



Corporate Finance Theory

Lecture 14

Risking Other People's Money (1) DeMarzo et al. (2014)

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Intended outcomes for the day:

1. **To compare and contrast** the conflict of interest (moral hazard) in DeMarzo et al. to previous models we have seen this semester
2. **To mathematically derive** the optimal contract for the manager in this setting
3. **To intuitively describe** why the optimal contract may not provide incentives for the manager to choose the efficient project



Introduction

DeMarzo et al. consider a setting with a **conflict of interest** between investors/owner and a manager.

Manager can be hired to implement a project

The manager requires incentives to:

1. **Select appropriate level of risk** (project selection)
2. **Honestly report** positive cash flows



Connection with risk shifting and asset substitution.

Modeled as principal-agent relationship with two-dimensional moral hazard.

Crucially, the owner **cannot observe** the manager's project selection or the realized cash flows



Make Money Fast

Purchase to Pay “Top Tips” - how to get rich from Purchase to Pay!

1. HACK THE FINANCE SYSTEM If you can get administrator access to the finance system, it's like having the keys to the safe. There's lots of ways of persuading the IT team to give you admin access, especially if you're involved in system design and testing. Try telling them you need to set up new user accounts out of hours for testing. In an organization that hasn't buttoned down its IT security procedures, you'll find a way. Once you've got admin access, you can set up users, suppliers, bank details, the lot!

2. FAKE INVOICES You'll need to collude with the supplier for this one. Just get them to send fake invoices. You'd be surprised how many companies will retrospectively create a purchase order to match it in order to get it paid. If invoices are paid on the nod below a certain level, make the most of it. Let's say that any invoice below \$1,000 gets paid – even if there's no purchase order – all you need to do is have a chat with one of your friendly suppliers, get a few invoices submitted and split the proceeds.



3. MAKE FRIENDS AND UNDERMINE THE SOX CONTROLS Segregation of responsibilities is all about preventing collusion. These rules are your enemy and you need to undermine them. Make friends. Do people favours and offer to take their workload off them. Share a few secrets in return for a few of theirs. When you need to call in a favour, it won't be a problem.



4. RECEIPT GOODS THAT HAVE NEVER BEEN DELIVERED

This is so easy and almost impossible to detect in the right circumstances. Take for example a building site. If the concrete is being supplied by your friendly supplier – (you really should have some friendly suppliers) – make sure you sign for the deliveries personally then watch as the truck leaves the site without dropping off the concrete. Your friendly supplier can then be paid twice for a single delivery. The architects will wonder why it's taken twice as much concrete to build the office block than they estimated but by the time they figure it out, you're long gone.



5. TAKE KICK BACKS

Always make sure there's room for a few unwritten clauses in the contract when you negotiate with a supplier. Whether it's cash or a few freebies, most suppliers are happy to build in some costs to cover your “commission”.



6. DIVERT SOME BIG PAYMENTS If you want to hit the big time there's a simple scam that will fool even the most competent AP team. Find a supplier that regularly invoices large amounts. You need to open a bank account in their name – or at least nearly their name. Once you've opened the account, it's a simple matter to inform AP of the new bank account details. They won't notice the minor name change and once set up, you'll enjoy a few weeks of someone else's money – sufficient time to cover your tracks and disappear.



“It really works!”

These are all examples of real frauds that happen every day. If purchase to pay processes aren't buttoned down tightly, some or all of these frauds are probably happening in your company.

To keep up-to-date on purchase to pay, supply chain finance and AP automation, visit <http://purchasinginsight.com>



We've seen many papers where conflicts of interest play a crucial role. These include:

- Model of credit rationing with conflict between creditors and shareholders; firm borrowing limited by pledgeable income
- Admati et al: conflict between creditors and shareholders leads to excessive debt
- Malenko and Malenko: conflict between creditors and shareholders leaves firm unable to borrow efficient amount

BEFORE: competitive credit markets, new investment. Conflict affected price of debt, willingness to lend

Alternatively: the conflict of interest affects the interest rate.

