# Are CEOs paid extra for riskier pay packages?

Albuquerque-Albuquerque-Carter-Dong

Kevin J. Murphy

December 2019

# Compensating Differentials for Risk

“Theory” predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[\text{Pay}]_i = \alpha + \beta \text{Var}[\text{Pay}]_i + \text{Controls}_i + \varepsilon_i$$

# Compensating Differentials for Risk

"Theory" predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[Pay]_i = \alpha + \beta Var[Pay]_i + Controls_i + \varepsilon_i$$

Estimating $\beta$ requires data on E[Pay] and Var[Pay].

# Compensating Differentials for Risk

"Theory" predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[Pay]_i = \alpha + \beta Var[Pay]_i + Controls_i + \varepsilon_i$$

Estimating $\beta$ requires data on E[Pay] and Var[Pay].

Authors consider 3 approaches

- Simulations based on performance metrics in incentive plans (Incentive Lab)
- E[Pay]=Mean[TDC1], Var[Pay]=Var[TDC1]
- E[Pay] and Var[Pay] based ARCH estimates using TDC1

# Compensating Differentials for Risk

“Theory” predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[\text{Pay}]_i = \alpha + \beta \text{Var}[\text{Pay}]_i + \text{Controls}_i + \varepsilon_i$$

# Compensating Differentials for Risk

"Theory" predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[\text{Pay}]_i = \alpha + \beta \text{Var}[\text{Pay}]_i + \text{Controls}_i + \varepsilon_i$$

Findings:

$\beta > 0$ under all 3 approaches

# Compensating Differentials for Risk

"Theory" predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[Pay]_i = \alpha + \beta Var[Pay]_i + Controls_i + \varepsilon_i$$

Findings:

$\beta > 0$ under all 3 approaches

But, $\beta$ seems "too low" to be explained by "theory"

# Compensating Differentials for Risk

"Theory" predicts that risk-averse CEOs will demand compensating differentials for accepting risky pay packages

$$E[Pay]_i = \alpha + \beta Var[Pay]_i + Controls_i + \varepsilon_i$$

Findings:

$\beta > 0$ under all 3 approaches

But, $\beta$ seems "too low" to be explained by "theory"

Apparently, our theories need updating . . .

# Paper has a “Fundamental” Problem

“A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages”

“This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint.”

# Paper has a "Fundamental" Problem

"A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages"

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

"This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint."

# Paper has a "Fundamental" Problem

"A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages"

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

Agency Theory is about conflicts of interest between principals and agents

# Paper has a “Fundamental” Problem

“A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages”

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

Agency Theory is about conflicts of interest between principals and agents

Modelers needed something to rule out trivial solutions (e.g. selling the firm to the worker), and risk aversion worked

# Paper has a "Fundamental" Problem

"A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages"

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

Agency Theory is about conflicts of interest between principals and agents

Modelers needed something to rule out trivial solutions (e.g. selling the firm to the worker), and risk aversion worked

This paper shows that we've taken the risk-aversion story too seriously

# Paper has a "Fundamental" Problem

"A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages"

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

"This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint."

# Paper has a "Fundamental" Problem

"A *fundamental hypothesis* in moral hazard models is that risk-averse CEOs require extra pay for riskier pay packages"

Is the trade-off between risk and incentives (or risk and the level of pay) *really* fundamental in Agency Theory, or is it just convenient modeling?

"This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint."

Does Agency Theory require the CEO's participation constraint to be binding?

# Paper has a "Fundamental" Problem

One way to model:

$$\mathrm{MAX}_{w(y)}\ (y-w(y)) \text{ subject to}$$

$$\mathrm{MAX}_a\ U(w(y),a)$$

$$E[U(w(y),a)]=\hat{U}$$

"This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint."

Does Agency Theory require the CEO's participation constraint to be binding?

# Paper has a "Fundamental" Problem

One way to model:

$MAX_{w(y)}$ (y-w(y)) subject to

$MAX_a$ U(w(y),a)

E[U(w(y),a)]=Û

Another way to model:

$MAX_{w(y)}$ E[U(w(y),a)] subject to

$MAX_a$ U(w(y),a)

E[y-w(y)]=0

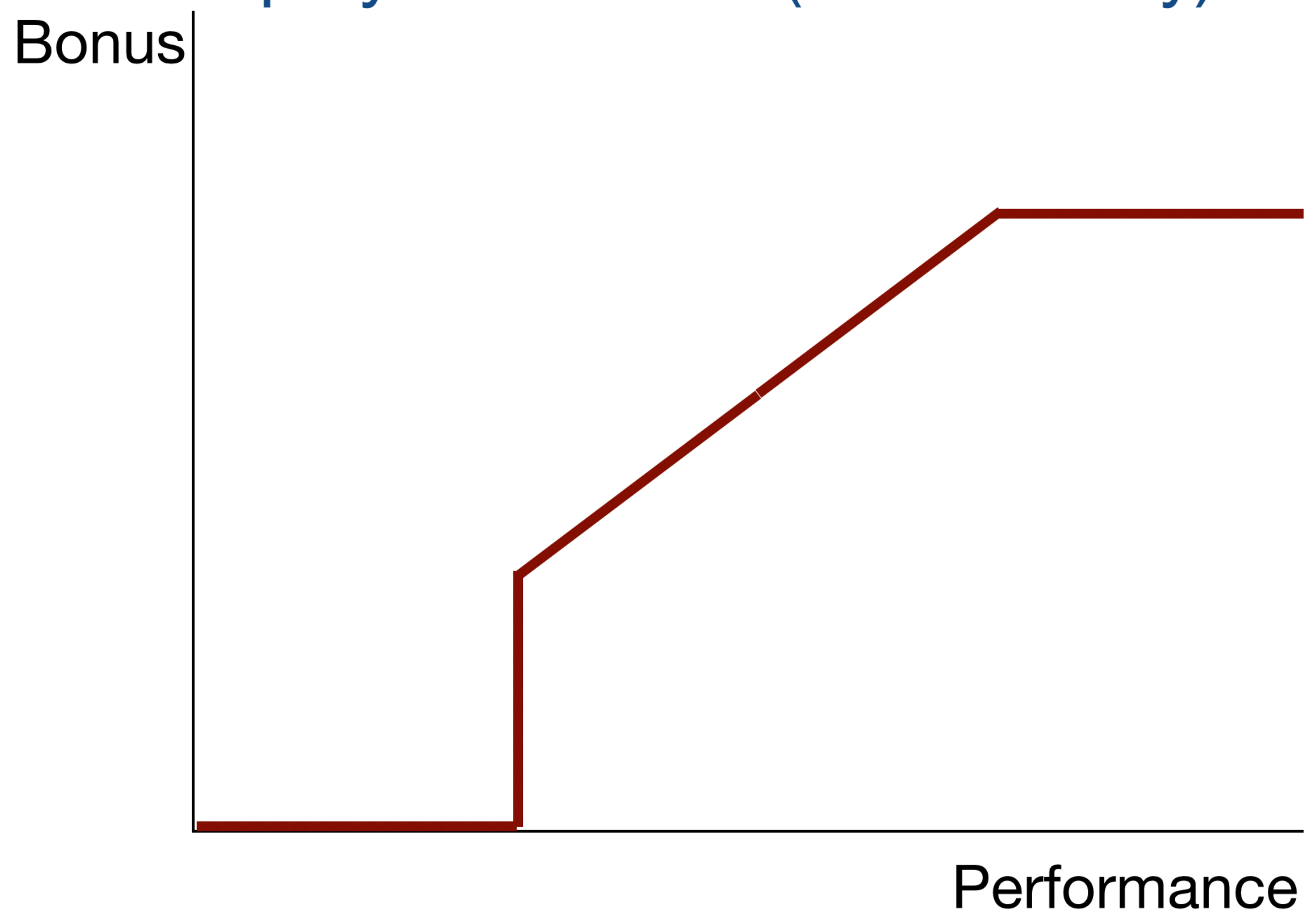
"This is a *fundamental hypothesis* in the sense that it is born our of the participation constraint."

Does Agency Theory require the CEO's participation constraint to be binding?

# Approach 1: Simulations

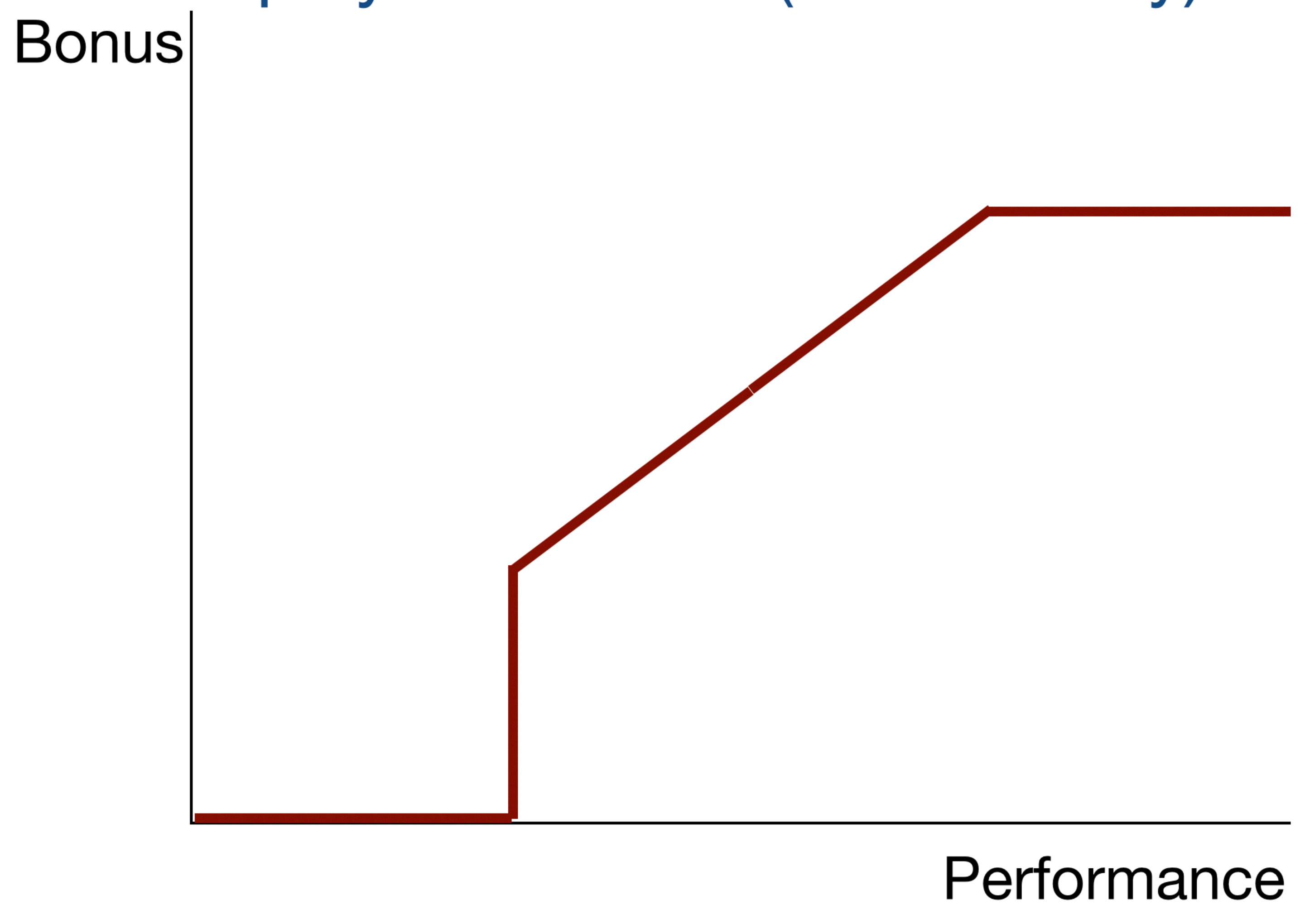
# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)

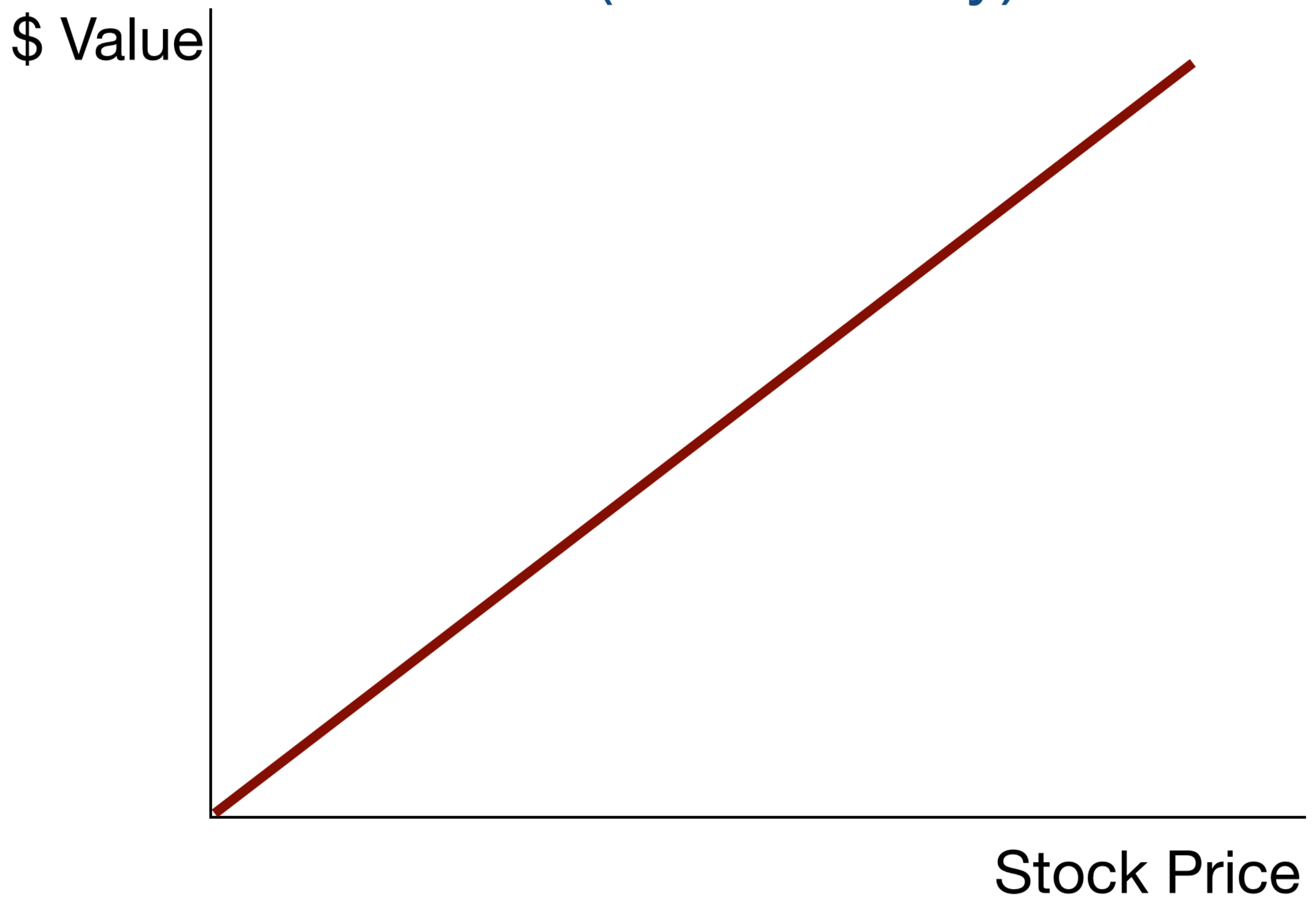


# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)

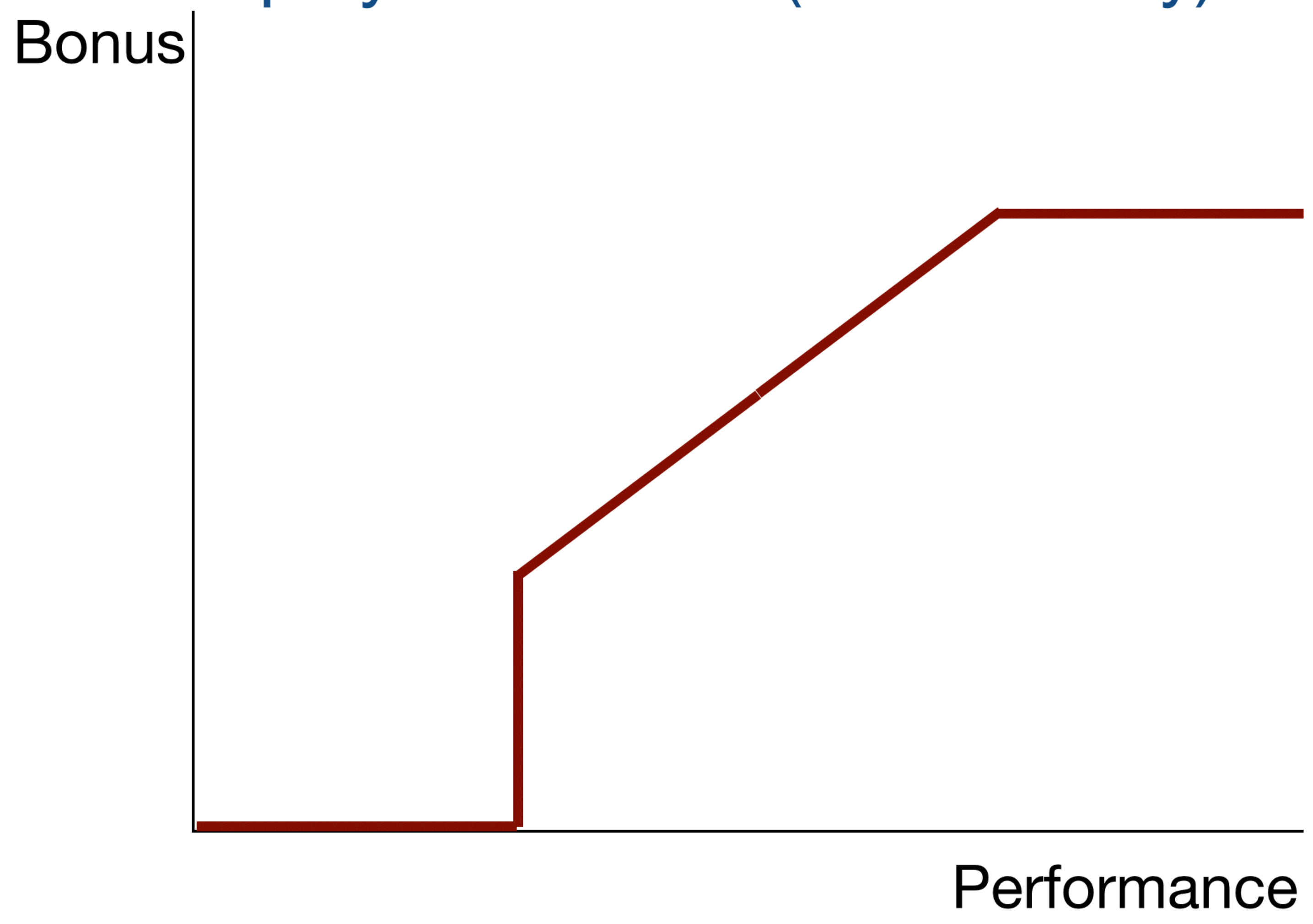



Restricted Stock (15% of Pay)

