\{\tilde{a}(1-t) - c(\tilde{a}(1-t))\} > M\{\tilde{a}(1) - c(\tilde{a}(1))\}$$

Requirement ⑤: Skilled Manager's Mimicry

With $a \in A$ and $F \in \Phi(a)$, Skilled Manager Receives;

$$E[\min[(1-\tau)y(z), y(z)] \mid F] - c(a)$$

$$+\{M - w(y)\}\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

No Incentive to CDP: $\forall a \in A \forall F \in \Phi(a)$:

$$V(y,t,\tau) \geq E[\min[(1-\tau)y(z), y(z)] \mid F] - c(a)$$

$$+\{M - w(y)\}\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$$

No CGT: Lemon (1)

Theorem 1 (Lemon): *Suppose CGT Rate* $t = 0$. *Then, There Exists No Fee Scheme that Satisfies Skilled's Entry* ①, *Unskilled's Exit* ②, *and Welfare Improvement* ④.

No CGT: Lemon (2)

Outline of Proof: Suppose $a > 0$ is only available, $c(a) = c$

By CDP, Unskilled Earns $a+1$ **with Prob.** $\frac{1}{a+1}$

0 **with Prob.** $\frac{a}{a+1}$

Unskilled Exit ②：

$$\frac{1}{a+1} y(a+1) + \frac{a}{a+1} y(0) \leq 0$$

$$y(a+1) - w(y)a \leq 0$$

No CGT: Lemon (3)

Skilled's Outside Opportunity: $M(a-c)$

Skilled's Payoff: $y(a+1)-c+\{M-w(y)\}(a-c)$

Skilled Exit ① + Welfare Improvement ④: $y(a+1)-w(y)a \geq \{1-w(y)\}c > 0$

Contradiction!

Positive CGT: Existence

Theorem 2: ***There exist*** $(t,\tau)\in[0,1]^2$ ***and*** $y\in Y^*(\tau)$ ***that satisfy*** ①②③④⑤.

Outline of Proof:

CGT Makes ① Compatible with ②

Skilled Has Incentive to Save CGT

Unskilled Has No Such Incentive ∵No Skill to Earn Alpha

'Low-Powered + Large Fund' is More Efficient Than 'High-Powered + Small Fund'

Welfare Optimization (1)

Specify Fee Scheme

$$y = y^{k,\tau}$$

$$(1-\tau)y^{k,\tau}(x) = k(x-1) \qquad \text{for all} \quad x \in [1,\infty)$$

$$y^{k,\tau}(x) = k(x-1) \qquad \text{for all} \quad x \in [0,1)$$

$$0 \le k \le \min[E, 1-\tau], \;\; w(y^{k,\tau}) = k$$

②③⑤

Specify CGT Rate

$$t = \hat{t}(k)$$

Binding①: $k\tilde{a}(k) - c(\tilde{a}(k)) = w(y)\{(1-t)\tilde{a}(1-t) - c(\tilde{a}(1-t))\}$

Welfare Optimization (2)

Specify (k^*, t^*, τ^*)

$k = k^*$ **maximizes** $\tilde{a}(k) - c(\tilde{a}(k)) - (M - k)\{\tilde{a}(1 - \hat{t}(k)) - c(\tilde{a}(1 - \hat{t}(k)))\}$

$t^* \equiv \hat{t}(k^*)$

$\tau^* \equiv 1 - k^*$

Tax Rate on Fee τ^* **is Greater than CGT Rate** t^*

Welfare Optimization (3)

Theorems 3&5&6: $(y^{k^*,\tau^*}, t^*, \tau^*)$ *Satisfies* ①②③④⑤. *There exists No* (y, t, τ) *that Satisfies* ①②③④⑤, *and*

$$S(y,t,\tau) > S(y^{k^*,\tau^*}, t^*, \tau^*).$$

No Tax on Fee: Useless HF

Skilled Manager Has Very Strong Incentive to Save CGT: Best Prefers $y^{\min[M,1-\tau],\tau}$

High Tax Rate on Fee Impedes Over-Solvency

Theorem 4 (Useless HF): **If** $M>1$ **and** $\tau=0$**, then**

$$\bar{S}(0)>S(y^{\min[M,1-\tau],\tau},t,\tau)=S(y^{1,0},t,0).$$