NOW: contracting approach, no investment. Conflict affects owner's ability to motivate manager through bonus contract



Owner wants manager to **truthfully report** positive cash flows.

- Must reward manager when reported cash flows are positive.
- But this provides incentives to choose the high-risk project.

Owner wants manager to **select low-risk project**

- Must reward manager when reported cash flows are zero
- But this also provides incentives to divert cash flows

The optimal contract may implement the inefficient, high-risk project

Solutions: condition payment on state, adjust project scale over time

See this in the next lecture



The model

Owner with initial assets A

Manager chooses:

safe project



Cash flow (safe)

1 with probability μ
0 with probability $1 - \mu$

risky project



Cash flow (risky)

1 with probability $\mu + \rho$
0 with probability $1 - (\mu + \rho + \delta)$
 $-D$ with probability δ

$0 <$

$0 < \mu < 1$

$\rho > 0$
 $D > 0$
 $\delta > 0$

Manager can honestly report positive cash flows or divert funds.

-Diverting funds gives private benefit $\lambda < 1$.

If diverted, owner gets **reported** cash flow

safe project



Reported cash flow (safe)

0 with probability μ
0 with probability $1 - \mu$

risky project



Reported cash flow (risky)

0 with probability $\mu + \rho$
0 with probability $1 - (\mu + \rho + \delta)$
-D with probability δ



Question

Recall the moral hazard problem in the model of credit rationing: whether or not to exert high effort.

Two differences here:

- 1) Moral hazard problem is not related to effort, but whether to divert cash flows.
- 2) Second dimension of moral hazard, whether to choose the appropriate level of risk

Question: which of these two differences matters most for the analysis in DeMarzo et al.

- most popular*
- a) Moral hazard related to diverting cash flows, not effort
 - b) Moral hazard in two dimensions, rather than one
 - c) The two differences are equally important

Go to socrative.com, room 897458, and vote on the best answer.



Discussion

The fact that moral hazard relates to diverting cash, rather than effort provision, is **unimportant**

See the discussion on p.6-7 of the article

In both cases, the agent will only do the right thing (truthfully report, exert effort) if his reward is sufficiently high after achieving a good outcome (positive cash flow)

The **crucial issue** here is the interaction between the two dimensions of moral hazard: providing incentives to choose the safe, efficient project indirectly makes the temptation to divert cash more severe.

A single tool (compensation package) may not be able to perfectly solve both problems. Generates tradeoff.



The safe project is **efficient**: $\delta D - \rho > 0$

Recall that the owner does not observe project selection or **realized** cash flows.

Owner offers incentive contract

$$\varphi = (w(0), w(1), w(-D)=0)$$

specifying payment based on **reported** cash flow

Payments are non negative (**limited liability**)

We assume: owner will only employ manager if expected reported cash flow minus expected payment is strictly positive.



Deriving the optimal contract

You can think about what the left-hand side represents, and what the right-hand side represents.

1. Argue that the optimal contract must satisfy the incentive compatibility (IC) constraint:

$$w(1) \geq w(0) + \lambda$$

Hint: think about the manager's incentive to truthfully report cash flows

How would you describe the intuition behind this constraint?

Left-hand-side:

Key idea: the optimal contract must induce the manager not to divert cash (ie to truthfully report).

Why? If the manager diverts, then the owner never earns a positive profit.

Key idea: manager's payoff from truthful reporting (conditional on positive cash flow) must exceed that from diverting (conditional on positive cash flow).

Right-hand-side:

Left hand side: wage for truthful reporting of 1

Right hand side: wage for reporting zero + the private benefit λ from diverting.



Extra comment: from slide 12, we can conclude that the owner should offer a contract that satisfies the IC constraint, and therefore gives the manager an incentive not to divert. Take that as given from now on.

2. Argue that the manager will implement the risky project if and only if the "High Risk Taking" (HRT) constraint holds

$$(\rho + \delta)w(0) < \rho w(1)$$

Hint: compare manager payoffs under the two projects

How would you describe the intuition behind this constraint?