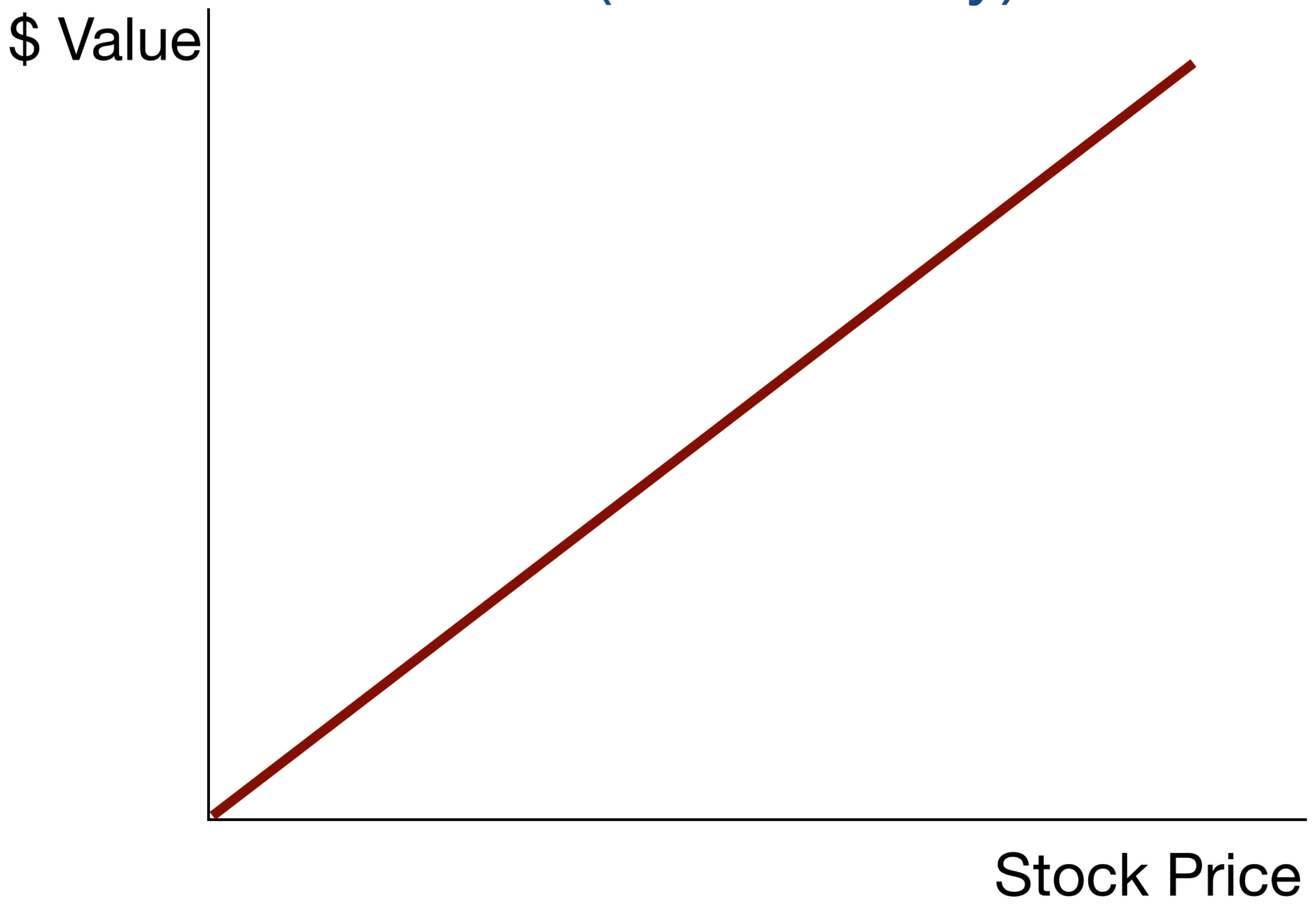


# Approach 1: Simulations

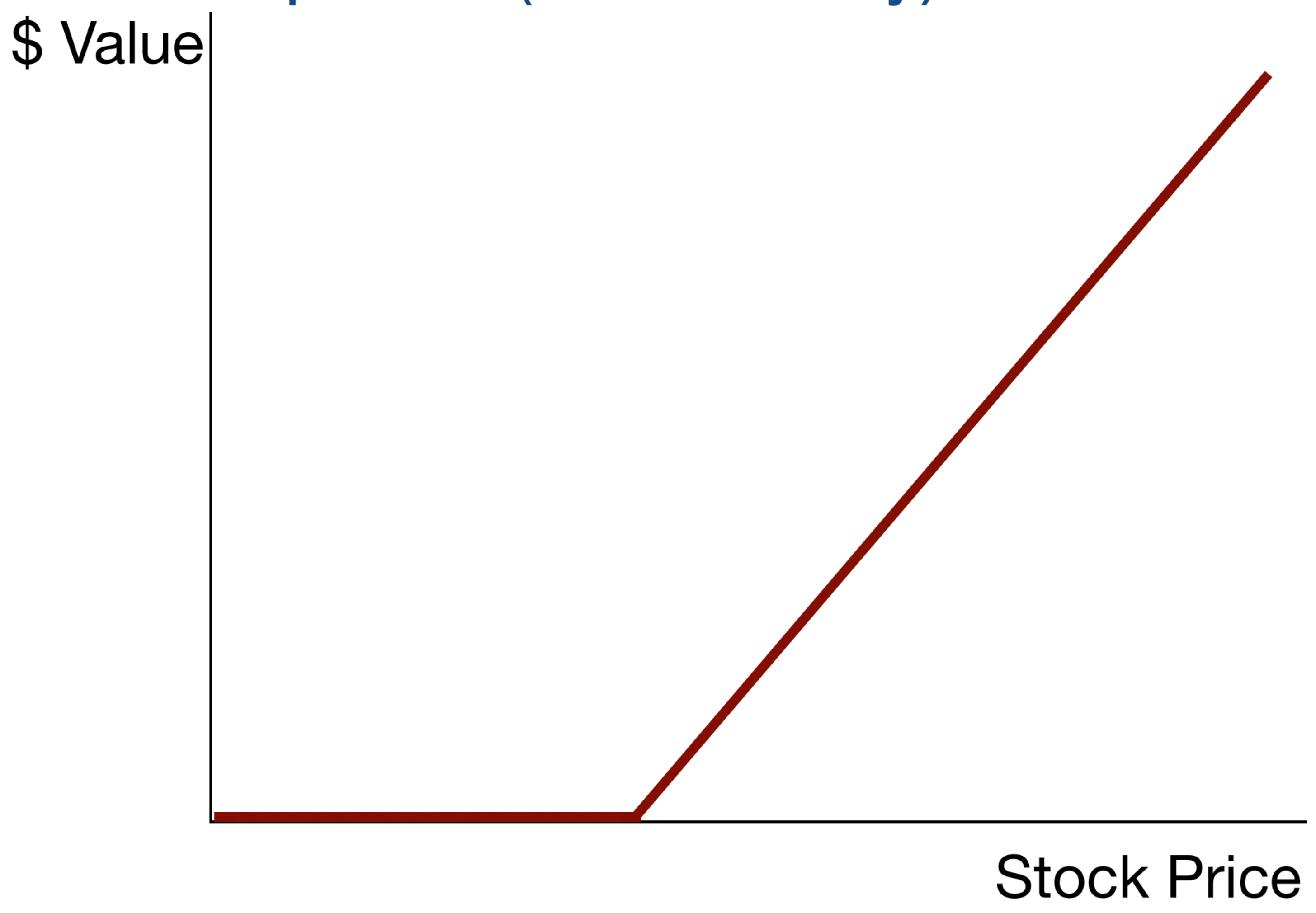
Non-Equity Incentives (24% of Pay)




Restricted Stock (15% of Pay)

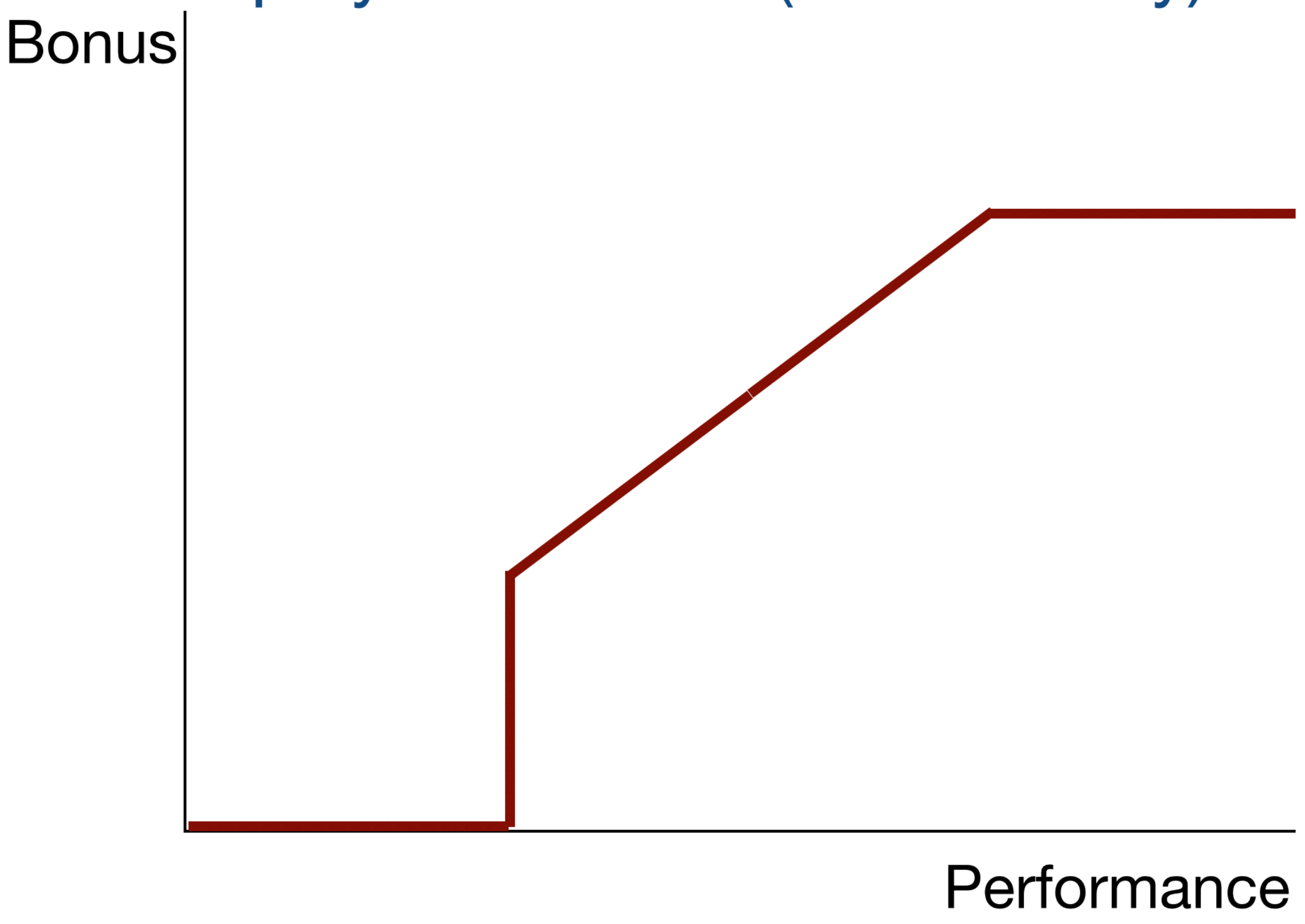



Stock Options (13% of Pay)