Left-hand-side:

Left-hand side is the effective cost to the manager from taking the risky project. Lower probability of a cash flow of 0 $\rightarrow$ would have given a wage of $w(0)$.

Right-hand side is the effective benefit to the manager from taking the risk project. Higher probability of a cash flow of 1 $\rightarrow$ gives a wage of $w(1)$

Right-hand-side:

Manager payoff, risky: $[\mu + \rho]w(1) + [1 - \mu - \rho - \delta]w(0)$

safe: $[\mu]w(1) + [1 - \mu]w(0)$



3. Draw the IC and HRT constraints in the following graph

-Mark the region where the IC constraint holds

-Mark the region where the HRT constraint holds

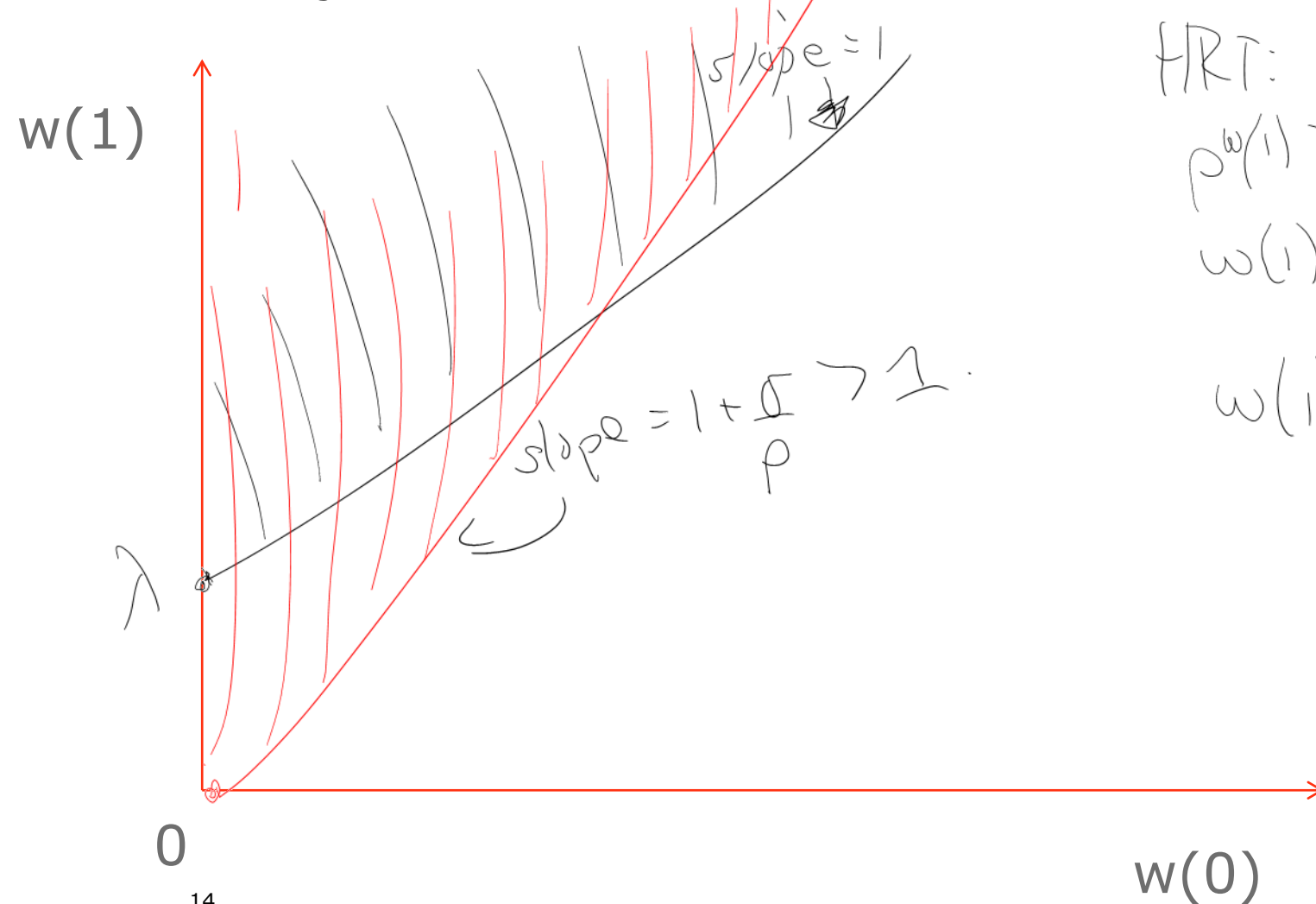
$$IC: w(1) \leq w(0) + 1$$

HRT:

$$p w(1) > (p + \delta) w(0)$$

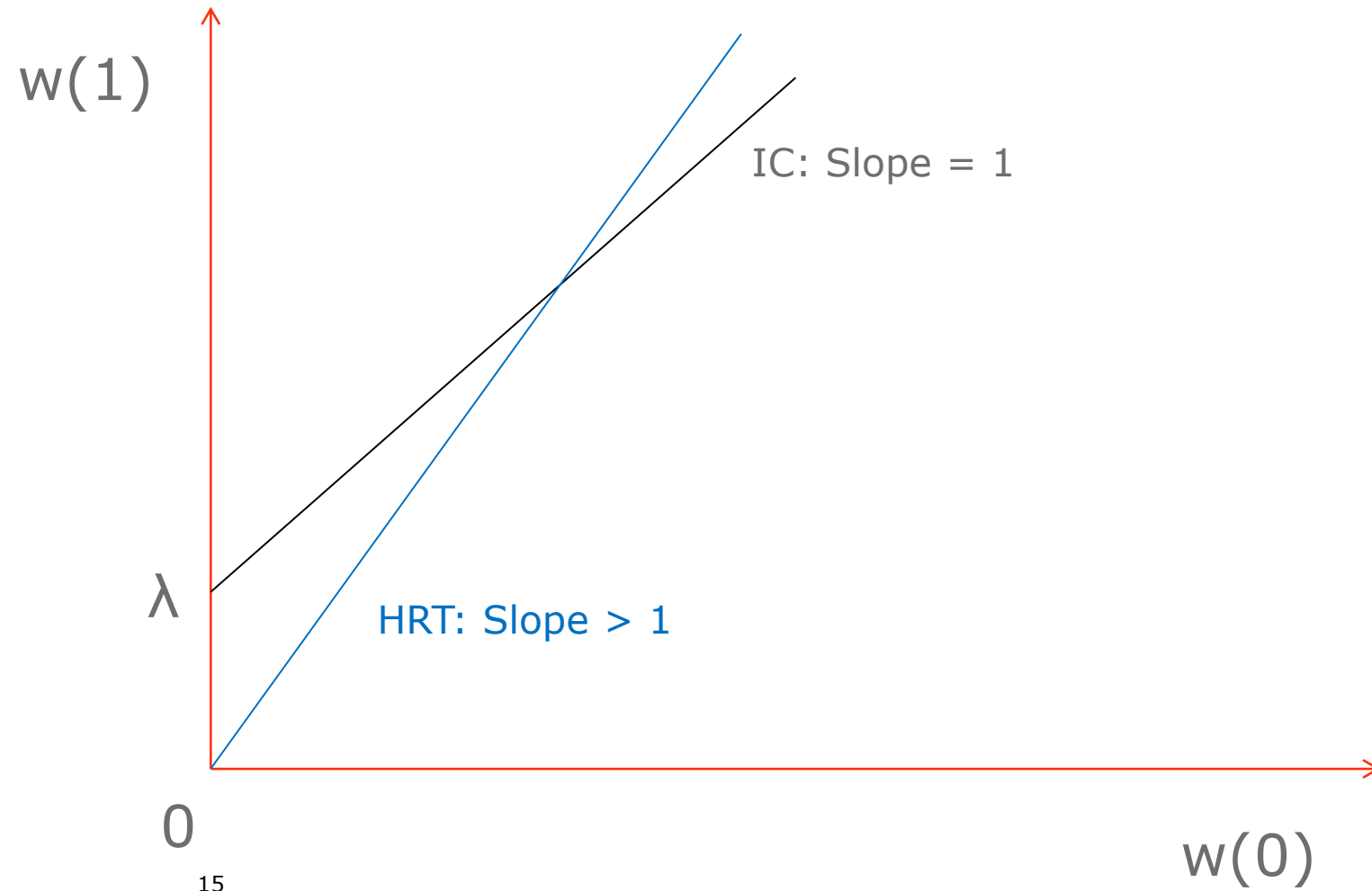
$$w(1) > \frac{(p + \delta)}{p} w(0)$$

$$w(1) > \left(1 + \frac{\delta}{p}\right) w(0)$$



3. Draw the IC and HRT constraints in the following graph

- Mark the region where the IC constraint holds (above the black line)
- Mark the region where the HRT constraint holds (above the blue line)