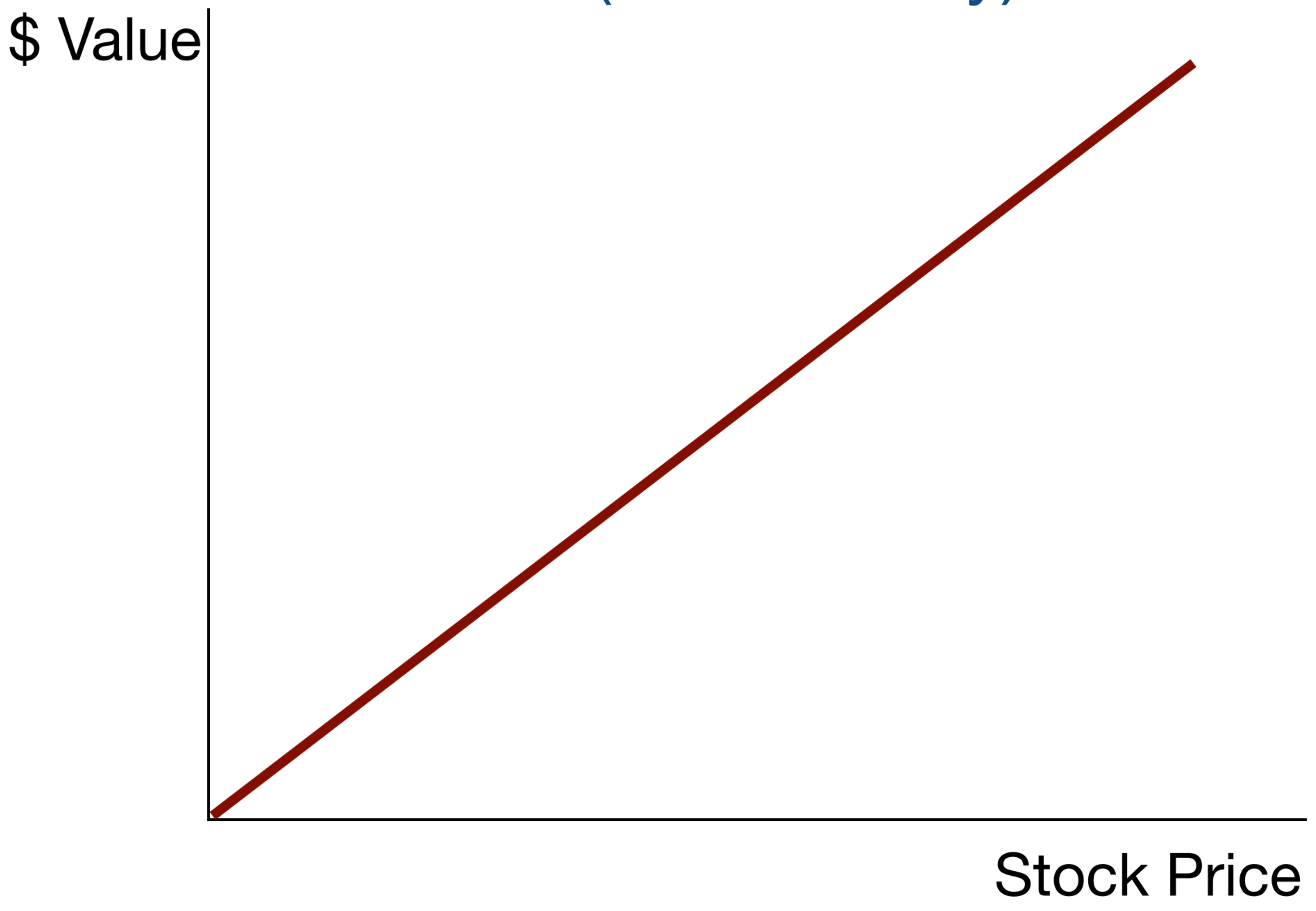


# Approach 1: Simulations

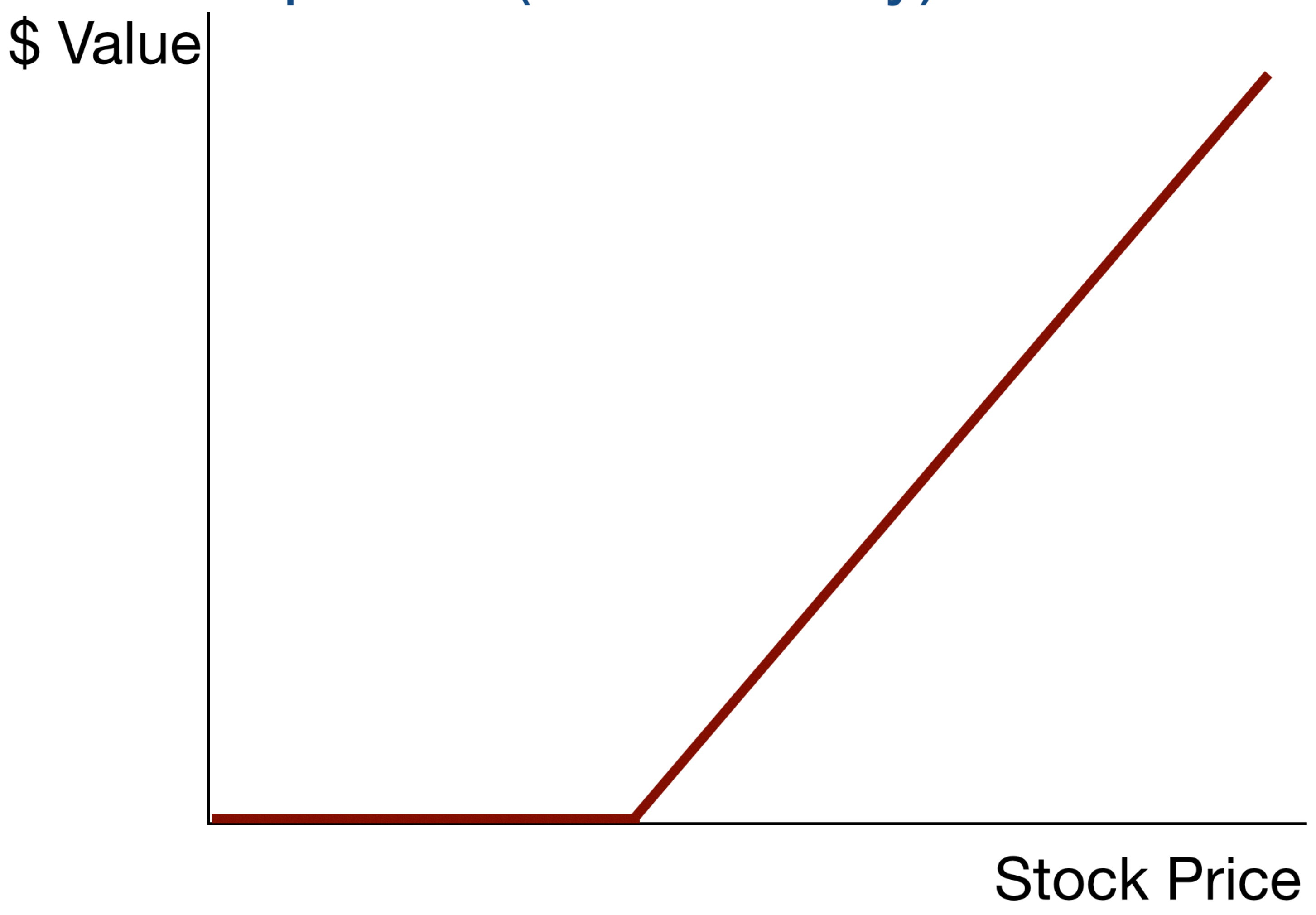
## Non-Equity Incentives (24% of Pay)



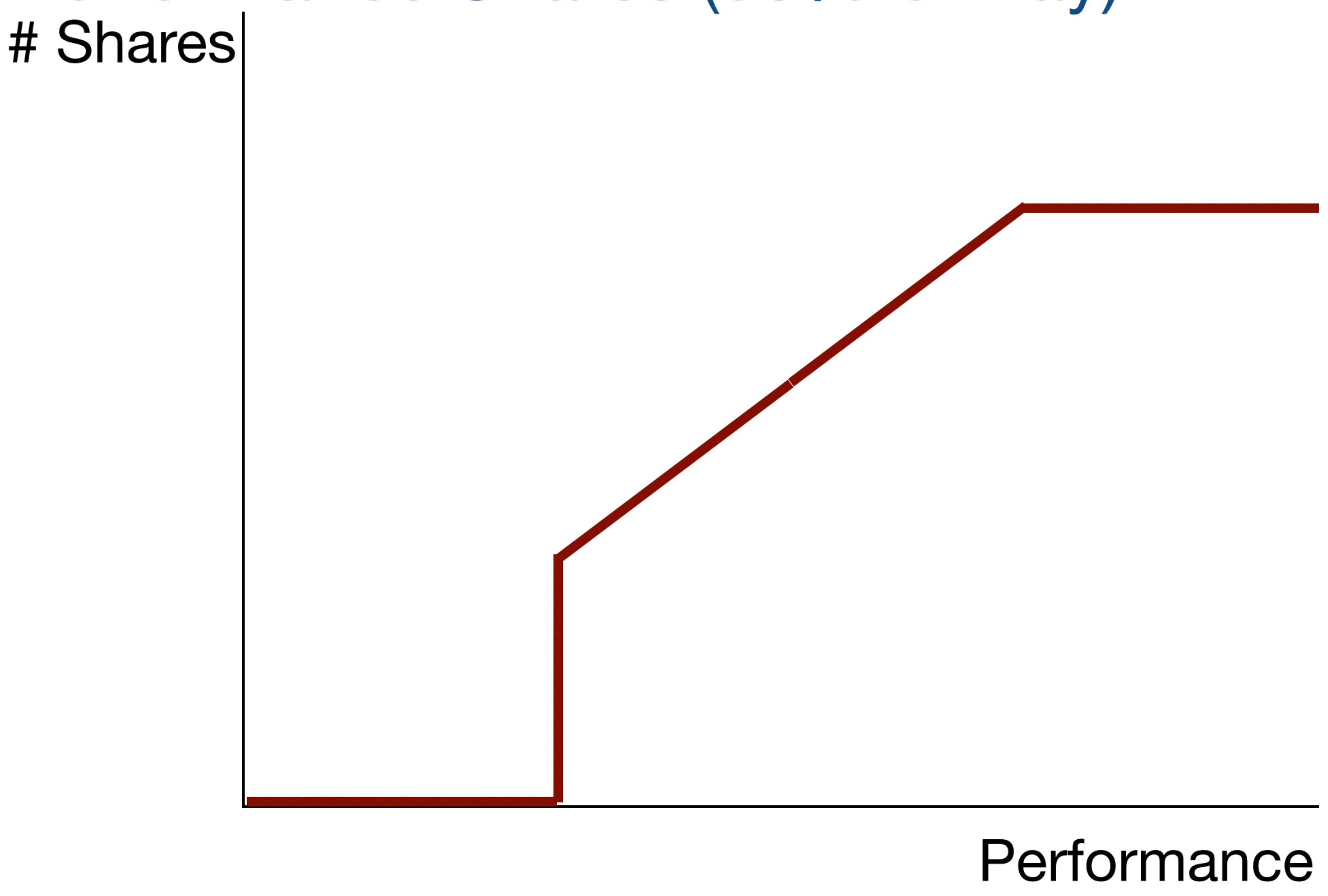

## Restricted Stock (15% of Pay)




## Stock Options (13% of Pay)

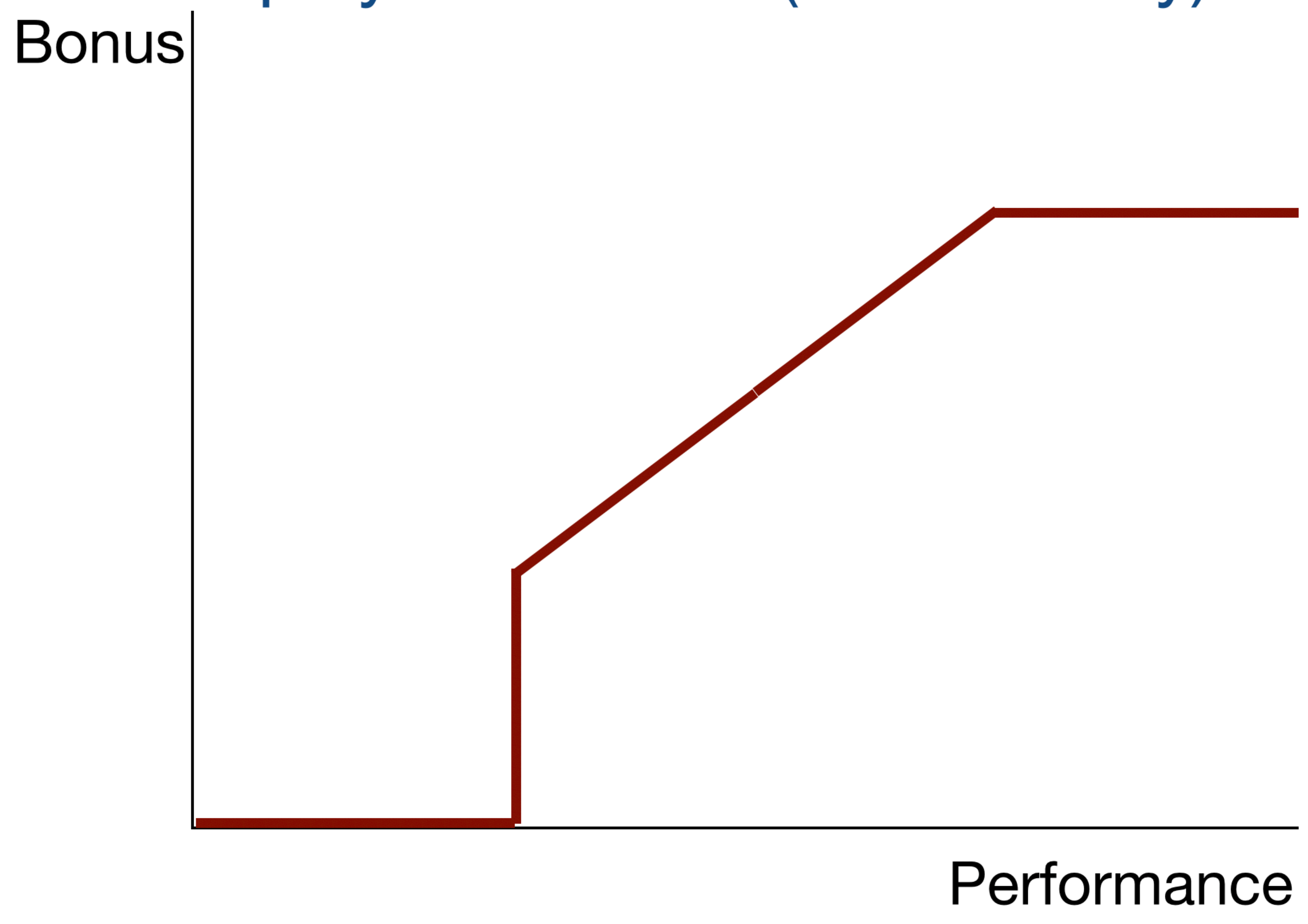



## Performance Shares (33% of Pay)

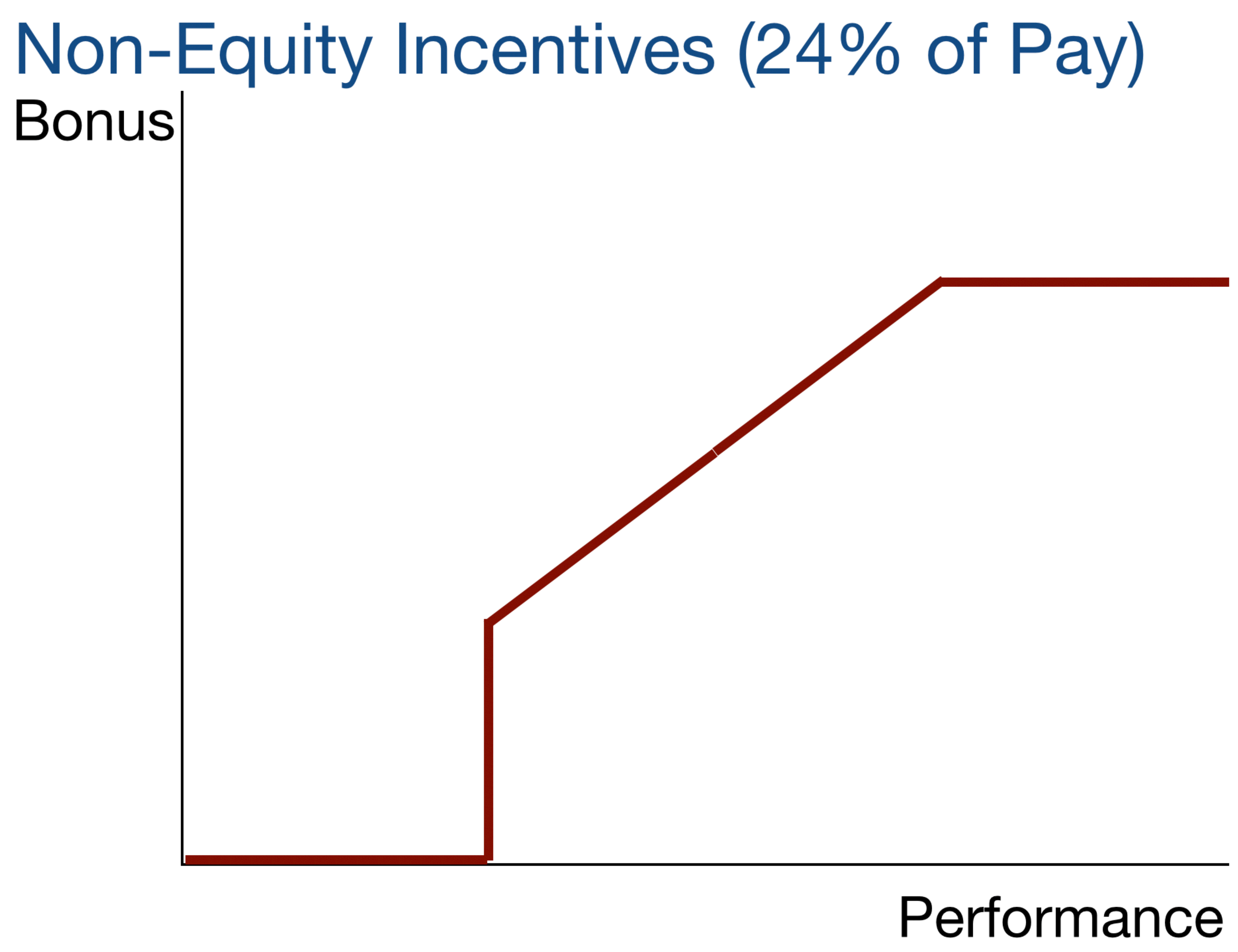


# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)



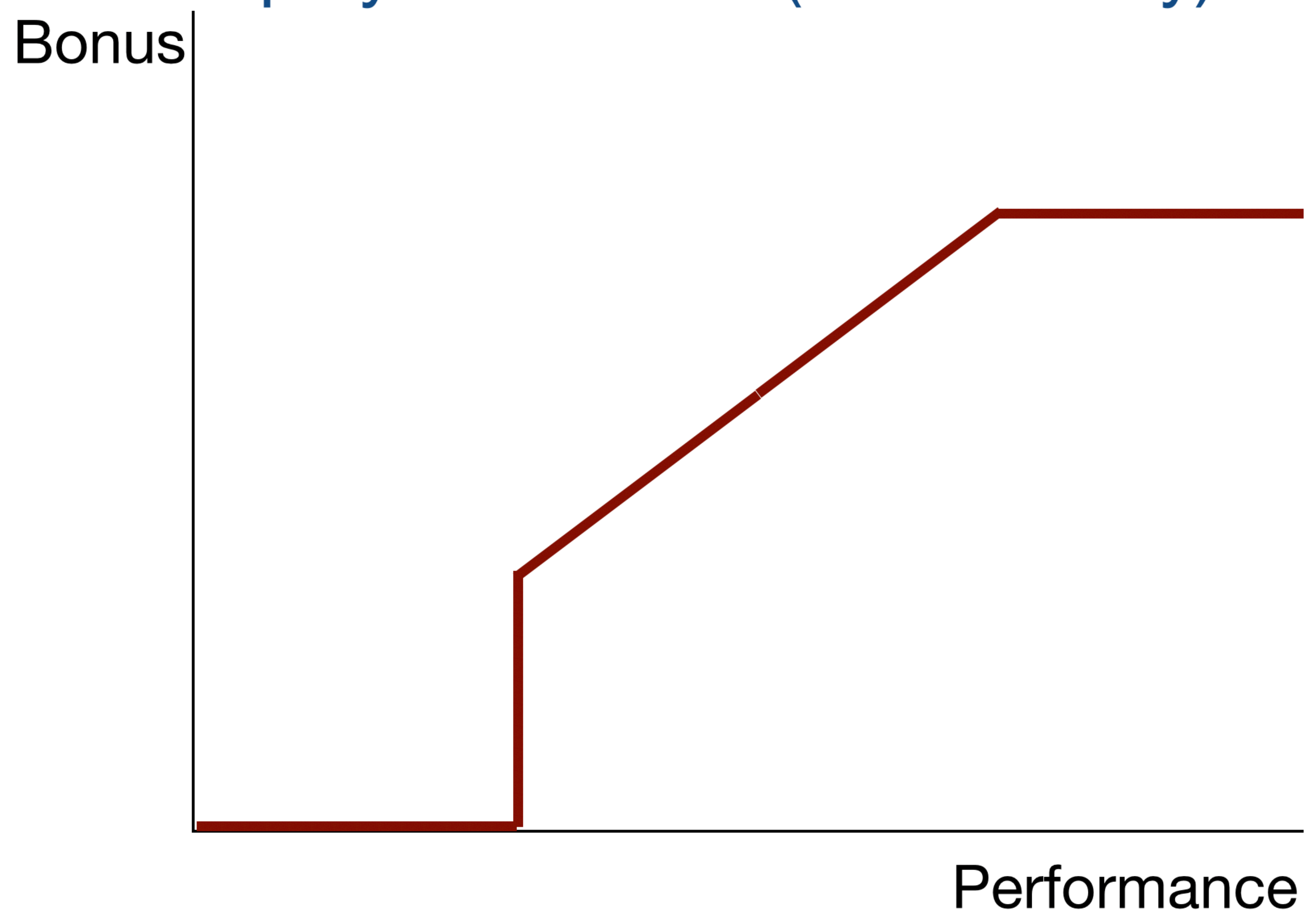
# Approach 1: Simulations




Over 90% of firms use non-GAAP or adjusted measures. How does this affect Var(Bonus)?

# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)

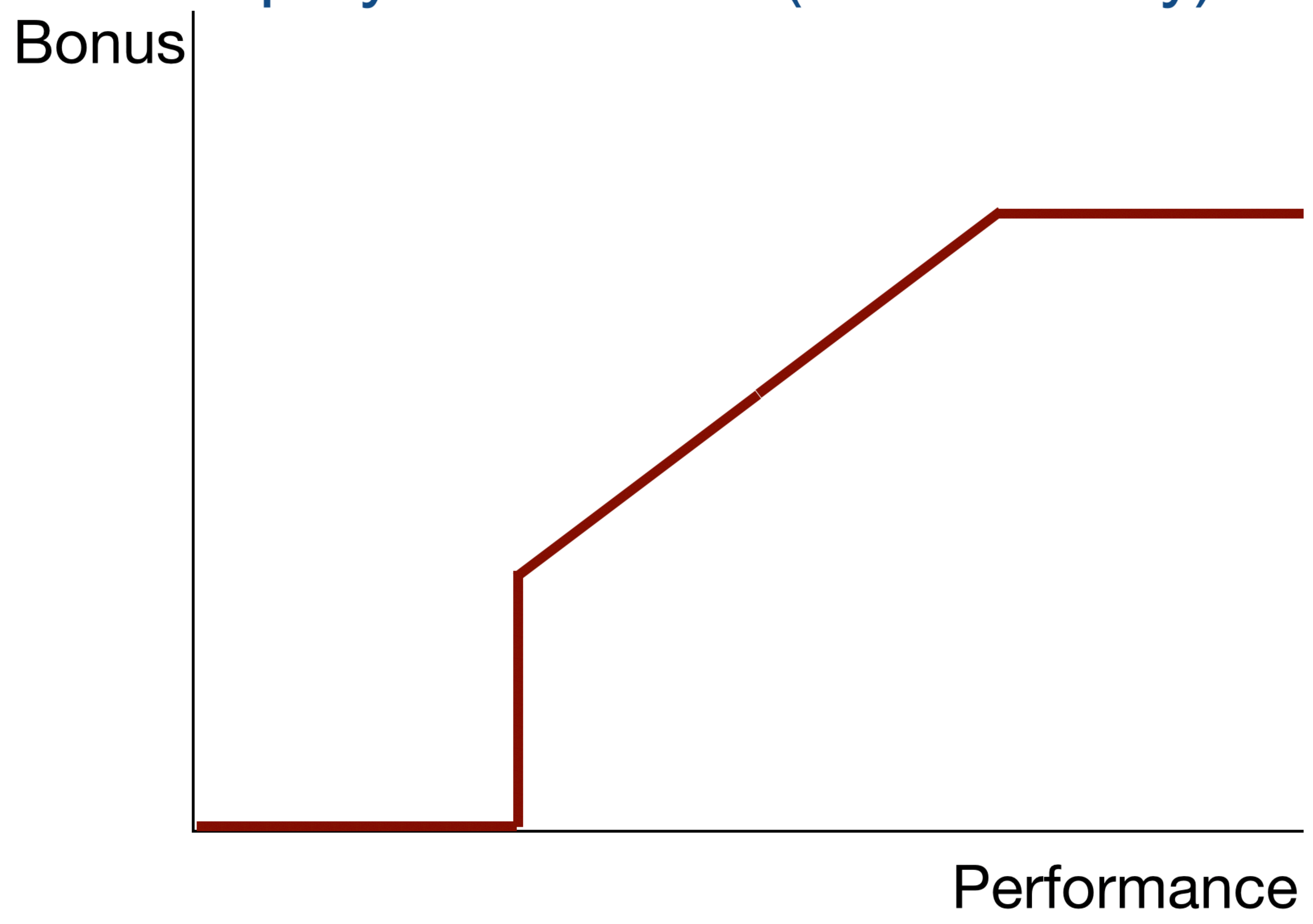



Over 90% of firms use non-GAAP or adjusted measures. How does this affect Var(Bonus)?

Most firms have "Individual Performance Modifiers" that can increase or decrease bonuses. How does this affect Var(Bonus)?

# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)



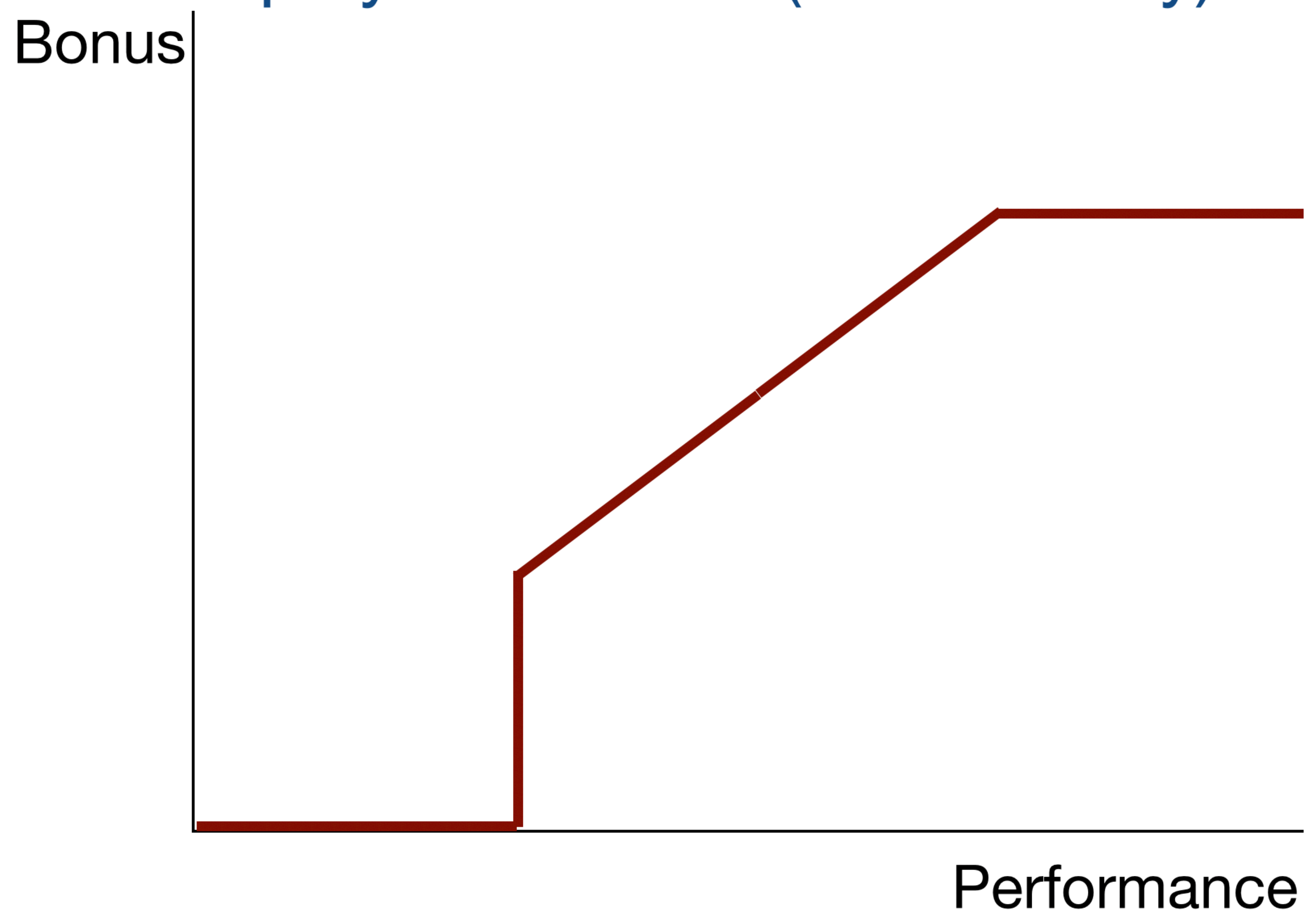

Over 90% of firms use non-GAAP or adjusted measures. How does this affect Var(Bonus)?

Most firms have "Individual Performance Modifiers" that can increase or decrease bonuses. How does this affect Var(Bonus)?

Suppose CEOs "make sure" they always get to threshold. How does this affect Var(Bonus)?

# Approach 1: Simulations

Non-Equity Incentives (24% of Pay)



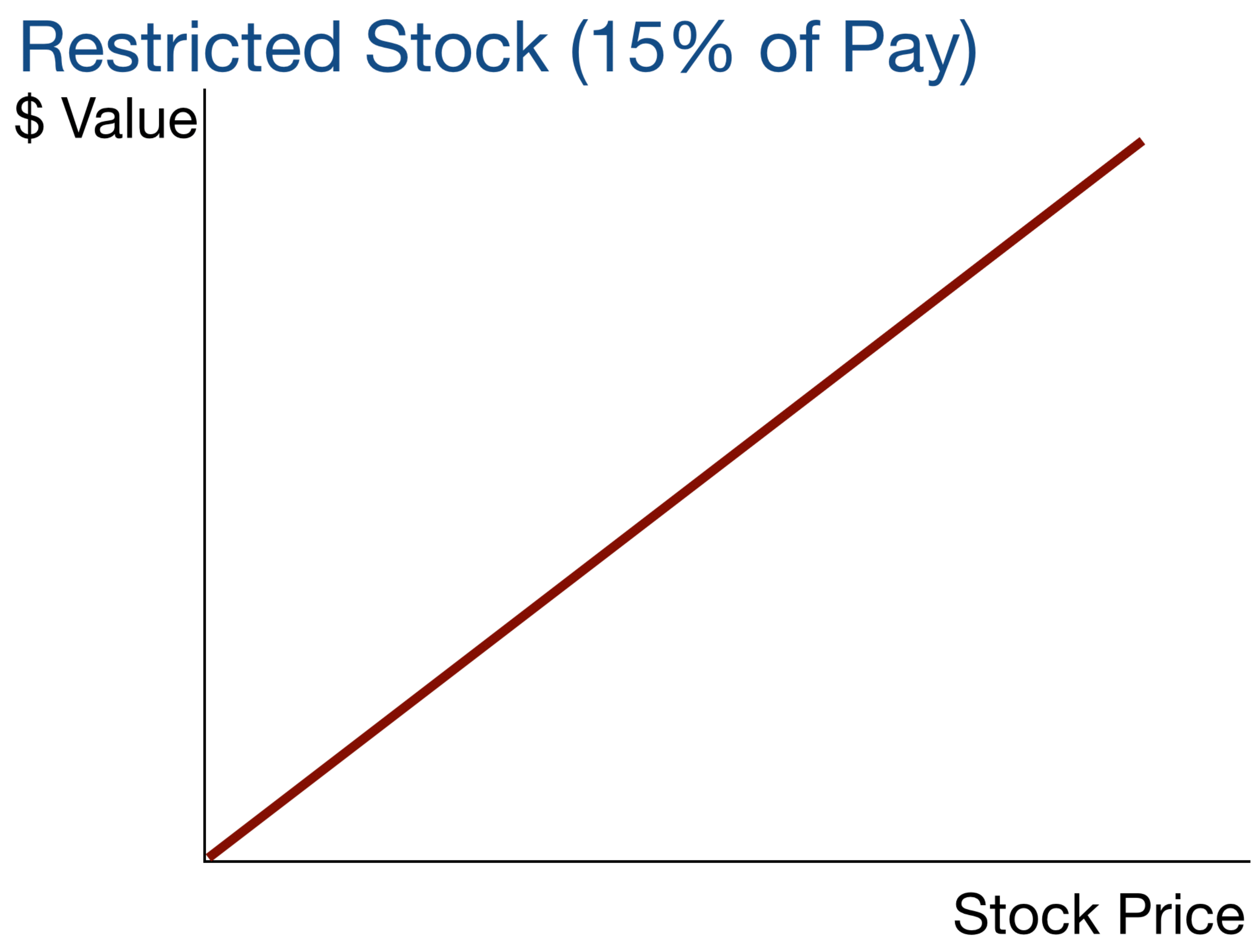

Over 90% of firms use non-GAAP or adjusted measures. How does this affect Var(Bonus)?

Most firms have "Individual Performance Modifiers" that can increase or decrease bonuses. How does this affect Var(Bonus)?

Suppose CEOs "make sure" they always get to threshold. How does this affect Var(Bonus)?

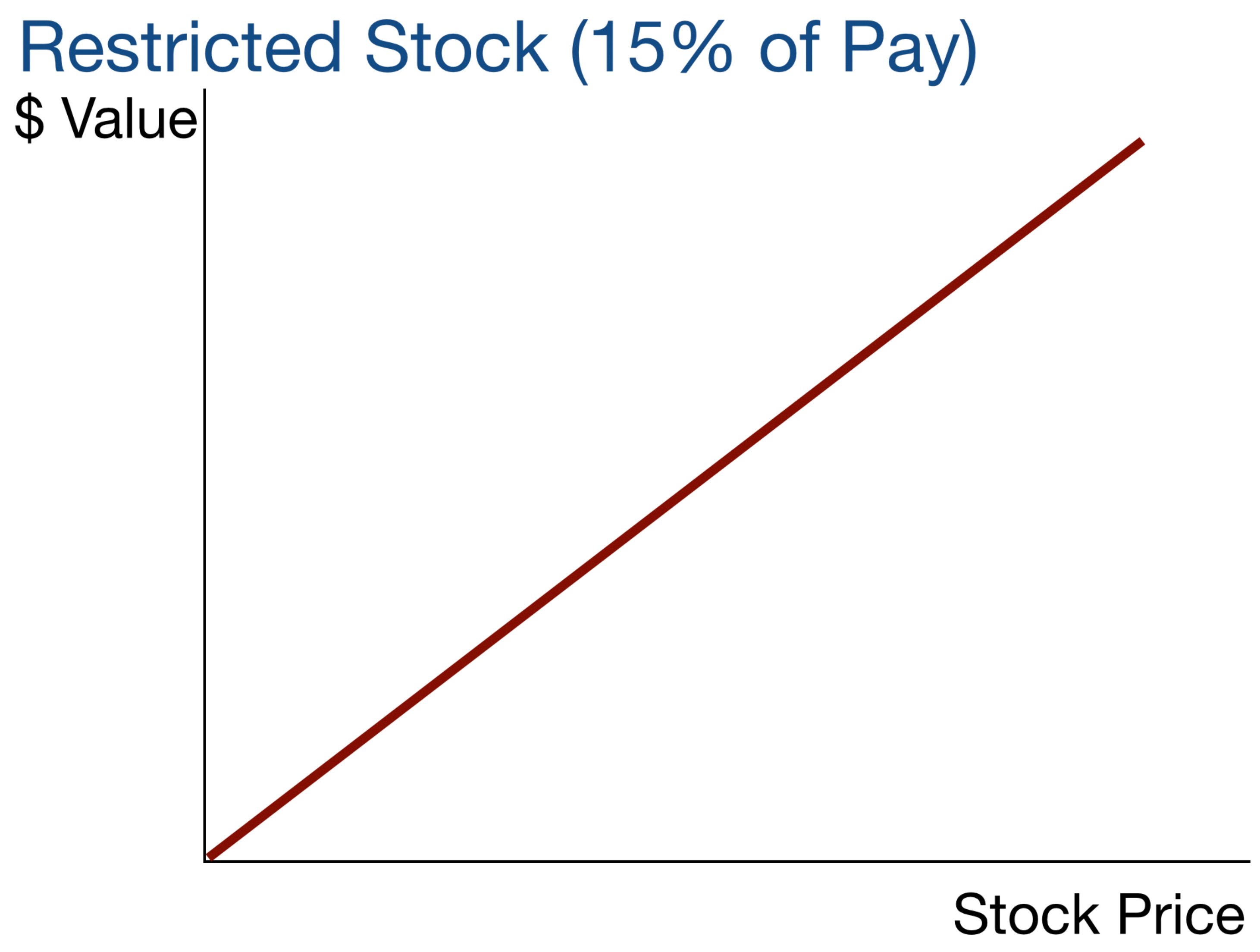
Missing values for goals may not be random