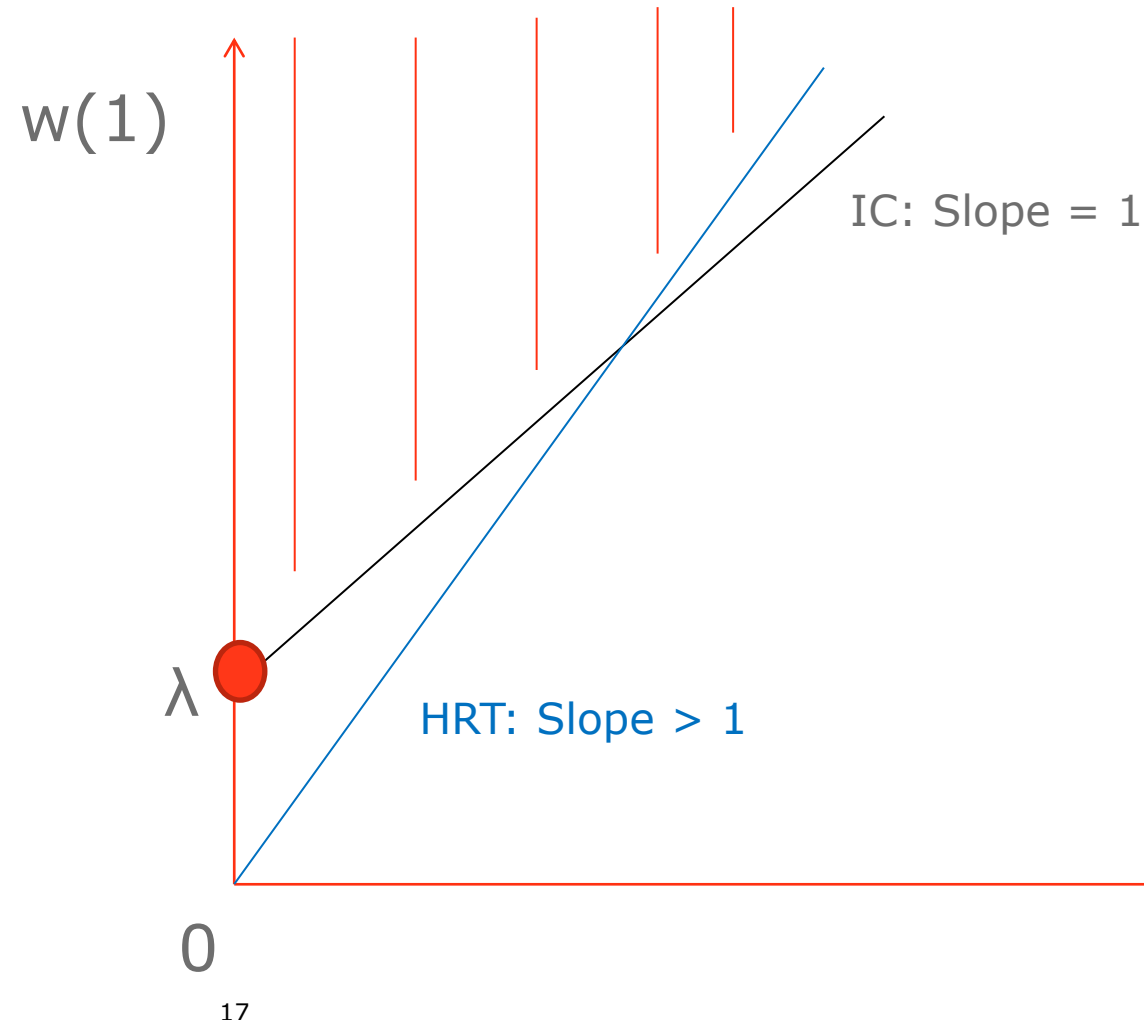


4. On the previous graph, mark the location of the optimal contract that implements the **risky** project. Argue that expected payments under this contract are $(\mu + \rho) \lambda$.

-Hint: think about which constraint(s) bind(s)



4. For **risky** project: Positive payment (λ) only for reporting positive cash flow. Positive cash flow occurs with probability $\mu + p$.