# Approach 1: Simulations



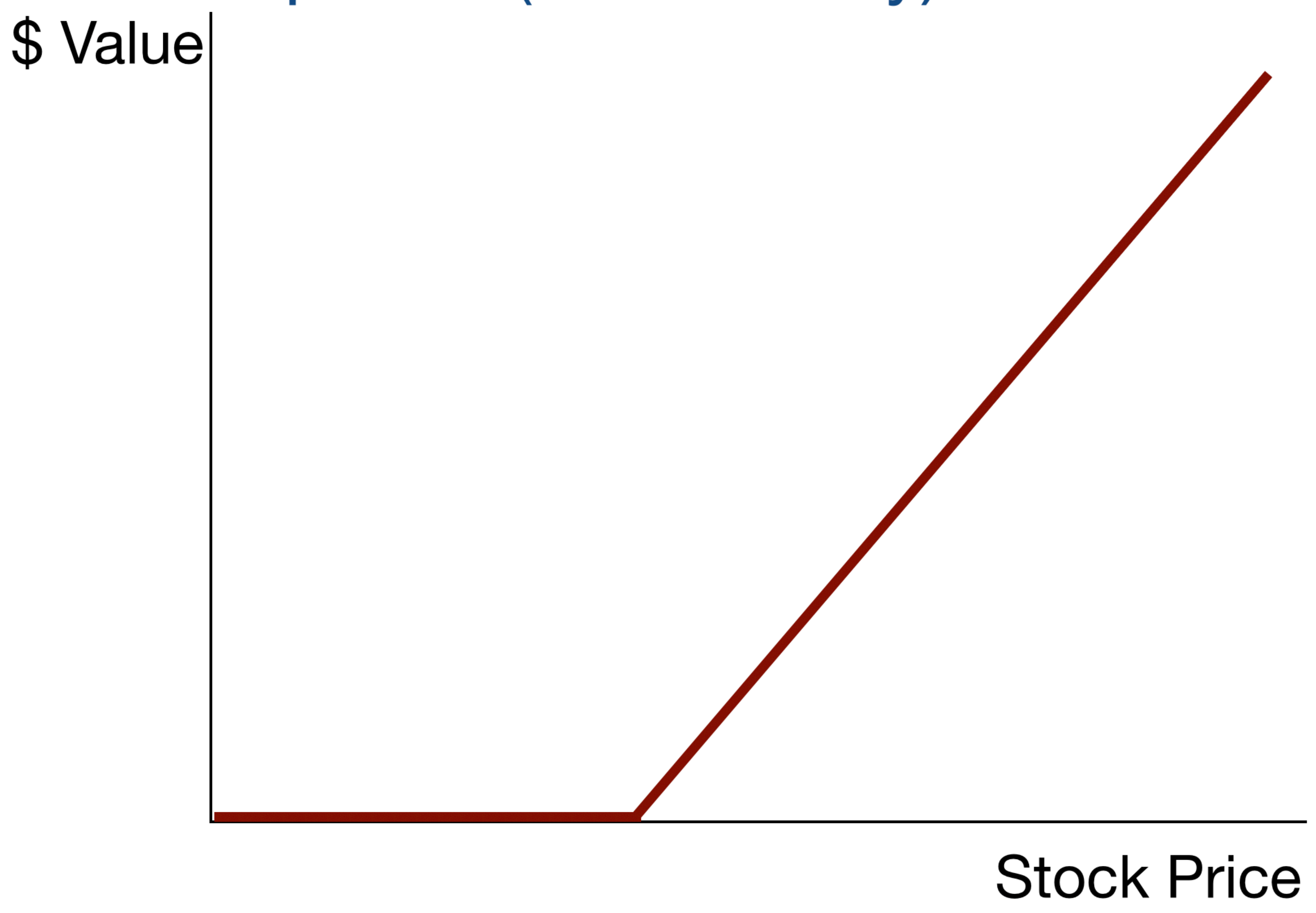
# Approach 1: Simulations

Easiest to model how Var(Stock Price) translates to Var(RSUs) . . . but you seem to ignore time-lapse restricted shares



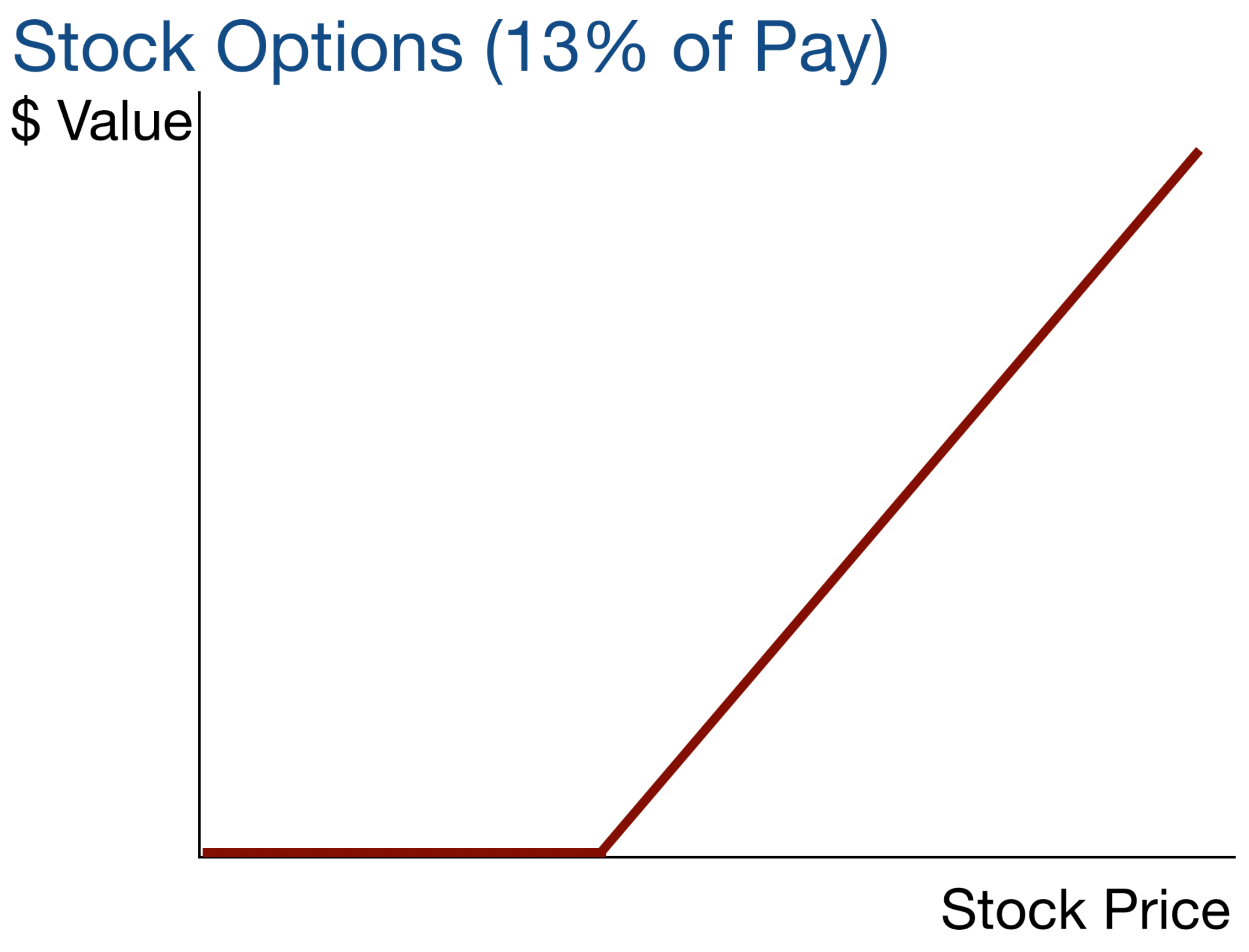
# Approach 1: Simulations

Stock Options (13% of Pay)

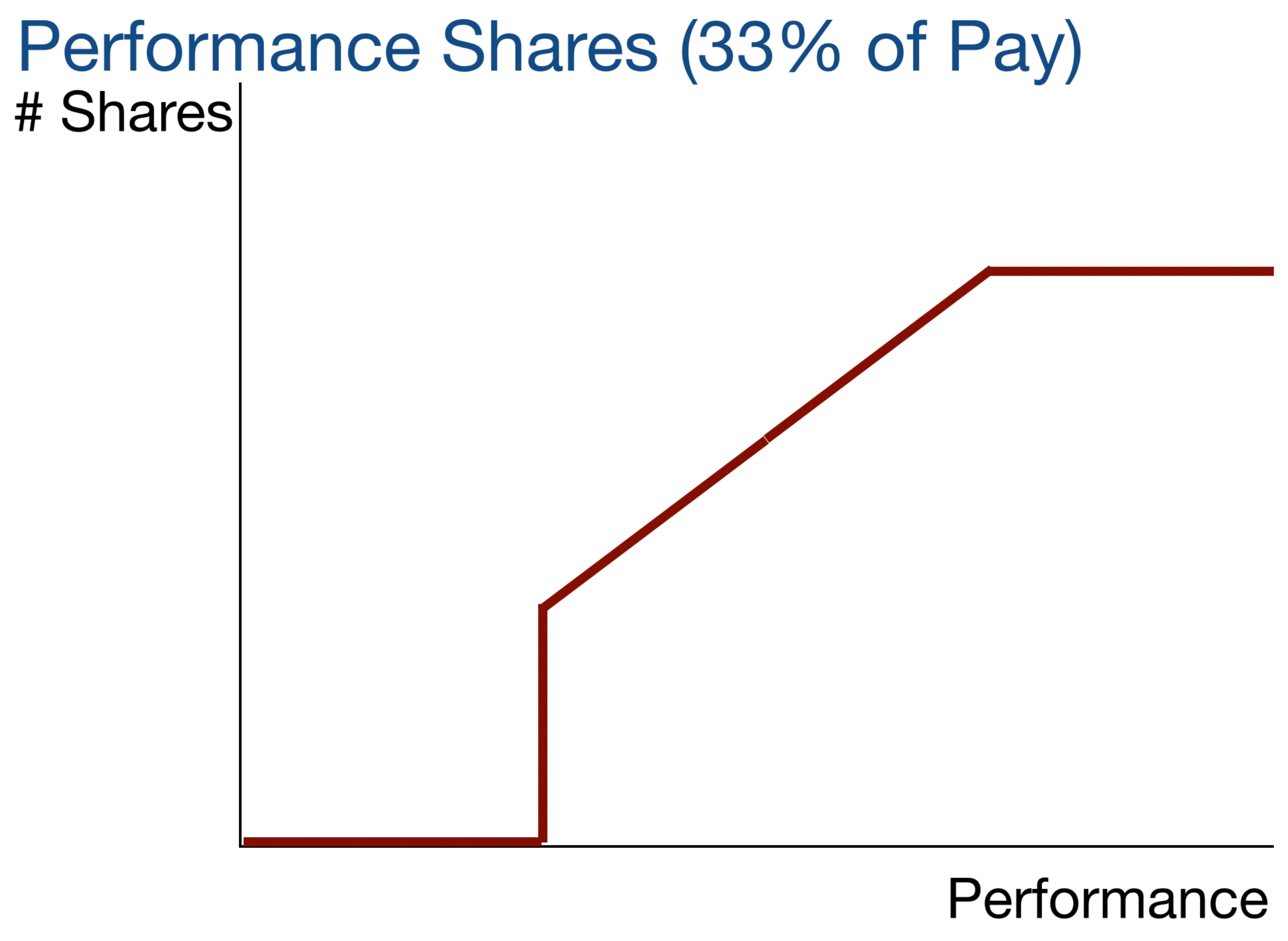


# Approach 1: Simulations

Straightforward to model how Var(Stock Price) translates to Var(Options) … but is this what you are doing?

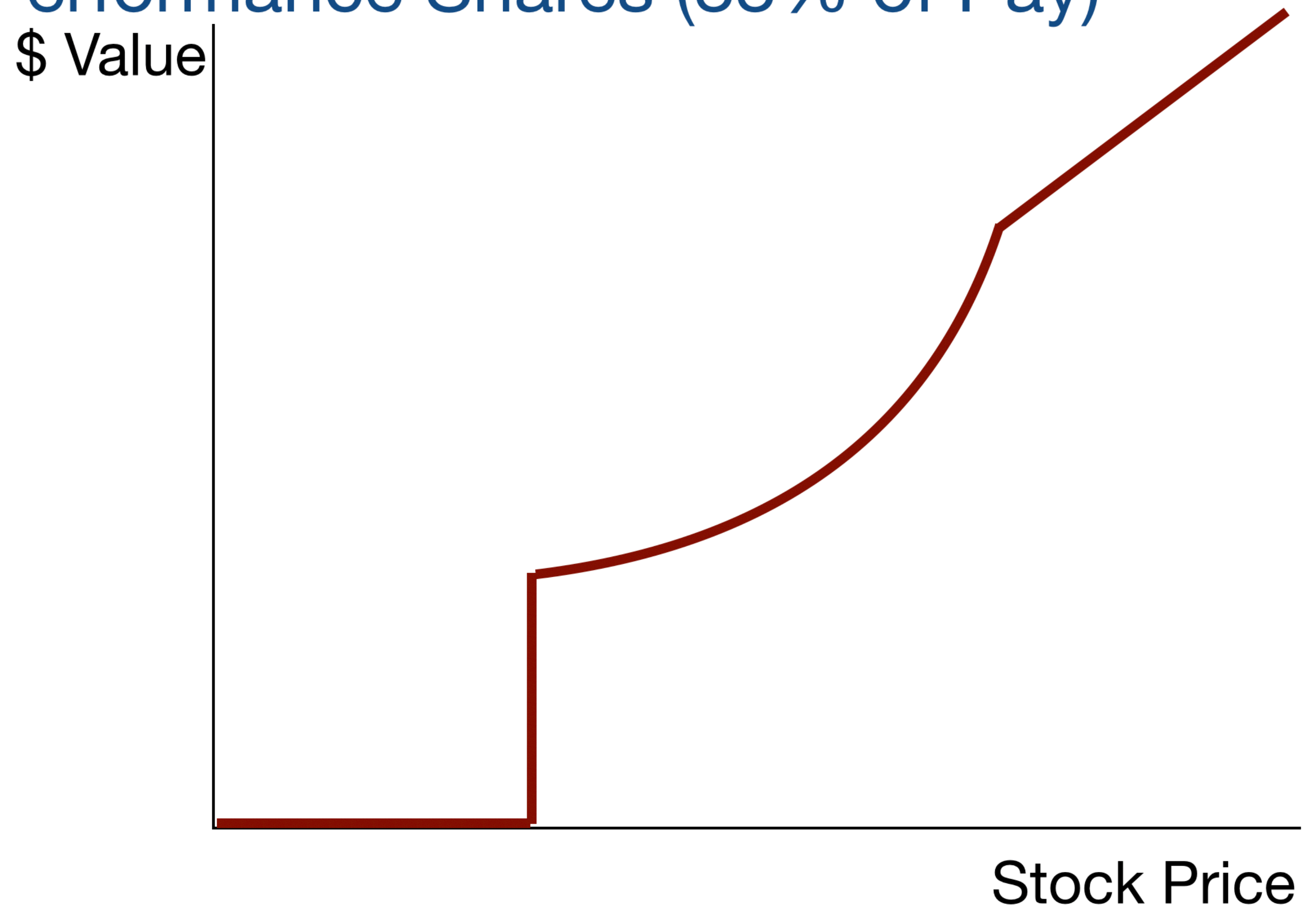


# Approach 1: Simulations

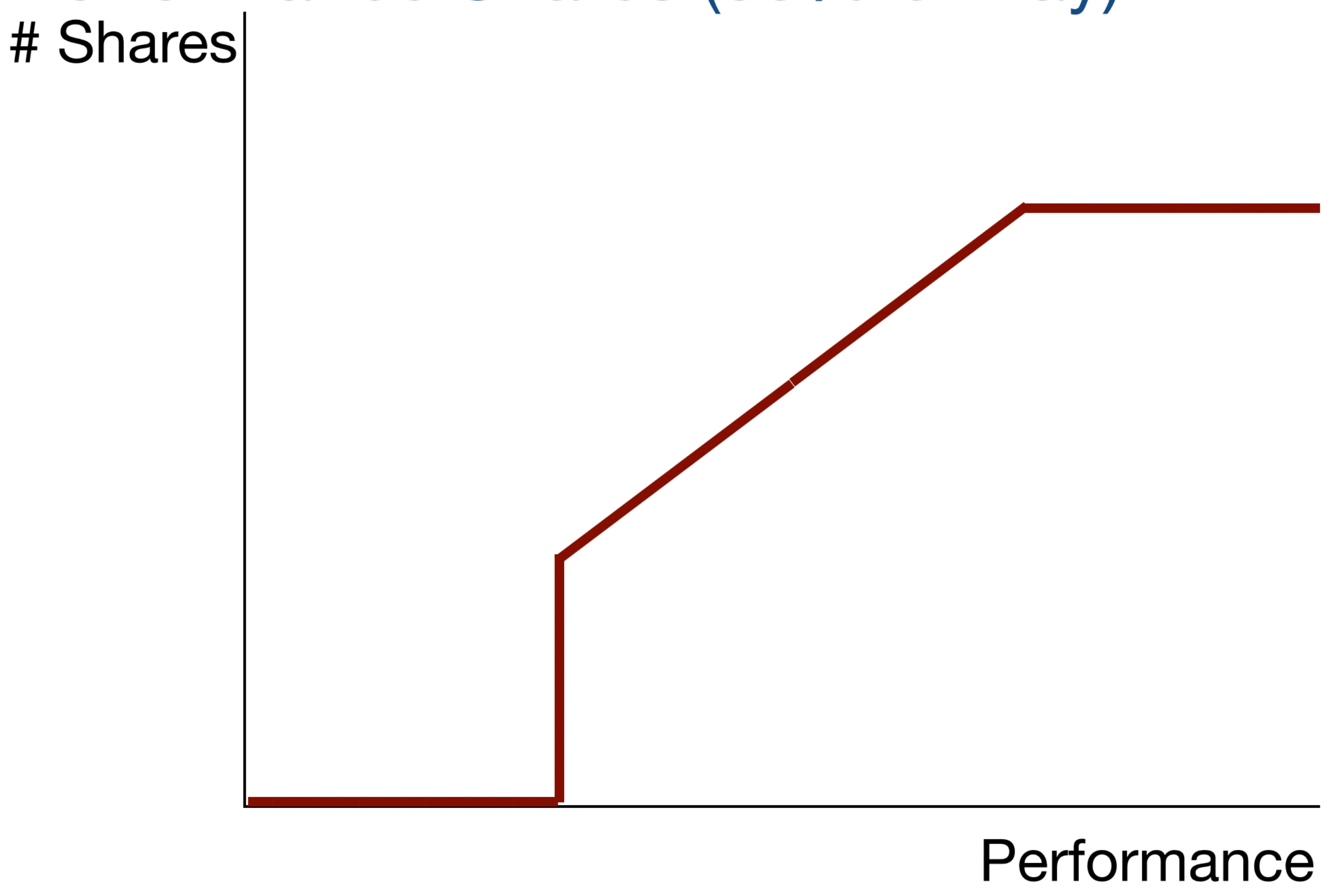


# Approach 1: Simulations

Performance Shares (33% of Pay)

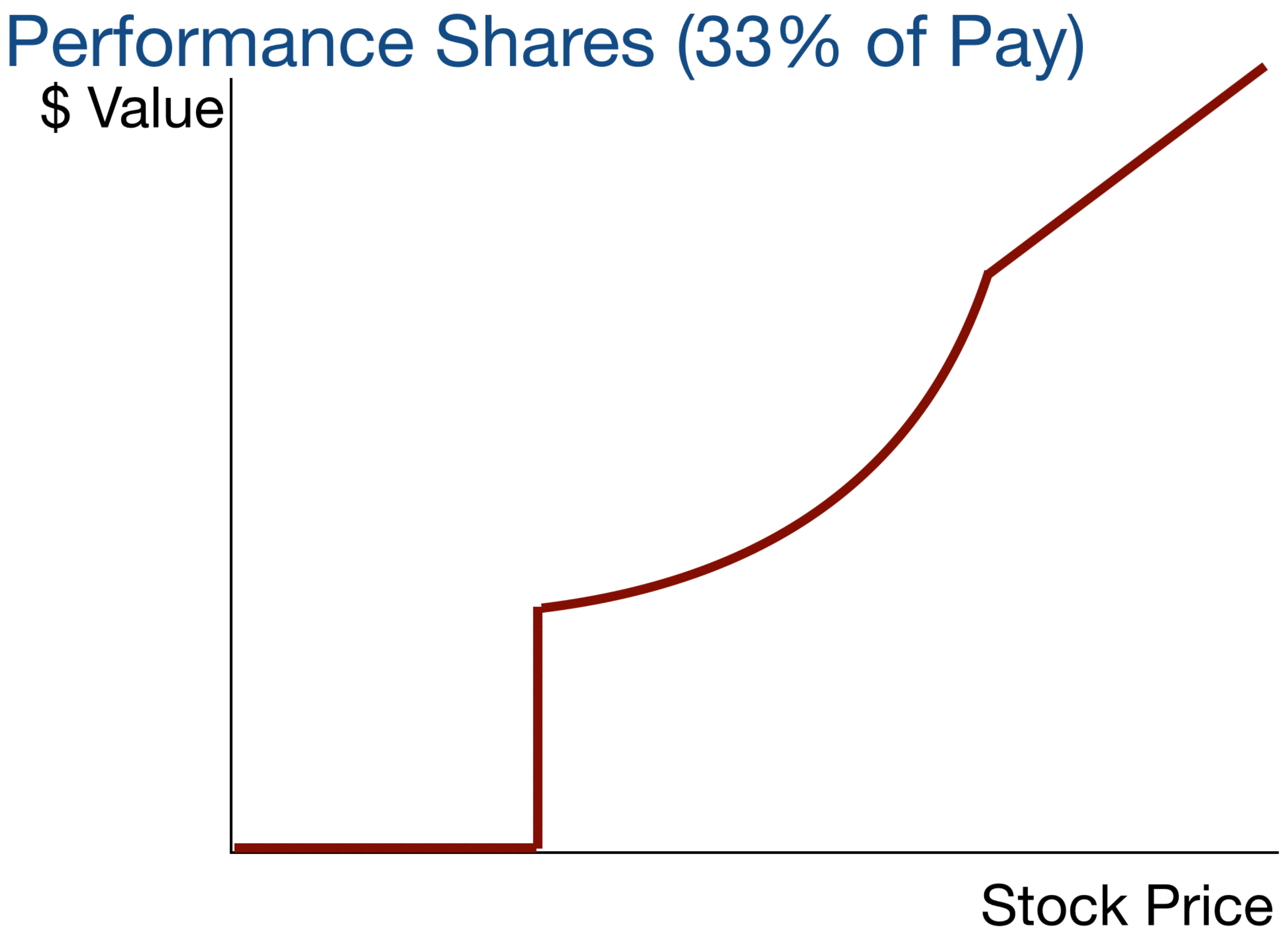


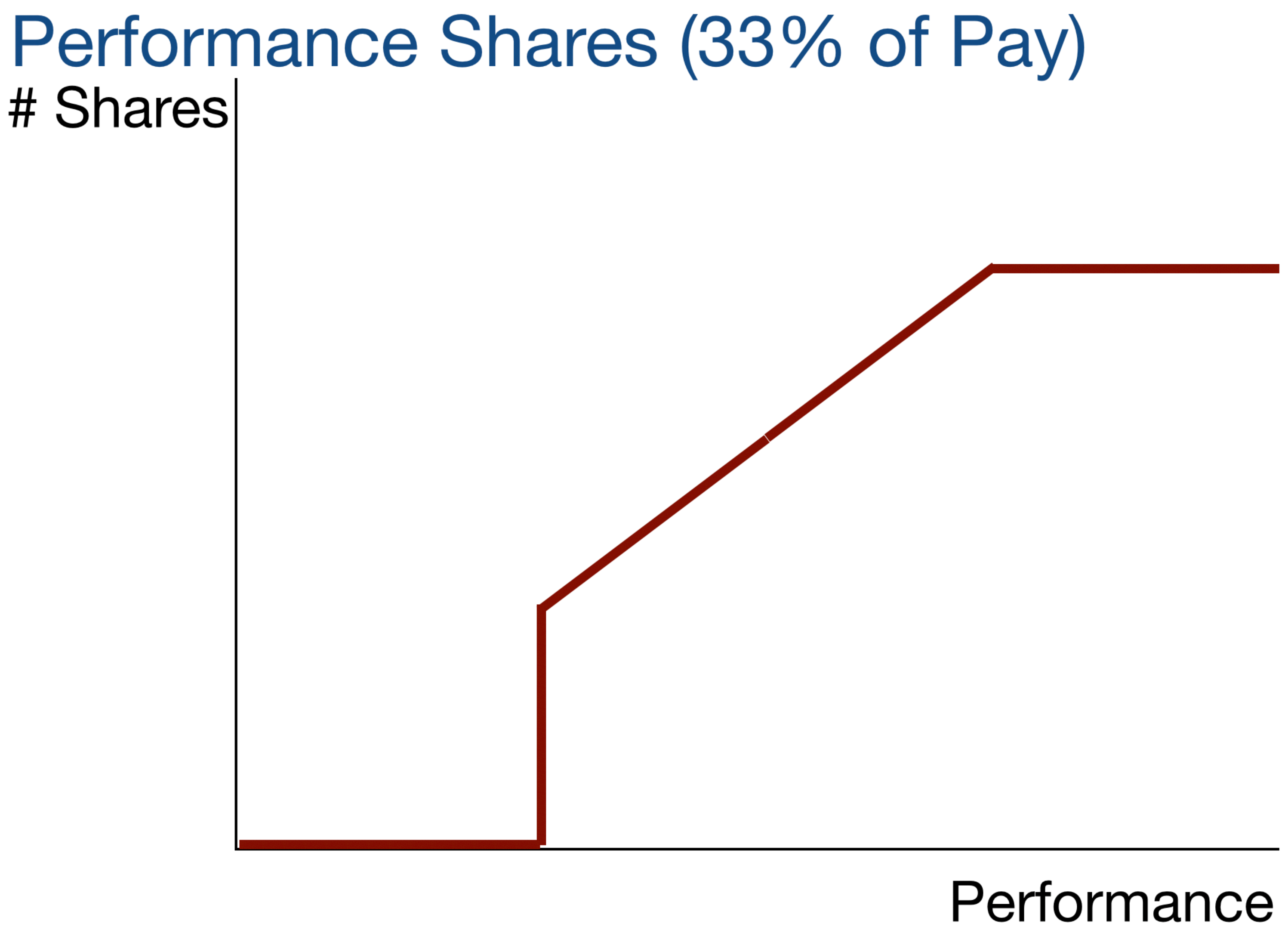

Performance Shares (33% of Pay)



# Approach 1: Simulations

Most of the action is in the stock price and not in the metric that determines # of shares

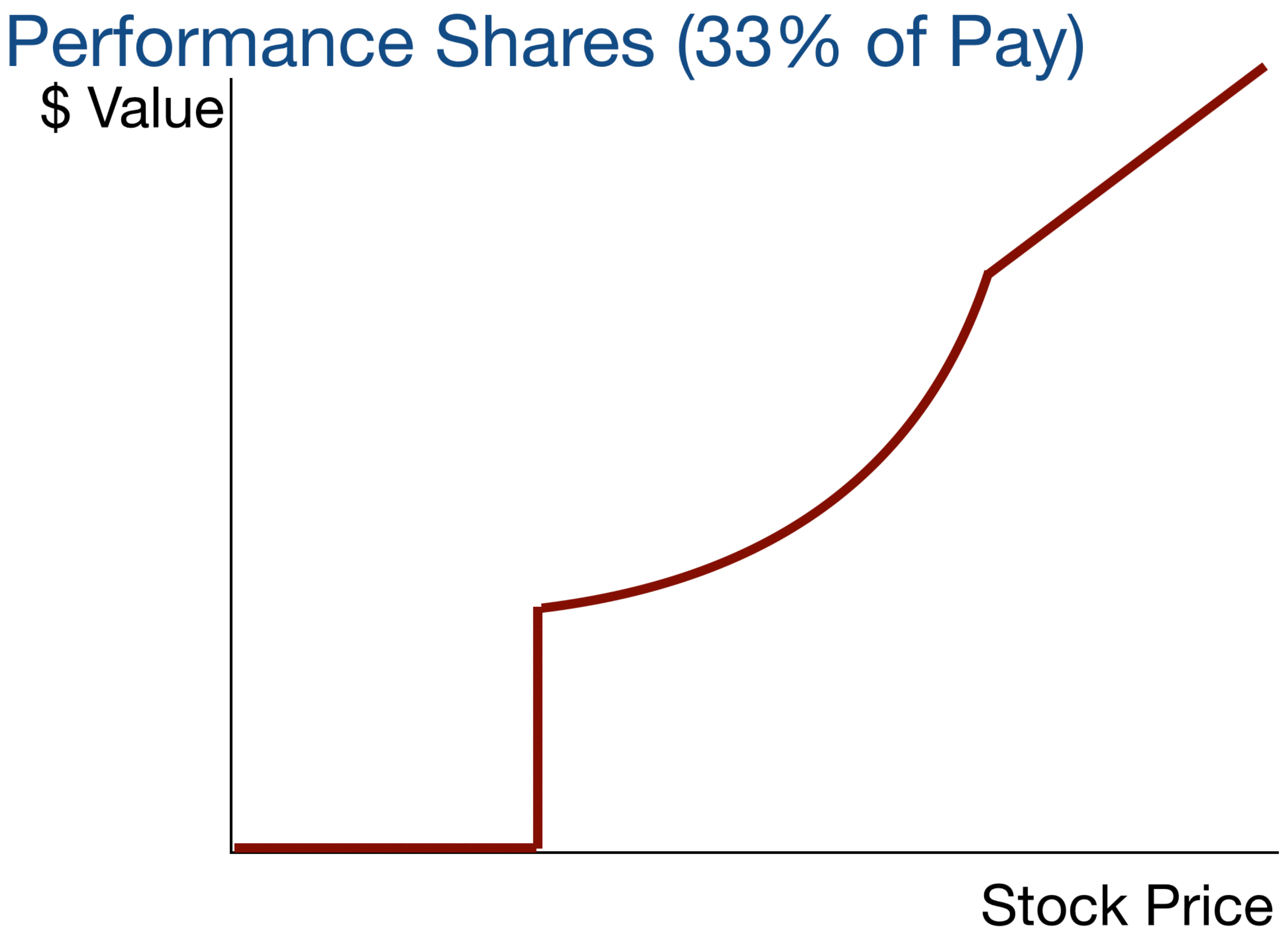


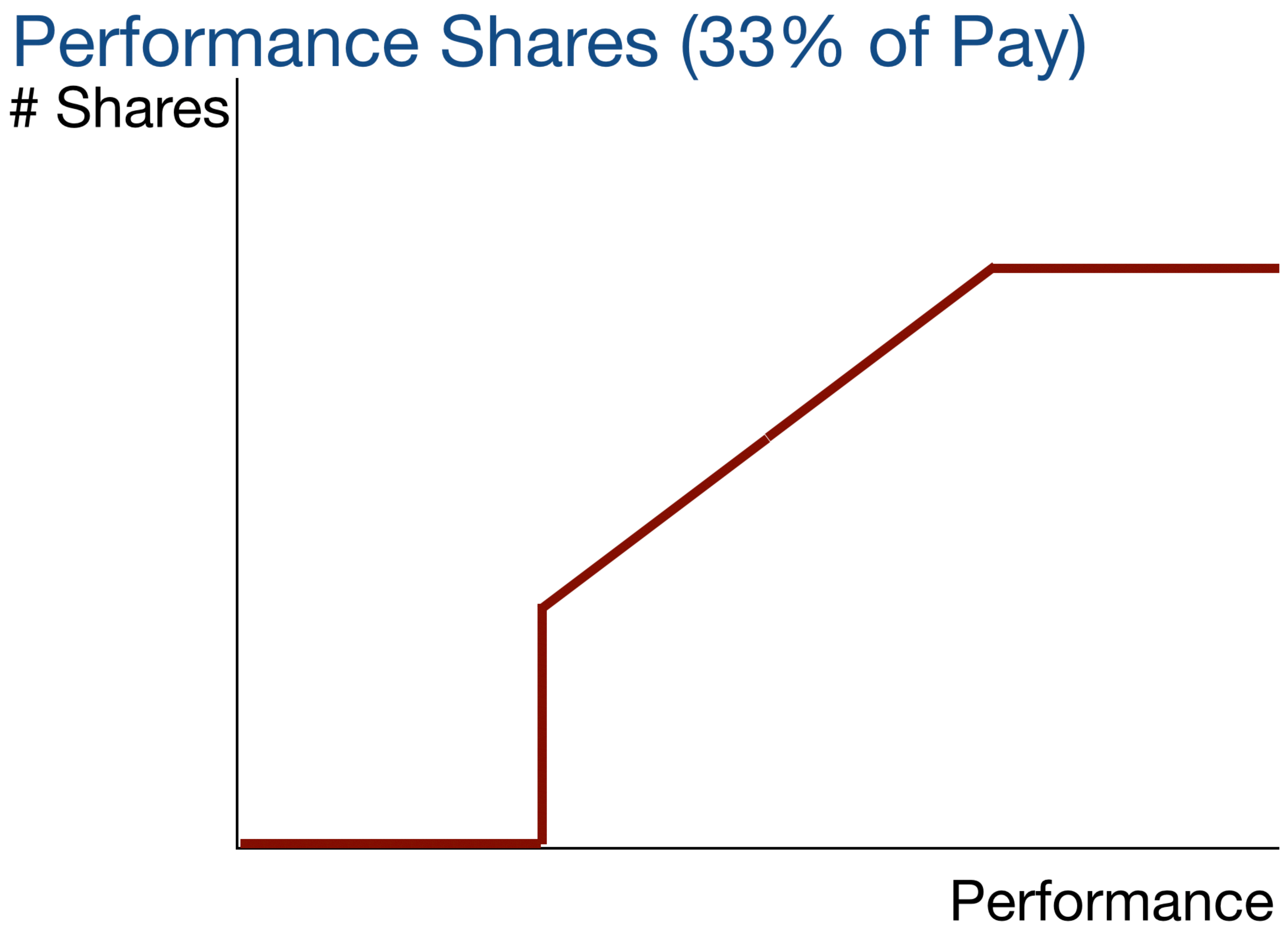



# Approach 1: Simulations

Most of the action is in the stock price and not in the metric that determines # of shares