This contract gives a wage of 0 for a "failure" (and for the disaster outcome) and a wage of lambda for a "success".

Think of it as a bonus contract. Only pay the positive bonus, of size lambda, if the manager reports a success (i.e. a cash flow of 1).



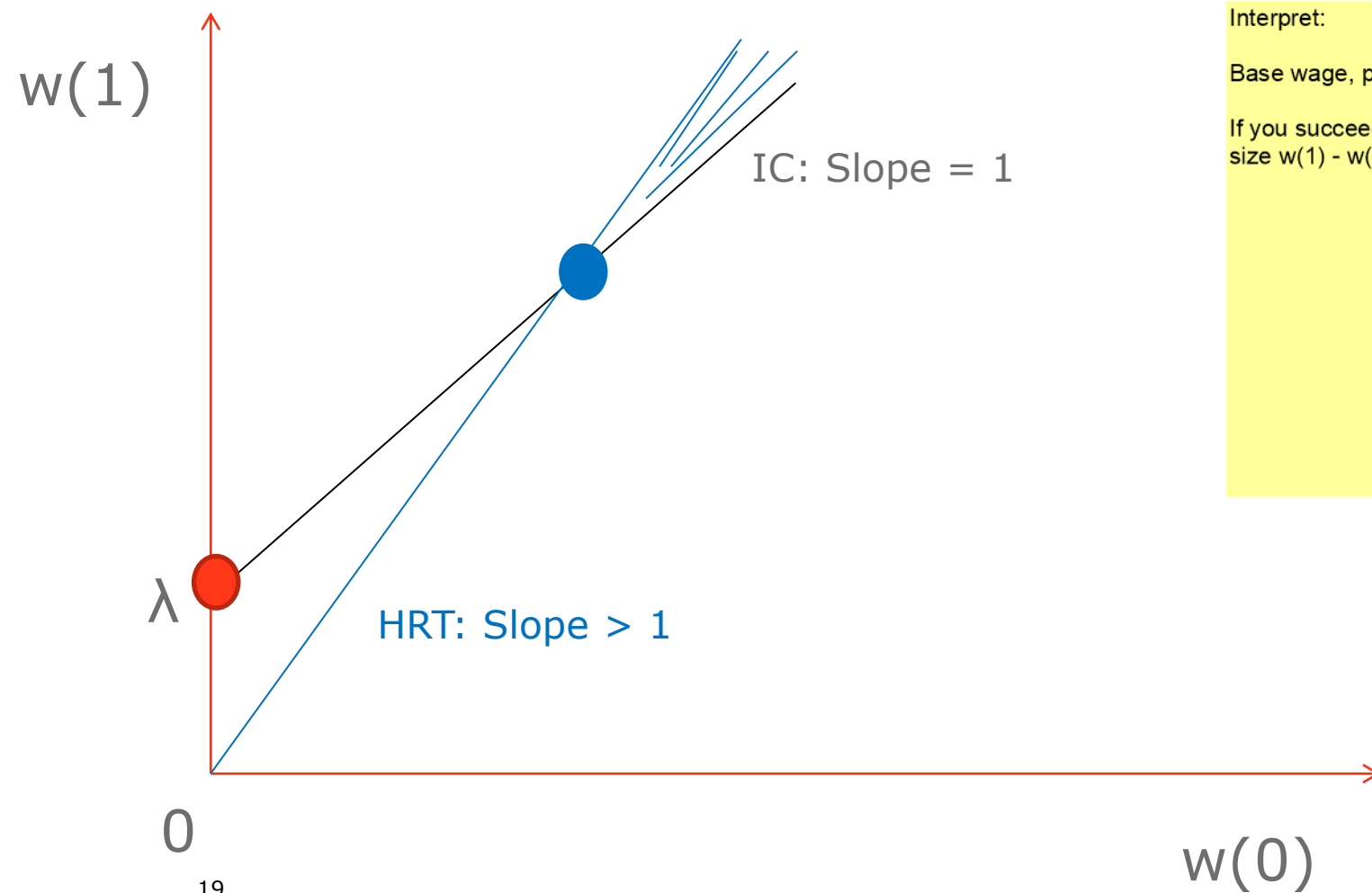
5. On the previous graph, mark the location of the optimal contract that implements the **safe** project. Argue that expected payments under this contract are