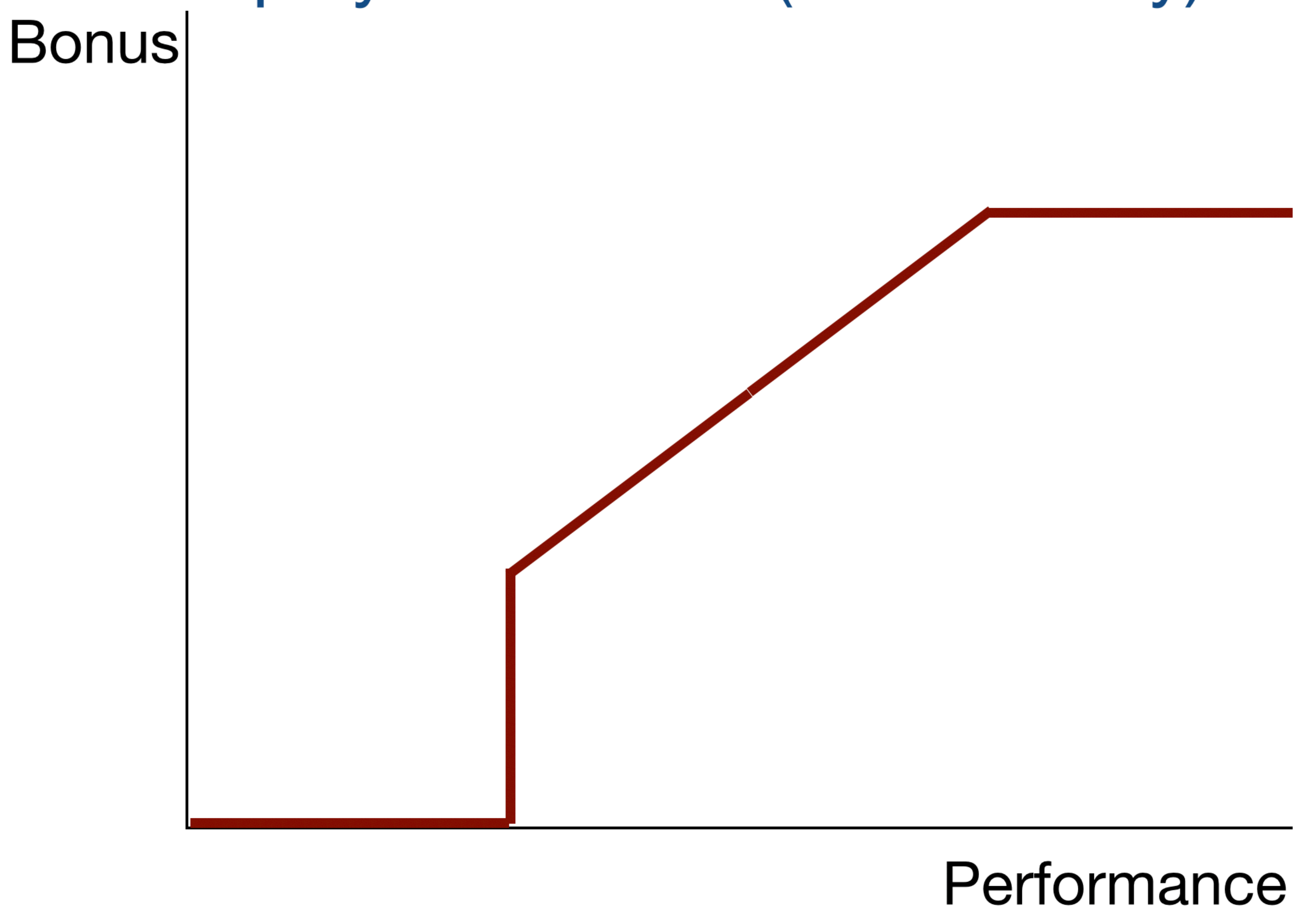
Why aren't you simulating stock prices directly (rather through a multiple of sales)?



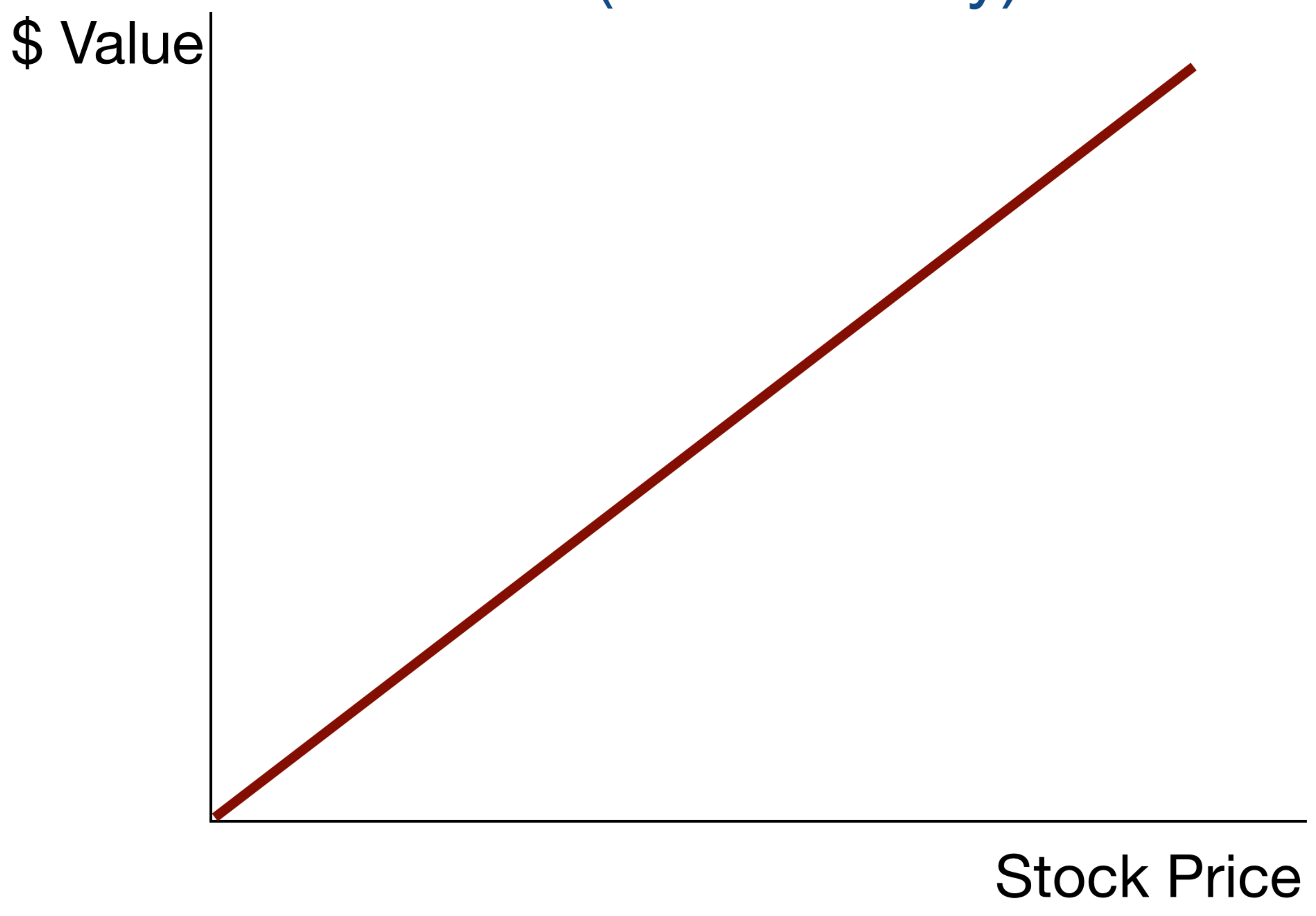



# Approach 1: Simulations

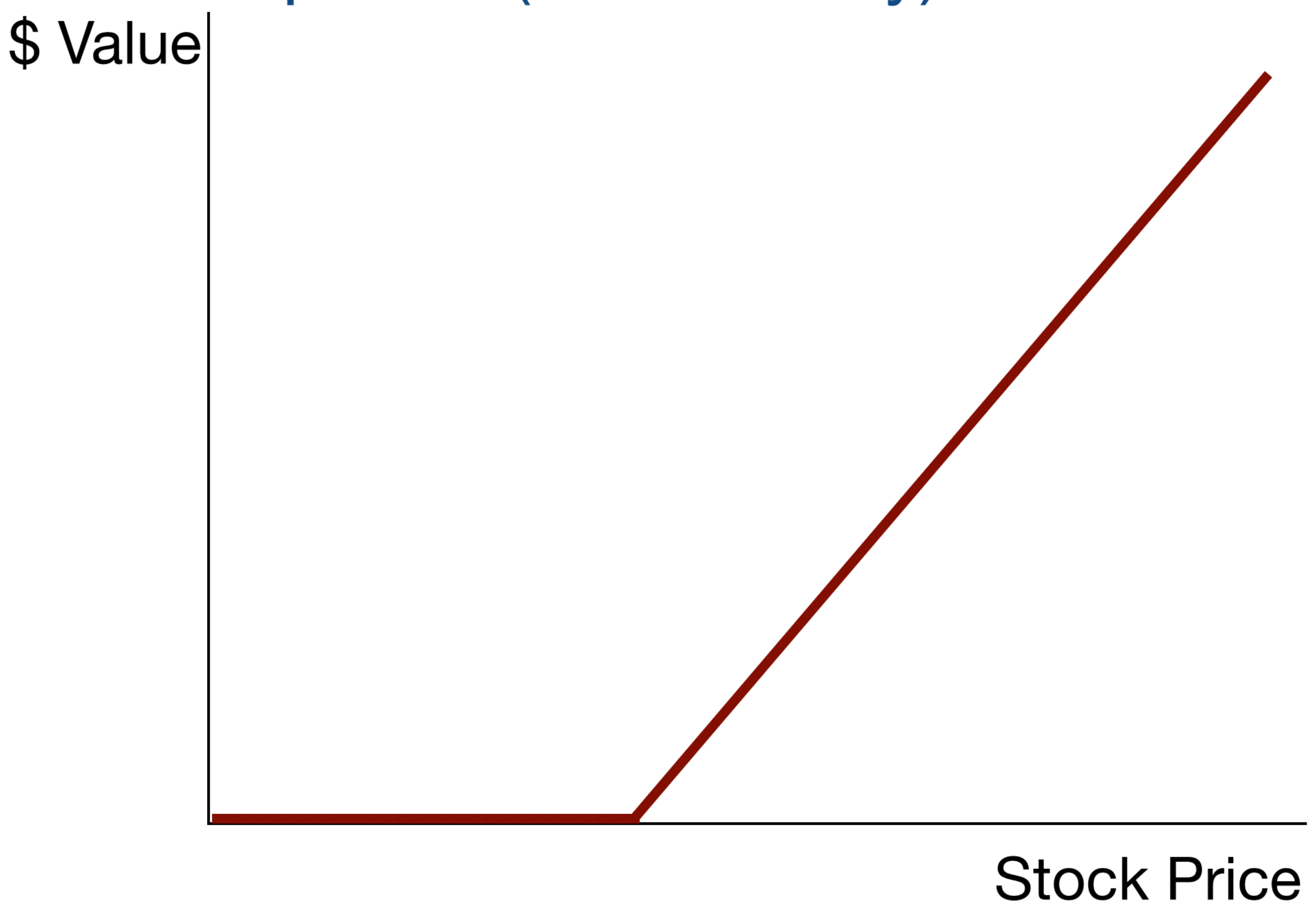
### Non-Equity Incentives (24% of Pay)



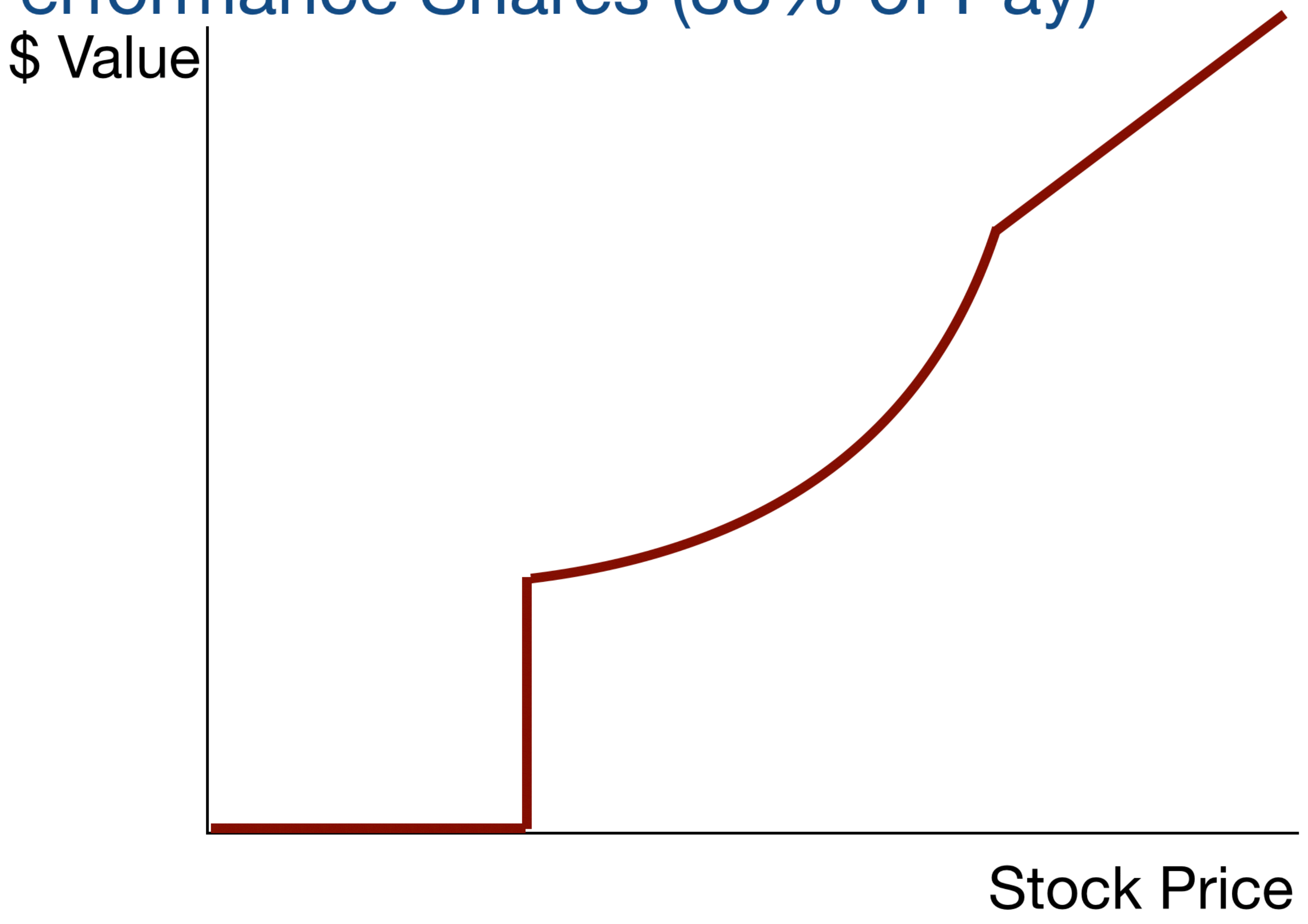

### Restricted Stock (15% of Pay)




### Stock Options (13% of Pay)




### Performance Shares (33% of Pay)



# Approach 2: Realized Var(TDC1)

Var[TDC1] is not the variance of realized pay

Mean[TDC1] is not expected pay

# Approach 2: Realized Var(TDC1)

Var[TDC1] is not the variance of realized pay

- CEO #1: Base salary of $1,000,000, no other pay
- CEO #2: Annual RSU grant of $1,000,000, no other pay
- Both have Var[TDC1] = 0, but CEO #2's pay is riskier

Mean[TDC1] is not expected pay

# Approach 2: Realized Var(TDC1)

Var[TDC1] is not the variance of realized pay

- CEO #1: Base salary of $1,000,000, no other pay
- CEO #2: Annual RSU grant of $1,000,000, no other pay
- Both have Var[TDC1] = 0, but CEO #2's pay is riskier

Mean[TDC1] is not expected pay

- Actual bonus rather than expected or target bonus
- Black-Scholes is not the "expected value" of options, etc.

# Approach 3: ARCH

# Approach 3: ARCH

Approach new to CEO pay, but not well described

Like approach #2, seems tied to TDC1 which is problematic

# Is Estimated E[Pay]/Var[Pay] Elasticity too low?

What is $\gamma$?

I suspect you have underestimated Var[Pay]

# Is Estimated E[Pay]/Var[Pay] Elasticity too low?

What is $\gamma$?

Modeled as Absolute Risk Aversion, discussed as Relative Risk Aversion

I suspect you have underestimated Var[Pay]

# Is Estimated E[Pay]/Var[Pay] Elasticity too low?

What is $\gamma$?

- Modeled as Absolute Risk Aversion, discussed as Relative Risk Aversion
- Can't estimate Relative Risk Aversion without some assumption on outside wealth

I suspect you have underestimated Var[Pay]

# Is Estimated E[Pay]/Var[Pay] Elasticity too low?

What is $\gamma$?

Modeled as Absolute Risk Aversion, discussed as Relative Risk Aversion

Can't estimate Relative Risk Aversion without some assumption on outside wealth

I suspect you have underestimated Var[Pay]

Which implies even lower elasticities than reported?

# Is Estimated E[Pay]/Var[Pay] Elasticity too low?

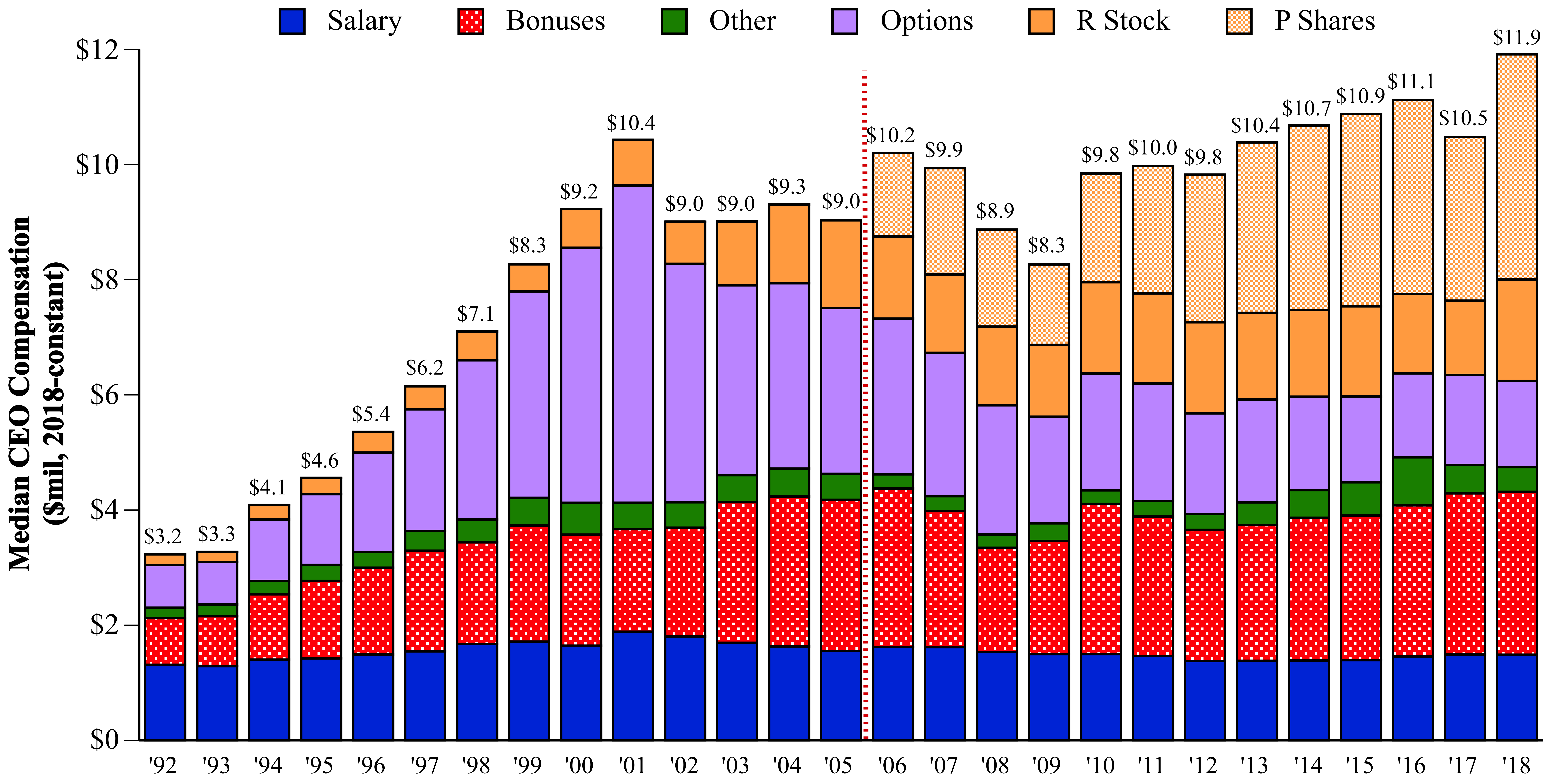
What is $\gamma$?

- Modeled as Absolute Risk Aversion, discussed as Relative Risk Aversion
- Can't estimate Relative Risk Aversion without some assumption on outside wealth

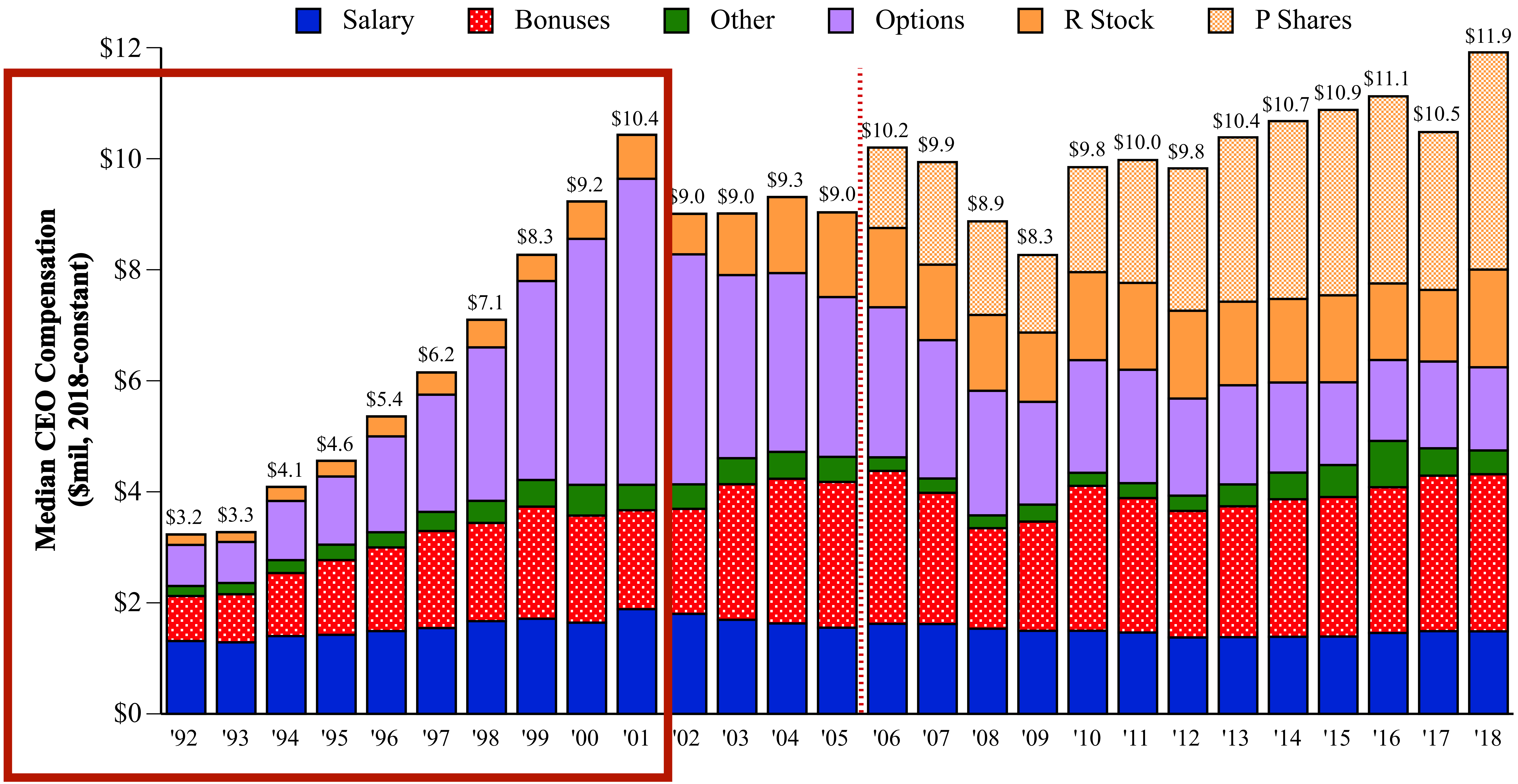
I suspect you have underestimated Var[Pay]

- Which implies even lower elasticities than reported?
- But, would a higher elasticity "confirm" the fundamental hypothesis?

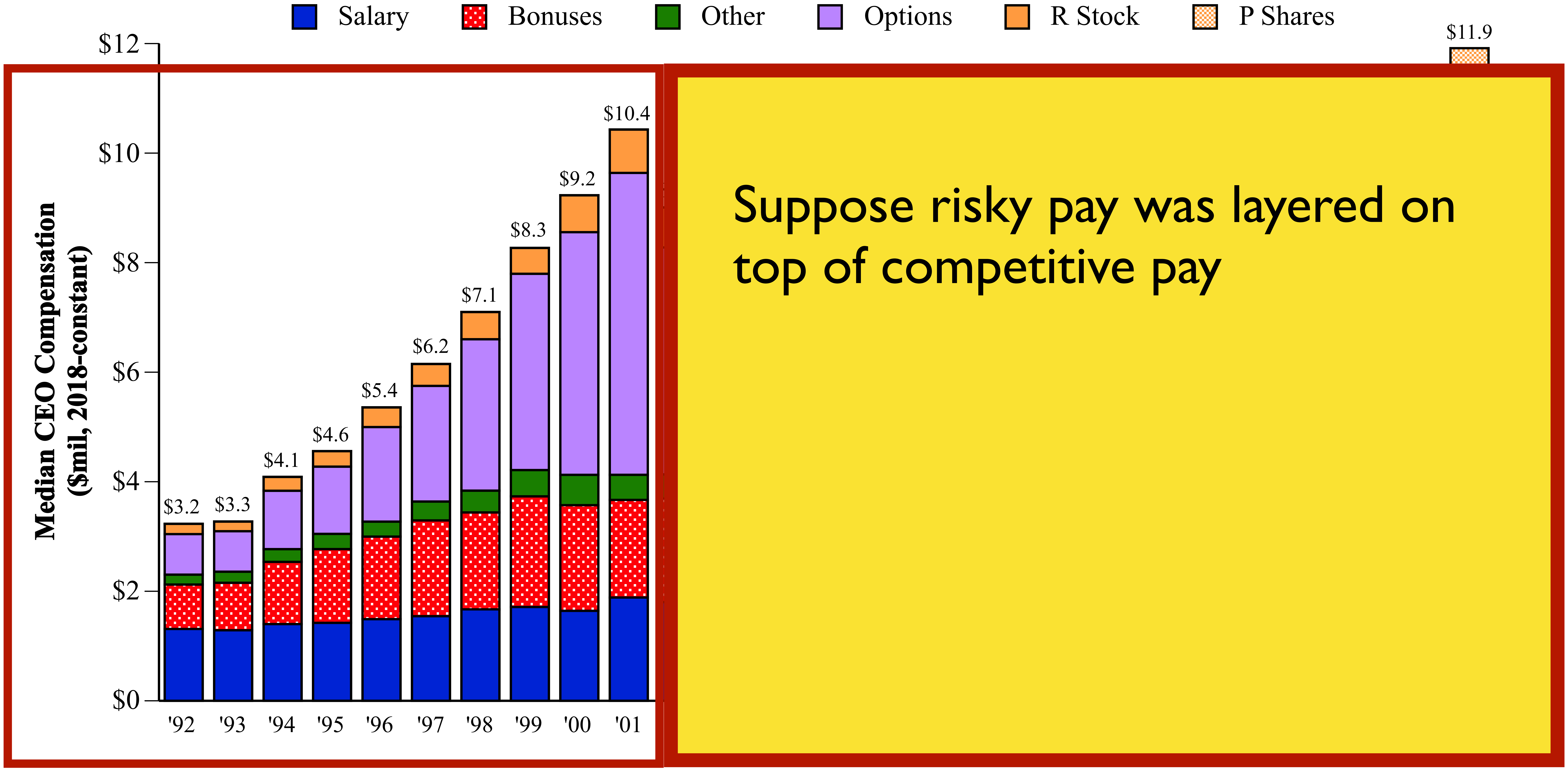
# Would a higher elasticity confirm theory?



# Would a higher elasticity confirm theory?

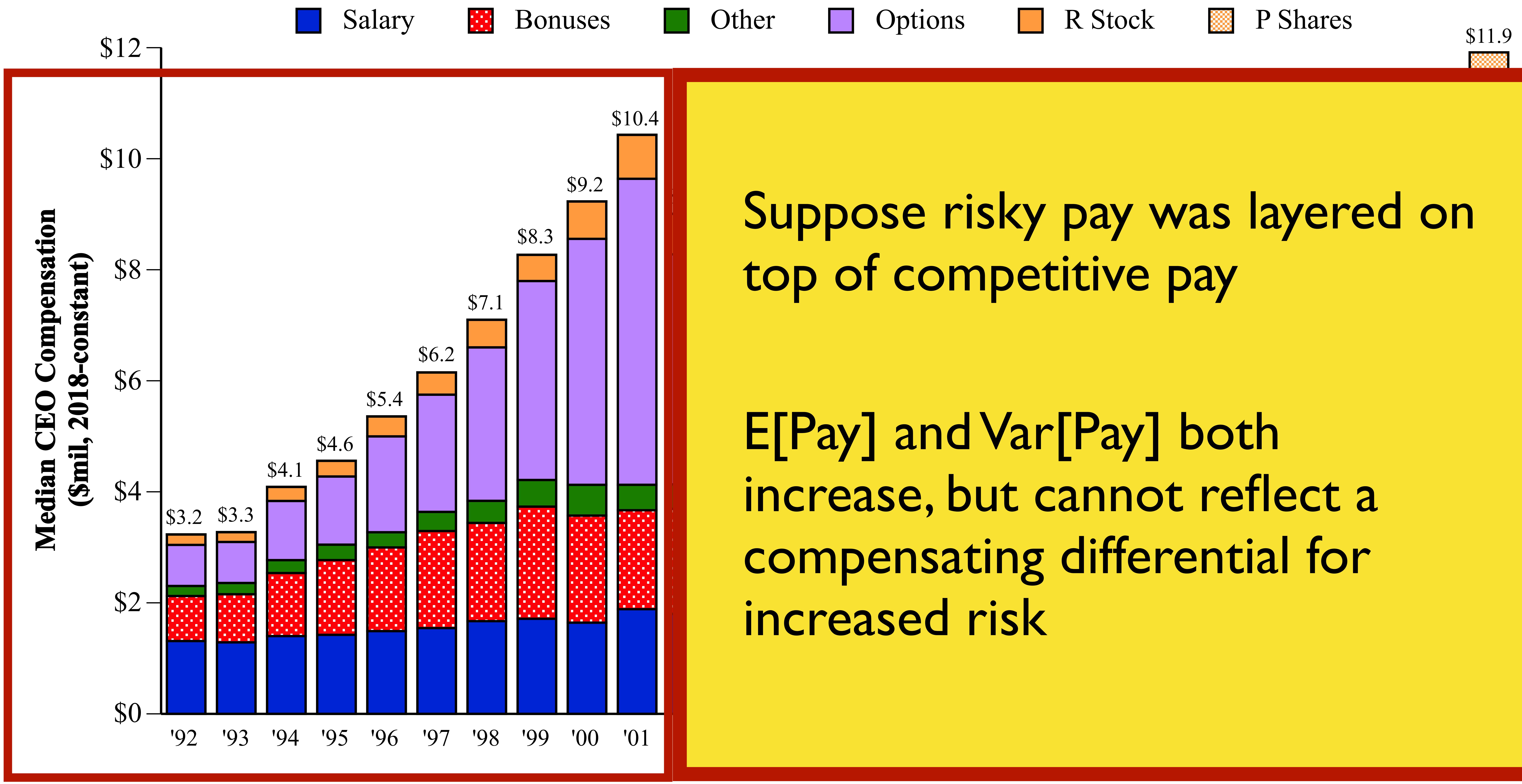


# Would a higher elasticity confirm theory?




Suppose risky pay was layered on top of competitive pay

# Would a higher elasticity confirm theory?




Suppose risky pay was layered on top of competitive pay

E[Pay] and Var[Pay] both increase, but cannot reflect a compensating differential for increased risk

# Evidence of Layering (Murphy-Sandino 2020)

$$\Delta E[\text{Total Pay}]_i = \alpha + \beta\Delta(\text{New Equity Grant})_i + \text{Controls}_i + \varepsilon_i$$

# Evidence of Layering (Murphy-Sandino 2020)

$$\Delta E[\text{Total Pay}]_i = \alpha + \beta\Delta(\text{New Equity Grant})_i + \text{Controls}_i + \varepsilon_i$$

Expect $\beta = 0$ under risk neutrality, and $0 < \beta < 1$ under risk aversion, with $\beta$ smaller for new RSUs than new options or performance shares

# Evidence of Layering (Murphy-Sandino 2020)

$$\Delta E[\text{Total Pay}]_i = \alpha + \beta\Delta(\text{New Equity Grant})_i + \text{Controls}_i + \varepsilon_i$$

Expect $\beta = 0$ under risk neutrality, and $0 < \beta < 1$ under risk aversion, with $\beta$ smaller for new RSUs than new options or performance shares

| | |
|---|---|
| Time-Lapse RSUs | $\beta = 1.476$ |
| Stock Options | $\beta = 0.965$ |
| Performance Shares | $\beta = 1.056$ |

# Evidence of Layering (Murphy-Sandino 2020)

$$\Delta E[\text{Total Pay}]_i = \alpha + \beta \Delta(\text{New Equity Grant})_i + \text{Controls}_i + \varepsilon_i$$

Expect $\beta = 0$ under risk neutrality, and $0 < \beta < 1$ under risk aversion, with $\beta$ smaller for new RSUs than new options or performance shares

| | |
|---|---|
| Time-Lapse RSUs | $\beta = 1.476$ |
| Stock Options | $\beta = 0.965$ |
| Performance Shares | $\beta = 1.056$ |

E[Pay] increases, but this cannot logically be a differential for increased risk

# Conclusion: Debunking Risk Aversion

Agency Theory is about the conflict of interest between principals and agents

# Conclusion: Debunking Risk Aversion

Agency Theory is about the conflict of interest between principals and agents

Most models *assume* that the conflict is due to agent risk aversion

# Conclusion: Debunking Risk Aversion

Agency Theory is about the conflict of interest between principals and agents

Most models *assume* that the conflict is due to agent risk aversion

This paper shows we should not take the models too seriously

# Conclusion: Debunking Risk Aversion

Agency Theory is about the conflict of interest between principals and agents

Most models *assume* that the conflict is due to agent risk aversion

This paper shows we should not take the models too seriously

I've suggested some "cleaning up", but I believe the results will hold and will be compelling