$$\frac{(\rho + \delta\mu_-)\lambda}{\delta}$$

-Hint: think about which constraint(s) bind(s)



5. For **safe** project: Positive payment for reporting zero cash flow, plus larger payment (by λ) by reporting positive cash flow. Equivalent to saying x-coordinate of blue point paid for sure, plus λ paid with probability μ



Interpret:

Base wage, paid for sure, of $w(0)$.

If you succeed, get an extra bonus of size $w(1) - w(0) = \lambda$.



6. Use parts 4 and 5 to argue that the owner will implement the risky project if and only if

$$\lambda\rho\left(\frac{1-\delta}{\delta}\right) > \delta D - \rho$$

Left-hand-side:

Right-hand-side:



Conclusion so far

1. The optimal contract may implement the risky project even though this project is inefficient
2. The safe project generates higher expected cash flows but requires higher rents for the manager to truthfully report
3. Rewarding the manager for positive cash flows encourages truthful reporting, but also makes it more attractive to choose the risky project
4. "Suppose the owner rewards the manager for reporting zero cash flow, to convince him to choose the safe project. The owner must then increase the reward for reporting a positive cash flow, to encourage honest reporting. But this means the owner must increase the reward for reporting zero cash flow, to convince the manager to choose the safe project. And so on."
5. Implementing the safe project becomes very costly when δ is small. Intuition: when δ is small, the manager becomes more tempted to choose the risky project, because a disaster (which brings him zero payment) only occurs with very low probability.



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The only way to **make the risky project unattractive** is to give the manager a relatively **low payoff** under the disaster outcome

But due to **limited liability**, this payoff is bounded below by zero

Hence, to make the risky project unattractive, the manager must receive a **relatively high payoff for zero cash flows**, since only this outcome is more likely with the safe project

But then the manager must receive an **even higher payoff for positive cash flows**, to encourage honest reporting



Intended outcomes revisited

1. To compare and contrast the conflict of interest (moral hazard) in DeMarzo et al. to previous models we have seen this semester.

Contracting approach, as opposed to perfectly competitive credit markets. Crucial point that moral hazard in project selection interacts with moral hazard in reporting cash flows.

2. To mathematically derive the optimal contract for the manager in this setting

Working analytically or graphically shows that the optimal contract makes either one or two constraints bind, depending on which project is to be implemented.

3. To intuitively describe why the optimal contract may not provide incentives for manager to choose the efficient project

More expensive to give manager incentives for the efficient project, since moral hazard in reporting cash flows becomes a more severe problem.



For next time

1. Concentrate on Section 2.4 and 2.5 of DeMarzo et al.
2. Read the article "Why Your Boss is Overpaid" from Forbes, posted in the folder for Lecture 15, and think about how it relates to the arguments made in Sections 2.4 and 2.5

Be ready to share your thoughts next time!

